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Second Report of the Royal  
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Technical Instruction

T9(A).3.M816 — Vol. IV  
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No. 1-254

6816

SECOND REPORT  
OF THE  
ROYAL COMMISSIONERS  
ON  
TECHNICAL INSTRUCTION.

Vol. IV.

EVIDENCE, &c. RELATING TO IRELAND.

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Presented to both Houses of Parliament by Command of Her Majesty.

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T914).3. M812  
B2.485  
6816

LONDON:  
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1884.

[C.—3981.—III.] Price 2s. 10d.

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**DIGEST**  
OF  
**MINUTES of EVIDENCE in Vol. IV.**

*Evidence taken at Dublin.*

**DAWSON, MR. CHARLES, M.P.** Pages 1 to 5.

Means of acquiring accurate knowledge by operatives are exceptionally deficient in Ireland. Recommends compulsory primary education, including elementary technical instruction by certificated teachers. The voluntary system with State assistance is inapplicable to Ireland; the State should initiate. Drawing has been taught in some schools, but without practical effect on trades. New industries requiring little machinery or capital might be introduced for young people, e.g., wood carving. Messrs. Supple introduced glove making at makers' homes in Dublin, but gave it up, as the gloves when returned were generally soiled. Gloves are made abroad at artisans' homes, their families having learnt careful and cleanly working at school. Recommends that actual home industries (not only drawing, &c.) should be taught by the State as part of the school curriculum, but not so as to conflict with existing trades, 4563-6. There would be no difficulty in obtaining teachers for carpentry, tailoring, &c. but there would be for new trades, e.g., wood carving. Thinks there would be difficulty in finding men who could teach the principles of wood and iron work, as the present system of apprenticeship in large houses does not produce them. Whatever the Commission think necessary for England might well be applied to Ireland, subject to such increased monetary assistance as the exceptional circumstances of the latter might require. Refers to the secretary of the Bakers' society, who will give information as to the needs of that trade, 4567-71.

**MULLIGAN, MR. JOHN, and WEBB, MR. ALFRED.** Pages 6 to 17.

(*Mr. Mulligan.*) Both are members of Dublin Town Council, and joint authors of a report from that body, setting forth the absence and need of technical education in primary schools, 4572-6. Boys and girls look down upon manual labour. The wages earned during training are not sufficient to attract them, while the time occupied places manufacturers at a disadvantage in competition. Technical education should be given in primary schools. Believes parents would willingly keep their children at school longer for it. As secretary of an orphanage committee has had difficulty in obtaining employment for boys in factories, some technical knowledge being required. Lately has taught them drawing, reducing plans, &c., and many get good situations, 4577-84. In schools of 150 or 200, boys should be taught drawing, cutting patterns, distinguishing colours, &c., girls sewing, dressmaking, &c., 4585. Girls are taught sewing in Dublin schools, and some of the larger schools elsewhere, but not in country schools, 4586-8. It would be desirable, if practicable, to teach use of tools in primary schools, 4589-91. Doubts if in towns of less than 7,000 inhabitants skilled workmen could be found to teach. Drawing could be taught, 4592-7. (*Mr. James Winstanley.*) At Ennis, a town of 3,000 or 4,000 inhabitants, stone for a new bank had to be brought 60 miles, as there



MULLIGAN, Mr. John, and WEBB, Mr. Alfred—*cont.*

was no one there to dress it; labourers came about the same distance. Such instruction would be very desirable if practicable, 4587-801. (*Mr. Mulligan.*) The absence of manufactories, &c. in small towns makes it difficult to teach apprentices, and more profitable to employ, when required, workmen from large towns. If boys were taught trades it would enable them to get employment, not in their native towns, but elsewhere. Labourers come to Dublin from all parts of Ireland; cannot speak as to their relative capacity, 4602-6. In convent and some other schools girls are taught, but insufficiently, as nursery governesses. Suggests prizes for cookery, &c., 4607. Occasionally ladies give lectures for adults on cookery, but they are not practical. Suggests that girls be trained to teach cookery in schools, 4608-10. Evening schools, and especially science classes, are very desirable. A course of instruction by lecture and practice was started at the College of Science with success, but interest flagged and practical instruction was discontinued, 4611-3. There is a literary class and drawing classes in Marlboro' Street, the latter not of wide application, 4614. (*Mr. Webb.*) Agrees generally with Mr. Mulligan. Is anxious to improve the teaching in remote schools, 4615. Drawing should be taught in nearly all schools, and the general teaching should be more thorough. More attention should be given to attendance. Approves of Kindergarten system. Sees no difficulty in making education compulsory if the system were arranged in accordance with the wishes of the people, especially as to religious instruction, 4616-26. (*Mr. Mulligan.*) Precedent to compulsion education must be denominational. The population of a district may not be large enough to support two efficient schools, Protestant and Catholic. In these cases schools for the minority should be established by extra Government assistance, or, if the minority is very small, special safeguards—inspection, &c.—should be provided. No change in the general outlines of the present system is needed. Liberty should be given to the Christian Brothers' schools as to religious emblems, prayers, &c. The schools of Religious Orders should be made part of the national system. Nuns' schools are inspected, if part of the national system, and are under restrictions as to religious emblems, 4627-41. (*Mr. Webb.*) Schools receiving Government grants are required to obscure religious emblems during the time of secular instruction. This should not be. Compulsion would be much aided if schools of Religious Orders were recognized, and allowed freedom as to their religious methods, the grant being given on results of secular instruction. Free instruction should be provided for very poor children, 4642-7. (*Mr. Mulligan.*) Total abolition of fees, though not essential, is desirable. At present poor children must be excused, 4648-52. Instruction in manual work might advantageously be given in higher elementary schools, to which children should be sent as a reward for efficiency after two or three years instruction in primary schools. Payment by results of examination leads to neglect of the more useful, but less profitable, subjects, and to cram; recommends constant inspection, &c. Suggests that the model schools, which have generally failed because they were purely secular, be converted into denominational elementary technical schools, teaching science, drawing, use of tools, &c. adapted to local needs, 4653-61. Government should support the schools, and the districts from which the children come should provide their board and lodging, which they would do voluntarily by scholarships, &c. Only promising children should be admitted, who should enter at 12 or 13, 4662-3. These schools would at first be sufficient. It is not desirable that the intermediate schools should become such, 4669-70. If grant were given for it, the Religious Orders would, either by themselves or assistants, give rudimentary trade instruction in their schools, 4671-2. The inspection he suggests would cost perhaps twice as much as the present system, but increased efficiency would repay it. If payment by results be retained increased inspection would still be advantageous, 4673-4. (*Mr. Webb.*) Concurs, 4675. (*Mr. Mulligan.*) The science and art classes are not so numerous as they should be in Dublin, partly owing to apathy of the people, partly to want of arrangement by the professors, 4676-7.

MULLIGAN, Mr. John, and WEBB, Mr. Alfred—*cont.*

Extensive manufactories in Belfast lead more persons to attend science and art schools there than in Dublin. The advantages of the Science College should be advertised, 4678-85. 15 years ago the number of persons attending science classes was large, then it fell off, and probably there is now a revival. (*Mr. Webb.*) The large attendance at Belfast science classes is partly due to manufactories there, but largely to accordance of the people with the Government. In Dublin, although the Science College professors have done their best, young men think that by attending they would do something Protestant and not national. These institutions should be made more national, 4686-7. Suggests that science instruction be under some representative Irish board. (*Mr. Mulligan.*) If the secondary system were carried out foremen, &c. would go on to the higher college. Suggests that applied science be added to the curriculum of the 3 Queen's Colleges. There should be more schools for teaching butter making. Does not suggest that it be taught in primary schools. There is no education in net making and fish uring. (*Mr. Webb and Mr. Mulligan.*) Do not blame the professors at Cork in any way, 4688-90. (*Mr. Mulligan.*) Girls should be taught designing. They should be allowed to attend the College of Science and to take degrees in science. Cookery is not taught there, except by occasional lectures. Knows of no intermediate girls' technical school in Ireland that would serve as a model, 4692-4.

WINSTANLEY, MR. JAMES. Pages 18 to 20.

Is a wholesale boot and shoe manufacturer, 4695. Boys of 12 to 14 should be taught in elementary schools the names and use of the tools and something of the materials of their future trades. Trades associations might usefully provide such instruction, but have never attempted to do so. It would be difficult, owing to the large number of trades. Teaching the use of tools generally, and training the hand, would answer the purpose, 4696-709. Boys from Dublin schools a little above the national schools have a distaste for trades, and prefer clerkships, &c. Their education is too purely literary. Workshop instruction should be given in both denominational and national schools, 4710-4. Boys and girls should, in some way, be taught the elements of several trades; carpentry is often most useful, 4715-6. Apprentices in his trade should attend evening technical classes, 4717. Evening drawing instruction would be useful to them. They might learn drawing under the Science and Art Department, but do not from apathy, 4718-22. Science classes might become popular if schoolmasters and employers encouraged lads to attend them, 4723-4. Dublin artisans were prejudiced against the instruction and work in industrial schools, but the feeling is dying out, 4725-6. Girls should be taught in much the same manner, especially needlework. This is now taught in convent schools, 4727-8. If science classes were established in parts where workpeople live they would be better attended. At present there is a feeling that they are intended for a higher class, 4729-30.

DAWSON, MR. CHARLES, M.P., re-examined. Page 20.

Recommends that, in any reorganization of the national school system, functions similar to those of English school boards be conferred on municipal corporations. Is aware that science classes may be started without Government initiative, 4731-4.

SHACKLETON, MR. ABRAHAM, and SEXTON, MR. ROBERT. Pages 21 to 23.

(*Mr. Shackleton.*) Both are guardians of S. Dublin Union, and have experience of the schools attached to the workhouse, 4735. Technical instruction should be given in these schools. Only a small amount is

SHACKLETON, Mr. Abraham, and SEXTON, Mr. Robert—*cont.*

given now, owing to over-crowding from increase of pauperism relatively to population. New schools are about to be built. Gives numbers, &c. of boys at various trades. Some of the boys follow in after life certain trades there taught to them, and do well (*gives instances*), but in other trades the instruction is not sufficiently systematic or technical to be of much use. The permanent inmates (about 50) look upon the work as a task, and take no interest in it, and the remainder (about 70) frequently leave the school for a time and then return, 4736-44. The difficulties in the way of improved instruction are (1) want of space, (2) the necessity of employing paupers as teachers, (*Mr. Sexton*) who are unpaid, and therefore indifferent, 4745. In the new premises a carpenter's shop may be provided, but training as weavers or tailors could only be given by transferring the boys to some outside school, 4746. Does not know of elementary schools to which they could be sent if the workhouse schools were closed. (*Mr. Shackleton*.) Thinks there are such schools, but prefers to teach them in workhouse schools. If there were a large Christian Brothers' school in the neighbourhood, giving technical instruction they might be sent there. (*Mr. Sexton*.) It would be very advantageous, as removing them from workhouse influences. They now get domesticated at the workhouse, and many come back after leaving it. (*Mr. Shackleton*.) It is desirable that technical instruction (of which boarded-out children would get the advantage) should be introduced into elementary schools generally, and that workhouse children should be sent to such schools, 4747-52.

McKENNA, Rev. J. Pages 23 to 27.

The neighbourhood of his parish (Belleek) is replete with mineral wealth—best limestone and lead and iron ore—still the people lack employment. Attempts have been made to work the lead and iron, but have failed, though not from want of mineral lode. A company is about to begin work again, 4753-7. There is also felspar (the existence of which probably led to the establishment of the potteries), peat, and coal, 4758-9. Technical instruction is needed as a means towards establishing manufactures, 4760. Factories have been rather discouraged in Ireland. Has heard that a factory, completed 20 years since, was bought up and kept idle that it might not compete with England, and that a similar course was attempted with the Belleek pottery. The peasantry think that the English are jealous of Irish manufactures, 4761-8. The Belleek potteries are the chief industry of Ireland, artistically and commercially, 4769-70. Establishment of factories, &c. would do much for Ireland. At Belleek there is a large, peaceable, industrious, and intelligent population suffering from want of employment, with abundant opportunities for factories round them. Many have gone to America, 4771-3. Has under his management 6 national schools. Only literary instruction is given in them. Strongly recommends the teaching of different trades suitable to the district, 4774-82. Belleek has sufficient skilled workmen to provide instruction for the district. In more remote districts local workmen could not teach, but if sufficient wages were given teachers would come, 4783-8. Work-people for the potteries are trained by apprenticeship. Drawing is not taught in the schools. Its introduction is desirable. The Board supplies materials. Introduced it, but from lack of pupils was obliged to discontinue it. The Board would pay for teaching drawing, but teachers rarely care or are able to undertake it. Recommends that they be paid to teach it to both boys and girls. Has science in connection with the Science and Art Department, but no art teaching, 4787-98. In his last parish, science teaching in national schools was introduced, but abandoned in his own school, as it occupied too much of the teachers' time and attention. There is no science class at Belleek school, 4797-800. The agricultural classes are of no practical use, 4801. Would like to see children taught trades, e.g., pottery painting, or the making of book markers such as are made in Dublin by girls taught in convents, 4802-4.

**BLOOMFIELD, MR. FITZMAURICE.** Pages 27 to 28.

Payment by results leads, in national schools, to neglect of useful but unpaid-for subjects, and to the cramming of a few clever boys. More recognition should be paid to the general condition of the schools, and certain useful subjects paid for on results, 4805-6. Suggests instruction in agriculture, wicker work, &c. Sewing, &c. for girls is entirely neglected, the inspector being a male, and a bad judge of the work. There are no ladies in the parish to assist. Belleek pottery has improved the condition of the people physically, morally, and intellectually, 4807-10.

**CONNOLLY, MR. THOMAS.** Pages 28 to 33.

Is emigration agent for Government of Canada, 4811. Is a stonemason, and self-taught, 4812-5. Irish artisans have more natural genius than those of any other country, but lack aids to learning. The Science and Art Department does not reach the people, 4816-8. Drawing is as essential to workmen as reading or writing. It should be taught to all children in primary schools, first freehand, then (to those having aptitude) linear, and those who wish it might go on to art schools, 4819-22. Use of tools should not be taught. Such teaching would prejudicially affect the boys' future skill, and would not correct the desire to become clerks, &c., 4823-5. Children should be taught literary subjects and drawing in schools, and afterwards learn their trades in workshops and the principles underlying them in science and art classes. These classes do not reach the people at a sufficiently early age. Children should begin to attend them at 12. Does not know how far the rules of the Department meet the need of such early instruction, but it exists throughout the United Kingdom, 4826-30. In Ireland the facilities offered by the Department are not taken advantage of, because the people, not having been taught drawing in primary schools, know nothing of art or its uses. Suggests the establishment of reading rooms, 4840-4. There are in Dublin a mechanics' institute (which does not answer the purpose) and a few clubs, &c., but no free library, 4845-50. In the United States and Toronto, free libraries are established and supported by municipalities; would like to see the same thing in Ireland, but everything done there is for the benefit of people able to take care of themselves, and does not begin low enough. More public spirit is wanted. Agriculture cannot sustain the population; manufactures are needed, and their establishment would be greatly aided by reading rooms. A museum is needed, showing the products of the country and a collection of labour-saving machinery. There are many industries that might be made profitable (e.g., marble quarrying), and plenty of capital in the country, but public spirit is wanting, 4851-66. Cheap railways are required. The absence of the aristocracy has been a great drawback. The prospects of Ireland are now better, 4867-8. Technical education in the United States and Canada is less satisfactory than in the United Kingdom. Trades might be advantageously taught in reformatories, &c., but in the main can only be properly learnt in workshops, 4869-70.

**O'CALLAGHAN, MR. PETER VINCENT.** Pages 34 to 39.

Introduced the manufacture of straw envelopes for bottles, &c. 50,000l. worth were formerly imported annually from France. Has introduced simple apparatus for their manufacture; the French make them by hand only, 4871-5. Produces about 5,000l. worth annually at 20s. to 25s. per thousand, 4876-9. They are not made in England or Scotland. Cannot manufacture more largely, or for export, for want of capital. People will not make them at home for fear of fire, and he had not capital to take a large store. Capitalists have no confidence in the manufacture; it has not been put before them as a limited company, &c., 4880-6. In France they are made for export in convict establishments, &c. The French have bought straw in Ireland. Rye straw is the best; there is not much grown in Ireland, but plenty of barley straw adapted for the purpose and otherwise useless, 4887-92. Has invented machines for the manufacture, but as

O'CALLAGHAN, Mr. Peter Vincent—*cont.*

it must be largely worked to pay the expenses of a company, thought it best to spread it over the country and have it taught in schools before attempting to get up one. Gives an instance of its introduction, 4893-5. A skilful hand can make 8 dozen per hour, worth 3*d.* to 4*d.* per dozen, Materials cost about 7*s.* per thousand. Workers can earn 2*d.* per hour, 4896-900. At Blackrock, co. Dublin, the makers are paid 1*d.* per dozen and earn from 8*d.* to 1*s.* a day. At Skerries, where the selling price minus cost of straw is divided among them, they earn about 7*s.* per week, 4901-9. Where the manufacture has failed it has been from waste and the mixing of badly made articles with good. Undertakes the sale himself, and now refuses to sell unless all are good. At some places the Irish are now making them perfectly, and better than the French, 4910-7. The trade and demand is increasing. Has not introduced them into England from insufficient production, 4918-20. The rates of carriage (*mentioned*) are very favourable, but has to compete with foreign convict labour, 4921-2. The work should be taught in schools. The Board rules do not allow it either in the day or the evening, otherwise persons would be willing to teach it in suitable districts. Has been paid 1*l.* per day and travelling expenses for teaching it (which can be done in 2 days), and in some cases travelling expenses only, 4923-7. Will put in unsolicited testimonials as to quality of envelopes. Gives names of certain firms in Ireland using them, 4928-9. Small rewards for the best work, especially in schools, would stimulate the industry, 4930. Suggests that local authorities should, from rates, pay for teaching of suitable local industries, *e.g.*, marble quarrying, preparation of peat for litter, &c. Peat from Kildare, &c. is used successfully in Dublin stables. Sketches its preparation. As to cost of carriage, many vessels leave Dublin in ballast, 4931-41. For making straw envelopes prefers home work; the factory system, however, leads to better and cheaper production. Describes a mixed system. One set of the 3 machines used costs 18*s.*, 4942-7.

## BOJRKE, MR. RICHARD. Pages 39 to 45.

Is Local Government Board inspector, and landowner in Limerick and Tipperary, 4948-9. Industrial education might usefully be given in national and workhouse schools by private effort, with Government inspection, and perhaps payment by results. Government recognition would give local committees, &c. *locus standi*, and so remove difficulties. Sanction of National Board and patron should be required. The sympathies of patrons (mostly clergymen) should be enlisted, and, as a rule, if the committees were representative religiously and socially, their sanction would be given. Would grant the use of his own schools, 4950-61. The subjects taught should be chosen locally from a published catalogue. Suggests certain trades. Agriculture would be the chief thing, to teach which small farms must be attached to schools, 4962-4. Farms, varying in size, are attached to almost all workhouses, sometimes let for meadowing, but seldom for agriculture, 4965-8. The workhouse farms in 10 of the 14 unions in Limerick district are used for agricultural instruction, 4969-70. Two acres would be sufficient for national schools. There would be difficulty in obtaining teachers for some trades, but not for agriculture, 4971-3. The agricultural instruction at Glanevin has been profitable. Gives instances, 4974-80. Thinks there would be no difficulty in introducing the French system of teaching use of tools after school hours. If it were conducted by local committees a central committee in Dublin should give instruction to special teachers, whom it should pay and send out as required, 4981-7. Volunteers could in many places be found to teach domestic industries. Gives instances. They would be aided by the use of a public room. There might be difficulty in obtaining this in some districts, in his own none, as he has a large vacant house, but he would be much aided by inspection, payment by results, and some public recognition, 4988-93. Many of the national school buildings are fit for the purpose. They are improving throughout Ireland, 4994. Work-

BOURKE, Mr. Richard—*cont.*

house children are not sent to national schools, as the workhouse schools have more competent masters, but children boarded-out (a large and increasing proportion) are, 4995-7. Believes the Religious Teaching Orders would qualify themselves to teach manual labour, 4998. No lace-making is done in workhouse schools, but generally only domestic work, to avoid interference with outside labour, 5000. Country national schools, even in remote districts, show great improvement. Inspection under the National Board is very careful and general, and payment by results has stimulated masters, 5001-9. In remote districts there would be difficulty in obtaining teachers of domestic industries, 5009a-10. Mathematical and freehand drawing are not taught to any extent in national schools, 5011-2. If domestic industries were taught, the teachers must know something of design, and should communicate it to the children, 5013. Time might, with advantage to the literary work, be devoted to drawing in the ordinary national school hours. Voluntary teachers might be found, or, failing local assistance, the central society (not yet organized) might send down teachers, absentees proprietors subscribing to the expense. The association for obtaining employment for women would be a suitable organisation for taking up industrial teaching, 5014-8.

PERRY, Mr. JAMES. Pages 45 to 52.

His education and early career, 5019-23. Good primary education is most important. The salaries of teachers (about 50l. a year altogether) are not sufficiently high to retain good men. They should be appointed by competitive examination at higher salaries. The school houses should be simple, but of good workmanship. Where local workmen were not able to build them well, would bring tradesmen from a distance, 5024-34. Does not advocate technical instruction or use of tools as part of ordinary primary school course. Considers it very desirable to teach it after school hours to those desiring it, but doubts whether teachers could be found, 5035-8. This refers to rural schools. In large towns there should be technical schools supported and managed by Government. Being expensive they could not be numerous, and should only be established where evident need for them existed. They should have special reference to existing trades. The localities of particular trades are generally chosen for physical reasons, e.g., the linen industry became located in Ulster because of the soft water there, 5039-47. Government should determine the position of the schools with reference to existing industries. Names suitable centres, 5048-50. By technical schools means schools (not necessarily day schools) where apprentices could learn the science underlying their trades. They would be simply an advance on science and art schools, in which payment is by results and the teachers lack technical education, 5051-4. Would teach in them everything suited to the locality, e.g., would teach the science of weaving, not the practice, machine construction, &c., 5055-7. Would teach the chemistry of bleaching in a practical manner. Elementary chemistry should precede such special instruction, and theoretical mechanics should precede machine construction, &c., 5058-65. With certain exceptions, farming is not intelligently carried out in Ireland, the land being devoted to grazing only. Traces origin, &c. of present land system, 5066-9. Suggests establishment of model farms, 5070-3. In towns apprentices should be bound by indentures to attend the proposed technical schools, and masters to give them time for the purpose. Apprenticeship should be revived. Contemplates action by trades unions, but believes there would be some jealousy of technically educated men at present, 5074-6. Technical art education would be of great value to painters, 5077-8. Plumbers, both journeymen and masters, should know something of sanitary science and more than they usually do of hydraulics. Technical education should be provided by the State, and every man should have the same chance. Would, as far as possible, limit the instruction to principles, except in localities having special industries, 5079-83. The Royal University will not give a science degree to a man who has not graduated

PERRY, Mr. James—*cont.*

in arts, including Latin and Greek. There is also an age limit. Both of these restrictions should be removed, 5084-8. There is not much industry, fishing or otherwise, in county Galway. Recommends evening technical instruction, and the establishment in Galway of a higher technical school with practical teachers, 5089-90.

DAVITT, MR. MICHAEL. Pages 52 to 64.

Has acquired knowledge of Irish educational system, &c. by residence, inquiries, &c., 5091-2. Better primary education is required. The books used in primary schools are antiquated and unpractical, and the teaching backward. The supply of books should be thrown open to competition, and teachers' salaries (*mentioned*) raised. Control of schools by patrons is mischievous; they should be under elective school boards. Inspectors should be shifted more frequently. Employment of untrained monitors is another evil; all teachers should be trained for the work, 5093-9. This need not exclude the Religious Orders, who could be trained in their own colleges. Would insist upon proof of actual training as well as examination before granting certificates of capacity as teachers. The instruction given by the Christian Brothers is far superior to that in national schools. Believes they would qualify themselves for certificates, if they were paid by the State, and if the examination were in secular subjects only. If trades were taught in primary schools there would be fewer criminals, 5100-7. Recommends compulsory attendance at school. Provision would have to be made that the poorer tenant farmers, who require their sons' assistance at certain times, should not suffer; and Government should afford assistance in food and clothing for children in the poorest districts. Boards of guardians (reflecting the poverty of the country) have only to a very small extent supplemented teachers' salaries. This shows the need of further Government assistance, 5108-13. Agricultural progress is much retarded by general ignorance among the peasantry, while the absence of technical education places emigrants at a disadvantage. Recommends the teaching of general history in primary schools, and the encouragement of mechanics' institutes, which have been of immense value to English workmen. Dublin Mechanics' Institute is languishing from lack of external support; in other cities, &c. they are not generally attended by artizans, 5114-20. More attractive buildings and provision of libraries would increase the attendance. Knowledge of the conditions upon which building grants are made by the Science and Art Department should be disseminated. Increased Government aid to education would lessen crime. Suggests free science and technological lectures. In Irish-speaking districts these lectures and the instruction in elementary schools should be given in Irish. School teachers are insufficiently acquainted with that language. The model farms, which have failed as such, should be converted into agricultural colleges, 5121-32. Recommends apprenticeship schools, as at La Villette, 5133-4. Such schools should be encouraged by Lancashire manufacturers; competition now is a question of quality and design, *e.g.*, Belfast linen, from its antiquated designs, cannot compete with continental. For boys having no previous technical knowledge, factory training, with evening theoretical instruction in mechanics' institutes and by free lectures, would be better, but all boys should have general technical instruction in primary schools, 5135-6. Technical instruction, including use of tools, should be given as part of the regular curriculum in Irish primary schools, and the general education more directed to industrial pursuits, 5137-42. Teachers of technical subjects could be obtained if sufficient salaries were offered. Results fees have stimulated teaching in intermediate schools, but lead to cramming, 5143-5. American technical instruction is very rudimentary, but great industrial progress has been made there, 5146-8. The backward state of Western Ireland is due to poverty. The people are as intelligent as those of the East, and under similar circumstances in America become as good mechanics, but all Irishmen are at a disadvantage there as compared with the better educated Americans, 5149-57.

DAVITT, Mr. Michael—*cont.*

Each boy should be taught at school the elementary principles of his future trade, the instruction being first general, then specific. The books used in national schools are calculated to produce a dreamy rather than a practical state of mind. Good literary instruction is valuable as a preparation for scientific study. Instruction for children should be simple, but fables, &c. in national school books are useless, and even harmful, 5158-65. By assistance of Ladies Land League, enabled Miss Yeates to establish a cottage industry (needlework, &c.) at Carraroe with some success. Not speaking Irish she had some difficulty. The Bishop of Clonfert proposes to establish a similar industry at Loughrea, 5166-7. Suggests other home industries that might be introduced. A central association is needed to help the movement, 5168-70. The work done under Miss Yeates is sold in England, where it has to compete with factory work; it pays the girls, however, to do it, as they would otherwise be doing nothing, 5171-2. The teaching of plain sewing in national schools would assist such a movement; girls should be taught occupations in primary schools, 5173. Recommends more attractive buildings for, and provision of libraries at mechanics' institutes, 5174. The wealthy classes are antagonistic to the working classes, and the tradesmen poor, hence voluntary aid cannot be much depended on, but something might be got from many parties for the extension of mechanics' institutes if the Treasury would assist. There is a national objection to S. Kensington control of Irish educational matters, 5175-81. The character of Irish female education is determined by the wishes of parents, who desire accomplishments rather than practical usefulness. Recommends the teaching of domestic and lighter technical occupations, sanitation, and hygiene, 5181a.

O'REILLY, PROFESSOR JOSEPH PATRICK, C.E., M.R.I.A. Pages 65 to 66.

Has been secretary of Royal College of Science for 8 and professor of mining and mineralogy for 16 years, 5182-6. Numbers, nationality, &c. of day students there, 5187-99. Many of the Irish students have received imperfect preparatory education, 5200-1. In the evening classes, strictly scientific instruction is given to from 60 to 100 students (some artisans) in chemistry, physics, &c. Cannot say whether they have laboratory instruction, 5202-3. All associate students take the same subjects in the first year, then differentiate. There is no entrance examination. Preliminary instruction is given in mathematics to those requiring it. Previous knowledge of other subjects is not insisted on. Believes the manufactures class is unique, 5209-15.

HARTLEY, PROFESSOR W. N., F.C.S., F.R.S.E. Pages 67 to 68.

Course of instruction, number of students, &c. in manufacturing class at Royal College of Science, 5216-20. All associate and some other students pass an examination in theoretical chemistry, only his class in technical chemistry, 5231. A reduction of the course to 2 years would increase the numbers attending, at the expense of efficiency, 5232-3. No other institution gives similar instruction. The small number of students (3 or 4) is due to the fact that the training given in schools does not attract attention to science. Engineering instruction is given in Queen's Colleges, but the number receiving it at Trinity College is very small. Cannot say as to Belfast, 5234-7.

BARRETT, PROFESSOR W. F., F.R.S.E. Pages 68 to 76.

The number of day students at the Royal College of Science is small, but of evening students (130) satisfactory, considering the recent great excitement. (*Prof. O'Reilly.*) There is a strong prejudice against trade in



BARRETT, Professor W. F., F.R.S.E.—*cont.*

Ireland, from which, and from the competition of Trinity and Queen's Colleges, Dublin Science College has suffered. (*Prof. Barrett.*) Anything connected with trade is considered degrading, hence the large number of barristers, clerks, &c. (*Prof. O'Reilly.*) The College is an extension of a museum of Irish industry. It is in advance of other institutions in chemical apparatus, &c., and is therefore, although copied, regarded with jealousy and decried, 5228-30. (*Prof. Barrett.*) The evening classes do not work with S. Kensington. . . Sketches their history, subjects, attendance, &c. They have had beneficial effect on the subsequent careers of students. Laboratory instruction in connection with them is desirable, but with the present staff and apparatus impracticable, 5231-3. The classes are purely voluntary, undertaken by about half the professors. No subvention is received for them, and under the Science and Art Department rules the professors are unable to receive payment on results, 5238-45. (*Prof. Hartley.*) Science teaching is not sufficiently carried out in Dublin. The professors of the College are not allowed to receive payment on results, but have established an evening class (*Prof. Barrett.*) in their individual capacity. Some former evening-class students now teach Department science classes, 5246-9. Science teaching in Dublin has somewhat fallen back lately. Gives comparative statistics for England, Scotland, and Ireland. Physics is the most popular subject in Ireland, then agriculture, 5250-2. Geometrical drawing is not taught in the evening classes. (*Prof. O'Reilly.*) There is an easily remediable defect of light, 5253-5. (*Prof. Hartley.*) There is a demand for science teachers, some of whom attend the College (*gives instances*), but they prefer to go to London. There is no vacation course at Dublin for teachers, 5256-7. (*Prof. Barrett.*) Such a course would be advantageous, and would popularise the institution, 5258-60. Political prejudice may to a slight extent affect the attendance at the College, (*Prof. Hartley*) not at the evening classes. (*Prof. O'Reilly.*) Being under Government does prejudice the College. (*Prof. Barrett.*) The points against it are (1) insufficient primary education, (2) poverty of the country, (3) it is insufficiently known. Irish science and art classes earn higher payments on results per head than English or Scotch, 5261-3. (*Prof. O'Reilly.*) The evening class fees are only 6s. or 7s. per course. They are no obstacle to attendance, but the reverse. (*Prof. Barrett.*) When fees were lower attendance was larger. They are fixed by and divided among the professors. (*Prof. Hartley.*) The lower the fees the smaller the attendance, 5264-6. The evening classes, except those assisted by the Drapers' Company, are worked at a loss voluntarily by the staff. An increased grant from that Company has been applied for to enable increased instruction in mathematics and practical instruction in chemistry and physics to be given, 5267-9. (*Prof. O'Reilly.*) A few students in metallurgy and chemistry attend the City Guilds technological examinations, 5270-1. (*Prof. Hartley.*) The payments on results that could be obtained would be insufficient to maintain evening classes in applied chemistry, &c., 5273-4. There is a course of applied chemistry at the College, and a diploma is given in manufactures. There are courses in manufactures at 3 other institutions only (*named*), 5275-6. (*Prof. Barrett.*) Day students of physics receive some, but not sufficient, practical instruction, evening students of physics and chemistry none. It is desirable that they should receive some, 5277-80. (*Prof. Hartley.*) The evening classes might be improved by the introduction of mathematics and practical instruction. As many attend as need the instruction and can give time to it. (*Prof. Barrett.*) The attendance might be greatly improved and the country benefited if the classes were made widely known and opened at a small fee, and if scholarships at the day classes could be gained at them, 5281-2. (*Prof. Hartley.*) Science teaching is insufficiently encouraged by the Intermediate Board. The marking for science in its examinations is below that for classics and literature. (*Prof. O'Reilly.*) The intermediate examinations encourage cramming, 5283-91.

SCOTT, Mr. THOMAS B. Pages 77 to 85.

Is a cabinet-maker in Dublin, and a considerable employer of labour, 5292-3. Cabinet-making in Dublin is at a very low ebb owing to the importation of inferior but cheap furniture. A demand is now growing up for a better class of goods, 5294-6. All kinds of goods might, given trained workmen, be advantageously made in Dublin. There are few apprentices, and they, from the small variety of work done in the shops, learn but little. Large houses could make good articles cheaper than buy them, but few will risk the necessary capital, and trained workmen are difficult to get, 5297-8. Proposes to start a shop for boys in which they shall learn the trade. Employs machinery. This does not remove the need for good cabinet-makers, 5299-301. The boys would be employed in the shop during the day, and attend a drawing school under a practical cabinet-maker in the evening. Fairly educated men with a knowledge of drawing are the best workmen. Many workmen are uneducated, their parents not having, in many cases, compelled them to attend school while children, 5302-5. Compulsory attendance would, if practicable, be advantageous, 5306-8. Drawing, beginning with instrumental, should be an important element of school education; even a little knowledge of it gives a workman an advantage over others, 5309-13. Learnt drawing in London and also at schools of Royal Dublin Society connected with S. Kensington. There are other such schools, all within reach of workmen's houses, but the hours are not suitable for apprentices. Gives his apprentices facilities, but they will not attend, 5314-20. Boys should be taught drawing in elementary schools, 5321. In drawing schools special attention should be given to drawing adapted to the trades of students. Believes this is done in the Royal Dublin Society's school, 5322-5. Modelling in clay is taught there, 5326. After elementary drawing, cabinet-makers should be taught styles, 5327-9. If apprentices, &c. used the opportunities of learning drawing, &c. which are available they would be better off, but technical schools, attached to elementary schools, in which the boys should, after school hours, be taught use of tools and the elements of their future trades, would be advantageous and would shorten apprenticeship. Believes boys would enjoy the work, 5330-6. Ordinary schoolmasters could not give the instruction, but even in small towns artisans could be got to teach the trades required, 5337-47. Country lads so trained would readily find employment in Dublin, 5348-51. Can never get sufficient men. There are men, no doubt, but not suited to the trade, 5352. Has employed English and Scotch workmen. Irishmen are as good workmen, have as good natural taste, and are as easily trained, 5353-6. Would be glad to see something in Dublin like Finsbury College, 5357-8. Instruction in cabinet-designing should be given by teachers acquainted with the trade, and having knowledge of drawing. Persons acquainted with the trade could be found who could materially assist drawing teachers, 5359-68. Drawing classes in Dublin are not well attended by cabinet workmen and apprentices. None of his 40 or 50 men attend art classes. Does not see how prizes for cabinet-making would stimulate such attendance, nor how the classes could be made more serviceable to artisans, 5369-75. Drinking habits and improper dwellings are a great drawback. Believes temperance principles are spreading, 5376-8. The apprenticeship system has been practically broken down in England and Ireland. This has been a great evil in many trades. Many lads enter the cabinet trade without apprenticeship, and are kept making one article, and never learn anything. In some shops apprentices are bound for five or six years. Thinks it desirable, and not difficult, to revive apprenticeship, 5379-85. All materials and machinery for cabinet-making have to be imported, which puts Ireland at a disadvantage in competition with England, 5386-9. There is a fair demand for furniture, chiefly of cheaper classes, 5390-2. Wages are about equal to those in large English and Scotch towns, but Irish cabinet-makers work longer hours,—59 hours for 32s. 6d. to 35s. a week, 5393-4. Trades unions control the trade to some extent, 5395. There is plenty of teaching power of a mechanical kind. Mechanics' institutions are a great benefit, 5396-7.

xviii ROYAL COMMISSION ON TECHNICAL INSTRUCTION :

PIM, MR. JONATHAN, and PIM, MR. THOMAS, JUNIOR. Pages 85 to 88.

(*Mr. T. Pim.*) Agricultural produce might be increased and improved by technical education of farmers. The teaching of agriculture to schoolmasters at Glasnevin is a good movement. If they and the priests had such knowledge they might greatly assist the people, 5398-403. (*Mr. J. Pim.*) Technical instruction of his workpeople is hardly possible, from their deficient primary education. (*Mr. T. Pim.*) Some write and read badly, others not at all, and all are ignorant of accounts, 5404-7. (*Mr. J. Pim.*) If compulsory education be introduced, schools should be managed by the people. (*Mr. T. Pim.*) The country is ripe for compulsion if the people's religious views are met. Government should judge by results, 5408-10. (*Mr. J. Pim.*) In thickly peopled districts a large increase of schools would be required; such districts had better for the present be left out, 5411-3. The schools should be denominational (they are practically so now). There should be denominational training colleges for teachers, 5414-7. Would only establish school boards where the accommodation provided is insufficient. (*Mr. T. Pim.*) People will not willingly be taxed for education not in accordance with their views. The Nationalist party wish to introduce manufactures, but their views are crude. Some manufactures are increasing, e.g., woollens, which are largely exported. At the very successful Blarney woollen mills the foremen are nearly all English or Scotch. There was great jealousy of their employment, which is now dying out, 5418-25. The large supply of water and its quality are of importance, but steam power is used in most mills. Many small trades might be extended in Ireland; thus, the manufacture of brushes and wheels is successfully carried on 5426-7. Technical instruction in dyeing would be useful to manufacturers of poplin; the master dyers are imported from England or Scotland. The poplin trade has nearly died out from change of fashion, &c., 5428-32. Many small trades might be developed, but the people are indisposed to steady labour and are unsettled by politics, 5433-4.

KENNEDY, MR. TRISTRAM. Pages 88 to 93.

As agent of an estate in co. Monaghan built nine schools where lace-making was taught, and on leaving the estate continued his connection with the schools. Hands in statement of payments made, results, &c. The head mistress was paid 50*l.* a year, the other mistresses 2*l.*, and 4*l.* from the estate. A lady in the neighbourhood had held a lace-making class for a few years, so teachers were readily obtained. The central school at Carrickmacross is now a mixed school. Cannot say whether lace-making is now carried on in the schools. It is in the neighbourhood, and has considerably increased. Taught plain work first, 5435-48. Applied for the schools in 1847, and they were opened in 1849 as national primary schools, in which, after fair literary knowledge was gained, certain industrial instruction was given. The central school was for girls. The teacher's salary was 50*l.*, 5449-56. The lace-making attracted scholars. Prefers this system to compulsion, 5457-8. Plain needlework was taken in to prepare the children for lace-making. No other industry was taught, 5459-62. The lace-makers, when proficient, worked at home; no factory was established, 5463-5. An art school was established at which all children learning lace-making were taught drawing, 5466-70. Certain prize designs produced were worked (by combining parts of other designs) by children trained there, 5471-6. Does not know whether industrial instruction in the schools was continued after 1855. It was most useful, and was not objected to by parents or the Board. Cannot account for the system not having spread, if it has not. The girls earned but little at first. Gives statistics. The Board cordially co-operated with him. The national system is adapted for training girls, to whom his attention was chiefly directed, 5477-83.

ROCHFORD, MR. THOMAS. Pages 94 to 102.

Is a farmer, charitably interested in the establishment of local industries at Nenagh. Hands in circulars and report of committee on work done

RACEFORD, Mr. Thomas—*cont.*

5486-9. Give statistics. The straw envelope makers can earn 11 to 13 pence per day of eight hours, 5490-5. There is a good field round Nenagh for establishment of a woollen industry. A liberal grant is required towards the foundation of an industrial school and dépôt for home-made goods, under management of some religious body. Lack of employment is the cause of Irish poverty. This leads to insecurity, and drives away the capital necessary to give employment. English capitalists crush out any newly founded Irish industry by selling at a loss. Powerful local machinery, with liberal State aid, can alone cope with the evil. Small industries should be introduced by State aid. Government should issue a report, giving details of all suitable trades. Local committees should then be formed, who should select the industries suited to their districts, and establish technical schools for teaching them and dépôts for selling the produce. Government should make liberal grants and superintend the management. The committees would develop agriculture, woollen trade, &c., 5496. Private enterprise will not suffice to force industries; the State should do it, 5497. Technical schools should be founded by local committees with Government aid. In Nenagh there is great poverty, and in the district a number of small farmers greatly needing help. Gives size of farms, &c., 5498-506. There is much water power. The committee has 120*l.*, and proposes to establish a technical school teaching suitable trades (*mentioned*) and a dépôt for sale of work, under management of some religious body; hopes for Government aid, 5507-8. The envelope making is in abeyance. It takes a week to teach a child the work. Mentions other trades suitable to be taught in a technical school, *e.g.*, basket-making, for which osiers could be grown in the district. Advocates liberal State aid. In the West such industries are depreciated by insufficient railway communication, not in his district, 5509-15. No considerable attempts have been made to introduce basket-making. Agricultural education in primary schools is much needed. The small farmers generally till badly and have no stock, 5516-7. Was educated in Northumberland. Tried the experiment of feeding stock on cultivated crops with marked success. Suggests that, to educate farmers to see the advantages of this system, local societies be formed in connection with the Royal Agricultural Society, who should collect money and offer prizes. They should also, to enable farmers to avail themselves of the borrowing powers given by the Land Act of 1881, assist them in carrying out improvements. This would lead to increased tillage, and therefore increased employment, 5518. Approves of Lord Spencer's system of granting prizes to small farmers for best cultivated farms. Small prize farms would have more effect, as examples, than large, 5519-23. Agricultural instruction in primary schools is necessary. Plots should be attached to schools. Qualified teachers would be required. The teaching of agriculture at Glasevin to primary teachers is a good movement, 5524-9. Some agricultural instruction is given in primary schools, but not sufficient; the national school books are defective in this respect, 5530-1. Children between 12 and 15 should and would willingly receive such instruction, 5532-4. Glasevin is the only agricultural school. The present would be a good time to take the suggested measures. Farmers begin to show anxiety for knowledge. Has, under the auspices of the local society, offered prizes, 5535-8.

## MATHERS, Mr. CHARLES. Pages 103 to 105.

Is secretary to Bakers' Association. Desires that the men should be educated in chemistry. Many of the operatives share this desire, 5539-43. Being employed at night they could only receive instruction in the day-time, 5544-6. There are 600 members of the association, all of whom work at night. Many would avail themselves of opportunities of day chemical instruction; no other trade, except printers, work at night, 5547-50. Did not know of the Guilds Institute bread-making examination, 5551-3. Practical bakers could not, from want of chemical knowledge, give the instruction needed. A chemist would be the proper person, 5554-7.

XX ROYAL COMMISSION ON TECHNICAL INSTRUCTION:

MATHERS, Mr. Charles—*cont.*

There are bakers sufficiently intelligent to qualify as teachers. Could not himself afford the time. Would like the Commissioners to try to obtain instruction for such from some practical chemist, but thinks it better that instruction should be given by professional chemists than by workmen teachers, 5558-63. Has not attempted to obtain cheap instruction from any of the professors of chemistry. Given a teacher nothing more would be necessary, 5594-6. Attended with benefit lectures at the Royal Dublin Society, 5567-70. Suggests circulation of pamphlets, &c. to make the science classes generally known. Never saw Science and Art Department programmes, &c. circulated in bakeries, 5571-3. During his apprenticeship as a baker attended lectures, was given by his employer a ticket for the library, then attended the art school, 5574-5. Dublin Mechanics' Institute would be more attractive if better conducted. It is governed by an elected committee of subscribers, 5576-9. Science instruction is given there, which might be improved, 5580-2. Bakers could not attend evening lectures there as they work at night, 5583. The teacher should come to the association, which has adequate accommodation but no laboratory, 5584-7. Apprentices are bound for five years. The association does not teach, 5588-90. Dublin bread is very superior, 5591-2. Some bakers are deficient in elementary education. Calls attention to the impurities in flour, 5593-4. There was, but is not now, a masters' association, 5597.

KAVANAGH, PROFESSOR C. U. Pages 105 to 115.

Was an inspector of schools till 1858, and since professor at the Catholic University, 5598-9. Irish primary school houses built by State aid (vested schools) are in fair, some of those built by the people (non-vested) in deplorable condition. Quotes statistics. Only about one-third of the teachers are trained, and those only for from 3 to 10 months, nearly all, especially of the Roman Catholics, for the shorter period. The present training school is in Marlborough Street, but Roman Catholics, by decree of their bishops, do not attend it. Government now aid denominational training colleges, 5600-7. The training is entirely defective, but will be improved, 5608. Of those not trained in the training schools some few were taught in convent and Christian Brothers' schools, some have been pupils or monitors in schools. They must pass a lower third grade examination by the inspector, 5609-11. Describes the system of classification and promotion of certificated teachers, 5612-3. Untrained men may in many cases be good teachers. The trained teachers are mainly Protestants. Gives proportions and the numbers in various classes, 5614-7. The attendance is put down at 1,066,259, but this is greatly exaggerated by duplication, &c. The average attendance is 469,192. Does not believe there are a million children to go to school, 5618-26. The school age is taken for statistical purposes as 3 to 13. This is inapplicable to Ireland. The actual school age varies in different districts, 5627-30. Gives the proportion, &c. of children reading the different books of the series, 5631-9. The old books, which were much objected to by the people, were cancelled or recast about 18 years ago, and those now used are well graded and well designed to teach children, except that the higher do not contain enough instruction with regard to Ireland, 5640-3. Poetry, &c. cannot be kept out of them. They were revised 18 years ago, not since, nor is anyone appointed to revise them, 5644-9. Advocates free trade in school books, subject to State power of veto, 5650-4. Elementary instruction is unsatisfactory, and therefore little can be done in the way of technical instruction. A comparison of the proportion of children in different grades 10 years ago and now would seem to show slight deterioration, but is unreliable from special causes. Originally only literary instruction was contemplated, but the National Board, acting on advice, formulated a wide scheme of industrial teaching. Quotes from the Board's report for 1837 passages showing what was proposed. The scheme has entirely failed, 5655-60. Under it agriculture was somewhat developed, but scarcely any trade teaching started, 5661. Would retain agricultural instruction on farms of 2 to 5 acres attached to rural schools. Gives

KAVANAGH, Professor—*cont.*

numbers, &c. of model schools, &c., 5663-6. The larger State model schools were abandoned as unsuccessful, 5667-9. Elementary schools with attached gardens, under private patronage, have rather increased, and the prejudice against them has diminished, 5670-2. They are under the National Board, and earn fees on results of examination in agriculture by the inspectors. Numbers presented, &c. Several schools are otherwise connected with S. Kensington. Agriculture is not taught under the Intermediate Board, but certain science and art subjects are, though with small results, 5673-6. The Board has recently done good, *e.g.*, the introduction of science primers, &c. The teaching appliances in intermediate schools have much improved as the result of competition. Nautical schools were provided under the National Board. Only one now exists, 5677-8. Recommends compulsory attendance in Dublin, and perhaps in Belfast and Cork, but not in rural districts, where it could not be enforced, and would render education unpopular. The attendance is better than is supposed, 5679.

BARRETT, PROFESSOR; DICKINSON, THE VERY REVEREND DEAN, D.D. Dean of the Chapel Royal; LA TOUCHE, Miss; and MEYBICK, Miss. Pages 115 to 117.

Call attention to the need of a permanent institution for technical education of women. The Queen's Institute for teaching home and other industries to middle class women failed from mismanagement, *e.g.*, the addition of a literary school, 5680-9. Propose to have an institution, without a literary school, teaching various industries (*mentioned*), 5690-2. Rely largely upon voluntary aid, but some paid teachers would be required. Would work for all classes, but chiefly ladies. Such an institution is needed for women who, unable to attend primary schools from death of parents, &c., are called on to support themselves. Hope some pupils will obtain employment as technical teachers. Would teach simple subjects without aid, but hope for Government or other assistance in certain beneficial but costly subjects, *e.g.*, wood engraving. Do not propose at present to teach cookery [this has since been added to the list of subjects], 5693-705. Propose to restore the Queen's Institute (which was supported by Irish subscriptions) upon a proper basis. Would be grateful for Government help, 5706-8.

MURRAY, Mr. JAMES. Pages 118 to 121.

Represents Irish Home Manufacture Association. Describes its composition, &c., 5709-13. Referring to the tenth recommendation in his statement (App. K.), had in his mind the College of Science and the School of Art in Kildare Street, which have failed because working people thought they were intended for a class above them. Although the fees at those schools are lower, and the Government grants proportionately higher than in any other part of the kingdom, the results are less. Technical schools should be bright and attractive, or workpeople will not attend them, 5714-8. The impression might be removed by those interested in technical education. Unless a large effort be made (instances the annual grant of 5,600*l.* by Lyons municipality) technical schools cannot be usefully established, 5719-23. Will send suggestions as to Dublin Science College, mechanics' institutes, &c. (App. L.). There is great objection in Dublin to S. Kensington. Dublin Mechanics' Institute is altogether different from English mechanics' institutes, and had better be left out of account so far as technical education is concerned, 5724-33. Previous literary education should be required of those entering technical classes, but not previous technical instruction, 5734-7. Recommends a system of branch classes in working class districts, giving primary technical instruction as preparation for and under supervision of a higher central institution, *e.g.*, the Royal College of Science, 5738-43.

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CARROLL, Mr. THOMAS. Pages 122 to 125.

Is Superintendent of Agricultural Department of National Education and of Glasnevin Albert Agricultural Institution, 5744-5. Course of instruction, students, &c. at Glasnevin school, 5746-55. Munster agricultural and dairy school is also under direct management of the Board, with local assistance. Puts in papers employed at last examination there, 5756-8. Course of instruction, fees, &c., 5759-60. Besides these two schools there are 74 national schools (*situations mentioned*) with farms attached, whose teachers receive results fees for agriculture. The instruction, founded on "Practical Farming," by Prof. Baldwin, is given to boys of 10 and upwards. It can be effectively given to children of that age. There are also about 20 schools with gardens attached. Agricultural instruction is now compulsory in all rural schools, 5761-80. The theory of agriculture may be taught effectively in schools with no land attached. Agriculture is one of the subjects upon which national school teachers are examined and classified. There are classes for them at Albert Institution. Course of instruction in these classes, numbers attending, &c., 5781-90. School farms are cultivated at expense of teachers. Employment of pupils on them during school hours is forbidden, and would, if attempted, be resisted by the people. They are in some cases owned by the managers, in none by the National Board, 5791-4. There were formerly about 20 schools like the Albert Agricultural School, 5795-8.

KEENAN, Sir PATRICK, K.C.M.G., C.B. Pages 125 to 142.

The large agricultural model schools were gradually abandoned (1) for financial reasons originating with the Treasury, (2) from lack of pupils, 5798a. They were Government property, some of them held on leases for various terms, 5799-800. Does not recommend their re-establishment until the so-far successful experiment of bringing up national school teachers for agricultural instruction to Cork farm and the Albert Institution (a reversion to the original purpose of that institution), and also the rule rendering agricultural instruction compulsory in higher classes in rural national schools, have had a fair trial, 5801-3. The agricultural instruction in schools is not working quite satisfactorily. Gives statistics. The instruction of teachers at the central institution will tend to improve its efficiency, 5804-5. The teachers are sufficiently educated to profit by the instruction given them. They must pass in agriculture to obtain certificates. (*Mr. Carroll*) Hands in questions set to them at last examination, and gives numbers of marks obtained, &c. (*Sir P. Keenan*) The results fees for agriculture are now higher than those for any other subject, 5806-8. The Board has never attempted to establish day schools of the type of the Albert School, 5809-11. Describes a school-garden experiment at Glasnevin which was stopped by the Treasury, who are opposed to the agricultural system altogether. (*Mr. Carroll*) Such school gardens generally resulted in profit. Recommends day agricultural schools, students lodging in the neighbourhood, 5812-4. Agricultural teaching is compulsory in all rural schools under the Board. The number of schools with farms attached is comparatively small. Recommends increased fees for practical agriculture. There are now 2 sets of fees (1) for proficiency of boys, as tested by practical examination by witness, &c. on the farms (2) for results on the farms, 5815-21. Believes the system has increased practical agricultural knowledge in Ireland. Is at present the only inspector of agricultural schools. Gardens are examined by the literary inspectors, 5822-5. Means to recommend results fees for instruction of girls in primary schools in dairy work, &c. Girls are admitted to Cork Dairy School, 5826-7. The literary inspectors know agriculture, 5828-9. The productive power of Ireland is less than it should be, owing to the backward state of agricultural knowledge. The teaching of agriculture in schools would improve the people's minds and make them more intelligent generally, 5830-3. Lord Spencer's scheme of prizes for small farms might, if judiciously worked, do much good. It has been discontinued. (*Sir P. Keenan*) It was carried on at Lord Spencer's own cost

KENAN, Sir Patrick, K.C.M.G., C.B.—*cont.*

for 5 years only, which expired long ago, 5834-5. (*Mr. Carroll.*) No one else has taken it up, 5837. The Royal Agricultural Society has offered prizes for labourers' cottages, &c., not for best kept farms, nor are they likely to do so. The agricultural societies in Ireland are not so intimately and beneficially connected with the people as in other countries. (*Sir J. Lentaigne.*) Several noblemen give prizes for best managed farms, with good results. (*Mr. Carroll.*) The influence of a resident landlord or agent is even more useful than the prizes, 5838-44. Separate accounts are kept for the farm of Glasnevin. The profits have increased. Gives particulars. It is managed on generally applicable principles. Ensilage has been successfully tried. A large silo is being built, 5845-52. An extended system of home feeding would be very beneficial to Ireland, but, involving large outlay, must be introduced gradually. It is dwelt on in schools and colleges, and recommended in national school text-books, 5853-60. Explains objects of, and experiments in progress at, the experimental station attached to Glasnevin model farm, 5860a. (*Sir P. Kenan.*) Has been connected with the Education Department for 38 years, and is now Resident Commissioner of National Education, 5861-5. Puts in copy of memorandum to Lord Lieutenant on technical instruction. (*See 5942a*), 5866-8. Technical instruction should be part of ordinary school course for all, and especially for working class children; it should begin at a very early age, 5869-73. Hopes in a few years to introduce use of tools into all ordinary schools. All national school girls are now taught needlework, and their proficiency is very creditable; 94·6 per cent. passed in needlework, &c. last year. Useful work is not neglected for fancy work. Schoolmistresses are examined in needlework, cutting out, &c. Schools in which needlework was neglected would receive greatly reduced results fees, or none. The inspectors are competent; they are trained for their work. In certain cases they submit the needlework to a jury of ladies, 5874-83. There is no corresponding technical subject for boys except agriculture, which is limited to the highest 3 classes. Every boy's hands and eyes should be trained, 5884. Inquired into education in Malta, and found that certain occupations were taught in primary schools there, though, from lack of enthusiasm, &c., with little effect. Thinks handiwork instruction should be given in Irish national schools, and 6 or 8 weeks since commenced it tentatively at Marlborough Street School, 5885-8. It would not be practicable nor desirable to teach trades, but only "handiness," 5889. The Board would encourage voluntary teaching of trades, &c. by granting use of schoolrooms, &c. It has done so. Believes payment by results for handiness will be introduced, 5890-1. Something of the same kind may be done in schools of Religious Orders. Fine needlework, &c. is taught with great success in convent schools, 5892. The rule that no religious emblems must be exhibited while secular instruction is given prevents certain Orders, e.g., Christian Brothers, from placing their schools under the Board. It is necessary in order to render national schools available for children of all denominations, 5893-5. Over 300 convent schools receive grants from the Board. The Christian Brothers' schools were connected with the Board until 1836, then separated, to obtain freedom in religious matters and in choice of books and to escape official inspection. This separation militates against the comprehensiveness, not the efficiency, of the national system. Regrets it, 5896-7. Would not personally object to inspection by the Board's inspectors of schools not connected with the Board. Reformatory schools are inspected, but not by the Board's inspectors, 5898-902. Describes organization, duties, &c. of inspecting staff, and means taken to ensure uniformity of standard, &c. There is no rule as to the time an inspector shall remain in one district, 5903-14. The inspectors' reports for 1891 show improved results as compared with previous years. Gives statistics of illiteracy, founded on Census reports for 1841-81, for all Ireland and for certain districts, 5915-20. The number of children in higher classes shows considerable improvement, 5921. Payment by results has proved a great blessing, 5922. A modified system of compulsory attendance might



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KEENAN, Sir Patrick, K.C.M.G., C.B.—*cont.*

advantageously be introduced where sufficient means of education exist. Landlords should be compelled to give sites for schools, 5923-6. Payment by results has considerably improved teachers' salaries. The proposal that guardians should contribute has failed. Of over 180 unions only 22 contribute—about 11,000*l.* to about 1,000 schools, 5927-31. Gives average salaries of different classes of teachers, 5932. The English system of school boards could not be introduced into Ireland, 5933. Books other than those published by the Board are used under the Board's sanction in national schools. Political books would be objected to. No book published for the English schools has been objected to. Sketches contents of the lesson books in use. They are revised as opportunities occur, 5934-42. Trades may be fitly taught in industrial schools, &c., and in exceptional cases in rural schools. Every effort should be made to give children such instruction as will fit them for their future trades, 5942*a*.

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*Evidence taken at Belfast.*

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JÄFFE, MR. JOHN. Pages 143 to 144.

Trade, &c. would be benefitted by technical instruction of workmen, foremen, and managers. A committee of the Chamber of Commerce have collected funds for establishing a small technical school, beginning with weaving, dyeing, &c. Would include art instruction. The staple trade of Belfast is not flourishing. Improvements are needed to keep pace with the time. Technical instruction would lead to them, and further promote the recent development of the fancy trade. The School of Art has assisted this development. Technical instruction should be extended to all trades, 5943-6.

MUSGRAVE, MR. JAMES. Pages 144 to 159.

Is Chairman of Executive Committee for establishing a technical school in Belfast, 5947. Technical education leads to improvements in manufactures and the introduction of new branches and processes, *e.g.*, the Bessemer and Siemens processes of iron refining. Some of the best manufacturers are prejudiced against it from fear that it will make their trade secrets known. Many Belfast people do not yet understand the advantages of technical schools, 5948-9. The committee have already received funds for establishing a technical school. Will put in report on the scheme, and estimate of cost. (See 5996*a*.) The school will commence in a small way, teaching the processes of the staple trade, and working with the excellent art school, 5950-3. Chemistry is not much sought after. Knows only 2 manufacturers who have studied it; they lead in their branches of trade. Queen's College will be used to train teachers for the technical school, 5954-5. Hopes to have in the classes sons of masters, managers, and workmen, 5956. The classes for workmen will be held in the evening, as at the art school. They will be taught the practical science applicable to their trades, *e.g.*, for weavers, applied mechanics, weaving, and combinations of threads. Men constantly attending machines are the most likely, given sufficient intelligence and knowledge, to invent valuable improvements in them, 5957-63. Is large owner of property in co. Donegal, and has experience in establishment of home industries there, 5964-5. In his district there are the nuclei of several manufactures, *e.g.*, Donegal frieze and white flannel, 5966-7. Frieze and other manufactures would be developed by improved communications. The district has good natural harbours, 5968-70. Springing,

MUSGRAVE, Mr. James—*cont.*

stocking knitting, and glove making are carried on there, 5971-2. Recommends small technical schools to teach elements of handicrafts. Technical teachers should be paid on results by the National Board. A central school could be established for their training. The people should be taught chemistry practically, not by book only, 5973-3. Selected national school teachers or others might be sent to works for practical instruction in trades. Does not know that this has ever been done. The small funds needed for providing technical education in his neighbourhood must be supplied by the National Board; there are few wealthy residents, 5979-86. Boys under the proposed system should be taught carpentry, working in and properties of iron, and drawing; girls, knitting, needlework, plain and finer, and dressmaking. The instruction should be given in the evening. Use of schools could be obtained, 5987-91. A small pier has just been finished at Pulhurrin, lying at the base of a mountain of white freestone; this freestone might be quarried. The country is mountainous, 5992-3. One large room, fitted with simple appliances, could be adapted for teaching several industries. The people are not too much scattered to avail themselves of the instruction. Approves of travelling teachers, 5994-6. The reports, &c. referred to in 5950 follow here. After pointing out the progress and advantages of trade schools in other countries, and the probable effect of technical instruction upon the linen trade, the Committee (*names given*) recommend the establishment of a weaving school, teaching the theory and practice of weaving in all its branches, with departments attached for bleaching, dyeing, and printing. Art school students could here learn practically to adapt their designs for manufacture and chemical students to apply their knowledge to trade purposes. The co-operation of other educational bodies should be encouraged. The school should be managed by a representative council. The Committee recommend that a beginning be made on a small scale, and give estimates of the cost and proposals for meeting it. They hope that branches may soon be formed for other manufactures, 5996a. Then follows a report by the Secretary of the Committee on the technical schools of England and Scotland, describing the arrangements, cost, instruction, &c. at Huddersfield, Bradford, Keighley, Leeds, and Glasgow, 5996b.

## EWART, Mr. WILLIAM QUARTUS. Pages 159 to 168.

We have nothing to learn from the Continent regarding manipulation, &c. of flax. Cannot give statistics of imports and exports of linen yarns for 1881-2. Believes the exports have slightly decreased. A technical school would be advantageous as giving its students better opportunities, than apprentices in large mills have, of seeing the whole of the various processes. There is sometimes an indisposition to give information to apprentices, 5997-8. A technical school would be valuable to future overlookers as well as managers, 5999-6000. Those so trained would not have less control over workpeople than others. Opportunities of study at a technical school might lead to improvements in flax spinning machinery, which has been almost at a standstill, both here and on the continent, for 20 years. Looms have improved. The Irish are behind other countries in weaving, especially of fancy goods. The French are far superior in twilling and design of damasks. Linen must be made more attractive; it is being supplanted, 6001-4. A technical school, where different methods of weaving could be shown, would be of practical service. Science might improve bleaching by diminishing the time required and risk involved, and by utilising refuse. Designing has greatly improved, owing to the influence of art schools. Irish dyeing is very backward. Gives instances. Does not think dyeing should be taught in the technical school at first, 6005-8. Flax-spinning operatives are principally women trained from children in the mill; technical instruction would be of no value to them. It would only be useful to intending managers, overlookers, and flax buyers, 6009-12. Lads training

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EWART, Mr. William Quartus—*cont.*

for these positions should go to the technical school for a year or two before entering the mills. This would shorten apprenticeship, and render them more efficient. Evening attendance of those in the mills would be advantageous. Cannot speak as to the influence of the technical school at Lille, 6013-20. Continental protective tariffs place Irish linen yarns at a disadvantage in continental markets, and lower the prices obtainable in Belfast by enabling continental spinners to sell their surplus there at a loss, recouping themselves by the high rates obtainable in their own countries, 6021-9. The exports of flax productions to the continent have decreased. Gives reasons, 6030-3. The shorter hours of labour in Ireland are a disadvantage. Continental, and especially Belgian, flax spinners work too long, Irish too short, a time. The 56 hours now worked might advantageously be increased to 60. The increase would not injuriously affect the machinery. Before the working hours were reduced the spindles were driven as fast as they could advantageously be, so that the reduction in time represents a proportional reduction in output. The people did not generally desire it, and the masters opposed it. Cannot say how it has affected the wage-earning position of operatives. Irish spinners keep pace, in machinery, with continental, 6034-48. The social condition and comfort of the operatives have improved of late years, perhaps from increased thrift and general low prices, 6040-52. The machinery used is equal to that in continental mills, and the operatives and foremen are more skilful in spinning (though inferior in weaving), but not sufficiently so to compensate for the difference in the time worked (56 and 72 hours respectively) and the lower rate of wages on the continent. Believes the cost of production there is lower than in Ireland, but cannot get accurate information on this point, 6053-64. The trade has declined from decreased exports, but believes it cannot be entirely superseded, 6065-7. The superior artistic and scientific skill of continental masters and managers enables them to produce a greater variety of attractive goods, and so beat the Irish in neutral markets. Technical and art education is required to enable the latter to compete, 6068-74.

BEADE, Mr. E. H. Pages 168 to 170.

Is manager of an establishment embracing all branches of flax industry, 6075. Agrees generally with Mr. Ewart. Technical education will be of no value to operatives, but only to overlookers, intending managers, and owners' sons. The technical school will focus the processes, which cannot be so well studied in large mills. Overlookers are not selected from operatives, the latter being females. The instruction should be coincident with, as well as precedent to, practical work. The tenters, &c., having opportunities there of studying looms, &c., would be more likely to suggest improvements in the machinery, and perhaps the preliminary processes. The trade in plain linen goods having fallen off, fancy goods have been taken up. In this branch foreigners are in advance, and to it the application of science and art is desirable, 6076-9. Is member of committee of proposed technical school. Was member of deputation urging (unsuccessfully) a grant to Queen's College, for applied science teaching. The Irish are most behind continental manufacturers in dyeing and printing linen. The establishment of a dyeing school is of great importance, 6080-5. Overseers are specially trained by apprenticeship, not selected from the operatives, who are principally females, 6086-8.

BOYD, Mr. WILLIAM. Pages 170 to 171.

Is a practical flax manufacturer. Does not see how technical education could be of use to ordinary flax mill operatives. Overlookers are trained as such from boys; for these boys only would the technical school be of advantage. They would and could with advantage attend evening but not day classes. The factories are mostly within a two miles radius. Agrees with Mr. Ewart and Mr. Beade as to the importance of the weaving school. More variety must be introduced, 6089-99. A technical

BOYD, Mr. William—*cont.*

school will stimulate the trade, otherwise its present decline (*instances given*) will go on, 6100-1. There is great want of technical education among mill boys, consequently the trade suffers in competition. They should be taught mechanical drawing and mechanics, 6102-6. There is a good school of art in Belfast, 6107-8.

## NELL, MR. THOMAS. Pages 171 to 172.

Is a weaving manager. Hand-loom weaving is dying out, and, as this is the best training for power-loom weavers, a technical school is required where it could be practised by future overlookers, 6109-16.

## PORTER, DR. J. L., D.D., LL.D. Pages 172 to 176.

Is President of Queen's College, Belfast, 6117. Instruction in natural philosophy, mechanics, and chemistry is most important for masters and managers of mills, &c., and Queen's College is prepared to give it, but increased accommodation is needed for teaching these subjects and also engineering. Mentions certain advantages that would follow from such instruction, 6118. The college has no evening classes, so purely technical instruction would have to be given elsewhere, but it would train teachers and act as a higher department of the technical school, 6119-21. Has visited certain technical schools in England and Scotland. The facilities there, but not the teaching power, are superior to those at Queen's College, Belfast. The great chemical school at Glasgow revolutionized manufactures, as regards dyeing and chemistry, in west of Scotland and north of England, 6122-4. Queen's College should be extended and laboratory accommodation increased by Government grant, to enable instruction to be given to teachers and to managers of bleaching and dyeing works, &c. Such increased facilities would have a very beneficial effect on manufactures, &c., 6125-30. Facilities for obtaining elementary instruction are as great in Belfast as anywhere in Ireland. Instances the Sullivan school—partly intermediate, with endowments, 6131-2. The national schools give sound useful instruction, but the children should be taught handiness. This is beginning to be taught. More attention should be given to drawing, both freehand and with instruments. Science should be taught both by object lessons and methodically, and, as far as possible, practically. Attendance should be compulsory from 4 or 5 to 15. This would be opposed, but is practicable, 6133-41. Workshop instruction, in connection with elementary schools, should be given to children showing aptitude. It should not be introduced into all schools, and should not commence until fair elementary education has been acquired; the age would vary, 6142-5.

## McCANCE, MR. HENRY. Pages 176 to 179.

Is manager of a flax spinning mill. Agrees with the greater part of the evidence he has heard. Flax spinning in Ireland is equal to that in continental countries—in finer qualities is far superior. Continental spinners can compete in lower counts in their own and Irish markets (*given reasons*), and in neutral markets when yarns sell at not less than 4s. per bundle, 6146-60. Lille spinners cannot produce yarn at a lower price than Belfast spinners. The latter can drive their spindles at much higher speed than the former. A great advance has been made in Belfast both in speed and machinery, 6161-3. The machinery used is for the present in a satisfactory position. Primary education is becoming so good that children entering mills will soon be more educated than the overlookers, 6164-5. Recommends that employers encourage overlookers to attend technical classes and give preference for employment or promotion to those who have so attended, 6166. The classes should be held in the evening. Was last year examiner in linen manufacture for the City Guilds Institute. No candidate from Belfast was examined, the men thinking that attendance at a class was a necessary condition. Would like this impression removed. An examination in spinning, and the

xxviii ROYAL COMMISSION ON TECHNICAL INSTRUCTION :

McCANCE, Mr. Henry—*cont.*

certificates obtained, would be an advantage to overlookers. Believes they would generally avail themselves of increased facilities for technical education, 6167-72. The technical knowledge of those examined was very small. Instruction in evening classes would be of benefit to present and intending overlookers, 6173-5. Spinners and weavers should be taught mechanical drawing and chemistry. The science underlying spinning is imperfectly understood, 6176-8. Believes French spinners are better informed scientifically than Irish, but lack energy. Their overlookers and managers are not better educated on the whole, 6179-80.

McBRIDE, Mr. ROBT. Pages 179 to 182.

Is well acquainted with linen bleaching, 6181. The process is much the same as it was many years ago. He and his predecessor have tried to introduce improvements, but with little success. Bleaching in Ireland is very unsatisfactory. Few master bleachers know enough chemistry, and they and their managers and foremen lack practical and scientific knowledge. Foremen work by "rule of thumb," but with fair success; with scientific knowledge their success would be greater. Does not think they would attend science classes, but the rising young men would, 6181-7. Doubts if master bleachers would assist young men to attend the technical school; they try to preserve trade secrets, mostly not worth keeping. Bleach-greens being scattered over the country, it would be difficult for young bleachers to attend a technical school at Belfast. They might attend before beginning work, and, having obtained a good basis of chemistry, apply and increase their knowledge afterwards, 6188-92. Irish bleachers have climatic advantages over their foreign rivals. The demand for pure white colour in fine fabrics is increasing, and in these the Irish bleachers compete successfully, but are not in a satisfactory position; in coarser goods continental bleachers nearly equal them, 6193-7. Continental bleachers use more roller-washing than Irish, otherwise their machinery is largely the same, and they are not far ahead in the application of science to bleaching, 6198-200. Irish bleachers can compete successfully, but cannot meet the demands made upon them, 6201. Master bleachers would be willing to allow their apprentices, &c. to attend classes on the subject, and scientific knowledge would be very useful, but distance would be a difficulty. It would be better that lads should be educated before commencing work, 6202-5.

EVERETT, PROFESSOR J. D., D.C.L., Ph.D. Pages 182 to 183.

Is Professor of Natural Philosophy at Queen's College, Belfast, 6206. There is a course of, and, degree for, engineering. With present staff evening classes could not be established, nor much additional technical education given. Agrees with Dr. Porter as to value of College for giving higher instruction and training teachers. A laboratory for practical training is needed. Would require an assistant, 6207-9. Managers in every branch of manufacture should have thorough training in kindred branches to enable them to make improvements, 6210.

LETTIS, PROFESSOR. Pages 183 to 185.

Is Professor of Chemistry in Queen's College. Differs slightly from Dr. Everett; agrees with Dr. Porter. Has taught chemistry of woollen industry at Bristol, and seen effects of science upon that industry. Technical education is much needed in Belfast. Few manufacturers' sons, &c. attend the College. Mentions a case in which study there has led to valuable practical results, 6211-2. Manufacturers are beginning to realise the necessity of using existing facilities for technical education. Not many send their sons to other colleges or to Germany for training, 6213-6. Employers in Belfast do not sufficiently appreciate scientific knowledge, hence the lack of improvement in the linen industry. The course of lectures at the College is perfectly full, but laboratories are

LETTIS, Professor—*cont.*

wanting, 6217. There are no technical chemistry lectures, but would be if there were a demand and facilities for them. There are no better students than those of Belfast, 6218-20. Dyeing could be better taught in a technical school than at the College. Is not acquainted with Leeds Dyeing School, 6221-2. A dyeing school at Belfast would be of great value. Ordinary chemical instruction, with practical teaching in the works, would not be sufficient, 6223-4. There is little systematic application of science to the linen industry, and no facilities for teaching such application in the district, and therefore Belfast is at a disadvantage. The manufacturers there do not appreciate the advantages of scientific education of all classes, 6225-30. Had a class at Stroud, at which masters and managers attended with valuable results. Few operatives attended, 6231.

## PORTER, Dr., and several other Professors of Queen's College, Belfast. Pages 186 to 187.

Full instruction in practical chemistry cannot be given in Belfast from want of accommodation, &c.; students therefore go to the Continent for it. There are about 200 chemical students, and only accommodation for 15 at a time for practical work, 6232-4. About 600*l.* a year is spent on the library; more could be profitably spent, 6235-7. Students pay about 10*l.* 10*s.* first year, and 8*l.* 10*s.* per annum after, 6238-9. The College receives 8,600*l.* annually from Government, 6240. There are certain scholarships (*described*). About 500*l.* a year is received from private endowments, 6241-4.

## BARKLIE, Mr. ROBERT, F.O.S. Pages 188 to 198.

In science master and Educational Superintendent of Belfast Working Men's Institute, 6246. Describes origin, management, &c. of the institute. Introduced and manages the science teaching there, the institute providing rooms, &c., 6247. Science classes held, number of students, &c., 6248-50. To a question why sons of artisans in dye-works around Belfast do not attend, replies, that there is only one large dye-works in the immediate neighbourhood. Fears that the foremen of dye and bleach works (who work mechanically, aided by old receipts) are jealous of the apprentices' knowledge and discourage their attendance, and that masters are not alive to the advantage of encouraging the classes, 6251. There are certain exhibitions from the classes, 6252. Belfast merchants willingly subscribe for prizes or for a local exhibition. Many of the exhibitors have obtained high prizes; the present holder gained highest position in chemistry at the Royal College of Science last year. Fears he will not obtain employment in Ireland, positions in which he would be of use being usually filled by selection from those already employed, who are generally without scientific knowledge, 6253-7. Manufacturers are beginning to appreciate scientific training, 6258. The institute classes have laid the foundation of the feeling in favour of a technical school, to which they would form an introduction, 6259-60. There are certain classes (*named*) connected with the City Guilds Institute. They are not very successful. Gives reasons. A technical school, where the actual machines used in trades were at work, would enable students to obtain a better knowledge, than can be obtained in the works, of the processes as a whole, 6261-3. There has been great difficulty in obtaining technical teachers, 6264. The young men and artisans of Belfast are anxious for, and sufficiently educated to receive, technical instruction; it would greatly benefit the trades of the district. In the linen trade it is especially required, as masters, managers, foremen, and workmen are generally ignorant of the scientific principles of their work. Masters' sons are not receiving better training; the best training now given is that received by apprentices, 6265-71. Suggests employment of organising masters by City Guilds Institute, 6272. The number of students in the technical classes has

XXX ROYAL COMMISSION ON TECHNICAL INSTRUCTION:

BARKLIE, Mr. Robert—*cont.*

increased, but is comparatively very small (33 only), 6273. Technical teachers might receive a short course of instruction on the plan of that at S. Kensington Science College. Technical education cannot be given at Queen's College, Belfast, under its present system, 6274-5. Some foremen and others attending technological and science and art classes do not like to compete in examinations with apprentices, nor to study with them, hence teachers lose results fees. The same applies to other towns. This would be largely remedied if employers were to encourage, not insist upon, their attendance at classes and examinations, 6276-80. More prizes are not required. Merchants have contributed liberally for prizes and local exhibitions. There is one exhibition each year. A prize for technology would encourage attendance at classes and examinations. Has suggested it, 6281-4. The teaching at Queen's College is at present almost worthless for trade requirements, but could be easily adapted to them, 6285-7. Sees no reason, other than lack of technical education, why the linen trade is not progressing, 6288-91. Primary education in Ireland shows decided improvement, 6292-3. Compulsory attendance is practicable and would be generally acceptable, 6294-5. Children of 13 or 14 should be taught agriculture in rural districts, and elementary science adapted to district industries in towns, irrespective of the standards they may have reached. The present rule confining extra subjects to those who have reached the fifth standard is prohibitory. Science classes in towns have done great good by training rural teachers in agriculture. Farmers' sons sometimes attend them, 6296-304. The elementary education in girls' schools is good. Sewing, &c. is taught. Cookery might with advantage be introduced, 6305-8. The intermediate system has not done so much good as was expected. It has led to the establishment of few new schools and has not reduced fees in old ones. The results fees are paid on examinations only; thus schools present and receive fees for students who have not been taught in them. This applies to the whole of Ireland. The examinations should be put on the same footing as those of S. Kensington, 6309-14. There are very few appliances for science teaching, and in many cases no science teachers, in intermediate schools. The children go to other science teachers, and the intermediate schools take the results fees earned, 6315-20. The schools are not available for the better class of artisans, &c., the fees being too high (about 1*l.* 1*s.* per class), 6321-4. There are no higher schools to which promising elementary scholars might be drafted, and only one or two scholarships from primary to intermediate schools, 6325-7. Flax-growing is not specially included in the Science and Art Department's agricultural examination. The teachers of agriculture are thoroughly qualified, and the teaching good, 6328. The weekly lecture at Glasnevin to teachers in training is insufficient, 6329-30.

MACILWAINE, Mr. JOHN. Pages 198 to 201.

Is engaged in shipbuilding and marine engineering (which have recently much increased) in Belfast, 6331-2. His apprentices, &c. attend science classes with benefit; suggests that employers should give advantages to successful students, 6333-6. Engineering has much advanced in Belfast in the last 10 years. Gives particulars. Recommends better education of engineers. Shipbuilding can be learnt in the works only, 6337-8. The technical school would be a great advantage to all trades. Preparatory evening schools, teaching arithmetic, mathematics, &c., would also be valuable. Recommends classes in the technical school for shipbuilding draughtsmen. Does not think Belfast shipbuilders would start them, but understands the Government think of introducing a system of examinations. As the community are taxed for national education, they might be for educating apprentices, 6339-45. Does not advocate teaching of handicrafts, but only such subjects as arithmetic, mathematics, &c. Marine engineering is attracting a superior social class, who attend science and drawing classes, 6346-7. Mentions Germany as a

MACLWAIN, Mr. John—*cont.*

probable competitor in shipbuilding. Knows of no other. Cannot give information as to cost of work or methods of instruction there, 6348-50. Some master shipbuilders are technically well educated, especially the younger. Their education is well provided for in England and on the Clyde, not in Belfast, where the only shipbuilding class is that connected with the Working Men's Institute, which is succeeding. Great efforts are made on the Clyde to educate apprentices, &c., 6351-6. More classes in shipbuilding and engineering for artisans should be established in the technical school. The few requiring higher instruction could obtain it elsewhere, 6357-61.

## HODGES, PROFESSOR. Pages 201 to 207.

Is Professor of Agriculture, &c. at Queen's College, &c., 6362. Agriculture in the north of Ireland is more advanced than in other parts, owing to greater intelligence and the operations of local societies. Describes objects, &c. of the Chemico-Agricultural Society of Ulster, 6363-4. The agricultural education under the National Board is of little value, the teachers not being qualified. Recommends small farms attached to schools, 6365-7. Was lecturer at Glasnevin farm when model farms were established throughout Ireland. These model farms failed for want of properly trained teachers. They might advantageously be re-established in connection with model schools, 6368-71. The effect of the instruction at Glasnevin must be very small on the whole country; quotes a paper condemning the system there, 6372-3. Is not personally acquainted with the present system of national school farms, &c.; there are none near Belfast, 6374. Agricultural knowledge in the north of Ireland is advancing, but might be further advanced. Quotes the superior agricultural education of young men in other countries, e.g., Germany. There are no institutions in Ireland corresponding to that at Hohenheim, 6375-7. Flax cultivation has diminished for commercial reasons. An attempt was made to extend it beyond Ulster, but failed, unsuitable soil being in many cases selected, 6378. It might be improved by the application of scientific knowledge, 6379-80. No agricultural instruction is now given in Queen's College. When it was, the lectures were attended by young men from all parts of Ireland. Lectures should be given throughout the country. School teachers might be taught advanced agriculture at the College, and the agricultural teaching in Queen's Colleges might be further developed, but for Government opposition, 6381-6. Efforts are being made to obtain Government assistance for the establishment of stations for experiment, not for teaching. Queen's Colleges would be available for the latter, 6387-90. The agricultural instruction in national school text-books is of practical value; one is his own, 6391. Proper instruction in the practical operations of flax cultivation, and the transfer of its preparation to skilled factors, would be very advantageous. Irish flax produces 3s. 6d. to 9s. per stone, Belgian (from superior cultivation and preparation), 80l. to 100l. per ton. In Ireland the seed is wasted, 6392-3. The price obtained varies greatly according to quality, and this depends upon (1) the soil and its preparation, (2) treatment, &c. of the plant before scutching. Ireland loses enormously as compared with Belgium through bad unscientific management, and by destruction of seed, 6394-6. Government sent instructors into the country to teach the Belgian system. This instruction has been discontinued. Suggests its revival. The rude traditional knowledge of flax management existing in Ulster is wanting in other parts, 6399-400. The agricultural knowledge of farmers has improved in certain districts. It is derived mainly from books and periodicals, not from practical instruction, 6401-2. Differs from Prof. Letta. There is a desire for technical education among Belfast manufacturers. Taught technical chemistry for several years to young bleachers, weavers, &c. Flax fibre has been investigated in Ireland and elsewhere. Irish bleachers are not inferior to continental, 6403.



xxxii ROYAL COMMISSION ON TECHNICAL INSTRUCTION :

GRAY, Mr. Wm., M.B.I.A. Pages 207 to 209.

Is secretary of Free Library Promoters' Committee, and has advocated the adoption of the Free Libraries Act, with the view of promoting technical education. Hands in papers on the subject, 6404-10. Suggestions of Committee as to establishment of library, museum, and art gallery, 6410a.

KENYON, Mr. JOHN. Pages 209 to 210.

Has much experience in printing and dyeing linen, 6411. Managers, foremen, and workmen have only practical knowledge. The linen printing trade is not extensive, 6412-3. To enable Ireland to compete with France and Germany technical schools should be established. Sufficient chemical knowledge can be got from books, &c., 6414. Is not aware that yarns have been sent abroad for dyeing because the required tints could not be obtained in Belfast. There is room for improvement in Belfast dyeing, 6415-7. Much information can be got from books on chemistry and dyeing. Does not think laboratory instruction necessary, 6418-22. Belfast linen printers get their instruction from England and Scotland. New colours come out chiefly in Germany, are next adopted in England, then in Ireland, 6423. Some designs are got from Paris, but many are locally produced, 6424-7. Schools are required for designing; it cannot be learnt from books, 6428-9. There is no school in Belfast where art adapted to linen printing is taught, 6430-2.

PRESTON, Sir JOHN. Pages 210 to 216.

Continental countries can compete successfully with Belfast in linen yarns mainly because they can buy the same machinery at the same price, and at about the same cost for packing and transit, get the best of the Irish foremen, &c., and work 72 hours as against 56 in Ireland, 6433-7. Belgian and French yarns compete successfully with Irish in the Belfast market. Imported over 53,000l. worth of yarns in 3 or 4 months, principally from Belgium, 6438-42. Belgian spinners can beat Irish in coarse numbers by 10 per cent. in many cases, Austrians, though not by so much, in numbers up to 50 or 60, 6443. Continental spinners compete in Irish, English, Scotch, Spanish, and Italian markets in some numbers, but not in the finer (100 to 200), to which their hands are not yet educated, 6444-7. They have no knowledge beyond that possessed by Irish spinners. Continental flax is much better prepared than Irish, 6448-50. Continental superiority is mainly due to the longer hours worked. Cannot compare wages, 6451-2. Shorter hours have not improved the social or material condition of workpeople; few employ their leisure profitably. Does not wish them to work so long as continental workers, but thinks 60 hours a week would be better for them, and would put employers in a better position to compete. Has heard the same view expressed by others, 6453-6. Education, whether of masters, managers, or workpeople, can do nothing more for the trade; everything conceivable has been tried. Does not believe continental workers to be superior in education or natural aptitude, but they do not strike, 6457-60. The trade has suffered from the substitution of cotton and woollen fabrics for linen, 6461. Can suggest no remedy but an increase of working hours to 60. The falling off is due to short hours and large imports of foreign yarn. Never heard of any corresponding falling off before the Act limiting the number of hours was passed, 6462-4. The continental export of yarn is a regular trade for profit, not a forced one, 6465-6. Gives exports and imports for 1869-80. The rate of decrease of exports for six years before and for six years after the passing of the Factory Acts was very similar. The former was due to stocks left over from inflation caused by the American war, 6467-73. In ordinary times compulsory military service does not seriously interfere with continental manufactures. Hands are abundant there. In Ireland they are scarce, and machinery is standing for want of them, 6474-5.

## MATIEB, Mr. HENRY. Pages 216 to 219.

Is a manufacturer in the important handkerchief trade. Technical and art knowledge are more important in this than in the plain goods trade, 6476-8. Better knowledge of design and improved printing and dyeing are required. We cannot compete with the French in some colours, 6479. Young men in the trade do not attend the Art School, the instruction given not being practically applicable, 6480-3. The technical school would be of great service in improving designs. Gets some designs from Paris, others are produced locally. The local designers have much improved lately; does not attribute this largely to the Art School. Some have been trained in print works, 6484-9. The young men would willingly attend the technical school, especially in the evening. Would give them facilities, 6490-1. There is little teaching in the Art School of design applicable to the trade, 6492. The French are superior in design and dyeing. Gives an instance, 6493-5. Buyers have to go to the continent for certain goods (not handkerchiefs) unobtainable in Ireland, 6496. More technical education is needed in weaving, designing, and colouring, 6497-8. Trade museums would be valuable. There are none. Manufacturers might be induced to establish collections of specimens, 6499-503. The establishment of a technical school is important for the trade, 6504. The embroidery is done at home by girls. It requires no special training. One girl teaches another. It would not be suitable for teaching in schools. The supply of labour is sufficient. Sewed muslin work was formerly done in Ireland, but is now done by machinery in Switzerland, and sold in Ireland and elsewhere. Attempts were made to transplant the industry, but failed, 6505-13. The colours of certain goods, principally Austrian (*produced*), cannot be so well produced in Ireland. Such goods should be exhibited that manufacturers might be led to make them, 6514-6.

## BYLETT, Rev. HAROLD. Pages 219 to 227.

Is a national school manager, 6517. There is a deficiency of science teaching in national schools. The science taught is very poor and unsatisfactory. Does not know of any indisposition on the part of the Board to teach it, 6518-24. Names subjects taught in the schools. Some extra subjects should be introduced. Does not think the teaching of experimental science need be limited to those who have passed fifth standard. Agricultural teaching begins in the fourth class, but the book used is defective and unsuitable. Teachers should be permitted to select their own books. They are practically confined to those selected by certain professors in Dublin, 6525-35. Recommends free trade in books, including those on history, notwithstanding differences of opinion in the country. The Board should have power of veto, but should be reformed first, 6536-43. The books have been in use as long as people can remember, 6544-6. (*Mr. Barkie*.) Teachers are prohibited from using other than the prescribed books. The text-book on natural philosophy was published in 1841 or 1842, and has not since been revised. (*Mr. Bylett*.) The books are defective in science; no history or biography is taught, and no drawing, except as a special subject; hence the children have no disposition afterwards to take advantage of the Art School, 6547. Elementary science should be commenced in the fourth or fifth class, drawing made an ordinary subject, and farming better taught. Prof. Baldwin's book is too technical, and the Board will sanction no other; it should be simplified. Bad attendance is a great defect. Would like to see compulsory attendance, but children now necessarily commence farm work at an early age. They consequently have no desire for technical or scientific education afterwards. Recommends general lectures to spread that desire. Advocates compulsion carefully applied. In some districts opinion is ripe for it, 6548-54. Calls attention to the irregular attendance at national schools. Recommends compulsion, a minimum attendance of 55 days in the summer half-year, and 70 in the winter half-year being insisted upon. Free trade in supply of school books should be established, history added to the curriculum, the agricultural instruction improved, and elementary drawing

XXXIV ROYAL COMMISSION ON TECHNICAL INSTRUCTION

RILEY, Rev. Harold—cont.

and science taught. In country schools increased teaching staff is required; that allowed by the Board's rules is insufficient. The regulations as to extra subjects taught out of school hours require alteration (gives examples), and the regulations are too numerous. Travelling science lecturers should be provided by Government, 6554a.

COMMITTEE OF BELFAST SCHOOL OF ART. Pages 228 to 231.

(*Mr. William Gray, M.R.I.A.*) Recommends more frequent inspection of the Art School. Local manufacturers do not sufficiently sympathise with its work. They employ foreign rather than native artists, 6555. (*Mr. Hugh Robinson.*) The school teaches general principles of design, not their applications. Give instances of past pupils obtaining employment as designers, &c., 6558. (*Mr. Gray.*) The fees are very low, and each subscriber of 5l. may nominate to a free studentship. All do not do so. (*Mr. John Brown.*) The designs are all in the conventional style. Variety should be encouraged, 6557-8. (*Mr. F. D. Ward, J.P.*) Has found the instruction given to Marcus Ward & Co.'s employes valuable. The school might work very advantageously with the technical school which he hopes will be established, in which no art instruction will be given. Weaving, &c. of linen will be taught. Would like to see other manufactures, e.g., woollen, silk, &c., introduced. (*Dr. James Moore, Hon. B.H.A.*) There is plenty of bloom, but it wants to be fructified, 6559-60. (*Mr. Gray.*) From lack of suitable premises, Belfast cannot avail itself so largely as is desirable of the South Kensington loan system. A museum and art gallery is needed, but is not included in the proposals for applying the Free Libraries Act, 6561. The penny rate will yield 2,200l. The building, to cost 16,000l., will consist of a library and two picture galleries only. Suggests that the Commission recommend a technical museum. (*Dr. Moore.*) Recommends a circulating museum from South Kensington. (*Mr. John Jaffe.*) Art instruction will not be given in the technical school, as it is hoped the Art School will supply it. (*Prof. Letts.*) The technical school will, it is hoped, be near the Art School, (*Mr. Ward.*) and the working men's classes be brought into connection with it. (*Mr. Gray.*) So far the technical education movement is entirely independent of the Art School and the Working Men's Institute, 6562-5. (*Mr. Ward.*) The Town Council proposed a free library only, but believes a picture gallery, and probably a museum, will be included. Will be glad of Government aid, 6566. (*The Chairman.*) Good pictures are expensive, and the knowledge necessary for their selection is not always obtainable, while a good and useful industrial museum can always be had. (*Mr. John Brown.*) Suggests obtaining good pictures on loan. (*Mr. Gray.*) A successful museum could be established. (*Mr. Troubridge, Head Master of Art School.*) Encourages students to continue the study of designing. They have a great tendency to give up designing and become painters. Art school instruction might be extended in a technical direction. Most of the leading designers in Belfast are natives, many from the Art School. Although foreigners sell their designs for less than natives there is no danger of the latter being supplanted. (*Mr. Jaffe.*) The Art School instruction has done much good. (*Mr. Gray.*) All classes of design are encouraged, and manufacturers are induced to give special prizes, 6566a.

*Evidence taken at Cork.*

SULLIVAN, DR. WM. K., D.Sc., Ph.D. Pages 232 to 254.

Mentions various professorships, &c. which he has held. Has paid great attention to technical education, 6567-74. Premiums were given by the Linen Board and the Dublin Society, with great success, for the encouragement of manufactures, but, as no Roman Catholic could be a tradesman in the towns, the trades so established were artificial and

SULLIVAN, Dr. Wm. K., D.Sc., Ph.D.—cont.

ultimately failed. Certain other trades were carried on outside the towns, 6575-81. Suggests encouragement of manufactures by a system, similar to that adopted in Flanders when machinery was introduced for linen manufactures, which would die out when it had served its purpose. All such efforts should be locally established and managed, with State assistance in money and inspection, as at Cork Dairy School, 6582-9. Workshops established upon this system would compete with private industries, which is objectionable, but the exceptional circumstances of Ireland render exceptional measures necessary, 6590-1. It might be enough if, when domestic industries were established by voluntary effort, especially in remote poor districts, Government aid were given upon proof that serious and successful work had been done. The system of payment by results in Ireland is a curse, as under it examination has been substituted for education, 6592-600. In Ireland more attention should be given to elementary technical than to higher technical education, but the system adopted should be such as would gradually develop, 6601-3. The foundation of higher technical instruction has been laid, but there is no intermediate step between the lower and the higher. The Science and Art Department system does not provide one, being mere examination. Efforts are being made to provide Cork, by the *ld.* rate and subscriptions, with a good school of art and science which will supply this want, 6604-7. The *ld.* rate produces 500*l.* to 600*l.* The Libraries Act was applied in Cork in 1855, in Belfast this year, and in no other Irish city, 6608-10. There are both science and art classes. There are other science classes in the town. The papers set at S. Kensington examinations are unsuited to the locality. Mathematics and mechanics are needed, but pupils will not attend to them, more money being obtainable for other subjects. Besides results fees, teachers should receive salaries from local subscriptions or rates. Recommends increased rate for this purpose, and for agricultural and veterinary schools, 6611-5. Good science knowledge lies at the root of technical education. The City Guilds Institute examination papers are not sufficiently practical for Ireland. A useful examination could be devised. Previous science instruction should be required, and to guard against cram the examination should be practical in all possible subjects, 6616-21. The examinations could be held locally, the body providing the money being represented. The Science and Art Department is usefully represented by engineer officers at its examinations, 6622-6. Will supply Mr. Magnus with his views on adaptation of Guilds Institute examinations to Ireland, 6627-8. Legislation for Ireland is not sufficiently adapted to its peculiar conditions, but is improving. The gentry must not be taken as guides, 6629-31. In educational matters local management is the best guide, Government aid being given to any proved good work, 6632. Government should not originate everything, but they should persevere in any good work undertaken. The model farm schools were not a great success, but owing to changed conditions were becoming useful when they were abolished. Centralised government ruined them. They were not adapted to the needs of each particular district, but were becoming so. The whole subject should now be reconsidered, keeping that point in view, 6633-9. Use of tools, &c. should be taught in primary schools, the State paying part of the cost. The superior advantages given to children in reformatories, &c. encourage drunkenness and improvidence, and are resented by the honest poor. Ordinary children are not received as day scholars at industrial schools, 6640-6. Girls in primary schools should be taught domestic economy. The sewing taught in national schools is too ornamental. The Commissioners try to foster plain work, but, from lack of local supervision, without much effect. Visiting committees might be appointed, 6647-52. The children prefer crochet, &c., as they can earn money by it, which is desirable, but witness would prefer to confine them to plain work, 6653-7. More industrial training might be given in workhouse schools. Farms were at one time attached to certain workhouses with good results, but were generally given up. A few workhouses still have farms attached.

XXXVI ROYAL COMMISSION ON TECHNICAL INSTRUCTION :

SULLIVAN, Dr. Wm. K., D.Sc., Ph.D.—*cont.*

The important question of industrial training of workhouse children is in abeyance, 6658-62. A complete system of technical education for Ireland should include something corresponding to German Polytechnic schools. The Royal College of Science does a good deal of work, but should be modified to do more. The attendance is small, and many of the students English, 6663-5. The instruction there is more distinctly practical than that at Trinity College. The latter has a matriculation examination, involving knowledge of Latin, Greek, &c., not required for technical purposes. The College of Science has had great influence in improving the teaching in and around Dublin. It is not sufficiently known and appreciated, 6666-9. Students admitted to Trinity College laboratory without examination are chiefly medical students; those at the College of Science essentially technological. The College of Science was a museum, first of economic geology, then of Irish industry. A technological museum was commenced, but is disappearing. This illustrates the dangerous tendency in Ireland to transform existing institutions without giving them time to develop, 6670-1. Day and evening teaching can be carried on together at the College. Instituted the evening teaching there, which was attended with good results, but politics distracted people's attention, and the institution was modified, hence that teaching has not been developed. The professors still give evening lectures voluntarily. Recommends that they be remunerated, 6672-5. Practical instruction was, but is not now, given, 6676-7. The collections, laboratories, &c., might, with little difficulty and without disturbing the day instruction, be utilized for the teaching of artisans, 6678-9. The evening instruction should be higher than that in science classes, 6680-2. The technological courses at Trinity College are important, 6683. The engineering faculty at Queen's College, Cork, has done much good. A little more development would make it a high technological school. This applies to other Queen's Colleges. The commencement of a technological museum is proposed, 6684-5. The laboratory is open to students, but, like every other part of the College, is too small. There is no special technological course. There was a chair of agriculture, now abolished. The professors are ill paid. Complains of Government action in the matter, 6686-7. Technology could be advantageously taught with regard to chemical manufactures. It is being given up on the continent, having answered its purpose there. Technological teaching is only needed in a transition stage. Agriculture is an exception, since it depends upon several sciences, the facts of which can advantageously be brought together by one man. Model farms are least required where agriculture is most advanced. Government have been unsuccessfully memorialised to re-establish the chair of agriculture, of which farmers now begin to see the utility, 6688-95. Ireland is fairly provided with means of higher technical instruction, 6696. There should be schools corresponding to the German Real Schule and Gewerbe Schule. The Real Schulen are schools for children who remain to the age of 15 and upwards, in which the elements of science are taught. Irish lower middle-class children remain at school till 16 or 17. The intermediate schools do not supply the want. They would if science were well taught in them, but there is no hope of that. In the south of Ireland they have been almost entirely superseded by schools of Religious Orders and secular clergy. There are few Protestant intermediate schools. For high-class intermediate education children are sent to private boarding schools in England or in the neighbourhood of Dublin, 6697-709. Boarding schools are too expensive, and day schools, which would help in technical education, are wanting, 6710-2. Elementary science is taught in the Christian Brothers' school at Cork, 6713. Schools of Religious Orders compete successfully in the intermediate examinations, and many have classes connected with E. Kensington, 6714-5. The Intermediate Board encourage science as far as possible, but it is mere cram, 6716. The system has led to improvement in books, apparatus, &c., and attracted attention to subjects previously neglected. There is no intermediate school with a good chemical laboratory, nor will there

SULLIVAN, Dr. Wm. K., D.Sc., Ph. D.—*cont.*

be unless practical examination is introduced. Has tried to introduce it in the Royal University, but so far, except in honours B.A. examination, unsuccessfully, 6717-21. As facilities increase, and practical examination is introduced at the Royal University, intermediate schools will be obliged, to enable their students to compete for university honours, to provide laboratories, &c. for practical teaching, 6722-3. In the Cork Christian Brothers' school much has been done in the way of technical instruction. The apparatus there is on a more extensive scale than would be generally needed. In remote districts too much should not be attempted, 6724-6. Plots of ground should be attached to all rural primary schools. Few now have them. The pecuniary responsibility should remain with managers and teachers, but greater encouragement should be given to those who manage them properly, 6727-9. Local committees should be appointed to assist the Board's inspectors, who are not generally competent to inspect these small model farms. Glasnevin should be converted into a central normal school for teaching agriculture to inspectors and teachers, 6731-5. Teachers in training at Marlborough Street attend for two hours weekly at Glasnevin. A six weeks' course there would be better, 6734-5. A short course of instruction would enable primary school inspectors to inspect much of the agricultural work. Their qualification should be tested before appointment. A few specialists would still be required, 6736-7. Recommends apprenticeship schools, founded by voluntary effort, State aid being given on proof of good work done, 6738-40. Technological instruction, though only needed temporarily in higher schools, should be permanently given in primary schools. Its need was felt as early as 1837, and in 1847 experiments were extensively made, the National Board encouraging them by increased grants, 6741-6. The instruction for boys was mainly confined to agricultural schools. The piscatory school at Galway was rather successful, but decayed during the troubles of 1847-53. There were also some navigation schools, not always well placed. Gives an instance, 6747-9. Much good was done by the experiments in the training of girls. The Irish lace industry is a survival from the teaching of that time. Instances Kinsale convent school, where lace-making, household industry, and cooking were well taught. Plain needlework was regarded there and at other schools as a necessary preliminary to lace-making. Mentions other trades taught with advantage at Kinsale school. The school exists still, 6750-63. (*Sir G. Colthurst.*) At Cork Exhibition there will be a large exhibit of work done by girls in primary industrial schools where industrial instruction has for some time been carried on, 6764-5. (*Dr. Sullivan.*) Kinsale is a typical convent school, under the National Board, receiving grants, 6766-8. Cannot name a national school with an industrial department. Sewing and other industries are taught in primary schools, but such teaching is not sufficiently encouraged, 6769-72. Drawing is taught, but not sufficiently. It should be as much a part of the system of teaching as writing, 6773. With certain exceptions (*named*) little is done in the way of night schools. Teachers should be encouraged to undertake the work, 6774-6. Is in favour of compulsory attendance. Parents should have liberty to select any efficient school, efficiency being tested by inspection. To this the Religious Orders would submit, with the exception, perhaps, of the Christian Brothers, who have an average of 25,000 children on their rolls. Almost all Irish schools might be brought under inspection, 6777-84. Compulsory attendance is necessary to ensure general instruction, and the towns are ripe for it. Allowances must be made for remote places, &c., 6785-7. The bog-oak ornaments and arbutus cabinet trades suffer from defective design. General art instruction, which should be given in every primary school, would develop them, and so provide employment. The bog-oak industry has not been pursued in many parts of Ireland, 6788-96. The Cork cabinet trade has been injured by want of design and objection to piece-work, 6797. The marble trade has suffered from defective design, but is now reviving, as the effect of the schools of design begins to tell, 6798-9. Irish mines are small and poor, and therefore have been beaten in competition, 6800.

xxxviii ROYAL COMMISSION ON TECHNICAL INSTRUCTION :

FOX, MR. JOHN. Pages 254 to 256.

Is manufacturer of eider down quilts, &c., and member of Town Council, &c., 6801-2. Trade in Cork suffers from lack of skilled labour, general ignorance of chemistry, objection to piecework, and limitation of amount of work to be done in a day, 6803. Manufactures goods in Cork, raw material and cheap labour being readily obtainable there, and exports them to England, Australia, &c. Employs much unskilled labour, which is abundant, but cannot be fully utilised because of the opposition of skilled workmen, 6804-6. Recommends teaching of trades (*e.g.*, sewing-machine work) in day technical schools, and lectures to show futility of opposition to machinery, &c., 6807-11. Manufacturers might combine for this purpose if there were sufficient of one trade. They now import skilled workers, who can dictate their own terms, 6812. Use of tools should be taught in primary schools and school workshops established. Weaving or any trade adapted to district industries should be taught in technical schools, 6813-5. Woollen manufacturers are sufficiently numerous to found a weaving school, which would be useful. Instruction in mechanical engineering would develop manufactures, 6816-7. The Cork Steamship Co. now do little shipbuilding, &c.—ships can be built cheaper elsewhere,—they do less repairs in Cork than formerly, and do not make their own boilers. Irish labourers are as able, intelligent, and persevering as English or Scotch, but their frequent strikes are a great drawback to trade. Gives instances, 6818-21.

JACK, PROFESSOR ALEXANDER, M.A., Q.U. Pages 256 to 260.

Has been for 28 years Professor of Civil Engineering in Queen's College, Cork, 6822. Aims at giving scientific training as preparation for pupils in engineers' offices, 6823. Subsequent occupations of his pupils. Few have been employed in Ireland, 6824-6. They have generally passed through a pupilship with civil or mechanical engineers, principally in England, after leaving him. The plan is a good one, 6827-9. At Queen's College, Cork, no instruction is given to artisans, nor are evening classes held. It was considered to be too far from the town. A shorter route being now available, the matter might be reconsidered, 6830-3. Workmen should be taught the elementary principles of science, with special reference to their trades, and trained to make deductions from them. The present tendency of teachers under the Science and Art Department is to abandon deductive teaching, and hasten on to the teaching of results. The sciences most required are mechanics and physics. Mathematics (elementary trigonometry and simple equations) should be more generally taught as a basis for these. Such mathematical instruction is now given in good national schools. A man having that knowledge would be a better and more intelligent workman, and would take more interest in his work, 6834-44. It is useless to teach results until a knowledge of their scientific basis has been acquired, 6845. Teaching of, or examination in, applications of a science should be preceded by examination in its principles, 6846-9.

LANE, MR. DEBRY, M.A. Pages 260 to 267.

Is secretary of Cork Gas Consumers Company, and a starch manufacturer, and is practically acquainted with many branches of trade, 6850-2. Technical teaching is needed. Opposition to use of machinery, limitation of the amount of a day's work, objection to piecework, &c., arising from ignorance of the simple principles of political economy relating to trade, have greatly injured the manufactures of Cork. Such principles should form part of the technical education of workmen. Ignorance of them is not confined to workmen, 6853-6. Technical education proper should be commenced on a low grade, and should include training of the hand and eye, afterwards the principles governing the work should be explained. Gives instances of ignorance of workmen in matters relating to their trade. They should be taught the need of accuracy in measurement, &c. Cork engineers and iron moulders are

LANE, Mr. Denny, M.A.—*cont.*

inferior to English or Scotch in mechanical manipulations, 6857-60. Technical instruction would not supersede workshop training, but would enable apprentices and others to work more efficiently and economically. Knowledge of the principles underlying their work would cause workmen to take more interest in it, 6861-2. A system of very practical technical education would do immense service to the men of Cork. They are quick at learning, but lack perseverance and ambition, and, unless immediate pecuniary results can be obtained, have no desire for improvement; hence mechanics' institutes and science schools have practically failed there, 6863. If technical classes were established there might be difficulty at first as to attendance, but, given good teachers, some would attend and others would follow their example. Employers might advantageously give slightly increased wages to successful students. Until recently most gasworks managers were Scotchmen, now many are Irishmen, 6864-5. Describes quantity and disposal of certain residual and by-products at Cork gasworks, 6866-70. Gas engineering has recently made great progress. The men connected with it are better educated and pay more attention to its scientific aspects. Many new and improved processes have been introduced, higher purification and more subtle testing are required, and more attention is given to the laws of heat, &c. Hence there is a necessity, not felt before, for technical teaching for all classes of persons employed in the business, 6871-7. Little progress has been made in brewing and distilling. Knowledge of chemistry might lead to improvements and would prevent fatal errors and the adoption of new and dangerous systems. Employed successively two boys from the Christian Brothers' schools to assist in ammoniac testings, &c., who, owing to the technical education they had received there (chemistry, manipulation, &c.), were able in a few days to perform the work required. Knowledge of tools, even though only of their names, is valuable. The Christian Brothers' schools are excellent technical schools as far as they go. The boys perform experiments, and so acquire handiness and intelligence. The Brothers are now establishing a school of a more technical character, in which boys may see the practical application of the physical science they have learned at the now existing schools. Dynamo-electric machinery, a lathe, models of engines, &c. are being provided; 6878-83. The instruction has hitherto been given entirely by the Brothers, but a practical workman is engaged to give lessons in turning, &c. at the new school, 6883a.

POLLOCK, Mr. Hux, junior. Pages 267 to 270.

Was a student at Glasgow Technical School. Weaving, designing, and dyeing are taught there. Theoretical education in designing and weaving can be better got in a college than in a mill. Such instruction is useful to overlookers and foremen as well as to owners and managers, and particularly so in new districts, 6884-7. Had a course of instruction in dyeing at the Young laboratory, having previously gone through a course of theoretical chemistry at Cork. Without the previous chemical instruction, could have understood the practical, not the theoretical, part of the dyeing course. The majority of the people of Cork could not understand the theoretical part of such a course if established, but the practical part would be very useful, 6888-91. The latter could be as well learnt in the dyehouse, except that difficulties which would cause trouble there could be explained and illustrated in the school. Thus, the practical teaching of dyeing in schools, even without theoretical instruction, is useful to workmen and foremen. Dyers try to keep their receipts secret. Hence attendance at a dyeing school would be advantageous to apprentices, 6892-4. Practical men have always been obtainable as teachers. Chemists now communicate information freely to each other (gives an instance), and the teachers would themselves experiment, so that the teaching would not become antiquated, 6895-8. Technical



**POLLOCK, Mr. Hugh, junior—cont.**

schools in Ireland should commence by training eye and hand, no books, lecture notes, &c. being used, 6899-900. The textile trades would be most benefited by a school which should render unnecessary the training of hands in the works. The woollen manufacturers are scattered but might combine to establish a central school, and would subscribe to it. Government assistance would be advantageous. Government could not be expected to start it, but might assist by a building grant. The regulations as to management, &c. of science and art schools should be relaxed in the case of a technical school in Cork. The City Guilds might also contribute, 6901-13.

**POLLOCK, Mr. J. W. Pages 270 to 272.**

Agrees with his son's evidence. Is an extensive manufacturer in flax and wool, and employs between 500 and 600 hands, 6914-20. From 5 to 7 per cent. of these would avail themselves of technical instruction. The trouble and expense of teaching hands obstructs the extension of manufactures. Recommends technical schools in populous places where trades should be taught, 6921-3. Hopes for Government assistance. Manufacturers would largely support such schools if they were managed by proper local committees, 6924-5. Technical schools should be founded, open at night as well as by day, where the elements of trades, *e.g.*, weaving, should be taught. Children of 11 or 12 could attend them while receiving literary instruction at other schools. Power looms could be used for teaching, 6926-31. A higher technical school should also be established, giving a regular scientific technical training. The great need, however, is to train the people to industrious habits, 6932-6. The woollen manufacture in Cork is similar to that at Galashiels and Chipping Norton. Wages are about the same, but managers, &c. are paid more in Cork, 6937-9. Cork manufacturers use wool grown in the district (principally long wool) and also wool bought elsewhere. They do not use Belgian yarns. An industrial museum and collection of textiles similar to those existing at continental textile centres would be of service to the trade, 6940-6.

**MAHONY, Mr. TIMOTHY. Pages 272 to 275.**

Is a woollen manufacturer and vice-president of Cork Exhibition, 6947. Technical instruction for dyers is much needed. Chemical knowledge is of less value to managers than acquaintance with the qualities, &c. of wool. If the chemistry of dyeing were taught at Queen's College it would pay to send one of his staff to learn it. Has about 25 men ignorant of the subject working under one dyer who is responsible for the results. If there were a dyeing school which these men could attend they would work with more interest, be more accurate and useful, and would earn higher wages. The men would attend such a school and the masters would assist them to do so, 6948-57. A central school should be established, and a time set apart at which the men from all the factories should be allowed to attend. The manufacturers would give up the men's time and add something to their pay, but are not sufficiently numerous to establish such a school without help from Government or elsewhere, 6958-64. Aid to theoretical chemical teaching could be obtained by establishing a science school in connection with S. Kensington, and witness has heard that the City Guilds aid instruction in its application. The manufacturers, however, are too few (four or five) to initiate a scheme, but would assist it if it came from outside. The school should be in Cork, 6965-74. There is difficulty in training workpeople, and many when trained go to America. Managers, &c. come from Scotland. Agrees with Mr. Pollock as to additional training which children should receive in primary schools, and with Mr. Lane as to the technical instruction of boys by the Christian Brothers, 6975-6.

MULLINS, MR. THOMAS, and MULLINS, MR. MATHEW. Pages 275 to 277.

Are extensive coach-builders, and one has taken important awards for technology, 6977-8. Evening science classes are needed. An evening chemistry class at Queen's College, if started, would not be attended by workmen. Schools somewhat on the plan of English mechanics' institutes would alone succeed. Know of no chemistry class in Cork. (*Dr. Sullivan.*) There is one this Session, 6979-84. (*Messrs. Mullins.*) The existence of such classes should be made known to workmen. They would be able to understand the instruction, 6985-7. Know of no evening class in practical mechanics. (*Dr. Sullivan.*) There is none this year. Attempts have been made to hold such a class but workmen will not attend. A committee has been appointed in connection with the Exhibition to consider the whole matter, 6988. (*Messrs. Mullins.*) The Exhibition ought to direct workmen's attention to technical instruction. Can suggest no further means of interesting them in it. There is no question of its value, 6989-91. Know what has been done by Mr. Hooper and others in London. Cork is too small for anything of the kind to be done there, 6992-5. Drawing would be necessary. It would be well to teach drawing with instruments, &c. in elementary schools, but lads from 15 to 20 could be better taught, 6996-9. There is a fairly good drawing school in Cork, which they have brought under the notice of boys employed by them. The amount of instruction there should be extended, and mechanics and elementary chemistry taught. Workmen would not attend classes in these subjects at Queen's College. Plain popular schools would be better, 7000-2.

BAGOT, REV. CANON. Pages 277 to 283.

Desires to supplement the information he gave to Mr. Jenkins by evidence on the promotion of dairy education, 7003-5. Munster Dairy School, though of great value, does not go far enough. A higher college is needed to train teachers. In Sweden, dairymaids who have spent 6 months at such a college, and passed an examination, are granted diplomas as teachers. They are eagerly sought for, as, receiving fees from their pupils, they require only small pay, and their pupils do most of the work of the dairy. After spending a certain time at the dairy the pupils receive certificates, and may then, if they so wish, go to college to complete their education and obtain diplomas as teachers. Under this system each farm becomes a dairy school. Suggests the establishment of a similar system in Ireland. There might be some difficulty, as the farms there are smaller. Most Munster dairies employ 6 or 7 hands, 7006-9. There is no such college in Ireland, 7010-1. In the suggested college the scientific part of dairying should be taught to a greater extent than he believes is the case at Cork. One dairy school for all Ireland is insufficient, 7012-3. The situation of the schools would determine itself. Large dairymen would be glad to get diplomaed dairymaids, who would be qualified to teach. A number of dairymaids are now boarded at most Munster dairies. The apprentices in Sweden and Denmark receive very small wages. Believes that dairy assistants in Ireland would, in consideration of instruction by the diplomaed dairymaid, serve for small wages. Mentions the case of two young ladies, about to emigrate, who are receiving instruction on a dairy farm near Hamburg, 7014-8. (*Sir G. Colthurst.*) Cork school would have taken them. (*Canon Bagot.*) They wanted to learn the ice system, which can only be learnt abroad. In several parts of the Continent ice costs nothing, or the system would not pay, 7019-21. In addition to the system of teaching by diplomaed dairymaids recommends that Cork school be developed into a dairy college giving higher scientific dairy instruction, and that numerous dairy schools be established teaching dairy manipulation, &c., 7022-5. In certain foreign colleges the teachers are men, 7026. Hopes many farmers in Munster and Leinster would be willing to pay for instruction of their daughters at dairy schools, 7027-8. Glasnevin would be the best centre

**BAGOT, Rev. Canon—cont.**

In Leinster for a dairy school, 7029-30. (*Mr. T. Carroll.*) Has been asked to report on the establishment of such a school there and is disposed to recommend it. (*Canon Bagot.*) Suggests payment of results fees for dairying by the Commissioners of Education. A school for dairying, &c. has been established at Navan, not a dairy country, 7031-2. Omagh would be a good centre for a dairy school for the North of Ireland. In Strabane market found the same price paid for bad butter as for good. There is little really good butter there, 7033-4. Does not know of any good centre in Connaught, 7035-6. Does not believe cheese-making will ever pay in Ireland, since the whole world can compete with her, 7037-8. The introduction of Laval's separator, which there is no difficulty in using, appears likely to open up a great future for Irish dairy business, 7039-41. Recommends that girls in National Schools be given instruction in poultry management and bee-keeping. They would receive it with avidity, and it could be given without detriment to literary instruction. Much of the instruction given to girls is misdirected. Gives an instance. Would like to see their education more directed to their practical work, especially in convent schools, 7042-9. Laundry work, cooking, and especially dairying should be included in the scheme of the National Board. Convent schools having interns could teach these subjects more efficiently than ordinary schools. Except for the comparative neglect of such subjects the education in convent schools is good. Is glad to see Catholic children attend them, 7050-3.

**CAHILL, MR. PATRICK. Pages 283 to 285.**

Is a wholesale manufacturer of, and practical worker in, metal plate and zinc ware, 7054-5. The use of machinery, by enabling manufacturers to compete with foreigners, would increase the amount of both skilled and unskilled labour employed. Technical instruction would cause workmen to see this, 7056-61. Recommends instruction in machinery and the use of models, and the establishment of travelling scholarships as prizes. The Corporation of Cork could not found such scholarships, the rates there being already very high, 7062-7. A school should be established by Government grant; the local gentry and the corporation might then assist. A thorough English education should be given, including elementary mathematics, and models and mechanical appliances should be provided for educating youths (especially apprentices) in the principles of their businesses. The instruction should be given in the evening and on Sunday. There is no feeling in Cork against Sunday instruction, 7068-73. Suggests as an industry that might be developed the preservation of fish in hermetically sealed tins. About 2,000l. for plant, &c., plus working expenses, would be sufficient. Sprats are plentiful at Youghal, but no one would take an order (to be repeated at frequent intervals) for 100,000 tins of them preserved as sardines. One man there carries on this business successfully upon a small scale, 7074-80. Fears working lads will be shamed at going to the proposed museum attached to the new Art School. If it contains a good collection of models and machines it will be very useful in educating youth, 7081-4.

**DORAN, MR. CHARLES G. Pages 286 to 289.**

Technical appreciation rather than technical education is needed in Ireland. The classes holding patronage should be thoroughly educated at their own schools. People know the true artists but will not pay them. Thus 70 per cent. of the engineers on Irish railways have risen from firemen, while in England and Scotland 70 per cent. have been properly trained as engineers. In the building trades Irish workmen are as well educated as those of other countries. Engineers, &c. would alone be benefited by technical instruction. Students in technical schools should receive a common training up to a certain stage, then instruction relating

DORAN, Mr. Charles G.—*cont.*

to their particular trades. Gives instances. Workmen should be trained to think about their work. At present they are mere mechanical appliances for carrying out the thoughts of those above them. At Queenstown Cathedral every figure was worked from the rough block by men educated there at the works. The stone for the sculptures in a large building in Cork was excavated in Ireland, and for no reason whatever sent to London to be carved. Called attention to the injury that was being done to Irish workmen and offered to have the work done, taking all risks, 7085-92. At Queenstown Cathedral trained his workmen up from the figures to the sculptures. Taught them only detailed drawing and the setting out of curves, not modelling. Gave them full-sized drawings for all work. This is the only building in Ireland wholly executed on the ground. Includes the human figures, some of them colossal. Round life-sized figures were executed, by men trained entirely during the progress of the work at the Cathedral, merely with the aid of the flat diagram. Mr. O'Reilly, who was employed there finishing the figures, always worked from witness's diagrams. Other workmen could do the same. The citizens of Cork leave Mr. O'Reilly unemployed and send to London for figures inferior to what he could execute. This shows the necessity for technical appreciation. There is want of knowledge in the class which should patronise art. Gives instances, 7098-107.

O'LEARY, Mr. MICHAEL A. Pages 289 to 290.

Is a cork manufacturer, 7108. Art workmen in Cork are very backward in art education. The old cast gallery was free and open at all times to all, but since it has been brought under the Art Department the school has been open for part of 3 days per week only, fees higher than labourers could pay have been charged, and incompetent masters appointed. It should be always open free to all, and rooms should be added for technical education, &c. Desires no Government grant, since injurious restrictions, &c., accompany it. There is no life school in Cork, 7109-16.

COLTHURST, Sir GEORGE St. JOHN, BART, D.L., and BARRY, Mr. W. H., J. P. Pages 291 to 303.

(*Sir G. Colthurst.*) Munster Dairy School is held in buildings formerly part of Munster Model Farm, and afterwards used as lodgings for the training school pupil teachers. It was established, after some difficulty in getting the buildings, by local subscription and Government grant, to meet the deterioration in Irish butter and its consequent supersession by the products of countries where attention was paid to technical education. Dairy instruction for girls was at once introduced and the school placed under the virtual (not entire) management of a local committee, 7117-22. The school is supported by Government grant, about 500l. a year being locally subscribed for prizes, supplementing superintendent's salary, &c. (*hands in statement of accounts*), 7123-8. For year 1882-3 the Government expenditure was 409l. 17s. 10d. for maintenance of students, salaries, &c., and 242l. 11s. 10d. loss on working expenses; the fees amounted to about 250l., 7129-30. The subscriptions have fallen off, but if an appeal were made could be brought up again. The Cork butter merchants, though at one time more or less hostile, now support and assist the institution. Government should help only those who help themselves. The school should be partly supported and mainly managed locally, under Government supervision. Illustrates the need for local management. Hopes to see similar schools in every Irish dairy district, 7131-2. Would give no assistance in any case, either from Government or by subscription, to localities which did not themselves contribute, or the gratuitous instruction will merely tend to demoralization. Irishmen as a rule do not care for what is given them. Suggests that travelling instructors not paid by Government be

COLTHURST, Sir George St. John, Bart., D.L., and BARRY, Mr. W. H., J.P.  
—cont.

sent to distressed districts, 7133-7. The teaching in agricultural schools should be adapted to the wants of the localities in which they are situated, 7133. 134 girls have passed through the school since 1880. It is proposed to devote 6 months of each year in 3 terms to dairy instruction; 23 or 24 girls could be taken at a time. It is now the agricultural students' time. Only 36 of these have passed, owing to the disturbed state of the country, and want of appreciation of the instruction given. The number of agricultural students remains nearly stationary (now 5). (*Mr. Barry.*) The small number is partly owing to the disturbed state of the country. Hopes the attendance will now improve, 7132-42. (*Sir G. Colthurst.*) It is intended to divide the year into 2 terms of 6 months, one for boys, the other for girls. Boys are more likely to attend in the autumn than in the summer, 7143-4. The fees are 7l. 10s. for 4 months for boys, 3 guineas for 6 weeks for girls. The latter fee will be reduced to 2 guineas. Had the Government been satisfied at the start that the dairy instruction would succeed, they would perhaps have supplemented the boys' fees. The dairy instruction was an experiment made by the committee at their own risk. Government would be willingly encourage the teaching of girls as that of boys, 7145-7. It is more important in a dairy country that girls should be taught than boys. Their labour is probably more valuable, but their instruction shows immediate results, while that of boys does not. The new arrangements are for the pupils' convenience. The number of students is increasing, and the fees are now nearly all paid by the farmers themselves, instead of, as formerly, by landlords and others, 7148-51. Bursaries for children from national schools would be very advantageous. Gives instances of the appreciation by, and value to, students and farmers of the instruction given, 7152-4. It is more important to train girls for employment on small than on large farms, but the training which fits them for the latter also fits them for farmers' wives. (*Mr. Barry.*) Had great difficulty in persuading farmers to send their daughters, but explained that the object was to train them to be valuable in their own families. Gives an instance of the success of the school in this. (*Sir G. Colthurst.*) Calls attention to the cookery and needlework classes. (*Mr. Barry.*) They were established and are carried on by a committee of ladies, and are of the greatest possible benefit to the people, 7155-7. (*Sir G. Colthurst.*) The instruction is given by the matron of the institution at the expense of the association of ladies, the institution giving use of kitchen. (*Sir G. Colthurst and Mr. Barry.*) Describe system of examination. Bill of fare with prices handed in, 7158-60. (*Sir G. Colthurst.*) Mentions prizes for dairy work won by the school. Gives an instance of the practical value of the instruction given, 7161-2. Sketches the course of instruction for girls, 7163, and for farm students. Suggests a technical school for the woollen trade, founded and supported by Government grant, in aid of local effort, under local management with Government supervision, 7164-5. Needlework is neglected in national schools for girls. Theoretical instruction in agriculture, which they could apply at home, might advantageously be given to the girls, although practical work in schools is better. (*Mr. Barry.*) It is most desirable to introduce works on agriculture into girls' schools, but theoretical instruction would be of little use unless assisted by practical work; the schools should therefore have ground attached to them. It would be practicable even in remote places to have farms where dairy work could be taught, 7166-75. (*Sir G. Colthurst.*) In establishing technical schools it would be most important to obtain and advertise the approval of the clergy of all denominations. The success of the movement can only be obtained by co-operation of the priesthood, and by keeping it quite clear of politics. An anxious desire has sprung up to develop the resources of the country, but a school taken up by any one party will fail, 7176-80. Under the Tramways Act the Treasury will bear half the cost of any practicable scheme (leaving the initiative and management to the locality), if the other half is locally provided; expresses a hope that similar provisions may be made as to technical education, 7108a.

**BARRY, Mr. W. H.** Pages 303 to 306.

Farmers, &c. are unable from want of agricultural knowledge to judge the value of land. This leads to competition and overbidding for farms, and has so contributed to the recent national suffering. Lads in agricultural schools should learn the construction of agricultural machinery, which from the increasing scarcity of labour is becoming more necessary, but cannot be profitably used by unskilled hands. The general laying out of a farm, growth of cereals &c., and keeping of accounts should also be taught. Younger sons of landlords should learn the nature of their fathers' properties that they may act as agents. Agricultural schools should be supported by localities with Government aid. There is much prejudice against them, to overcome which local management is necessary under Government supervision, 7181-4. From the more backward state of agriculture there, agricultural schools are more required in Ireland than in England. It is necessary to show Irish farmers what can be done by improved cultivation, e.g., utilising headlands, &c. Gives instances, 7185-7. The schools should be supported by local subscription, supplemented as required by Government, 7188-91. Agricultural education is so necessary that the funds must be got. The value of the schools gives them an equitable claim upon local rates, but doubts if the guardians would vote the necessary money. Quotes the failure of boards of guardians to contribute to results fees for elementary teachers, 7192-7.

**BYRNE, Mr. JAMES.** Pages 306 to 309.

Was educated at Glasnevin. Advocates extension of technical agricultural education, for which the present is a favourable time, 7198-202. To increase the attendance of farmers' sons at Munster school, copies of its syllabus should be distributed and exhibitions at Glasnevin established for the best scholars. Many men from Glasnevin are now engaged as stewards, in place of the English and Scotch stewards formerly employed, 7203-6. Although sufficient veterinary science is taught at Munster school and Glasnevin for the ordinary farmer, there is no veterinary school in Ireland, and Cork is very favourably circumstanced for the establishment of one. Veterinary science and forestry should be taught at Munster school, 7207-11. The instruction in agriculture given to boys at national schools is valuable even though only theoretical, 7212-3. Similar instruction might usefully be given to girls. They are now more employed at house than field work, 7217-9. Land could be readily obtained by the primary school managers for practical instruction of children. The schoolmasters should be trained to agriculture, but should not hold the school farms, 7220-4. Cookery, needlework, &c. (in his district principally plain work) are taught to girls in national schools with advantage, 7225-30. Industrial occupations are not, but might advantageously be taught to boys in those schools. Many workhouses have farms attached, 7231-3. In remote parts where unreclaimed land can be readily obtained its reclamation might profitably be taught in national schools. (Mr. W. H. Barry.) In his part of the country farmers prefer to hire labourers with many girls, because the girls are so useful on the farms. (Mr. Byrne.) That is contrary to his experience, 7234-6.

**DUNNE, Mr. P. F.** Pages 309 to 313.

Has had 17 years experience as a tanner. Now tans only sole leather. Tanning has not been prosperous, owing to the importation of American leather, which is tanned more cheaply than English, the American tanneries being established in hemlock forests. Uses valonia, which is cheaper here than in America. English tanners are the best in the world, 7237-40. Uses machinery where possible, which is not opposed by the workmen. They are all labourers. Fleasing, which is done by hand, requires some training and care, but is not a trade, 7241-5. Has heard of opposition to machinery in building trades, but not in his own, probably

DUNNE, Mr. P. F.—*cont.*

because the men are not organized, 7246-7. Had difficulty in introducing piece-work, but it is now popular with the men, who do double the work and earn more wages, while the work is cheaper, 7248-50. Vast numbers of machine-made boots are imported from England with disastrous effect on the local trade. The industry could be well developed in Ireland, but the people would have to be educated from the beginning. A factory has been started at Waterford, which appears successful, 7251-4. A boot factory has been established in Cork by gentlemen unacquainted with the leather trade. Doubts its success, 7255-7. Science can do little for young tanners, but a technical school for currying and boot and shoe making (a large industry) might be established. Such a school in Cork must begin at the beginning. There is only a very small factory in existence, 7256-61. The waste products from tanning are (1) roundings, used for sizing paper, and (2) fleshings, used for glue making. There were 2 or 3 glue makers in Cork, but, probably through their ignorance (instance given), the business has died out, 7262-3. Chemical knowledge would be very useful in glue making, 7264. No one is now anxious to start a glue factory in Cork. The material obtainable would probably be sufficient to employ 10 or 12 hands. Mentions tanneries from which it might be obtained, 7265-7. Leeds is a great centre of the currying trade. Chemical knowledge would be valuable in currying, 7268-9. Boarding-out is better than industrial training of children in workhouses. Few learn anything there, 7270-1. Local Government Board rules, which do not allow money to be put to the credit of paupers, prevented a number of females in the workhouse being taught match-box making. There was no objection to the industry being carried on, but the women would not work without some inducement. Thinks the rule prohibiting payments might profitably have been modified in this case for a short time. Guardians should have power to teach handicrafts to the inmates, 7272-80.

COLTHURST, LADY EDITH. Pages 313 to 314.

As to female work exhibited at Cork Exhibition encloses a circular and catalogue, and states that there were over 1,000 articles of needlework, &c., in 6 classes. In (1.) plain needlework, excellent specimens were shown from national schools where local assistance had been given to the teachers, and from industrial schools. (2.) White embroidery was very good both in design and execution. The demand greatly exceeded the supply. (3.) Lace was well executed but failed in design. Efforts are being made to improve the teaching of lace designing at Cork Art School. (4.) Art needlework showed (with exceptions) the same faulty designing. (5.) Crochet was not generally good. The decline of the Irish crochet trade is perhaps owing to the use of old and inartistic patterns. (6.) Knitting exhibits do not need special notice, 7281-81a.

DELANY, COMMENTATORS, T.C. Pages 315 to 321.

Is a builder, 7282. In no trade is technical education so much needed as in building. Gives instances. Recommends technical evening schools, supplied with the best machinery and models. The use of labour-saving machinery would not reduce the demand for skilled labour in his trade, 7283-8. There should be one large school for all trades of which the building trades school would form part. Suggests retention of the Exhibition buildings for the purpose. Believes the taxpayers of Cork would agree to a tax of 1d. in the £., which would enable them to borrow £1,600L from Government. This would be sufficient to raise the school and provide machinery, and Government might provide teachers. One gentleman, e.g., Dr. Sullivan, could teach all the trades of the South of Ireland, and tradesmen, for a small sum, would show the practical application of the machines, 7289-97. Has heard of the Central Institution of the Guilds Institute and its probable cost for building, &c. Would begin in a modest way and afterwards increase, 7298-9. If a technical school were

DELANY, Commandators, T.C.—*cont.*

established in Cork, instruction should be given in the principles underlying, and machinery used in, the building trade, 7300. Has heard of the payments for building instruction and grants for apparatus by Science and Art Department, and hopes by their aid to make the proposed school self-supporting. The only reason why classes are not already established is that he and others were asleep. They are now wide awake. As an instance of the desire among workmen for advancement, mentions that they voluntarily gave permission to employers to use what machinery they thought necessary in the erection of the Exhibition buildings, 7301-5. If, by technical education, the men were shown the advantages of machinery, there would be no difficulty with respect to its use. There is no free library in Cork under the Libraries Act. One is much needed. The rate has been applied to music. The School of Art is not made use of, the buildings being ill-adapted to their purpose. A new school is talked of. There is no place where young men can go to read and study, 7306-11. Left school at 14. Boys desire to become tradesmen, not, in Ireland, shopmen or clerks. Went to London and in 3 weeks became foreman and soon had charge of a large business. Found men in the building trades there no better educated technically and less capable of doing good work and doing it quickly than those in Ireland, although they had better means (classes, &c.) of educating themselves. With similar opportunities, which they will now avail themselves of, Cork builders will go far ahead of them, 7312-8. Attendance, as a boy, at a technical [school would have been of great advantage to him, 7319-20. Had he learnt the use of tools while at school it would have enabled him to shorten his apprenticeship. It would be of great advantage to teach this to young boys in primary schools. Would compel employers of 300 hands to provide evening schools for their workmen, failing better provision, and all employers to send their apprentices to technical schools, 7321-4. There are in Cork small classes in machine drawing and building construction. The instruction given, is valuable; his workmen do not understand working drawings, and the instruction would not enable them to do so. Technical instruction is needed by engineers and architects. Employers should, and do, encourage the classes. Several boys in his employ attend the School of Art, but the building is cheerless and the models insufficient. Advocates a collection of models, &c. of various manufactures, 7325-36. Thinks the community might and would willingly tax themselves 1d. in the £, and that the whole cost of maintenance should be borne by Government, 7337. Knows the expenses of Munster Dairy School and that a large sum is annually raised for its maintenance. Its success is attributable to the exertions of Sir G. Colthurst and Dr. Sullivan, 7338-9a. Employers and the public of Cork would willingly tax themselves for the teaching of a great industry. Efforts of the kind should be subsidised proportionately to the local support obtained. Is aware of the Science and Art Department system of payments upon results of teaching. Given a fair start the school he proposes would soon become self-supporting, 7340-6.

## HAYDE, REV. JOHN. Pages 321 to 326.

Has practical knowledge of English educational systems, especially of elementary education, and has read a good deal about the Irish system of primary instruction, 7347-53. Primary education is still very defective. Thinks compulsory attendance should be enforced in cities at first, then generally, and believes that to be the general opinion in Cork, 7354-6. Technical instruction is absolutely necessary, 7357. In elementary schools a few general principles of science should be taught, with special relation to district industries. The teaching should be as far as possible a preparation for the workshop. Practice and theory should go together. Boys at work should attend evening technical schools, 7358-60. The teaching under the Science and Art Department requires to be supplemented by practice, 7361. Geometrical and machine drawing are useful but not essential preliminaries. It has long been felt in Cork, especially



xlviiii ROYAL COMMISSION ON TECHNICAL INSTRUCTION:

HAYDE, Rev. John—*cont.*

by the promoters of the Exhibition, that technical education was a necessity, and that a technical school should be established, where each man should be practically prepared for his specific trade. A committee has been formed to draw up a scheme, 7362. It is the general feeling that the school should be initiated and managed locally, Government aiding and supervising. The aid given need not be permanent, and would be repaid by increased industry and loyalty of the people. Gives instances of the effects of technical education at Upton Reformatory. Boys there choose their own trades, after working for some time in the fields. Gives number of boys taught certain trades there. Has difficulties from (1) expense, (2) jealousy of trades' unions. The boys are from 6 to 18 years old, 7363-6. Has to carry on their whole education. They are put to industrial occupations as soon as they are strong enough, even at 8 years old. States time given to school and to work respectively, 7367-70. Some trades, e.g., cabinet-making, by sharpening the boys' intelligence help them in their literary studies very considerably, 7371. Boys in elementary schools should be induced to learn industries, and should as far as possible be taught the practical application of the principles underlying them, the use of tools, and, where it will be their future avocation, agriculture, 7372-4. Does not wish to speak on the proposed technical school, but approves of the general scheme as stated by Dr. Sullivan. There must be evening classes where boys should learn the theory of the work on which they are engaged in the day. Proposes to introduce this system at Upton Reformatory, 7375-7.

SULLIVAN, Dr. W. K., re-examined. Page 326.

A committee has been formed in Cork for the establishment, among other things, of a technical school, and he has been appointed to prepare a scheme. Will send a copy of it to the Commission, 7378-83.

BURKE, Rev. JAMES D. Pages 327 to 332.

His school is both primary and intermediate, as is the case in all houses of the Christian Brothers in Ireland, 7384. Subjects of instruction. The boys pass in gradation from infant school to highest class, the poorer boys leaving before reaching the higher classes. The Order passed last year one-fourth of all the pupils passed in Ireland under the Intermediate Education Act, 7385-8. Has also a very successful drawing school, assisted by the Corporation under the Public Libraries Act. The greatest attention is paid to freehand drawing, but perspective, instrument drawing, and geometry are also taught. The boys are examined by the intermediate examiners, 7389-92. Numbers of establishments and pupils, 7393-4. The City of Cork is fitting up a technical school. The Christian Brothers do not at present teach handicrafts. They are forming a technical museum, and getting instruments to explain the principles of machinery. They teach chemistry and physical science in laboratories, the boys seeing and taking part in the experiments. It is proposed to extend this practical instruction; want of funds is the only drawback, 7395-400. Boys generally leave the schools at 16 or 17, and, except the School of Art, have no place where they can carry on their education. There is no museum. The Christian Brothers propose to establish a private technical school where boys will be taught science and the principles and practical use of machinery as preparation for instruction at the city technical school. Some of the reverend Brothers might qualify themselves to teach use of lathe, &c. They already have a large dynamo which, with certain other machines, will be worked by gas engine; other appliances will be worked by compressed air, 7401-12. The schools of the Order in Ireland are not connected with the National Board, but their industrial schools are under Government supervision, 7413. If infant schools were widely established and children taken into them at 4 or 5 years of age compulsion would not be needed. Parents generally desire their children to be educated, except

BURKE, Rev. James D.—cont.

perhaps among the extremely poor, and children of this class might be got in by providing them with suitable clothing, free instruction, &c., 7414-7. In the schools of the Order the education is free; 2s. to 6s. per week is sometimes charged for repairs, appliances, &c., but the poorer children do not pay this, 7418-9. The Order would be willing to meet any fair requirements of the Government for testing the efficiency of its schools, 7420-1. If their schools were put under the National Board, the Brothers would have to sacrifice their own system (e.g., the exposure of religious emblems at all times), which they are reluctant to do. The experiment was tried, but given up, 7422-5. The boys are not presented for examination in drawing by the Science and Art Department. The Order would be glad to avail themselves of any privileges given by the Department if acceptable overtures were made. Has heard that the Department teaching is not of a practical character, but this does not deter them from adopting its system, nor does the objection to connection with the National Board apply to such adoption. They are very desirous that children should be taught drawing, and employ S. Kensington teachers to teach it, 7428-33. The intermediate Board examinations seem to be the same as the Department's. The intermediate education system has been very beneficial. It precludes crams. The Board insist that science teaching shall be illustrated by experiments, and its examinations test whether this has been done, 7434-8.

O'SULLIVAN, SIR DANIEL VINCENT. Pages 332 to 333.

Is a merchant and exporter of butter in Cork and member of Dairy School Committee, 7439-41. The school is calculated to do immense good by the knowledge gained and disseminated by its pupils. Its effects are already clearly traceable. Will furnish opinions and cases in proof. The export of butter amounts to nearly 1,500,000l. per annum, 7439-47. Is member of the Committee of Merchants. They approve of the Dairy School, and have subscribed, but not liberally. They are now, seeing the good it has done, prepared to give it warm support, 7448-50. It and other technical schools should be supported by local contributions as a condition of Government aid. Technical education is much needed and is interesting the people very much; they are determined to provide it. Testifies to the great ability of the Christian Brothers as teachers, 7451-4.

JOHNSON, MR. PHILIP F. Pages 334 to 337.

Is a commission agent and hotel keeper at Kanturk. Has answered the questions in the Commission's circular, 7455-6. Calls attention to the need of employment for the female members of the families of small farmers and labourers. Suggests basket-making. Rough basket-work is done at Kanturk. Would like to see finer work done there. Instructors might be obtained there if the trade were taken up in other parts, as it might easily be at little cost, 7457-62. The people have plenty of public spirit but no money. If the landed proprietors would take the matter up it might be done, 7463-8. Suggests that a few girls be sent to Germany to learn basket-making, or that a public instructor should go through the country to teach it, 7467-8. The middle class would contribute to the cost if the impulse were given from above or from Government, but will not commence it, 7469-70. Suggests reel-making. This requires little machinery, but the working people have no money, and those who have, lack public spirit, 7471-9. Suggests also the establishment of tweed and saw mills. The prejudice against machinery is less than is supposed and is wearing out, 7481-2. Has not considered the bog-oak industry, 7483. The population of Kanturk is 2,000. There is no drawing school there. 20 years since lace collar and hair-net making and crochet work were introduced, but from changes in fashions were soon given up. Lace collar making is still carried on in Ireland but not at Kanturk. Specimens will be shown at Cork Exhibition, 7484-92. The people are thrifty and anxious for instruction, 7493-4. Lectures on farming would be attended by the small farmers, who are

JOHNSON, Mr. Philip F.—*cont.*

industrious, and would lead to improved farming, 7495-8. There is no industry for the women. Children attend school to 12 or 13, are idle till 15 or 16, then go to America, 7499-500a. Government must take the initiative in technical instruction, but local support and control would be necessary and forthcoming. Recommends that public lecturers, especially on agriculture, be sent by Government, 7501-6.

PARKER, Mr. Wm. D'ESTERRE. Pages 337 to 344.

Has been a poor law guardian, and takes great interest in workhouse and other primary schools, 7507-9. In workhouse schools industrial education, though allowed, is generally neglected, and the workhouse grounds are sometimes let to tenants. Thinks it the duty of Government to see that workhouse children are trained to habits of industry; the neglect of industrial training is a great blot on the system, 7510-2. The reason for this neglect is that the teachers receive result fees for literary education, and the agricultural inspectors are very few, 7513. There is only one inspector of agriculture for all Ireland. There are 7,000 schools and only 74 farms in connection with the Board of Education, 7514-5. This proportion is not satisfactory. Would remedy it by attaching to each national school an acre or two of ground, which could be got without difficulty. The cost should be borne by the general taxpayer. Agricultural education is as valuable as, or more so than, literary. There are only 20 schools having gardens, 7516-21. Recommends that an hour or two of each school day be devoted to hand training. Does not approve of evening instruction. Manual occupation, by relieving mental pressure, would enable boys to learn more in a given time, 7522-4. Use of tools could be taught without difficulty, and such instruction is necessary. School buildings could be easily and cheaply adapted for it, 7525-7. For non-vested schools some indirect compulsion or a stimulus would be required to induce patrons to incur the necessary expense. Would pay the teachers on examination results, 7528-9. Basket-making could be taught in schools; in some places the ground without preparation is suitable for growing twigs, 7530-2. Lace-making is an increasing industry in his district. It gives the girls and old women constant occupation at crochet work; they earn 3s. to 6s. a week. The wholesale houses furnish the designs; does not know where they get them, 7533-7. Lace-making might be taught in girls' schools; it is now taught, most successfully, in convent schools, 7538-9. Sewing, generally plain, is taught in national schools. At one school, members of a ladies' committee attend in rotation daily with good effect, 7540-1. Advocates local inspection and local management of all schools, as giving the upper classes an interest in the lower. The district inspector only visits once or twice a year, 7542-4. Committees of inspection might be elected through the National Board, not at present by popular election. Amazing progress has been made with regard to education. The humblest classes desire it. Letters, &c. from America and the Colonies have partly produced this result, 7545-7. The fees charged in schools are so high as to lead to irregular and non-attendance; labourers with ordinary families find it difficult, and those with large families impossible, to pay them. Education should be compulsory. It should be free for those who cannot afford to pay; it is so under the present rules, but they are not carried out by the managers, 7548-53. The salaries of school teachers and mistresses are much too low, 7554. Knows that teachers now get fees on results. Boards of guardians refused to contribute because the tax is only levied on land and houses, and although the general taxpayer pays masters' salaries and a large proportion of the result fees the guardians object to paying 2,000*l.* or 3,000*l.* a year beyond what they already pay, 7555-60. If that difficulty were removed the teachers' positions would be improved, 7561. The difficulty in promoting industrial employments is due to (1.) land agents and landlords, who take no interest in the matter, (2.) drinking habits, (3.) insufficient house

PARKER, Mr. Wm. D'Esterre—*cont.*

accommodation. The remedies required are healthy homes and technical education. The Steam Packet Company is prosperous owing to the large import of manufactured articles, while the people are idle, and the export of cattle reared on land which, under tillage, would furnish employment. Suggests the training of boys as seamen and of girls in workhouse and national schools to cooking and domestic service; and also the delivery of lectures to adults to teach them their responsibilities as to technical education of the young, 7561a.

## FORREST, Mr. T. Andrew. Pages 344 to 346.

Is a butter inspector of Cork, 7562. The inspectors are appointed by the trade. They classify the butter, and would therefore know of any change in its quality, 7563-5. It has improved for 15 or 16 years, principally during the last 10, but farmers still need instruction, 7566. Munster Dairy School is calculated to benefit Munster. Tried to induce farmers to send their daughters; the school and the number of pupils has since increased. After a session there they make much better butter, 7567-8. The prices realized by butter depend much on the way it is made. Technical knowledge and skill may be acquired in a school like Munster Dairy School; the education there is very practical. The methods of butter-making in Munster are still very imperfect. The brands are attached in the market; gives instances of girls who had not previously obtained the highest, but did so, greatly to their advantage, after attending the school, 7569-76. One dairy school in Munster is not sufficient, there should be several in different parts, 7577-81. People gain little information from the travelling dairy school; it is necessary that girls should be under instruction for several weeks. Merchants issue instructions annually as to improvement of butter. Wrote a pamphlet on the subject (*handed in*) in which he drew attention to the Dairy School. Practical instruction is more useful than any literature, 7582-4.

## HEGARTY, Rev. Canon. Pages 346 to 349.

Is administrator of the parish of S.S. Peter and Paul, and manager of schools, connected with the National Board, for 700 children. Has paid great attention to schools in various parts of Ireland and in America. In Ireland fees are willingly paid and do not lead to irregular attendance. The people desire technical education. Opened last winter a night school for boys. States what grants may be earned, &c., 7585-90. Teaches in the night school the 3 R's principally, but people flock in to witness experiments, &c. Has spent large sums in schools and on church furniture for the purpose of educating the people. Imported a pulpit, altar, &c. Could not get them made in Ireland, although all the materials exist there. If the rising generation are given a fair start, such orders might be kept at home. Ireland has good materials—bog-oak and 5 or 6 different marbles—but the people do not know how to use them, 7591-2. There is an art school in Cork, which is beginning to be useful. Hopes for better results when the new building is completed and the number of teachers increased, 7593-4. Manual work should be taught in primary schools—girls sewing, &c., boys (in the evening) use of tools, 7595-7. If such instruction were given by elementary teachers in the evening, and paid for on results, progress would be made (gives an instance), otherwise they would be reluctant to interfere with the regular course. Suggests erection of cooking stoves in schools. If Government would give 50l. for such purposes 75l. would be subscribed. There would not be much contention about technical education, 7598-602.

**CAREY, MR. RICHARD.** Pages 349 to 351.

Is director of the Baltimore Fishery Company. It was started to cure pilchards, but now deals in mackerel, &c. in addition. The plant cost over 2,000*l.* The pilchard fishery lasts from July to 1st November. Women and children are employed in packing, &c., and are paid 2*d.* per hour. The Baroness Burdett Coutts gave money to the fishermen of Cape Clear, &c. to buy boats, and his company buy their fish (mackerel) and send it to England. A Cornish man was employed to teach the people how to cure pilchards, but they have now become so expert that he has been discharged. The company supply seines to the fishermen, receiving half the fish in payment, 7603-10. Would like to see the trade further extended. A good curing cellar, which is necessary for curing pilchards, costs 1,500*l.* A small steam launch now collects the pilchards caught. The country people do not care for pilchards, and the fishermen believe that the oil in the fish rots their nets. The company's nets are tanned, 7611-2. Suggests that the people round the coast be taught to pickle pilchards, which his company would then take at remunerative prices. Tried to teach them, but was too busy. Does not know anyone else who would do so. Is told that the sea at Dungarvan is alive with pilchards, but the fishermen will not catch them as no one will undertake to cure them. The oil and refuse from curing are very valuable. Hopes his statement will stimulate others to take up the work, 7613-21.

**BRENNAN, MR. JAMES.** Pages 351 to 354.

Artizan evening classes in the usual subjects have been held at Cork Art School (of which witness is head master) since its establishment in 1854. Students, mainly artizans, are prepared for Second Grade examination, 7622-4. The Science and Art Department gives great latitude as to course of study. The prescribed course in building construction and machine drawing is very full, and the students appear satisfied with it and are very successful in the examinations, 7627-8. Believes the classes to be valuable to Cork building trades' operatives, both as to the time at which they are held, and the way in which they are conducted. Gives instances. Will put in number of passes, &c. (see 7635*a*), 7629-30. If employers encouraged their apprentices and workmen to attend the school much good might be done. There is little demand for art designers in Cork. Suggests that intending designers should become acquainted with the technique of the trade to be designed for. Gives an instance showing the need of this, 7631. Gives cases of successful designers trained at the school, 7632. Suggests that manufacturers should give increased wages to employes passing Science and Art examinations, admit promising art students to their works to study technique, and send promising workmen to the school, 7633-4. It is advisable to call the attention of the authorities to the want of an industrial museum. A new art school with museum attached is contemplated, 7635. Gives numbers of students at Cork Art School science classes who attended and passed the examinations from 1875 to 1883.

**SCOTT, MR. THOMAS.** Pages 355 to 357.

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## APPENDIX J.

Appendix J.

*See Evidence of Mr. Mulligan (p. 6.)*

## DUBLIN MUNICIPAL COUNCIL.

## REPORT of the Science and Art Museum Committee, re Technical Education.

On the 4th December 1882, the Municipal Council adopted the following resolution, and referred it to the Committee named at the request of the public meeting of citizens in the matter of the Science and Art Museum:—

RESOLVED:—That the Council make a representation to the Government of the extreme importance of extending to Ireland the inquiries of the Royal Commission now engaged in investigating the state of Technical Education in Great Britain and on the Continent; and to empower the Commission to report as to the best plan for establishing a system of technical instruction suitable to the circumstances of the country.

Your Committee have received and adopted the following report, prepared by Councillor John Mulligan and Councillor Webb:—

Your Committee have considered the question of technical education in Ireland. They have had before them the Report of the Royal Commission, so far as it relates to France. They have carefully gone over the scheme being carried out by the Associated Guilds of London, and are aware of much of what has been of late written and spoken in Ireland upon the subject. Their conclusions must take the shape more of general than of very definite proposals.

The more the question is looked into, the more its importance becomes apparent. Your Committee are persuaded that unless immediate steps are taken to carry out the technical idea in the primary, intermediate, and higher schools in Ireland, the people at large will inevitably be left behind in the industrial progress of the time, and as permanent injury may be inflicted upon Ireland as was inflicted upon her in the last century, when her manufactures were deliberately extinguished. The Continental nations are straining every nerve in the matter; England is fully alive to its importance, and in its board schools (backed up by the public opinion of the country, and managed on a flexible system that leaves an opening for different plans and systems being tried side by side), all the intelligence of the country is brought immediately to bear upon every phase of the education question.

We think that the subject is of especial importance in Ireland, where the circumstances of the country have led to large numbers of the people being reared and nurtured in listlessness; where for such a long period, education was forbidden or discouraged; and where, so far as the State is concerned, it has never been brought fully into accord with the feelings of the people.

We conceive that education in Ireland is on too exclusively a literary basis. We believe that from the earliest years the training of the hand, the eye, and the mind, whether by the *kinder-garten* system or otherwise, should be made a matter of primary importance. We think that all alike should be taught drawing, as the best preparation for almost any avocation. We think that for girls who have to go out into the world as domestic servants or tradesmen's wives, there might be some better preparation than a smattering of French or the ability to play a few tunes on the piano. Calisthenics should be a part of the every-day training in all schools. In some way the record of each child's attendance and progress should be carried on from year to year, as a surer incentive to steadiness, and a surer test of character than any examination or examinations.

In the principal towns throughout the country, schools should be more completely equipped for instruction in industries suitable to the particular locality—such as weaving, dyeing, chemistry in its relation to trade,

Appendix J.            cookery, seamanship, and fishing; special instruction should be provided for butter-making; schools of agriculture should be re-organised or revived.

To provide for students in the higher branches, and for the education of young men to be managers and foremen, the College of Science in Dublin would very well serve as a central institution—for entrance into which, as into secondary schools, a strict examination (taking into consideration the personal record) should be made, otherwise its uses would be impaired, and its professors would be wasting their energies teaching the rudiments of science. The higher education of women in arts and industries and teaching should be fully provided for in the local schools, and in a central institution upon the plan of the Queen's Institute in Molesworth Street. We consider that the advantages offered by examinations under the London Guild Schools' scheme should be immediately availed of by committees of manufacturers, without prejudice to the ultimate establishment of a similar scheme for Ireland, upon an independent basis.

It might be desirable that the power should be conferred upon boards of guardians of transferring orphans to industrial schools.

To what extent the advantages of the changes we have shadowed forth can be obtained through present institutions in Ireland, and to what extent, and in what manner legislative powers should be sought, this Committee does not take it upon itself to determine. Every legitimate use should be made of existing instrumentalities.

Your Committee must, however, declare its conviction that until the educational institutions of the country are brought fully into accord with the religious and national convictions of the people all education will remain dwarfed, all real progress will be retarded, and the best interests of the people will be irremediably sacrificed.

If such accord were established, your Committee would recommend the introduction of a compulsory system of education.

Under the present system, attendance is exceedingly bad, and whilst this continues, the foundation of success in technical training, namely, sound and accurate primary teaching, cannot be laid. Furthermore, an injustice is inflicted upon the teachers, who do not get a fair chance to sustain their reputation, or of earning the increment to their meagre salaries dependent upon results. There is also injustice to the children, who are only half taught, and, above all, there is an injustice to the country, which suffers from the absence of the sound education of its people, and from the presence in our midst of all the evil consequences of ignorance and idleness.

There is no need of any Act like that of the School Board to effect a reform in this matter of attendance. Committees fairly chosen could, as in several places in England, be charged with this duty. Your Committee strongly press this point upon your notice.

All which we submit as our report this 29th day of January 1883.

CHARLES DAWSON, M.P.,  
Lord Mayor,  
Chairman.

City Hall.

Appendix K.

#### APPENDIX K.

*See Evidence of Mr. J. Murray (p. 119).*

#### MEMORANDUM FROM IRISH HOME MANUFACTURE ASSOCIATION.

To Her Majesty's Commission on Technical Instruction.

GENTLEMEN,

As a body, the aim of which is the encouragement of manufactures in Ireland, we beg to lay before you the following statement of our opinions upon the subject of your inquiries.

The need of technical training being perhaps, nowhere more apparent, than in Ireland, for in no other country in Europe are the natural resources so little developed, owing in a great measure to the absence of skilled labour, which is the great preventive of advantage being taken of many of the resources which would yield employment and profit:—

I. There is, therefore, an absolute want for technical instruction.  
 II. In imparting which it is necessary to guard against superficial and imperfect methods. Under this head, we would express our condemnation of the system at present pursued in reformatory schools, which, according to the testimony of employers and tradesmen, is of but little practical use.  
 III. The necessity of technical training for juvenils and female labour in the lighter branches of manufacture, which would be a means of lessening the cost of production, and enable competition, as regards price, with the goods of foreign countries. For such labour there being little or no employment here.

IV. The introduction of processes of manufactures not now carried out in this country, but for which a fair field exists; such as—

Carpet making.	Wood Carving.
Clock "	Straw plaiting.
Toy "	Glass engraving.
Leather case making.	Leather dressing.
Calico making.	Calico printing.
Pottery "	&c. &c.

V. The introduction of improvements in the processes of manufactures already carried out in this country. Instruction in the use of new tools and of machinery, as far as practicable. A skilled comparison of the goods of other countries, with those manufactured here.

VI. To advocate a system of free lectures in the evening, as given in Paris.

VII. If examinations are to be held, that they should be, as far as possible, viva voce. As many practical and even clever workmen, not being used to furnishing written statements of their views, would, in many instances, but imperfectly express their meaning.

VIII. To remember, that owing to the very different and almost entire want of opportunities for instruction in this country, it might be necessary to have a system differing in many particulars from that which would be suitable in England or Scotland.

IX. Instruction in the use of tools to form a part of the education given under the "National Board" in Ireland.

X. That the system adopted be in sympathy with the people, and that no obstacle be placed in the way of those wishing to join such schools, either for want of previous instruction or position.

The last suggestion may, in the minds of some, seem unnecessary, but when we consider the number of well-meant schemes which have been launched amongst us, and which have proved but a waste of public money, we would wish to emphasize it in the strongest manner.

This statement is made as the result of our discussion upon the question, and if the Commissioners desire to address any queries with reference to their own views, or respecting the statements contained in this paper, two or three of the members of the association, who have been deputed, will, in the event of the Commissioners requiring their attendance, wait upon you.

We, have, &c.

B. MATERNIS, Chairman.  
 JAMES MURRAY, Secretary.

## APPENDIX L.

*See Evidence of Mr. Murray (p. 120.)*MEMORANDUM RESPECTING TECHNICAL EDUCATION IN DUBLIN FROM  
MR. J. MURRAY.29, Lower Sackville Street, Dublin,  
July 30th, 1883.

To the Royal Commission on Technical Instruction.

GENTLEMEN,

I beg to lay before you the following suggestions which are made, as the results of some inquiries made amongst the classes for whose benefit technical schools are intended, viz., employers and workmen.

I.—“*Royal College of Science.*”

As I gathered from the statement of one of the members of the Commission, that it was the intention to recommend the use of the building now occupied as the “Royal College of Science,” for the purpose of the Central School for technical education in Dublin, I would first say, that as the number of pupils who attend the college in the day-time is so limited, and as other institutions in Dublin offer facilities for the study of applied science, these classes might be discontinued. The classes held in the evening, however, are fairly well attended, and there is no other place in Dublin where such instruction can be had at night classes; it would be a serious loss to have those classes discontinued.

The collection of minerals, &c., could be sent to the new museum, and ought to be kept intact.

It would be, I think, feasible to carry on the evening classes, now held in the Stephen’s Green building, in the “Royal University,” and under the auspices of the senate and fellows of that corporation.

II.—*Branches.*

Two or more branches to be established where the more elementary subjects only should be taught. These branches to be situated in the more crowded parts of the city, and care to be taken that they be near the residences of the workpeople.

III.—*Technological Museum.*

There is, even at present, need of a collection in which “raw materials,” and their state, and the changes which they undergo in the course of manufacture, would be shown. There being scarcely any part of the specimens exhibited in Dublin of any use for the purpose of showing the stages of manufacture, the temporary museum not excepted.

IV.—“*Dublin Mechanics’ Institute, &c.*”

Facilities, such as exist for the formation of classes under the Science and Art Department, might be offered to institutions such as the “Dublin Mechanics Institute,” “Dublin Working Men’s Club,” &c., for the establishment of primary classes in connection with the Central School. But, I am of opinion, that such institutions in Dublin could not, with any advantage, be otherwise made use of.

V.—“*Model Schools.*”

Although this is a matter that concerns the provinces of Ireland, I will add a word, as it is from the provinces that a great number of the tradesmen of the city are annually drafted.

In different parts of the country the "Model schools," deriving a very large annual grant, are, when attended by pupils at all, attended by such as require no State aid for their education, their parents being almost without exception, well able to pay for their teaching. If such schools were devoted to the purposes of technical education, and the money spent on their maintenance used for a like purpose, a real profit would be derived from them, instead of the glaring loss.

Appendix L.

## VI.—Control.

This is really the important point, and is the one at whose doorpost failures are to be laid.

The persons to be selected as "Visitors," "Governors," or whatever title may be given to them, should be such as have gained the favour and confidence of the populace, and should be persons intimately acquainted with their wants and wishes. A greater necessity for such a choice exists in this case for the reason, that as the instructors of technical education must almost of necessity be persons from other countries, every provision should be made to guard against the new institution being viewed with prejudice, as would naturally be the case, where both the governing body and the teachers were persons who were strangers to the people. For, I include under this head many of the well-meaning gentlemen who are usually selected for such appointments in Dublin.

I have, &amp;c.

JAMES MURRAY,  
Secretary,  
Irish Home Manufacture Association.

## APPENDIX M.

Appendix M.

## CIRCULAR OF INQUIRY RESPECTING INDUSTRIAL EDUCATION.

The following Circular was issued by the Commissioners to a large number of oligymen, landed gentry, newspaper proprietors, manufacturers, and others in Ireland, and the answers received have been epitomised in the following tables.

The replies are placed according to the position of the counties on the East, going from North to South, and then the Western counties are taken in the same sequence.

## ROYAL COMMISSION ON TECHNICAL INSTRUCTION.

## IRISH INDUSTRIAL EDUCATION.

"The members of the Royal Commission on Technical Instruction having ascertained that in some Continental countries instruction is being given successfully to the children in elementary schools in the use of the tools ordinarily employed by workers in wood and iron, and that, in remote and poor districts, domestic trades have been and are being taught, with the result of giving fairly remunerative employment to the population, two of their body recently visited Ireland in order to inquire whether similar steps might be taken with advantage to the people, more especially in the West, where employment is at present scarce and greatly needed, in order to supplement the very inadequate sustenance afforded by the cultivation of small patches of a barren soil. They have obtained promises of support from various influential quarters, including His Grace the Catholic Archbishop of Tuam, several Bishops and members of the Protestant and Catholic Clergy, the National Board of Education, the Managers of the Artane Industrial School, and various other public bodies and representative persons. At the suggestion of the Archbishop of Tuam, and of the Very Rev. Dr. McCormack, Bishop of Achonry, they have drawn up the following questions, with the view of obtaining definite information that may guide them in their conclusions and recommen-

Appendix M. datations, and they will be glad to receive such answers thereto as your local knowledge may enable you to give :—

1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needle-work, &c.?
4. How, and from what age, are children occupied?
5. Are the people generally intelligent, industrious, and handy?
6. What natural products or materials (such as wool, leather, wood, straw, marble, or osiers) are obtainable in your district which are not at present profitably employed for industrial purposes?
7. Is water-power easily obtainable from streams?
8. At what distance apart are the National Schools? Name the schools nearest to you.
9. How many children attend the schools?
10. From what distance do the children come to attend school? What are the school hours?
11. Do any of the children learn drawing? If so, how many?
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?
14. Is there any skilled artizan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of tools employed in his trade?
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payments on results?
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?
18. Have you reason to believe that the people
  - (a.) Children
  - (b.) Adults
 would avail themselves with alacrity of such instruction if offered to them?
19. Have you any other suggestions to offer, which may assist the Commissioners in carrying out the objects they have in view?
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?
21. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.
22. State your own name and occupation, and proper postal address.

(Signed) B. SAMUELSON, *Chairman.*

Please send this form, when filled in with your replies, to

GILBERT R. BEDGRAVE,

*Secretary of the Royal Commission on Technical Instruction,*  
 South Kensington Museum,  
 London, S. W.

## REPLIES TO CIRCULARS.

---

Antrim	12
Down	1
Down and Armagh	1
Louth	3
Monaghan	2
Meath	3
Longford	2
Westmeath	1
King's County	2
Cavan	1
Queen's County	5
Kildare	5
Dublin	8
Wicklow	3
Carlow	2
Kilkenny	1
Donegal	5
Fermanagh	1
Fermanagh and Tyrone	1
Tyrone	2
Sligo	4
Galway	4
Clare	1
Mayo	0
Limerick	10
Kerry	2
Cork	11

Questions.	Answers.	
	ANTHIM.	
22. State your own name and occupation, and proper postal address.	Rev. G. Johnson-Smyth, M.A., clergyman.	Rev. Jno. W. Bleator, clergyman.
23. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Glenary . . . . .	Soldierstown, parish of Aghalee.
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Farming . . . . .	The higher class farming; some of the lower class weaving. Many have hardly any means of livelihood.
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	. . . . .	Weavers earn 10s. week. Labourers 6s. to 8s. week.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, etc.?	They help in the families. Knitting and needlework, &c. are done by the girls.	"Some of them weave. Hem stitching."
4. How, and from what age, are children occupied?	Generally from the age of 10 years.	From about 10. Many of them wind bobbins for their parents.
5. Are the people generally intelligent, industrious, and handy?	Fairly so . . . . .	Yes . . . . .
6. What natural products or materials (such as wool, leather, wood, straw, marble, or osiers) are obtainable in your district which are not at present profitably employed for industrial purposes?	Osiers are cultivated in some districts, and baskets are made.	Straw and osiers . . . . .
7. Is water-power easily obtainable from streams?	Water-power might be utilized.	In a few places . . . . .
8. At what distance apart are the National Schools? Name the schools nearest to you.	"There are many in the parish, and three scriptural schools."	3 miles apart. 4 named . . . . .
9. How many children attend the schools?	"Very good attendance in the scriptural schools; cannot answer for the National Schools."	About an average of 45 per school.
10. From what distance do the children come to attend school? What are the school hours?	. . . . .	½ to 1 mile. 10-5 . . . . .
11. Do any of the children learn drawing? If so, how many?	Not that I am aware of . . . . .	A few of them . . . . .

Continued on page 394.



Answers.			No. of Ques- tion.
ANSWERS.			
Rev. Samuel M. Moore, M.A., clergyman.	Rev. Jno. McConnell, Presby- terian Minister.	Rev. Geo. Conway, P.P.	23
Lisburn, Dunmurry, Derrigley, Upper Falls.	Dundrod (Crumlin)	Hannahstown, Rock, Stoneyford, Dunmurry.	21
Agriculture (chiefly), bleaching. Hand-loom weaving still exists.	Farming and dairy work	Farming, quarrying, and break- ing stones.	20
The well-doing work hard and allow themselves little leisure. Earnings not nearly so good as they were.	" " "	6 a.m. to 6 p.m. Barely a suffi- ciency for their support.	19
Yes, largely in the bleach-works, and in house-weaving, lam- bouring, &c. Earnings small.	No home industries	Help on farm and do house- work. No home industries worth speaking of.	18
Half-timers go into the mills at 12. Full-timers at 14	Generally on the farm as soon as they are able to work.	Herding, nursing, &c. from 5 years upwards.	17
A fair proportion are; a few exceptionally so.	Yes	Yes; some of them extremely so.	16
None that I know of	" " "	Some wool, straw, cattle grazing, hay and rushes, heather.	15
Yes	Yes	Yes, with rare facilities	14
About 3 miles. (?) 4 named	About 3 miles. 8 named	Between 3 and 4 miles. 2 named.	13
(?) About 100. Large attend- ances at all.	At Dundrod an average of 70	Hannahstown, 60 to 70. Rock, 30 to 40.	12
Some over 3 miles	From 1 to 3 miles. 10-3	Up to 3 miles. 10-3.	11
No	Does not know of any	No	10

Continued on page 394

Questions.	Answers.	
	ARTHRIM.	
13. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	As regards the school-rooms under my control arrangements might be made.	Soldierstown School which I am both patron and manager, can be obtained with pleasure.
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	See 12	Yes
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	- : -	- - -
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	Cannot answer	- - -
6. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	Could recommend a very intelligent and skilful carpenter.	There are carpenters, blacksmiths, shoemakers, &c. but whether they could teach I do not know.
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	This is a very comprehensive question, and the success of such a scheme would, I apprehend, altogether depend on the extent of the advantages offered.	- - -
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	See 17	Yes
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	- - -	Will be happy to assist in any way.
20. What facilities, if any, exist for disposal of the work done by adults or children? What railway or canal communication exists?	Railway communication with Belfast.	Believes articles could be disposed of. Station at Moira; also canal; within 12 miles of Belfast.

Answers.			No. of Question.
ANSWERS.			
Yes . . . . .	Is sure the school-room would be obtainable.	Yes, with pleasure . . . . .	13
One erected which could be made available.	Yes . . . . .	Plenty of room . . . . .	13
Yes . . . . .	There is a country carpenter, but cannot say as to his ability to give instruction.	Not more than 3 miles distance . . . . .	14
Yes, I think so . . . . .	It is likely the master would . . . . .	No . . . . .	15
Several good house carpenters, & . . . . .	. . . . .	Could be found easily . . . . .	16
Very frequently . . . . .	We could make the effort and see.	Everything possible will be done under the circumstances.	17
If they saw a prospect of turning it to account they would.	Some probably would . . . . .	I believe so . . . . .	18
None at present . . . . .	. . . . .	Not at present . . . . .	19
Both close at hand . . . . .	Railway 4 miles distant, canal 3	Railway at Dummurry, 3 miles distant. Railway at Belhat, 3 miles distant.	20

Questions.	Answers.	
	ANTRIM.	
22. State your own name and occupation and proper postal address.	Lancelot Turtle, Esq., gentleman.	Mr. Bennett Magarry, farmer.
21. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Aghalee . . . . .	Lisburn, Magheragall, Stonyford.
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Linen weaving, farm work . . . . .	Agriculture, linen weaving, and domestic service. (Women earn same as men, and sometimes more.)
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	Farm; 7 a.m. to 6 p.m. (summer), 6 p.m. (winter). Weavers longer time, but irregular. Men earn 6s. to 11s. per week.	8 to 14 hours per day. 6s. to 12s. per week.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	Weaving (8s. a week); winding (4s.); needlework (about 6s.); and farm work (4s. to 6s.).	Some dressmaking, others as stated in Question 1.
4. How, and from what age, are children occupied?	From 12 years of age on the farm.	From 10 years of age . . . . .
5. Are the people generally intelligent, industrious, and handy?	Yes . . . . .	I should say they are . . . . .
6. What natural products or materials (such as wool, leather, wood, straw, marble, or osiers) are obtainable in your district which are not at present profitably employed for industrial purposes?	Straw and osiers . . . . .	The only thing is straw that can be sold at a fair price.
7. Is water-power easily obtainable from streams?	Not in the immediate neighbourhood.	No . . . . .
8. At what distance apart are the National Schools? Name the schools nearest to you.	2 miles. 5 named . . . . .	1½ miles. 5 named . . . . .
9. How many children attend the schools?	From 30 to 60 (numbers given) . . . . .	I think over 200 . . . . .
10. From what distance do the children come to attend school? What are the school hours?	1½ to 2 miles. 10-3. . . . .	Up to 2 miles. 10-3 . . . . .
11. Do any of the children learn drawing? If so, how many?	No . . . . .	I should say 20 at Sheepswall and Ballycarrickmaddy.

Continued on page 200.

Answers.			No. of Question.
ANTRIM.			
Mr. Wm. Dawson, farmer	Sir Ed. Wallace, M.P.	Mr. Richard Bell, farmer	22
Magheragall	Lisburn	Magaberry, Trammery, Soldiers-town, Mullaghearton.	24
Farming; a few in weaving	Flax mills	Farming and agriculture. Some hand-loom weavers	1
10 hours daily. Weavers 10s. a week.	56 hours per week. Average wages, 18s. per week.	7 a.m. to 5 p.m. Labourers 9s. to 10s. per week. Weavers 9s. per week.	3
Some in weaving, and earn 10s. a week; others in household work. No other industries for women.	In weaving and spinning (12s. week). No other employment.	Weaving. Farm work in spring and harvest, 7s. per week. No home industries.	3
Not specially employed, except by their parents.	From 10 to 14 as half-timers. Doffing, as machine boys, &c.	At school till 10; then employed on the land or at weaving.	4
Generally speaking, they are	Yes	They are	5
	None unemployed.	There are none	6
No	Yes	Yes; any mills in this locality are turned by water.	7
1½ to 3 miles. 3 named	In the country about 2 miles. In town about ½ mile. 3 named.	1 to 1½ miles. 4 named	8
105 attend this school here	About 1,000	About an average of 60	9
A few come 2 or 3 miles	Two miles. 0.50-3	Up to one mile. 10-3	10
Yes	Yes, in the school here. 150	About 10 in each school	11

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F F 2

Questions.	Answers.	
	ASTRIM.	
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	In Aghalee a permanent room could be obtained for a small remuneration.	I think so, if required - -
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Yes, Aghalee - - -	There is - - -
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	Yes, if paid - - -	I do not know of any - - -
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	The master would not - -	Thinks the master would not have time.
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	Yes, if paid - - -	Fears not - - -
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	"An effort would, I believe, be made, but as the people are just now very poor, but little could be expected."	Would have fears on this matter.
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	I believe a number would - -	Could not say - - -
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	- - -	The working people are generally employed, and the surplus go into the towns and get work.
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	G. N. Railway and Lagan canal.	Abundant accommodation -

Answers.			No. of Question.
ANSWERS.			
School-room could be obtained -	I think they could - - -	I believe the school-rooms could be obtained.	13
No - - - - -	No - - - - -	Any quantity of room - - -	13
No - - - - -	No - - - - -	There are - - - - -	14
No - - - - -	Yes - - - - -	Yes. Many would be very glad of the opportunity.	15
No - - - - -	No - - - - -	Yes, if promised payment on results.	16
No - - - - -	Doubtful - - - - -	They would, and I believe with every prospect of success.	17
I don't believe they would generally.	Yes - - - - -	They would - - - - -	18
No - - - - -	This being a manufacturing district, hardly comes within the scope of the Commissioners' inquiries.	Every assistance would be given to the objects in view.	19
Dublin and Antrim Railway, within 2 miles.	Good markets in Lisburn and Belfast. Railway and canal to Belfast.	G. N. Railway; Lagan canal -	20

Questions.	Answers.	
	ANTRIM.	
22. State your own name and occupation, and proper postal address.	Rev. Canon Sayers, clergyman -	Rev. A. Macaulay, P.P. -
23. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Ballinderry - - -	Whitehall, Aghalee, &c. -
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Farm labour and hand-loom weaving. A few basket-makers.	Weaving, fishing, and agriculture.
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	6 a.m. to 6 p.m. in summer; in winter while light. Farm work, 8s. a week; weaving, 6s. to 12s. a week.	7 a.m.—6 p.m. - - -
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.	Field work, weaving, knitting, and winding; also some embroidery and handkerchief hemming.	Weaving, 10s. week - -
4. How, and from what age, are children occupied?	Generally they go to school till 9 or 10 years old, and then begin work.	Winding - - -
5. Are the people generally intelligent, industrious, and handy?	Fairly so - - -	Yes - - -
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	I know of none - - -	- - -
7. Is water-power easily obtainable from streams?	Not easily; but there are some small streams that might be utilized at some cost.	- - -
8. At what distance apart are the National Schools? Name the schools nearest to you.	About 2 miles. 6 named -	1½ miles. 2 named -
9. How many children attend the schools?	About 300 to 400 - - -	150 - - -
10. From what distance do the children come to attend school? What are the school hours?	Up to 2 miles (except a few who come a great distance). 9.30—3.6.	2 or 3 miles. 10—4 -
11. Do any of the children learn drawing? If so, how many?	I think not - - -	About 20 - - -

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APPENDIX.

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Answers.			No. of Question.
DOWNS.	DOWNS and ARMAUGH.	LOUTH.	
Rev. L. B. Price, clergyman -	Maxwell C. Glose, Esq., M.P. -	Henry Bellingham, Esq., M.P. -	22
Downpatrick - - -	Drumbanagher, Newry (co. Down).	Castle Bellingham, Dunauy, Dunleer.	21
Farm labour, carpentry, small shop-keeping.	Entirely agricultural - -	Principally agriculture - -	1
12 hours. 10s. per week -	12 hours. Labourers 9s. to 10s. a week.	7 a.m. to 7 p.m. 8s. to 10s. per week.	2
Excepting a little hand embroidery, they have no occupation whatever. No home industries.	Farm labour (6s. week). In spinning mills; home weaving; in hem-stitching, girls earn 2s. 6d. per week.	Farm-work (earning something less than the men). Lace is made in the convents, and crochet work by some of the labourers' wives.	3
No employment for children except as shop messengers.	All ages; they assist in farm work and in spinning factories.	In farm operations, often from the age of 10.	4
Intelligent, but unaccustomed to handwork.	Very much so - - -	Yes - - -	5
Nones, except osiers, of which common baskets are made.	Not any - - -	- - -	6
Yes - - -	Yes - - -	Yes - - -	7
Six National Schools in the town	About 2 miles. 4 named	1½-2 miles. 4 named - -	8
300 to 400 - - -	Average, 80 to 90 - -	A fair proportion - -	9
Town and immediate neighbourhood. 10-3 or 4.	About 1 mile. 10-3 - -	Up to 2 miles. 11-3.30 -	10
About 20 - - -	No - - -	- - -	11

Continued on page 403.

Questions.	Answers.	
	ARTHM.	
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	(a.) Yes. (b.) Cannot say	.
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Yes	.
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	Probably	.
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	I am sure of it	.
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	There are handy and intelligent persons who would gladly qualify if promised payment.	.
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	It is almost impossible, especially at the present time, to obtain local aid.	.
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	Can scarcely say. The people here are very slow to take up any new employment; but after a time I should think they would.	.
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	Not at present	The queries do not, in my opinion, refer to such a district as this. As a rule, all have plenty of work, such as it is.
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	Railway at hand. Canal within 3 miles.	.

Downs.	Answers.		No. of Question.
	Downs and ARMAGH.	LOUTH.	
Yes. Schools and other rooms -		Should think so; without much difficulty.	12
Probably - - -		Yes - - - - -	13
There are carpenters, upholsterers, &c. who could do this if employed.	Not answered, as the neighbourhood affords no requirements for them.		14
Should think so - - -		Should think the master would	15
Probably - - - - -	There are many skilled tradesmen in the locality.	- - - - -	16
The Church of England clergyman and his family have always endeavoured to promote any industry; but to make it remunerative is difficult.	"I think not, as there is no poverty, and plenty of work. Not hands enough for farm requirements."	I think they would - - -	17
Women and children would be glad of any employment. Could knit and make ordinary clothing. Have not tried anything else.	- - - - -	(a.) Yes. (b.) I think so	18
If some one industry were taught at which both men and women (the latter especially) could work, and a sale ensured or prizes given until the thing became general and remunerative, the people (naturally enterprising) might be induced to try to hope for improvement.	- - - - -	- - - - -	19
- - - - -	Two: railway and canal	Two harbours at Dundalk and Drogheda. G.N. Railway.	20

Questions.	Answers.	
	Louth.	
22. State your name and occupation, and proper postal address.	Benj. Whitworth, Esq., M.P.	Rev. Jno. Archer, A.B., clergyman (Rural Dean).
23. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Drogheda	Drogheda
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	A considerable proportion in flax and cotton mills.	Cotton and linen factories. Iron and wood works. Chemical manure works. Some agriculture and fishing.
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	10 hours per day. 5s. to 15s. per week.	6 a.m.—6 p.m.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	Ample employment in flax and cotton mills at 5s. to 15s. per week. No home industries.	Many in the mills and shops. Dressmakers, milliners, &c.
4. How, and from what age, are children occupied?	From 12 years of age in the factories.	- - -
5. Are the people generally intelligent, industrious, and handy?	Very intelligent and fairly industrious and handy.	- - -
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	None, except a very fine light-coloured limestone.	- - -
7. Is water-power easily obtainable from streams?	Yes, to a moderate extent	- - -
8. At what distance apart are the National Schools? Name the schools nearest to you.	Most of the children are educated in the convent and Christian Brothers Schools.	- - -
9. How many children attend the schools?	Nearly all children attend school, but I do not know number.	120 Protestant children attend the parochial schools.
10. From what distance do the children come to attend school? What are the school hours?	No great distance. Usual hours	- - -
11. Do any of the children learn drawing? If so, how many?	A few in the Christian Brothers Schools.	- - -

Continued on page 406.

Answers.			No. of Question.
MONAGHAN.		MBATH.	
Very Rev. Thos. Smollen, Archdeacon and P.P.	Very Rev. J. J. McMahon, D.D., Dean, V.G. and P.P.	Rev. Jos. S. Bell, LL.D., rector of Kells.	23
Kells and neighbourhood	Donaghmoyno, Carrickmacross, Magheracloone, Killany (part), Inniskeen (part).	Kells and immediate neighbourhood.	21
Agriculture	Agriculture and farm work	Agricultural labour	1
—6 in summer; 7—7 in winter. 1s. 6d., 1s. 9d., and 2s., according to season, and 2s. 6d. (per day) for a short time in spring and harvest.	About 14 hours daily. About 7s. a week; but many of them now have no employment.	7 a.m.—3 p.m. About 2s. a week	2
in spring and harvest in field work at 10d. or 1s. a day. Lace-making and needlework had paid well in the past. Crochet is now paying well.	Some occasional farm work at 10d. per day. Domestic service, 6s. a year and diet. Some home industries, but on very small scale.	Only in spring and harvest. About 1s. 6d. a day. Very little home work.	3
From 10 to 12 years of age at field work or crochet. Go to school at seasons that work cannot be done in fields.	From 12 years upward in domestic service and on farm. Many have no employment.	From 12 years in weeding, &c.	4
Not certainly	They are intelligent and handy, and inclined to be industrious if they had prospect of remuneration.	Intelligent, but not industrious or handy.	5
Nothing of the kind	Leather, wool, flax, straw, wood	Wool, wood, and straw	6
Fox, in great abundance	Yes	Yes	7
½ miles or less. 7 named	About 3 miles. [Carrickmacross National Schools.]	Two in Kells, about ½ mile apart	8
70 is the average at 6 schools	Roughly estimated, about 3,000.	About 200	9
¼ to 2 miles. 10—3	About 1 Irish mile. 10—3	A few from 3 miles. 10—3	10
I think, none	Very few	Yes; I think about one-half	11

Continued on page 407.

Questions.	Answers.			
	Louth.			
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	Thinks the school-rooms could be got, if not other rooms could be easily obtained.	-	-	-
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Cannot say	-	-	-
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	Thinks not	-	-	-
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	Cannot say	-	-	-
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	Thinks not	-	-	-
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	It is very difficult to get subscriptions for any object except of a religious or political character.	-	-	-
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	Yes, if free of cost	-	-	-
19. Have you any other suggestions to offer, which may assist the Commissioners in carrying out the objects they have in view?	The district is well situated for manufacturing purposes, coal being cheap.	-	-	-
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	Excellent railway communication. Canal to Navan little used.	G. N. Railway. Steamers to Liverpool daily.	-	-

Answers.			No. of Ques- tion.
MONAGHAN.		MSATH.	
Yes, but would scarcely be suitable. In some cases a room could be got for a trifle.	Not easily; but a room could be obtained for a small remuneration.	(a.) I think not. (b.) Cannot say.	12
In 4 or 5 there is room - -	Yes - - - - -	Yes - - - - -	13
I fear not, except perhaps in 3 cases.	Yes - - - - -	None, except a carpenter - -	14
No - - - - -	A person (not the master) would so qualify himself.	Doubtful - - - - -	15
I fear not - - - - -	Yes, for remuneration - - -	I cannot say - - - - -	16
Local effort would not be possible.	I am not certain, but I apprehend not; at least, to a large extent.	I fear not; those likely to encourage such efforts having suffered such reductions of their incomes.	17
Something of the kind would be useful, as giving boys the chance of learning their trades quickly and whilst in their own homes, thus rendering unnecessary the slavery of apprenticeship.	If there was a clear prospect of profit they would.	A recent experiment proved they would not.	18
- - - - -	The Irish Railway Companies should offer much better and cheaper facilities for carriage than they do.	None - - - - -	19
Abundant outlet by G. N. Railway.	Railway communication with Dundalk, Drogheda, Dublin, &c.	Railway - - - - -	20

Questions.	Answers.	
	MEATH.	
23. State your own name and occupation, and proper postal address.	Mr. Jno. G. Henderson, printer and editor.	E. H. Meigs, Esq., M.P., land-owner.
24. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Kells and neighbourhood	Navan, Kilcainr, Skryne, Bohernacree, &c.
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Little tillage. No factories. Only occasional rough work.	Small farming and farm labour
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	Impossible to answer. A few weeks' work in spring, summer, and harvest. In winter mostly idle. Probably 30 days' work from end October to end February.	10½ hours summer, 5½ hours winter. 10s. to 14s. week when in constant employ; 6s. week with house; 2s. 6d. to 2s. 6d. day in harvest.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	No, except in spring and harvest, when they may earn 2l. or 3s. A few knit socks at home.	"Field work 10d. to 1s. day. No home industries, except in Navan, where there are several mills giving plenty of employment.
4. How, and from what age, are children occupied?	- - - - -	In the fields, from 8 years; also in the mills at Navan.
5. Are the people generally intelligent, industrious, and handy?	Most intelligent, but not industriously disposed.	Very much so
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present probably employed for industrial purposes?	Wool, wood, straw, leather, osiers.	Good demand for all products
7. Is water-power easily obtainable from streams?	Ample water-power	Any amount
8. At what distance apart are the National Schools? Name the schools nearest to you.	7 named within 3 to 5 miles around Kells.	3 or 5 miles apart
9. How many children attend the schools?	Mostly all attend, but very irregularly.	50 to 100
10. From what distance do the children come to attend school? What are the school hours?	2-5 miles, 10-2	Up to 2 or 3 miles

Continued on page 410.



Answers.			No. of Question.
LONGFORD.		WESTMESH.	
Very Rev. N. O'Flanagan, D.D. Archdeacon and V.G.	Very Rev. Canon Reynolds, V.F., P.F., and Rural Dean.	Rev. S. Canon Hoare, P.P.	23
Granard - - - -	Edgeworthstown - - -	Street, Rathowen - - -	24
Farming, labouring, shopkeeping, trades.	- - - -	Farming and farm labouring -	1
Labourers' work in summer, 6 a.m. to 6 p.m. 1s. 6d.—2s. 6d. per day, according to season of year.	- - - -	10 hours. Farm labourers 9s. week.	2
Only in spring and harvest in the fields. 1s. to 1s. 6d. day. No home industries.	The nuns in the adult schools could teach the adults to knit, do lace work and cambric, if they could find a market.	Inconstant farm work; 1s. day. No home industries, except knitting and needlework.	3
From 10 years old, in the fields	- - - -	From 8 years, in farm work -	4
They are intelligent and industrious.	- - - -	Yes - - - -	5
Wool, wood, and straw - - -	- - - -	Wool - - - -	6
Very little water-power - - -	- - - -	Yes - - - -	7
1½ miles. Convent School and National School, Granard.	- - - -	2 miles. 1 named - - -	8
80-100 in each - - - -	- - - -	20 - - - -	9
1-1½ miles. 2-3 - - - -	- - - -	3 miles. 10-3 - - -	10

Continued on page 411.

Questions.	Answers.	
	MR. BATE.	
11. Do any of the children learn drawing? If so, how many?	In Kelle Sisters of Mercy school. About 40.	None . . . . .
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	Yes . . . . .	In some cases . . . . .
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Plenty of room . . . . .	Yes . . . . .
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	I don't know . . . . .	Yes . . . . .
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	I think not . . . . .	I don't think so, except in a few cases.
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	I think not . . . . .	I'm sure many would offer their services.
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	I think not . . . . .	Very hard to get local aid. Farmers have little to spare.
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	(a.) Very many most probably would. (b.) I do not think they would.	Confident that they would . . . . .
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	- . . . . .	No. Will endeavour to obtain information.
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	Two lines of railway to Dublin . . . . .	Good railway communication with Drogheda, Dublin, &c.

Answers.		No. of Question.
LONGFORD.	WESTMEREATH.	
about 6 children in convent school.	- . . . .	No - . . . . 11
do - . . . .	I think "Yes" in all cases	Yes - . . . . 12
do - . . . .	Yes, in most cases	Yes - . . . . 13
do - . . . .	Yes, in towns; no, in country districts.	No - . . . . 14
do - . . . .	No - . . . .	"Cannot say, because I do not know what amount of qualification would be required." 15
do - . . . .	- . . . .	I rather think not 16
social efforts in a pecuniary sense would be uncertain.	- . . . .	I don't think so at present 17
they would - . . . .	Yes . . . .	Yes, if offered gratis - 18
there is hardly any employment during the winter months, labourers are on the verge of starvation. Constant work is what is needed, though the wages be small.	- . . . .	No - . . . . 19
station on M. G. W. Railway, 2 1/2 miles from the town.	"This is the great difficulty, and I fear an insuperable one."	No facilities near here. G. W. Railway. 20

Questions.	Answers.	
	KING'S COUNTY.	
22. State your own name and occupation, and proper postal address.	Rev. Graham Craig, A.M., rector of Tullamore.	Rev. Jno. Canon Monahan, D.D., P.P.
23. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Tullamore and district - -	Banagher, Cloghan, Shannon Harbour.
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Agriculture and trade (tobacco manufacture, distilling, milling, shopkeeping).	Small farming - - -
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	10 hours. 12s. a week - -	All the day. Farm labourers 1s. 8d. per day all the year round.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	Women earn 3s. 6d. a week by sewing sacks. Dress and shirt making for the shops. No lace-making. Knitting chiefly for home use.	Dairy and farmyard work. No home industries. [Knitting, lace-making, &c. might be easily and profitably established in the nuns' schools.]
4. How, and from what age, are children occupied?	From the legal age in the manufactories (chiefly of tobacco).	At school, and in such domestic work as engages small agriculturists.
5. Are the people generally intelligent, industrious, and handy?	Fairly so - - - -	They are, indeed, without any exaggeration.
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	All mentioned are plentiful (except marble). There are limestone quarries, and some good building and monumental work is done.	Abundant wool, straw, and osiers.
7. Is water-power easily obtainable from streams?	Water easily obtained, but not of much power.	Abundant water-power - -
8. At what distance apart are the National Schools? Name the schools nearest to you.	2-3 miles. 1 mentioned - -	4 miles. 3 named - - -
9. How many children attend the schools?	86 on the roll - - -	About 460 - - -
10. From what distance do the children come to attend school? What are the school hours?	Some come 7 miles, the school being superior to those nearer.	Up to 2½ miles. 10-6 - -

Continued on page 414.

Answers.			No. of Ques- tion.
CAYAN.	QUEEN'S COUNTY.		
-Col. H. J. Clements, D.L. and J.P., landowner.	Hon. B. Fitzpatrick, M.P.	Miss Mary Delany, National school teacher.	28
otehill, co. Cavan, and Maam, Maamtrasna, and Derrypark.	District comprising Baronies of Clonmellagh, Clandonagh, and Upper Woods.	Clononagh, Cloncourse, Clonada- nsey, Maryborough.	31
all farming; migrate to Eng- land for harvest.	Agricultural pursuits and herd- ing of cattle.	Their daily work	1
om dawn till dark	10 hours in summer, 6 to 7 winter. Farmers generally pay 1s. to 1s. 2d. per day. At certain times wages rise to 2s. 6d. per day.	7 a.m. to 7 p.m. 7s. to 10s. per week.	2
men knit socks and weave riese cloth, but have no market for this production.	Women also occupied in agricul- ture. There is a very little knitting done and some spin- ning. Knitting schools for- merly existed, but have died out from opposition and care- lessness of those using them.	Majority are employed at home, in and out of doors; some dressmaking (10s. week), knitting, and needlework.	3
how	Help on the farms from an early age.	At all work they are capable of performing, and as soon as they are able.	4
oldedly so, but of a very low type of neutral "education."	Intelligent.—Yes. Industrious. —No. Handy.—No.	They are industrious, and some handy.	5
t-straw, wool, marble, indica- tions of lead; oysters could be rown.	Plenty of wool, wood, straw, and some marble. Oysters might be grown to any extent.	Straw is the only plentiful material.	6
me, but not much fall	Yes	Yes, very	7
r 4 miles as a rule. 4 named	4 miles. 5 named	3½ miles. 5 named	8
out 60 in one, 40 in another	About an average of 60 to each school.	30 to 100 in each	9
me come some miles. Hamlets scattered. 10—3.	About 4 miles. 10—3	1½ miles. 10—3	10

Continued on page 415.  
G G 2

Questions.	Answers.	
	King's County.	
11. Do any of the children learn drawing? If so, how many?	Yes, about 20 - - -	Yes, 20 - - -
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	Yes, and free of cost - - -	(a.) Yes. (b.) I have a room at Hanascher I would give free of charge for these purposes.
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Yes - - - - -	Yes, in each case - - -
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of tools employed in his trade?	Yes - - - - -	Yes - - - - -
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	Master would hardly have time. He has a S.K. science and art class.	Yes (in 2 cases.) (They have S.K. certificates.)
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	There are stonecutters, basket-makers, shoe and beehive and chair makers, who, I think, would gladly give instruction if paid by results.	Yes, as regards wood, wool, leather, straw, oser, and iron (blacksmiths') work.
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	I think there would be some effort made to meet a grant.	Yes, I will make an effort, and, unless the local sum should be too large, I have no doubt it will be subscribed.
18. Have you any reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	The thing is much wanted, there being little variety of occupations. I consider that the desire would grow fast; thus learning trades at home.	I am certain they will - - -
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	Water-power might be much more used than it is, and wind-mills, of which there are none.	Suggests the sending of an agent to consult with him.
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	Good market at Tullamore, and railway and canal communication to all parts.	Grand Canal. Railway should be opened (Aug. 1862).

## APPENDIX.

415

Answers.			No. of Question.
CAVAN.	QUEEN'S COUNTY.		
me to my knowledge - -	Not that I am aware of. I am informed they learn drawing at Castletown National School.	Yes, in Maryborough and Mount-rath. Cannot say how many.	11.
s, in two places named -	Yes - - - - -	(a.) No. (b.) Yes, I think so -	12.
s - - - - -	Yes - - - - -	No - - - - -	13.
substantial. Carpenter and intelligent blacksmith.	I should say not - - - -	Yes - - - - -	14.
sensibly; indeed very probably	I should certainly imagine that they would.	No master at present. Some other person might.	15.
(a.) Possibly. Quite worth trying for. (b.) Might be managed.	I know of no one who would do so, or is qualified.	Yes - - - - -	16.
certainly would be made by landlord; possibly by one or two of the better class of farmers.	It is possible that in some districts such an undertaking might succeed. Much would depend on initiation.	Yes, as they are badly needed. I cannot say with what prospect of success.	17.
have good reason to think they would; certainly young men, and perhaps the young women.	I am "afraid" not. All would depend on how the undertaking was judged of by the priesthood in the district.	(b.) I have, as they seem very impoverished.	18.
hiera should be grown, and tweed factory established.	[Adverse opinion stated at length on a sheet accompanying the Circular.]	- - - - -	19.
Water carriage by L. Corrib to Galway, and thence to Dublin. Railway $\frac{3}{4}$ miles off.	No markets. Railway communication fairly good, but freight high.	I know of no markets. Gt. S. & W. Railway. No canals.	20.

Questions.	Answers.	
	QUEEN'S COUNTY.	
21. State your own name and occupation, and proper postal address.	Capt. Cosby, J.P., D.L., land-owner.	Mr. Danl. Whelan, V.C.P.L.G., farmer, (90.)
22. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Stradbally - - - -	Borrowhouse, Ballyroe, Churchtown, Ballyinan, Kiltabbin, Misgeney.
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Agriculture - - - -	On the land - - - -
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	7s. to 8s. per week - -	6 a.m. to 6 p.m. 9s. week -
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lacemaking, needlework, &c.?	Farm work. Lately a good many women employed knitting socks.	Sometimes they are employed on the farms. Knitting and crochet.
4. How, and from what ages, are children occupied?	- - - - -	They begin to do something from 8.
5. Are the people generally intelligent, industrious, and handy?	Yes - - - - -	Generally so - - - -
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	Wool, straw, a few others. There is a very large extent of ground under hazel copse on Lord Lansdowne's, Sir Allan Walsh's, Mr. Treneh's, and my own property which might be made into hampers and baskets, and for which hazel there is little or no sale, and it might be used in giving employment to hundreds of women and children.	Wool, wood, straw - - - -
7. Is water-power easily obtainable from streams?	Yes - - - - -	Water-power is available in winter, but fails in summer.
8. At what distance apart are the National Schools? Name the schools nearest to you.	2 and a large convent school -	3 miles. 5 named - - - -
9. How many children attend the schools?	50 and 150; the other I do not know.	From 40 to 70 - - - -
10. From what distance do the children come to attend school? What are the school hours?	2 and 3 Irish miles	Up to 2 miles. 10-3 - -

Continued on page 418.



Answers.			No. of Question.
QUEEN'S COUNTY.	KILDARE.		
hd. Lalor, Esq., M.P., farmer.	Rev. Jas. Doyle, P.P.	Rev. Canon Bagot	20
infrash, Abbeyleix, Maryrough.	Athy	Foulstoun, Kilmood, Narraghmore, Murnoy, Ballyshannon, Suncroft.	21
icultural labour	Agriculture. Brickmaking	Small farming	1
on employed, about 90. a week.	Summer 6 a.m. to 6 p.m.; winter 7 a.m. to 7 p.m. Wages vary with the season.	All their time. Labourers' wages average 1s. 6d. per day.	2
y field labour, and not efficient.	Some little knitting and needlework. Earnings precarious. Except in harvest, they are mostly idle.	Women if instructed in dairy work, &c. could earn a livelihood. Large quantities of poultry are now reared. No home industries.	3
busy seasons only, and at agriculture. From 10 years of age.	As soon as they are able to work they are engaged in whatever employment they can get.	From about 15	4
	They are	Very much so	5
sw, wool, and raw hides in large quantity.	The materials named are obtainable.	Plenty of leather and straw to be had.	6
many places	Abundance of water-power going to waste	Yes	7
out 4 English miles. 4 named	About 4 miles. 5 named	1½-3 miles. 4 named	8
out 60 in each	Nearly 1,000		9
out 2 miles. 10-3	Some come 5 miles. 10-3	From 2 miles and under	10

Continued on page 419.

Questions.	Answers.	
	QUEEN'S COUNTY.	
11. Do any of the children learn drawing? If so, how many?	- - - - -	No - - - - -
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	Yes. Also a large room called the Lecture Hall for a small sum.	Yes, with the consent of the manager.
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Yes - - - - -	It could be managed - - -
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	No. I once tried to get a family to come to teach the people basket and hamper making, but did not succeed.	A carpenter resides within a ½ mile.
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	- - - - -	I daresay he would - - -
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	- - - - -	I think they would be willing -
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	Yes, certainly - - - - -	I fear the people are unable to offer any assistance.
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	Yes - - - - -	I think in many instances they would.
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	Lace-making flourished some years ago, but succumbed to the low price paid by the trade.	It would be a great boon to have something besides the land to look to for substance.
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	Canal 3 Irish miles distant. Railway 5 miles distant.	Railway and canal at Athy 3 miles distant.

APPENDIX.

419

Answers.			No. of Question.
QUEEN'S COUNTY.	KILDARE.		
o - - - - -	Some 80 or 90 - - - -	No - - - - -	11
s. I think not. (b.) No fit place.	I think so - - - -	At Foulstoun we could give a school-room 40x20 almost exclusively for it.	12
careoly - - - -	Certainly - - - -	Yes - - - - -	13
o - - - - -	Yes, if paid - - - -	No - - - - -	14
o - - - - -	I think so - - - -	Would have to get a qualified master.	15
o person qualified. No person able to qualify without pecuniary assistance.	Certainly, if paid as much as working for employers.	No. But I have no doubt some would qualify for payment by results.	16
think such efforts would be made.	I could not promise for local aid. The people are poor and have sufficient to do to live.	No doubt subscriptions could be had.	17.
believe they would, but I have no reason for my belief, as it has never been tried.	The project would be new to them, but they would take to it if they saw that it led to some beneficial results.	I am sure they would - -	18
not being acquainted with the means at your disposal, I cannot suggest.	No - - - - -	Gives detailed suggestions respecting dairy schools.	19
It R. & W. Railway within a short distance.	Railway and canal to Dublin and Waterford.	- - - - -	20

Questions.	Answers.	
	KILDARE.	
20. State your own name and occupation, and proper postal address.	Edw. Fenelon, Esq., farmer, Vice-Chairman Naas Board of Guardians.	Col. G. B. Dease, J.P. . . .
21. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Kilcullen, Giltown, Kilgowan, Oak Calverstown.	Celbridge - . . . .
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Farmers, labourers, smiths, carpenters, &c.	Agricultural labourer. [3 local flax-mills have been given up.]
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	Farmers, &c. all day. Labourers 8s. to 12s. week without board. Labourers 4s. to 6s. with board.	10 hours a day, 10s. a week, when in regular work.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	Occasional farm work, &c. Not a few apply themselves to knitting, needlework, and lace-work, &c.	Since stoppage of mills, only farm work. [When in work the mills employed 600-700 hands in all.]
4. How, and from what age, are children occupied?	From 12 to 14 on the farms . . . . .	- . . . .
5. Are the people generally intelligent, industrious, and handy?	Generally intelligent, industrious, and handy under their circumstances.	Not particularly . . . . .
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	Wool, wood, straw, peat, and brick clay.	- . . . .
7. Is water-power easily obtainable from streams?	Fairly supplied with water-power.	First-rate water-power, and 3 unused mills in full order.
8. At what distance apart are the National Schools? Name the schools nearest to you.	2 miles. 2 named . . . . .	About 2 miles. One at Celbridge, besides a nuns' female school.
9. How many children attend the schools?	200-400 attend school, according to the season.	About 200 . . . . .
10. From what distance do the children come to attend school? What are the school hours?	1 to 2 miles. 10-6 . . . . .	3 miles or less. 9-6 . . . . .

Continued on page 422.

Answers.		No. of Question.
KILDARE.	DUBLIN.	
v. Jno. H. Donovan, P.P.	Rev. P. A. Yorks, C.C. Rev. J. K. Walsh, P.P. [Replies identical.]	Rev. D. P. Mulcahy, P.P. - 23
bridge and Straffan - - -	Skerries - - - - -	Swords [Malahide, Drumcondra]. - 21
formerly a manufacturing town. 3 flax thread mills employing 300 hands. Now few farmers, &c.	Fishing principally. Also farming.	Men and boys labour in the fields. - 1
day. Labourers 2s. to 3s. or week. Most are very poor.	A fair proportion of their time occupied. Wages very precarious, say 3s. a week.	8 to 11 hours. At present time wages 3s. to 6s. per day. Average 2s. a day. - 2
most parts of the year; they have little employment now. Said work at harvest.	Net mending, knitting, tanning, making of straw envelopes. Much not to be earned in consequence of French competition.	Wishes they had occupation for women "to keep them from gossiping." Good opening for factory. - 3
or leaving school at 12 or 13, they do any work they can get, but there is little to be said now.	General employment, and from about 14 years.	In the fields from the age of 9 - 4
A few tradespeople are -	Yes - - - - -	As a rule, yes - - - - - 5
sh. wood, limestone, &c. nothing special.	Wool, leather, wood, straw, limestone.	Good supply of wool, straw, and limestone. - 6
- - - - -	Quite abundant - - - - -	A constant supply - - - - - 7
elementary school for girls and children, and boys' school (National) at Colbride. At Straffan, 3 miles distant, a mixed National School.	Schools in town and country -	2½ apart. 3 in parish - - - 8
when at best; 260 when at worst.	Daily average in all the parochial schools=487.	Nearly 500 - - - - - 9
roads are conveniently situated or most. 10-3.	About 2½ miles. 10-3 - - -	1-4 miles. 10-3 - - - - 10

Continued on page 423.

Questions.	Answers.	
	KILDARE.	
11. Do any of the children learn drawing? If so, how many?	Drawing is not taught in schools. No encouragement given by Education Board.	A few at nuns' schools . . .
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	Yes . . . . .	There would be no difficulty . . .
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Yes . . . . .	Yes . . . . .
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	Has no knowledge of what may be intended by proposed instruction, &c.	I know of none . . . . .
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	Master and mistress will qualify if sufficient remuneration is guaranteed.	Probably he would . . . . .
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	I feel sure that several tradesmen would gladly assist in teaching handicrafts if sure of remuneration.	
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	Local efforts will gladly be made in view of remuneration and permanent results.	The district I write about is peculiarly situated, and for many years, whilst the Bazmills were at work, the people depended entirely on the employment thereon given. Since they have ceased to work, many of the best of the population have left the district to seek employment elsewhere, leaving the least industrious portion behind.
18. Have you reason to believe that the people (a) Children (b) Adults would avail themselves with alacrity of such instruction if offered to them?	Both children and adults will eagerly avail themselves of any instruction calculated to afford them a means of support.	
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	To be sincere in your desire, and prove to the people that your object is to permanently improve their condition.	
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	No markets. Railway 5 miles; canal 3 miles.	

Answers.			No. of Question.
KILDARE.	DUBLIN.		
- - - -	About 25 or 30 - - - -	None - - - -	11
ere is a place which has been school. Would suit as a workshop.	Yes - - - -	(a.) Yes, in summer; they are used in winter. (b.) Yes, for a small sum.	12
- - - -	Abundant accommodation, workshops already existing.	Yes - - - -	13
renters, masons, bricklayers	Yes - - - -	The usual country carpenter, 3 or 4.	14
- - - -	Yes - - - -	I should think so - - - -	15
ear there is no prospect of any success at present.	Yes - - - -	We have several intelligent young men who are only too willing to be employed.	16
above - - - -	Judging from personal knowledge, I believe efforts would be made.	It is indeed a great pity these offers were not made years ago. We should have less discontent, and our people would be grateful.	17
me might; not many. I fear the attendance of boys would be very small. We had night schools when the factories were at work, and even then the attendance was bad.	I have - - - -	Under proper training, with kindness and firmness, I should have great hope.	18
me, except that some companies should work the factories.	Yes - - - -	If the work is started I will leave nothing undone by word and encouragement to make it a success.	19
S. & W. Railway 1 mile distant. G. W. Railway 3 miles distant. Grand and Royal Canals at some distance.	Communication with Dublin and Belfast by rail; also by sea.	Swords 6 miles from Dublin by road, and 3 miles from Malahide railway station.	20

ROYAL COMMISSION ON TECHNICAL INSTRUCTION :

Questions.	Answers.	
	DUBLIN.	WICKLOW.
20. State your own name and occupation, and proper postal address.	Rev. H. Murphy, C.O. - - -	W. J. Corbet, Esq., M.P. - - -
21. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Kingstown - - -	Kilcool, Delgany, The Downs, Newton, Mount Kennedy.
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Hardly any manufactures. Even ordinary tradesmen sent from Dublin. Chief employment in connection with the sea, railways, and Harbours, &c. Commissioners.	Small farming and farm labour
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	6 a.m.—6 p.m. - - -	The whole time. Labourers 10s. a week.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.	Servants and dressmakers. No home industries.	In harvest time, get 2s. a day for 3 or 4 weeks. No home industries.
How, and from what age, are children occupied?	No occupation except as shop messengers, &c.	From 10 years or so, in the fields
4. Are the people generally intelligent, industrious, and handy?	Fairly so - - -	Very much so - - -
5. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	None. All built upon - - -	Plenty of wool and straw. Others might with a little trouble be had in quantity.
6. Is water-power easily obtainable from streams?	No - - -	Yes. There is a good-sized corn-mill near, lying idle.
7. At what distance apart are the National Schools? Name the schools nearest to you.	No National Schools for boys; two Irish church schools; Christian Brothers' schools.	2 or 3 miles. 4 named - - -
8. How many children attend the schools?	Girls' National School has 300 girls and infant boys.	Cannot say with accuracy. Probably 200 on the average.
10. From what distance do the children come to attend school? What are the school hours?	Up to 1½ miles. 10—3 - - -	2 or 3 miles. 10—3 - - -
11. Do any of the children learn drawing? If so, how many?	About 60 - - -	No - - -

Continued on page 42B.



Answers.			No. of Question.
WICKLOW.		CARLOW.	
Wm. Canon Dillon, P.P.	Rev. Jas. Dunphy, P.P.	Rev. F. F. Nolan, Adm.	23
Arklow, county town	Arklow	Tullow	24
Artisans and labourers. Employment in chemical works.	Chiefly by herring fishing, &c.	Farming and agricultural labour. 50 out of 200 families in the town practically without employment.	1
8 a.m.—3 p.m. Artisans 80s. week; labourers, 10s. to 12s.	All their time	10 hours in summer, 7 hours in winter.	2
with the exception of sempstresses.	Mending nets. Some at knitting guineas.	No occupation, as a rule, except in spring and harvest.	3
occupied, except in message work.	No employment after leaving school.	Generally speaking, the children have no employment.	4
Diligent and very industrious, it not handy.	They are	Yes	5
best wool and plenty of food.	Wood, straw, granite in abundance. [Unused saw mills.]	Wool, wood, straw, oats	6
	Yes	Yes	7
and National Schools in the town and in a village 1½ miles away.	National Schools in the town of Arklow, male and female.	2 to 3 miles. 5 named	8
	About 500 in both schools	Between 500 and 600 children attend.	9
fly from the town and village. 9.30—3.	Up to 2 and 3 miles. 10—3	Up to 2 miles. 10—3	10
	Some in the advanced classes	No	11

Continued on page 427.

Questions.	Answers.	
	DUBLIN.	WICKLOW.
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration.	Doubtful - - - -	(a.) Doubtful. (b.) No doubt at a trifling cost.
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	No - - - -	No doubt - - -
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade.	- - - -	There are carpenters, smiths, and shoemakers, but I doubt if they could undertake to give instruction.
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	- - - -	I think not - - -
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	- - - -	I don't think it likely -
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	I think not - - -	If it is asked, would money be subscribed, I fear the people are too poor to, give much assistance.
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	No - - - -	I have no doubt they would eagerly avail themselves of such advantages.
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	- - - -	- - - -
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists.	In vicinity of Dublin - -	No local market. Railway communication with Dublin.

Answers.			No. of Ques- tion.
WICKLOW.		CARLOW.	
Yes - - - - -	Yes - - - - -	Rooms could be obtained	12
Yes - - - - -	Yes - - - - -	Yes - - - - -	13
carpenters could be got -	Yes - - - - -	Carpenters, blacksmiths, painters, and glaziers.	14
think the master could give instruction in agriculture.	Yes - - - - -	" " " " "	15
doubt much if such persons could be got.	? - - - - -	Shoemakers, carpenters, smiths, bakers, tailors.	16
think not - - - - -	I think there would	Fears jealousy on part of trades- men already established.	17
think girls would avail them- selves of instruction in needle- work and cooking, and boys of instruction in agriculture and gardening.	Yes - - - - -	Believes that children of 15-20 would.	18
	Teach the females with their ordinary course—plain sewing and good plain cooking.	" " " " "	19
railway and a new harbour about to be opened.	Railway; and good harbour about to be constructed.	Railway 8 miles distant -	20

Questions.	Answers.	
	CARLOW.	KILKENNY.
12. State your own name and occupation, and proper postal address.	Chas. Casey, Esq., native timber exporter.	W. J. Hamilton, Esq., Local Government Inspector.
21. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Carlow town and neighbourhood.	Fiddown [Piltown]. His district, as inspector, under Local Government Board.
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Farmers, artisans and labourers	Agriculture - - -
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	8-12 hours per day. Artizans 2s. to 30s. week; labourers 8s. to 12s. week.	8 a.m.—6 p.m. 1s. 6d. per day.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	At harvest, &c. 2s. to 12s. a week. Mostly idle and in want. sempstresses 8s. to 12s. week. No home industries.	Chiefly in the fields. 3s. to 4s. per week. Very few home industries.
4. How, and from what age, are children occupied?	From 12-16 years old at any employment they can get.	From the time they are able to do anything. No compulsory education. Kept at home on slightest pretence to work on farms.
5. Are the people generally intelligent, industrious, and handy?	Intelligent enough and handy, but cannot say they are industrious or thrifty; demoralized by want of steady employment.	Yes . . . but not so good as they were before congested in towns, and idled and demoralized by agitation, drink, &c.
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	None unutilized - - -	None - - -
7. Is water-power easily obtainable from streams?	Yes - - -	Yes - - -
8. At what distance apart are the National Schools? Name the schools nearest to you.	1 to 2 miles. named - -	About 3 miles. 1 named -
9. How many children attend the schools?	2 schools with 20, 3 schools with 60, on an average.	- - -
10. From what distance do the children come to attend school? What are the school hours?	Up to 1½ miles. 10-6 - -	2 or 3 miles. 10-6 - -
11. Do any of the children learn drawing? If so, how many?	Very few, if any - - -	A few, especially in convent schools, but not generally in rural schools.

Continued on page 430.

Answers.			No. of Que- s- tion.
DONEGAL.			
W. Sinclair, Esq., landed proprietor.	Most Rev. M. Logue, D.D., Bishop of Raphoe.	Rev. Jas. McFadden, P.R., Letterkenny.	20
West Donegal generally -	Every part of Donegal -	Gweedore -	21
Agriculture and fishing -	Farm produce (crops). Profit on cattle and sheep. Going to England and sending children to service.	Meagre crops and earnings of family by service in England, America, &c.	1
Greater part of population small landholders, who do not work as they ought.	Whole time occupied in summer; none in winter. 7s. to 8s. per week.	About one-fourth of time	2
Knitting, and some in muslin embroidery.	Some in field work in summer. A few in winter earn 1s. 6d. to 2s. per day by knitting.	Girls generally go to service during spring and summer. A few earn about 3s. a day at knitting.	3
Begin to knit at 10 to 11 years old.	Children from 12 to 16 tend cattle in summer.	From 6 years upwards are generally put to service.	4
Intelligent enough, but not industrious or handy.	Both intelligent and industrious. Are capable of being trained.	Highly spoken of as general servants and labourers.	5
Wool, wood, straw -	Marl, straw, marble, granite, coals.	Granite, marble, furbary and peat, oxide of iron, wool, fishing, &c.	6
To any extent -	Water-power in every part magnificent.	Magnificent water-power	7
Schools numerous and good -	Two miles apart on average -	8 schools, 2 to 4 miles apart -	8
A very large number -	-	Average per school: winter 100, summer 50.	9
Have seldom more than 3 miles to go, but will go more to favourite schools.	1 or 2 miles. 10-3 -	3 miles. 10-3 -	10
No -	Hardly any -	No -	11

Continued on page 431.  
H H 2

Questions.	Answers.	
	CARLOW.	KILKENNY.
13. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	Thinks so in all cases - - -	- - -
14. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	In most places, yes - - -	As a rule, yes - - -
15. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	Local artisans can be had, but cannot say whether they would undertake to give instruction.	Carpenters, masons, stone-cutters, &c.
16. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	I think they would - - -	- - -
17. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	- - -	- - -
18. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	Doubtful - - -	Has no doubt local efforts would be made, but at present there is general poverty amongst all classes.
19. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	(a.) Thinks so. (b.) Doubtful, as they generally live "from hand to mouth."	Yes, very gladly - - -
20. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	That an Inspector should visit the district and see for himself before entering on the enterprise.	Unless instruction be of the highest class, as at Artane, a question whether it would be of much value.
What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	Railway and canal communication.	Rail, river, &c. - - -

Answers.			No. of Question.
DONEGAL.			
Yes . . . . .	Yes, everywhere . . . . .	Yes . . . . .	12
Yes, in most places . . . . .	At most schools . . . . .	Yes . . . . .	13
There are carpenters . . . . .	Yes, in the small towns, and frequently in the country.	Thinks not . . . . .	14
Thinks not . . . . .	I don't believe anyone would, except someone who is already employed at some trade.	Thinks so . . . . .	15
Fears it would not be easy to find anyone likely to qualify.	Yes, for wool stockings and homespun cloths. Other must be found.	(a.) Thinks not. (b.) Is not sure	16
Thinks that, in consequence of recent legislation, few, if any, contributions would be made.	Little chance, as people are poor and landlords non-resident.	People too poor . . . . .	17
Cannot say . . . . .	Yes, both, if prospect of fairly remunerative results.	Would exert them to do so, but cannot speak confidently of result without trial.	18
Teaching of rough carpentry would be useful.	To introduce some of the industries to give a practical proof of the advantages of learning them.	- . . . .	19
. . . . .	Railways are being extended throughout the country.	Chiefly by sea; only carriage by land.	20

Questions.	Answers.	
	DONEGAL.	
20. State your own name and occupation, and proper postal address.	Very Rev. Jas. Stephens, P.P. -	Rev. Chas. McGlynn, P.P. -
21. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Killybogs - - -	Lettermacaward, Upper Tompsonoe, Dungleo, Maghery, Ducarry.
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Agriculture and fishing. A few labourers and artisans.	Crops. Kelp manufacture; children's fibre. Scotch and English harvests.
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	Sunrise to sunset. Labourers 1s. 6d. per day.	Entire day in spring, summer, and harvest; none in winter.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	A few in "sprigging," knitting, and millinery.	In the harvest (men being absent). 3d. to 4d. per day at knitting (when there is work).
4. How, and from what age, are children occupied?	About one-half from 6 to 12 attend school; others at home.	Boys from 6 years herd cattle and sheep; girls from 6 knit.
5. Are the people generally intelligent, industrious, and handy?	Generally - - -	Difficult to find people more so
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	Wool and straw - - -	Red and grey granite (unlimited).
7. Is water-power easily obtainable from streams?	Yes - - -	Any number of streams, and upward of 40 lakes.
8. At what distance apart are the National Schools? Name the schools nearest to you.	1 mile apart. 5 schools - -	About 8 miles apart. 15 schools
9. How many children attend the schools?	800 on rolls - - -	820 boys and 721 girls; average 40 per school.
10. From what distance do the children come to attend school? What are the school hours?	2 miles at most. 10-6 - -	1½ miles. 10-6 - -
11. Do any of the children learn drawing? If so, how many?	20 - - -	Very few - - -

Continued on page 434.



Answers.			No. of Cases Coun- ted.
FERRANAGH.	FERRANAGH, TYBONS, &c.	TYBONS.	
ev. Jno. McKenna, P.P.	Most Rev. J. Denuelly, D.D., R.C., Bishop of Clogher.	A. J. Mathews, Esq., newspaper proprietor.	23
ettigo and Belleek	Diocese of Clogher (Co. Mona- ghan, nearly all Co. Fer- managh, large portion of Tyrone, and portions of Donegal and Louth).	Dungannon and district	21
elleek pottery. A little la- bouring. Bad pasture. Re- mainder waste mountain and bogs.	Agriculture; shopkeepers. A very few in small factories.	Flax spinning, linen weaving, agriculture, coal mining, manufactures, farming imple- ments.	1
hief part idle, for want of em- ployment.	Agricultural hands, labourers, and factory hands in regular employ. Others about half time. Farm labourers 9s. (women 6s.) per week.	6 a.m.—6 p.m. in the linen- mills wages low, and accord- ing to class of work.	2
ome stockings made and wool spun. Girls go 10 miles for 1s. worth of work.	In 2 districts 2s. to 4s. per week earned in crochet and lace- making. Most others at farm or house work, or not at all.	In the mills. Outside the towns little except field work (in summer).	3
fone, except at Belleek pottery. "Naked, and half starved."	From 13 to 14; but at spring and harvest time younger children are at farm work.	In mills and workshops accord- ing to Factory Acts. In other cases no fixed age.	4
es, very	Generally shrewd and intelli- gent; would be indust- rious if they had employ- ment; would be handy if they got some technical education.	Yes, except in mountainous districts.	5
aluable minerals; plenty of wool, marble, clay, iron, lead.	Wood, flax, and others that are general to the country.	Others plentiful; tanning trade once flourished; excellent building stones (is quarried).	6
ery; plenty	Water-power easily obtainable everywhere	Yes	7
	About a mile apart	1½ miles apart. 5 national besides Royal School and private schools.	8
From 100 to 50	Average attendance the year round about 35 to 40 per school.		9
ome 3 miles. 9.30—3.0			10
Almost none	Drawing taught in 3 or 4 schools to about from 100—200 pupils.	To senior pupils in some schools. Science and Art Department class in Dungan- non.	11

Continued on page 432.

Questions.	Answers.	
	Doubtful.	
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	-	Yes . . . . .
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	-	Yes . . . . .
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	-	Carpenters, smiths, masons, tailors.
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	Teacher would . . . .	Yes, but a good deal would on scale of results.
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	Many would desire to learn use of sewing-machine.	Quarrymen, but no professional stonecutters.
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	-	Too poor . . . . .
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	-	Yes . . . . .
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	Sewing-machine work, shirt-making, spinning (wheel).	-
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	17 miles to railway station. Passenger car service daily.	Steamers pass every week. No railways, canals, &c.

	Answers.		No. of Question.	
	FERRANAGH.	FERRANAGH, TYRONE, &c.		TYRONE.
		Most probably, or other suitable rooms.	In most cases place of instruction could be had, and school managers would be interested in the subject.	13
		In many cases	Yes	13
enters, blacksmiths, shoemakers, &c.		Skilled artisans could be obtained.	Could be easily arranged, much machinery being worked; have good artisans.	14
most cases		Many, no doubt, gladly would if made worth their while.	Believes so in every case	15
ers; cement and pottery makers.		Is sure such persons could be found.	Believes so, certainly	16
would gladly avail themselves anything that gave employment.		Is not sanguine of co-operation of landed gentry who are the moneyed class.	Believes local effort could be easily enlisted.	17
strong reasons to believe so		(a.) Largely. (b.) To some extent	Believes so, especially the young people.	18
open factories		Those trades preferable which keep the children under parental eye and control.		19
lway with 6 stations in Clogh and Belleek.		Railway within reasonable distances. Markets must be provided.	Both railway and canal to larger towns.	20

Questions.	Answers.	
	Tyrone.	Sligo.
22. State your own name and occupation, and proper postal address.	W. Armstrong, Esq., Local Government Inspector.	Rev. Jno. Gunning, C.A.
23. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Kilkeery and district -	Tonrlestrane, Tubbercu Kilmactyne, Aclara. (Dist 12 x 6 miles.)
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Labouring - - -	High by tilling soil, and sowing 4 months in the year in England.
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	Differs according to time of year. 7s. to 10s. per week.	(1) at home 8 to 10 hours; (2) home, nothing; in Engl 1l. per week.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	Needlework and knitting, and house work.	Only in their homes and their own fields.
4. How, and from what age, are children occupied?	In various ways, and at different ages.	In the fields, from 12 -
5. Are the people generally intelligent, industrious, and handy?	They vary - - -	Yes - - -
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	I can offer no opinion - -	Wool, wood, straw - -
7. Is water-power easily obtainable from streams?	In several places - - -	Yes - - -
8. At what distance apart are the National Schools? Name the schools nearest to you.	2-3 miles. 3 schools - -	3 miles apart. 5 schools near
9. How many children attend the schools?	- - - - -	700 - - - -
10. From what distance do the children come to attend school? What are the school hours?	10.0-3.0 - - - -	1 1/2 miles. 10-6

Continued on page 438.

Answers.			No. of Question.
Sligo.			
en. Archdeacon O'Rourke, D.D., F.P.	Arthur W. Malley, Esq., newspaper editor.	Rev. Canon Staunton, F.P., V.P.	20
oloonay, Ballysadare - -	Sligo, Ballynedher, Ballisaden, Clifony.	Tubbercurry - - -	21
ome on small farms; others work in mills and stone quarries.	Ordinary labour; farm work; flour and pin (?) mills.	Farmers and labourers - -	1
ll their time. Labourers 9s. per week, stone-cutters 1l. per week.	6 a.m. (summer) 7 a.m. (winter) to 7.0 p.m. 10s. to 20s. per week.	12 hours per day in summer. 7s. to 10s. per week.	2
homestic work. Effort made to start industry in embroidered articles, but very little done (girls got 4s.—5s. per week).	Some few earn a general livelihood, "and could earn more if they were inclined to be industrious."	In the fields when they can be spared from house work. Some knitting for home use.	3
- - - - -	From 10—16 years, at mill and farm work.	At school till 10, "except when parents are too poor to clothe them."	4
uperior intelligence - -	No 11 - - - -	Very industrious and intelligent	5
'enty of wood and limestone -	Wood is manufactured into pins, and some straw mats are made, but, as a rule, this industry is avoided.	Wool and straw in abundance -	6
est water-power in Ireland -	Very easily - - - -	River Moy runs through parish for 5 miles, and in that length does not turn a single wheel.	7
.0 National Schools - -	In Sligo a first-class Model School, and smaller National Schools.	Within 2 miles of each other. 10 schools (Tubbercurry 3).	8
100 in each - - - -	A fair share - - - -	About 1,000 in attendance many more on the rolls.	9
Sometimes 2 miles - -	To the Model School, from long distances.	Some 2 miles. 10—3 - -	10

Continued on page 43

Questions.	Answers.	
	TYROON.	SLIGO.
11. Do any of the children learn drawing? If so, how many?	Thinks not . . . .	No . . . . .
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	Should apply to the Committee of school.	(1) Yes. (2) Thinks not
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Same . . . . .	Yes . . . . .
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade.	Cannot say . . . . .	Yes . . . . .
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	Same . . . . .	Yes . . . . .
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6 and if not, would any persons qualify themselves for that purpose, if promised payment on results?	Same . . . . .	(1) No. (2) Yes . . . . .
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	Same . . . . .	Yes, in case of instruction handicraft.
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	Same . . . . .	Yes . . . . .
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	No . . . . .	Get support of bishops, priests, and let them recommend the project to the Rector.
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	. . . . .	Railway 12 miles distant

Answers.			No. of Question.
SLIGO.			
- - - - -	A few in the Model School -	About 50 - - - - -	11
- - - - -	Yes. (2) In the country districts, no other places could be had.	Yes. (2) In towns room could easily be had.	12
- - - - -	Certainly - - - - -	Plenty in every case - - - - -	13
is, if made worth his while -	Plenty - - - - -	Shoemakers, masons, carpenters -	14
rdly - - - - -	Certainly - - - - -	Likely, in many cases - - - - -	15
14 - - - - -	Plenty - - - - -	No doubt, if they had a sufficient inducement.	16
ible to be got from local sources.	Yes - - - - -	Would be glad to give any assistance he could.	17
s - - - - -	Certainly - - - - -	Is sure they would - - - - -	18
o - - - - -	Make education compulsory -	- - - - -	19
undant railway accommoda- tion.	Plenty - - - - -	Nearest railway 8 Irish miles away (an extension is hoped for).	20

Questions.	Answers.	
	GALWAY.	
20. State your own name and occupation, and proper postal address.	A. Gaffney Scott, Esq., printer and publisher.	Miss Ada Yeates (enlarg teaching cottage industr
21. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Galway - - - - -	Clynagh, Killeen, and Carr
1. What are the means of livelihood of the population of the districts in which you reside, or with which you are most familiarly acquainted?	Brushmaking; haymaking -	Cultivation of their hold which hardly yield a subsistence.
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	9 to 10 hours per day; men 15s.; women 6s.	Every family does its own
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	Many old women and young girls are engaged in sewing bags at their own homes. Wages trifling.	Since eviction of 1861 an att has been made to esta cottage industries (knit crochets, lace, needlework
4. How, and from what age, are children occupied?	From 8 or 9 years of age - -	Children from 8 years old learning crochet, &c.
5. Are the people generally intelligent, industrious, and handy?	A great many are, and a great many are not.	Such has proved to be so in cases where they have opportunity of showing it
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	Wool, leather, marble, splendid building stone, paving setts, &c.; all idle.	Nothing whatever that could be turned to profitable accou
7. Is water-power easily obtainable from streams?	Any amount refuse waste, and at least two pieces with wheel and machinery lying idle.	Plentiful - - - - -
8. At what distance apart are the National Schools? Name the schools nearest to you.	Well supplied with schools -	3 National Schools, 4 miles tant.
9. How many children attend the schools?	Not half. Say the Scotch proportionate average.	150 per school - - -
10. From what distance do the children come to attend school? What are the school hours?	Ordinary hours - - - - -	Up to 5 miles. 10-6 or 1.30
11. Do any of the children learn drawing? If so, how many?	Fair number - - - - -	No - - - - -

Continued on page 642.



Answers.			No. of Question.
GALWAY.		CLARE.	
Richard J. Kelly, Esq., newspaper editor and proprietor.	Wm. Young, Esq., J.P.	Mr. O. L. Nono, professor of music and newspaper editor.	22
iam	Tract of country between Clifden and Roundstone.	Ennis	21
employment (except small wood factory with 20 hands) wholly agricultural, and only half the year occupied.	Tillage farming and sea-fishing.	Labouring	1
work very broken and precarious (subject to weather). Average wage: summer, men 2s., boys 1s.; winter, men 1s. 6d., boys 10d. a day. Annual average for man 1s. a day.	Time well occupied in fishing, cutting turf, gathering seaweed, &c. when not farming. Wages comparatively high, and labour scarce, at 1s. 6d. to 2s. a day.	6 a.m. to 6 p.m., with 2 hours for meals.	2
No domestic industries except a little knitting (whilst in Connemara knitting is largely done).	Household and farm work. Some spinning and weaving of wool.	Women work on farms like the men. No home industries.	3
employed, except for a few weeks at haymaking.	Sheep and cattle tending and farm work.	At any age, almost in same way.	4
extremely so; "if taught some domestic trade, as the Swiss peasantry, would be found as handy and energetic."	Very intelligent, fairly handy, but certainly <i>not</i> industrious.	Very much so	5
Wool, wood, straw, marble (excellent at Connemara), oysters.	Wool (which is all worked up); a little flax grown for fishing-lines, &c. Oysters grow badly, and are <i>invariably</i> stolen.	Plenty of wool, kid skins, oysters	6
excellent	Yes	Very easy to obtain	7
excellent school accommodation	1 to 2 miles. 4 named	4 to 5 miles	8
early every child attends school	Fair attendance		9
known some to come every day 8 Irish miles to school.	Short distances only, the schools being near. 10-3.	9 to 3 or 4	10
technical training of every (even the most elementary) kind absent.	Thinks not	In some of them	11

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Questions.	Answers.	
	GALWAY.	
13. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	Any or either could be had pretty easily, as much wanted, and would be greatly appreciated.	School-room could be most likely got in evening. No suitable room.
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	That could be found easily	Suitable sites at both schools
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	They are to be had, but are fast dying out, especially the Connemara polishing trade, which is a secret, and only one man in the town knows it.	No trade practised in the neighbourhood.
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	They would	"No person capable of teaching a trade."
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	They would	Neither persons qualified work nor material on which practise.
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	Great efforts would be made readily (he thinks) and would pay well.	A grant of money could be fitably expended in the extension of work already commenced.
18. Have you reason to believe that the people (a) Children (b) Adults would avail themselves with alacrity of such instruction if offered to them?	Thinks they would	The people (men, women, children) would grasp earnestly any means of employment or improvement offered.
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	None, except that there being great natural facilities, a good field is offered for turning a large idle population into an industrious one.	Suggests a grant of money aid the work commenced, to find a teacher for the trade.
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	Plenty of communication by road and rail.	No means of disposal in neighbourhood. Nearest rail 20 miles. Nearest mail 14 miles. Goods sent to Craggy by small fishing-boats.

Answers.		No. of Question.	
GALWAY.	CLARE.		
Several suitable rooms (chiefly in connection with the convent) could be found.	Thinks there would be no difficulty.	Not the slightest doubt but that several buildings would be given gratis.	13
	Yes, in all cases	Yes; and also at the Town Hall, formerly a Mechanics' Institute.	13
If connection with the convent persons could be found competent to teach any simple trade.	Fairly good carpenter	Is sure there are plenty in Ennis.	14
	Thinks not	Has no doubt of this with respect to the Christian Brothers.	15
See 14	Persons qualified to teach stone-cutting, carpentry, sawing, &c. required.	None that he knows of. Believes the Christian Brothers would.	16
	Fears that the Land Act has so impoverished the landowners as to render them unable to assist.	Cannot say	17
The people (having no resources) would be most desirous of availing themselves of any facilities offered.	Thinks the young people would, with a view to the utility of the knowledge, in America.	Yes	18
	Considers emigration the only panacea for the privation in co. Galway.		19
Railway connection with Dublin	No canal or railway nearer than 40 miles. A narrow-gauge railway or steam tramway would do more for Connemara than all other private or public works.	Good railway connections	20

Questions.	Answers.	
	MAYO.	
23. State your own name and occupation, and proper postal address.	Rev. Jas. Canon Waldron, P.P., parish of Arinagh.	Rev. D. O'Hara, P.P., E. C. Ad.
24. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Ballyhaunis (post-town)	Parish of Killoonhan and Carrmore, Ballyhadareen.
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Tilling, small farms. English and Scotch harvesting.	Agriculture. A few artisans
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	Most of time occupied in farm work.	Most of the men spend a considerable part of the year in England. At home they work 9 hours daily.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	None, except house keeping, pig feeding, and poultry keeping.	None
4. How, and from what age, are children occupied?	Not employed except at farm work and at home.	At 10 begin to help parents cultivating the land.
5. Are the people generally intelligent, industrious, and handy?	As a rule intelligent and industrious if they had any work to do.	Not very; fairly so
6. What natural products or materials (such as wool, leather, wood, straw, marble, or stone) are obtainable in your district, which are not at present profitably employed for industrial purposes?	Wool only (this is sold to travelling merchants).	District very poor and with little of such products.
7. Is water-power easily obtainable from streams?	Yes (at present is used for small mills which manufacture oatmeal and Indian meal).	Yes - - -
8. At what distance apart are the National Schools? Name the schools nearest to you.	3 miles apart. 5 schools	About 3 miles. 16 National Schools.
9. How many children attend the schools?	80 to 150 per school	About 1,400
10. From what distance do the children come to attend school? What are the school hours?	Up to 2 miles. 10-3.	Up to 3 miles. 10-3
11. Do any of the children learn drawing? If so, how many?	No	A few in convent school

(Continued on page 445.)

Answers.			No. of Question.
MAXO.			
Very Rev. M. Finn, P.P., Dean, &c.	Rev. Jno. O'Grady, P.P.	Jas. Daly, Esq., newspaper proprietor.	27
11 places within a radius of 10 miles of Swinford.	Bohola, near Swinford	Castleturk	28
small patches of poor land, and working in England 3 or 4 months in the year.	Earnings from England and small crop of potatoes and oats.	Majority hold 5 acres of land and are very poor. Labourers 1s. 3d. a day without food.	1
working till night. Hired labour brings 1s. per day, but there is very little of it.	In winter no employment. Heat of year 7 a.m. to 8.30 p.m.	6 a.m.—8 p.m. Labourers without keep 6s. to 8s. per week.	2
No home industries; do all they can for their little tillage whilst their males are absent.	Women take men's place on farm in their absence. There are no home industries, and there might be if encouraged.	Adults—(men) go to England. Large section of young girls go to Scotland as farm and factory hands. Those left attend to the land.	3
Go to school; "but many, before doing so, come to neighbouring town to sell an ass load of turf (for 8d.)	At 10 or 12 have to quit school to do father's and brother's work in their absence.	From 10 to 12; work in the fields.	4
For - - - -	Remarkably so - - - -	Very intelligent and industrious and easily taught.	5
None - - - -	Wool; flax; wood; straw	Wool; wood; straw; marble; osiers.	6
Very easily - - - -	Quite so - - - -	Unlimited - - - -	7
1 to 2 miles. 11 schools mentioned.	1-2 miles. "Abound in schools."	Abundant National Schools; about 6 in the parish.	8
At least 1,000 - - - -	626 at present - - - -	160 per school - - - -	9
1 to 1½ miles. 10-3.50 - -	1-2 miles. 10-3 - -	Average distance 2 miles. 10-3	10
None - - - -	None - - - -	Scarcely any - - - -	11

Continued on page 447.

Questions.	Answers.	
	MAYO.	
13. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	In most cases, and other rooms could be had.	Room could be got at small remuneration.
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	In most cases	Yes
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	Does not think so	Yes
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	Cannot say with certainty. Teachers' spare time occupied by study to gain higher salary.	Yes
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	Not aware of any	Persons would qualify the selves.
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	If aid were granted, efforts to establish cottages, &c. industries would be made.	
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	Yes; if it was brought to them in such a tangible way that it would help them to earn a little.	They would
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	Reclamation of waste land	
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	Railway to Dublin, &c.; seaports	Railway to Dublin and Sligo

Answers.			No. of Question.
MAYO.			
1.) No. (2.) No; except at Bwinford.	(1.) Very cheerfully. (2.) Free of cost.	Several places could be got, some free, others at low rent.	12
No; but there would be no diffi- culty in getting room near for a small remuneration.	Yes, on the school plot, which is generally 3 roods.	Nearly in every instance	13
Scarcely any; and where there is one we can scarcely rely on his skill or punctuality."	Yes - - - - -	Carpenters, shoemakers, tailors	14
It is to be regretted that the teachers are already too hard worked to do so.	Should think so if encouraged (at least in some cases).	Thinks many of them would	15
No; except (as is probable) qualified adults could be got from Artene and other indus- trial schools.	Yes - - - - -	Thinks there are many	16
Certainly, and with success	Quite too poor - - - - -	Thinks local assistance could be got.	17
Thinks so; especially if instru- tion be given in or near school.	(a.) Strongest reasons to believe so.	(a.) Sure they would	18
- - - - -	Workshop in connection with a central school in parish. It would become a shop to which people from the surrounding town, &c. would come; and would soon be self-supporting.	Thinks such work would not only become self-supporting, but ultimately source of pro- fit.	19
Railway station 8 miles distant	- - - - -	Railway on spot, and shipping 3 miles distant.	20

Questions.	Answers.	
	MAYO.	
23. State your own name and occupation, and proper postal address.	Chas. L. Fitzgerald, Esq., J.P., D.L. for Mayo. (80.)	Martin Sheridan, Esq., ed and proprietor of "Mayo, & miner."
21. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Parishes of Turlough, Castlebar, and Kildonmogh.	Mayo county - -
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiar acquainted?	Agriculture on own holdings. Some daily labours.	Land chiefly. Artizans h little employment.
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	10 hours daily. 7s. to 8s. per week.	Small farmers have little oc pation in winter; 40s. annum average earning these.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	Women in fields, 4s. to 6s. per week. No home industries.	Very limited - -
4. How, and from what age, are children occupied?	School. Those are glad of herding, &c. who can get it.	No general employment. E gration large.
5. Are the people generally intelligent, industrious, and handy?	Generally intelligent; tolerably handy; not at all industrious.	Very; but want of work ; wages injures them.
6. What natural products or materials (such as wool, leather, wood, straw, marble, or oysters) are obtainable in your district which are not at present probably employed for industrial purposes?	Wool and wood; straw; marble; oysters.	Wool, straw, oysters -
7. Is water-power easily obtainable from streams?	Very easily - - -	Everywhere, and at all seasons
8. At what distance apart are the National Schools? Name the schools nearest to you.	4 National Schools within radius of 4 miles.	Schools convenient -
9. How many children attend the schools?	- - - -	Attendance good -
10. From what distance do the children come to attend school? What are the school hours?	No great distance - - -	10-4 - - -
11. Do any of the children learn drawing? If so, how many?	No - - - -	In some schools -

Continued on page 450.



Answers.			No. of Question.
MAYO.		LIMERICK.	
Mr. Jno. Kilkenny, teacher and farmer.	Rev. R. Canon O'Hara, P.P.	Rev. Wm. Casey, adm.	29
Murneen, Claremorris	Clooniron, Eggeol, Caralacky, Bushena, Bailenwohir, Cloonanna, Shraheena, Clooneera, Culclara, Maherabey (postal address, Levedick).	Abbyfoale	31
Agriculture	Almost exclusively agricultural	Agriculture (small farmers and labourers).	1
8 to 14 hours. No employment for labour.	10 hours or 12 hours in busy season; 6-8 hours in winter. 10s. to 12s. per annum.	Work all day, and earn about 4s. 6d. per week.	2
Field labour; pig-feeding; home work.	Field labour. Some as domestic servants at 4s.-5s. per annum. Very few home industries.	No	3
10-12. School and field labour alternately.	10-12 to 16-18 on farms, after which they migrate to England for 6 or 8 months of year for employment.	From 10 years	4
Yes	Yes	Very much so	5
All, except marble	Wool, wood, leather; straw easily obtained, but not used.	"All the land in the neighbourhood is bog."	6
In abundance	In abundance	Indeed it is	7
About 2 miles. 3 schools	2-3 miles	About 2 miles	8
40 to 100, according to season	District populous, and schools well attended.	1,100 children attend the schools in the parish.	9
1-2 miles	1-2 miles. 10-3.30	Some come 5 miles 10-4	10
No	No	About 20 in the convent	11

Continued on page 351.

Questions.	Answers.	
	MAYO.	
13. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	Does not know . . . .	Thinks so. . . .
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Yes . . . . .	No . . . . .
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	Should say, No . . . .	Fears there would be difficult in present tone of the times
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	Time too much occupied . . . .	No . . . . .
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	Good carpenter . . . .	Fears not (as 14) . . . .
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	Doubts it . . . . .	Mentions Board of Education
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	In some instances, but not to great extent.	Thinks many would . . . .
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	Flax factory. Refers to his unsuccessful attempt.	Apprenticing to mechanics might be tried if there were work.
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	Good railway accommodation (Dublin, Westport).	Ample . . . . .

	Answers.		No. of Question.
	MAYO.	LIMERICK.	
Most likely . . . .	Rooms could be got at small cost.	Yes . . . . .	12
Plot of land vested in trustees -	Yes . . . . .	Yes . . . . .	13
A smith . . . . .	Yes . . . . .	Yes . . . . .	14
Teacher can't, but his three daughters, aged 16, 15, 13, will if paid for it.	Yes, if suggestion below (19) were carried out.	Yes . . . . .	15
	Workers in wool, wood, leather, &c. would prefer surety of a market to payment on results.	No qualified persons, but numbers who would qualify.	16
Sure of success . . . .	Effort would be made, but there are but few local gentry.	Of course . . . . .	17
Believes they will with alacrity	Believes so . . . . .	Yes . . . . .	18
Suggests a sort of agricultural station.	Suggests teaching with central depot for sale of articles made (lace, knitted goods, needle-work).	No . . . . .	19
Railway station at Claremorris, 4 miles.	Railway at nearest post-town in connection with Dublin, Sligo, &c.	Railway . . . . .	20

Questions.	Answers.	
	LIMERICK.	
22. State your own name and occupation, and proper postal address.	Maurice Leneham, Esq., J.P., M.R.I.A., newspaper proprietor.	R. O'Shaughnessy, Esq., J.
21. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Limerick city and district; Tipperary town; Ennistown, county Clare; Ballykeale, county Limerick; Killisnoe, county Clare; Newcastle West, &c.	Limerick city - - -
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Agriculture (except in the cities).	Generally unskilled labour
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	Labourers at harvest time get 2s. 6d. per day and food. But they are idle occasionally; in some places mostly.	Work very inconstant, yield scarcely enough to live on.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	The old home industries of knitting, lace-making, needlework seem to have died out.	Lace-making (which is very remun-rative); army clothing factory; unskilled lab
4. How, and from what age, are children occupied?	The boys keep their parents -	None, except going to school
5. Are the people generally intelligent, industrious, and handy?	Quick witted, learn easily, and when employed are industrious.	Intelligent?—Yes. Industrious?—Yes, if they have occupation. Handy?—Yes
6. What natural products or materials (such as wool, leather, wood, straw, marble, or osiers) are obtainable in your district which are not at present profitably employed for industrial purposes?	All the materials named, and only a small quantity of leather and osiers used.	Leather, marble, osiers; all abundance.
7. Is water-power easily obtainable from streams?	"Nowhere in the world is there more water-power, and it is going to waste.	Yes - - - - -
8. At what distance apart are the National Schools? Name the schools nearest to you.	City is crowded with schools (Christian Bros., Nuns, &c.)	Several primary schools, more under religious bodies,
9. How many children attend the schools?	- - - - -	About half the number that ought.
10. From what distance do the children come to attend school? What are the school hours?	2-3 miles. 10-12 - - -	From the city, 9 or 10-5

Continued on page 454.

Answers.			No. Question.
LIMERICK.			
Wm. H. O'Sullivan, Esq., M.P.	Mr. Cornelius O'Brien, farmer	Mr. Martin O'Sullivan, National School teacher.	22
Kilmallock - - - -	Ballyhatrill, Loughill, Glin, Ballyguiltenans.	Athea - - - -	21
Land tilling, quarrying, shoe-making, tailoring, painting, and slating.	Farm work - - -	Agriculture and dairy farming and labour.	1
10 hours per day. 8s. to 21s. per week.	12 hours daily. 6s. per week. Farm servant, 10l. per annum with diet.	6 a.m.—6 p.m. when they can get work (spring and harvest). 8s.—9s. per week. Farm servants: male, 10l.—12l. female, 8l.—8l. (with diet and lodging).	2
Only as milkmaids, servants, and as some farm work in spring and autumn.	No employment, save on odd days in harvest.	None, except as domestic servants.	3
Nil - - - -	No employment till manhood -	To school till 15; then help their parents or are hired out.	4
Yes - - - -	Yes - - - -	Very much so - - - -	5
Straw (rough), marble, osiers -	Wool, wood, straw, and osiers -	Very superior stone quarries. Other natural products undeveloped for want of capital.	6
Yes - - - -	Yes, plentifully - - - -	Yes - - - -	7
3—4 miles. Kilmallock - -	3 miles. 4 named - -	About 3 miles. 4 named -	8
About 700 - - - -	About 100 in each - -	Average 50 to 100 - -	9
About an average of 1 mile. 10—3.30.	1½ miles. 9—3 - - - -	2, 3, and more miles. 10—3 winter, 10—4 summer (but could be lessened).	10

Continued on page 155.

Questions.	Answers.	
	LIMBRICK.	
11. Do any of the children learn drawing? If so, how many?	Yes, in Christian Broc. Schools -	Yes, in the good primary school in the higher classes.
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	Thinks so, decidedly - -	Thinks so - - -
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Thinks so, in most cases -	Thinks not, generally -
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	Believes there are such - -	Many, all over the city -
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	Cannot say. [The Christian Broc. have a large school in which car and cart making, &c. are carried on.]	Does not think so, except in the case of the nuns, who will do anything and everything with very little regard to payment by results.
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts such as the working up of the materials named in Question 8, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	Quite certain many such could be found.	Payment by results will induce many to qualify themselves.
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	Believes so - - -	If the thing is really to succeed you must enlist the clergy, the people, and not ask to much money.
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	No doubt - - - -	Yes, certainly - - -
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	Making a personal visit - -	Begin in a small way; avoid high social patronage. Get an intelligent priest on your side, and for girls take the advice of Sisters of Mercy.
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	Excellent railway and canal accommodation.	Not stated. Good transit

Answers.			No. of Question.
LIMERICK.			
Thinks so . . . . .	None . . . . .	No . . . . .	11
Cannot say . . . . .	Yes, after school hours, and other rooms for remuneration.	Yes; the manager will give every facility and help. (3) Yes.	12
Thinks so . . . . .	Yes, in all cases . . . . .	Excellent facilities for doing so	13
Thinks so . . . . .	Yes . . . . .	Smith, carpenters, coopers, &c. Females qualified to give instruction in knitting, lace-making, embroidery, &c.	14
Yes . . . . .	Yes . . . . .		15
Is not aware . . . . .	None save wood workers. Many would qualify for payment on results.	Yes; and willing to do so for small consideration by result or otherwise.	16
Thinks so . . . . .	Efforts would be made, and believes they would be successful.	Locality very mountainous, people poor, and no local gentry; so fears local efforts would be small in result.	17
Yes . . . . .	Would be most anxious to avail themselves of it.	They certainly would . . . .	18
Thinks young boys ought to have some instruction in farming.	Knows families in the Glin district actually starving for want of employment.	None, except to urge the necessity of such instruction.	19
G. S. & W. Railway Station . . . . .	Daily steamer to Limerick, and in connection with Foynes train 8 miles distant.	Railway a few miles distant. River Shannon within 6 miles.	20

Questions.	Answers.	
	LIMERICK.	
22. State your own name and occupation, and proper postal address?	Richard Bourke, Esq., Local Government Inspector.	Mr. W. C. Upton, carpenter and builder (Secretary of Labourers' League).
23. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Castle Connell (Lismagry)	Ardagh
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Agricultural labour	Labour on farms or on works of the roughest nature.
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	12 hours in summer; 8 to 10 in winter. Men about 2s. week, women 2s. 6d., boys 4s.	7 a.m. to 6 p.m., except 1 winter; but they do not last half the year employed. 7 week. Servant boys 10l. year.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	No special employment	In service to farmers; earn 10 year. No home industries.
4. How, and from what age, are children occupied?	Children get some work at times on the farms.	Go in service to farmers
5. Are the people generally intelligent, industrious, and handy?	Intelligent and tolerably handy, but not industrious.	They are
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	All the products named. Wool is manufactured at some small mills (worked by water). A few basket-makers.	All on list obtainable (except marble, which is 7 miles away). Leather and wood alone use profitably.
7. Is water-power easily obtainable from streams?	Yes	Yes
8. At what distance apart are the National Schools? Name the schools nearest to you.	From 4 to 5 miles. His own school in own grounds.	National Schools 3 miles apart. Ardagh National School.
9. How many children attend the schools?	75-80 boys; 30-40 girls	An average of 60
10. From what distance do the children come to attend school? What are the school hours?	Sometimes 3 miles. 12-4	To 3 miles. 12-3
11. Do any of the children learn drawing? If so, how many?	No	No

*Continued on page 462.*



Answers.			No. of Question.
LIMERICK.		CORK.	
Mr. Jeremiah Dineen, carpenter	Mr. Patrick O'Shaughnessy, draper.	Mr. F. F. Johnson, innkeeper	22
Ballingarry	Bruff	Kanturk	21
Farm labour	Labourers, and shoemakers (a few).	Casual manual labour	1
7 a.m. to 7 p.m. (summer), or 8 p.m. (winter). Without diet 2s. week, with diet 2s.	6 a.m. to 6 p.m. Labourers in spring and harvest 2s.—3s. a day; artisans 3s.—4s. day.	12 hours daily. 8d. per day with 2 meals; 1s. per day with no meal.	2
None; would gladly avail themselves of such if they had opportunity.	None, except in the fields. There are many girls and women trained to crochet, but trade has died out, there being no demand.	No work except weeding in spring; and in autumn binding.	3
From 10 years, in such work as weeding, haymaking, &c.	No occupation	No employment for children under 14; girls above that age help in the dairy.	4
They generally are	They are	Intelligent, but spirit of industry dead.	5
Wool and straw	Wool, straw, osiers	Wool, wood, straw, and osiers	
It is. [There is an old mill near the town, not used.]	Yes	Superabundant	7
4 miles apart. Ballingarry school.	Nine schools within a radius of 4 miles.	4 and 5 miles; Kanturk nearest	
Average: male 127, female 95	Christian Bros. School, 120 boys; Convent School, 108 girls; 8 National Schools, 325 boys 335 girls.	400 on an average, male and female.	9
Up to 3 miles. 10—4	About 2 miles. 9—4	Females come 6 to 8 miles to convent schools under National Board.	10
No	No	No	11

Continued on page 460.

Questions.	Answers.	
	LIMERICK.	
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	School-room would be given, and also room in another building available, free of cost.	Use of school-room would be inconvenient on account school furniture. Place can be got for a few shillings weekly.
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Yes - . . . . .	Yes - . . . . .
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	Only tradesmen, except perhaps a basket-maker.	Yes - . . . . .
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	Teacher would do his best, but is at present acquainted with no handicraft.	Yes - . . . . .
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 4, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	No such person; but probably some might be found willing to learn.	None fully qualified, but persons would (be himself, for example) teach what they could and strive to qualify themselves.
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	They probably would . . . .	Local efforts would be made with every chance of success.
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	No doubt that plenty of children and a few adults would commence; but unless found remunerative they would soon give up.	Has found from inquiry that both children and adults would.
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	Wood carving and, perhaps, decorative art might offer best chance of striking root.	Yes - . . . . .
20. What facilities, if any, exist for disposal of the work done by adults or children? What railway or canal communication exists?	Railway excellent. The market would be rather scanty and precarious.	No market. Drapers in local towns could be got to purchase female work. Trade and Limerick Railway.

Answers.			No. of Question.
LIMMICK.		CORK.	
(1) Could not be got - -	(1) Yes. (2) No- - -	Yes; no difficulty whatever -	15
There is room for such a shed, &c.	Room at four of the schools -	Yes; plenty of available room -	15
There are artisans, most of whom have nothing to do.	No - - - - -	Yes - - - - -	14
Yes (not the master of the schools).	Thinks the masters would -	I should say so - - - -	15
There are such persons - -	No; but persons would qualify	Yes. Orders may be largely used for basket work.	16
Efforts would be made - -	Thinks that if woollen fabrics were made they would repay a good deal of the advance.	Would personally guarantee assistance.	17
Yes, both - - - - -	Thinks they would - - -	Yes, though nothing has been done to stimulate them.	18
Lord of the soil is a good land- lord, and would aid in carrying out the work.	- - - - -	Send a representation and I will point out how the scheme may be developed.	19
Nearest railway 5 miles. Many goods might be sold in locality.	Railway within 3 miles - -	Large demand for basket work in Cork. Station 2 miles dis- tant.	20

Questions.	Answers.	
	KERRY.	
20. State your own name and occupation, and proper postal address.	Capt. J. C. R. Colomb, J.F.	Miss Frances FitzGerald
21. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Drounquinna, Kenmore	Valencia Island
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Mountain farming - - -	Farming, labouring, flint slate industry (but it is working well at present)
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	Very little of their time fully occupied. Ordinary labourers in constant work 9s. per week.	The whole day could be profitably employed by industrious farmers most of the Good labourers, when employed, earn about 9s. 6d.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	Butter-making. Here and there wool-carding. Lace-making at convent school.	Farm service (4s. a year), hawking, and "sawing" turf per day. Dairy work at farm; some of the latter work is lately started.
4. How, and from what age, are children occupied?	At school - - -	Boys from 12, field work
5. Are the people generally intelligent, industrious, and handy?	Most extraordinarily intelligent; not industrious, for there are no influences to make them so; in youth naturally handy, but get awkward for want of practice.	Very intelligent; industrious; put in the way; very handy.
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	None to speak of at present	Wool, slate (quarry). [O would probably do well.]
7. Is water-power easily obtainable from streams?	Yes - - - - -	Yes; one very good stream in middle of island.
8. At what distance apart are the National Schools? Name the schools nearest to you.	Most convenient; the most remarkable being the convent school	3 in the island (a separate one for boys and girls in each island 7 by 6 miles.
9. How many children attend the schools?	- - - - -	50 boys and 55 girls in (probably more in the other)
10. From what distance do the children come to attend school? What are the school hours?	10-4 - - - - -	Up to 2 miles. 10-5 - -

Continued on page 462.

Answers.			No. of Ques- tion.
CORK.			
Rev. Peter Hill, clergyman -	Rev. Jas. J. Stoney, clergyman	Rev. Thos. C. Abbott, clergy- man.	22
Skibbereen and West Cork -	Goleen, Skibbereen - -	Schull - - - - -	21
Agriculture, combined (along the sea coast) with fishing.	Agriculture and fishing -	Principally small, and very poor farmers and farm labourers. A few indifferent workmen.	1
Early morning till 7 or 8 p.m. Labourers earn 1s. 6d. per day.	Most of their time is thus occupied, but time could be found for other remunerative labour if provided. A bare subsistence.	Generally from light till dark (dependent on season of year). Labourers 1s. a week; trades- men 3s. a day.	2
No particular work for women, except at house work.	House work, carding, and spin- ning for family purposes. No home industries.	Wives of small farmers fully occupied at home. No home industries.	3
Generally as domestic servants, and from the age of 15.	Leave school at 15, and are employed at home as occasion requires.	From 15, at farm and labourers' work.	4
Shrewd, and fairly educated in reading, writing, and arith- metic.	Very intelligent, and fairly handy; but they certainly might make more of their time than they do.	Intelligent and industrious -	5
Wool and straw good. (There is a tanning establishment at Skibbereen.)	Wool and straw, and only in limited quantity. Slate quarries could be worked under proper management.	- - - - -	6
Abundant water-power - -	It is - - - - -	Yes - - - - -	7
2-4 miles. 6 named -	5 miles. 3 mentioned -	3 miles. 4 named -	8
An average of about 70 - -	About 300 attend the above schools.	- - - - -	9
2-3 miles. 10-3.30 - -	An average of 2 miles. 10-3.30	- - - - -	10

Continued on page 463.

K K 2

Questions.	Answers.	
	KERRY.	
11. Do any of the children learn drawing? If so, how many?	Yes, at convent school	Yes, a few
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	In all probability, with sanction of National Board.	Yes
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Many square miles of room	Yes
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	Many might undertake, but would not be really competent.	Carpenter and stone-cutter
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	I should say so	Some other person probably
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	(a.) No. (b.) Would depend upon payment.	Most probably
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	Possibly	Efforts would be made
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	(a.) Yes. (b.) No	Yes
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	Country is being ruined by book-learning, and honest industry is going out of fashion.	To send teacher of book-making.
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?		Very difficult. Steamer to Valencia to Cork.

Answers.		No. of Question.	
CORK.			
None, except about 70 in the convent school.	Not that I am aware of	11	
Yes, in the town and other places; also there is a mill idle which would form a factory at a small cost.	Would depend upon the National Board, the patrons, and the arrangements proposed. Possibly rooms could be got for small remuneration.	12	
Yes	Yes, in some cases	13	
Yes	Carpenter and boat-builder, who might be induced to do so.	14	
Schoolmasters have quite enough to attend to. Others could be got.	Cannot say	15	
None, except for leather work. A person should be trained.	Probably such could be found	There are carpenters	16
Undoubtedly, and with prospect of success, if trained instructors were at first employed for some time.	Under a local committee, with a manager or overseer, a good measure of success would attend such efforts, but no local source of revenue.		17
I believe so	I think they would	At first there would be great difficulty in inducing the people to take any interest in it.	18
Factory for fishing-nets. Woollen and linen factory.	Lace work and knitting of various kind might be taught in the schools with a prospect of being remunerative.	Home industries mentioned in Question 3, if well taught, might be profitable.	19
Railway to Cork	No local facilities, except in case of carpentry work and boat-building. Nearest railway 20 miles.	None	20

Questions.	Answers.	
	COBK.	
22. State your own name and occupation, and proper postal address.	Rev. Robt. Noble, clergyman	Rev. Ed. H. Hopley, clergy
21. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Ballydehob, Skibbereen - -	Toomore, Skibbereen
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	On small farms - - -	Labouring, farming, and f
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	Their whole time when not asleep. (2.) Does not know.	The whole day. Lab: 1s. 6d. per diem.
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	House and farm work. No home industries.	Generally assist the fami out-door work. A little n work and knitting done.
4. How, and from what age, are children occupied?	From 12-14. Are engaged in farm work, or go to shops, &c.	Leave school at 15 or 16, then employed in wor home, in England, o America.
5. Are the people generally intelligent, industrious, and handy?	Yes - - -	Mostly intelligent; gen industries; only a few be called handy.
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	A grass and furs district. Copper works abandoned because unremunerative.	None, except straw -
7. Is water-power easily obtainable from streams?	Not in the immediate neigh- bourhood.	No - - -
8. At what distance apart are the National Schools? Name the schools nearest to you.	2 miles. 4 named - -	1½ miles. 4 mentioned
9. How many children attend the schools?	20 in attendance of two of his own schools.	Average of 70 - -
10. From what distance do the children come to attend school? What are the school hours?	Most only a short distance; some 2 miles. 10-4.	Up to 1½ miles - -

Continued on page 465.



Answers.			No. of Question.
CORE.			
Rev. Stephen Moxley, LL.D., clergyman.	Rev. Wm. W. O'Grady, clergy- man.	Rev. Jno. Pratt, A.M., clergy- man (Rural Dean).	22
Drumoleague - - -	Bantry district - - -	Durrus - - -	21
Agriculture of the rudest and most thriftless kind.	Agriculture (and on the sea coast fishing).	Entirely agricultural - -	1
3 or 7 a.m. to 7 p.m. in summer; sunrise to sunset in winter. Generally 1s. 6d. per day.	Time occupied varies with the season of the year. 2s. a week.	All their time - - -	2
Sitting in the house and minding their numerous children.	Farm and household work. No local industries.	No work by which they earn money.	3
Children are allowed to play in the streets till they are 11 or 12 years of age.	- - - -	From 14 years, at farm work -	4
Not intelligent; not indus- trious; not handy; in fact, not willing to do anything but beg.	I think so - - -	Yes - - -	5
These materials do not exist, or if they did the people would not turn them to any account. Slate quarries.	All mentioned (except marble) may be had in limited quantity.	Yes - - -	6
Water supply most copious -	It is - - -	- - -	7
1½ miles. 3 schools named -	3 miles. 3 in the town of Bantry.	About 5 miles. Durrus -	8
Average of the 3 schools 158 -	80 to 100 - - -	- - -	9
Up to 4 miles. 10-3 or 4 -	Up to 3 to 4 miles. 10-3 -	- - -	10

Continued on page 467.

Questions.	Answers.	
	CORR.	
11. Do any of the children learn drawing? If so, how many?	No - - - -	No - - - -
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	Yes, if they would not be damaged. A room could be got for a small remuneration.	Places could be obtained - -
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	Yes, near country schools, but not so easily near village schools.	Yes - - - -
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	None whose instruction would be valued much.	Good house and boat carpenter
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	I fear not - - -	I think not - - -
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 8, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	I do not know of any fit person	Carpenters as above named -
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	I fear not - - -	Most probable in such case -
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction, if offered to them?	I think they would be slow to attend at first, but I could not say what they might do after some time.	I think so - - -
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	No - - - -	No - - - -
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?	None. Nearest railway station at Skibberoo, 9 to 10 miles. No canal.	The remoteness and isolation of this locality create a great difficulty.

Answers.		No. of Question.
CORK.		
I think not	Only a few, as extra subject	No - - - - 11
Yes	Rooms could be got	Buildings could be got - - - 12
There already exist rooms which are available.	Yes, in nearly all cases	- - - - - 13
Yes, near the Drimoleague School.	Nones	- - - - - 14
I fear not; they are in no way enterprising.	I should say they would	I think not - - - - - 15
(1.) No. (2.) I do not think they would.	(1.) Nones. (2.) If made worth their while, some would, I think.	No - - - - - 16
A grant might operate as stimulant, but effect would soon die out. Nones; charity and give; give is the standing rule here.	No funds available in the present state of the country.	
I do not think either children or adults would so avail themselves.	If they saw any prospect of earning even a little by it, I am sure they would eagerly.	46
Train technically the paupers in workhouses, the prisoners in gaols; those outside those places are incorrigibly lazy, and will work only when they see want approaching.	There are two mills (now idle) available, with water-power and capacious buildings.	Remarks on emigration here added. 19
Railway	(1.) No local market. (2.) Railway and steamboat communication.	20

Questions.	Answers.	
	CORE.	
23. State your own name and occupation, and proper postal address.	Very Rev. Canon McLevinay, P.P., V.P., Parish Priest.	Wm. D'Hesterre Parker, Esq. solicitor.
24. Please state the names and full postal addresses of the locality or districts to which the foregoing particulars relate.	Bandon	Passage West.
1. What are the means of livelihood of the population of the district in which you reside, or with which you are most familiarly acquainted?	Agriculture, some wool-spinning, &c. in the rural districts. In the town ordinary trades, basket-making, &c.	In the dockyards and shipping tradesmen and labourers.
2. What portion of their time is occupied in their ordinary daily work? How much do they earn per week, or per annum?	About 6 a.m. to 7 p.m. Wages from 4s. or 6s. to 80s. per week.	6 a.m. to 6 p.m. in the summer. From 14s. to 21. or per week
3. Are the women occupied in any work by which they earn money? If so, how much? If not, what is their occupation? Are there any home industries such as knitting, lace-making, needlework, &c.?	Some knitting and needlework, but no lace-making or crochet. Millinery, mantle-making, &c. Work for bootmakers; earn 4s. to 10s. per week.	Some few women work at knitting, crochetwork, and needlework, and their earnings may be about 2s. or 3s. per week.
4. How, and from what age, are children occupied?	Some boys from 12 upwards at bottling stores, &c., and get 2s. 6d. to 6s. a week.	At school to 14 or 15.
5. Are the people generally intelligent, industrious, and handy?	There are, and desirous of work, but don't find it.	Yes.
6. What natural products or materials (such as wool, leather, wood, straw, marble, or others) are obtainable in your district which are not at present profitably employed for industrial purposes?	Wool, leather (hides), wood, straw, others.	Wool, wood, straw.
7. Is water-power easily obtainable from streams?	Everywhere	Yes.
8. At what distance apart are the National Schools? Name the schools nearest to you.	Several in town, and at distances of 3 or 8 miles elsewhere.	5 to 6 miles. Nearest school 1/2 a mile.
9. How many children attend the schools?	Convent schools, 700; others from 70 to 160.	250.
10. From what distance do the children come to attend school? What are the school hours?	2 or 3 miles. 9.30 to 3.30	About 1 1/2 miles. 10-4.
11. Do any of the children learn drawing? If so, how many?	A few learn drawing	Very few.

Continued on next page.

Questions:	Answers.	
	CORK.	
12. Could the use of the school-rooms be obtained after school hours for giving instruction in the use of tools or in any particular trade? Could any other room be obtained temporarily or permanently for such a purpose, free of cost, or for a small remuneration?	I fear not, but others could	Yes.
13. Is there room to erect a shed or temporary building to serve as a workshop near to, or in connection with, the school building?	I think not	Yes.
14. Is there any skilled artisan near to the school, engaged in some handicraft or not, who would undertake to give instruction in the use of the tools employed in his trade?	Carpenters, masons, blacksmiths, and horse-shoers everywhere.	Yes.
15. Would the master of the school or any other person qualify himself to give such instruction, if promised payment on results?	I think not	Yes.
16. Is there any person in the neighbourhood who is qualified and will undertake to teach handicrafts, such as the working up of the materials named in Question 6, and if not, would any persons qualify themselves for that purpose, if promised payment on results?	Such might be found	Yes.
17. If a grant from an extraneous source were offered in aid of local efforts, would such efforts be made, and with what prospect of success, towards defraying the cost of instruction in the use of tools or in a handicraft?	I think so	It depends upon the managers of the schools. The public are much in favour of technical education.
18. Have you reason to believe that the people (a.) Children (b.) Adults would avail themselves with alacrity of such instruction if offered to them?	I have	Yes.
19. Have you any other suggestions to offer which may assist the Commissioners in carrying out the objects they have in view?	Such industries and others might usefully and successfully be introduced into union workhouses for inmates, and perhaps in or near them, but separate from them, for out-purses also.	That the local managers be consulted and their co-operation solicited.
20. What facilities, if any, exist for disposing of the work done by adults or children? What railway or canal communication exists?		Railway and steam-packet communication with all parts.

## REPLIES TO CIRCULAR OF INQUIRY by Mr. W. J. DOHERTY.

## IRISH INDUSTRIAL EDUCATION.

1.—Agriculture is the principal means of support of the country districts with which I am familiar. In two of the cities and towns in which I have resided, Dublin and Belfast, other commercial pursuits are available, Dublin being largely dependent on the agricultural prosperity of the country generally, whilst Belfast depends both on agriculture and the linen trade.

2.—The time of *agricultural labourers* is fully occupied, and they earn from 7s., 8s., or 9s., and even 12s. weekly, or an equivalent in house-rent and gardens in some cases. In the vicinity of towns where labourers are scarce, or where public works are in progress, their rate of wages increases from 12s. to 14s. or 15s. per week for *selected and steady hands*; but the great bulk of the agricultural classes of Ireland are chiefly employed on the small farms belonging to their own immediate families, and do not earn any specified wages, all the labour of the family being absorbed in the common work of daily labour, the produce of the crops going to pay the rent, taxes, and supply food, clothing, and other necessaries.

3.—The bulk of the women in the agricultural districts are engaged in like manner on the requirements of the holdings, in turnip cleaning, turf-winning, flax pulling (in Ulster), haymaking, and all other employment attending to the management of poultry, dairy produce, and marketing. Where there exists a redundancy of home assistance, many of the girls are hired out as domestic servants into districts where the farms are larger in area, and in which the daughters of the larger farmers do not from their better position work at out-door labour; in these cases the girls receive from 3l. 10s. and upwards per six months, that being generally the time for which they are engaged, say, from 1st May to 1st November, many of them remaining at home from 1st November to 1st May, during the slack season of agricultural pursuits, during which time they devote themselves to knitting, &c., generally for the use of their own domestic circle. In many cases, in the west and north-west of Donegal, knitting is an employment largely availed of by girls and boys alike, because they receive payment of from 2s. and upwards per week for their labour through local agencies, chiefly through the medium of one well-known establishment, the Messrs. Mac Devitis of Glenties. In the eastern district of Donegal, shirt-making was formerly done on a large scale, but at present, since the introduction of sewing machines, this hand-sewing has been largely discontinued.

4.—In the agricultural districts among small farmers, those children are not hired out to larger farmers, are invariably engaged attending to the watching and herding of cattle, and assisting in the domestic arrangements of the household; many are sent to the national schools from five years upwards till they are 13 years old. In the case of many of the people of the congested districts, where no occupation is available for them on their own small holdings, the larger children are hired out for small sums half-yearly, as is the case with the more grown boys and girls. *This hiring out is a very unfortunate system, as it does not afford any opportunity to the youth so treated to avail themselves of school or education, and it results in many cases in moral destruction. Frequently they are removed from all the influence of home, and in many instances, are not looked after either morally or intellectually, in the households where they are engaged*

*For these people any training at home whereby they could earn 4l. yearly would be an untold blessing.* Appendix N.

5.—The intelligence and industry of the people, considering the means at their disposal for acquiring the one, or applying themselves to the latter can, be best judged from the fact that thousands of the labouring classes emigrate year after year to Scotland and England during the harvest, which is earlier in England than with themselves, in order to earn as much money as may pay the rent of the small holdings they occupy. If this is not industry in the midst of hardships and privations I know of none greater; journeying miles to the nearest seaport, and undergoing all kinds of fatigue during the eight or ten weeks they are so engaged.

As to being handy, that want is their great defect; they are handy, so far as they have been taught, or have had an opportunity of learning. How is it possible for the bulk of our poor Irish labourers, without any instruction in industrial occupation, to be anything else but coal carriers and earth fillers, brick and clay carters, and mortar mixers and carriers, to the more educated and technically trained workmen of the more favoured countries of England and Scotland?

6.—Wool could be produced in quantity, but is not in great abundance at present the small tanneries, formerly numerous in the country have disappeared, and having become profitless to the owners, too, they are not worked. This is owing in a great measure to the importation, on a large scale, of hides from Buenos Ayres, Australia, and elsewhere—cargo lots, which can be imported at a cheaper rate than home-produced hides, and the tanning of leather, not only in the district, but throughout Ireland generally, has been in a great measure abandoned through the competition of Leeds, Manchester, and London, with capital to work it on a large scale available, they have been able to drive the Irish leather trade out of the market. Even shoes and boots, the produce of Northampton Maybole, and other centres of bootmaking in England and Scotland, has crowded the markets, tempted the sellers of such wares in Ireland with long credit, the result of capital, so that clean, unmanufactured English leather, that is leather ready for the bootmaker, harness maker, or belt maker, can be sold at from 1d. to 2d. per lb. cheaper than Irish tanned leather.

*Salt Pans*, for the production of salt, were formerly frequent around the sea coast. This employment has also disappeared. A large trade could be introduced by the converting of peat into litter, as is now practised in Holland. Bent growing and mat-weaving, sackings, and textile weaving should also be introduced.

*Wood*.—The country has been denuded of timber, and would become improved by plantations judiciously arranged as shelter plantations, not wholesale re-forestry, as has been advocated in some quarters, except that forestry could with advantage be taken up as a branch of technical study in districts where large tracts of mountains otherwise incapable of being rendered productive could be set apart for that particular use; but sufficient wood of the meaner kinds, such as alder, ash, larch, fir, and birch, are to be found that could be converted and used for the requirements of technical instruction, and in many parts a trade could be established by articles manufactured from local woods.

The want of plantations, judiciously arranged, has been a great neglect of the landlord class in Ireland, as the law gave the right of every tree planted by the tenant to the landlord, so that tenants did not plant, and very rarely did the landlords do so.

*Oriens* are not abundant, but they could be profitably produced if the demand existed for their use, and the children were taught how best to convert them into marketable articles. This is one branch of reproductive work that would be specially taught in a technical school for the young children of both sexes. In many parts of the marshy districts of Ireland this would become in a few years (from the quickness of growth of the

Appendix N. plants) a most important adjunct to the every-day work of a technical parochial school—the planting, rearing, and treatment of various sizes and the full grown osier and its conversion into wicker and basket work of the class required in the district and local towns, might become, under proper treatment, a remunerative employment.

*Straw* is available over the greater portion of Ireland; and straw-plaiting, bottle-casing, and such like employments should be one of the trades taught everywhere to children. In this branch much could be done, especially by girls if properly taught.

*Marble*.—In many districts of Donegal, notably near Dunfanaghy, marble quarries exist, but have never been worked to any advantage. There also exists on the mountains of Muckish, in the latter district, large deposits of glass-making sand, but, owing to the want of inter-communication, it remains an unmarketable article; also fuller's earth and soap stone (French chalk) are to be found in many parts of the north-west of the same county.

Granite and slate quarries, limestone and freestone, abound in many districts of the country, but all are more or less valueless on account of want of means of conveyance. Light, narrow-gauge railways, are the great want of the country, and until proper means of transport are provided, many of the industries of these congested districts cannot be profitably carried on; but education can be introduced everywhere, so that the rising generation may be able to apply their hands to do work they now know nothing of.

Bog iron ore deposits have been found among the worn out bogs, and cargoes have been shipped from Dunfanaghy, Crossroads, and Bunclans. It is used for clarifying purposes in gas works and aniline dyes.

7.—*Water-power* is the one natural agent that is almost everywhere available throughout Ireland. Streams and rivers abound, and could, with intelligence, be applied to drive any amount of machinery, turbines, and water-wheels, and their use as a medium of imparting motion to machines and engines should be taught practically in every district. They might be on as primitive a scale as the ancient Persian wheel, so as not to be expensive in their construction nor difficult of application. This should not prevent the more modern systems from being taught; but it is useless teaching people how to use and construct a machine that would cost 1,000*l.*, if they could only provide one at 50*l.* for their own use. Yet pupils should be instructed in the higher grades at the advanced schools. Water-power in all its branches, the use of levels, reservoirs, aqueducts, sluices, and also turbines, power of falls of water, and everything connected with hydraulics in an applied form, ought to be taught, whereby the farmer could apply it to threshing his grain, churning his milk, working his flax mills, and other industries; in fact, this question of water-power as applicable to the furthering of Irish industries should be one of the chief features of any technical training, because it is available everywhere.

8.—National schools are about three to four miles apart (except in mountain districts, where they may be more); as a rule sufficient schools for primary education in the three R's exist, but there is a total want of even the semblance of technical instruction imparted in any of them. So far as primary education is concerned, plenty of opportunities are afforded by the National Board of Education, but they seem to have neglected altogether the important question of technical instruction.

The Resident Commissioner, Sir P. J. Keenan (with whom the writer has spoken years ago on this subject), is fully alive to the existence of the want. The means whereby it could be applied seemed to him the difficulty. No doubt the distance of schools from each other could be best supplied by a national school chart.

9 and 10.—In country districts the average attendance would be about 60, and the distance would be from  $1\frac{1}{2}$  to 2 miles radius generally.



11.—In none of the national schools (that I am acquainted with) do drawing classes exist. It is one of the most essential branches of technical knowledge, and should be taught to every child from the age of six years and upwards, in the same way as their alphabet. Black-boards, and chalk for rough drawings of lines and forms, should be introduced into every school, and as the pupils advanced in knowledge the finer instruments could be put into their hands. Objects in every-day use instead of flat surfaces should be the examples selected. Appendix N.

12.—The school-rooms, as they are at present arranged, could not well be adapted to technical instruction. Benches and forms used for reading and writing would not suit pupils using tools.

In many places suitable rooms might be obtained at a small rent, but temporary sheds could be constructed adjacent to the school-room, of a uniform pattern for general technical instruction, and of other shapes for special districts. This could only be determined upon by the local authority, assisted by the directions of the inspecting demonstrators.

13.—In the case of almost all country school grounds there is sufficient room whereon to erect a workshop, and these technical workshops would be best erected at or near the existing schools, being well known centres in every district.

14.—The skilled artizans in country districts in Ireland consist of the village blacksmith, the carpenter and wheelwright combined, the shoemaker, the tailor, and the gardener. Many of the best blacksmiths the writer has known in England have been first educated, technically, in some village in Ireland. The trade of country carpenter in Ireland embraces all branches of the business, from glazier to that of cabinet-maker, of course mostly in a rude way. The smith performs all the duties of agricultural implement maker, up to the finer art of the locksmith. Millwrights, or superior carpenters, are fast disappearing, since the supply of American flour and Indian-corn meal has reduced home milling to an unremunerative art. The use of machinery and the power of capital has destroyed almost every branch of local technology in Ireland, so that the inducements for sending boys to learn trades that existed half a century ago are not now present, and yet the want of the development of these local trades have never been more keenly felt from an economical point. Cash has now to be paid for the imported article, whereas formerly it was supplied from home industry, and consequently allowed the value to be spent in the locality.

In the vicinity of towns many skilled artizans would yet be found, ready for a fixed remuneration to give practical lessons in their various arts. But with an awakening to the value of this class of education many years would not elapse before apt pupils would have learned, who would be able to bring better educated minds to bear on their various callings.

A few selected and skilled demonstrators could impart technical knowledge to a district, but the local tradesmen in many cases would be found available for supplying the drudgery of the instruction. Masons are yet abundant, but stone-cutters and workers in the advanced forms of building construction are deficient, except in the vicinity of large towns; and in the dwellings of the people this class of knowledge is particularly required.

15.—The present masters of schools could not well qualify for the position of technical instructors, and it would require some years before they could do so, even if they were willing to apply themselves. What is required is a central technical college or training establishment, where all future masters would require to take out certificates of merit, on the general theoretic study of technical knowledge, as applicable to their several schools and districts, whereby they could impart the literary portion of the lectures to their pupils, whilst the skilled artisan or demonstrator practically explained the use of the tools, and the technical teaching

Appendix N. required to put the theoretical into practice; thus the masters should be taught how to teach drawing in its general principles, colouring, mapping, surveying, levelling, and proportion of plans, simple architectural drawing, as adapted to country districts, or such other special training as the sub-committee in charge of the district considered should be taught.

In addition to this central training college, district schools of higher technical knowledge should be provided in the vicinity of the local towns where apt pupils from the general schools would receive an advanced technical instruction, and where parochial teachers could be further strengthened in the knowledge they obtained at the central establishment, whereby they might obtain payment for results from the proficiency of the pupils they taught, in the same way that the intermediate schools and scholars now receive remuneration.

Assistance should be given to local pupils at the primary schools, who showed marked progress, to enable them, by means of free education or otherwise, to attend the baronial or intermediate technical schools, and also to further assist those who would excel to proceed to the central establishment or technic university.

Any aid given through the medium of the Government should be given alike to all schools, whether conducted by the Government or by the religious orders, or by denominational bodies.

The new Science and Art Museum about to be erected in Dublin should be constituted wholly a technical college, the same as the Swiss College at Zurich or the Polytechnic Schools.

If this were done, and a system of baronial affiliations established throughout Ireland as intermediate schools or county colleges for higher technical instruction, making every national school a feeder in the branches of knowledge required for its particular district, it would only require the means and the governing power to produce in Ireland, during the next twenty-five years, a very superior class of educated artisans, workers, and labourers skilled in the various callings of industry required either at home or abroad.

16.—In the vicinity of towns many persons qualified to teach handicrafts would be found; in the country districts, owing to the absence of all manufacturing industries, there would be greater difficulty in obtaining qualified teachers, but with a central and distributive system this difficulty would soon vanish. Only once show the people that they can gain intrinsically by attending to technical instruction, and you will soon have them applying themselves assiduously towards acquiring it. The most simple forms of technical knowledge is what is first required in the country districts, and the skilled teachers therein would not be a highly expensive quantity. It must be remembered that the case of Ireland (if we exclude Belfast and one or two other manufacturing centres) is different from almost any other country; there has been no means hitherto available for the people to acquire technical knowledge.

In England and Scotland every establishment and workshop is more or less a technical school, where boys earning their daily wage learn the art of manufacturing. We have to create all this in Ireland, so that domestic trades and home employments are the first technical wants for the country.

17. There cannot exist any doubt that if an extraneous grant were offered, and this the writer considers would be an absolute necessity, local efforts hereafter would be forthcoming, so soon as the advantages of the system were seen and appreciated; but to create local aid among the majority where the usefulness of technical instruction is at present unknown would be a matter of time.

The funds for the development of technical instruction should be a Government grant; there are many sources from which this grant would be derivable in a country such as Ireland, provided the whole details of its internal taxation were within the management of local boards.

These are matters appertaining more to the region of politics than education, but to anyone acquainted with the efforts made in the direction of educating the Irish people they are unfortunately made aware at every step of their inquiry that politics have hitherto invariably held the first place in the consideration of the promoters.

That education in Ireland has been largely provided for by means of grants derivable from landed property, it is only necessary to name Trinity College (or the Dublin University); the intermediate education scheme out of the proceeds of the sale of the lands of the disestablished Church, provision for national school teachers' annuities, &c.

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18.—That grown up boys, girls, and children, would avail themselves of such instruction is a question the reply to which does not permit of a doubt. If the 33,000*l.* per annum now available is already considered too little for the purpose of the Intermediate Act, which has been only a few years in existence, wherein only the more advanced pupils can avail themselves of its advantages, and whereby they learn no trades or occupations, it would be found that with the whole of the 450,000 pupils on the rolls of the national schools, being taught, in some degree, the use of tools, and handicrafts that a large grant would be required; and if only 15*l.* yearly were offered to each school, it would absorb about 100,000*l.* per annum.

That this sum would be well spent, and that the education it produced would be taken advantage of by the children, is my impression. Hereafter, this amount might be augmented by local efforts.

I am of opinion that, if the Government offers a suitable grant for technical instruction and places the disposal of it in the hands of popular bodies, some local aid would be forthcoming towards supplementing it. For instance, a general fund for this purpose might be raised in the parts of the country which are better off, either by means of contributions or subscriptions, for the benefit of the poorer districts.

19.—The observations already made under the heads of the different queries have been hurriedly written down as they occurred to me, but, as already stated in my letter to the Secretary of 6th February last, I am of opinion that a clearly distinguishable Irish Council or Board of Technical Instruction, separate and apart from the present Educational Government of Irish Education, should be elected by the people themselves for the purpose of administering the project.

If technical workshops are to be erected at the national schools, or in their vicinity, the teachers of the national schools should be allowed, if they were qualified, to teach therein, in every case, the general principles of technical instruction. Drawing, &c. should be taught in the national schools, and under the present educational body, but purely technical and industrial training should be reserved for the Council of Technical Education and the sub-committees of the parish, of which the manager of every national school would be a member ex officio.

These sub-committees should arrange with local artisans for the time they could devote, and, with the aid of the inspectors or demonstrators of the council, decide upon the course of technical instruction to be learnt at every particular school, which should always be in accord with the wants of the district.

In manufacturing districts the value of trained hands would soon be found out by manufacturers, who could locally assist eager and apt pupils to excel in their specialties, and whose efforts to advancement would soon become efficient in that direction. What ought to be avoided in any system of Irish technology would be the aiming at too high a standard at the commencement and the teaching of subjects unsuited to the every-day wants of the population.

The education of a country should accord with the views and feelings of the people, otherwise you cannot attract to it that confidence so essential to ensure its success. Hence my desire for an elective board. The great drawback to all subjects of legislation in Ireland taking root therein has been that the people have never been taken into the confidence of the legislators; they are not trusted, and from a variety of circumstances, every effort, no matter how well intended, because of this thrusting of it upon the people without consulting them, in a short time becomes barren in its results. The endowed schools, the charter working schools, the Erasmus Smith schools, the model schools, and the Queen's Universities are all examples.

Appendix N. Technically educated, Irish children at home would find other employments besides depending on the small farm, and emigrants would be enabled to occupy the post of vantage now occupied by technically instructed immigrants from the other portions of the United Kingdom and the Continent.

Industries now unknown would rapidly spring into existence. All these questions are becoming clear to many of the thinking Irishmen of the present day, who would, if they possessed the power of local self-government, not only employ it towards educating the people in industries, but would open up the country by means of light railways, so as to enable them to come forth from their seclusion. If the English Government who have undertaken these duties for the people, keep them from progressing by neglecting the means adopted by every other country similarly situated from the fault of their being behind every other nation cannot be laid at the door of the Irish nation.

20.—The facilities for disposing of the work done by adults and children would be the demand in the various localities for articles of domestic and farming requirements. Much of the furniture and pottery, kitchen utensils, and crockery ware, baskets, and such articles, are now imported into Ireland; all these might and ought to be made in the country.

Railway and canal communication throughout the country is entirely inadequate, and can never be constructed to the extent it should be done solely by local efforts.

21.—The district I have spoken of applies in great part to County Donegal and to the country generally, both north and south. Of the west of Ireland I do not know sufficient to speak with authority.

22.—Although I do not believe that much good can be produced from a hasty examination of this subject, considering that it is not inquired into locally, yet believing as I do that the Commissioners are anxious to give the case of Ireland as fair consideration as the limited time at their disposal will permit, I am wishful to contribute replies to their queries without prejudice, especially as Ireland requires primary technical education in a greater degree than either England or Scotland.

WILLIAM J. DOHERTY,  
C.E., and Contractor;  
Associate Mem. Inst. C.E.  
Member Royal Irish Academy.

29, Rogerson's Quay, Dublin,  
February 8, 1863.

Appendix O.

#### APPENDIX O.

##### MEMORANDUM ON IRISH INDUSTRIAL EDUCATION by Mr. A. HARRIS.

SUGGESTIONS with regard to IRELAND for the use of the ROYAL COMMISSION ON TECHNICAL INSTRUCTION.

I would propose that a *Department of Industry* be formed in Dublin; its functions to extend over the industrial education of the people, and the development of the industrial resources of the country.

The aims of the department should be—

1st. As regards education—

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To bring within reach of industrial training all children, of both sexes, now dependent upon public funds or private charity for their support;

To supply means and appliances for extending industrial training to all other children whose parents may desire to have such instruction imparted to them;

To enable youths of both sexes after leaving school, and adults, to continue to receive a course of industrial education;

To establish technical schools in connection with various industries; and training schools for teachers.

2nd. As regards development of industries—

The Department should be provided with large discretionary powers in the means to be adopted for encouraging in Ireland industries which have already existed in the country, or which it may be found expedient to introduce or develop.

These powers should include the disbursement of money for the purpose of utilising water power, and for the introduction of steam engines and other motive power into schools for teaching trades and manufactures on a practical basis.

Loans to skilled workmen for the purpose of establishing workshop schools.

The payment of apprentice fees for indigent boys at such schools; the inspection of schools.

The establishment of museums for tools, machines both agricultural and manufacturing, new patents, &c., in various part of the country, with free access and loans of same on conditions.

The formation of trade guilds and chambers of commerce in the larger towns, to co-operate with and assist the Department in their trades or districts. Travelling teachers to be sent to the smaller towns and country districts to give technical instruction and to teach special trades and handicrafts.

The formation of libraries of works bearing on trade knowledge and general industries in connection with the museums of tools, &c.

The functions of the Department would be of a paternal character.

It would strive to develop "local influences" now almost non-existent; its ultimate aim being to enlist local co-operation and to create local interests. Wherever these remain in abeyance the department would have to take the initiative by direct action, withdrawing gradually from too much interference as local influences began to develop.

With regard to Section 1.—*Education*.—The Department would take under its supervision and continue on their present basis, the existing industrial schools. It should encourage present managers to extend their schools and afford reasonable assistance to enable them to do so. It should also promote the formation of new schools, so as by this combined operation to enable all children now in workhouses to receive instruction in industrial schools.

The Treasury would continue to make the weekly payment for children as at present. The Unions would be relieved from the cost of the workhouse children, and it would be desirable for the local payments for children throughout the country to be provided on an even scale and by a uniform rate, instead of by the present unequal payments from the grand jury cess.

New schools would be located where none now exist, so that every part of the country would have a free industrial school within easy reach. The process of admittance to these schools should be carefully guarded so as to admit only the really destitute. Children convicted of crime being (as at present) committed to the reformatories.

These schools should, so far as practicable, be made to have a bearing on the industrial resources of the localities in which they are placed (general handicrafts being taught in all); for instance:—Fishing and seafaring schools on the coast. Textile industries where wool or flax

Appendix O. abounds. Agriculture and gardening everywhere. In these schools water and steam power should be used, and the trades taught should be made as real as possible. Everything required by the school should as far as possible be made in its workshops, and such products as were not required by the school should be of a saleable quality, and be sold for the benefit of the school.

For the training of children who are not destitute, but whose parents are too poor to pay the cost of industrial education with maintenance (as in the existing industrial schools), I would recommend mixed day schools (scholastic and industrial) at which a low scale of charge should be made.

In these, the standard of scholastic teaching might be lower than that now adopted in the national schools.

In these schools, two or three useful handicrafts might be taught, in addition to sewing, knitting, and other similar work which is now taught to the younger children at Artane and other industrial schools.

For young persons who have left school, and for adults who desire to improve themselves, evening classes should be established. The instruction should be of a generally useful character and should have a bearing on local industries or resources. The course of teaching should resemble that adopted at the German Fortbildung schools. The classes might be held in existing school-houses or other buildings hired or built for the purpose. A low scale of fees should be charged which might vary (as at the national schools) according to the means of the students.

The rooms should be provided by the locality. The expenses should be defrayed, 1st, by school fees; 2nd, by the locality; 3rd, by the Department. The two latter in equal proportions.

The teachers should be practical men who have received good instruction; say, clever artificers, English or Irish, who hold science or art certificates, or are otherwise qualified. They could employ part of their time for their own advantage, and teach in the evenings at a moderate rate of payment.

Elementary drawing should be taught in all the schools and classes.

Should the ideas which I have propounded be pronounced utopian or impracticable, I may refer to the Kingdom of Wurtemberg, which 50 years ago was a purely agricultural country, without minerals and with but few trades. By means of the formation of a Department of Industry, which has spread its operations to every town, village, and hamlet in the country, a most beneficial change has been effected. Trades, both large and small, have been everywhere established and flourish, and agriculture is carried on upon vastly improved systems. The active energy of one man (Dr. Von Steinbeis) has effected a great part of this extraordinary economical revolution.\* Wurtemberg, however, had the advantage of a long established system of compulsory education, upon which the industrial system was grafted.

As regards Ireland, probably three-fifths of her children are equally ripe for industrial training, and she has the advantage of a system of excellent instruction in industry at her industrial schools, and a staff of careful and conscientious teachers of both sexes ready to hand.

In conclusion, I may add that Ireland does not avail herself of the advantages of the Art Department at South Kensington, and I consider it necessary that she should have a department for industrial art distinct from South Kensington, and better adapted to the requirements of the country.

The Department of Industry would have to take the place of South Kensington, and to combine education in technical and industrial art along with its other duties; the two subjects, industry and art, being indissoluble so far as early training is concerned. It is greatly to be hoped that any system of art instruction as applied to industry which

\* Mr. A. Tylor, who was Dr. Von Steinbeis' correspondent since 1866, is about to communicate with you on the subject of the Wurtemberg system.

may be adopted in Ireland may work free from the defects of the South Kensington system, which cannot be said to fulfil satisfactorily the requirements of Great Britain as regards industrial art, and which as regards Ireland might almost be non-existent, as the following figures show:—

The total grants made to elementary schools in the United Kingdom for instruction in drawing are	35,048
Of which Ireland receives only 88%.	
Total aid to art classes	5,840
Of which Ireland receives only 20%.	
Total aid to schools of art	20,193
Of which Ireland for six schools receives 56%.	

ALFRED HARRIS.

Lunefield, Kirkby Lonsdale.

NOTE.—The above suggestions are the result of personal observation of the present wants of Ireland, and of a knowledge of the practical work which is being done in Wurtemberg and other countries on the Continent for the development of industries by means of education and other stimulating methods.

## APPENDIX P.

Appendix P.

MEMORANDUM ON TECHNICAL EDUCATION FOR IRELAND by  
Mr. J. PERRY.

To the Royal Commissioners for Technical Instruction.

GENTLEMEN,

I beg to put in writing, as concisely as I can, the points which I think of importance in regard to technical education. By technical education I understand any education which keeps in distinct view the fitting of the pupils for any particular trade or profession, or for a set of trades, &c., which the course of instruction will serve by a common influence. Primary education comprehends all school education below the standard which ought to be set up as the minimum for every individual of average capacity in the rudiments of what are called subjects of general information. It has a technical aspect which is easily apparent. The children of the very poor cannot see in their own homes a proper differentiation of utensils. A stool, for instance, which should only be a seat, is also made to do duty as a barrier across the door, to keep the youngest child in the house; on it the turnips and cabbages are sliced for the cow, and the same stool supports the bread set up to bake before the fire. Unfortunately, the same system is also followed in the school, and so the child has difficulty in acquiring what is the instinct of a good workman, that tools have distinct uses. The outraging of tools is expressed among workmen by a very vulgar but expressive phrase. With young children, the memory is most easily trained to hold things, which must be acquired, by mere repeating, as, for instance, the multiplication table; and habits of observation have to be set up. I am of opinion that the most intelligent men should be the masters of primary schools, and, if there is to be a place for "dames" in the educational system, I should be rather disposed to put them in the Chairs, and make them holders of teaching fellowships in the Universities. I do not wish to be misunderstood, and I explain that the intelligence is needed less for cramming the children than to make the teacher resolute in leaving the children to

M-P 2

Appendix F. themselves. The Irish schoolmaster is now, socially, the equal of the policeman. I should like to see him, socially, equal to the clergyman, who is now the "manager." There are, at present, difficulties about this whole subject, but especially in Ireland, which, I am quite sure will, within a reasonable time, work their own solution. I observe a good many schoolhouses being built which fairly agree with my ideas; these are built, under the supervision of the Board of Works, for the Commissioners of Education, in agreement with the local authorities.

In answering the question as to whether the schoolhouses should be made use of for purely technical education, I said I thought they should; but I imagine they will really be of very little utility in this way. Technical schools will require special fittings and furniture, for the lecture will be only a portion of any effective system.

In rural districts I am of opinion that the rural handicraftsmen will not be available even to the extent of teaching the use of tools in any regular sort of way in a school. Individual jealousies in small country villages are more important than in towns. The man who is commonly employed to make a door or a window has a profound contempt for the cart-maker, and the jobbing smith in a small village is an artist by comparison with the man who only shoes horses, and such men would condemn each other's methods. There is less need for effort in such places than in large towns; the country village workmen work with tools of no great nicety, and they good-naturedly allow boys to practise in their shops, and even to make use of cuttings of materials, which boys work into small articles. In my own experience there were at least two cart-makers' shops in which I was at perfect liberty to make birdcages, manufacture small boats and sundry firearms, and turn spinning tops. The use of tools is a very small part of a workman's education; indeed, if he works at all, what may be called the knack or the sleight of a particular tool becomes his, by what is called practice. Good workmanship is not at all proportional to this *knack*, except where the work requires absolutely no thought, as, for instance, in nailmaking. It requires no special cultivation; it is manifested in so many operations necessary to life. It makes a man handy as a carver at table, makes him a neat batsman or bowler at cricket, and helps him as a performer on a musical instrument; and it would largely determine the superiority of a savage among savages. In the use of tools in technical schools, I would have for object rather to teach the best shape of tool for a particular work, and to teach the differences among materials, than the mere knack of the tool. The object of technical instruction is to produce the results of work, the best of their several kinds with the least possible waste of materials and labour. Among workmen, the man who will be the best foreman is not necessarily the best workman; my experience is that he is not usually a first-class workman, but he can do good work when he likes, and he can make naturally bad or indifferent workmen do good work. The type of the foreman ought to be the ideal in technical education.

Establishing workshops in connection with schools where the boys are not likely to become workmen is a very useful thing, but I would not call this a part of technical education, except, of course, where they enable a young man to become an engineer without passing through the stage of workman; if they merely produce amateurs they fall outside my definition of "technical." In like manner the laboratories of one kind and another in Universities are only technical in so far as they are used in giving a professional education to men who will actually practise.

The technical education of the workman does not resemble the work done by the professional laboratories. In the one case the object is to impart the science to a young man or boy already practising a handicraft; in the other case, the attempt is to give practice in experimenting with theories set forth in books or lectures. Their common bond of connection is the combination of theory and practice. The furniture of the laboratory may be the same for both kinds of students, and the experiments may be very much identical; but the object of the teacher must vary with the



class of his pupils. I can imagine a number of University men meeting an equal number of workmen in a common workshop to work out a pre-arranged programme, and succeeding in the work in pairs, without any teacher whatever.

The chief difficulty with the workman is that, as a rule, existing elementary text-books have been written without regard to him, or by persons unable to approach the subjects from the workman's point of view. The text-book may make a great deal of fuss about something the workman knows very well, and which he considers commonplace, and in other places it assumes that he knows more than he does know. In all technical schools for workmen, elementary science must be taught, but taught somewhat differently from the usual way; indeed, in almost the reverse of the usual order; for example in chemistry;—the usual course is to make the lecture precede the laboratory. Begin as simply as you please, but show the workman results, before you give him reasons; in a little time it will be possible to take him either way. Explain to him the setting of plaster of Paris, which has probably puzzled him, or why a smoky wall will get damp in wet weather, however unnatural it may be for damp to appear on it. Tell him why a lead tank corrodes into holes with rain water, and will not do so with pump water. Explain why white-lead paint blackens in some situations, and why zinc-white does not; why house-painters must "flat" white, or light coloured work, inside a house, and so on, and he feels at once the usefulness of what you are able to do for him.

Again, mechanics, as a subject of education, is usually approached through mathematics, more or less advanced, the reverse order is necessary; for the practising mechanic, mathematics must be reached through mechanics. This, however, is only the case with the mere elements; a stage is soon reached which is common, after which the progress is, for all kinds of students, in the same direction.

I think I was asked if I would advocate teaching a dyer, say, the elements of chemistry, or only what might be thought directly useful. It is the elements I would aim at teaching him, but, if possible, making use of the experience his trade has given him.

The system of South Kensington has been of immense benefit as compared with no system, but a much more effective way of doing the work is needed. Hardly any other subject except that of pure mathematics can be efficiently taught without apparatus of one kind or another. Apparatus in places like Belfast would be supplied by the local people, and a good deal has actually been done in this way; but the schools which have been set up from time to time have been of a more or less ephemeral character; and the whole thing is more or less loose and incoherent. Teachers of the best kind are not continuous; they are usually young men who are pushing themselves for some of the professions, and they take up these classes merely to earn some money. These men usually commenced as pupils, and the phenomenon is at once the glory and the bane of the system. I can count, without effort, even such teachers of 12 years ago who are now, four of them, graduated civil engineers in practice, and three of them doctors of medicine in practice.

Of course, the business of technical education is not to make "professional" men of workmen, but to uniformly raise the standard of intelligence among workmen, and to have direct application to the various handicrafts. A system imperfectly carried out may weaken the ranks of the workmen, by merely giving facilities to a few of the best men to escape from the ranks, and it may, from a national point of view, be even pernicious. In my opinion the lines of demarcation between the professional classes and the working classes will ultimately disappear, through the equal technical education the State will ultimately set up; and, while I will not set a "profession" as a goal before every working man, I would break down every barrier between the workman, who has acquired elementary science in technical schools, and the further pursuit of science in the Universities, whether the object is to get knowledge for its own sake, or to get a higher qualification as a superior foreman or engineer.

Appendix P. The late Queen's University was well calculated to take part in this work. The Queen's Colleges, no doubt, remain, but they have been injured by the separation from the University; and the Royal University, both, by insisting on the ancient classical languages and by the age-limitation for prizes, has effectually put an end, for the present, to an important educational current which had set up, especially in connection with Queen's College, Belfast.

I am, Gentlemen,  
Your obedient servant,  
JAMES PERRY.

Appendix Q.

#### APPENDIX Q.

##### MEMORANDUM ON RECREATION CLASSES as a means of INDUSTRIAL TRAINING by Mrs. E. L. JEBB.

SIR,  
The Lyth, Ellesmere, February 8, 1883.  
In reply to your letter, I beg leave to say that, besides some in Dublin, "recreation classes" have been formed in country places in the counties of Dublin, Wicklow, Monaghan, Limerick, and Kilkenny. Beginnings are also being made in Fermanagh, Queen's County, and Donegal. The "recreation classes" are held on Saturdays by voluntary teachers, with or without professional assistance, for the purpose of teaching boys and youths handwork. Wood-carving has been the occupation hitherto chosen. I call these "recreation classes," lest by giving them any more ambitious name it should be imagined that by classes of this kind it is proposed in any serious degree to supply the great existing need of classes for handwork for those who cannot obtain a thorough industrial training.

In some cases our recreation classes are held in the village schools, and in one instance a plan has been adopted which may interest some who are waiting to see the report of the Technical Commissioners, before considering in what manner they can best initiate those "local efforts" to establish industrial education in Ireland, which we are told must precede any of an official character. One difficulty which will have to be considered is space. In the school to which I allude, a very strong carving bench has been erected down one side of the schoolroom, but it is constructed as a flap, and when not required can quickly be let down, when it hangs flat against the wall. The iron legs hook up underneath, and when in use stand in small iron sockets let into the floor. This arrangement is found to answer perfectly, the table being as steady as a rock. No practical inconvenience whatever is found to arise from the schoolroom being used once a week as a workshop.

I believe that "recreation classes" are not merely useful in themselves as tending against idleness and intemperance, but that if a certain amount of encouragement were afforded they would conduce to a large amount of effort being made to establish real industrial training throughout the country. They act as the thin end of a wedge, which it is difficult to introduce less abruptly. It is an easy matter to get a few workers in the temperance cause to start a recreation class in a parish. When subscriptions are asked for to meet the small preliminary outlay, the subject of handwork for boys is introduced in a practical form to the neighbourhood. To judge by the questions asked, and objections often raised in the beginning, there is much need to familiarize the upper classes with the elementary principles of industrial education. At first our class is regarded with scepticism, but by degrees interest is evinced. One

neighbour offers presents of wood, another, models or patterns, a third requests admission for a promising boy. The boys and their parents, moreover, begin to acquire new ideas of education. It is but a step from this to making a "local effort" to procure a qualified teacher to hold a regular class for handwork. If a small grant were allowed for every child who received a certain number of hours instruction in the half year from a certificated teacher, I believe that, in a locality where the minds of rich and poor had become sufficiently familiarized with the advantages of teaching handwork to both sexes, it would not be difficult to raise the remainder of the sum which would be required for the teacher's salary and the necessary plant. There are many simple handicrafts which could be taught in the village school in cases where a regular workshop could not be afforded. A teacher established in a central position might instruct several schools in the course of the week, as is done in the case of teachers of cookery in England. Such a teacher ought to be qualified to introduce such exercises in handwork as are taught in the Salles d'Asiles, and to the junior classes in some of the elementary schools in France, as well as some more advanced kind of industry for the older pupils.

May I be allowed to suggest that it would lead to a considerable amount of local effort if peasant pupils, taught in recreation classes or by any other private agency, were allowed, under certain conditions, to present themselves for examination by an authorised examiner; and that, in the case of a certain number of pupils from one parish or township simultaneously passing a satisfactory examination, a grant should be offered to the managers of the schools of that locality in aid of the salary of a certificated teacher?

Judging from my own experience in interesting rich and poor in industrial education, I am convinced that the prospect of leading, by means of small individual efforts, to substantial and permanent results, would have the most beneficial effect in stimulating exertion of the kind which is so much needed in Ireland.

In making this suggestion I venture to quote the words of the Abbé Martin in the "XIXth Century" for October 1882. In writing of the system of payment by results, he observes: "the business of the State is not to fill the place of individual enterprise but to foster and aid it . . . . The increased sense of responsibility in the teachers, their feeling of satisfaction in the fulfilment of their duties, the zeal and self-devotion called forth, the economical administration of the funds, the self-reliance fostered by a system which gives free scope for action to all, the high moral tone and kindness of bearing which prevails, are an unmixed good in themselves, and they extend an influence as far reaching as it is salutary."

I remain, Sir,  
Faithfully yours,  
E. L. JMB.

Gilbert R. Redgrave, Esq.

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#### APPENDIX R.

Appendix R.

#### LETTER FROM MISS F. FITZGERALD.

Glanleary, Valencia Island, Ireland,  
29th November 1882.

SIR,

I HAVE just read some questions signed by you about Irish local industries, also a pamphlet dedicated to you by Mr. Bloomfield on the same subject. I should like to bear my testimony to the eagerness with which the poor people avail themselves of any means of employment and their cleverness in learning, and also to beg for advice and possibly assistance in promoting other industries.

Appendix B. In the Island of Valencia, in March 1880, we began to employ a few women in knitting (assisted by a small grant from the Relief Committee). Then *very few* could knit well; most of them not at all. The beginning was not very cheering, but we felt when we saw the anxiety of the people for work, that we *must* go on. Now we have been able to undertake an order for 12 dozen jerseys for one of the American Lines, and excellent gloves are made, as well as socks and stockings.

Strangers who used to say that our women sat with folded hands, have quite changed their tone, and see that they are only too glad to work. Farmers say I have injured them, as I have "raised the wages on them," which means that girls are able to ask rather higher wages for the three months of the year during which the farmers employ them! One great use of the knitting is that it gives work to those whose time is not fully occupied, but who have no other means of earning. My great wish is, now that they are taught, that the work should be taken up by some business people, on thoroughly business principles, as it is bad to have it depending on individual exertions to get orders. Perhaps in time a woollen factory might be established.

But one of my chief objects in writing to you is about willows and basket work. I have long wished that willows (or osiers) were more grown here, and perhaps you, or Mr. Bloomfield (whom I do not know how to reach), could give advice from some understanding person as to the best means of growing osiers and the best kind to grow, and then later, if this plan of promoting local industries is carried out, and basket-making could be established here, we should be ready to supply our own materials.

Formerly many of the people of this island were employed in the slate quarries, but now, owing either to the incompetence or want of funds of the present lessee, it is worked in a most unsatisfactory manner, and the people are suffering in consequence.

We are 40 miles from a railway station (Killarney), but we have a steamer calling once a week from Cork—very good for imperishable goods.

I am most willing to take any trouble, provided any industry could be established on lasting business principles. I trust you will forgive my troubling you.

I am, &c.  
(Signed) FRANCIS FITZGERALD.

Appendix S.

#### APPENDIX S.

##### LETTERS FROM THE BISHOP OF ARDAGH AND CLONMACNOISE.

###### I.

St. Mel's Cathedral, Longford,  
13th December 1882.

SIR, I SHALL be most happy to give your Commissioners all the assistance in my power in the laudable object they have in view. This diocese is very extensive, stretching into seven counties, and into three out of our four provinces. May I beg you, then, to send me a few copies of your query-sheet, and I will endeavour to get answers from well-informed members of my clergy in various localities.

I have, &c.

(Signed) BARTH WOODLOCK,

G. B. Redgrave, Esq., Bishop of Ardagh and Clonmacnoise.  
Secretary of the Royal Commission  
on Technical Instruction.

## II.

Appendix E

St. Mel's Cathedral, Longford, Ireland,  
20th March 1883.

SIR,

I HAVE delayed answering your letter of the 18th of December last, in order to be able to give your Commission all the information I could on the important subject about which you write.

I now beg leave to enclose the answers which I have received to your query-sheet from three of the most influential members of my clergy, two of whom reside in this county, and one in the county of Westmeath. I regret to say that the discouraging reports as to want of employment, and difficulty of setting on foot any organisation for supplying this want, which are given in these letters, seem equally applicable to every part of this extensive diocese, with scarcely any exception. This town of Longford, comprising over 4,000 inhabitants, and Athlone, which is larger, but of which only one-half is in the diocese of Clonmacnoise, are the largest towns in the diocese, which thus may be said to be a purely rural one, extending into seven counties, and into three of our four provinces.

The great desideratum seems to be—some remunerative employment other than agriculture, which would give occupation to hands which are now idle, and by work, capable of being done at all seasons and by persons of either sex, and of various ages, would supplement the precarious and insufficient earnings to be gained in the fields.

Part of the machinery of the Board of National Education in Ireland is a so-called Organiser, whose duty it is to visit schools and give practical instruction for some weeks on discipline, organisation of classes, &c. Now I beg to suggest, that some such officer, in connection with technical education might be found useful, who, according to the wants and capabilities of the various localities, would visit the schools of the neighbourhood, and give practical instruction in handicrafts, and still more awaken an interest in the young, and in others, so that all might co-operate, each in his own way, to develop the industrial resources of the place. These industrial developments would, probably, be on a very small scale, especially at the beginning, through want of capital; but, there seems no reason why they should not increase, and perhaps rapidly, when capitalists would find it to their interest to help local efforts.

There is one industrial resource, which appears to be offered in a special manner by the geographical position of this diocese, stretching, as it does, for over 120 miles along the left bank of the Shannon. The sluggish waters of that river and the low lands adjoining, through the greater part of its course through the diocese, seem to afford special facilities for the growth of osiers, a crop, which I am told, would be most profitable to the owners, and at the same time furnish employment to a great many persons.

Again, the number of lakes and rivers in this diocese is very great; two of the rivers, the Shannon and the Inny, are considerable. If measures were taken to multiply fish in these lakes and rivers, and then to teach the people, and especially the young, how to utilise the supply thus brought to their doors, an addition might be made both to the food available for the people, and to their income, in those waters which are now unproductive.

But, I think, the greatest and most wide-spread advantage would be obtained for our population, whether in the country or in our small towns, and at the least possible investment of capital, if encouragement were given in a practical way to those industries which are specially adapted for girls and women, namely, knitting and needlework in their various branches. For this purpose, however, two things seem necessary: 1stly, that centres should be established, where work would be given out, to be taken and executed at home; and 2ndly, that a market should be found for the work, when done.

The Messrs. McDevitt have, I am informed, carried out this plan at Glenties, in the county of Donegal, with great profit, both to themselves and the locality. Their manufactory is of woollens. There

Appendix S. seems no reason why the system might not be extended so as to embrace the beautiful needle-work executed in some of our convent schools. What is needed is, organisation, and that a market for the work be secured in London and other rich centres. If your Commission were to form such an organisation and to secure such a market, it would, in my opinion, confer incalculable benefits on Ireland; and there are at hand, as it seems to me, numerous local agencies in every way highly qualified for carrying out the plan in the many convents scattered up and down, throughout the country, some of them in the poorest localities, the members of which devote themselves to the education of poor girls. The religious ladies in these convents possess a thorough knowledge of the circumstances of the places where they reside, and especially of the poor, and in particular of the female poor of the population; and they thoroughly enjoy the confidence of the clergy and people, whose co-operation they would be sure to have, and on the other hand, as they devote themselves gratuitously to the sacred work of education and the care of the poor, their valuable aid would be obtained at the least possible cost to the undertaking.

To resume: I beg to offer to your Commission the following suggestions in reply to the letters and circulars with which you have favoured me:—

1st. The expediency of having persons skilled in various kinds of technical knowledge, who would visit schools in various localities, and impart instruction according to the requirements and capabilities of each neighbourhood, and awaken interest;

2nd. The development, in connection with the Shannon and adjacent lowlands, of the growth of osiers, and the instruction of the people in their cultivation and manufacture;

3rd. The stocking our lakes and rivers with fish, and the instruction of the people in their neighbourhood in the mode of utilising the advantages thus brought home to them; and

4th. The encouragement of those industries, such as knitting and needle-work in their various branches, which are specially suited for girls and women, by establishing centres for the distribution of such work to be executed in the workers' homes, and securing a market for the work, when executed, and in particular by utilising for the purposes of such organisation, the convents, in which female children are educated in every part of Ireland.

I have, &c.  
+ BARTH WOODLOCK,  
Bishop of Ardagh and Clonmacnoise.

Gilbert R. Redgrave, Esq.,  
Secretary, Royal Commission,  
Technical Instruction.

Appendix T.

#### APPENDIX T.

##### LETTER from the BISHOP of CLOGHER.

St. Patrick's Purgatory,  
Lough Derg, Pettigo, co. Donegal,  
8th July 1882.

DEAR MR. BLOOMFIELD,

YOUR valued communication has reached me, as you see, on the island of Lough Derg. Though busily occupied here, I shall at once reply to your letter by assuring you and all concerned, that I would consider home industries, such as you describe, to be the most desirable boon that could be brought within reach of our people. Industries of the character indicated would seem peculiarly suited to a population, like ours, mostly

engaged in agriculture; and having, therefore, a large proportion of time for other pursuits. Occupations too, practised by the members of the family under the parental care and guardianship would be vastly preferable to the factory system, which is found so deteriorating, morally and physically, and which at best is only applicable to towns and cities. I feel assured that the encouragement and support of the Irish Catholic bishops and clergy may be counted on as a certainty for such industries, and of course for the schools of instruction in which our young people might be trained to exercise them. From my knowledge of the people, I am also persuaded that they would take warmly to occupations of this nature, and from their well-known talent and adaptability of character, I venture to presume that the task of instruction and training would be found comparatively easy.

Appendix T.

I have, &c.  
 (Signed) JAMES DONNELLY,  
 Bishop of Clogher.

T. C. Bloomfield, Esq., J.P., D. L.

## APPENDIX U.

## LETTER FROM MR. W. F. M. BLOOMFIELD.

SIR, Kildare Street Club, Dublin, 15th June 1888.

WHEN I had an interview with the Royal Commissioners on Technical Instruction, I had only intended introducing the Rev. John M'Kenna, the parish priest of Belleek and Pettigo, in which the family property and Belleek Pottery are situated, and was, therefore, quite unprepared to give evidence myself, but as my name has appeared as giving evidence I beg to enclose a written statement.

Technical education, used in a national sense, means, in my opinion, the education of the youth of a country in such trades and professions as are most suited to their class in life, and most likely to make them useful and industrious members of society, and such education does not at present exist in Ireland.

The only national education is represented by the national schools, and these form the rules under which the masters are appointed. The examinations required, and acquirements necessary do not impart in the slightest degree what technical education, in the sense I attribute to it, should do, and, are in fact, in my opinion, more of an obstacle to its development than otherwise. My reasons for this supposition are as follows:

The youth of Ireland are quick and easily impressionable, and, unfortunately for themselves, much more inclined to talk than to work; looking upon anyone who excels in speechmaking, provided he holds forth on their wrongs, as a great man. Consequently every village has its spokesman, generally, if not always, educated at these schools, who is nothing else than an embryo political agitator, giving his own version of history, "a subject untaught in these schools;" and this class or profession, as it now undoubtedly is, from the encouragement it has received by recent legislation rendering it so profitable, is, I am sorry to say, greatly on the increase.

The stock in trade of these individuals is well known. It consists of abuse of everything and person connected with England, assigning to them, according to their version of history, every misery that exists in this unfortunate country, and thereby instilling into the minds of the multitude a feeling of hatred and a longing for vengeance against their enemies, who are solely represented as the English, thus rendering them restless in spirit, dissatisfied with their lot, and ready to join in any

Appendix U. organisation, secret or otherwise, so long as its object is revenge, and they are consequently, ready tools in the hands of unscrupulous and clever agitators.

To undermine and counteract this feeling is my chief reason for strongly advocating the claims of technical education, in the hope of its diverting the thoughts and feelings of the rising generation (by having other hopes and aspirations placed before them from childhood) from a state of feeling so injurious to themselves and fraught with such danger to the State.

I will now endeavour to lay before the Commission how, in my opinion, the same expenditure of money, slightly altered in its application, may be made the means of rendering the education of the future more in accordance with the best interests of the country.

The present expense of the national system is, in round figures, about 750,000*l.*, and for this you have an educated population of about 89 per cent., out of which 80 per cent. at least are disloyal and discontented, without either knowledge of, or inclination for, any industrial pursuit whatever, except agriculture, and this being only theoretically taught, and only compulsory for teachers to know since 1881, is for practical purposes, almost useless.

This being so, I hold that the present system of education in Ireland, supported as it is by such vast sums of money, is simply educating the people in a wrong direction, and results solely to the advantage of the few who having ability enough to turn their proficiency in the higher branches to account, become successful agitators, members of the extreme section of the Irish representatives, and the worst enemies of the commonwealth; while the many receive just sufficient education to render them discontented with their lot; disinclined to adopt any manual or industrial occupation; and from being idle and earning nothing become equally a burden to their families and to the State.

In arguing thus, I should not like it to be supposed I am an advocate for lessening the education of the people, far from it, I am strongly in favour of its extension, but I should like such extension to be in the direction of those pursuits the wants of which are, I think, the chief cause of the ills of Ireland, and, therefore, it is that I am anxious that some part of the large amount of nearly a million of money, which is now spent upon what might be called the aristocratic branch of the subject, should be placed to the credit of the commoner but more useful branch for this country, namely, that known as technical education.

The only comparison I will draw between the two countries, England and Ireland, which, I think, fairly justifies me in asking this, is as follows:

The numbers per cent. that can both read and write in the two countries are, I think, if anything, in favour of Ireland, while those employed in industrial pursuits are in England 33 per cent., and in Ireland only 11. Thus you have, in England, with a slightly smaller percentage of people with the rudiments of education, three times the percentage engaged in those pursuits which require technical education, and to which you may attribute her wealth, contentment, and happiness, as compared with the poverty, misery, and discontent of Ireland. Thus, also, you can see even in Ireland the difference in those parts of Ireland where trade and manufactures exist, and are therefore brought prominently to the notice of the young. I do not think it could be better exemplified than in the very extensive parish, the Roman Catholic priest of which, the Rev. Mr. McKenna, I introduced to your Commission for examination. In the one part, where the Belleek pottery exists, they are comfortably housed and clothed; the scholars from the schools find employment, because from boyhood they have had their attention drawn to industrial pursuits. In the other part there is misery, squalor, and discontent; the parents urging the priests to find employment for their children who having been educated at their schools under the present system, will not work, cannot earn money, and are therefore idle and a burden to them.



The alterations which I would therefore advocate in the present national system would be as follows:—

To every national school there *should be of necessity* a plot of ground, sufficiently large, according to the number of pupils, to enable them to learn practical farming. This could be easily got, and would, I am certain, be reproductive, no money grant being required for the teachers, as the knowledge of agriculture is now compulsory.

To every school should be attached instructors in the different trades, such as tailoring, shoemaking, carpentering, and masonry for the boys; cooking, sewing, spinning, for the girls; that such instructors should be allowed to prosecute their own trades, giving so many hours a week, according to the numbers to be taught, to their duties as instructors, for which a small addition to their earnings, as salaries, would be sufficient, knowing, as they would, how much to their advantage it would be to have skilled hands in their district, and thereby to be enabled to do at home a great portion of that work, payment for which is now given to strangers and foreigners, because no hands qualified can be found at home. Instructors should also be provided for any special branch of industry suitable to the district, such, for instance, as basket making, where osiers exist, acres of which, grown in Ireland, are manufactured in England and elsewhere.

My scheme would therefore run thus:—

After the pupils had arrived at the requirements of the third class the parents should be consulted, after being told the different trades or occupations connected with the school, whether they wished their children to continue at the school with an education such as at present, or to learn the trade so connected with the school, the youths had most fancy for. This being decided on, the youths should be transferred to the number of those coming under the technical division, in a similar way to that now used at public schools where they are divided into classical, mathematical, &c. Payment for such instruction, according to the use, difficulties or importance of the trade should be provided by a deduction from the fees of the school, at the same rate as the capitation grants now payable, according to average attendance. No deductions could of course be made from present teachers, but as the result fees from the higher orders of education would, I imagine, be, by thus diminishing the numbers likely to compete, much reduced, a considerable amount would be available, to which might be added the sums now spent on the special national agricultural schools, which I feel certain the Commission, on inquiry, would find to have been of little use, the only one worthy of being kept being the model farm at Glasnevin, which might be reserved for the education of the teachers. The permanent salaries of the appointed instructors to be at the rate now paid to monitors.

This, I know, is both in its inception and in the mode of carrying it out only a rude attempt at laying the foundation of *hew*, I think, technical education could be grafted on to the system already existing in this country. The want of turning the attention of the people into some other channel than that of merely ousting the landlords, and thereby procuring separation from England, is now acknowledged by every description of politician in the Kingdom, and if not soon accomplished must, ere long, lead to results the most disastrous to the empire. Therefore, I would beg of the Commission to forward, as far as in them lies, the policy of creation, in opposition to that of destruction, which has been so extensively tried, and has so signally failed within the last few years, and thereby they would have the satisfaction, in after years, of knowing that their inquiries and report were the thin end of the wedge, which when driven home, was found to have upset the agitator's calculations, and become the foundation of a people's happiness whose previous lot had been that of misery and discontent.

Faithfully yours,  
W. F. M. BLOOMFIELD.

Appendix V.

## APPENDIX V.

LETTER from the Rev. R. MAXWELL, Superior General of the ORDER of CHRISTIAN BROTHERS.

DEAR SIR, Marino, Dublin, March 4, 1884.

Not will kindly excuse my delay in replying to your letter. My numerous engagements do not allow me to be as punctual in my correspondence as I should wish to be.

I have carefully considered the subject of day industrial schools for Ireland, referred to in your letter of 23rd January last, and I do not think, even admitting the scheme were practicable, that the result would be equal to your expectations. I do not think the combining together of elementary teaching and instruction in industrial pursuits would be productive of real practical utility. On the contrary, I greatly fear it would end in disappointment.

The school time devoted to elementary teaching in ordinary day schools, even for subjects as simple as the 3 R's, is limited enough at present, and when we consider the extreme irregularity in the attendance of many of these children, the difficulty of imparting this scanty amount of knowledge is much increased, but to crush into this narrow space of time devoted to elementary subjects, the teaching of industrial trades will, it seems to me, end in failure for both branches.

This the result of my own experience and I give it with diffidence, others of larger experience may and very probably will differ from me.

If however it were intended to confine industrial teaching to after hours, such as evening classes, no doubt a certain amount of knowledge of the trades taught might be acquired, and, so far the object in view would be thereby promoted, but in order to secure this satisfactory result, great care would be required to guard against the evil effects that might follow from the indiscriminate assembling of a number of youths at late hours.

As a rule, the children attending the day schools of the elementary class are absent for a good portion of the school time, particularly such as come from agricultural districts in many instances, too, the parents are indifferent to their children's education, hence it is always a difficult matter to keep up the school attendance. All this would tell, I apprehend, with still greater force upon industrial teaching in day schools, but which could not affect the ordinary industrial schools.

But if to counteract the evil effects of this irregular attendance, the Imperial Parliament should pass a law of compulsory attendance, such a measure would, I believe, have a beneficial effect on the children in the cities and large towns, where numbers of them are daily met carelessly wandering about the streets, apparently neglected by their parents, who may very likely be then of necessity at their work, but I would not advocate such a law for the agricultural districts, where the need of employing youths in field-labour at certain seasons is now more than ever called for, by reason of the great drain, hitherto in the country districts, of the young and able bodied men by emigration. A measure of compulsory attendance at school without well-considered qualifications would, in my opinion, press heavily upon very many honest hard-working and deserving country families.

It is hardly necessary for me to refer to others matters in connection with day industrial schools, doubtless these and others bearing on the question have been already fully considered by the members of the Commission, nevertheless I shall here mention them. They are for example, suitable accommodation for workshops in connection with the schools, masters or skilled workmen to instruct in the various trades, a sufficient supply of raw material to work with, a market for the sale of the goods when manufactured, and, in time, a complete organization established for the proper and efficient working of the system.

And here I may be permitted to observe, that in the case of markets for disposing of the manufactured wares, a grave question suggests itself to my mind, whether or not the sale of these goods may excite the keen susceptibilities of the artizan class, who may regard an extensive system of day industrial schools as an infringement on their own prescriptive rights, and an interference with their legitimate means of livelihood; this consideration, it seems to me, ought not to be overlooked.

As to our joining in this meritorious work, I feel bound by circumstances to say that, considering our present numerous engagements, I could not promise my co-operation, however willing I should be to do so.

I am, &c.

(Signed) RICHARD MAXWELL.

William Woodall, Esq., M.P.

## APPENDIX W.

LETTER FROM MR. T. F. BRADY.

Office of Irish Fisheries,

Dublin Castle,

7th December 1882.

DEAR SIR,

I AM favoured with your letter of the 5th instant, and in reply beg to say that I have had an idea for some time that it would be of great importance if the wives and daughters of the fishermen, particularly on the west coast of Ireland, were taught the art of making nets. I need not say how much employment is wanted, and of what importance it would be to create any industry in the country. Thousands of pounds annually leave this country for England and Scotland for the supply of nets and fishing lines, not only for the sea coast fishermen, but also for the proprietors of large salmon fisheries, who, as a rule, are of a wealthy class, and pay cash for their nets.

If instructors were sent to certain localities where there are a number of women belonging to the fishing population, they might teach a certain number of their women the trade. Depots might be formed at these stations to keep the manufactured nets for sale, and many coastguard stations and officers might, I think, without injury to their own service be made available. These women could make the nets for their husbands and fathers when the thread was supplied to them, which could be done at first cost from the best markets, under the provisions of the Irish Reproductive Loan Fund Act.

This is a rough outline of my ideas on this subject. I have not entered into the details by which they might be carried out, as it would take a good deal of writing to do so; but if I could have a personal interview great with you or with the Royal Commissioners at any time, it would give me pleasure. I have a strong feeling that any apparent difficulties in carrying out any scheme could be easily overcome; that it would not be an expensive one to carry out; and that the Act under which the inspectors are entitled to make loans to poor fishermen might under it be availed of largely and with great profit, not only to these people, but to the country at large.

I beg to assure you that it will afford me great pleasure to give you all the information in my power that you may require.

I am, &c.

THOS. F. BRADY.

Gilbert R. Redgrave, Esq.,

Royal Commission on Technical Instruction,  
South Kensington.

Appendix X.

## APPENDIX X.

LETTER from MR. W. C. SULLIVAN.

SIR, Bandon, Cork, January 22, 1883.  
 THE town of Bandon, in the county of Cork, had a population of 14,100 in the year 1824, the majority of whom were artisans employed in the manufacture of linens, woollens, corduroys, &c., which were produced by hand looms; females being employed in weaving and spinning. There were two extensive cotton mills, driven by water power, in full work for upwards of a half a century, until 1826, when the protecting duty was removed, and the country became flooded with English manufactures, resulting in the total destruction of the trade, and causing quite a panic in the local industries.

Manual labour was superseded by machinery, the power loom taking the place of the hand loom. Bandon was at that time considered the Manchester of Ireland. The population rapidly declined. Thousands of our artisans left for England and for America.

The present population is 5,880, being a falling off of 8,000 inhabitants. There is scarcely any manufacture at present in Bandon, except a large distillery, a brewery, and three flour-mills. There are very few artisans in the town, while a number of labourers flock in from the country in search of employment, on account of many of the large farmers lessening hand labour and adopting machinery. In a word there are thousands of our young people growing up without any means of employment whatever.

I should say about 1,500 children attend the national schools in the town, and when grown up, there is no industrial occupation for them.

This will apply to all the small towns in the south of Ireland. I think if night schools, both for children and adults, were established for instruction in branches of industry, it may lead to the revival of manufactures. It appears to me that the national schools may be utilized for industrial education. Singing and music may also be taught as a means of recreation and promotion of happiness, and good conduct. In Germany and Belgium, schools are established for industrial education in connection with factories for the production of textile fabrics. If assistance were given for the encouragement of factories, the result, no doubt, would be favourable. Bandon is eminently eligible for trade, having an industrious and peaceable population. I venture to say there is not in Ireland a better circumstanced locality than Bandon for the starting of any project intended for the re-establishment of industry amongst us. Now that the country is settled, and that law and order are restored, we may look for brighter and happier days for this hitherto unhappy land.

I have the honour to be, Sir,  
 Your obedient servant,  
 To Gilbert B. Redgrave, Esq., Secretary of the Royal Commission on Technical Instruction. W. C. SULLIVAN,  
 J. P.]

**✓** SECOND REPORT

OF THE

ROYAL COMMISSIONERS

ON

TECHNICAL INSTRUCTION.

Vol. V.

FOREIGN REPORTS, APPENDICES, &c.

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Presented to both Houses of Parliament by Command of Her Majesty.

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### APPENDIX AA.

Appendix A.A.

Handwork  
Instruction in  
Sweden.

#### REPORT ON HAND-WORK INSTRUCTION IN SWEDEN.\*

By Professor JOHN M. ORDWAY, Boston.

To the Hon. JOHN W. DICKINSON.

DEAR SIR,—In a flying visit to Sweden in August of this year, I was much impressed by the prevalent interest which is there practically shown in hand-work instruction. While the other nations of Europe have only here and there taken some tentative steps towards meeting the requirements of the age, this free-minded northern people have gone forward in earnest and have found it possible, with very limited means, to enlarge in the right direction their already excellent system of general education. In Stockholm I received much information and kind attention from Herr C. J. Meijerberg, who has been for many years the efficient inspector of common schools for the city. Though it was vacation time, we fortunately found a class of boys busily at work in the joiners' shop of one of the public-school buildings, the teacher having kindly yielded to their request for extra instruction and practice. In the Stockholm schools the manual instruction is limited to wood-working, and the teachers are men who have learned the trade. At Näs (pronounced *nass*), some sixteen miles from Göteborg, we were very hospitably received by Herr August Abrahamson, the munificent founder and supporter of the Normal Slöjd Seminary, and by Herr Otto Salomon, the superintendent. Thirty-one common-school teachers and one very bright young lady from Göteborg were taking a six weeks' vacation course in hand-work to enable them to teach this branch in their respective schools. These teachers, as well as the regular students of the seminary, receive instruction and lodging free, having to pay only the bare cost of board. Connected with the Normal School is a model school of boys from the neighbourhood who, on the day of our visit, were just beginning a new school year, so that we had a chance to see them also at work. The seminary building is a neat well-arranged structure, in the midst of Herr Abrahamson's own delightful grounds. It contains under one roof airy and well lighted school-rooms, work-rooms, study-room, sleeping-rooms, and a model-room. Herr Abrahamson also sustains another home-like school near by, for giving girls a regular course in all branches of house-keeping.

As Mr. Salomon considers wood-working the most suitable branch for schools, the hand-work at Näs is limited to joinery, turning, and simple carving. Like some other intelligent educators in Sweden, he very justly looks on hand-work instruction as calculated to assist and round out the general training of the faculties, rather than as something particularly desirable of itself, and he therefore deems a variety of branches unnecessary. But in some places a greater range is provided for. Thus at Göteborg, by the kindness of Herr Rubensen, we were shown through one of the public-school buildings in which there were, in the upper loft, a room for bookbinding and a joiners' shop, and in the basement a room for smiths' work and a tinkers' shop.

In the very limited time at my command it was not possible to visit any of the public schools in the country, or in the other cities of Scandinavia;

\* Extracted from the 46th Annual Report of the Board of Education, Boston, U.S.A.

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Appendix AA. and since my return home incessant occupation with various duties has hitherto hindered my making a full digest of the considerable mass of printed educational matter gathered together during the summer tour. But happily there is at hand an excellent report by a Norwegian school inspector, who has had time and means to make a full study of the Swedish schools, and this I will take the liberty of translating in full from the original Danish. Besides this, in order to give some idea of the origin of the system, I will first give in English an extract from one of the four very interesting papers which have been published by Mr. Salomon, in 1876-78-80-82, on "Slöjd\* Schools and Common Schools." These translations I send herewith.

Handwork  
Instruction in  
Sweden.

Respectfully yours,  
JOHN M. ORDWAY.

Mass. Inst. Technology, Dec. 17, 1882.

[From "Slöjdskolan och Folkeskolan, IV. En pedagogisk Studie, af Otto SALOMON, Göteborg, 1882," pp. 70-2, Finland.]

Without doubt we can properly say that to this country belongs the honour of having been the first, at the present day, to realize the idea of hand-work as a regular exercise in the common schools. For its being so, Finland is under obligation to the founder of its public school system, Uno Cygnæus.

From his early youth, taken about by his father to various workshops, Cygnæus had opportunity, when young, to acquire a general manual skill, of whose value and advantage he had good chances to convince himself during his shifting and varied life. Perhaps for that very reason, when, having arrived at manhood, he began his pedagogic studies, the philanthropic experiment occurred to him of introducing hand-work into schools as an important means of instruction and cultivation. By thorough study of Pestalozzi's and Fröbel's writings, the idea of hand-work as a regular means of development gradually became clear to him. He conceived that, with the design of seeking to awaken the sense of form and beauty, there should be introduced into the school certain kinds of hand-work which, unlike Fröbel's play lessons, should be perfectly suitable for older pupils. With this intent, there should of course be no attempt in the common schools to acquire any great skill as artisans in the different branches, or, in respect of the articles made, to come in competition with men of the trade, but pupils should merely learn something of how to use their hands, and should acquire the habit of doing all their work neatly and methodically, making all the joints exact and the forms in good proportion and style. In his opinion we should carefully guard against considering hand-work in school, as recreation or play, rather than as an actual means of cultivation, and also against entrusting the instruction therein to artisans without any pedagogic training. Hand-work must necessarily be put on the same footing with the other school work, and be conducted by a person of pedagogic education, and in the country public schools, wholly and with the proper aim, by the school teacher himself. At the seminary he should gain both theoretical and practical knowledge in this subject, just as in others which enter into the programme of common schools; that is, he should first get a just comprehension of manual exercise as a regular means of cultivation; and, secondly, he should learn such manipulations as are needful to enable him at least to guide and assist the pupils of common schools in this branch.

With this idea of the importance of hand-work in common schools, which he had cherished ever since the middle of the year 1840, Cygnæus, at the order of the imperial senate, in the autumn of 1858, undertook his pedagogic tour in foreign countries, visiting, on that occasion, Sweden, Denmark, Germany, Austria, Switzerland, and Holland. Whenever he met with teachers, he set forth enthusiastically and with the entire warmth of conviction his proposals of reform in matters of education, maintaining

\* The Swedish word "slöjd," which means work with the hands and with simple tools, has no exact English equivalent, and I have in many places transferred the word instead of giving an insufficient rendering in our language.

decidedly the great importance of hand-work as a regular means of cultivation and the advantage of employing it as such. In consequence of an innate dislike of any appearance in public, it was mostly in private circles and before some interested persons that he sought to propound his pedagogic system, which comes very near to the principles of Pestalozzi, Fröbel, and Diesterweg. Appendix AA.  
Handwork  
Instruction in  
Sweden.

After his return home, being appointed inspector of public schools in Finland, in 1861, and director of the seminary established by him in Jyväskylä, opened in 1863, Cynäus was placed in circumstances to carry out in practice his ideas touching the use of hand-work in the service of education. The statute of 1866, respecting the organization of the common school system in the Grand Duchy of Finland, drawn up chiefly according to his recommendations, is certainly the first common school ordinance which adopts "technical hand-work" as an obligatory exercise in seminaries, and slöjd for boys in the country schools. As a proof that this instruction is on the same footing as other subjects, it should be observed that the teachers thereof, in the seminaries, like the other teachers, have the title of "lector" (professor). In the seminaries, and partly even in the common schools, the instruction embraces joinery, carving, smiths' work, tin-plate working, and basket making.

[Extracts from "Work Schools for Boys in Town and Country." "Their Object and Arrangement." By H. K. KJENNERUD, School Superintendent. Kristiania, Alb. Cammermeyer, 1882.]

#### *Preface.*

In 1880 I obtained a public appropriation for a journey to Sweden, and into the interior, to visit the public schools and such work schools as I might find on my way.

On my journey I visited Stockholm, Upsala, the Näs Slöjd Seminary, Göteborg, Wenersborg, Kristiania, and Fredrikstad.

Having for many years had the immediate charge of the work schools of the Fredrikahald Slöjd Union, partly as member of the board of directors of this Union, and partly, for the last two years, as inspector of schools, there was on my part a strong desire to find out how such schools worked elsewhere. In an undertaking of a new kind, as work schools for boys must still be everywhere regarded, there is need of groping and feeling the way forward; and one is always desirous to assure himself that the experience of others agrees with his own.

In the establishment of a work school and in its later management questions often arise, among which may be mentioned: What should be set forth as the most important object of a work school? Should hand-work for boys be taken up as a branch in the public schools, and if so, what proportion should the time of instruction bear to that appointed for the other departments of the school? In what manner and according to what plan should the instruction be given? What branches of industry should be preferred? How should the workshops be arranged and furnished? How many pupils can probably be instructed at a time? How must the economy of the school be regulated, and what is the least possible expense required to set such a school in operation? Is it a right principle that the instruction should be paid for? Should the pupils earn anything by their work? and so on. Although this subject is still somewhat new to us, and has hitherto received but little attention from the press, it is one of the highest importance, as regards not only the education of our youth, but also the future progress of our fatherland, and it may prove interesting to communicate what I have learned on my journey as to what has been done for the advancement of these schools in our brotherland, and to what extent they have thus far been introduced.

#### *The Swedish Slöjd Instruction.*

The subject of "slöjd" has developed wonderfully in Sweden during the last few years. Slöjd, a word derived from the old Norse, is, in the signification in which it will be used here, a peculiarly Swedish word, the

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Appendix AA. meaning of which is very comprehensive and difficult to define, but which it is convenient and natural, in this paper, to adopt from the Swedish. Handwork Instruction in Sweden. The signification will be shown by the connection.

According to a lecture which was given in the summer of 1880 by O. Salomon, superintendent of the Slöjd Seminary, and which has been printed in the Göteborg "Handel's og Sjöfartstidende" (Journal of Commerce and Navigation), the Swedish slöjd schools for boys have been in existence only ten years. In making this statement no account is taken of two establishments, the Willinsk school in Göteborg and the Prince Carl's Institute at Gäddede, which are institutions established as homes for children, and not schools in the ordinary sense.

The kind of industry in which instruction was given at first was that which was in fashion at that time, scroll sawing, which "did not hold out" as well as it promised, but which, nevertheless, as a starting-point gave "a strong prominence to the subject whereby it came under earnest discussion, and whereby they little by little came to a clear understanding of the direction which hand-work instruction should not take, in order to gain sympathy at home."

The year 1872 is mentioned by Herr Salomon as the birth-year of some of the larger slöjd schools, as those of Upsala, Näås, Ulsäter, and Wenersborg. In the flourishing times of the year 1875 many new ones came into existence; in 1876, 80 were already known, in 1877, 100, in 1878, 120, and now there are in all about 300 slöjd schools in the country. Particularly in the year 1880, as Herr Salomon told me in conversation, the matter has made such progress that intelligence of the establishment of new schools is constantly arriving.

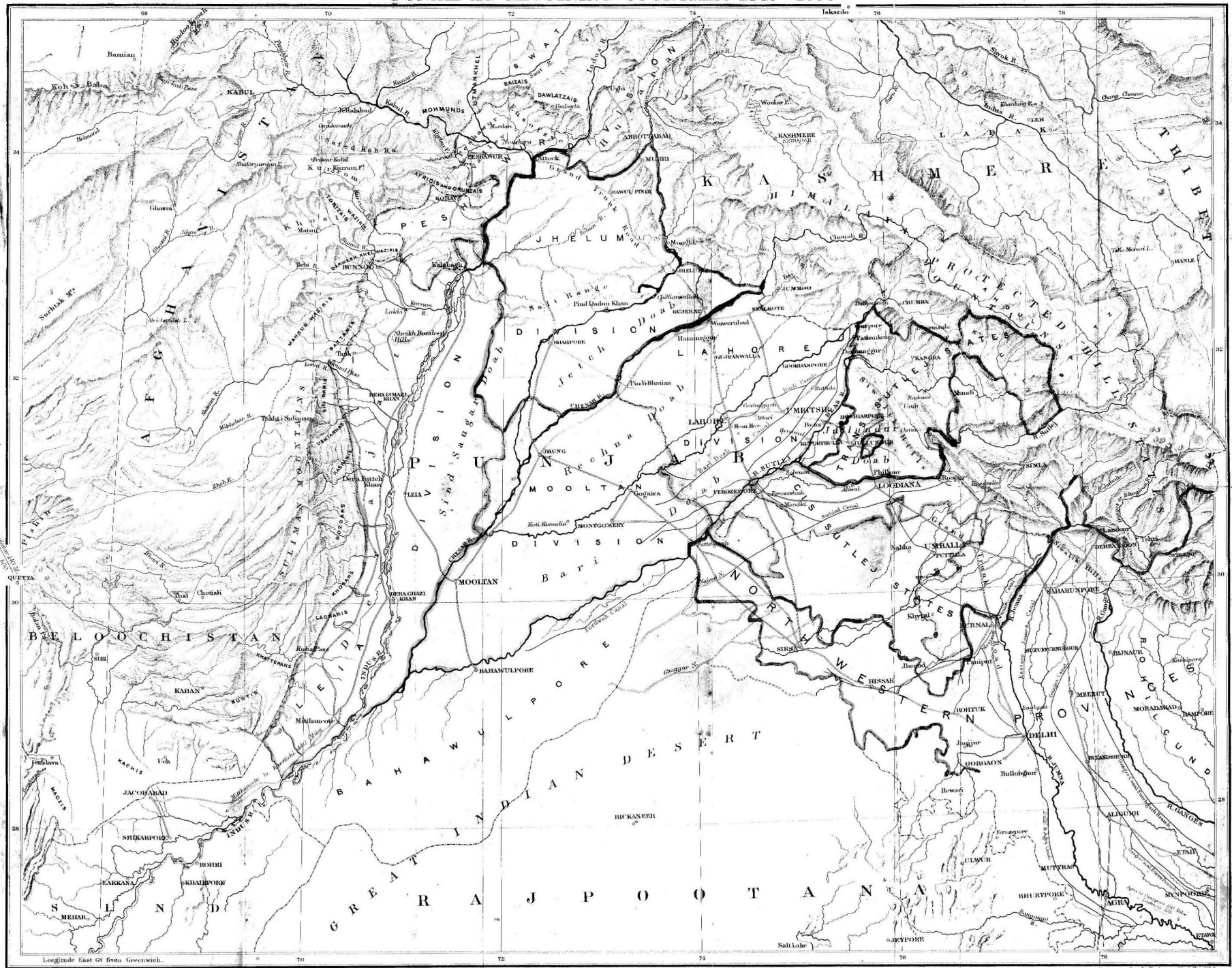
We have a striking confirmation of this in the circumstance that the parliamentary appropriation for 1880, from which it was calculated that every slöjd school in the country should receive 75 kronor (4*l.* 2*s.* 6*d.*) as a direct State contribution, actually sufficed to give only 63 kronor; and the demand for the two slöjd inspectors paid by the State and sent about by the Agricultural Academy, one of whom was appointed in 1875, and the other in 1878, and whose duty it is to travel about and hold courses for slöjd teachers and to instruct the people, is so great that they can answer only a third of the calls.

A proof of the interest with which work schools are regarded in Sweden was given also by the home-slöjd exhibition, held in Stockholm in the winter of 1880, wherein, notwithstanding the very short notice, not less than 147 slöjd schools were represented, 97 of them for boys. In addition to prizes in money, there were offered for award among the boys' schools 4 gold medals, 6 silver medals, and 21 in bronze. Gold medals were given to the Näås slöjd seminary, the Kongsholm slöjd school, which was strongly recommended to me, but which I unfortunately had no opportunity to visit, Gäddede slöjd school, and Göteborg common school. In the award regard was paid to the principle and plan of the schools, the age and number of pupils, and likewise to the consideration whether the work exhibited was of an honest character; that is to say, whether it was done in the manner and by the person represented. The "Friends of Handwork," whose permanent exhibition in Stockholm I visited twice, took no part in the competition for prizes.

It is becoming more and more general in Sweden to combine slöjd instruction with the common schools, and to employ the school teachers themselves to give the instruction. The idea of this probably came to Sweden from Finland. About one-half of the Swedish slöjd schools have been already united with the common schools. Of 80 slöjd schools in Elfsborg län, there are, according to a statement kindly given me in writing by Herr Salomon, not more than 12 in which the instruction is not provided by common-school teachers themselves. The courses for slöjd teachers which are held in the län were intended exclusively for the already appointed teachers of the common schools.

The Swedish slöjd instruction is, however, not limited to children's schools. There are also here and there in Sweden schools and courses in operation for grown persons. Two such schools, which are much frequented by young country boys, will be described below.

"PUNJAB AND ADJOINING COUNTRIES 1849-1858"



Longitude East of Greenwich.

Scale of British Miles

Scribner's Geographical Establishment

This instruction is also introduced into the public high schools, but I have no data showing to what extent. A Swede who had for some years given slöjd instruction in Fredrikshald, in 1880 received an appointment to a Swedish public high school.

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*Slöjd Schools in Elfsborg and Upsala Län. Sale of Products of Domestic Industry.*

The Economic Society of Elfsborg has set apart slöjd, from its work, as a separate branch, whose interests are attended to by a so-called Slöjd Union, which is divided into two sections; the northern having its seat in Wenersborg, the southern in Borås. The administration of the section consists of a member from each district, and this member again is the chairman of the district administration. The governors are chairmen of both sections. Slöjd unions are supported, according to a statement of Herr Salomon, by 8,000 kronor from the State, 8,000 kronor from Parliament, and 8,000 kronor from the Economic Society. The operations of the union extend to the establishment and maintenance of its own slöjd schools and the support of the slöjd school pupils; but its most important work consists in labouring for the introduction of slöjd into the common schools of the län. It holds courses in slöjd and drawing for common school teachers, pays to every teacher who instructs in slöjd in his school 100 kronor yearly, loans models to the schools, and gives in some cases assistance in the purchase of tools and materials. It pays the town schools in the län 200 kronor each. The Union controls the work in the schools through three unsalaried slöjd inspectors, the parish priest Gillgren in Amål, chamberlain Westfeldt in Källingsholm, and Herr Salomon, superintendent of the seminary at Nääs; and common school teachers do not have their salary paid for slöjd, unless they have procured from the slöjd inspectors an approval of the school's plan and work.

The union has been fortunate to an astonishing degree in securing an interest in slöjd on the part of the teachers. The inspectors are flooded with letters from them. Herr Salomon showed me two which he had received the day before, asking advice in regard to the introduction of slöjd into their schools, and the many questions which arise, concerning the starting and maintenance of such schools. Occasionally the teacher shows so much zeal that, when there is a difficulty in obtaining a work-room, he has one constructed at his own expense. At other times, on the contrary, he may be opposed to it, and allows himself to be sent to take part in a slöjd course, only because compelled by the strong feeling in his district in favour of the matter. But the experience of the superintendent of the seminary shows that such men, in almost all cases, have changed, and often even become the best advocates of slöjd.

As to the economy of the country schools, it has been already explained that the teachers have a salary of 100 kronor, paid by the union; still, 75 kronor is said to be a sufficient amount. The time devoted to slöjd was six to eight hours per week. I omitted informing myself how many months in the year the schools are in session, but, judging by what is the case in Upsala län, it is eight months. The outlay for tools for a moderately furnished school is estimated at from 150 to 300 kronor (84. 2s. 6d. to 16l. 5s.).

The number of hours' instruction which each child receives depends on whether or not the number of boys from 11 to 14 years of age is so great that they must be divided into two sections. The average number mentioned was 24, and so, when the pupils are divided into two sections, there are three to four hours for each, otherwise the number of hours might be twice as great. An experienced and capable teacher is considered able to instruct 16 at a time; it might also be six, eight, or 12 who are instructed at once. Schools had the opportunity to purchase models from the Nääs slöjd seminary at a low price.

Courses for the improvement of slöjd teachers are generally held in the summer vacation. They are differently arranged in different län. In this län (Elfsborg) the courses last five to six weeks. They are held in Wenersborg, Borås, Källingsholm, and at the Nääs slöjd seminary. The average age of the teachers who took part in these courses was stated as about 40 years, but many were even as much as 50 years.

Appendix AA. **Handwork Instruction in Sweden.** It must be mentioned that instruction in hand-work is not yet, as in Finland, made obligatory in the Swedish teachers' seminaries (normal schools), and it is optional in only two seminaries, and then at private expense. On the contrary, Sweden has a separate place for the instruction of slöjd teachers. The slöjd seminary in Elfsborg län was founded in Näs, two Swedish miles from Göteborg, as a private institution, to supply the demand for teachers of slöjd. About 16 pupils have gone out yearly, having had a one year course. The founder, Herr Abrahamson, a wholesale merchant, on whose estate in one of the pleasantest places in Sweden his own seminary is built, has secured its future continuance by a donation once for all of 200,000 kronor (11,012*l.*), of which only the interest can be spent. The principal seminary building was first ready for use in the summer of 1880. It contains two workshops and two school-rooms (for the seminary students and for a boys' school), two sleeping halls with the adjoining toilet rooms, a study room with a writing-desk for each pupil, and finally an exhibition room for the collection of models and tools. There is a separate building for the superintendent, and another in which a girls' school is kept and the steward lives. The plan of the school is given in the report of our journey by the chief of the expedition, Herr Hertzberg.

Notwithstanding I was so unfortunate as to arrive at the seminary just as the superintendent was about to start on a journey, and therefore had opportunity for only a short conversation, I yet consider this little visit the most instructive respecting work schools that I had anywhere. I received many explanations and hints that appear to me very valuable. What particularly attracted my attention there was that they work according to models arranged in a systematic series. I obtained a printed catalogue of the models, and had an opportunity to spend some hours among the collection, which I examined piece by piece. The superintendent with great courtesy consented to fill an order from Fredrikshald for supplying a workshop collection of models.

The catalogue contains 216 numbers, and is divided into the following sections:—1. Models of full size; 2. Polished work; 3. Wood carvings; 4. Models on a smaller scale. Seminary students are capable of working all the numbers. Objects coming under the denomination of *toys* are zestlessly excluded.

Pupils of the boys' school receive no pay for their work, although this had been considered necessary at first, before the significance of the work school was fully recognised by the public. The school is now so firmly established that we may assume that hand-work is now taught in school, like any other branch, for its own sake. Indeed, as children receive no pay for their exercise in writing, ciphering, &c., they should, in the superintendent's opinion, learn to regard hand-work in the same way.

Respecting the slöjd committee of Upsala län, I learned during my stay in the city of Upsala that it has a secretary and a slöjd commission, which has, among other duties, that of inspecting the work schools of the län. The slöjd committee assists each of the schools with a payment of fifty kronor, provided that the instruction in slöjd is so managed that the common school inspector can give the school a recommendation which entitles it to a state contribution, and provided, also, that an annual report is made containing accounts of the time of instruction and the branches of work, number and ages of the children, information as to the teachers' qualifications and pay, area of the slöjd-rooms, and their distance from the common schools, and so on. With the addition of the state contribution, every school here thus receives a yearly subsidy of 125 kronor. The slöjd committee loans school models, sometimes also tools. They have for a number of years kept up in the city of Upsala a sale of domestic industrial products and a home slöjd school, with a two years' course. In the last-named institution slöjd teachers have also been further instructed, as a rule common joiners in some of the finer joiner's work, and basket making. During that part of the year in which the building was not used for the courses of the committee the school has been kept in operation on private account. In January 1890 the school was for the first time arranged exclusively for common school teachers, and thirteen of these obtained a month's stay at the school and a stipend

from the Economic Society of forty kronor. The instruction embraced joinery, turning, simple carving, and basket work. Pupils received gratis the articles which they had made.

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In Upsala I was so fortunate as to obtain the slöjd committee's report of August 31, 1880, from which I learn that at the end of the school year 1879-80 work-schools were in operation in six communes in the län. They have not made as much progress here as in Elfsborg län. Pupils received four, six, and eight hours' instruction per week, which was deferred to Saturday. The reason for choosing this day I inferred to be that the common school teachers in the country, in Sweden, who are engaged for thirty hours' instruction weekly, can divide this time into five or six days, and they generally arrange it so as to have Saturday a free day. Then, too, since these teachers do not as yet give the slöjd instruction, making it necessary to employ a special teacher, it was found more convenient to have it given all on one day. In Elfsborg län, on the contrary, where circumstances are different, hand-work was assigned to different days in the week. In the account of two schools the teacher's pay is given as 125 kronor and 75 kronor respectively for six hours weekly during eight months. In one province, where there are five schools established, they pay 86 öre an hour.

Fourteen to sixteen pupils were instructed at a time. The subjects were joinery, including turning, and in some cases blacksmithing and wire-working. Respecting the schools in one of the districts, it is specified that the instruction shall be such that the pupils will acquire dexterity and ability in making such articles, particularly, as are necessary for working people—as rakes, spades, axe-handles, harness-pins, lids, &c. In most of the schools models are borrowed from the slöjd committee in Upsala, and sometimes tools also. In one school the boys receive as their own property what they make, and in another they have half the value of the work, or may buy it at half price. Shops, the capacity of which amounts to from 13,000 to 19,000 Swedish cubic feet, might be situated as far as one-eighth of a mile (about one English mile) from the common schools.

Judging from the articles which I saw exhibited in the store of Upsala län, which, as already mentioned, is kept in the city of Upsala, domestic industry is in an advanced state in the län. The exhibition was particularly rich, comprising men's and women's work, useful objects, and articles of luxury in infinite variety.

The work of producers is bought, while the work of schools is sold on commission at ten to twenty per cent. profit. The sales were at first made in the interest of the "Country Economic Society"; but, owing to the great difficulty of inspection and revision, it became a private enterprise, and the agency of the above-mentioned slöjd committee was undertaken by the bailiff of the neighbouring district, Dannemora, who is granted a loan of 4,000 kronor without interest, and a yearly subsidy of 1,000 kronor to maintain it. It was said that this arrangement has been found satisfactory. The services of a capable woman, who is entrusted with all purchases, and of an assistant, are also furnished. These two are paid respectively 400 and 140 kronor yearly.

There are several such agencies in Sweden, mainly of a private character, but receiving more or less support from public means. Work is partly bought, partly taken on commission, at the rate of five per cent. for producers within the län and 10 per cent. for others, as I learn from a Swedish journal, "Uddevalla Times," which contains a description of the conditions of many such recent sales. Arrangements of this kind are of great advantage to schools, and make the success of domestic industry almost a necessity, since by means of them the poor producer is enabled to turn his work directly into skillings; while, if this could not be done, industrial work would be a failure. Since our industry is as yet but slightly developed, there is, as far as I know, only one such agency in Norway, and this was established in Kristiansand, in 1877, by a gift of 8,000 kronor from the Distillers' Union of that place. Of this fund there have been used in the past four years 2,350 kronor, or, in other words, there has been needed to maintain it, on an average, a yearly subsidy of



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Appendix AA. about 800 kronor. The yearly sales have varied between 3,500 and 4,500 kronor. The manager's pay has been 880 kronor, besides two per cent. of the sales and free rent. The articles sold consisted principally of those required about the house, and kitchen utensils. Models have been loaned to constant workers.

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##### *Slöjd Schools in the Cities of Stockholm, Upsala, Göteborg, and Wenersborg.*

Hand-work for boys has been introduced into the common schools of Stockholm. A plan under consideration for several years, for making hand-work obligatory in the upper class, and for the appointment of a slöjd inspector of all the schools, has not yet been carried out. But in five of the "föreläring" or parish schools, meanwhile, hand-work has been optional, so that in the school year 1879-80 253 boys in all received such instruction. The workshops were scantily furnished, and gave one the impression of a want of care and system; but the instruction is to be re-organised in due time. They had no collections of models. Pupils who succeeded in securing places had two and one-half hours' instruction, three afternoons in the week, throughout the whole school year. Pupils did not pay for instruction, but received 20 per cent. of the proceeds of the sale of their work. The work was sold after examination. The teacher's pay was 20 kronor per week for 28 hours' instruction. The subjects were joinery and turning, and in one school modelling in clay, bookbinding, shoemaking, and tailoring. There were, as a rule, 12 boys in each department; in bookbinding there were only eight, as the workroom did not allow places for more. The work was generally well done.

Rector Palmgren's school in Stockholm corresponds in subjects taught to the higher private schools in Kristiania, but in the two years of its existence it has not become so far advanced that pupils can go from the school to the university. Since I may suppose the principle and plan of this school already known from the report of Hertzberg, chief of the expedition, and since, moreover, I took no notes of it on my journey, as belonging to a kind of school the investigation of which was not included in my plan, I shall limit myself to two observations.

The school receives younger pupils than such schools generally do; I saw boys under six years of age busy with such work as paper-braiding and straw-plaiting in patterns, sewing buttons on cards, &c. A little boy of six years was engaged on a very simple, but neat, piece of embroidery. The workshop was furnished with very small lathes, of which there were many, and by means of which the ornamentation of wood was much practised by the older pupils, in the old Norse style preserved by the Norwegians, of which I found a rich collection in the Norwegian division of the Ethnographic Museum at Stockholm, but hardly any in the Swedish division.

Objects useful and ornamental, carved in this way, formed the furniture in Herr Palmgren's private apartments. The same idea was noticed in the school-rooms. On the tasteful school-desks varnished to preserve the natural colour of the wood, and on the curtains, the well-known twining dragons were to be recognised.

The work school of the city of Upsala is separate and under the care of the slöjd committee of the län; there is everywhere in Sweden, in town and country, an association concerned with school affairs. This is the oldest in the country, since it was established under the lead of the governor, Count Hamilton, as early as 1872. Hand work for boys is made obligatory in the two upper classes of the common schools and as such stands on a par with the other branches taught. The slöjd has also its work-room in the public school building. The arrangements are such that boys work three hours in succession. Normally the boys have 18 hours of lessons and 12 hours of slöjd, or in all 30 hours per week in school. The subjects are joinery with turning, a little carving and basket making, as well as shoemaking, according to the pupils' own choice. Pupils receive conditionally even as much as half the proceeds of the sale

of their work, paid after approval, and they earn in a year from 50 öre to six kronor and upwards. The number of those who were instructed at once in the joinery department varied according to the number of pupils in the classes, and when I visited the school it was respectively 20, 12, and 30. Teachers had for their assistance in the numerous classes a boy past the age for confirmation, who is paid five öre per hour, and who has also to instruct pupils in turning.

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The work is distinguished by solidity and neatness in execution; I have not seen stronger or better work in any children's school. But it would be hardly correct to call it the work of the pupils; for when the schools aimed especially to make saleable commodities and received orders from the townspeople, it was, of course, the teachers who executed the difficult parts. The conditions according to which the teacher was appointed were peculiar for schools. His working time was reckoned from 6 a.m. to 8 p.m., with the usual times of rest for day labourers. Out of school hours it was his duty to split out and mortise together the children's work, to give it a final finish, and moreover to busy himself in filling the orders given by the townspeople. He received a salary of 1,000 kronor and a house containing two rooms and a kitchen, with firewood. He had a vacation of eight days at Christmas; during nearly all the summer vacation of two months. However, he gave instruction to pupils from all the classes in school who voluntarily enrolled themselves for slöjd for that time.

In shoemaking, as in joinery, the school keeps the products. Poor children, but not particularly those who needed charity, were allowed their shoes-mending free, while those who had the means paid for materials; and the same arrangement was made in regard to new work. It seemed strange to me that a class of more than six pupils in shoemaking should be considered too large there when the teacher of this branch in Fredrikshald succeeds so well in taking care of 16. The shoemaker had 500 kronor per year for 30 hours a week.

The slöjd division of the common schools had a special superintendent, one of the public school teachers, who at the same time was secretary of the slöjd committee, and attended to the private business of the home-slöjd school. He superintends the arrangement of the school, the purchase of material, and the sale of work, determines what shall be made, fixes the children's pay for the work, and keeps the accounts of the school, for which labour he receives a salary of 500 kronor. According to his statement the slöjd schools of Upsala commune cost yearly 2,500 kronor.

Nowhere in Sweden has so much been done for slöjd as in Göteborg. It has been introduced as obligatory for the older classes into all the common schools, which have 26 different work-rooms, and which furnish instruction to about 1,400 children. The working time of the pupils is ten hours per week. For the supervision of all this there is appointed a technically and practically educated slöjd inspector, a man eminently qualified for the place, who has a salary of 4,000 kronor. At the time of my visit to Göteborg, in 1880, slöjd had been in operation only two full years; but in 1879 the outlay had amounted to about 30,000 kronor, from which, however, must be deducted the value of the articles made. The teacher's pay was 900 kronor for seven hours' instruction daily, but eight hours of duty, and with two and one-half weeks of summer vacation. It is advanced to 1,000 kronor after six years. Overtime is paid for at 30 öre an hour. Joiners could gain as many as 100 extra hours a month.

The subjects in which instruction was given were joinery with turning, basket-work, blacksmithing, tin-plate working, painting, and bookbinding.

The school is considered a preparatory school for hand-work, wherefore the teachers are, without exception, hand-workers. As the school is only preparatory and the aim is not for the pupil to acquire general dexterity, one to three months are spent in each department, and the remaining time, when possible, devoted to that work for which he has shown greatest interest and aptitude. But there is not always, by any means, opportunity for this. The pupils oftentimes wish to be joiners; but it has been found necessary so to arrange it that tall boys should be put to the lathes and small ones to tin-plate work, bookbinding, or painting. It was a rule that

Appendix AA. the teachers should help the pupils as much as possible. The demand determined what articles were to be made, but there were some indications of a method for beginners. "Thus in one workshop I found some beginners who, according to the teacher's statement, in two months had done

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nothing but saw and plane on a piece of wood and use the rasp in making hammer handles. This would hardly do except in schools where hand-work is obligatory, since it pre-supposes a perseverance which children do not commonly have in optional work. The pupils had not, as far as I understood, anywhere in the school particular occasion to finish a piece of work independently, since the school aimed to be productive, and for this reason there were generally several engaged with one piece of work, the putting together and the difficult parts of which were left for the teacher to attend to in extra hours.

So far as possible they did work for the common schools, since they hardly wished to come in competition with the trade and thereby run the risk of incurring the opposition of artisans to the slöjd schools. Thus at the time when I visited the workshops there were in process of construction a great many electrical machines; as nearly as I recollect, a whole score, for supplying material for instruction to the common schools. Nearly every part was made in the shop, even to the shaping of the round discs, which were made out of a common thick glass plate. The manufacture of a number of lathes also gave employment to the joiners, turners, and smiths. There were already finished several school closets for books, etc., each one the result of the work of many pupils and the teacher. In the bookbinders' shop a great number of plates for schools were being mounted. In the paint shop they were busied with the polishing of school desks. The making of toys, which was rejected as a matter of principle at the slöjd seminary, here found its defence; I saw of such work, among many other things, very well made objects, partly in tin-plate and lathework, which had been at the Stockholm Exhibition. Work which was not done for communes was disposed of in a Christmas bazaar.

Pupils received a profit from their work; but at the examination premiums were given to the most skilful, provided they had also given satisfaction in the school studies: for this purpose 1,000 kronor were granted out of the school funds last summer. The premiums consisted of tools or a reward in money of 5.40 kronor, according to the pupil's choice; but most of them preferred the former. In the new school buildings of Göteborg rooms for the workshops are suitably arranged at the outset. They are placed partly in the basement, partly in the upper loft, and show nothing unusual except that they are provided with a great number of very small windows (I counted in one room not less than 12), which stand so close together that they allow the light to enter equally all parts of the room. The rooms are spacious, and this is necessary, since, not infrequently, there are to be found as many as 20 or 25 pupils in one branch, as in joinery and bookbinding. In consequence of this great number, however, the pupils are not, of course, kept fully occupied; many must stand idle. The teachers said that they considered 15 pupils a suitable number. Still it would seem that in smith's work more could be kept busy.

Slöjd instruction in the common schools of Göteborg has attracted much attention, and certainly with good reason, when we consider the great sacrifice which the city has made, and the truly, in many respects remarkable, skill with which it is managed. But it may well be a question whether in the management of these institutions there is not rather a want of the right pedagogic view, and whether the work schools have not come to run in the service of the trades and in a track in which they should not go.

In Göteborg there is also a so-called "school of restraint," or, as it is termed at present, a reform school (strafeskolan), in which hand exercise forms an integral part of the instruction. Though I took occasion to make myself well acquainted with this institution, I shall omit particulars in order not to be prolix. Since the introduction of hand exercise for boys into the common schools has found no support in Swedish legislation, and hand-work is nevertheless compulsory in many places, I inquired of

the slöjd inspectors in Göteborg what was done in case the parent positively refused to send his child to the slöjd instruction. I was answered that such a case had never been met with. On the contrary, I learned later, in my visit to the reform school, that many boys were sent to this school on account of truancy in slöjd.

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In Wenersborg slöjd has been compulsory in the common schools since 1872. Before that time every child had 30 hours of school studies; but on the introduction of slöjd the number of hours was increased to 36, one-half being devoted to school studies and the other half to slöjd, from the child's eleventh to his fifteenth year. Instruction is given from 9 to 12 o'clock in the forenoon, and from 2 to 5 o'clock in the afternoon.

The branches of instruction are joinery, smith's work, shoemaking, and tailoring. The school furnishes material, and the products are the property of the school. But the pupils, as a reward for diligence, are allowed to make repairs for themselves. The joiners' school makes various useful objects; the tailors' school sews, particularly on trousers for sale; the shoemakers' school makes up boots and shoes, which are sold at about the cost of material; and the smithy turns out such things as hammers, tongs, screw-taps, and the like, well made and neatly polished. The smithy was remarkable for its great neatness and a regard for order, which made a good impression. As for tailoring, the experience has been that boys, as a rule, had no inclination for this. The workshops were small, and the pupils were so divided that there were not more than eight or ten in a party at once. The school took orders, and the things made up were sold at auction.

The joiner and the smith had 600 kronor a year, the tailor and the shoemaker 500 kronor; the times of instruction were 36 hours a week, with a summer vacation of two months.

One of the elementary school teachers was appointed superintendent of the slöjd departments with a salary of 600 kronor.

In Wenersborg is held the school of the northern division of Elfsborg län, which has been in operation four years and is intended to teach grown-up young men from town and country to be useful at home. The school is most frequented by young country boys who have their food from home and hire rooms in town. Turning, joinery, carving, smith's work, and drawing are the subjects taught. The school, whose course is continued from the 15th of September to the 15th of May, with eight and a half hours' instruction daily, costs, with the rooms, 2,000 kronor a year, from which the earnings of the school are to be deducted. They employ the smith and use the smithy of the common school.

#### *Work Schools in Kristiania and Fredrikstad.*

A very favourable impression was made by the work school of the Kristiania Workmen's Union, which, however, for a city of the size of Kristiania, is to be considered as nothing. The school is held in the evening, for children whose parents belong to the Union. There were two classes in joinery, one class in basket work, and two classes in drawing, each having exercises six times a week, besides classes for women's hand-work. The working classes consisted of 16 pupils each. The teachers were paid one kronor per hour. I had an opportunity on two evenings to see the class in basket-making at work, under the instruction of an uncommonly able teacher.

The school owns the material, and the work, which is disposed of at an exhibition at the close of the course, belongs to the school. Still the most active and diligent pupils reserve one piece of their own work, which is given as a premium. What I saw of models and work executed gave evidence of good taste.

The work school in Fredrikstad is, I presume, an exceptional one of its kind in this country, since it is maintained by the common-school funds. For hand-work there is arranged a roomy place in the second story of the gymnasium of a public-school building. The teacher is paid 1,200 kronor per year, and has besides 240 kronor for six extra hours weekly in drawing. He receives the State allowance as a public-school teacher, which, by

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reason of the number of hours, is greater than that of the other teachers. He instructs pupils in joinery, turning, basket work, painting, and tin-plate work. The work school has in all 60 pupils, divided into classes of 15 each. The pupils have 12 hours weekly, and every pupil must go through the different branches of work. Most of the pupils paint their own work. The most diligent are allowed in the summer vacation to paint in the school and other public buildings, and receive therefor 50 öre per day. The boys, after they have been pupils in the school two years, have leave to make for themselves a part of the tools. Other encouragement is regarded unnecessary, since there is a competition for places.

*Work Schools of the Fredrikshald Slöjd Union.*

Hardly anywhere in this country (Norway) have greater sacrifices been made for hand-work instruction than in Fredrikshald. Both for this reason, and because, as a consequence of the relation in which I stand to the Fredrikshald work schools, I can give a clearer representation of this than of schools in which I have had opportunity for only a brief visit, I will allow myself to communicate some more particular information respecting their origin and mode of working.

Fredrikshald Slöjd Union, invitations for the foundation of which had been already sent out in 1873, at the instance of candidate Oskar Anderson Dietz, was formed in 1875, with the object of labouring for the advancement of domestic work and habits of industry. While the union was still hardly organized, the committee of arrangements invited Herr Ahlborn of Stockholm to give a lecture on domestic industry, and when the union was established there were already subscribers for the purchase of models and a part of the wood-carving tools intended for loans. A more striking sign of the existence of the union was the establishment of a work school immediately after New Year, 1876. The school was first opened in Tistedal for 48 pupils, and a little later in town for 130 pupils, but at first for a course of short duration only, since the means of the union still consisted only of the gifts of subscribers and the yearly fees of the members, amounting to about 400 kronor.

But, fortunately for the school, it happened that the Distillers' Association of Fredrikshald in 1876 made so great a surplus profit that it could assist the union with 800 kronor. The city also made a contribution of 400 kronor. Meanwhile the Association's contribution was successively increased. It has been in the three last years respectively 2,000, 1,940, and 3,000 kronor, and the contribution of the city has in consequence ceased.

As a result of these circumstances, so fortunate for the union, the work school from a small beginning has constantly gone on in its development. It has by degrees been furnished with a fine collection of tools and models, and this last year it has likewise obtained the lease of a suitable new building with three very spacious work-rooms, besides a room for models and a store-room. In 1882 the school will move into a newly opened public school building, in which there have been placed at its disposal four large rooms in the basement, each 14 yards by 12, and of good height. One of the rooms has been divided by a wainscotted wall, so that the school gets a joiner's shop, a shoemaker's shop, a room for bookbinding, and separate classes in wood carving, one for painting and materials, and a model room in which the finished work is exposed for sale.

A regular work school for boys is also established in the Tistedal suburb of the city, located in the commercial building of that place. The work-schools are no longer under the direct control of the slöjd union, but have a separate board of three members, of whom one must be a member of the slöjd union board and the other the inspector of work-schools.

The number of pupils has varied somewhat, but is for the present (first half of 1881) 177. These are divided into 14 classes, with an average of 13 pupils each. One hundred and six of them are common-school boys, 67 are pupils of the Latin school, and four are grown persons who go with

the boys. One hundred and twenty are joiners, nine bookbinders, 43 shoemakers, and five tailors. All the bookbinders and 11 of the shoemakers are from the Latin school. The Latin school boys have four hours per week, boys of the paying division of the public school six hours, of the free schools nine hours; but the shoemakers have all, without exception, had six hours per week. The number of hours has always, however, depended in some degree on how the classes could be arranged.

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The chief teacher of the school is a joiner with a salary of 1,000 kronor for eight months' instruction, and a special payment of 50 öre for every hour of instruction between the 1st of May and the 30th of August.

The regular term of the school is from the 1st of September to the last day of April, but Latin school pupils may begin October 1. It is the teacher's duty to instruct on an average seven hours a day, and in addition to spend six hours a week in keeping the tools in repair, &c. He is a very skillful carver, and can also, when required, give instruction in basket-work, brush-making, and painting; sometimes also in bookbinding. The school has at present five teachers by the hour, one shoemaker for 18 hours, one tailor for six hours, one bookbinder for eight hours, and one journeyman joiner for six hours a week. The pay per hour for them is partly 40 öre, partly 30 öre. In Tistedal they have, moreover, a teacher who has gone through two courses of domestic industry in eight months of the year, 13 times a week (at 30 öre per hour), and a shoemaker four months, six times a week (at 40 öre).

Besides the more regular work of the school, there have been held every year extra courses. At present (first half of 1881) there are instructed in the city school eight grown women and 12 young girls in bookbinding and wood-carving. Of the courses given before, we must mention two in the manufacture of wooden shoes. In Tistedal there have been held likewise other courses, especially in joinery, including some for grown-up workmen in the winter-time, when they have been either not at all or only partly engaged in their business. Last winter the school made an expenditure of 347 kronor as teacher's pay alone for such extra instruction for grown-up artisans. By this means instruction was given to 64 persons in basket work, tin-plate work, shoemaking, and wooden shoe manufacturing. It should be said decidedly, with respect to the two last-named branches, as well as joinery, that the instruction has shown itself very fruitful. Much time which would otherwise have been spent in idleness has been turned to account in this way. Now every winter there are made for sale in Tistedal various simple articles of furniture, as well as wooden shoes; the costly boots and shoes of leather have been to a great extent replaced by the cheap wooden shoes, and workmen with trades have been in part employed in place of mere hand-workers.

The pupils in the Fredrikshald work-schools have themselves made choice of the branches of work with which they have busied themselves. These branches I shall take occasion to speak of singly.

*Joinery.*—Together with joinery, that is to say, by the same teachers and in the same place, instruction has been given in turning, carving, basket-making, and brush-making. At first there were several pupils in basket-work and brush-making, but generally these two branches fell off of themselves. The school furnishes all the tools, except saw-blades, which are used in wood-carving, as well as all the material, and it retains the pupils' work.

The workshop is furnished with 10 smaller carpenters' benches, and one longer bench along the side by the windows, on which places are made for three joiners. In each bench is a drawer containing three chisels, one rasp, one file, one rule, two squares, one brad-awl, and one draw-knife. In addition, every bench has a small jointer plane, a jack plane, a smoothing plane, a saw, a mallet, and a hammer. The other tools are used by the pupils in common.

From New Year, 1881, they have worked, according to a systematic collection of models, the idea of which is derived from the *Nåas löjd*

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seminary. We had, indeed, before this, tried to have a little system for example, the pupils were given easier work at first, but no definite scheme was drawn up. Our order of work differs, however, in many important points from that laid out for the slojd seminary. Herr Salomon's catalogue has 216 numbers for joiner's work. Our list has not more than 32; but in very few cases is there only a single article which it has thought advantageous for every pupil to make. On the contrary, the articles are generally included from two to six different things, of which the pupil according to circumstances, has to make one or all; but no number may be wholly past over. The reason for having so many articles under each number is partly that, otherwise, of some objects there would be so many made that they would be unmanageable, partly because it is desirable that sometimes the pupil should have a chance to make his own choice. We enjoin the pupils, and especially the more skilful ones, to make two pieces after the same pattern. If, when one piece is finished, they can make another of the same kind without receiving any assistance from the teacher, that is, without any other help on his part than oversight and guidance, such a work is particularly commended.

The catalogue from Näås begins with some articles which are intended to exercise the pupils in the use of knives. We begin, on the contrary, as we have always done, with small objects, on which the pupil practices handling the saw, the plane, and the file. With us whittling exercises are taken at a certain time in the year, several weeks in succession, by all classes in joinery at the same time. Formerly it was considered risky to trust the youngest pupils with knives, but in the whittling exercises given latterly all took part, and the whole was done without any other mishap than a very inconsiderable scratch of the skin by a single pupil. At the same time the teachers were at their posts and warned the pupils against dangerous handling, and the inspectors likewise constantly enjoined them to be careful. The pupils in joinery also received instruction twice a week in soldering, although this is not connected with joinery; the oldest boys bring tin-plate utensils from home for repairing. January is the month employed for whittling and soldering.

In the Swedish list of articles there are also inserted pieces of turning work and simple carving; but with us the turning work is put into a separate list, since we desire that it should be voluntary on the part of the pupils. A very few simple pieces of carving are made by requirement, but the pupil can, if he wishes, get leave to devote himself more exclusively to wood-carving, although not before the 18th number of the work-list is completed. The school has an especially rich collection of patterns in wood-carving, which has been supplied during the last year with things entirely in the Norse style.

In the order of work thus laid out, the aim has been to go from the easier to the more difficult, as far as possible to practise one mode of hand-work at a time, to teach the pupils the most important manipulations and methods of working; and finally to make the work less tiresome by giving opportunity for change. After one has examined the list of articles below he will have no doubt of the suitability of following a fixed plan of work. The pupils themselves appear to be much interested in having an object in view. The teachers on their part are much pleased with this arrangement, for the reason that before they found it difficult and tiresome to guide each pupil in the choice of work.

There is, however, reason to suppose that the plan cannot always be followed entirely to the end. When a work-school has laboured for some years in a place, the homes in the vicinity are furnished with the productions, and it is then necessary to seek some other way of disposing of them.\* This may be done partly by letting the more skilful pupils, when somewhat advanced in the course, omit some, and partly by constantly seeking to bring in to use new and suitable models and drawings.

\* Hitherto it has not been difficult to dispose of articles through exhibitions and lotteries.

The plan of work, of which many copies are hung up in the workshop, is from New Year 1882 as follows:—

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#### A. JOINERS' WORK.

- |                                       |                                      |                   |
|---------------------------------------|--------------------------------------|-------------------|
| 1. Stick for flower-pot.              | carving).                            | buttering - board |
| 2. Clothes-pin.                       | (common).                            |                   |
| 3. Key-tag.                           | 19. Wood-box, coal-box, book-shelf   |                   |
| 4. Cutting-board, bat (simple),       | (large).                             |                   |
| clothes-peg, stocking-board.          | 20. Doll's bedstead, boot-jack (with |                   |
| 5. Hammer handle.                     | carving).                            |                   |
| 6. Axe handle.                        | 21. Large meal-chest, potato-box,    |                   |
| 7. Coat-hanger, boot-jack.            | small table.                         |                   |
| 8. Ruler (which the pupil keeps).     | 22. Meal-chest (with sliding cover), |                   |
| 9. Egg-rack, fish-fork, flower-pot    | stool, bat (with carving),           |                   |
| shelf.                                | sausage-press.                       |                   |
| 10. Stool, flower-pot stand, little   | 23. Chopping-board, book-case (with  |                   |
| rake.                                 | turning), doll-waggon, photo-        |                   |
| 11. Wooden slippers.*                 | graph frame (carved).                |                   |
| 12. American axe-handle.              | 24. Spice-box (with two sliding      |                   |
| 13. Polish box, salt or meal box.     | covers), house-keeper's box.         |                   |
| 14. Single knife-case, double knife-  | 25. Saw-frame, other joiners' tools. |                   |
| case, rake (common size),             | 26. Field-tent bedstead, flower-pot  |                   |
| match-chest.                          | case, small spice-box.               |                   |
| 15. Small wheelbarrow, small book-    | 27. Child's commode, doll's com-     |                   |
| shelf, clothes-horse (to draw         | mode, child's stool, stool.          |                   |
| out), snow-shovel.                    | 28. Stairs, table, bedboard.         |                   |
| 16. Baking utensils, scoop, scap-     | 29. Wash-stand, trunk.               |                   |
| trough, bat (common).                 | 30. Sled.                            |                   |
| 17. Bread-board, work-box, baby-      | 31. Wardrobe (polished), tobacco-    |                   |
| stool, wooden gun.                    | box, key-hanger, tooth-brush         |                   |
| 18. Foot-scraper, grater-stand, shoe- | holder.                              |                   |
| brush, buttering-board (with          | 32. Stool with legs.                 |                   |

#### B. WHITTLING.

- |                      |                             |
|----------------------|-----------------------------|
| 1. Sausage-peg.      | 6. Harness-pin.             |
| 2. Rake-tooth.       | 7. Jumping-jack.            |
| 3. Mouse-trap pin.   | 8. Different small animals. |
| 4. Clothes-pin.      | 9. Butter-spoon.            |
| 5. Flower-pot stick. | 10. Butter-spade, &c.       |

#### C. TURNING WORK.

- |                               |                              |
|-------------------------------|------------------------------|
| 1. Tool-handles (many forms). | 10. Chair-legs (many forms). |
| 2. Knobs (many forms).        | 11. Barrel-tap.              |
| 3. Harness-pin (many forms).  | 12. Rolling-pin.             |
| 4. Meat-club (many forms).    | 13. Coffee-crusher.          |
| 5. Stocking-last.             | 14. Match-holder.            |
| 6. Beefsteak pounder.         | 15. Fish-fork.               |
| 7. Meat-clubs (round).        | 16. Plate-rack.              |
| 8. Potato-masher.             | 17. Wardrobe pins.           |
| 9. Fish-masher.               | 18. Yarn reel, &c.           |

The plan for the instruction in wood-carving has not yet been completed, but is being worked out.

In shoemaking the arrangement here is somewhat different from what I saw in Sweden. Pupils take all their work from home, and purchase for themselves the needed material. They are busied particularly in repairing their boots and shoes, but not unfrequently they make new ones. A capable and industrious boy often keeps in repair the shoes of a whole family. After the course in the joinery school, pupils make themselves a pair of wooden soles on which they put the upper leather. Of tools the school has only lasts, nippers, some polishing tools, and very few hammers, knives, and like things very much needed, so that the pupils will be

\* Pupils who furnish the upper leather may keep these. In other cases only the wooden bottoms are made.



**Appendix AA.** compelled to procure these for themselves. The work times are six hours a week. Shoemaking is received with great favour by many parents, because of the advantage which is derived directly from the children's work. In the shoemaking school, as a rule, only such obtain places as have worked at least the first 11 numbers of the above list.

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Tailoring has been tried for two years. Since the town has a great number of seamen, it was supposed that the chance to learn how to mend and to make simple working-clothes would be improved both by grown people and by boys who were going to sea. But the experiment did not succeed, as none of the seamen have presented themselves, and of the boys not more than four or seven have been got together at one time. So the class was given up in 1882.

Painting has not yet been established a full year as an independent branch; but, at the end of the regular eight months' school time, they have undertaken to paint all the joiners' work made up. Not all the pupils of the joiners' school have been engaged in it, but only those who have desired it. Staining has been carried on, particularly in imitation of walnut and oak. One year, during the vacation of the common school, the boys carried on, under the direction of the teachers, different kinds of work for schools, such as painting school-desks, floors, and walls, at forty öre per day.

In the bookbinding the pupils do work for themselves, and so bring to school, books and material, the school supplying only the tools. Without including grown people, nearly all the pupils are from the Latin school.

Instruction in drawing has been introduced into the work schools only since the autumn of 1881, when a course was arranged for thirty of the pupils (common-school boys) with three hours' instruction weekly, after the Stuhlmann method, which is not particularly known in this country, but has been introduced generally into Sweden, where it is the one authorized for all technical and other public schools in which such instruction is given. We may state as one advantage, so far as it has been practised here, that it makes the first trivial exercises interesting to the pupils, who have the immediate satisfaction of forming very pretty figures and patterns without its being difficult or departing from the common pedagogic principle of going from the easier to the more difficult. The drawing is done first in a book ruled in squares, and next in a dotted one, according to the teacher's sketch on a dotted blackboard painted for this method. Further on, after figures in straight and curved lines have been drawn, with the help of lines and points in the two books, there are commonly used drawing books for geometrical figures according to the teacher's sketch on the blackboard, with the use of the Stuhlmann plates. Then follow other figures, and, finally, drawing from plaster, objects in bas-relief, blocks without shading, plaster figures in alto relievo, and blocks with shading. One can learn about the method by reading Dr. Stuhlmann's original work published in Hamburg, or the Swedish translation, both of which are to be had in the bookstores (six kronor).

As to the teaching and the course pursued in the schools, the rules and instructions given below furnish some further information. As to the children, the method of ordinary schools is carried out as far as possible. The school has regard to good behaviour and aims to inculcate habits of courtesy, neatness, and order. The teachers, for example, must require of the pupils a neat appearance, and when school is dismissed must see that everything is put away in exactly the right place.

It was found, as a rule, that it was the younger boys who came to school, and that they left it when they came to the age at which they would derive most profit from the instruction. Such has been the case with pupils in the public high schools, because home work makes great demands on their time when they become farther advanced in school. The reason seems to be that older boys are more useful at home and often can earn wages for work; also, in great part, that older boys have generally a dislike of any constraint. To remedy this, and to try to keep the pupils longer in school, it was decided, instead of giving premiums as rewards for diligence, constant attendance, and good conduct, to credit the pupils in those branches of work, in which the school furnishes materials and keeps the products,

with wages, which are regularly entered in a work book, and are not paid to them until they leave the school, after having been for a certain time constant pupils. These work wages should, as a rule, not exceed half the value of the work, and they depend on its saleability; but a work carried out without the teacher's help receives the highest pay. The work is judged in the pupils' presence by inspectors and teachers jointly, and any observed inaccuracy is pointed out on this occasion. What further care is taken will be seen from the following rules for pupils, who must pass an examination at this time. When the pupil leaves school, instead of money, a savings-bank pass-book is given him, with encouragement to use it for future savings. The idea of this arrangement respecting work-books is derived from the slöjd department of the Upsala common school.

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Since it has been supposed that the school will be more highly esteemed and more constantly attended if there is fixed a fee, ever so small, for instruction, there has been demanded a yearly enrolment fee of 3 kronor, which amount for the children of the public schools is lowered to one-half and paid in two terms. This enrolment fee has served to do away with the inconvenience of having a great many report themselves, attend a few times, and finally disappear, which is unavoidable, unless measures are taken to prevent it, in places where a great part of the working class is on a low level morally.

#### *School Statutes.*

SECTION 1.—The object of the school is to promote dexterity and domestic industry in the Fredrickshald community, to give instruction in hand-work to persons of both sexes, and particularly to children.

SECT. 2.—Its operations are maintained by, 1, school tuition money; 2, sale of articles made; 3, contributions by slöjd unions or others.

SECT. 3.—It is managed in all parts by a board of three members chosen by the government of the slöjd union, of whom one in each case is chosen from the government itself.

The school-board members remain in office two school years, so that one or two go out every year.

In case the slöjd union government employs a paid inspector of schools, he is a member of the board, which can then have two chosen members, of whom one goes out every year.

In case woman's hand-work is included among the objects of the school, the board may call to its assistance one or more ladies, who are willing to aid.

The president of the slöjd union takes part in the meetings of the board when he chooses.

SECT. 4.—The board chooses its president and adopts its own rules of business; it must make a report of its doings. It makes out instructions for the school inspector, when such a one is chosen, and arranges the daily care of the school.

It makes out a budget for the school year, which extends from Aug. 1 to July 31, and sends to the slöjd union's government at the close of the school year a detailed account of the school's receipts and expenditure, together with an account of the doings of the school for the past year. It chooses an accountant and treasurer, who have to give suitable security.

It manages the means of the school, except so far as that the salaries of the permanent teachers are determined by the government of the slöjd union after the board has made a recommendation. It sees that the school property is suitably insured against fire.

SECT. 5.—Provided either the operations of the school are discontinued and closed, or the Fredrickshald community should choose to set up a school with a similar object, the school property of every kind, according to an arrangement formerly made, is to be given over to the city without any payment in return.

#### *Extract from Instructions for Teachers.*

5. The teacher must show the pupils the use of tools, explain the names and arrangement of the parts, and, both by word of mouth and by showing,

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make plain the mode of working, which must be done not only for the single pupils, but, as often as opportunity affords, for the whole division at a time, while all keep still and give attention. That the pupils may learn to help themselves, the teacher must not, on the other hand, help them, except when absolutely necessary. Still, the finishing touches must be given to the work by the teacher, when the pupil cannot do it himself. The teacher must keep his attention directed to the exercise of the pupil in accuracy of eye, the awakening of his thought, and the opening of his eyes to the forms of objects.

*Extract from Rules for Pupils.*

7. The wages earned are entered in a savings-bank book made out in the pupil's name, but he does not receive this until he leaves school; and, as a rule, not then unless he has been a pupil of the school without interruption for three years, or three half-years after the age of 12 years. It may be forfeited by staying away from school, except in case of sickness or with permission of the teacher, or by the pupil rendering himself undeserving by his conduct in or out of school.

8. Pupils can make a purchase of their work at two-thirds of a moderate valuation; but in this case no wages are given for the work.

9. If the pupils furnish their material themselves, as in shoemaking, tailoring, or bookbinding, they have the product free.

10. Unconfirmed pupils pay for enrolment money three kronor (3s. 3d.) per year, payment being made in advance; pupils who are enrolled at New Year pay two kronor. Those who are not in good circumstances can, on request, be let off with half payment. The inspector may demand of free pupils that they deposit fifty öre, which they receive back at the expiration of the school year if they observe the rules of the school.

*Object of Hand-work Instruction.*

Having now finished this description of the method of instruction in hand-work followed in this city, where I have had occasion to study it thoroughly, I shall attempt to answer the questions proposed at the beginning of this paper, so far as this has not been done already in what has gone before.

One question left unanswered is this: What is the object of hand-work instruction? That the answer has not been the same in the different places that I have visited arises partly from differences in the methods of instruction, partly from the unequal importance which is attached to hand-work in relation to the other school work.

It has been maintained with great force and with much justice that hand-work does not have its full rights unless it is regularly incorporated in the school course, and receives such treatment that it may exert an educating influence on the child, inasmuch as, like modelling and drawing, it aims to develop the pupil's eye, and his sense of form and of beauty. Therefore it should have an acknowledged place, in the higher, as in the lower schools.

This idea of hand-work as a means of intellectual cultivation is represented in Sweden by Rector Palmgren in Stockholm, and by the provincial governor, Count Eric Sparre, who, in virtue of his office as inspector of the higher elementary schools in Wenersborg, at a closing festival in July 1880, gave a long discourse, which is reported in the city journals under the title "A Plain School Talk," wherein hand-work considered from different sides is brought forward as an important link in the higher cultivation. The same ideal view of hand-work as a branch of instruction is also maintained by the first defender of hand-work schools in the North, the Finlander, Dr. Cygnaeus. But now, when a regard for the hand-work school has been but recently awakened, it may certainly very easily be somewhat overrated as positively refining, and some may, in a great measure, fail to look at its practical side, which is what the well-known Finnish teacher must have done in a late letter concerning this subject, published in a Norwegian newspaper.

In other respects, on the contrary, hand-work can scarcely be ranked too high as a link in the true education. This is no place, however, to

consider its significance for moral training. But if we start with the idea that schools likewise have acknowledged it as their business to impart such skill to female children as every child ought to possess, so ought the public school to give instruction to boys also in the use of the hands, so that every man, to whatever station he belongs, should have acquired such power that he may not stand helpless in many occasions of life, as a consequence of a one-sided education; then will a path have been broken by which to arrive at the method in which the school must work.

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The exercises should begin with the handling of the tools most often used in daily life, as, for example, the knife, axe, hammer, plane, saw, file, and possibly the paint-brush, because a person with but a very moderate ability in the use of these tools, or only one of them, will many a time find it of value to him; at any rate he will have acquired a practical judgment which will be of use, and he will be prepared to employ his spare time for the repair of furniture and utensils, as well as for the making of simple objects for the practical uses of life, or for the embellishment of his home.

The chief importance must be attached to joiners' work, for the reason that he who understands how to handle joiners' tools will have little difficulty with other simple work. Although turning will train the eye and the sense of form and symmetry, it must still take a subordinate place, particularly for him who cannot be supposed to have the means to procure the necessary tools. A little wood carving can be practised, not only because it serves in a high degree for the cultivation and refining of taste, but because one need not practise it much to be able to produce tasteful pieces of work for his own recreation.

Whittling should not be neglected in the hand-work instruction for boys, since the knife is a tool for the use of which many opportunities will be found at home. If the school omits to give this instruction, there is a risk that the boys will not realize what can be done with this simple and easily available, but, in many respects, superior tool. A certain care, however, must be observed, particularly for the smaller boys. There is more security in this respect when there is opportunity to undertake whittling exercises with the whole school, as in this case rules of prudence can be more forcibly inculcated. At any rate, whittling exercises should begin in this way.

Whether basket making should have a place in school may be exceedingly doubtful. Here, indeed, is a material which happily can be easily made to take any required form, and hence the work therewith may be said to be instructive, and some things for use and ornament can be easily made. But basket making commonly requires much practice and strong hands; the work is of inferior strength and durability, the material cannot be procured in many places, since our native species of willow have a very limited use; and, finally, it cannot be maintained that exercises in basket making have a general value. In order, therefore, not to undertake too much, they should, as a rule, hardly meddle with it. It is another matter to give courses in basket work to grown people with a trained and skilful teacher when there can be hope of fostering an industry thereby, and when, at the same time, instruction can be given in regard to the planting of osiers.\*

That undue weight, however, may not be given to my perhaps entirely individual opinion, I should mention that basket work is taught in most of the Norwegian and Swedish schools which I visited on my journey. But here in Fredrikshald, where pupils themselves have their choice of work, it is said to have dropped out of itself, I presume, by reason of a correct instinct in the children or their parents.

Painting, particularly of manufactured articles of wood, appears to be suitable for work schools. I have found by personal experience how easy

\* It is very doubtful whether osier planting is suitable for our (i.e., the Norwegian) climate. The experiment which was made at the Aas Agricultural School did not succeed, because of the severe winter cold.

Appendix AA. it is to produce on furniture and household utensils, in an acceptable, though perhaps not artistic, manner, the common wood colours, as oak and walnut, particularly the latter. Moreover, floor and other painting may be done when good colours can be obtained by the mere grinding of the colours, and without the help of any other tool than the brush. Very little, therefore, is needed to contribute in this way to convenience and comfort at home, and many will not do without it when it can be done by their own work.

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It would be well to give a short course in smiths' work, since some practice in the use of the file always proves of use in daily life, and in many cases a forge is not necessary. Tin-plate work, on the contrary, may be said to be less necessary. Still, a little soldering often comes in use and is quickly learned. Other classes can have instruction in this four or five hours every year, the pupils bringing with them old vessels of tin-plate or utensils in need of repair upon which to practise.

It can hardly be allowed that shoemaking is of great importance as a means of cultivation. The position which this requires during work is by no means the most suitable for bodily development. Herr Ahlborn of Stockholm said that the medical council of Dresden, for this reason, expressed themselves against its introduction as a school branch. But, on the other hand, skill in mending shoes is so important for people of the working class, both economically and on sanitary grounds, that its place in school may be said to be justified on this account, which cannot be said of tailoring, for instance, for which the boys have shown no liking. The making of wooden shoes with leather uppers should, as a part of the joiner's work, be taught in every working school for boys of the poorer class.

Bookbinding can hardly be of practical importance in any other schools than those which are intended for children in whose homes there are books to bind.

According to the proposition which is laid down as a basis for the consideration of the place of each thing in the work school, namely, that hand-work must be considered as a link in the common education, the work to be carried out should be particularly limited to actually useful objects, and such as do not lie above the pupil's power to make with little assistance. It should be customary for the pupil, as far as possible, to be self-helping, and he should not be deprived of the satisfaction and encouragement to diligence and perseverance which are always sure to follow when one has accomplished a piece of work with only his own help. And that there may be opportunity for the development of taste and a sense of beauty in work, when procuring models, the coarseness and ugliness which often characterizes the work of schools should be avoided.

A plan derived from any other fundamental principle than that the school is for life in general will very certainly lead astray, as has happened, in my opinion, in some places in Sweden where a disproportionate number of hours has been assigned to hand-work, even as many as half the whole time of instruction. With three to six hours a week of obligatory hand-work running through two or three years, any reasonable demand would appear to be satisfied.

#### *The Question of Economy.*

As to the simple question of economy, which arises when a work school is to be established, the information from different places which has been already given will, I hope, afford sufficient guidance as to the pay of teachers. A limitation in the outlay for teachers' help may happen when the number of pupils is very large, but the workshop spacious; in which case, as in Upsala alöjd school, it may be advantageous to make use of a steady half-grown boy as the teacher's assistant. Such a one would without doubt be able to furnish many of the aids to pupils which are necessary in order that they may not stand idle.

In regard to the outfit of tools for the workshop, it is difficult to determine what sum to apply for, inasmuch as it depends, among other things,

on how many pupils may be calculated upon, what they require, and how far the teacher understands how to use the means placed at his disposal.

If there is not a sufficient number of joiner's benches, planks furnished with cheap appliances with which to fasten the work, and placed along the walls of the workshop, may be used to advantage.\*

It is also a question touching the economy of the school, how far teachers should furnish material to the pupils. Even if it should be found that this affords certain advantages, still the arrangement is hardly advisable, since in such a case the teachers will be tempted to be too sparing of material, to the detriment of the instruction. On my journey I had opportunity to see to what such regard for saving might lead.

Nor is it advisable to let the pupils themselves furnish material. In the work school of the Fredrikshald Slöjd Union in Tistedal this has been tried one year by reason of the ease with which pupils in this place may obtain wood material. But it was given up because the lumber furnished by the children was very often poor, and because it was made impossible to follow a definite plan of work.

Although it would be a great encouragement to the pupils to be allowed to keep their work, there is something to be said against this. In the nature of things, when this is done, parents will demand to have the choice of what the children shall work at, and they will be dissatisfied if this right is not granted. This is true, particularly of joiners' work, while it need not be said that in branches like shoemaking and book-binding, for example, preponderant reasons may be found for a different arrangement.

#### *Teachers in Hand-work. School Superintendence.*

It is a question of no inconsiderable importance, and one which has not been plainly brought forward before, whom we should choose for teachers of the work schools, or, in other words, what are the principal qualifications which one should seek for in them.

It must be unconditionally insisted on that only one who is able to give explanations fluently can make this instruction a means of cultivation for the pupil, awaken his thought, and lead him to the apprehension and understanding of his work. Likewise only he will have the power to preserve discipline who himself either has had a pedagogic education or possesses a decided innate gift in this respect. If hand-work is a compulsory branch, ability to preserve discipline will naturally be one of the first conditions for a useful teacher, while a very little deduction can be made in the requirements where it is in his power to keep out of school those of less easily manageable dispositions.

In Fredrikshald, where, as a matter of course, they have been obliged to seek, for teachers of work schools, men brought up as artisans, they have still been so fortunate as to get respectable and in other respects, particularly suitable teachers; but hitherto it has not been altogether as could be desired as respects the ability of the teachers to give the pupils a full understanding of their work by oral instruction. Discipline, likewise, has not appeared to be their strongest side, and, therefore, they

\* From the third in the series of pamphlets by O. Salomon, which has lately come out—"Slöjdskolan och Föreläsningen"—we subjoin the following extract from the description of a Finnish school for eighteen pupils, the Nygård Educational Institution for Neglected Children:

\* Eighteen of the boys are instructed in slöjd at the same time by the superintendent, who does not consider this number large. As a guide for those who perchance wish to introduce joiner's work as an object of practice into common schools, I here give a list of the slöjd tools and utensils which the teacher at the Nygård school had at his disposal, and which he considered amply sufficient for the male pupils. They were: three planing benches, six hatchets, eighteen hammers, eighteen knives, eight vices, twelve wedges, twelve pairs pinons, six gouges, twelve mortising chisels, fifteen dimer chisels, four turning chisels, five scroll saw frames, four saws, six small and two large gimlets, two bitstocks with bits, three drawknives, three mallets, two pairs compasses, one pair calipers, two jackplanes, two jointers, two smoothing planes, one butt plane, three squares, two bevels, one two-foot rule, one drill, one filing vice, one glass cutter, one glue pot, one gauge, one screw driver, one whetstone, one scraper, one rasp, one lathe.

\* Many, to be sure, would find the above enumerated tools all too few for instructing at one time so many as eighteen pupils, but proof is here given that one can, without much difficulty, get along with small means, if the will is good. The Superintendent himself directs the instruction of all the boys. He assured me that he considered it by no means a burden,—this alternate guidance in theoretical and practical objects of teaching. His interest in the former does not hinder him from being warmly enthusiastic for the latter."

Appendix A.A. have sometimes been under the necessity of sending unruly boys out of school.

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The superintendent of the Swedish slöjd seminary expressed it as his settled opinion that we should strive to obtain slöjd teachers who have been pedagogically trained. The reason for the desire in Sweden that teachers of the common schools shall give instruction in slöjd must be sought partly in this idea. But among teachers so cultivated, even when they have gone through an institution like the Naäs seminary, there will not be found such practical skill as in a man who has served his time in a trade. But when I expressed to the superintendent of the seminary some doubt of the sufficiency of this short course which the Swedish teachers commonly take he remarked that it is not of so much consequence for teachers to possess a full degree of skill as artisans as to learn modes of work for the simple operations, and to understand the handling of tools. It is, moreover, astonishing, he said, how much an enthusiastic man can learn in a short course, and how much the common-school teachers thus instructed usually accomplish with the little that they have learned in a vacation course.

But directly the contrary view was expressed by the slöjd inspector in Göteborg, who did not wish to hear of any other teachers than hand-workers. He thought it was not difficult to impart the pedagogic habit to them in a tolerably short time, which, however, must be more easily said than done.

If there is occasion to procure a teacher for a work school, of course he will be the best who has acquired a perfect education, both pedagogic and practical; as, for example, if, after having wholly or half served his time at a trade, he has obtained continued instruction in a pedagogic and practical institution.

Such an institution would have been formed in a certain degree if the seminary course among us had been widened out, and at the same time hand-work had been made a compulsory branch in it. Our country boys not so very rarely possess already considerable dexterity, which is sometimes held back. But it would be otherwise with those who came to the seminary after hand-work had been introduced. Probably many of the young boys who intended to be teachers would employ the time between confirmation and their entrance into the seminary, far more than hitherto, in acquiring manual skill, since this now would have a real value for what is to be their life-work. In this way it would be possible to get very eligible teachers for work schools, and this in a still higher degree if matters develop so far that everybody already as school boys should receive instruction in hand-work. Then those in seminaries who distinguished themselves in hand-work would not lack opportunity for continued development, and would be able to prepare to serve as practical teachers of hand-work for schools which have need of such.

I have seen the thought expressed that we should have a seminary exclusively for hand-work. But it is not to be supposed that such an arrangement would in the long run be sought for among us, because there will not, in general and to a great extent, be found special employment for practical teachers of hand-work. As respects the country districts, as a rule, it will be necessary only so to arrange the hours that there will be no occasion to employ a special man for the sake of this branch. In the towns, and particularly the larger ones, practical teachers will be necessary; but it is doubtful whether the need can be supposed to be so great that it is reasonable to have a permanent special school established. Probably for some time to come we shall have to look to artisans, and among them seek out such as naturally possess the ability to manage and instruct children.

If circumstances are such as to make it desirable to have one and the same man undertake instruction in many branches of work, as a rule it will be best to engage an active joiner who will consent to take, either in his own town or some other, if he prefers it, a short course in such hand-work as is most commonly practised by a man of the trade.

In case the instruction in hand-work is thus left to teachers trained only in the way of the trade, and, in particular, when the school is so large

that it has many teachers in hand-work, the superintendence of a pedagogically educated man should not be dispensed with. But we cannot suppose that this superintendence will be satisfactorily provided by an ordinary school board; on the contrary, we must start with the idea that among the teachers of a large city, either in the higher or lower schools, some one may be found who is so endowed that he will be able to undertake this superintendence with success. Examples of such cases are already adduced from Sweden. In Upsala one of the common-school subordinate teachers, and in Wenersborg a teacher in the elementary school, is superintendent of the slöjd department of the common schools.

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But as to the country districts, when a step is taken, at the public expense, to put aside the obstacles to the introduction of this instruction into schools, care should be taken that the want of assistance for teaching may be supplied by the establishment of courses, like the Swedish in vacation time, for those who are already appointed teachers.

But too many branches of work should not be undertaken. In a course of five to six weeks it can hardly be advisable to be busied with anything except joiner's work together with a little carving and wood turning, unless some make trials in painting, guided by written instructions. Desirable as it would be to include drawing, still the time is too short for it. In Sweden they are accustomed commonly to arrange so that there are provided separate drawing courses, and this as well for the female as the male teachers of the common schools. In such courses, for teachers in manual exercises, the work should be done according to an established series of models, and it will be of great advantage for each one to carry home with him the work done, not for his own private property, but to belong to the school, as the foundation of a collection of models. The Fredrikshald Slöjd Union has taken the initiative in having a course arranged according to this principle, held yearly in Fredrikshald, in the summer vacation, at the public expense. The outlay for materials is estimated at Näs at five kronor for each pupil in a five weeks' course, and in Upsala at one hundred kronor for a course of one month for thirteen pupils.

If such courses are extended, according to Herr O. Th. Ödes' plan, to three months, time may be spared for drawing; but still it should be unhesitatingly decided to lay stress on joinery and to institute basket-work, &c., as being branches of like character. Yet there are certainly important circumstances which are unfavourable to courses of such long continuance. Teachers will not, as a rule, have a chance to be away from their work so long, and there will be no use for trade teachers instructed in so many kinds and at the same time to so small an extent.

The need of carrying instruction further than is possible in a short vacation course must be satisfied in another manner, as by the establishment of special courses for those who have gone further, or by reserving for those who have gone through one course, places in a following course. In general, we shall hardly be able to reckon on giving teachers opportunity to attend more than one.

While it is desirable to take a step for the introduction of hand-work into schools, by the establishment of yearly courses at convenient places around in the country, it is important that the instruction, from the very beginning, should be brought into the right track. For the districts which would introduce this instruction into the schools there should be a chance to obtain guidance for their arrangement, and the schools which must obtain public aid, therefore, should be subject to an inspection to make sure:

1. That the work is done according to a well-devised plan.
2. That the work is done, not after clumsy patterns, but tasteful ones.
3. That teachers know how to induce their pupils to carry out their work with exactness and care.

To this should be added, perhaps:

4. That schools in places where circumstances invite thereto should try to work in the service of industry.



## Appendix AA.

Handwork  
Instruction in  
Sweden.

*Introduction of Hand-work into our Country Schools.*

It is asserted that domestic industry in our country districts has retrograded in the last decade. The long winter evenings, when hard labour does not tax all the working force, in many places, as we are assured, are now passed in idleness, while before it was common to find the family busy around the fire-place, the male and female members each with his and her own work. No doubt, also, the extended operations of factories in later times have made it easy to obtain many objects of necessity which one must formerly make for himself or do without; and then, too, advancing civilization has brought in a division of labour, whereby much of that which earlier lay within the field of the farmer's industry has been absorbed in trade work. If such a division of time is an inestimable gain for him who always has his time occupied, it by no means follows that the same is the case when one has, at certain times of the year, many leisure hours to spare. If it is true that the large industries in our time are likely to stifle domestic industry, and that the farmer, the cottager, and lodger are often without occupation, then there certainly is no better remedy for this evil than the introduction of hand-work for both sexes into the common schools. Thereby will children be given early an inclination and desire for work and a comprehension of the value of time which will be useful to themselves and others. There will no longer be such clumsy and awkward servants as before; there will be laid a good foundation for diligence and domestic industry in all homes. In Finland Sweden, and Germany philanthropists have made great efforts for this object, and with good fruit. Then why shall not we also follow this good example, and with a means so natural seek to promote the welfare of our poor people and bring the blessings of industry into the house and cabin.

There can be no doubt that what is called labour does not stand in high estimation in our country among the higher class of the community. It was formerly so that only the young girls avoided as base almost every thing that is called work, this view now presses itself as a cancer more deeply into the family, and it has outwardly reached even the better situated class of farmers. The introduction of hand-work into the schools will certainly also help to remove this contempt for bodily labour and promote a recognition of its actual nobleness.

To be sure, it would be of great advantage to have established here and there separate work schools; but the work school is first assured a permanent existence when attached to an established institution. Moreover, there are, as already mentioned, many circumstances which show the advantage of their connection with the school. When only a very limited number of hours is to be allowed, we cannot reckon on any other teacher in hand-work than the common-school teacher, whose pedagogic training and practice in preserving discipline, and in giving oral instruction besides, must be of great value; moreover, the objection cannot be raised any more in boys' hand-work than it can in girls' work, as well as in such branches as writing and gymnastics, that it will serve to divert the teacher from his proper business and spread out his labour, since such branches must much rather be a rest for him and a beneficial change of work.

It is at length established by the experiments made in Sweden that what may be lacking to him in practical skill can be replaced by his superiority in other respects, especially when by exercise in a definite plan of work he has accustomed himself to the commonest manipulations and modes of work, beyond which instruction, in a boys' school, can never be carried. I have in this connection sought to show what may be said in favour of the employment of school teachers for instruction in hand-work, notwithstanding I have been obliged to repeat some things which have been said before.

It does not require a very great outlay to introduce hand-work into the common-schools, the district schools, and the public high schools of the country, and I shall add some remarks on what it will cost to introduce hand-work for boys as an ordinary branch in a common-school in the country, in which thirty-two weeks is fixed as the average amount of

school time. There must, of course, never be any idea of bringing in hand-work at the expense of the studies, and so there must be a little increase in the teacher's salary. If we call the time of instruction six hours per week, and the pay per hour 50 öre, we have 96 kronor a year. On the supposition that this outlay is equally divided between the State, the country, and the district, it is not very much for each. We may consider that the cost of material, as far as relates to joinery, will be about covered by the income from the pupils' work.

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Providing a shop is undoubtedly one of the greatest difficulties in the introduction of hand-work, since in the very rarest cases only will there be a vacant room suitable for it in the school-house or in the immediate neighbourhood; and it will not do to arrange the school-house loft for this purpose, wherefore a small building must be erected. But even this is hardly impracticable if there is only an interest awakened. Furnishing the workshop with tools will occasion no great difficulty; there need be procured only just the things necessary. Even if a beginning is made at first by borrowing, the teacher, with the assistance of the largest and more skilful pupils, can make a part. It will do to have two at one planing bench, and the pupils can busy themselves by turns with turning, carving, whittling, shoemaking, etc. In Sweden the tools are moderately reckoned at 150 kronor.

*Catalogue of Tools for a Liberally Furnished School-room for Joinery.\**

10-12 small planing benches, 35 kronor each; 1 wrench, 1.5 kronor; 1 to 3 bench screws with bench-hook and drawer for fixed bench, 7 kronor each; 13 jointer-planes, 5 kronor each; 13 smoothing planes, 3.5 kronor each; 13 jack planes, 1.5 kronor each; 13 gauges, 1.5 kronor each; 13 saws with brass mounted frames, 2 kronor each; 13 turned wooden mallets, 39 English chisels, 80 öre each; 13 English rasps, 1 kronor each; 13 English files, 80 öre each; 13 hammers, 1 kronor each; 26 squares, 40 öre each; 13 scraper-blades, 40 öre each; 13 scratch-awls, 25 öre each; 1 large saw, 2 kronor; 1 tenon-saw, 50 öre; 1 back saw, 2 kronor; 1 compass saw, 1.5 kronor; 1 filing clamp, 80 öre; 1 saw-set, 30 öre, 1 tonguing-plane with iron, 2.5 kronor; 1 grooving-plane, 11 kronor; 1 butt-plane, 3.5 kronor; 1 rabbet-plane, 1.7 kronor; 1 screw-plate, 3 kronor; 12 hand-vises, 1.25 kronor each; 2 screw drivers, 1.75 kronor each; 1 bevel, 60 öre; 1 beveled rule, 80 öre; 1 pair beam compasses, 1 kronor; 1 meter-stick, 60 öre; 1 pair compasses, 50 öre; 1 spoke-shave, 1.5 kronor; 3 reamers, 40 öre each; 1 brace with auger and centre-bits, 4 kronor; 1 pair pincers, 80 öre; 1 screw-tap, 50 öre; 1 American axe, 2.5 kronor; 1 vise, 9 kronor; 1 glue-pot, 1.6 kronor; 1 paraffine heating lamp, 5 kronor; 1 grindstone, 6 kronor; 1 whetstone; 1 chalk line; 2 lathes, 50 to 80 kronor each; 1 oil can, 60 öre; turning-tools, in all, 7 kronor; 2 pairs calipers, 50 öre each; 3 saw-frames, 2 kronor each; 36 carving chisels, in all, 30 kronor; 15 sheath-knives, 2 kronor.

(Equal to 886.71 kr. = 484. 16s. 8d.)

APPENDIX BB.

Appendix BB.

PRÉCIS OF A REPORT HANDED IN BY SIGNOR GIOVANNI CUCCO.

Technical  
Instruction in  
Italy.

TECHNICAL INSTRUCTION IN ITALY.

The primary schools for boys in Italy are called Quattro Elementari, being divided into four standards, and in them are taught the ordinary rudiments of education. Boys remain at these schools till they are about 13 years old, when they either are sent to work, or go to other educational establishments for the pursuit of higher branches of study.

Primary schools  
in Italy.

\* The catalogue corresponds to the furnishing of the joiner's workshop in the Fredrikshald work school; the annexed prices are in most cases reckoned from the work school of the Bierman foundation in Kristiania, which received its tools from Fredrikshald.

32 ROYAL COMMISSION ON TECHNICAL INSTRUCTION :

Appendix BB. These establishments are of two kinds, classical and technical ; the former being divided into gymnasia, lyceums, and universities, and the latter into technical schools, technical institutes, and polytechnics. There was, however, a lack of technical education for those who had to leave the schools at 13, and who were unable from want of means to attend the higher schools. To meet this want, an agitation was set on foot by Signor Quintoni Sella, which ended in the formation at Biella of a professional school, of which the following is a brief description :—

Course of instruction. The course extends over a period of three years, and embraces Italian literature, arithmetic, book-keeping, elementary algebra, geometry, descriptive and applied, kinematics, applied mechanics, physical and mechanical technology, chemistry and its application to industrial arts, building construction, dyeing, drawing, plastic and engraving arts, and textile manufacturing. The school is furnished with laboratories fitted with ample apparatus, as well as with a large library and museum.

Laboratories.

How supported. It is supported by annual grants from—

	Francs.
(a.) The Government - - - -	12,000
(b.) Chamber of Commerce, Turin - - - -	3,500
(c.) Provincial Corporation of Novara - - - -	5,500
(d.) Municipality of Biella - - - -	5,000
The last also gives the school, the premises rent free, which is equal to an annual sum of - 4,000	
Total - - - -	30,000

Administration. The administration of the Institution is in the hands of a Committee of Advice, which elects the director, professors, assistants, &c., and reports to the Government on the condition of the school.

The teaching is divided into two sections, namely, that given in the daytime and that which is given in the evening and on Sundays, and is further divided into such courses as suit those intending to engage in large public works, engineering, textile manufacturing, and ornamental engraving work respectively.

All apparatus is provided by the school ; for its use a laboratory-fee of 16s. per year is charged to each student requiring its aid.

Examinations; diplomas. Examinations are held and diplomas and certificates are awarded to successful students.

Prizes. Prizes also are given each year to the best students.

Fees. The fees vary from 6 to 20 francs per annum, but these are dispensed with in the case of poor students who have shown themselves to be diligent.

Analyses and other experiments for the public advantage are performed in the school laboratories.

Appendix CC.

APPENDIX CC.

French  
Technical  
Art Schools.

FRENCH TECHNICAL ART SCHOOLS.

Memorandum by Monsieur L. ARNOUX.

EXTRACT FROM THE "MONITEUR DE LA CÉRAMIQUE," 1882.

The municipality of Paris are about to open a new special drawing school in the school buildings situated in the Rue des Petits Hôtels. It will be called the *École d'application des Beaux Arts à l'Industrie*.

*Handwritten initials*

The teaching will be gratuitous, and will comprise the practical science of drawing, painting, and decorative modelling and carving, architectural drawing, lectures on the history of art, and the analysis of the styles of various periods. Furthermore three technical studios (*ateliers d'application*) will be annexed to the school:—one for pottery, glass, and enamels; a second for carving in wood and ivory, and metal-work; and a third for wood engraving, designs for fabrics, decorative panels, tapestry, and mosaic work.

Appendix CC.  
French  
Technical Art  
Schools.

The number of pupils will be strictly limited to about 100, and the requisite knowledge for admission to the school will involve an acquaintance with the elements of the artistic and scientific facts indispensable for the practice of pottery and glass-working, carving and engraving on wood, metal work, designing for fabrics and furniture, the decoration of panels and of the different parts of the house.

All Frenchmen, without any distinction, who have attained the age of 15 years completed, will be eligible to compete at the entrance examination.

#### FRENCH ART SCHOOLS.

EXTRACT from the "MONITEUR DE LA CÉRAMIQUE," in reference to the Establishment of two new Schools in Paris for the teaching of Drawing, &c., applied to Industrial Art.

Deliberation of the Municipal Council (20th December 1882).

New school, Rue Ste. Elisabeth—Number of teachers, assistants, and salaries:—		£	s.	d.
1 <sup>o</sup> . Director, professor of architectural drawing	- - - - -	200	0	0
To be raised gradually to	- - - - -	240	0	0
2 <sup>o</sup> . Drawing master	- - - - -	112	0	0
To be raised gradually to	- - - - -	136	0	0
3 <sup>o</sup> . Modelling master	- - - - -	96	0	0
To be raised gradually to	- - - - -	120	0	0
4 <sup>o</sup> . Professor of mathematics and geometrical design	- - - - -	32	0	0
To be raised to	- - - - -	58	0	0
Assistant masters for each class	- - - - -	51	4	0

New school, Rue des Petits Hôtels—School of application for a defined number of artistic industries:—		£	s.	d.
1 <sup>o</sup> . Director, professor of architecture	- - - - -	200	0	0
To be raised gradually to	- - - - -	240	0	0
2 <sup>o</sup> . Professor for drawing and painting	- - - - -	144	0	0
To be raised to	- - - - -	168	0	0
3 <sup>o</sup> . Professor for modelling and engraving	- - - - -	104	0	0
To be raised to	- - - - -	128	0	0
4 <sup>o</sup> . Professor of mathematics and geometrical drawing	- - - - -	40	0	0
To be raised to	- - - - -	64	0	0
5 <sup>o</sup> . Assistant master for drawing and painting	- - - - -	96	0	0
6 <sup>o</sup> . " " for engraving and modelling	- - - - -	70	8	0
7 <sup>o</sup> . " " for mathematics and geometrical drawing	- - - - -	64	0	0

In both schools the assistant masters may be appointed masters after two years' teaching.

In both schools pupils who may be noticed for their *good conduct* and *regular attendance* will be entitled to money premiums (or purses) in the following way:—

3	purses for students of the 1st year, 10 <i>l.</i> ; 8 <i>l.</i> ; 6 <i>l.</i>
3	" " " 2nd year, 10 <i>l.</i> ; 8 <i>l.</i> ; 6 <i>l.</i>
3	" " " 3rd year, 12 <i>l.</i> ; 10 <i>l.</i> ; 8 <i>l.</i>

The students qualified for prizes will be proposed by the directors and professors, and approved by the committees appointed for the superintendence and improvements to be carried out in these schools.

Appendix DD.

Manchester  
Mechanics'  
Institution.

APPENDIX DD.

MANCHESTER MECHANICS' INSTITUTION.

DEAR SIR,

October 27, 1882

IN compliance with your request, I will endeavour to indicate some deficiencies in the course of study usually pursued in Art classes and School of Art connected with the Science and Art Department, having regard to the broad requirements of technical training and general utility. Train as I have been in the system, it would have been impossible for me to have brought an unbiassed judgment to bear upon the question, were it not that I have been for many years associated as teacher with that class of students who most require that the instruction they get shall be practical as possible in its bearings, so that in some degree I have been able to form opinions upon the utilitarian side of our system. I wish to be understood as dealing mainly with the elementary portion of the instruction, estimating, as I do, that 95 per cent. of our artisan Art students come within the range of no other instruction than that contained in what is known as the Second Grade course, which is perfectly and completely fixed in its nature and extent by the Second Grade examinations of the Department, which occur usually after about seven months of study. Thus the time is short, and the teacher, conscious that it is his main hope of remuneration, goes for the examination in the most direct manner he knows.

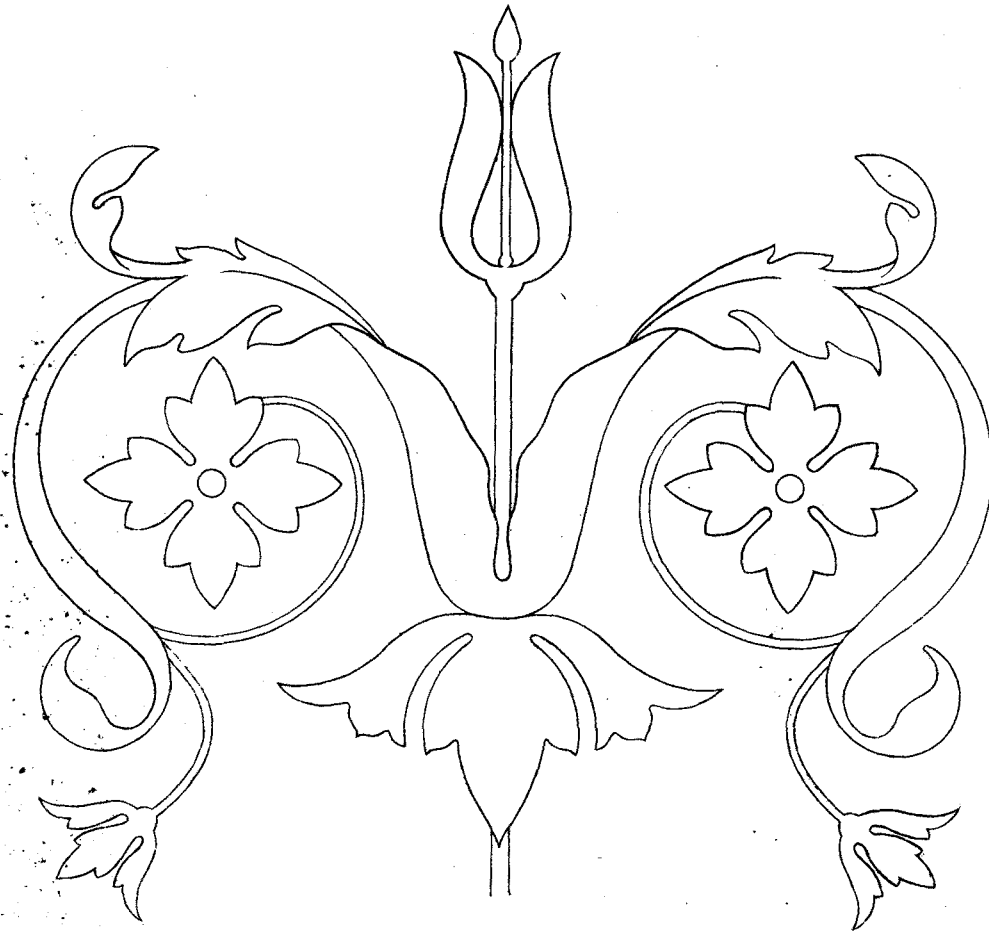
This course must be regarded as the preparatory or grounding course of our system, as it is the first upon which any grant is made for the teaching of artisan students, and it is divided into four subjects of study and examination, viz., freehand drawing from flat copies; model drawing in perspective; and plane with elementary solid geometry.

With regard to freehand from the copy, it will be at once evident, from the sample examination papers I send herewith, that the preparation necessary to enable a student to draw such a piece of foliated or flor ornament in a given time, does not constitute a grounding in the general principles of drawing, even if it were admitted that any course of drawing from drawings could do so. Without entering here upon this question I complain that this examination is at once too high and too narrow to be applied and prepared for by a general body of elementary students. It is too highly specialized to call for a general grounding in the principles of drawing. I should even regard it as being too highly specialized for a mixed class of designers and Art workmen, since, to reach the degree of manual skill it demands, in the working time comprised in the session of an Art class, many matters of more importance may have to be neglected.

It is, then, almost useless as a grounding in the principles and practice of general drawing, and but little less so as a special training for Art workmen; nor can it, I think, be defended as an incubator of correct ideas in good taste, being too narrow in its scope to be of material use in that way. The students receive through their preparation for this examination no grounding in the broad principles which should in all cases be the first care of the system, even for those whose ultimate desire is of a narrow technical nature. I believe that the course is much too abstract in its nature, since all such training as would tend towards enabling students to draw plants, implements, instruments, tools, utensils, arch tecture, the human figure, and objects of general occurrence, finds no place in it, neither, therefore, does it tend to store the memory with any useful or tasteful forms, such as constitute the materials of design and efforts of representation. On the other hand, it certainly does give in its own narrow field, great love for accuracy and refinement, together with manual control of a high order.

SCIENCE AND ART DEPARTMENT OF THE COMMITTEE OF COUNCIL, ON EDUCATION:

SECOND GRADE ART EXAMINATION PAPER.—FREEHAND.—T1.



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D

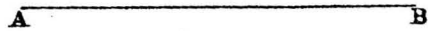
Copy in pencil, with a clear outline, the above figure, increasing the height to CD, opposite, and the width in proportion. No ruling, squaring or measuring of any kind is allowed. The Candidate must not *write* anything on this paper.

**One hour and a half allowed for working this Exercise.**

Fig. 1.

A  
⊙

Fig. 2.



⊙D

Fig. 4.



FIG. 1. Construct at point A a plain scale of 7ft. to 1 inch, showing 30 ft.

FIG. 2. On the line AB as base, construct an irregular five sided polygon. The side BC =  $1\frac{1}{4}$  in.; CD =  $1\frac{3}{4}$  in.; EA =  $1\frac{1}{2}$  in., and is perpendicular to the base. One diagonal AD = 3 in. Another AC makes  $30^\circ$  with AB.

Fig. 3.

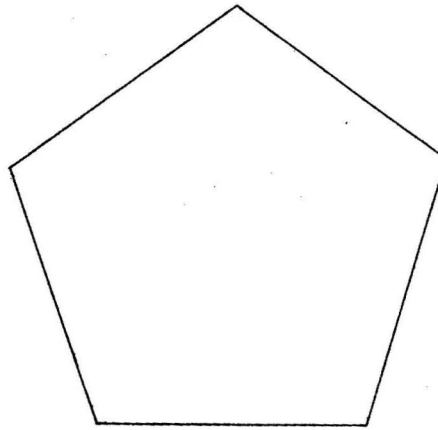


Fig. 5.

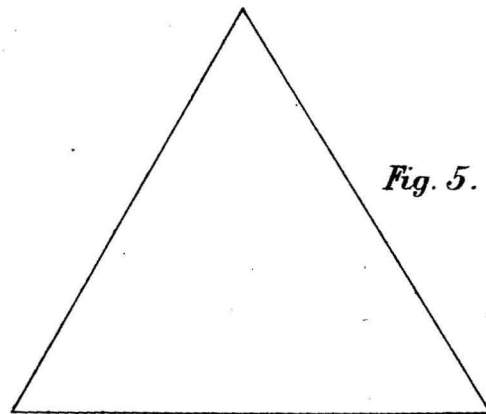


FIG. 3. Place a square in the given pentagon, each angle to touch a side of the pentagon.

FIG. 4. Draw a circle touching AB in point C, and passing through point D.

Fig. 6.

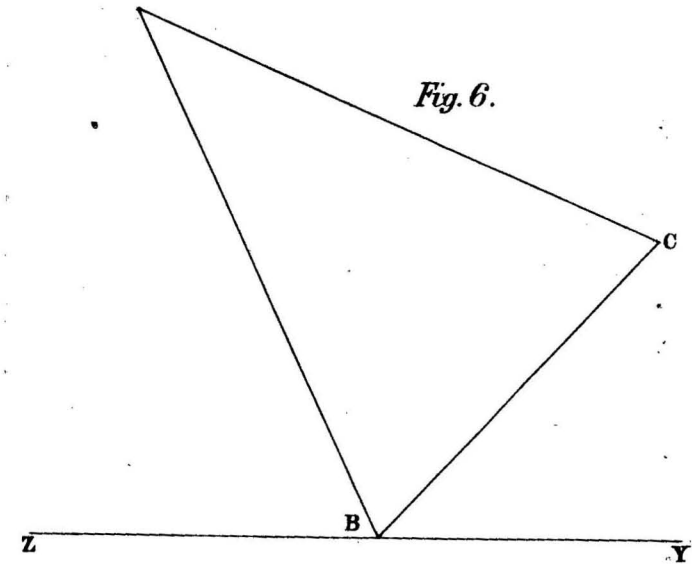


FIG. 5. In the given equilateral triangle place six equal circles, each in contact with two others and one or more sides of the figure.

FIG. 6. ABC is the elevation of a right cone. Give the plan of the solid.

The course in model drawing is of a sounder character, as it gives at least some of the instruction necessary for the drawing of simple objects, singly or in groups, when situated on a plane below the level of the eye. It is to be regretted, however, that the models used for the purposes of examination are very limited in number and abstract in character, so leading to a corresponding narrowness and unreality in the actual instruction. The models prescribed for study by the Department consist of the cube in solid and skeleton forms, the cylinder, cone, hexagonal prism, sphere, together with nine forms of vases. As the teacher has always the option of using a group of three of these objects in the examination, there exists a great temptation to work all the session at these models only, and not to introduce other forms to the notice of his students.

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I think it would be better for the Department to insist that the geometric models should not be used at all in the examination, but to test the power of the students in referring general objects to their geometric bases, and correctly drawing them with reference thereto. In addition to this, the drawing of geometric models alone, gives no power of managing even the simple detail which is found more or less on common objects, such, for instance, as handles, points of attachment, thickness of edges, &c., the proper drawing of which is a most essential part of a good representation. I have repeatedly experienced that students prepared for the geometric model examination of the Department fail in the drawing examinations of the University local examination schemes, because, in them, domestic and other common objects are given, bearing detail which they are totally unaccustomed to. I do not see why, if general drawing power is sought, the objects should always be placed below the level of the eye. As often as not in actual experience, we desire to draw things which are fixed in other positions, nor is there any reason why the models should be at a constant distance, and of a fixed size. Any such fixity of conditions is contrary to the spirit of the subject, and has a strong tendency to produce "cramming" for examination.

I may dismiss the subject of perspective by saying that in the Department system the representations are gained by methods which, though scientific and beautiful in their reasoning, are at once long, tedious, and never used in practical work outside the class-room. As usually happens where rules will supersede reasoning, the rules only are given, and our students of perspective work blindly according to them, so that they are quite unable to prove that their picture is correct when they have made it. Indeed, there must be very few students who even recognise that it is a mathematical operation upon which they are engaged, and that it is consequently capable of proof. The method which the architects employ is not less true, yet it is much easier to understand thoroughly, and much easier to learn practically, whilst being much more rapid and quite sufficient for all useful purposes.

Practically, linear perspective with the aid of mathematical instruments is only required for technical purposes by architects, and perhaps occasionally by engineers. All the practically useful perspective that is necessary for the common problems of representation comes naturally in the course of model drawing, and I think I should not hesitate to exclude linear perspective with instruments from an elementary course of drawing, since whatever slight good effect its study may have, if taken concurrently with model drawing, can be much less laboriously obtained by occasional references to perspective laws. I regard model drawing as including practical perspective, especially if care is taken to use objects of geometric form, so that the perspective effects may be readily discerned.

I send you a copy of the syllabus in geometry, and also a sample examination paper. From the former you will gather that an attempt has been made to give the subject a practical turn, an impression which will not, however, be confirmed by the examination paper. The questions on the construction of polygons, ellipses, scales, irregular figures to given angles and dimensions, are all most useful, as also is the elementary solid geometry. Drawing to a different scale simple geometric patterns is mentioned in the syllabus; but questions of the kind are very rarely given.



Appendix DD. The conditions specify that all lines used in working the problems must be shown, which is, I think, absurdly, held to include the working of right angles and parallel lines by ruler and compasses whenever they are required.

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The time of examination is too short, viz., one hour, as in most drawing, so that students are always nervous about not having time enough to do all they might do.

The paper would be much more interesting, and would encourage a more useful course of preparation, if, wherever possible, a practical word was applied to the questions. As, for instance, instead of "Construct a regular pentagon having an altitude of 3" let it be, "Show how you would cut out of a sheet of metal 12" wide the largest possible regular pentagon, scale  $\frac{1}{2}$ ." Did the examination assume this character nothing would be easier for the teacher than to show his students numerous useful applications of the subject which they would not otherwise learn. It should, I think, be regarded as an axiom as applied to the technical instruction of artisans that, unless the application is pointed out by the teacher, it will not be seen by the students. Every effort should, I think, be made to encourage the study of solid geometry. Representation in plan and elevation is of pre-eminent value for the purpose of conveying information about the solids and constructions used in the Arts, hence its value to the technical teacher is great. Being, as between him and his students, at once the vehicle of knowledge, the proof of its reception, a powerful auxiliary in its retention, its importance cannot, I think, be easily overestimated, especially as it confers a truly scientific imagination upon its possessor, giving a power over solids in their absence, rendering him able to understand the interactions of yet unmade combinations of solids, and how things may be best arranged to produce a required result with perfect clearness and accuracy. Its most immediate benefit is to enable the workman to understand common working drawings, and to produce, in the solid, things which may be, perhaps, obliquely represented on the paper.

I would take as a test of the soundness of a system of teaching elementary drawing that it should enable the student to draw with clearness anything he may meet with or be able to picture in his imagination, either from memory or invention, in a method suitable to the occasion, the object, and the requirements. This consideration leads to the conviction that our system must be broad enough to include at least types of all such objects as may be required to be represented, both natural and artificial.

I would take as an auxiliary test of the system that it shall tend to store the memory with natural or artificial forms of useful nature, and so produce the full memory necessary to designers and first producers. I should also prefer that the system should be negative in every possible way the idea of studying art for its own sake. Pure art, like pure science, is pure nonsense, at all events for the workman. I am afraid that our system has a distinct tendency to annul ideas of the usefulness of drawing and that it takes advantage of the docility and respect of its students to work them a moral injury by leading them through an inexperienced system. Practically, all useful objects are excluded from our Art school. It would not, of course, be possible to introduce all the useful and chaste objects into a drawing school; but surely such a school should possess such useful and chaste objects as have the well-defined form necessary to fit them for use as types of the classes of forms to which they belong together with good representations of them to serve as exemplars to the students.

Under the system of the Department the student of elementary drawing has no natural forms and the fewest possible artificial forms brought to his notice.

I would also prefer that the system should, as far as possible, arouse and intensify the imaginative powers, the faculty of internal picturing which I have referred to as being up to the present the special province of what is known as solid geometry.

I would reject entirely drawing from drawings, as not being drawing in a true sense, being too dangerously illnsory, and unnecessary for instruction in the drawing of actual things or abstractions thereof, such as the conventionalites of ornamental forms, &c. I would endeavour to inculcate refinement, accuracy, and good qualities in drawing by the near presence and inspection of manually executed exemplars possessing the desired attributes.

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I should desire that our system should be capable of endowing the constructive artizan with such powers as Mr. Naemyth claims from drawing in the following passage: "Sixty years' experience with engineering works, and with the mechanics and other classes of workmen engaged in such occupations, enables me to say that of all the useful acquirements beyond those of 'the three R's' is that of drawing. By the term drawing, I mean the art of representing the forms of natural or artificial objects by lines which, when even rapidly sketched by a practised hand and educated eye, can bring an object before you with a distinctness and rapidity such as no oral or written description could accomplish. During a long and active life, engaged in occupations in which I have daily occasion to communicate definite ideas to others in respect of forms and combinations of forms, the possession, to a certain extent, of the power of rapidly sketching such, in order to convey ideas of what I desired to communicate to others, has done me more real service than any other acquirement or faculty I may be in possession of. If we desire to produce really useful and effective men by means of our schools, let the pupils by every opportunity acquire this valuable art of hand sketching. . . . Nothing but a most earnest feeling of the practical importance of this subject would have caused me to venture to place it before your attention."

So the power of drawing with simplicity and clearness, though it cannot be regarded as technical education in itself, is at least the most important aid in effecting such training.

I would have, however, all artizans employed in the ornamental arts to regard drawing as a most essential portion of their technical training, giving them, in addition to manual skill, a true and accurate knowledge of their working materials. They should regard it as a harvester of the material forms of design, such as plants, animals, the human figure, instruments, implements, either in a natural or conventional dress, and as showing the fundamental principles of their application to the purpose in view, such as geometric distribution, contrast, and balance of tints, &c. To the purely constructive designer it should stand in place of the laborious task of model-making, in addition to teaching him graphically the details and principles of his work.

To the non-artizan student it should give a general power of making and fully understanding representations. It should give him standards of good taste, since he would not be permitted to draw anything in bad taste, or of extravagant and unchaste form.

I now venture to suggest the following course of work as comprising much that is essential:—

First attempts of children and untrained persons to consist of drawing straight-lined and simple common objects in various positions and at various distances. Such things as boxes (square and round), slates, simple bowls and ewers of various sizes, for attempts at perspective representation. For a more diagrammatic treatment, such objects as simple leaves, fans, wheels, scissors, hand mirror, spoons, casts of simple natural forms in low relief, certain musical instruments, &c., &c., might be used. In elementary day schools, at least, the children should draw the printed and written alphabet to a large scale, shading the thick parts by strokes or flat washes of colour. They should also draw maps with more or less generalized outline on prepared diagrams of parallels and meridians, and learn to flat-wash them with colour and print the names with neatness. To arouse emulation, each pupil, if possible, should have beside him a good drawing of a somewhat similar object previously executed by one of his more skilful fellow-students. A student is too certain to think a

Appendix DD. printed example inimitable, and will not try to imitate it, so much as he would try to imitate or improve upon a manually executed work.

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Concurrently with the above should proceed lessons in elementary plane geometrical constructions, and exercises therein; also making with ruler, squares, and compass simple drawings, from measurement, of simple tools, &c.; simple pattern drawing. Geometry usually arouses a more intelligent interest than arithmetic amongst young boys, because it is a handicraft, and because the reasoning is seen, being graphic, whereas in arithmetic it is hidden greatly by rules. I consider that geometry might most advantageously take the place of arithmetic to some extent in schools. Elder pupils should learn modelling in clay and papier-maché. Such work as making relievé-maps might usefully be done in the latter material. All work to be done in the presence of exemplars, such as the pupils might reasonably hope to equal or excel if they tried. Whenever a pupil equals or excels his exemplar his work should be purchased by money or a prize, and added to the school collection, a certificate stating the purchase, and the reason thereof being also given.

As a more advanced course, say in night classes, the student might learn to draw more difficult objects of all kinds and sizes in any position, at various distances and directions of view, for general perspective work. For refined drawing, the detail on such things, and the drawing of plants, leaves, natural products, tools, implements, instruments, ornamented vases, and objects of refined form. Drawing from bas-reliefs and round casts of animals, ornament, the human figure. Studying the essential forms of plants and flower petals, seeds, buds, leaves, details of branching, &c. Drawing from memory or imagination any common or well-known thing in any required position. The ability to add such slight, but well-managed, shading as will enhance the clearness of the representation of form or suggest the texture whilst not demanding too much time for its accomplishment. Pen and ink work, such as printing, and more especially lining-in drawings, would be advisable. Elementary modelling from natural forms, casts, and shaded drawings. Matching and laying tints in tempera and water-colour, forming diagrams of colour rules, contrast, and balance. Plane geometry. Space covering combinations of geometrical figures. Filling the same with tints of colour. Practical problems in geometrical constructions. (The wording of every problem or exercise to refer to some actual thing or things.) Scales, their use and construction. Practical solid geometry. Making different views of simple solids and constructive details, drawings and sections of tools and appliances, developments of surfaces, true forms, cuts and bevells. Isometric drawings and sketches of similar forms. Inserting dimensions neatly, drawing to one scale and setting off dimensions from another. Making freehand dimensioned sketches of constructions and finished drawings therefrom to scale.

Perspective by architects' method. All work to be done in the presence of exemplars of similar subjects previously executed by the more skilful students, so that each student may see what can be done, and thus, by having evidence of another's thought and care placed before him, be induced to think himself about the treatment of his own subject with reference to such matters as the qualities of the line, selecting point of view, introduction and management of shading, position on paper, suggesting perspective, suggesting texture, &c. &c. All sufficiently good work to be purchased for use as exemplars, such drawings being either framed and glazed, varnished, or gelatinized, to protect them from injury. Such a system would, I think, be worked with a minimum of labour, when once the collection of exemplars was completed. At the same time it would be progressive, since the best exemplars would sooner or later be excelled.

The students should be encouraged by prizes to draw, away from the class, tools, instruments, utensils, ornaments, natural forms, new constructive arrangements, or anything which may interest them in their workshops or homes, either by the freehand or geometric method, with the object of giving them an aptitude of application in actual life, of the class-room training.

It would be unadvisable to make all the subjects I have mentioned compulsory to all students. Whenever the work of a student's life is decided upon he should be allowed to spend by far the greatest portion of his time in studying subjects which have bearing upon it. Thus art-workmen and designers would spend much time in drawing and learning from nature the material forms suited to their work; reading the principles of their work, their progress being tested by sufficiently frequent examinations requiring written and graphic answers. Lithographers would practice stippling, &c. &c. All artizans engaged in the art trades would be encouraged to undertake the preparation of sheets of specimens of work bearing upon their respective trades, such sheets having a high commercial value when applications are made for situations. In fact, some employers decline to employ persons who have no specimens of work to show.

Appendix DD.  
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The 23 stages of instruction defined in the Art Directory of the Science and Art Department specify many of the subjects I have mentioned above, and the perusal of them would lead to the impression that we have already a fairly practical system in operation.

It is, however, the incidence given to the grants in aid of instruction which entirely determines the kind of work done in the classes. The Department has a most complete command over the work done in its classes, inasmuch as *all drawings* done in them are annually gathered to South Kensington, and are there submitted to an examination which fixes, in large proportion, the grants due to the classes and schools, and the amount allowed upon the instruction of each individual student.

Having such a system as this, it should be easy to effect a change, for let an alteration be made, after due notice, in the incidence of the grants upon different kinds of work, and an immediate change will follow in the character of the work done.

There is, perhaps, one obstacle in the way. The number of works sent up is now so large, being last April 300,000, that an efficient examination of them cannot be made because of the large amount of labour involved in it, together with the virtually duplicate examination of the same students by means of the papers locally worked in May. I see no reason for this double testing; and, as the shortest way of commencing reform, I would sweep away the local examinations. What more can be required, in order to estimate the degree of merit, than that the whole session's work of the student be submitted for inspection? The sum of the internal evidence as to industry, progress, and attainments contained in such a set of drawings is infinitely greater than can possibly be gleaned by the examination of a single hour's work.

I regret that I have not been able to include even within the compass of this long letter all the information I had desired to convey with reference both to the matters discussed within it and to others upon which I have not touched, such, for instance, as the technical value of the more advanced work of our schools, and the changes I would propose in it with the object of increasing its value to persons engaged in specified artistic handicrafts, the possibilities and means of forming connections between the schools and the art workshops, and several other matters of like importance.

I am,  
 Faithfully yours,  
 (Signed) W. E. CROWTHER.

To Professor Henry Roscoe, F.R.S.,  
 The Owens College,  
 Manchester.

P.S.—Certain objections have been raised to the system of art teaching advocated in my letter. It is urged, for instance, that, if the Department awarded grants entirely by examination of drawings, there would be great danger of an unfair quantity of the master's skill being spent upon some at least of the drawings sent up for inspection. If the Department, under the present system, can make sound awards in respect of all the most

Appendix DD. important prizes and medals, and also distribute the greater portion of the total grant upon inspection of the works sent up, this mode of judging should be sufficiently sound to be extended. It is undeniable, however, that abuses in the way of unfair helping do exist in certain schools, and if a still greater proportion or the whole of the grant depended upon the work sent up, such abuses would probably become increased, unless the Department definitely interdicted any work being done by the master upon the drawings sent to the examiners. Whatever system of teaching a master adopts, it is distinctly unfair that his work should in any degree be made the subject of an award. It is not necessary that there should be any danger of this, as a master's manual illustrations can be as well done marginally as on the actual drawing. I think the Department would be justified in issuing a well-considered set of rules to the Art Schools, and this interdiction might form one of them. (Such rules to be sent out ready mounted for hanging permanently in the school.)

The preparation of such exemplars as I recommend would probably in the beginning fall to a considerable extent upon the masters, and, I think, properly so. The graphic reproductive processes are, however, available for the multiplication of the drawings so prepared. Such reproductions to be used *pro tem.*, that is to say, until a collection of manually executed exemplars had accumulated through some such process as the following. When the works are sent up in April, let those drawings which the master would desire to have as exemplars be marked by him. These, if approved of by the examiners, would carry a sufficient grant to effect fairly their purchase from the student, together with a certificate of purchase and a prize. Such drawings should then be fixed, varnished, or otherwise suitably treated, and sent back to the school in a permanent form. To such drawings might be affixed any desirable examiners' notes. The master would thus be at liberty to form such a collection of exemplars as would best suit the needs of his school and benefit its locality, and it would become the object of his ambition to possess an imposing collection, such as would be a clear expositor to strangers of the work done in the school, a valuable guide and incentive to students, and a strong element in the prestige of the school. (The power of compulsory purchase might be another of the proposed set of rules.) The system of instruction would consist, from beginning to end, in the drawing of actual objects, with the guidance of oral instruction from the teacher, and an actual piece of similar work approved by a South Kensington examiner and possibly annotated by him. The incentives would be the hopes of purchase, certificate, and prize, together with the pleasure and interest which comes from doing actual work. Further, in the case of artisans, there would exist the feeling of improving in their art or industry.

Middle class students might not, in some cases, like to have their drawings compulsorily purchased from them, but artisans, as a rule, would be glad of it.

Permit me to recommend to your notice a pamphlet issued by Messrs. Rand, Avery, & Co., 117, Franklin St., Boston, entitled "Lectures upon Drawing," by Walter Smith.

I am,  
Faithfully yours,  
(Signed) W. E. CROWTHER.

P.P.S.—With the object of encouraging the study of modelling, might not the Department accept photographs as evidence of the class-work in this subject, and award its grant upon an inspection of them? It is difficult otherwise to make evident at South Kensington the progress of a provincial class in modelling, and, as a consequence, this study has been greatly neglected. Wet models in clay photograph extremely well. No casting in plaster would be required. Photography would be introduced into art schools. Students would get a record of their work. If necessary or advisable, glass positives could be sent to be examined with the aid of a lantern and screen at South Kensington, so that no printing would have

to be done. If you consider the suggestion of value, I will send some prints and glass positives of specimens of elementary modelling, in order that you may judge whether they could be made the means of estimating a student's progress. After mature consideration, I am able to say that I feel sure such a scheme would greatly encourage the direct study of form.

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The want of contact between the Art schools and the industries for whose benefit they exist is, in my opinion, the cardinal defect of our present system. If such contact could be brought about, the necessary utilitarian reactions would at once follow. Some points of contact might be easily established, such as the institution of a custom amongst employers of applying to Art schools for their apprentices and young workmen in those cases where artistic skill is essential. Nor would it be difficult to make the Art school of a town the recognised centre for such odd jobs of designing and drawing as may be required by the manufacturers in the neighbourhood who do not keep designers or draughtsmen upon their own premises. The introduction of practical workshop art into the schools so far as it is practicable, as, for instance, drawing on the lithographic stone or grained paper in litho ink or crayon, drawing on the wood block for wood engraving, line and scroll exercises on the copper plate for young engravers, wood-carving, modelling in clay, modelling in wax as employed by jewellers and fine metal workers, ornamental lettering, the drawing of plants and other things in a style suitable for designing. The preparation of specimen sheets of drawings bearing upon particular trades I have already referred to. Endeavours should be made to give the Art school, or at least the technical portion of it, something of the character of an art workshop and emporium for the district.

If Art study is to become practical and useful in its bearings, the time spent upon each piece of work should be noted upon it and taken into account in estimating the value and success of the student. Our English art student takes no note of time. This surely is a very unpractical trait. With a view to the correct appreciation by the examiners of the progress made by the students, the Department should at least require that the sheets be fastened together in the order of their execution. The system of sending up drawings to South Kensington has gradually developed to comparatively overwhelming importance compared to the local examinations, yet the rules for sending up the drawings are the same now as when only advanced works were sent.

In my opinion there is great need of systematization in this, the most important, function of the Department.

Grants upon a higher scale should be made upon the works of bonâ fide art workmen than those of amateurs. This could be managed by taking an employer's certificate when such grants are claimed.

Note on teaching the values of lines.—A student, it is true, imitates these values when working from a flat outline copy, but without understanding them. And, though imitating, he is not applying these values to the solution of any real problem in representation, and cannot therefore learn that which he is not trying to learn, viz., the means taken to ensure correspondence of impression between the drawing and the object.

It is erroneous to suppose that, when working from the flat, he will store his mind with values which he will apply on being set to draw the real object, for even if his teacher explains these values to him (a proceeding not necessary to the immediate object in view) his remarks will fall unheeded or partially so, since they do not apply to the problem or work in hand, and so will not be appreciated and remembered. Theoretical art instruction is not assimilated by artisan students unless it has an immediate practical application of some kind.

To allow the student to fall into a difficulty, only in order that he may be rescued from it by theory, is often the only means of impressing the value of theoretical instruction upon him.

In teaching the art of drawing, I believe that the right way is to use flat examples, to show what is required, and to illustrate some of the necessary explanations, but to require the drawing to be made from reality. A flat copy represents a solved problem. Will the copying of such a solution confer the power of solving a similar problem?

Appendix DD. Is there any reason why the annual summer courses of teachers' training lectures at South Kensington should be confined to scientific subjects and science teachers? These courses were first suggested by Professor Huxley, and have resulted in much benefit to science teachers. I think the principle of the suggestion applies with equal force to art, and that its application would do something to remedy the present lack of theoretical teaching.

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I would strongly urge upon the Department the advisability of in some way recognising the home work of students, as by (1) allowing such work to be included in the sets of drawings sent up for inspection, (2) by the provision of separate grants and prizes for such work.

The educational influence of voluntary home work or private study is of a thoroughly healthy nature, and should be encouraged.

I think that a special grant might be made to any school which forms and maintains a museum or collection of examples illustrating the contemporaneous state of such art industries as may be carried on in its neighbourhood, with special reference to the processes employed.

A school should endeavour to arrange for the occasional visits of such managers or foremen of art workshops as can be induced to interest themselves in the teaching. From such persons the master would learn with accuracy the precise wants of the locality. Indeed, only from such persons can they be learnt.

#### FIRST AND SECOND GRADE ART.

##### SYLLABUS OF SUBJECTS OF EXAMINATION.

###### I. FIRST GRADE ART.

The subjects of examination in elementary drawing of the first grade are—

1. Freehand drawing from flat examples.
2. Freehand drawing from models.
3. Practical geometry.

These examinations are of a very elementary character, being intended for the children of elementary day schools only.

###### (1.) *First Grade Freehand Drawing.*

By freehand drawing is meant drawing without the aid of any kind of mechanical means of execution, such as ruling, measuring, or tracing, or the use of anything but pencil, paper (or slates), and india-rubber.

The very simple character of the first grade examination in this subject will be understood from the following specimens, which are reduced to about two-thirds of the size of the examples actually set in the Department's examinations (see p. 44). The children are required to draw their copies on the papers on which the examples are printed, one half of the same side of each paper being left blank for the purpose. An F or HB pencil is the best for outline work. Care should be taken not to press so heavily with the pencil as to indent the paper, as the lines which may have to be corrected cannot then be so easily rubbed out; and by drawing too heavily the hand is cramped, and freedom is lost.

###### (2.) *First Grade Model Drawing.*

In the examination in first grade model drawing, candidates are required to draw the outlines only of two simple solids, or other objects, of different form, arranged so that the candidates may have to draw both curved and straight lines. The candidates must be so seated as to be able to see more than one side or end of at least one of the models, and they are expected to be able to make a freehand copy of the models as they appear from the position in which each candidate happens to be placed.

No ruling, measuring, or use of instruments is allowed in working this exercise.

(3.) *First Grade Art Geometry.\**

Appendix DDA

## FOR CHILDREN IN ELEMENTARY SCHOOLS ONLY.

Manchester  
Mechanics'  
Institution.

The instruments required are a plain scale of inches divided into eighths, a pair of dividers, a pair of pencil compasses, two set squares, an H. pencil, and a piece of india-rubber; a drawing board and T square, although not indispensable, are very desirable.

This stage is intended to teach elementary notions of practical geometry, and the use of simple drawing instruments.

The pupil should be taught to draw clean, join lines passing fairly through indicated points, and the greatest care should be exercised to prevent the formation of slovenly habits, such as using both hands to the dividers, or forcing their points into the paper. He should then be shown how to take given distances from the scale, and step them along a given line, and he should be practised in the use of set squares for drawing lines parallel and perpendicular to each other.

By the help of the blackboard the teacher should explain and define an angle, a triangle, a square, a rectangle, a circle, &c. The pupil may then be practised in such simple exercises as the following:—Construct a square or rectangle, the lengths of the sides being given in inches and eighths. Divide them when drawn into a given number of equal parts. An irregular four-sided figure is roughly sketched on the blackboard; the dimensions of its sides and diagonals are given. Draw the figure its proper size. Neatness and accuracy should be insisted upon, and, if unsatisfactory in these respects, the figures should be withdrawn. It is desirable to accustom the pupil to the erasure of superfluous lines or portions of lines, and to the employment of "dotted" or "chain-dotted" lines and arcs to distinguish lines drawn for constructional purposes.

The examination will be confined to examples in the following constructions, and equal value will be attached to neat drawing and to geometrical accuracy.

1. The division of a given line into a given number of equal parts by trial with the dividers, and also by construction.
2. To draw lines parallel and perpendicular to given lines by means of the set squares, and also by construction.
3. To construct an equilateral triangle and a square of given sides.
4. To construct an angle equal to a given angle.
5. To bisect a given angle.
6. To construct a triangle, given the sides, or sides and angles.
7. To construct a triangle similar to a given triangle and standing on a given base.
8. To describe two circles of given radii touching each other.

## II. SECOND GRADE ART.

The subjects of examination comprised in the second grade course are these four:—

1. Freehand drawing from flat examples.
2. Freehand drawing from models.
3. Practical geometry.
4. Perspective.

The second grade examinations are of a considerably higher standard than those of the first grade, though still elementary. One hour and a half is allowed for working the exercises in freehand drawing and perspective, and one hour for model drawing and geometry.

- Teachers of Public Elementary Schools are also required to pass in—
5. Drawing on the blackboard.

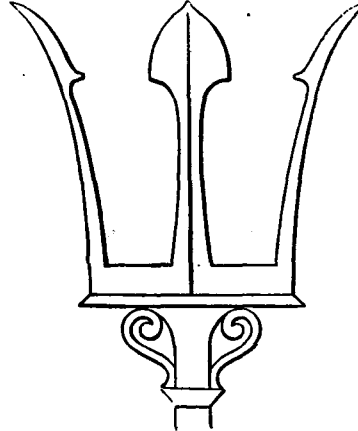
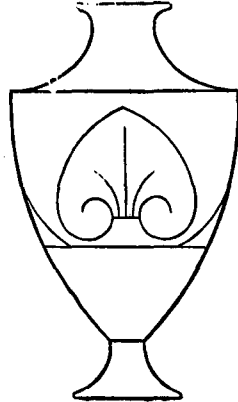
(1.) *Second Grade Freehand Drawing.*

See the specimens of Second Grade Freehand examples given on the following page. An F. or HB. pencil is the best for outline work. Care

\* The course of practical geometry prescribed for the Art examinations of the 1st and 2nd Grades may be considered as preliminary to the study of Science Subject I, as well as to the Art examinations of the 3rd Grade.



*Specimens, in a reduced size, of First Grade Freehand Drawing Exercises.*

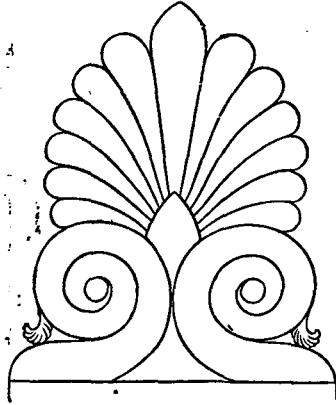


Write here—

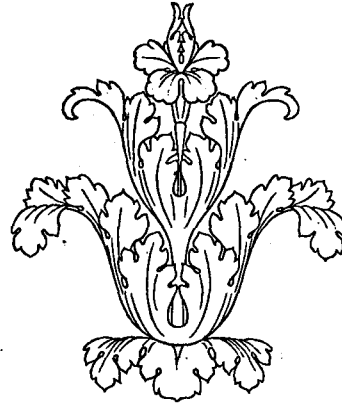
1. Your Name at full length \_\_\_\_\_
2. Your age \_\_\_\_\_
3. The Name of your School \_\_\_\_\_

The copy may be required to be drawn a little larger or smaller than the example.  
An HB or F Pencil should be used.  
No ruling, measuring, or tracing of any kind is allowed.  
Forty minutes are allowed for this exercise.

*Specimens, in a reduced size, of Second Grade Freehand Drawing Exercises.*



A.



B.

Candidates for Examination in Freehand Drawing of the Second Grade are required to draw, from a copy, outlines like the above, either enlarged or reduced in size. No ruling, measuring, tracing, or use of instruments is allowed.  
One hour and a half allowed for working this exercise.

Appendix DD.  
 Manchester  
 Mechanics'  
 Institution.

should be taken not to press so heavily with the pencil as to indent the paper, as the lines which may have to be corrected cannot then be so easily rubbed out; and by drawing too heavily the hand is cramped, and freedom is lost.

(2.) *Second Grade Model Drawing.*

The exercise in this subject consists in drawing from a group of three or more objects of well-defined form, such as geometrical models, simple vases, or objects of plain construction. The Candidate is required to draw the objects placed before him as they appear from the point of view in which he may be seated, and Candidates are expected to show a knowledge of the effect of perspective in modifying the appearance of the models.

No ruling, measuring, or use of instruments is allowed in working this exercise; but the pencil may be held between the eye and the objects for the purpose of estimating their apparent relative size.

(3.) *Second Grade Art Geometry.*

The instruments required in this stage are the same as before (*see p. 41*), with the addition of an inking pen to the compasses, a drawing pen for lines, a protractor, and a set of scales on a six-inch rule.

This stage is intended to embrace simple plane geometrical constructions relating to lines, circles, and tangents to circles. The pupil should be shown how to hold a drawing pen, and practised in ruling ink lines and describing ink circles of different strengths. Indian ink should be used, as ordinary inks corrode and destroy the nibs of the pen.

A general idea of the form of such simple solids as the cube, pyramid, prism, cylinder, cone, and sphere, is to be imparted at this stage. For this purpose models should be employed. By means of sketches on the blackboard the elementary notions of orthographic projection and of section should be explained.

The examination paper will embrace the following:—

*Plane Geometry.*—Elementary constructions required in geometrical pattern drawing and simple tracery. Construction for circles passing through three given points, or touching three given lines. Tangents to two circles. Construction of regular polygons by any general method, together with their inscribed and circumscribed circle. Construction of irregular polygons from given sides, diagonals, and angles. Proportional division of lines. Reduction and enlargement of plane figures. The use of plane scales and scales of chords. Elementary construction of the ellipse. *Solid Geometry.*—Plan, elevation, and section of the solids above named, in simple positions. Projection of plane figures.

(4.) *Perspective.*

In this exercise candidates will be required to show a knowledge of the use of vanishing and measuring points used in horizontal planes; and to represent simple solids, or objects on the ground plane in any position.

(5.) *Drawing from Memory on the Blackboard.*

This exercise is intended to test the candidates' power to use, in aid of their general teaching, the skill which they may have obtained in drawing. In addition to facility in the use of chalk and the black-board, it is required that they should be able to give a fair representation of the form of any familiar object. To do this from memory should be the result of sound instruction in model drawing, in the course of which teachers of drawing should form in their pupils habits of observation enabling them to represent familiar objects in any point of view. Candidates will therefore be required to draw from memory one of three or four objects of ordinary household furniture or domestic utensils of well-defined form, to be named by the examiner.

Candidates will also be required to draw Roman or Italic letters about nine inches high.

Ten or fifteen minutes are allowed for working this exercise.

## APPENDIX EE.

Appendix EE.

## TECHNICAL EDUCATION IN WURTEMBERG.

Technical  
Education in  
Wurtemberg.

TO THE ROYAL COMMISSION ON TECHNICAL INSTRUCTION.

GENTLEMEN,

I HAVE during the past 30 years been in correspondence with Doctor von Steinbeis of Stuttgart, who presided over the creation and development of the Wurtemberg system for the advancement of agriculture, industrial pursuits, and technical knowledge. I have much pleasure in testifying to the efficiency of the system. After the war, Wurtemberg was left in a state of great prostration, improved machinery was unknown, and trades were carried on upon the old Bethnal Green system. By means of instituting local and central exhibitions, by training industrial teachers, by transplanting trades from other countries, and watching over them until they rooted, Doctor von Steinbeis converted a population without mechanical knowledge into one carrying on most of the small trades practised in Europe. This has helped the agricultural interest very much, as it has provided a manufacturing population close to the farmer. The expenses have not been excessive, about 150,000*l.*, a year. Mr. Julius von Diefenbach has succeeded Dr. von Steinbeis as President; he formerly resided many years in England. I strongly recommend the Commissioners, or whoever introduces the Wurtemberg system into Ireland, to ask the Wurtemberg Government to allow Mr. Julius von Diefenbach to spend a year in Ireland, so as to implant the system throughout the whole of that country at one time. This system would bring the local people together, and would also bring consumers to the immediate neighbourhood of the farmers. I strongly approve of Mr. Harris's report. I may add that 30 years ago I never thought that Dr. von Steinbeis would succeed, but that year by year I have seen the wisdom of his plans, which I feel sure, if carried out in Ireland, would be of the greatest service to the people.

Yours truly,  
(Signed) ALFRED TYLOR.

## APPENDIX FF.

Appendix FF.

MEMORANDUM BY MR. T. R. ABLETT on the TEACHING OF DRAWING.

System of teaching  
drawing under the  
London School  
Board.

The Offices of the School Board for London,  
Victoria Embankment, London,

February 5th, 1884.

SIR,

IN response to your letter stating that you were directed to ask me to be good enough to furnish a brief statement with respect to the teaching of drawing under the London School Board, and the system I advocate, I am happy to forward the following account:—

Section A. is a statement of facts as to the instruction actually given in the schools of the Board.

Section B. is a statement of the system I advocate.

## Appendix FF.

System of teaching drawing under the London School Board.

## SECTION A.

*Statement as to the teaching of Drawing under the London School Board.*

The School Board for London has passed these, among other regulations:—

- “1. In every department of a school there must be at least one teacher with a full drawing certificate (D).
2. Two hours a week in all boys' schools, and one and a half hours a week in all girls' schools must be devoted to drawing. (The hours of attendance per week are 27½.)
3. Every school must submit its pupils to the examination by the Science and Art examiners.”

There is an annual exhibition of the best drawings made in the schools. The pupil-teachers are taught drawing at the central classes formed for their general education, at each of which an art class has been recently established under the Science and Art Department.

A grant for instruction in drawing is allowed by the Science and Art Department, but the subject is not included in the New Code of the Education Department, Whitehall, except as part of the instruction for pupil-teachers.

The success of the teaching of drawing in the schools, as shown by the Science and Art Department's examinations, is of the most varied description. For the information of the Board and for purposes of comparison between school and school, the results of these examinations are represented each by a numerical value. During the year ending September 30th, 1883, the highest number gained, in this comparison was 302·3 as showing the most successful of the boys', and 5·6 as showing the least successful of the girls' schools. The average numbers gained in the schools has risen from—

	Boys' Departments.	Girls' Departments.	Mixed Departments.
Half-year ending:			
March 1883	101·5	49·8	55·4
March 1884	135·5	71·9	119·1

Some years ago, owing to the lack of teachers holding the full drawing certificate (D.), the Board gave a sum of 5*l.* annually to each teacher possessing this qualification. The sum paid on this account for the year ending September 30th, 1883, was 8,860*l.* Under the recently adopted scheme of giving an inclusive salary, this payment will not be made. The teachers received, for the like period, about 5,000*l.* as grant from the Science and Art Department for success in drawing, that is, on the average, a payment of 25*s.* to each of the 4,000 teachers.

Many head teachers, on my earlier visits to the schools, told me that drawing was not taught with the same vigour as the other subjects, because success in it was not essential to their reputation, and because the grant from the Science and Art Department had diminished. In one of the schools, still amongst the most successful, the grant was (1880) 16*l.* 12*s.* 3*d.*, (1881) 12*l.* 17*s.* 2*d.*, (1882) 9*l.* 4*s.* 4*d.* I found on my unannounced visits, many schools not teaching drawing during the time set down for it on the time-table.

The teaching of drawing is much more vigorous in the boys' schools than in those of the girls. A greater proportion of the teachers of the former hold the drawing certificate (D).

Since my appointment, I have been occupied in visiting the schools, superintending the teaching of the pupil-teachers, lecturing on methods of teaching, and in assisting a body of head and assistant teachers to work for the Art Class Teacher's certificate.

One or more of the following subjects are taught:—

*First Grade.*—Freehand, geometry, model, drawing to scale.

*Second Grade.*—Freehand, geometry, perspective, model, and drawing on the black-board.

*Third Grade.*—Freehand, geometry, model, and shading.

The work of the children is chiefly of the first grade, and the work of the pupil-teachers is entirely of the second grade. At the Saffron Hill School of Art the head and assistant teachers are working at the third grade.

Appendix FF.  
System of teaching drawing under the London School Board.

The qualifications of those who teach the pupil-teachers are not, as a rule, sufficiently high.

Of the subjects of instruction, the freehand drawing, which is practised almost entirely from outlines of conventional forms of a decorative character, unintelligible to the vast majority of the pupils, is uninteresting. The hard lining in, also, which is insisted on and can never be skillfully performed by young students, encourages an unfeeling habit of making lines directly opposed to artistic drawing. No practical application is evolved from the geometry, and the model drawing is little less than a failure. In the few schools in which the last subject is taught, the great majority of the children, who are carefully trained in drawing the models given in the examination, do not really grasp the idea that the appearance of an object differs from its real form, and if required to represent a simple object, such as the glazed panel of a door opened towards them, in the delineation of which they have not been coached, do so as though entirely ignorant of the first principles of drawing from objects. Drawing to scale, recently introduced, may, it is thought, prove useful if made more practical and not too difficult.

The fluctuating standard of the examination, held by the Science and Art Department, is said to be very prejudicial to the best interests of the drawing by seriously discouraging the teachers.

#### SECTION B.

##### *Statement of System advocated.*

The teaching of drawing in elementary schools should have first an educational and then a technical character. Respecting the *educational benefits* to be derived from it, which are not yet generally acknowledged, I need not quote the words of Professor Huxley, Mons. Guillaume, Mr. Herbert Spencer, and others. They may be summarized as being,—

System advocated.

1. The development of habits of,—
  - a. Precision.
  - b. Accurate observation.
  - c. Delicate manipulation.
2. An increase in,—
  - a. The powers of description (a sketch is often the shortest and best description).
  - b. The capacity for enjoyment and culture in the realms of natural beauty and of art.

What sort of drawing is likely to secure these gains to the children of the poor who come chiefly from pictureless homes, having had little or none of the unconscious training of the eye and mind which the children of the well-to-do receive from pictures and picture books? A plentiful supply of pictures on the school walls will supply the information illustrations give, and which other children get at home as a matter of course. These should be of high excellence, and, above all things, deal with subjects attractive to children. The illustrations usually contained in the picture books of the nursery will naturally take a prominent place. Reproductions from the old masters, however valuable or attractive to adults, are generally beyond the comprehension of ordinary children. The drawing lessons should excite the interest to the greatest possible extent, and be adapted with great nicety to the powers of the intelligence. Good drawing can only come from intelligent and zealous effort on the part of the pupil. Instead of a dreary discipline of copying the lines of decorative forms, meaningless to the young, it would be much better to give practice in outlining from common flat objects (placed so as to present no difficulties of foreshortening), such as slates, books, kites,

Appendix FF.  
 System of teaching drawing under the London School Board.

shovels, dishes, &c., which are familiar and real. If outline copies are used, let them be made attractive by the addition of colour. Children delight much more in colour than in form, and need to be tempted to draw outline well. Learning the curves of written letters may be made to train the powers of observation and the graphic memory, if writing and drawing are taught by the one kind of stroke natural to children, and which is acquired by finished artists. It is an open question whether the plain line of the drawing teacher might not be entirely laid aside. The judgment at sight of the length, proportion, and inclination of lines may be taught with or without any drawing by the employment of apparatus made for the purpose. Young pupils should be provided with a ruler marked with inches and the simple divisions of an inch, and use it constantly until the judgment of length at sight is somewhat developed. Coloured written drawing, combined with the drawing in outline of common objects, furnishes a means, I believe, of developing good writing and drawing at an early age. Geometrical and model drawing should be in hand, and be at first entirely practical. After representing a rule and measure the real dimensions of an object, geometrically, a glass plane should be used on which to trace experimentally its apparent shape. The differences in the result having been pointed out, a drawing should be made by each pupil of the appearance of the object in application of the knowledge gained. Model drawing should be a real power gained by delineating the objects of everyday experience. The present system of teaching this subject from cubes, cylinders, prisms, and the like, calculated to lead to the belief that it is a mysterious process only to be employed in representing odd-shaped figures made especially for the purpose. When a student is so far advanced and interested as to be able and willing to work alone, the solution of knotty little problems of model drawing will be pleasing. Put at the beginning of a course, they produce listlessness. The drawing of objects bounded by straight lines or simple curves may be speedily acquired if practice is given from those which have a size so large that the effects of foreshortening and perspective can be readily seen by the pupil when holding the pencil between the eye and them.

The first principles of solid geometry can be experimentally shown, as well as simple methods of drawing plan and elevation, without the aid of much practical plane geometry. The processes of the latter, however, may be made interesting if employed in working figures combined and coloured so as to form pleasing patterns.

Dictated drawing necessitates the employment of a precise language between teacher and pupil.

Memory drawing makes it necessary to look well and intelligently in order to retain that which is seen as so much preserved observation.

Much finish ought not to be required in early efforts, as the intelligent must not be held in abeyance for the sake of developing a mechanical precision, which would come of itself, in course of time, without causing the disgust it now so often does. Any system that leaves the children without less delight in, or enthusiasm for, drawing at the end of the course than they had at the beginning is a failure. Industrious, clever children, with only average ability for drawing, will, by steady perseverance, gain skill in any kind of work given them. Those who have the special aptitudes of ingenuity, and imagination of the artist are precisely those who lose interest and become listless in plodding through a course of work which they find distasteful. At present, so far as I can see in the London Board schools, in the middle class schools with which I am acquainted, and from the experience which I gained as an examiner for the Science and Art Department, we bring to the fore those who have no particular talent, and "snuff out" the really gifted scholars.

Some there are with quick intelligence, but little manual dexterity, who can benefit by a training in drawing without ever being able to produce good drawing.

The drawing that all can learn should be taught to all, and form a definite part of elementary education as does writing. If it were included in the code and examined by Her Majesty's Inspectors, which

could be economically done, it would, I believe, soon be as well taught as that subject. Appendix FF.

That art may reach its full development in England, drawing must be an essential subject in all schools. The producer has but a poor field open if the consumer is uncultivated. As bearing on this, I may say, that after seeing the elaborate system of teaching drawing and modelling at the Ecole Turgot, Paris, I learned from the annual publication of the "Association Amicale" of the school that, out of some 1,500 old pupils, about 150 by the widest estimate had betaken themselves to art work, two of these only being picture painters, and three sculptors. The Lycées have much the same course of work, and the elementary schools have a syllabus much beyond that provided for our young people.

System of teaching drawing under the London School Board.

Respecting the *technical character* of drawing, it may be said that the drawing, which is of value to the art workman, and that which is the written language of the workshop, can be properly taught only by specially qualified teachers, and inspected and examined only by experts.

Lectures on methods of teaching drawing are not of the benefit one could wish, to teachers in elementary schools, because they have so little skill in artistic drawing. Such drawing as freehand, geometry, and perspective of a mechanical kind, forms the chief part of their training. Pupil-teachers and students at training colleges appear to require instruction from more highly qualified teachers.

Those children who have obtained some skill, and who show special aptitude, should be drawn together at a convenient centre and receive their lesson from a person accustomed to deal with such pupils and specially qualified in drawing. Good artistic drawing is the root of all art work. This appears to be felt and acted upon more strongly in France than in England.

The work at such centres should be, at first, advanced model drawing, special stress being given to the effect of foreshortening on curves, and drawing from objects with rounded surfaces, such as casts large enough to enable the teacher to illustrate with unmistakable distinctness each principle of good outline drawing. The use of the brush should be encouraged as much as possible in the representation of form and in direct design. As knowledge and power is gained, the casts used should gradually exchange their roughness and boldness for the refinement of the antique figure. For first practice, a thick rope, pumpkin, large shell, group of vegetable marrows, &c., are very suitable. Concurrently with these the typical boughs of trees and the foliage of the largest growing plants may be represented.

Time and energy are wasted in drawing from very refined forms before some delicacy of appreciation is developed.

Modelling in clay should be begun as soon as some fair notions of drawing have been gained.

In order to economise the brief time the working class can give to the study of art the most productive methods of teaching should be employed. All the work mentioned above lends itself to collective or class methods of teaching. A body of 20 or 30 pupils should work from the same large object, placed so as to give to all, approximately, the same view, and be constantly attended by a teacher who would explain principles and demonstrate processes on a large scale in front of the pupils and beside the object. Very little individual assistance will be required if the demonstration is good.

Eighty head and assistant teachers of the London Board schools began, last September under my direction, to work for the Art Class Teacher's certificate. It was desirable to enable these students to work up to the required standard in the least possible time, as attendance at the class necessitated considerable sacrifices on their part. For six weeks the teaching was entirely by class methods. The progress was rapid and the average attendance very good. When the actual work for the certificate was begun, the regulations of the Science and Art Department necessitated the abandonment of almost all the class teaching. With individual teaching from small casts the attendance fell off and the progress of the



Appendix FF.  
 System of teaching drawing under the London School Board.

students became painfully slow. Our teaching power, amply sufficient for class methods, was altogether inadequate for individual methods.

The Science and Art Department has encouraged the use of casts and examples, and arranged the examinations in a way which countenances individual teaching and precludes, in the majority of the work, the employment of class methods. Possibly the explanation may be that the lines of the Science and Art Department were laid down 20 or 30 years ago, before the great development in the science and practice of teaching of the past 10 years had begun.

Something of the organisation and methods of a well-conducted high school, board school, or grammar school, might with advantage be copied in art teaching.

The French are quite alive to the advantages of class teaching, and the newest drawing class-rooms, built in Paris, in connection with the elementary schools, are fitted up and furnished with the view of giving every help to its extension and development. Even there M. Jules Pillet (Inspecteur de l'enseignement du dessin) could say, in a lecture to art teachers at the École des Beaux-arts of Paris, in 1882, that art teaching hitherto lacked system, and was especially wanting in methods of collective teaching.

There appears to be no doubt that if we are to make any considerable advance it must be in consequence of the development of class teaching. By it may be reached the nine-tenths of the artisans who, Mr. Armstrong says in the Thirtieth Report of the Science and Art Department, would be all the better workmen for some knowledge of and practice in drawing or modelling, and who do not come to our schools or art classes.

Good class teaching can only be given by a teacher who is experienced or who has been trained in teaching. There are many assistant teachers and pupil-teachers in the elementary schools who have decided talent for art work and a desire to improve their qualifications. If encouragement and help were given to such individuals to work onwards, and a career were opened for them as special art teachers, indifferent schoolmasters would in some cases develop into good drawing masters.

At the present time a great amount of latent ability is allowed to drift away undeveloped. It has been pointed out that a nature acutely sensitive to the influences of art training may become a blessing or a curse to itself and society, according as it is encouraged in, or balked of, its legitimate development.

To the most promising boys and girls attending the drawing centres already alluded to, scholarships might be given on the termination of the ordinary school course, which should be interwoven with an apprenticeship to some art-work, so that the scholar would become a half-timer at a drawing centre.

To those who had made good use of such a scholarship, first-class instruction in the evening might be given free of cost, and a chance of winning a travelling scholarship.

Possibly each drawing centre might become of such importance that it could be intrusted to the organisation and management of a thoroughly competent teacher, who would insure that the instruction proceeded on approved pedagogic principles. Lessons of the highest description could be given by teachers thoroughly skilful in some one branch, such as figure drawing, modelling, the principles of designing, or the practical designing and art workmanship of the shop. A staff of such teachers could be organised so that a definite class lesson would be given at regular times stated in the time-table. The teachers of the staff would pass round to the various centres at regular intervals for the purpose.

It seems undesirable to train each art teacher in every branch of art. Many years are occupied in giving a little of everything and no particular skill in anything. For each subject a really competent teacher should be trained.

At sixteen, a clever boy or girl ought to have been well trained in the appreciation of the beauties of form, and in those qualities of light and shade, tone, texture, and colour, which underlie all art. The awakening and training of the inventive faculty of the designer, best effected by class

teaching, as it calls on a number of minds mutually to assist one another in working out the same idea, should run side by side with the general art education. Appendix FF.

Good decorative art will not come by teaching nothing but decorative art. The best designers and the most intelligent decorative artists will always come from those who have the best grasp of the vital principles of art. System of teaching drawing under the London School Board.

Englishmen stand first in landscape painting, and yield to no one in water-colour drawing. We need not question the art capacity of the descendants of those who built our cathedrals.

The possibilities of an immense art development are very great if, by the exercise of economy, we lose little of the latent power which has hitherto been almost untouched.

Our pressing wants appear to be such rooms and appliances as will enable a teacher to exert his or her powers to the utmost advantage; special teachers, so that the short and therefore precious school life of the pupils may not be wasted by profitless study; organisation, system, and a development of class teaching which will secure to each individual just such instruction as he or she is fitted to receive; and lastly, an examination that will necessitate the pursuance of the most suitable course of study, and encourage to further efforts good teachers and diligent pupils.

I have the honour to be,

Sir,

Your obedient Servant,

(Signed)

T. R. ABLETT,

The Drawing Instructor to the  
School Board for London.

Gilbert R. Redgrave, Esq.,  
Secretary to the Royal Commission on  
Technical Instruction.

## APPENDIX GG.

Appendix GG.

SOCIETY FOR THE ENCOURAGEMENT OF ARTS, MANUFACTURES, AND  
COMMERCE, John Street, Adelphi, London, W.C.

Technological  
examinations of  
the Society of  
Arts.

## TECHNOLOGICAL EXAMINATIONS.

SIR, March 22, 1882.

In accordance with your letter of the 4th instant, I have now the honour to submit, for the information of the members of the Royal Commission on Technical Instruction, the following Memorandum on the Society of Arts Technological Examinations.

I am, Sir,

Your obedient Servant,

(Signed)

H. T. WOOD,

Secretary.

Gilbert Redgrave, Esq.

In 1872 the Society of Arts added to the scheme of examinations they were then carrying on a series of examinations in the technology of arts and manufactures. The idea was originated by Col., then Major, Donnelly, a member of the Council of the Society of Arts; and, indeed, to Col. Donnelly was due, not merely the proposal for holding these examinations, but the whole system on which they were carried out by the Society. Col. Donnelly's plan was based upon that of the science exami-

Appendix GG. nations of the Department of Science and Art, and the examinations were conducted through the agency of the Department. A candidate for examination in each industry was required to have passed in certain specified subjects of the Science and Art Department's examination, and he was also required to produce a certificate, signed by his employer, stating the nature of his employment, and affirming that he was practically conversant with at least one branch of the industry in which he was examined. Certificates in three grades were awarded, elementary, advanced, and honours. Money prizes were offered by the Society to the best candidate in each grade, and special additional prizes were offered in certain of the subjects by some of the City Guilds, private individuals, and institutions.

Technological  
examinations of  
the Society of  
Arts.

For the examinations in 1873, the first year in which they were held, five subjects were put forward, cotton manufacture, silk manufacture, paper manufacture, steel manufacture, and carriage building. In 1874 the five subjects above-mentioned were retained, with the addition of four more, cloth manufacture, glass-making, pottery and porcelain, and the manufacture of gas. In 1875 five more were added: agriculture, silk dyeing, wool dyeing, calico bleaching, dyeing, and printing, and alkali manufacture. Agriculture was afterwards omitted on its being included in the list of the subjects of the Science and Art Department examination. In 1878 telegraphy was added, and in 1879 photography.

In the first year three of the five subjects were taken up, the number of candidates being only six. In the second year, with nine subjects, five were taken up, and the total number of candidates increased to 36; in the third year, with 14 subjects, eight were taken up, and the number of candidates advanced to 46; in the fourth year seven subjects were taken up by 62 candidates; and in the fifth year eight subjects by 68. In the sixth year the numbers increased to 164, the number of subjects taken up being only seven. The reason for this increase was that, before the holding of the examinations in 1878, the Clothworkers' Company voted 200 guineas to pay the teachers of successful students in the same way as science teachers were paid by the Department. In consequence of this several classes were formed for the teaching of technological subjects, and the students from these classes swelled the number of candidates for the examinations. In the following year the examinations were transferred to the then newly established City and Guilds' Institute for the Advancement of Technical Education. The arrangements for the examinations were made by the Society, but the Institute took them over before the date fixed for holding them. The number of candidates that year was 202.

The programme for the following year was remodelled by myself for a Committee of the Institute, and various alterations made in the hope that larger numbers might be attracted to the examinations than had hitherto offered themselves. Ten new subjects were added, and a system organized by which the examinations were conducted independently of, though concurrently with, those of the Department of Science and Art. The result of these changes was an increase in the number of candidates to 803.

In 1877 a practical examination in blowpipe analysis was started by the Society of Arts, prizes amounting to 10*l.* being offered for proficiency in qualitative blowpipe analysis. The examination was held in Cornwall. These examinations were transferred with the technological examinations to the Institute, but after having been held by them for one year the Committee decided to abandon them.

For the past two years the City Guilds have carried on the technological examinations mainly on the same system as that prepared for the examinations in 1880. Any information, however, respecting the progress of the examinations since the City Guilds Institute have taken charge of them would of course be obtained, if desired, from the Institute itself.

## APPENDIX HH.

Appendix HH.

Uppingham  
School work-  
shops.

## WORKSHOPS IN UPPINGHAM SCHOOL, by the REV. E. THRING, M.A.

This carpentry at Uppingham School was opened in October 1862, and put in the hands of a very-clever man, recommended by the late Mr. G. E. Street. A payment of 1l. 10s. per annum gave a boy the right of admission to the workshop as a learner, and at first tools were found for beginners. From 50 to 80 boys, year by year, were carpentry pupils, and from time to time very good work was done, but little need be said of this period, as no true system was followed, and the teacher, clever as he was, failed to work the thing in a satisfactory manner. Individuals did well, and profited, but there was no real effective description, or definite plan. Matters continued in this state until the year 1882.

In the autumn of 1882 a class was formed for the purpose of giving greater reality to the science teaching. The boys who joined were taught to make scientific apparatus of a simple kind, and then to experiment with it.

A small room was fitted up as a workshop, with a lathe, and a couple of benches. The class was not a part of the regular school work, but was taken up voluntarily by the pupils. Attendance, when a boy had joined, was compulsory.

During the first term various instruments were made: a barometer, an acoustic bridge, several galvanometers, &c.

As the numbers promised to increase, it was considered advisable to engage an assistant to be constantly at work under the superintendence of the science master. A first-class mechanic was found, who had considerable experience in scientific instrument making. A larger room was fitted up, and the classes grew in size.

In the spring of 1883 the carpenters' workshop was thrown under the same direction as the new scientific workshop. All the mechanical branches are now under the superintendence of the science master.

A forge was established by the head-master, who also defrayed the expenses of the fitting up of a new carpenters' shop. But, apart from this, no pecuniary assistance has been received from without for the works.

## THE CARPENTERS' WORKSHOP.

There are two departments, a lower shop and an upper. In the lower shop the boys begin with (1) tenon and mortise, (2) tool-box, dovetailed, (3) cabinet door panelled, and so on. There is a certain amount of work set for each term. Boys who have completed this are allowed to submit a design to the teacher, and to work at it if approved of. Drawing is not obligatory.

There are two times of attendance in the week for each boy, during which he receives lessons. If he wants to work out of his regular time, he applies for a bench, and if there is one vacant it is allotted to him. There are a number of small benches, at which pupils are allowed to occupy themselves with fretwork, &c. But this is not allowed in the regular time. It is considered advisable to provide an opportunity for amusement in a mechanical pursuit for the boys who have an inclination; but this is quite separate from regular work in the shop.

In the upper workshop, at stated times, lessons are given in cabinet-making. But, except for these, attendance is not obligatory. Drawings are required. There are only a limited number in this shop, and there

Appendix HH. is always room for those who are promoted to it. In this manner, a boy who has won his promotion has full opportunity for getting through a great deal of work.

Uppingham School workshop.

The wood-turning lathes stand in this shop.

Terms :

Carpentry, 10s. } a term.  
Turning, 5s. }

The cost of an outfit is about 30s. All materials are charged for, and the work done belongs to the pupils.

Number of pupils - - - - - 70.

Men employed: Carpenters—foreman, man, and boy; cabinet maker and assistant - 5 hands.

THE FORGE.

The forge.

In the forge the pupils make nails, brackets, hammer-heads, &c. Forgings are made for the metal workshop; boys make their turning tools. When some familiarity with the work has been acquired, pupils are taught to make horse-shoes, and to fit them on the dead hoof, and when they can do this they are allowed, under careful supervision, to shoe horses brought into the forge.

Number of boys - - - - - 12.

Fee - - - - - 11. a term.

The forge teaching is partly undertaken by the mechanical teacher from the metal shop, partly by a local blacksmith.

METAL WORKSHOP.

Metal workshop.

This workshop was started for the purpose of making scientific apparatus, but it has grown into a mechanical workshop for all kinds of work.

Boys do not pass into it from the carpenters' shop, but can enter it without previous training.

The work commences with the forging and filing of a set of turning tools. Then an electric bell is made, which affords a variety of work, none of it of too difficult a nature. Opportunity is taken to interest the boys in the scientific facts connected with everything which they make, or see being made, and no trivial work is allowed, except by special permission out of work hours.

When the bell is completed, which generally takes more than one term, various pieces of apparatus are chosen to be made, such as a scribing block, a pump, an electric motor, or an induction coil.

Stress is laid on the boys learning to make and sharpen their own tools. They are required to make a drawing of the machine to be made.

In this shop a set of scientific instruments is being made for the use of the school.

Work is also being turned out for outside orders, and in every way the pupils are given to understand that they are admitted to a place in which real work is turned out, not to a place in which they can play with metal and tools.

A room is set apart for experiments with the instruments made. The boys are led as much as possible to take an intelligent interest in science. But the workshops are distinct from the scientific teaching of the school, although boys working at physics are often sent into the workshops for special purposes, and the facilities of the mechanical department are always ready for scientific requirements.

Boys who intend to take up the engineering profession are allowed more time at practical work, drawing, and mathematics during the last year of their stay than is laid down in the ordinary school-course.

Also, after leaving school, boys occasionally stay in the workshops for a special training to fit them for their further education in technical work. Appendix HH.

The times of attendance are twice a week, an hour and a half each time. But many boys come six or more hours a week. The fee is £1. 10s. 8d. a term. There are 23 boys in the workshop. Every boy buys a set of necessary tools and castings. The work turned out belongs to the boy.

A foreman, a man, and a boy are employed in this shop.

The machinery consists of two Whitworth screw-cutting lathes, eight 5-inch lathes, one planing machine, vices, benches, &c.

(Signed) EDWARD THRING.

Uppingham School workshops.

Uppingham, March 1884.

Time Table of Uppingham School workshops.

FORCE.

Time.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	—
12 to 1.30		Mr. Tyler's Class.		Mr. Lee's Class.			The number of each class does not exceed 15. There are different from the Metal Work pupils; but, in general, each Metal Work pupil works for one hour in the Force. Tyler is a local blacksmith.
2.15 to 3.30	Mr. Lee's Class.	Mr. Tyler's Class.			Mr. Lee's Class.		
3.50 to 4.45		Mr. Tyler's Class.					

METAL WORK.

Time.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	—
12 to 1.30	6	6	5	5	6	3	The numbers refer to the attendance of the pupils. To three numbers there are the special Workshop pupils. These work on the average two hours per week in the Workshop.
2.15 to 3.30		4	4	4			
3.50 to 4.45	4	4		3	6		

Appendix HH.

CARPENTERS' SHOP.

Uppingham School workshops.

Time.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	—
12 to 1.30	8	11 Advanced Class of 5. Taught by Loder.	7	14 Advanced Class of 5. Taught by Loder.	7	10	The numbers refer to the attendance of boys. Each class meets on two occasions a week. Teachers: Carpenter—D. C. C. The numbers in addition to these numbers but they do not receive lessons except at regular times.
2.15 to 3.30	5	7	6	7	7	4	
3.50 to 4.45	1	2	1	5	1		
After Lock-Up.		7					

Appendix II.

APPENDIX II.

Ontario Agricultural College.

TO THE CHAIRMAN OF THE ROYAL COMMISSION ON TECHNICAL INSTRUCTION,  
SIR BERNHARD SAMUELSON, M.P.

SIR,

In the course of a visit to Canada and the United States in the past summer, I endeavoured as far as possible to become acquainted with the chief institutions for scientific education so far as the time of year and the limited time at my disposal would permit. As most of the educational establishments were in vacation, I was often unable to obtain so full an account of the work done as I should have liked. Much of the information which I did obtain was practically identical with that already communicated to the Commission in the Report made by Mr. W. Mather, and there is little or nothing to add to the account he has given of the institutions which he visited. I find, however, that there is one important college in Canada which he does not appear to have visited. A short notice of this college may perhaps serve also to supplement the Report on agricultural education already published.

THE ONTARIO AGRICULTURAL COLLEGE.

This college, which has now been ten years in existence, is situated at Guelph, Ontario, some thousand feet above the sea level and 700 feet above Lake Ontario, and consists of a farm of about 550 acres in extent, with the necessary buildings both for farm-work and for the teaching purposes of the college. The farm was bought by the Government of Ontario, who immediately on taking possession appointed a Commission to enquire and report on the best manner of adapting the said farm and the management and control thereof to the purposes of a

"model and experimental farm." The Report of this Commission recommended that the objects of the Institution should be:—

"First, to give a thorough mastery of the practice and theory of husbandry to young men of the province engaged in agricultural or horticultural pursuits; or intending to engage in such; and, second, to conduct experiments tending to the solution of questions of material interest to the agriculturists of the province, and to publish the results from time to time."

"All permanent improvements on the farm should be carried out in such a manner as to exhibit and test the comparative values of the most approved methods of executing the several works; and to test the cost, convenience, and durability of the several appliances from time to time recommended for adoption on the farms of the province."

These suggestions have been carried out, the control of the Institution being divided between a President, who is responsible for the "college" portion of the instruction, and a farm superintendent, who is responsible for the management and practical work of the farm. Each is required to work in harmony with the other, but both are directly responsible to the Commissioner of Agriculture for the province. The instruction is embraced under two heads, called the course of study and the course of apprenticeship. The course of study extends over two years, and embraces the following subjects:—

## FIRST YEAR.

*Subjects :*

Agriculture.	Structural and Physiological Botany.
Live Stock.	Geology and Physical Geography.
Inorganic Chemistry.	English Literature.
Organic Chemistry.	English Composition.
Veterinary Anatomy.	Book-keeping.
Veterinary Materia Medica.	Arithmetic.
Zoology.	Mensuration.

## SECOND YEAR.

*Subjects :*

Agriculture.	Entomology.
Arboriculture.	Meteorology.
Live Stock.	English Literature.
Agricultural Chemistry.	Political Economy.
Veterinary Pathology.	Book Keeping.
Veterinary Surgery and Practice.	Mechanics.
Systematic and Economic Botany.	Levelling and Surveying.

In the apprenticeship course the students are daily distributed among the following departments:—

1. Live Stock Department.
2. Field Department.
3. Horticultural Department.
4. Mechanical Department.
5. Experimental Department.

The students are taught the proper manner of performing the various operations in each department, and are sent in rotation to each, so that at the end of two years they may have served a thorough apprenticeship.

The instruction extends over nine months of the year, and the daily work averages nine or ten hours a day, arranged as follows:—

Lectures in the College	-	Three hours.
Manual labour	-	Three and a half to five hours.
Private study	-	Two hours.
Drill and Gymnastics	-	One hour (alternate weeks).

Candidates for admission must be at least 16 years of age, and must pass a simple entrance examination or produce a certificate of having passed some equivalent examination elsewhere. The boarding and tuition

Appendix II.

Ontario Agricultural College.



Appendix II. fees are framed on two scales, one for residents in the Province of Ontario and the other for non-residents. Payments are, however, made to each student, for his farm work, of from 4 to 10 cents an hour, according to the value of his work, so that a student of Ontario with no previous knowledge of farming would pay from 50 to 65 dollars a year for board, washing, and tuition, which might be reduced by his farm work to 40 or 55 dollars. To non-residents these charges would vary from 120 to 150 dollars. Students who attend the full course and pass a final examination receive the diploma of "Associate of the Ontario Agricultural College." Medals are also awarded for proficiency in certain subjects. The total number of students in 1883 was 202, of whom 134 were from Ontario, 35 from other parts of the Dominion, 30 from the United Kingdom, 2 from the United States, and 1 from India. Most of the students who pass through the College engage in farming in various parts of the Dominion.

The college is arranged to take sixty boarders. It contains a good lecture theatre, arranged so that animals can be readily brought in for the purposes of demonstration; a museum, to which additions illustrating the agricultural and veterinary work are constantly being made; and a library of over 4,000 volumes, on the different subjects embraced in the course of study. The live stock department contains good specimens of seven breeds of cattle, six of sheep, and three of pigs. The horticultural department consists of three greenhouses, a vinery, a thirty-acre lawn, a four-acre kitchen garden, and a large variety of fruit and ornamental trees. A portion of the farm is laid out in small plots, and a series of experiments with cereals, roots, grasses, and manures, and various modes of management, are regularly carried on from year to year. In addition to the field experiments others are made in the feeding of live stock. The results of these experiments are annually published, as are the usual weather statistics. The chief need of the college appears to be a good chemical laboratory for the proper instruction of the students in agricultural chemistry and for analysing soils, manure, food-stuffs, &c. Professor James Mills, the President of the college, to whom I am indebted for most of my information, is anxious that elementary instruction in agriculture should be made compulsory in all rural schools in Ontario instead of merely being optional, as at present, and that a course of lectures on agriculture should form part of the teaching given to all teachers in training at the Normal School.

I am,  
Your obedient Servant,  
(Signed) CHAS. A. BUCKMASTER.

## Appendix JJ.

The Wurtemberg  
Educational  
System.

## APPENDIX JJ.

## THE WURTEMBERG EDUCATIONAL SYSTEM.

## LETTERS FROM DR. VON STEINBEIS.

DEAR SIR,

Leipzig, 4th May 1862.

I RECEIVED your esteemed letter of April 18th, together with one from Sir Philip, of the 17th, on my way through Stuttgart when you had already left London some days. I wonder my friend forgot that I had given up my official duties; I did so after 53 years service, and because I could not agree with the new German-economic system, nevertheless with regard to Wurtemberg, as a superannuated government officer, I stand on the best possible footing. I regret very much indeed that I am no longer in a position to devote myself to you and to the members of your esteemed Commission, both in Stuttgart and all over Wurtemberg wherever you wish to carry on your investigations. I remember well our

former meeting with pleasure, and am full of sincere and constant thankfulness for the great and precious favours and the rich and enlightened information, which in the course of 40 years, I have received from all parts of England, and most particularly from all connected with the South Kensington Museum, and from the Society of Arts. Of this latter Society, I have been the honorary corresponding member, alas, with but few communications, since 1851, and their journal, even to-day, together with the "Economist," forms part of my regular reading.

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The Wurtemberg  
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System.

Besides my regret that I cannot accompany you through Wurtemberg, I must also lament that I did not know of your intention of studying the technical instruction given in Wurtemberg and its results, upon the spot itself, some weeks earlier. Great efforts have been made during the last 30 years to bring back the country, by increased industrial activity, to a higher state of prosperity. Until the middle of the century, Wurtemberg had been nearly entirely occupied with agriculture, with the supply of articles for daily consumption, and in carrying out the repairs necessary for domestic trades. Moreover the country was much impoverished by considerable over-population. What happened in the department of education, and in the direct promotion and introduction of industrial occupations, is closely connected as a whole, and he who cannot conceive it (or review it as a whole) is still less able to judge of it in part, and to appreciate the prejudices and hindrances the movement encountered, which were very difficult to overcome; while the pecuniary means, also, were very small. In government circles even, much opposition arose, and had not the late King William upheld the policy with a clear insight and strong will, and in many ways personally contended for it, it would not have been possible to accomplish that which has now been achieved. After the King's death his son, King Charles, pronounced himself resolutely in favour of carrying on what his father had begun. That if these hindrances had not arisen, much more might have been done, and have been achieved, is clearly to be seen when the circumstances are more closely examined. No one could tell you more on the subject than I can, for during that long period the chief problems, both in the department of education, as also in that of industry, fell to me, partly personally, partly as chief of the commissions relating thereto. Meanwhile, I can assure you that a closer examination into our efforts would not be unsatisfactory for you and your Commissioners. To render this task more easy for you, I would, had I known sooner of your journey, have sent you a book in which all the above-mentioned undertakings are noticed fully in detail, and I should even now recommend you to get this book; it is entitled "The industrial development of the Kingdom of Wurtemberg" and the Work of its Central Office for Trade and Industry, by Vischer, "Stuttgart, published by Carl Grüninger, 1875." Unfortunately, I have no available copy of this work at hand to send you. You can, however, buy it within five minutes of your arrival, between the station and the Hotel Marquardt, at Wittwers, the bookseller's shop, failing this, from the publisher, Grüninger, who lives in Augusta Strasse. The table of contents at the beginning of this work, which you can read in 10 minutes, will place before you all which would come within the sphere of your intended investigations.

I must here specially remark that the requirements of a country, comprising within it a number of small towns, necessitate that the government action in connection with such a development should be more diffused than centralised, and the fact that the country counts within it a number of petty capitals and chief towns, which in the last century and earlier were centres of industry and trade, would exert a similar influence; for these towns were better starting points for industries and industrial education, than the capital town itself. I must therefore place in the first rank, as worthy of being visited, Reutlingen, Gmünd, Heidenheim, and Heilbronn, among which you should certainly visit the first three, or at the very least the first-mentioned town.

In Reutlingen you will find an apprentice-workshop, which has now been flourishing for many years, for the development of all branches of

Appendix JJ. weaving, for educating foremen for machine weaving, and for all varieties of hand weaving and machine knitting. The students must, in addition to their literary studies, work regularly at the looms, and earn a part of their keep. You will find there a highly interesting school for women's work, which teaches feminine handicrafts on a scientific and artistic basis, and which has hitherto been a unique example of its kind. I sent you yesterday, in a little packet addressed to the Hotel Marquardt, and which you will doubtless receive on your arrival, the prospectus of this school.

—  
The Wurtemberg  
Educational  
System.

Moreover, you will find in Reutlingen a very good trade continuation school, in which instruction in drawing and modelling, and in the departments of physics and commerce, is very well given.

There is also an excellent Realschule, which prepares the students previous to their entry upon a practical career, partly for the higher polytechnical engineering school, partly for the commercial desk or the manufactory. As all these institutions in Reutlingen are situated very near together, and sometimes are actually associated together, you will here most quickly become acquainted with the organisation of the Wurtemberg trade schools. In this town, too, is found an institution for the poor, founded on benevolent principles, and highly interesting to a student of State political economy. It was founded by a very noble and enterprising clergyman, who was in the beginning very little versed in matters of economy, and it grew by means of charity, pecuniary aid, and loans into large dimensions, and was, when bad times arose, very nearly becoming bankrupt, when it would have plunged many families, it had succoured, into the greatest want and misery. We placed it under a kind of sequestration, so that its really large possessions, farms, manufactories, workshops, and shops came under a strictly economic management, and as the times improved, and as no creditor pressed for payment, it gradually recovered. The administration was restored to the patriarch who had founded it, and it has now accumulated, so far as I know, a considerable fortune. Its whole future, however, depends upon Mr. Werner, as its founder is named. As a communistic, or rather a really patriarchal institution, which in a sideway came under the guardianship of the estate, which really had to help it through its troubles, it is certainly worthy of notice. Mr. Werner is the pattern of a self-denying man, relying upon God's help. He will often tell you it is through Him alone the work has succeeded, and he is right. The Almighty has, however, not only worked through the hearts of others, but also through the Treasury Department. He has ordered things here, as in other places, for it is only by benevolent efforts that such institutions can live and thrive.

I have, though, still to tell you what is to be seen in the other towns enumerated. There is in Gmünd, which lies at the foot of the Hohenstaufen, the birthplace of the old German emperors, situated on the railway to Heidenheim, a special school for jewellery, which is very well conducted, a very good continuation school and a museum for jewellery and gold and silver work which has just been begun. In Heidenheim you will find a workshop school for machine and hand weaving, and a school of design.

The other towns are more specially noticeable for their continuation schools, but you will find a tolerable number of other schools scattered about the country.

It is a pity that you did not come to Stuttgart in the middle of last summer, when you would have seen a large exhibition of native Wurtemberg industries, and of articles made in the Wurtemberg trade schools, which would have convinced you that in no country are industrial drawing and modelling more developed than in Wurtemberg.

You will find, in the work of these schools, and in the central trade museum, and the central institution for trade and industry (at the Legions Caserne) the index, so to say, of the trade exhibition, and in this latter, the practical use of the former, and you will be pleased with the practical and certain proof that it is possible with the powerful help of railways and telegraphs to make quite a new era in a formerly half-idle country, and that you can raise the industry of a State both by teaching

it and showing it what is good, and all this without any injury to its agriculture. Appendix JJ.

But I have omitted to thank you for the highly interesting "First Report of the Royal Commissioners on Technical Instruction," which I have read with much pleasure. Pray kindly accept my heartfelt thanks for it now. The conclusions specially delighted me; it seemed as if I had written them myself from my heart. The Wurtemberg Educational System.

That this is really, and indeed the case you will see by the little work entitled—"On trade education; seven opinions and reports," and more particularly from the first of these reports which was written by me. In these you have an account of a system, which I may venture to say has been proved *practical*; a system upon which the trade schools of Wurtemberg are conducted and managed. In this work of 24 pages, which may be quickly read, all is explained as to how these schools are or should be managed. It gave me great pleasure and relief to find that your Commission is no longer called upon to deal with technical "*education*," but with "*instruction*." These two words denote the beginning and the ending of a widely spread error, of one in which it was proposed to turn labour into play, and to substitute mere bookwork for skill, industry, and obedience. But I will not say more about it here, I have said enough in my pamphlet. Your Commission will spread a blessing over all the world if they remove this fatal mistake, both by word and deed. Once more I must beg you to draw your attention to the collection in the central institution (in the old barracks), particularly to the collection of educational apparatus, you will find many English things there, and will be convinced that we have become your grateful pupils, in that, with small means, we have tried to follow the example of your great Kensington Museum, and with our institution which was founded in 1848, but, which was greatly enriched by the 1851 exhibition, we have sought little by little to educate and improve all branches of trade. I would particularly beg you to see the trade collections of the year, 1840, and still earlier exhibited there, and, in doing so, I must beg of you to remark how very low down we had to begin. At present, the Wurtemberg Trade Department cultivates chiefly "art-trade," a new "art division" of industry which, in foreign lands will hardly be understood by such names or master, I consider this term to be most pernicious, applied as it is, for every industry can have its art associated with it, and should include art in the last and highest stages of its development, and this final stage should not despise or look down upon the preceding ones.

With this I enclose you some introductions, will you make use of them as you may want them.

To Gilbert Rodgrave, Esq.

Yours faithfully,  
(Signed) Dr. STEINBECK.

#### LETTER 2.

DEAR SIR,

Leipzig, May 24th, 1882.

I AM in receipt of your esteemed letter of the 22nd instant, for which please accept my hearty thanks. I should only have been too pleased to learn the opinions which you and the members of the Commission have formed concerning the industrial education of Germany, and, as I might almost be inclined to dread that England, (which I honour so highly because we owe her so much) might again become somewhat enamoured of the German Schoolmaster System, I cannot resist the gratification of once again recording my views concerning education and the training for industries; seeing that I have been struggling for so many years against the existing state of things. Letter from Dr. von Steinbeek

My conclusions are as follow:—I can recognize no other task for education than to induce and to cultivate in the recruits of industry, from their earliest years until their full physical development, a capacity for useful activity, but in so doing to take the utmost care that, avoiding

Appendix JJ. at the same time both idleness and overwork, the intellectual and physical (mannal) training shall be so carried out, in accordance with the natural capacities of each individual, but ever in harmonious and uninterrupted combination, in order that work should be regarded as a necessity and delight,—never as a task.

The Württemberg Educational System.

How easily this may be accomplished has been taught me during a career of sixty years, in which I have passed from the lowest to the highest grade of practical industrial employment, and in the teaching of trades; by a survey of three continents; and by the results of my own very numerous experiments.

Unfortunately the tide of affairs in Germany has taken another direction, and although lately there have been demands on many sides for a return to the former condition of things, they have not as yet been productive of much effect. The system now is to shut young children up, compulsorily crowded together, both morning and afternoon, in gloomy school-rooms; to stuff them while there with theoretical knowledge, which for the most part runs to waste, as from an over-filled vessel, either neglecting entirely the development of their physical powers and manual dexterity, or doing so only to such an extent as to exclude the aspiring and assiduous youth by legal enactment from the workshop in which he will nevertheless subsequently have to earn his livelihood, and in which he might and ought to acquire, while he is young, the manual skill and muscular power which in the future will be demanded from him.

Having by this means become quite another class of man to the one needed in the workshop, the immature lad, mature only on the score of his age and in accordance with the strict letter of the law, enters the workshop and finds himself so uncomfortable and so oppressed therein that he regards his trade only as drudgery, and his labour as slavery; he becomes in fact a candidate for social democracy. Then the Legislature attempts to win him back, with provisions for old age, for sickness, for infirmity, and similar communistic institutions, and ends by making him an idler and a spendthrift!

Why, then, do they not pursue the opposite course and induce the contractor, who cannot exist without workpeople, to assist them by training the young workman from the outset, by means of half time work and half-time schooling, and by contributing to the cost of his food and clothing. Would it not be possible for the factory inspectors to see to this? Such will I hope be the policy that England will inaugurate, and the other countries will follow her example. Now, I will bring my letter to a close, and bid you farewell. The reason I have not written to you in English, will, I fear be evident from the one which went before. Let me further beg of you to keep me in your friendly remembrance and consider me always at your service.

(Signed) Dr. STEINBEIS.

Gilbert Redgrave, Esq.

#### LETTER 3.

Letter from Dr. von Steinbeis

DEAR SIR,

Leipzig, May 27th, 1892.

WHEN I despatched my letter of the 24th inst. I had certainly no intention to trouble you for a reply, and still less to deal with things present, as I know how little time you have for writing while on a journey, but I feel bound to acknowledge the receipt of the friendly salutation of your Commissioners, and to thank you for the second copy of your First Report, and for your letter holding out to me the hope of a visit from you, which would give me great pleasure. I will take this opportunity of adding a few remarks upon the questions raised in your former letter, even at the risk of your thinking me tedious. You ask what is to be done in order that the school may not stifle the inclination for the carpenter's bench and the vice? Now I hold two decided opinions on the subject; first, the school must not injuriously influence the bodily, and more particularly the muscular, development of the pupils by excessive

sedentary work and brain-effort; and second, it must also aim at the production of a taste for active industry, by deriving the subjects for instruction from the affairs of daily life, as well as from history. Then, farther, instead of the unreasonable exclusion of children from the factories it would be necessary to arrange, if needs be by legislative enactment, that industrialists, in like manner that they care for their machinery and plant, should also take active part in the training of their working people, beginning indeed from their earliest years. You tell me the success of your half-time schools is doubtful; I permit myself the enquiry—Have these schools been properly organised, managed, and superintended? It is easy in the case of every business, without any considerable expense, to employ a certain number of children, in proportion to the staff of adult workers, who may, singly or collectively, be placed under the charge of trustworthy, responsible workpeople. It is then, however, not only necessary that they should not be employed for too long a time, or on work of too heavy a character; they must not be allowed to suffer hunger or thirst, and care must be taken that they are properly clad and kept clean. Is it not necessary to oil and clean the machinery at fixed intervals? In the same way the young workers should receive from time to time a slice of bread and butter and a small glass of beer or cyder. Moreover, on leaving the shop their cleanliness must be looked after, and even in case of need small articles of clothing might be given them. It is very important that the child should as far as possible receive directly the fruit of its labour, its earnings. By this means the child becomes accustomed to its work and its frame is fittingly developed, but it also learns to know the value of work and acquires a love of it. Yes, work grows into a necessity. One must not be afraid of difficulties in this respect. I have myself allowed my own son to run about the workshop from the age of six, beginning at the bottom of the ladder, and he has become a sound and scientific, but also a thoroughly practical and stalwart engineer, and with him have grown up a number of excellent and suitable workers for the factory. At this moment five of my grand-daughters, between the ages of 14 and 17, are attending the Women's Work School at Beutlingen, and are receiving at the same time instruction in the sciences and foreign languages, together with music and drawing. I was obliged to exert some pressure in order to induce them to attend this school, and now they are delighted with it. It does undoubtedly take time to establish institutions of this kind and it is acting very imprudently to start them at once with ordinary arrangements and regulations. It is necessary in the first instance to provide oneself with suitable persons and localities, to make a beginning with these, and when once favourable results have been obtained, to come forward with them: "principis docent, exempla trahunt."

I have done myself the pleasure to send you the programme of the Beutlingen Women's Work School, it was the first of its kind; now it has found imitators in some 20 towns in Württemberg and in many other places besides, and others of the same kind are continually being established, though perhaps not upon so large a scale. These schools are attended by the daughters of all classes.

Generally speaking, in these questions of industrial education much must be left to time, partly because a sufficient number of suitable teachers must be trained, and because it is necessary to follow public opinion, in order that learners may be supplied spontaneously. Exhibitions have rendered me the most excellent services in my efforts in this direction; their results have proved in the most astonishing way the truth of the above-quoted Latin proverb. Things, however, have gone much slower with respect to the education of the male workers; after ten years' exertion, I was often tempted to doubt that any practical success would ensue. But as soon as a number of good skilful workmen had secured positions in the State workshops, the young people crowded into the schools, and then the industrial results at once became completely changed. No doubt, as you observe, the trade schools deserve special study, but they must only be established for the training of apodes of industry, not for the great masses and especially not for persons who have had no previous experience in industrial occupations, and who are still too

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 The Wurttemberg Educational System.

young for this. In such cases these schools do more harm than good, as frequently the main point (money-making) is neglected in them (for, after all, the earning of money is the chief thing in trade undertakings). In your remarks that "our primary schools" and our "military service" system are of immense worth, as an incentive to higher education, I regret to say I cannot agree with you, as on the contrary I regard both of them as our chief cancers. Certainly, if in our primary schools the children were allowed to go out as soon as they had become proficient and were not (the clever and the dull ones alike) shut up for eight years in what are for the most part ill-ventilated school rooms, they might perhaps be valuable, but, as they are at present constituted, they have not elevated the intellectual position of our population and they have decidedly lowered the physical status of the people. And then, as respects the military system, which by its voluntary examination permits those who are clever to break through; it has drawn away from the technical schools, which train men for a practical industrial career, many of their students and among them some of the best. The military career, however, only teaches blind obedience and the art of destruction, but not to work and to earn one's living by means of an inventive spirit. But now I have said enough. Have a prosperous journey with your Commissioners. Do not forget your promise to come and visit me. Give my respects to my honoured friend Owen, and bear in your friendly remembrance

Yours sincerely,  
 (Signed) STEINBERG.

To Gilbert Redgrave, Esq.,  
 Secretary of the Technical Instruction Commission.

Appendix KK.

Technical Education for Shipbuilders.

#### APPENDIX KK.

##### TECHNICAL EDUCATION FOR SHIPBUILDERS.

##### LETTER FROM MR. W. DENNY, OF DUMBARTON.

Hotel des Reservoirs, Versailles,  
 April 25, 1893.

DEAR MR. SAMUELSON,

I must ask you to forgive me for the delay which has occurred in sending you the enclosed printed documents referring to our attempts at technical education in our shipyard and engine-works. They consist of the following—

- a. Rules as to the admission by examination of apprentices and others into the shipyard offices.
- b. The same for our engine-works.
- c. Rules for the awards committee to guide them in recommending the workmen for inventions or improvements.

A similar scheme of awards has been begun in our engine works.

From these papers, and the private information given to you as to the awards made, you will observe that our attempts to stimulate the intelligence of our employes, have developed in two forms, corresponding to the main divisions of these employes. *First*, by examinations, we have tried to secure a supply of apprentices and others for our offices, elected for ability and steadiness, and with some knowledge suitable for the careers before them. *Second*, we attempt by rewards to stimulate the minds of our workmen directly to invention and to a continual criticism of the methods of work, tools and machines employed by them. We have not tried as yet to induce them to attend technical classes, but a few of them do attend such classes in the town, conducted under the control of the Science and Art Department.

All our draughtsmen attend such classes, and in addition have from us the use of our offices, with paper, &c. free, also of a very complete library of works on naval architecture and cognate subjects, every evening excepting Saturday and Sunday.

Technical education has most come under our notice in connection with the naval architecture classes and examinations of the Science and Art Department. Previous to last year, the instruction in this subject was very antiquated and insufficient, but it is now greatly improved and promises to be of very great utility to the country. I believe it is through the Science and Art Department, that technical education can best be forwarded. Their system of forming the standard of teaching by examination is the only one capable of wide and easy extension, and, if the returns to masters, the payments by results, were only sufficiently large to induce more first-class men to become teachers, great improvements could be made. The fees could not be raised, but the results payments might be lowered without reducing the number of students, even if a portion of the results payments were made obligatory on the districts having the classes.

Beyond such direct means of teaching, the last indirect means of raising the technical skill and intelligence of our workmen would be cheap and easily procured. In the interests of the whole country, there is no property a workman should be made to feel more real and valuable than the useful inventions of his brain. Could you obtain this result, your commission would create the spur and stimulus to great technical improvements, and you would develop a large amount of genius now latent. The workman would see possible personal advantages in his skill, instead of as at present and generally, no advantage at all. I have no great hope of your doing much through the influence of employers. The great mass of them are as little interested in technical education as their men, and with much less reason. Most of them sneer at anything out of their routine. I would place more confidence in a direct appeal, by means of amended patent laws, to the great body of the workmen. They know the meaning of personal interest when it is brought within their grasp and made tangible. Perhaps, your colleagues may think I am wandering from the text of technical education, but, it is only so apparently, for you will not interest working men in the subject till you show them a personal and immediate interest in it. Show them that clearly, and you will have no reason to complain of their want of interest in the subject that you and your colleagues have so painstakingly and generously taken in hand.

B. Samuelson, Esq., M.P.  
House of Commons.

Yours very sincerely,  
Wm. DENNY.

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Technical  
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Shipbuilders.

Rider A. to Mr. DENNY'S LETTER, APPENDIX KK.

RULES for I. ADMISSION of APPRENTICES to DRAWING OFFICE. II. ADMISSION of BOYS as APPRENTICE CLERKS. III. ADMISSION of GIRLS as APPRENTICES in TRACING DEPARTMENT.

Rules for  
admission to  
Drawing Office

I.—APPRENTICES for the DRAWING OFFICE.

1. When an opening occurs in the Drawing Office for the admission of an apprentice from the Yard, it will be filled up in future by competitive examination, according to the following rules.
2. This examination will be conducted by Professor Lambert, of the Royal Naval College, Greenwich, who has kindly undertaken this duty; and the candidate whom he decides upon as having the highest total of marks will be the one selected for entering the Drawing Office.
3. The examination will be open to all our apprentices who shall have been not less than two years in our employment as apprentices, and who for the time they have been in our employment have not been absent during the regular working hours for more than one hour in thirty, except through ill health, certified by a medical man, or with the written consent of their foreman.



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4. Candidates must bear a good character from each foreman under whom they have been working. They must have attended the South Kensington naval architecture classes for two years, in each year for the minimum number of nights required to enable them to compete in the examinations conducted by the Department. They must also have passed the elementary stage of these examinations in naval architecture.
5. The subjects of examination will be—
  - (a.) Mathematics, including arithmetic; geometry, as far as the first two books of Euclid; algebra as far as and including simple equations, and logarithms.
  - (b.) Theoretical mechanics, as required for the elementary stage of the Science and Art Department.
  - (c.) Practical plane, and solid geometry, as required for the elementary stage of the Science and Art Department.
  - (d.) Freehand drawing.

For the first subject a maximum of 200 marks will be given; for the second subject, a maximum of 100 marks will be given; for the third subject a maximum of 100 marks will be given; and for the fourth subject, a maximum of 50 marks will be given.
6. Successful candidates, in the event of their conduct and application being satisfactory, will be retained in the Drawing Office for an apprenticeship of four years, being paid at the rates of 30*l.*, 40*l.*, 50*l.*, and 60*l.* for each successive year.

II.—ADMISSION OF BOYS TO THE COUNTING HOUSE.

Rules for  
 admission to  
 Counting-House.

1. When vacancies occur in the counting house for boys as apprentice clerks, these will be filled by competitive examination, according to the following rules.
2. The examination will be open to any boy, not under 14 years of age, who is able to show a good certificate as to character, and whose nearest relative has been in the employment of Messrs. Denny & Co. or ourselves, for at least two years prior to the date of examination, and who is in the above employment at that date, or who has died while in above employment, after working in it for at least two years.
3. The subjects of examination will be—
  - (a.) Arithmetic, as far as and including decimal fractions, for which a maximum of 120 marks will be given.
  - (b.) Handwriting, for which a maximum of 100 marks will be given.
  - (c.) Writing to dictation, for which a maximum of 80 marks will be given.
4. Apprentice clerks will be engaged for four years, and their wages will be 15*l.*, 20*l.*, 25*l.*, and 30*l.* for each successive year.

III.—ADMISSION OF GIRLS.

Rules for  
 admission of  
 Girl Tracers.

1. When vacancies occur for girls in the Tracing Department, these will be filled up by competitive examination, according to the following rules.
2. The examination will be open to any girl, not under 15 years of age, who is able to show a good certificate of character, and whose nearest relative has been in the employment of Messrs. Denny & Co. or ourselves for at least two years prior to the date of examination, and is in the above employment, or who has died while in above employment, after working in it for at least two years.
3. The subjects of examination will be—
  - (a.) Arithmetic, as far as and including decimal fractions, for which a maximum of 120 marks will be given.

- (b.) Writing to dictation, for which a maximum of 120 marks will be given. Half of these marks will be set apart as a maximum for accuracy, correct spelling, and punctuation; the other half will be set apart as a maximum for penmanship. Appendix KK.  
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- (c.) Block-letter printing, as practised in our Tracing Department, for which a maximum of 120 marks will be given.
4. Apprenticeships in this department will be for four years, with wages at 6s., 8s., 10s., and 12s. per week for each successive year.

The above Rules may be revised by us from time to time, if found necessary. Notice of any alteration will be given at least twelve months before the alteration comes into operation.

Leven Ship Yard, Dumbarton,  
26th August 1881.

WM. DENNY & BROS.

Rider B. to Mr. DENNY'S LETTER, APPENDIX KK.

RULES FOR I. ADMISSION OF APPRENTICES TO DRAWING OFFICE. II. ADMISSION OF BOYS AS APPRENTICE CLERKS and as APPRENTICE DRAUGHTSMEN. III. ADMISSION OF GIRLS AS APPRENTICES IN TRACING DEPARTMENT. Rules for admission of Apprentices to Drawing Office.

I.

1. One of the apprentices employed in the works will be annually selected for admission to the drawing office.
2. The selection will be made by competitive examinations, which will be conducted under some neutral person.
3. These examinations will take place in the last week of December in each year. The successful candidate will begin in the drawing office after the new year holidays following.
4. The first examination will be held in December, 1881.
5. These examinations will be open to all our apprentices who shall have been not less than three years in our employment as apprentices on the 15th January following the date of examination, and who during that time have not been absent during the regular working hours more than one hour in forty in the aggregate, except through ill health, certified by a medical man, or with the consent of their foreman, and of whom their foreman can give a good report.
6. Subjects of examination will be freehand and mechanical drawing, arithmetic, algebra, up to and including simple equations, first two books of Euclid, and use of logarithms.
7. No apprentice can compete in these examinations oftener than twice.
8. Successful candidates, in the event of their conduct and application being satisfactory, may remain in the drawing office for at least two years, being paid at the same rates as if they were in the works until their regular time of apprenticeship has expired, when their rate of wages will be arranged by us according to their merits.
9. All intending candidates must hand in their names at the counting house not later than the 1st December of each year.

NOTE TO RULE 5.—For the first two or three years difficulties may arise regarding the amount of time lost by the apprentices up to date. Each doubtful case will be considered by us on its merits. From present time a careful record will be kept of attendance.

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II.

1. When vacancies occur in the counting house or drawing office for boys as apprentice clerks or apprentices draughtsmen, competitive examinations in elementary subjects will be held, and the successful candidates will be appointed to the vacancies.
2. These examinations will be open to any boy, not under 14 years of age, who is able to show a good certificate as to character, and whose nearest relative has been in the employment of Messrs. W. Denny & Bros. or of ourselves for at least twelve months prior to the date of examination, and is in above employment at that date, or has died while in above employment, after working in it for at least twelve months previously.
3. Apprentice clerks will be engaged for four years, and their wages will be 15*l.*, 20*l.*, 25*l.*, and 30*l.* for each successive year.
4. Apprentice draughtsmen will be engaged for five years. Their wages will be the same as other apprentices in the works.

III.

1. When vacancies occur for girls in the tracing department, they will be filled up in the same manner as for boys in the counting house and drawing office. Age must not be under 14 years; other conditions as for boys.
2. Apprenticeships in this department will be for four years, and wages will be 6*s.*, 8*s.*, 10*s.*, and 12*s.* per week for each successive year.

The above rules may be revised by us from time to time, if found necessary. Notice of any alteration will be given at least twelve months before the alteration comes into operation.

Engine Works, Dumbarton,  
16th August 1881.

DENNY & Co.

Rider C. to Mr. DENNY's Letter, APPENDIX KK.

C.—RULES and REGULATIONS for the guidance of the Committee of Awards.

AWARDS COMMITTEE.

*Members :*

WILLIAM JARDINE, Esq., Burgh Registrar, President.  
JOHN WARD, Esq., Manager, Leven Shipyard.  
ROBERT B. POPE, Esq., Manager, Engine Works.

*Secretary :*

Mr. ALEXANDER WATT, Counting House, Leven Shipyard.

1. Any workman in our employ may claim an award from the Committee on the following grounds:—
  - (a.) That he has either invented or introduced a new machine or hand-tool into the yard.
  - (b.) That he has improved any existing machine or hand-tool.
  - (c.) That he has applied any existing machine or hand-tool to a new class of work.
  - (d.) That he has discovered or introduced any new method of carrying on or arranging work.

Rules for  
guidance of  
Awards Com-  
mittee.

- (e.) Or, generally, that he has made any change by which the work of the yard is rendered either superior in quality or more economical in cost.
2. In the case of a workman who is unable to test the merits of his supposed invention or improvement, either through inability on his own part to make the necessary experiments or to pay for the same, the firm, on the recommendation of the Committee, may agree to bear the whole, or part, of the necessary expense; or the Committee will be at liberty to grant the free use of tools and appliances in the yard for this purpose, and if the invention should afterwards prove a practical success, an award will be granted.
3. On the establishment of a claim under the conditions above specified, the Committee are to make an award, which is not to fall below two pounds, nor to exceed ten pounds. Between these limits the award will be fixed by the Committee according to the opinion they may form of the value of the improvement or invention for which claim has been made. But in the case of an invention or improvement being considered by the Committee worthy of a greater award than 10*l.*, they shall submit a report on the same to the firm, who may sanction either (1) the granting of such greater award than 10*l.*; or (2) should the invention be considered worthy of being protected by patent, an award of 10*l.*, together with the taking out at the firm's expense of provisional protection at the Patent Office on behalf of the inventor, all with a view to enable him either to dispose of his invention during the period of protection, or to make arrangements for completing the patent at his own or his friend's expense, provided always, that the firm shall have for all time coming the use of any such invention so provisionally protected at their expense, free from the payment of any royalty or patent rights that may be chargeable on the same, should the patent be completed.
4. The Committee shall, in the case of difference of opinion, decide the matter by vote, the majority ruling.
5. After the Committee have completed their investigation of a claim, the Secretary shall intimate their decision to the claimant, and, if it is favourable, enclose an order on our firm, signed by the President, for payment of the amount awarded, and this order shall be payable on presentation to our cashier.
6. The Secretary shall, under the direction of the President, keep full minutes of the proceedings and decisions of the Committee, which must be approved by the Committee at the first meeting after that to which the minutes refer.
7. No award shall be made excepting on a clearly defined and written statement of the claim, which must be lodged with the Secretary. All statements of claims are to be engrossed in the minutes.
8. If any claimant desires such help, the Secretary will put his claim into proper form, and write it out for him. All claims, however, must be signed by the claimant.
9. The Committee will meet once during the first week of each month, when necessary, and for as many evenings following as may be required to despatch the business in hand.
10. The Committee may call before them, as evidence on the claims made to them, any person in our employ, or, if necessary, any member of the firm.
11. We reserve to ourselves the right to modify, change, or annul any, or the whole of the foregoing rules.

(Signed) Wm. Denny & Bros.

Leven Shipyards,  
Dumbarton, 1st December 1881.

Appendix KK  
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Technical  
Education for  
Shipbuilders.

## Appendix LL.

Memorandum  
respecting  
Designs for  
Linen.

## APPENDIX LL.

## MEMORANDUM WITH RESPECT TO DESIGNS FOR LINEN.

Paris, March 25, 1883.

I made inquiries about the designing for the linen trade in the north of France.

It appears that these manufacturers have various ways of getting up drawings.

Some have designers attached to their works, some have them in their house of sale in Paris. One or two designers (merchants of designs) sell them now and then some ideas.

I am told, by one of these merchants of drawings, who see them now and then, that one of the two best manufacturers of this class of goods has a private studio in Paris, and scarcely ever buys a drawing.

It is the "Maison de Blanc"; another firm "La maison Casse" of Lille has a few designers in its works in that town, and buys ideas, often enough from the Parisian designers, who work for that speciality. The designing part of this trade is often artistic, but employs very few hands.

\* \* \*

## Appendix MM.

Memorandum  
respecting  
designing for  
Lace.

## APPENDIX MM.

## MEMORANDUM WITH RESPECT TO DESIGNING FOR LACE AT NOTTINGHAM.

It is rather a difficult matter to go into the entire question of the relations between the School of Art, and the designing for lace. There is no doubt that the lace trade is greatly indebted to the school, inasmuch as it is there that they receive their art education. Designing for lace is not specially taught there. The greater part of the lace designs are designed by Nottingham men, but, there is no doubt that the French still beat us both in taste and imagination.

The French designers work well for a couple of years when here, but, after that time they lose all their freshness, and have to go back to Paris to get fresh ideas and inspirations. We still, however, have to buy a great many French designs, for after all Paris leads the fashions.

The great advantage our School of Art offers, is that the scholars are taught drawing thoroughly, and learn to discriminate between the true and the false in art. I think the great use of the schools of art, and art museums is that the public (that is the buyer) is learning to judge what is good in art, and consequently is constantly *compelling* the manufacturers to improve their designs.

\* \* \*

**APPENDIX 2.**  
**ZÜRICH CANTONAL SCHOOL.**  
**TIME TABLE OF GYMNASIUM.**  
(See Vol. I., p. 21.)

**I.—LOWER GYMNASIUM.**

Subject.	Number of Hours devoted to each Subject.			
	Class I.	Class II.	Class III.	Class IV.
	Religion	2	2	2
German	4	4	3	3
Latin	10	8	5	7
Greek	—	7	7	7
French	—	—	6	6
Mathematics	4	4	3	3
History	2	2	3	3
Geography and Natural Sciences	3	2	—	2
Singing	1*	1*	1*	1*
Writing	2	—	—	—
Drawing	2	2	2	—
Gymnastics	2	2	2	2†

\* An additional hour of choir practice optional.

† Three hours in summer.

N.B.—Religious instruction optional; also Greek in Lower School and Hebrew. Students in Upper School who take Greek need not study English. Those students who take Hebrew may drop French.

**II.—UPPER GYMNASIUM.**

Subject.	Number of Hours devoted to each Subject.		
	Class I.	Class II.	Class III.
Religion	—	2	—
German	4	4	3
Latin	7	7	7
Greek	7	7	7
French	3	3	3
English	3*	—	—
Hebrew	—	4	3
Mathematics	4	4	3
History	3	3	3
Natural Sciences —			
a. Physics	2	3	1-2
b. Physical Geography	—	—	2-3
c. Chemistry	3	—	—
d. Natural History	—	2	—
Singing	1†	1†	1†
Gymnastics	2	2	2
Exercises with Arms	1‡	1‡	—

\* Will subsequently be introduced in all three classes.

† Half of the time devoted to gymnastics, for rifle practice, &c., in summer.

‡ Optional.

APPENDIX 2—continued.

TIME TABLE OF THE INDUSTRIE SCHULE.

A.—PREPARATORY SCHOOL.

Subjects.	Hours of Study per week.
Religion . . . . .	2
German . . . . .	6
French . . . . .	6
History . . . . .	4
Geography . . . . .	3
Natural History . . . . .	3
Mathematics . . . . .	3
Calligraphy . . . . .	3
Freehand Drawing . . . . .	4*
Singing . . . . .	1†
Gymnastics . . . . .	1

\* Two hours in winter.  
† One hour optional.

B.—TECHNICAL DIVISION.

Subjects.	Number of Hours.		
	Class 2.	Class 3.	Class 4.
Religion . . . . .	2	—	—
German . . . . .	4	3	3
French . . . . .	5	6	3
English . . . . .	5	6	4
Physics . . . . .	—	4	4
Chemistry . . . . .	—	3*	2
History . . . . .	3	2	—
Geography . . . . .	3†	—	—
Natural History . . . . .	3‡	—	—
Mathematics . . . . .	7	6	6
Geometrical and Technical Drawing . . . . .	4	4	4
Freehand Drawing . . . . .	2	4‡	2
Singing . . . . .	1‡	1‡	—
Gymnastics . . . . .	3	3‡	3
Mechanics . . . . .	—	3	3
Practical Geometry . . . . .	—	1‡	4
		3	0

NOTE B.—In the Natural Science Division the classes in German, French, English, History, Physics, Chemistry, Mathematics, Singing, and Drill are identical with the above; there are also the following added subjects:—Minerology 3 hours in winter only. Laboratory work in Chemistry 4 hours in winter; Botany 4 hours in summer, and Freehand Drawing 2 hours.

NOTE C.—In the Natural Science Division the classes in German, French, English, Physics, History, Drawing, Singing, and Gymnastics are identical with the above; there are also the following added subjects:—Chemistry 6 hours, Minerology 3 hours, Botany 3 hours, and Mathematics 3 hours. Singing is optional in all the classes, as is also the Religious Instruction.

\* Four hours in winter. † One hour in winter.  
‡ In winter only. § Two hours in winter.  
¶ Optional.

C.—MERCANTILE DIVISION.

Subjects.	Number of Hours.	
	Class 2.	Class 3.
Religion . . . . .	2	—
German . . . . .	4	3
French . . . . .	5	6
English . . . . .	5	4*
Italian . . . . .	5*	4*
History . . . . .	3	3
Geography . . . . .	2	2
Physics . . . . .	3	—
Chemistry . . . . .	3	3†
Knowledge of Merchandise . . . . .	—	1‡
Algebra . . . . .	1	—
Mercantile Arithmetic . . . . .	4	4
Theory of Commerce . . . . .	2	2
Book-keeping and Accounts . . . . .	1	2
Calligraphy . . . . .	2	—
Freehand Drawing . . . . .	2	2*
Singing . . . . .	1	1*
Gymnastics . . . . .	3‡	3‡

Choral Singing not obligatory for any class. Exercises with military weapons and rifle practice on Saturday afternoons. Military drill 1 hour in winter.

\* Optional. † One hour in winter.  
‡ Two hours in winter.

## APPENDIX 3.

## EDUCATIONAL EXPENDITURE OF THE CANTON OF ZURICH.

Appendix 3,  
Educational  
Expenditure of  
the Canton of  
Zurich.

(See Vol. I, p. 21.)

The budget of the Canton of Zurich for the whole of its education, for which information we have to thank the Regierungsrath Zollinger of the Obmanant, Zurich, amounts to 1,847,490 fr. (73,900*l.*). The following are the principal items of expenditure :—

	fr.
Office expenses - - - - -	22,300
The University - - - - -	192,800
Contribution to Federal Polytechnic - - - - -	16,000
<i>Gymnasium</i> - - - - -	81,000
<i>Industrie Schule</i> - - - - -	44,000
Miscellaneous expenses on cantonal school - - - - -	12,900
Veterinary school - - - - -	25,100
Normal schools - - - - -	54,950
Technikum at Winterthur - - - - -	84,200
Libraries and collections - - - - -	50,600
Scholarships and bursaries to teachers and students - - - - -	59,000
Gas, water, and coals - - - - -	17,000
Primary schools - - - - -	1,010,700
Pensions, &c. - - - - -	108,550
Military drill - - - - -	2,500
Sundry subventions, Winterthur, &c. - - - - -	65,890
Total - - - - -	1,847,490

The estimated expenditure of the canton under all heads being, for 1882, 5,845,144 francs, it follows that the education vote absorbs nearly 32 per cent. of the total expenses of the canton. In addition to the cantonal expenditure on education, each commune pays for its own primary schools. Thus, for example, the estimated outlay of the town of Zurich for 1881 for education purposes amounts to 437,900 fr. (17,513*l.*). Of this total, elementary schools take 119,448 fr., 183,710 are allotted to higher elementary schools, 15,290 fr. for the *Real Gymnasium*, 30,075 fr. for the higher girls' school and the normal schools for female teachers, 96,724 fr. for miscellaneous expenses, and 105,000 fr. for interest on loans for the erection of school buildings.



## Appendix 5.

Educational  
statistics of the  
Kingdom of  
Saxony.

## APPENDIX 5.

## EDUCATIONAL STATISTICS OF THE KINGDOM OF SAXONY.

See Vol. I., p. 23.

STATISTICS of the ELEMENTARY SCHOOLS, PRIVATE SCHOOLS, &c., of SAXONY,  
for the year ending December, 1880.

	Number of Schools.	Number of Pupils.	Number of Classes.	Number of Teachers Places.*	Number of actual Teachers (active).†		
					Male.	Female.	Total.
Public Elementary Schools.	2,146	471,918	10,061	5,909	5,736	1,678 (1,534)	7,406
Continuation Schools	7,978	67,776	2,936				
Sp. School Bodenbach	1	84	3	Included in the Seminaries.			
Sp. Seminary Exercise Schools.	18	2,069	75				
Deaf and Dumb Schools.	2	354	30	36	41 (6)	7 (7)	46
Private Elementary Schools with State Sanction.	96	6,854	419	—	244	291	535
Private continuation Schools.	20	1,979	30				
Private Teachers and Governesses giving lessons at home.	—	—	—	—	30	94	124
Totals - - -	4,161	551,621	13,233	5,945	6,041 (6)	2,070 (1,542)	8,111

\* Excluding places for Needlework Teachers (female) and teachers of manual work.

† Including 1,462 Needlework Teachers (female) and five teachers of manual work, the numbers of these being also given in parentheses.

ELEMENTARY - OR PRIMARY - SCHOOL.

OBSERVATIONS.

- 1) *The Elementary instruction is obligatory for all children from the 6<sup>th</sup> to the 13<sup>th</sup> year of their age, unless they go to a higher school.*
  - 2) *The Students of the Humanistic Gymnasium can pass into all the faculties of the University and the Polytechnic, those from the Real Gymnasium can only enter the Polytechnic and the Philosophic faculty of the University.*
  - 3) *Students who have passed through the Industrie-Schule can likewise enter the Polytechnic.*
- Munich May 1882.*

## APPENDIX 5—continued.

Appendix 5.

EDUCATIONAL STATISTICS OF THE KINGDOM OF SAXONY—continued.  
 SUMMARY of all the SCHOOLS in SAXONY under the MINISTER of EDUCATION  
 and CULTUS, December 1880.

Educational  
 statistics of the  
 Kingdom of  
 Saxony.

	Number of Schools and In- stitutions.	Number of pupils and scholars.	Number of Classes.	Number of teachers	Amount of Teachers' salaries.	Total amount of expenses of Schools.	Amount of State aid.
1. University (Leip- sic.	1	3,444	-	173*	23,037	53,370†	24,905‡
2. Polytechnic (Dresden).	1	478	-	33	8,338	13,467	12,203
3. Gymnasiums	15	4,768	171	340	51,183	81,424	32,239
4. Real Schools of Class I.	19	3,183	141	244	29,640	36,646	8,735
5. Real Schools of Class II.	20	2,633	126	214	24,136	34,738	10,660
6. Seminaries	18	3,376	115	273	34,818	62,301	46,921
7. Special Seminary Exercise Schools.	12	2,069	76		included under Seminaries.		
8. Institute for training teachers of gymnastics.	1	60	-	4	383	695	458
9. Higher Girls' Schools (san- ctioned).	2	343	29	38	4,450	6,988	-
10. Pensions granted to teachers of Higher Schools, or to their orphans and widows.	-	-	-	-	-	5,737	included under 12-14
11. Higher (second- ary) Private Schools	3	829	47	103	-	-	-
12. Public Elementary Schools.	3,146	471,916	10,081				
13. Continuation Schools.	1,878	67,776	2,688	7,404	519,087	704,706‡	66,975‡
14. School at Roden- bach.	1	64	3				
15. Deaf and Dumb Institutions.	3	364	30	47	4,135	16,307	8,930
16. Private Element- ary Schools, with State sanction.	96	6,854	419	535	-	-	-
17. Private Continuation Schools, with State sanction.	20	1,979	30				
18. Private Teachers and Governesses in Houses.	-	-	-	124	-	-	-
Totals	4,539	569,213	13,961	9,560	899,317	1,004,297	213,973

\* Including 54 Privat-Dozenten.

† Excluding the cost of erection, amounting to 229,941.

‡ Here are included certain pensions granted to teachers of Higher and Elementary Schools.

APPENDIX 6.

PROGRAMME of the ÉCOLE D'APPRENTISSAGE DE GARÇONS of HAVRE.  
(See Vol. I., p. 49).

Course.	* Day.	6.30 to 8.0 (in Summer).	8.0 to 8.40.	8.40 to 9.30.	9.30 to 10.0.	10.0 to 12.0.	12.0 to 2.0.	2.0 to 3.40.	3.40 to 3.50.	3.50 to 4.0.	4.0 to 6.0.	6.0 to 7.0 (in Winter).	
Elementary Course (2nd Section). Prof. M. Letellier.	Monday	Drawing	Manual work.						French Arithmetic Writing	Arithmetic French	Reading Hist. & Geog. Geometry	Manual work	Drawing
	Tuesday	Do.	Do.						Arithmetic French	Reading Arithmetic	Geometry Writing	Do.	Do.
	Wednesday	Do.	Do.									Do.	Do.
	Thursday	Do.	Do.									Do.	Do.
	Friday - Saturday	Do.	Do.									Do.	Do.
Elementary Course (1st Section). Prof. M. Letellier.	Monday	Drawing	French Arithmetic Writing	Arithmetic French	Reading Hist. & Geog. Geometry	Manual work		Manual work.				Drawing	
	Tuesday	Do.	Do.	Do.	Do.	Do.		Do.				Do.	
	Wednesday	Do.	Do.	Do.	Do.	Do.		Do.				Do.	
	Thursday	Do.	Do.	Do.	Do.	Do.		Do.				Do.	
	Friday - Saturday	Do.	Arithmetic French	Reading Arithmetic	Geometry Writing	Do.		Do.				Do.	
Intermediate Course (2nd Section). Prof. M. Tubaut.	Monday	Drawing	Manual work.						French (Reading) French (Reading)	Comm. Arith. Arithmetic	History Geometry Geography	Manual work	Drawing
	Tuesday	Do.	Do.									Do.	Do.
	Wednesday	Do.	Do.									Do.	Do.
	Thursday	Do.	Do.									Do.	Do.
	Friday - Saturday	Do.	Do.									Do.	Do.
Intermediate Course (1st Section). Prof. M. Streff.	Monday	Drawing	French (Reading) French (Dictation) French (Reading)	Arithmetic	History Geometry	Manual work		Manual work.				Drawing	
	Tuesday	Do.	Do.	Do.	Do.	Do.		Do.				Do.	
	Wednesday	Do.	Do.	Do.	Do.	Do.		Do.				Do.	
	Thursday	Do.	Do.	Do.	Do.	Do.		Do.				Do.	
	Friday - Saturday	Do.	French (Comp.) French	Arithmetic Do.	History Rep. Hist. & Geo.	Do.		Do.				Do.	
Superior Course. Prof. M. Tubaut.	Monday	Drawing	8.0 to 9.0.	9.0 to 10.0.	10.0 to 12.0.			Manual work.				Drawing	
	Tuesday	Do.	French (Reading) French (Dictation)	Arithmetic Geometry	Do.			Do.				Do.	
	Wednesday	Do.	Mechanics	Hist. & Geog.	Manual work.			Do.				Do.	
	Thursday	Do.	Do.	Do.	Do.			Do.				Do.	
	Friday	Do.	French (Style)	Geometry	Do.			Do.				Do.	

Dinner and Recreation.

## APPENDIX 7.

## THE ROYAL FACHSCHULE OF ISERLOHN, PRUSSIA.

## Appendix 7.

Prospectus of  
the Royal Fach-  
schule of  
Iserlohn, Prussia.

(See Vol. I., p. 51.)

The object of this Institution, as an Academy of Arts, is to impart a thoroughly sound education, at once Scientific, Technical and Manual. The subjects comprehend the manufacture of Iron, Copper, Brass, Bronze, Nickel and Silver.

To aid the students in acquiring a comprehensive, well-grounded, practical knowledge of the diverse processes and successive stages of manufacture in those metals, they have the advantage of spacious drawing halls, auditoriums, workshops replete with all necessary apparatus, instruments, tools, machinery, &c., and a steam engine of six-horse power, all within the walls of the institution.

The establishment is conducted under proper supervision in every department, and all suitable measures are adopted to maintain the students in vigorous health, both of body and mind. From time to time excursions are made to visit the picturesque scenery of the neighbourhood, as well as into Rhenish-Prussia, and visits are paid to the large industrial establishments in the district.

The terms for the Science Instruction begin after the Easter vacation, but instruction in Manual Work can be commenced at any time. No student is bound to attend all the branches of instruction specified in the Prospectus.

The school fee is 14. per quarter.

## PROSPECTUS.

## A. Scientific Education.

## FIRST YEAR.

1. Model Drawing.
2. Ornamental Drawing.
3. Geometry.
4. Geometry applied to Design.
5. The German Language.
6. General Arithmetic and Book-keeping.
7. Algebra.
8. Natural Philosophy.

## SECOND YEAR.

1. Ornamental Drawing.
2. Anatomical Drawing (the human figure).
3. The Science of Shadows.
4. The Science of Perspective.

5. The German Language.
6. The Science of Projection.
7. Mechanical Calculations.
8. Natural Philosophy.
9. Technical Chemistry.
10. Mechanics.

## THIRD YEAR.

1. Composition and Designing.
2. Drawing from the Antique.
3. The History of the Arts.
4. The German Language.
5. Natural Philosophy.
6. Technology.
7. Technical Chemistry (Laboratory).
8. Statistics.

## Appendix

Prospectus of  
the Royal Fach-  
schule of  
Iserscheln.

## B. Manual Education Division.

## FIRST YEAR.

1. Modelling in Fine Clay.
2. Carving Wood.
3. Moulding and Carving in Gypsum.
4. Moulding in Sand.
5. Chipping and Filing.

## SECOND YEAR.

1. Modelling in Wax.
2. Carving in Wood.
3. Carving in Gypsum.
4. Moulding in Sand and Wax.
5. Casting in Bronze.
6. Shaping.
7. Planing.
8. Drilling.
9. Turning in Wood.

10. Turning in Metal.
11. Chasing in the Lathe.
12. Pressing, Stamping, and Coining.

## THIRD YEAR

1. Forging.
2. Soldering.
3. Burnishing.
4. Embossing.
5. Chasing.
6. Engraving.
7. Etching.
8. Scouring.
9. Varuishing.
10. Galvanizing.
11. Nickel-Plating.
12. Fire-gilding.

THEODORE BEUTER, Director.

## Appendix 8.

Report on  
Technical  
Training in  
Prussia.

## APPENDIX 8.

## REPORT ON TECHNICAL TRAINING IN PRUSSIA by HERR VON PUTTKAMMER.

(See Vol. I., p. 82.)

The following is a resumé of a Report on the Organisation of Technical Instruction in Prussia, prepared for the Commission by Herr von Puttkammer.

No Technical  
Instruction for  
foremen and  
workmen in  
Prussia.

In the first place, it appears that no system has yet been developed for the technical instruction of foremen and workmen in Prussia. Such arrangements as exist, differ in various places, and cannot be regarded as permanent. Indeed it may be said that by far the larger proportion of skilled artisans, foremen, and operatives in Prussia have no opportunity afforded them, and, it may be added, often exhibit no desire to obtain further information than they have gained in the primary school, where the instruction in drawing, of such special importance to the future artisan, has hitherto not received the attention it deserves. An improvement in this direction is contemplated, but its execution will be tedious and costly.

Technical educa-  
tion for masters  
and managers.

Secondly. The technical education of the persons intending to become masters and managers of industrial establishments has been placed in Prussia on a systematic basis. This is especially the case for the subjects of mechanical and civil engineering, chemistry, and architecture, and for his purpose, technical high schools of Berlin, Hanover, and Aachen have been established, the cost of these establishments being borne solely by the State. All persons employed in the Civil Service in the branches of engineering or architecture are obliged to attend one or other of the above schools, and are required to pass examinations in the several courses of study, whilst entrance to the technical high schools is allowed only to those who can present the leaving certificate from a gymnasium, Real gymnasium, or an upper Real school, indicating the proper completion of a strict preliminary training.

Side by side with this advanced system of technical instruction in Prussia a number of "Real" and "Trade" schools exist. These perform the function of giving a training of a less advanced type available for persons in the position of sub-managers, or for students of secondary rank. The higher class of these schools are called upper real schools, and include a course of instruction spread over nine years; others, of a somewhat lower type, have courses lasting for six or seven years; these latter are termed burgher schools, and in them a general education is given. For carrying on the technical training of pupils from these, or from the primary schools, or of persons already apprenticed or engaged in trade, a class of schools known as "trade schools" (Fachschulen) exist. The number of these institutions in Prussia is but small, and efforts recently made for their increase and improvement have not been so successful as might be wished, the reason being that the locality is obliged to defray the cost of buildings, and half the annual expenses not covered by school fees. The fact that the total annual cost to the State of these schools does not exceed 18,000*l.* proves that they can neither be numerous nor of an elaborate character.

- The technical schools proper of Prussia include the following:
- (a.) Eight building schools in Berlin, Nienburg, Eikernförde, Breslau, Höxter, and Idstein.
  - (b.) One school for machine construction at Einbeck.
  - (c.) Four weaving schools at Crefeld, Mulheim, and Einbeck.
  - (d.) A training school for basket makers at Heinsberg.
  - (e.) A trade school for pottery at Höhr.
  - (f.) A trade school for workers in metal at Iserlohn and another at Remscheid.

In addition to these special schools about 10 or 12 trade drawing schools exist in various towns, as well as trade continuation-schools for apprentices and artisans under 18 years of age, who can, by local enactment, be compelled to attend these schools, their employers being bound to grant them the necessary time, and attendance at such obligatory schools is recognised by the State. In cases where the obligatory attendance is enforced, the State pays half the expenses, but the total yearly amount of State grant is not more than 8,000*l.* The most recent additions to this class of school are the artisan school in Berlin, and the Sunday and evening school at Breslau. In neither of these, however, is the attendance compulsory, and the number of pupils in the classes last winter was 700 and 400 respectively.

Other more special technical institutions are the agricultural schools, the educational workshops of the State railways, the navigation schools, and the higher mining schools. Each of these sets of schools is placed under the direction of the Departmental Ministry. Of 561 apprentices in the Government railway workshops, 277 attended the special schools established for their benefit. Of the navigation schools about 14 exist. They provide a suitable training for persons entering the merchant service, assisting them in obtaining the knowledge requisite for passing the prescribed examinations for steersmen. No schools for the education of mates or petty officers exist in Prussia. Seven mining schools proper exist in Prussia, viz., in Tarnowitz, Eisleben, Bochum, Siegen, Dillenburg, Saarbrücken, and Clausthal, whilst five preparatory or inferior schools for a lower grade of miners are established in the mining centres.

A Royal Commission on technical instruction in Prussia is now sitting for the purpose of receiving communications on the development of the opportunities for technical instruction.

Appendix 8.

Report on  
Technical training  
in Prussia.Technical  
Schools of  
Prussia.Trade drawing  
schools.Number of  
pupils.Other technical  
schools.Royal Commission  
on Technical  
Instruction.

APPENDIX 9.

PROFESSIONAL AND INDUSTRIAL EVENING INSTRUCTION IN BELGIUM.

(See Vol. I., p. 55.)

	Schools established at	Date of Formation.	Subsidies granted in 1878.*	Special Instruction in each School.†	Duration of Course.	No. of Students in 1878.
			£			
1	Antwerp	1800	869	Architecture, book-keeping	3 years	149
2	Arion	1878	190	Architecture, painting, wood-carving	3 "	75
3	Aix	1871	318	Architecture	3 "	116
4	Bruges	1853	360	Designing for lace-work, architecture	6 "	106
5	Brussels	1809	905	Mechanics and steam-engines, photography, drawing for working painters	3 "	619
6	(Girls)	1868	1,648	Modelling and painting industrially applied, foreign languages, needlework, dress-making and cutting out, artificial-flower making.	3 "	329
7	Charlevoix	1846	1,084	Commercial geography, mechanics and steam engine, metallurgy, mining, modelling	3 "	1,074
8	Châtelet	1879	314	Drawing, "soudeserie," mechanics, mining, metallurgy	3 "	455
9	Courtrai	1868	510	Land-surveying, mechanics, course for stokers and drivers of steam-engines	3 "	196
10	Purnee	1809	145	Drawing, architecture	3 "	89
11	Ghent	1833	1,874	Photography, ornamental drawing, spinning, and weaving	3 "	887
12	Russelt	1864	274	Architecture, drawing, painting, wood-carving	4 "	125
13	Deux-Houdong	1864	178	Special course for workmen, engine-fitters, foremen, and gangers	3 "	215
14	Huy	1836	341	Mechanics, construction	4 "	180
15	Jambouix	1868	118	Drawing	3 "	138
16	Junot	1870	313	Accounts, mechanics, commerce, Flemish language, chemistry	3 "	144
17	Lilloe	1826	604	Mechanics, chemistry, mathematics	3 "	308
18	Louvain	1876	300	Drawing, accounts, mechanics, construction	3 "	269
19	Marchienne-au-Pont	1873	350	Drawing, mechanics	3 "	100
20	Mouvaux-sur-Sambre	1873	373	Industrial drawing, metallurgy, mining	3 "	308
21	Morlanwelz	1871	454	Mechanics, land-surveying, mining	3 "	186
22	Namur	1861	373	Accounts, mechanics, construction, chemistry, masons' work	3 "	234
23	Nivelles	1878	313	Drawing, wood-carving, architecture, mechanics	4 "	147
24	Ostende	1867	311	Drawing, mechanics	3 "	168
25	Pâturages	1868	152	Mechanics, mining, drawing	3 "	117
26	Rouais (discontinued in 1879)	1868	136	Flemish, geography, mechanics, chemistry, drawing	3 "	148
27	Saint-Ghislain	1868	133	Mining, industrial mechanics	3 "	253
28	Seraing	1858	495	Mathematics, mechanics, metallurgy, commercial sciences	3 "	264
29	Seraing	1859	880	Mechanics, masons' work, modelling, architecture	3 "	146
30	Tournai	1800	301	Construction and industrial drawing, mechanics foundry-work for hosiery and boiler-making.	2 "	89
31	Verrires	1862	983	Machine construction, dyeing, weaving, woollen manufacture	3 "	393
32	Ypres	1866	143	Knowledge of materials, construction, architecture	5 "	150
	Total		£ 16,613		Total	8,387





APPENDIX 10—continued.

TIME TABLE of the AMBACHTS SCHOOL at ROTTERDAM—continued.  
 (See Vol. I., p. 66).

Days.	Hours.	First Class.			Second Class.		Third Class.		
		A (Smiths).	B.	C.	A (Smiths).	B.	A (Smiths).	B.	
THURSDAY.	8	Linear Drawing	Arithmetic	Drawing Ornament	Algebra	Drawings of Construction	Nature of Tools		Carving and Modelling, 9-12.
	9	Arithmetic	Reading	Linear Drawing	Drawing Details of Construction	Drawing Ornament	Drawings of Construction		
	10	Drawing Ornament	Linear Drawing	Arithmetic			Arithmetic	Industrial Work	
	11	Reading		Drawing Ornament	Descriptive Geometry	Industrial Work			
12	Industrial Work	Industrial Work	Industrial Work	Industrial Work		Industrial Work	Industrial Work		
FRIDAY.	8	Arithmetic	Drawing Ornament	Linear Drawing	Drawing Details of Construction	Nature of Tools	Algebra	Drawing Ornament	Wood Turning, 1-4.
	9	Drawing Ornament	Linear Drawing	Arithmetic					
	10	Linear Drawing	Arithmetic	Drawing Ornament	Algebra	Drawings of Construction	Industrial Work		
	11		Mental Arithmetic				Industrial Work	Industrial Work	
12	Industrial Work	Industrial Work	Industrial Work	Industrial Work	Industrial Work	Industrial Work			
SATURDAY.	8	Arithmetic	Linear Drawing	Drawing Ornament	Arithmetic	Drawings of Construction	Drawings of Construction	Drawings of Construction.	
	9	Linear Drawing	Drawing Ornament	Reading					
	10	Drawing Ornament	Arithmetic	Linear Drawing	Drawings of Ornament	Reading	Industrial Work		
	11	Linear Drawing		Arithmetic			Industrial Work	Drawing of Ornament	
12	Industrial Work	Industrial Work	Industrial Work	Industrial Work	Industrial Work	Industrial Work			

APPENDIX 10—continued.

TIME TABLE OF THE AMBACHTS SCHOOL, AMSTERDAM.  
(Vol. I., p. 65.)

SUBJECTS.	MONDAY.				TUESDAY.			WEDNESDAY.				THURSDAY.			FRIDAY.			SATURDAY.			Hours weekly.				
	Class.				Class.			Class.				Class.			Class.			Class.			I.	II.	III.	IV.	
	I.	II.	III.	IV.	I.	II.	III.	I.	II.	III.	IV.	I.	II.	III.	I.	II.	III.	I.	II.	III.	I.	II.	III.	IV.	
Linear and Architectural Drawing.	8-12	8-12	8-12		8-12	8-12	8-12					8-12	8-10	8-10	8-12	8-12							18	10	12
"    "    Afternoon													2-4	2-4	2-4					6-12					4
Details of Construction																									2
Plan Drawing													10-12	10-12											6
Ornamental Drawing								2-12	2-12	2-4	2-4														2
"    "    Afternoon								2-4	2-4	8-12	8-12														2
Drawing from Nature			2-4	2-4																					6
Modelling	2-4	2-4	2-4									2-4	2-4	2-4											6
Continuation of	2-4	2-4	2-4									4-5	4-5	4-5											1
Reading	2-3A				2-3	2-4									3-4	3-4									1
Writing	2-4B						2-3	2-3	4-5	4-5	4-5														1
Grammar												5-6	4-5	5-6											1
Arithmetic					2-4		2-3	2-3	4-5	4-5	4-5		5-6	4-5	5-6	2-3	3-4								1
Algebra and Geometry																									5
Physics and Mechanics																									2
Reading and Repetition																									2
Carpentry	4	—	8		4	—	8	6	—	8		6	—	8	4	—	8								16
Forging	4	—	8		4	—	8	6	—	8		6	—	8	4	—	8								16
Turning	6	—	8		6	—	8	6	—	8		6	—	8	6	—	8								16
Wood Carving	4	—	8		4	—	8	6	—	8		6	—	8	4	—	8								16
Knowledge of Materials																		8	—	—					2

APPENDICES, &c.

Appendix 10.  
Time Table of  
the Ambachts  
School, Amsterdam.

Appendix 11.

## APPENDIX 11.

Time Table of  
the Women's  
Work School,  
Reutlingen.TIME TABLES OF THE WOMEN'S WORK SCHOOL, REUTLINGEN.  
(See Vol. I, p. 170.)

## 1a.—LITERARY SUBJECTS, taught at the HIGHER GIRLS' SCHOOL.

Subjects.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Essays	—	8-9	—	—	—	—
Literature	—	—	9-10	—	—	9-10
Arithmetic	—	—	—	9-10	—	—
Geography	10-11	—	—	—	—	—
History	—	9-10	—	—	—	10-11
Chemistry	8-9	—	—	10-11	—	—
French	9-10	10-11	10-11	—	—	8-9
English	—	—	8-9	—	—	—

1b. LITERARY and GENERAL EDUCATIONAL SUBJECTS taught at the  
WOMEN'S WORK SCHOOL.

Subjects.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Book-keeping and Commercial Arith- metic	—	4-5	4-5	4-5	4-5	—
Correspondence and Business Essays	4-5	—	—	—	—	—
General Housekeeping and Domestic Economy	—	—	—	5-6	—	—
Lectures on History and Literature	5-6	—	—	—	—	—
Gymnastics, Dancing, and Deportment	—	—	5-7	—	6-7	—

## 2a. ARTISTIC COURSES at the WOMEN'S WORK SCHOOL.

Subjects.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Linear Drawing	2-4	—	—	—	—	—
Freehand Drawing	—	2-4	—	—	—	—
Projection and Draw- ing applied to pat- tern cutting	—	—	—	2-4	—	—
Painting and Laws of Colour	—	—	—	—	2-4	—
Style and History of Costume	—	—	2-4	—	—	—

APPENDIX 11—continued.

3. INSTRUCTION IN NEEDLEWORK, &c., DRAWING applied to SAME, and PAINTING.

Subjects.	Monday.		Tuesday.		Wednesday.		Thursday.		Friday.		Saturday.		
	Morning.	After-noon.	Morning.	After-noon.	Morning.	After-noon.	Morning.	After-noon.	Morning.	After-noon.	Morning.	After-noon.	
Knitting and Crochet	Hand work	8-12	2-6	10-12	2-6	8-12	2-6	8-12	2-6	10-12	2-6	—	—
	Applied drawing	—	—	8-10	—	—	—	—	—	8-10	—	8-12	—
Hand sewing*	Hand work	—	2-6	8-12	2-6	8-12	2-6	8-12	4-6	8-12	2-6	—	—
	Applied drawing	8-12	—	—	—	—	—	—	2-4	—	—	8-12	—
Machines ewing†	Hand work	8-12	4-6	—	2-6	8-10	2-6	8-12	2-6	8-12	2-6	8-12	—
	Applied drawing	—	2-4	8-12	—	10-12	—	—	—	—	—	—	—
Dressmaking†	Hand work	8-10	2-6	8-12	2-6	10-12	2-6	8-12	2-6	8-12	2-6	—	—
	Applied drawing and painting	10-12	—	—	—	8-10	—	—	—	—	—	—	—
Embroidery	Hand work	8-12	2-6	10-12	2-6	8-12	2-6	8-12	2-6	10-12	2-6	8-12	—
	Applied drawing and painting	—	—	8-10	—	—	—	—	—	8-10	—	—	—
Trimming and flower making	—	—	—	—	—	—	—	—	—	—	—	—	2-6
Ironing	—	—	—	—	—	—	—	—	—	—	—	—	2-6
Cutting-out and fitting-on	8-12	2-6	8-12	2-6	8-12	2-6	8-12	2-6	8-12	2-6	8-12	—	—

\* Two parallel courses a and b.  
† Three parallel courses a, b, and c.

APPENDICES, &c.

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Appendix 11.  
The Table of  
the Work of  
the School  
Birmingham.



APPENDIX 12—continued.

TIME TABLE OF LA MARTINIÈRE SCHOOL—continued.

ARRANGEMENT OF THE CLASSES FOR BOYS, school year 1881-82—continued.

Begin.	End.	Year.	Section.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	SATURDAY.
To March 27th 10.50	11.50	3rd	A.	Hist. and Geog.	Grammar.	English.	Grammar.	English.	Accounts.
After March 27th 10.50		2nd	B.	English.	Hist. and Geog.	Grammar.	Mathematics.	Hist. and Geog.	English.
			C.	Accounts.	English.	English.	Hist. and Geog.	Accounts.	Grammar.
10.50	11.50	3rd	D.	Shop-work.	Modelling.	Writing.	Shop-work.	Modelling.	Writing.
			E.	Modelling.	Writing.	Shop-work.	Modelling.	Writing.	
			F.	Writing.	Shop-work.	Modelling.	Writing.	Shop-work.	Modelling.
11.50	2.10	Dinner -		Lessons in weaving for 2nd year students on Tuesdays, Thursdays, and Saturdays from 11.50 to 12.50, and for 3rd year students on Mondays, Wednesdays, and Fridays at the same hour. The 2nd and 3rd year students of the workshop section are engaged on the same days and at the same hour as the above, in work in the shops.					
Begin.	End.	Year.	Section.	MONDAY.	TUESDAY.	WEDNESDAY.	FRIDAY.	SATURDAY.	
2.10	2.25	3rd	A.	Chemistry.	Chemistry.	Mathematics.	Grammar.	Chemistry. Chemistry. Chemistry. Grammar. Arithmetic. Physics.	
			B.	Chemistry.	Chemistry.	Chemistry.	Chemistry.		
			C.	Chemistry.	Chemistry.	Chemistry.	Chemistry.		
			D.	Physics.	Mathematics.	Mathematics.	Grammar.		
			E.	Grammar.	Hist. and Geog.	Grammar.	Mathematics.		
			F.	Grammar.	Grammar.	Hist. and Geog.	Mathematics.		

APPENDIX 12—continued.

TIME TABLE OF LA MARTINIÈRE SCHOOL—continued.

ARRANGEMENT of the CLASSES for BOYS, school year 1881-82—continued.

Begin.	End.	Year.	Section.	MONDAY.	TUESDAY.	WEDNESDAY.	FRIDAY.	SATURDAY.
3.35	4.35	3rd 2nd 1st	A. B. C. D. E. F.	Mathematics. English. Grammar. Hist. and Geog. Physics. Mathematics.	Mathematics. Accounts. Hist. and Geog. Spelling. Grammar. Arithmetic.	Grammar. Accounts. English. Arithmetic. Grammar.	Mathematics. English. Mathematics. Hist. and Geog. Grammar. Arithmetic.	Mathematics. Physics. Grammar. Spelling. Writing. Morals. Spelling.
4.45	5.45	3rd 2nd 1st	A. B. C. D. E. F.	English. Grammar. Physics. Grammar. Mathematics. Hist. and Geog.	Accounts. Grammar. English. Grammar. Spelling.	Comml. Geog. English. Grammar. Grammar. Mathematics. Mathematics.	Morals. Grammar. English. Mathematics. Hist. and Geog. Grammar.	English. Morals. Writing. Arithmetic. Grammar. Grammar.
5.55	7.0	Preparation work carried on under the charge of the ushers of each section.						







APPENDIX 12—*continued.*

TIME TABLE of LA MARTINIÈRE SCHOOL for GIRLS—*continued.*

ARRANGEMENT of the CLASSES, school year 1881-82—*continued.*

A. 1st Year's Studies. B. 2nd Year's Studies. C. 3rd Year's Studies.

1. Commercial Section. 2. Industrial Drawing Section. 3. Dress-making, &c. Section.

Begin.	End.	Year and Section.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	SATURDAY.
3.30	4.0	Recreation.						
4.0	5.30	A. 1.	English.	English.	English (Prep.)	English.	English (Prep.)	English.
		B. 1.	English (Prep.)	Needlework.	Writing.	Accounts (Prep.)	English (Prep.)	Accounts (Prep.)
		C. 1.	English (Prep.)	Accounts (Prep.)	Accounts (Prep.)	Needlework.	Accounts (Prep.)	Accounts (Prep.)
		A. 2.	Drawing.	Drawing.	Needlework.	Drawing.	Drawing.	Drawing.
		B. 2.	Drawing.	Drawing.	Drawing.	Drawing.	Drawing.	Drawing.
		C. 2.	Drawing.	Drawing.	Drawing.	Drawing.	Drawing.	Drawing.
		A. 3.	Needlework.	Needlework.	Needlework.	Needlework.	Needlework.	Needlework.
		B. 3.	Needlework.	Needlework.	Needlework.	Needlework.	Needlework.	Needlework.
		C. 3.	Needlework.	Needlework.	Needlework.	Needlework.	Needlework.	Needlework.

Appendix 13.

Budget of the  
Professional  
School of Rheims.

## APPENDIX 13.

BUDGET OF THE PROFESSIONAL SCHOOL OF RHEIMS.  
See Vol. I, p. 78.

	£
Salary of Director	200
" Teacher of French, History, Geography, and Political Economy	120
" Teacher of Mathematics	138*
"     " German	68
"     " English	60
"     " Spinning and Weaving	138
"     " Mechanics and Drawing, who is also chief of the workshops for erecting and pattern-making	138
" Teacher of physical sciences who is also entrusted with the course of evening public lectures	148
" Teacher of agriculture and natural sciences	60
" General Superintendent in charge of the classes	120
" Elementary schoolmaster	92
" Usher	80
"     } also receive board and lodging	32
" Additional usher	24
Payment of Foreman for working in iron	24
"     "     " wood	96
"     "     " spinning and weaving	80
" drill instructor	20
" hall porter	40
" laboratory assistant	54
" labourer	26
Various payments for extra teaching	52
Office expenses, printing, and postage	22
Expenses of chemistry course	100
" workshops	108
Scholarships	40
Maintenance of Library	16
Prizes	28
Heating, lighting, and housekeeping expenses	140
Structural repairs, &c.	60
Total	2,414
Receipts for the year 1880, 140 students at 4l. each	560
Deficit	-1,854

As the school contained 140 pupils the cost for each pupil to the town of Rheims was 13l. 5s.

\* The minimum salary of the teachers has been fixed at 120l. per annum, which is subject to an increase of 16l. every 5 years.

APPENDIX 13—continued.

MUNICIPAL PROFESSIONAL SCHOOL OF RHEIMS—TIME TABLE FOR 1881-82.

(See Vol. I., page 78.)

	Third Year.	Second Year.	First Year.		Preparatory Class.		
			Section A.	Section B.	Hours.	Subjects.	
MONDAY	8-9 9-10 10½-11½ 11½-12	Account Keeping. German and English. Handicraft and Workshops.	Mathematics. Ditto. German and English. Preparation.	French. Ditto. Workshops.	Mathematics. Ditto. Workshops.	8-9½ 9½-10½ 10½-12	Arithmetic. Preparation. French.
	1½-3 4-5½	Workshops. Mechanics.	Workshops and Handicraft.	Drawing. Mathematics.	Drawing. French.	1½-2½ 2½-3½ 4-5	Writing. Preparation. Geography.
TUESDAY	7-8 8-9 9-10 10½-11 11-12	Mathematics. Ditto. Handicraft and Workshops.	Chemistry. Ditto. Geography. Ditto.	German. Ditto. Natural History. Writing. Preparation.	Natural History. English. Preparation. Writing.	As above, " " " "	Arithmetic. Preparation. French.
	1½-3 4-5½	Workshops. Mathematics.	Drawing. French.	Workshops. Chemistry.	Workshops. Chemistry.	" " " "	Drawing. Preparation. Natural History.

Note.—All the lessons are preceded by preparatory work.

APPENDICES, &c.

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Appendix 13.  
Time table of  
the Professional  
School of Rheims.

APPENDIX 13—continued.

MUNICIPAL PROFESSIONAL SCHOOL OF RHEIMS—TIME TABLE FOR 1881-82—continued.

—	Third Year.	Second Year.	First Year.		Preparatory Class.		
			Section A.	Section B.	Hours.	Subjects.	
WEDNESDAY.	7-8 8-9 9-10	— Political Economy. Commerotal Geography.	— Handicraft. Ditto.	German. Ditto. Geography.	— Geography. English.	8-9½ 9½-10½ 10½-12	Arithmetic. Preparation. French.
	10½-12	Handicraft and Workshops.	Drawing.	Workshops.	Workshops.		
	1½-3 3½-4 4-5½	Workshops. German and English. Accounts.	Physica. Preparation. Mathematics.	Drawing. Preparation. French.	Drawing. Preparation. Mathematics.	1½-2½ 2½-3½ 4-5	History of France. Preparation. German and English.
THURSDAY	8-9 9-10 10½-12	Mathematics. Ditto. Mechanics.	History. German and English. Natural History.	Chemistry. Ditto. Mathematics.	Chemistry. Ditto. French.	As above. " "	Arithmetic Preparation. French.

Note.—All the lessons are preceded by preparatory work.

APPENDIX 13—continued.

MUNICIPAL PROFESSIONAL SCHOOL OF BREIMS—TIME TABLE FOR 1881-82—continued.

1 17678

		Third Year.	Second Year.	First Year.		Preparatory Class.	
				Section A.	Section B.	Hours.	Subjects.
FRIDAY	7-8	Law and Civic Education, Handicrafts and Workshops.	Chemistry. Ditto. Drawing.	German. Ditto. Natural History. Workshops.	Natural History. English. Workshops.	8-9½	Arithmetic. Preparation. French.
	8-9					9½-10½	
	9-10					10½-12	
	10½-12						
	1½-3	Workshops. German and English.	Workshops. French.	Drawing. Physics.	Drawing. Physics.	1½-2½	Writing. Preparation. Geography.
	4-5½				2½-3½	4-5	
SATURDAY	8-9	Chemistry and Practical Work in Laboratory.	Account Keeping. German and English. Drawing.	Mathematics. Ditto. Workshops.	French. Ditto. Workshops.	As above.	Arithmetic. Preparation. French.
	9-10						
	10½-12						
	1½-3	Gymnastics. Physics.	Workshops. Mathematics.	Drawing. French.	Drawing. Mathematics.		Writing and Gymnastics. History of France.
	4-5½						

APPENDICES, &c.

Note.—All the lessons are preceded by preparatory work.

Appendix 13.  
Time Table of  
Municipal Professional  
School, Breims.





APPENDIX 14—*continued.*

Appendix 14.

Technicum,  
Winterthur.TECNICUM AT WINTERTHUR—*continued.*SUMMER SESSION, 1882.—PLAN SHOWING ARRANGEMENT OF STUDIES IN  
EACH CLASS—*continued.*

CLASS III. B.		CLASS III. C.	
	Hours.		Hours.
Physics	3	Physics	3
Mathematics	3	Mineralogy and Petrography	2
Descriptive Geometry	3	Outlines of Geology	1
Practical Geometry	2	Inorganic Chemistry (Technic)	3
Architectural Drawing	3	Organic Chemistry, Volumetric and Quantitative Analysis	0
Building Materials	3	Introduction to Organic Chemistry	3
Building Construction	5	Laboratory work	18
Mineralogy and Petrography	2	Agricultural Chemistry	3
Ornamental Drawing	4		
Modelling	4		

CLASS III. H.		CLASS III. M.	
	Hours.		Hours.
German	3	Physics	3
French	4	General Mechanics	6
English	4	Algebra	4
Italian	4	Trigonometry	3
Mercantile Arithmetic	4	Descriptive Geometry	2
Algebra	2	Theory of Construction	4
Mercantile Geography	4	Machine Drawing	12
Theory of Exchange	2		
Book-keeping	2		
Political Economy	2		
Knowledge of Merchandise	2		
Physics	3		

CLASS III. G.		CLASS III. K.	
	Hours.		Hours.
Physics	3	Descriptive Geometry	2
Algebra	4	Architectural Drawing	4
Trigonometry	4	Styles of Architecture	8
Practical Geometry	5	Freehand Drawing	-
Land Mensuration	4	Technical " " }	-
Planning	4	Modelling	-
Descriptive Geometry	2		
Mineralogy and Petrography	2		
German	3		

\* In accordance with the profession adopted by the student.



APPENDIX 15.

TIME TABLE of the ÉCOLE D'ARTS et MÉTIERS at CHÂLONS-SUR-MARNE.  
(See Vol. I., p. 109.)

Division.	—	Hours.	MONDAY.	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.	SATURDAY.	SUNDAY.
1	Morning	6 to 7½	Preparation	Preparation for Chemistry or Physics.	Preparation for Grammar.	Rise at 5.30 Questions in Grammar.	Preparation	Preparation for Grammar.	Rise at 6.30 Dressing, Recreation, Breakfast Review, Mass at 8.0 o'clock, From 8½ to 10½, Recreation and Library, From 10 to 12, Preparation for all the 3 Divisions, From 12 to 14, Dinner and interval for Recreation, From 14 to 2, Dressing and preparing for Walk, At 2.0, Walk or free time for Study, At 6.0, Supper, From 6.30 to 7.0, Recreation, From 7 to 8, Free time for Study, Bed (1st half year at 8.0, 2nd " at 8.30.
	Afternoon	7½ to 8	Chemistry or Physics. Workshops Drawing Religious Instruction Workshops Grammar	Breakfast and short interval for recreation for all the 3 Divisions, except on Sunday Workshops Drawing Workshops Supper and short interval for recreation for all the 3 Divisions daily, except on Sunday Preparation for Mechanics.	Preparation Workshops Drawing Workshops Grammar	Workshops Drawing Workshops Preparation for Mechanics.	Chemistry or Physics. Workshops Drawing Workshops Preparation for Chemistry or Physics.	Mechanics Workshops Drawing Workshops Preparation for Mechanics.	
2	Morning	6 to 7½	Grammar	Preparation	Questions in Grammar, Mathematics	Preparation for Chemistry or Physics.	Grammar	Preparation	Preparation for Grammar. Account } Preparing } ration. Workshops Drawing Workshops Preparation for Mathematics.
	Afternoon	7½ to 8	Mathematics Workshops Drawing Workshops Preparation for Mathematics.	Account } Preparing } ration. Workshops Drawing Workshops Preparation for Grammar.	Workshops Drawing Religious Instruction Workshops Preparation for Mathematics.	Workshops Drawing Workshops Preparation for Chemistry or Physics.	Workshops Drawing Workshops Preparation for Mathematics.	Workshops Drawing Workshops Preparation for Grammar.	
3	Morning	6 to 7½	Preparation	Grammar	Preparation	Preparation for Grammar, Mathematics	Preparation } Account } ration } keeping.	Questions in Grammar, Grammar	None—Questions are asked daily during the work time in the Shops from 9.15 to 10.45.
	Afternoon	7½ to 8	Workshops Drawing Workshops Preparation for Grammar.	Workshops Drawing Workshops Preparation for Mathematics.	Account } Preparing } ration. Workshops Drawing Workshops Preparation for Mathematics.	Workshops Drawing Religious Instruction Workshops Preparation for Mathematics.	Workshops Drawing Workshops Preparation for Grammar.	Workshops Drawing Workshops Preparation for Mathematics.	

## Appendix 16.

Programme of  
the École  
Centrale, Paris.

## APPENDIX 16.

PROGRAMME OF THE ÉCOLE CENTRALE DES ARTS ET MANUFACTURES  
PARIS.

(See Vol. I., p. 177.)

## 1st YEAR.

	No. of Lessons.
Mathematical Analysis (Differential and Integral Calculus) -	30
Kinematics and General Mechanics -	52
Descriptive Geometry -	60
General Physics (Heat, Electricity, Magnetism, Acoustics, and Optics) -	60
General Chemistry (Metalloids, Metals, and Organic Sub- stances) -	60
Mineralogy and Geology -	30
Biology (Zoology and Botany) -	35
Machine construction -	20
Architecture -	24

## 2nd YEAR.

Applied Mechanics (Theory) -	60
"    "    of Construction (Resistance appliquée) -	22
Construction and erection of machinery -	52
Industrial Physics (Heat, Gas, Ventilation) -	45
Principles of the Steam Engine -	35
Analytical Chemistry -	50
Technology (Metals, Colours and Dyes, Pottery and Glass) -	36
Mining (1st part) -	25
Civil Architecture and Construction -	54
Zootechny -	20
Phytotechny -	20
Industrial legislation -	30

## 3rd YEAR.

Applied Mechanics -	60
Construction and erection of machinery -	55
Industrial Chemistry -	45
General Metallurgy and the Metallurgy of Iron -	52 to 55
Mining (2nd part) -	15
Public Works -	60
Railways -	60
Rural Economy -	40

*Note.*—During each year the pupils have to prepare designs and drawings, and to work in the laboratory under the guidance of the professors.

## APPENDIX 17.

PROGRAMME OF THE ZÜRICH POLYTECHNIC SCHOOL.  
(See Vol. I., p. 188.)

Appendix 17.

Programme of  
the Zürich  
Polytechnic  
School.

## I.—SCHOOL OF ARCHITECTURE (Total Course, Seven Sessions)

School of  
Architecture.

## 1st YEAR'S COURSE (Two Terms).

	No. of Hours per Week.
Higher Mathematics, with revision	4
Descriptive Geometry, with applications	6
Theory of Building Construction	3
Exercises in Building Construction	6
Architectural Drawing	6
Drawing of Ornament	4
History of Ancient Art	4
Modelling in Clay (4 hours, optional).	

## 2nd YEAR'S COURSE (Two Terms).

Theory of Style	3
Exercises in Composition	6
Theory of Building Construction	2
Exercises in Building Construction	6
Theory of Structures	2
Perspective	1
Exercises in Perspective	2
Drawing of Ornament	4
Road-making	2
Mechanics of Construction	4
Landscape Drawing	4

## 3rd YEAR'S COURSE (Two Terms).

Theory of Style	3
Architectural Designs	6
Ornament	3
Heating and Ventilation	2
Exercises in Building Construction	4
Theory of Structures	2
Technical Geology	2
Laws relating to Building	3
Figure Drawing	6
Modelling	4

## 7th TERM.

Drawing of Ornament and Coloured Decoration	4
History of Renaissance Architecture in Italy	3
Architectural Design	12
Landscape Drawing.	

In the Summer Term there are additional lectures on the Mechanics of Construction and the Chemical Technology of Building Materials in the First Year's Course, and on Petrography and General Law in the Second Year's Course.

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Appendix 17.

Programme of  
the Zurich  
Polytechnic  
School.  
School of  
Engineering.

II.—SCHOOL OF ENGINEERING (Seven Sessions).

1st YEAR'S COURSE.

	No. of Hours per Week.
Differential and Integral Calculus	6
Repetition of each subject	1
The same subject in French, 6 hours, with repetition, 1 hour	7
Descriptive Geometry, with revision	4
Exercises in Descriptive Geometry	4
Technical Mechanics, Part I.	2
Revision of ditto in groups	2
Theory of Building Construction	3
Exercises in Building Construction	4
Plan Drawing in two groups, each two hours	4

2nd YEAR'S COURSE.

Theory of Ordinary Differential Equations	2
Exercises on the above	1
Theory of Differential Equations	2
Revision of same	1
Technical Mechanics, Part II.	6
Revision of the same in groups, each	1
Descriptive Geometry, with revision of same	5
Technical Geology	2
Topography	2
Theory of Machine Construction (Lectures)	3
Exercises in ditto	3
Applied Physics	1
Repetition.	1

3rd YEAR'S COURSE.

Theoretical Machine Construction, Part II. (Theory of Heat and Steam Engines)	4
Repetition.	1
Geodesy	3
Graphic Statics, Lecture	2
"    Exercises	2
Earthworks—Stone Bridges and Tunnel Construction	3
Repetition, in three groups, each	1
Exercises in Engineering Construction	6
Weir Construction and Hydraulic Engineering	2
Map Drawing	3
Introduction to Astronomy	3
*The Manufacture and Testing of Building Materials, with Practical Use of the Testing Machine. (2 hours.)	
*National Economy (Fundamental Principles). (4 hours.)	
*The Principles of Applied Electricity. (2 hours.)	

7th Session.

Iron Bridges and Railway Construction	4
Revision of the same, in three groups, each	1
Weir Construction and Hydraulic Engineering	2
Exercises in Construction	6
Map Drawing	3
Laws of Property	3

\* Optional.

	No. of Hours per Week.	Appendix 17. Programme of the Zurich Polytechnic School.
Mechanism of the Heavens	3	
Revision of Astronomy, in two groups, each	1	
*Selected Chapters on Subjects relating to Electric Telegraphy. (3 hours.)		

In the Summer Term there are Lectures for the School of Engineering in the Chemical Technology of Building Materials, Astronomy, Part I., Practical Work in the Observatory, Continuation of Graphic Statics, Exercises in Land Surveying and Petrography.

### III.—SCHOOL OF MECHANICAL TECHNOLOGY (Six Sessions).

School of  
Mechanical  
Technology.

#### 1st YEAR'S COURSE.

Differential and Integral Calculus	6
Revision of same in groups, each	1
Differential and Integral Calculus, 6, and Revision, 1 (French)	7
Descriptive Geometry	4
Exercises in Descriptive Geometry	4
Analytical Geometry	3
Revision of same in groups, each	1
Technical Mechanics, Part I.	2
Revision of same in groups, each	1
Machine Drawing	6

#### 2nd YEAR'S COURSE.

Theory of Simple Differential Calculus	2
Exercises on the same	1
Theory of Differential Equations	2
Exercises	1
Technical Mechanics, Part II.	6
Revision of same in groups, each	1
Technical Physics	3
Revision of same	1
Theoretical Machine Construction (Introduction, Elements of Machinery)	4
Revision of same	1
Practical Machine Construction	10
Mechanical Technology (Methods of Shaping Solid Bodies)	4
Revision of same	1
*Spinning (3 hours).	
*Sewing Machines (1 hour).	

#### 3rd YEAR'S COURSE.

Theoretical Machine Construction, Part II. (Theory of Heat and the Steam Engine)	4
Revision and Exercises on same.	
Theory of Slide-valve and Governor	2
Revision of same and Exercises.	
Turbines, Water Wheels, and Water Power Machines	4
Practical Machine Construction	10
Analytical Mechanics	3
Revision of same, in groups	1

\* Optional.

## Appendix 17.

Programme of  
the Zurich  
Polytechnic  
School.No. of  
Hours  
per Week.

Civil Architecture and Drawing Exercises	5
*Spinning (3 hours)	
*Sewing Machines (1 hour)	
*The Principles of Electro-Technology (2 hours)	
*National Economy (Fundamental Principles) (4 hours)	
*Selected chapters on subjects relating to Electric Telegraphy (3 hours)	

In the Summer Session in the First Year's Course there will be Additional Lectures in Chemistry and Mechanical Technology. (The further Optional Instruction in Mechanical Technology embraces, distributed over a Two Years' Course, Lectures on Spinning, Weaving, Paper-making, Milling, &c.)

School of  
Chemical  
Technology.

## IV.—SCHOOL OF CHEMICAL TECHNOLOGY.

A.—*Technical Branch* (Six Sessions).

## 1st YEAR'S COURSE.

Higher Mathematics, with revision of same	5
Inorganic Chemistry	6
Revision of the same	1
Analytical Chemistry, Part I.	2
Practical Chemical Analysis	12
Elements of General Botany	3
Mineralogy	4
Revision of same	1

In the Summer Session the above subjects will be continued; Lectures on Analytical Chemistry, Part II., Organic Chemistry, Practical Analysis, Chemical Physics, Petrography, and Anthropology.

## 2nd YEAR'S COURSE.

Metallurgy	2
Preparation of Chemical Products, Part I.	3
General Theory of Machinery	3
Technical Drawing	3
Chemistry of the Benzole Derivatives	4
Chemical Physics	4
Revision of the same	1
Practice of Chemical Technology	12

In the Summer Session the continuation of these subjects and Lectures on the Chemical Technology of Building Materials, the Preparation of Chemical Products, Part II., Mechanical Technology, Technical Agricultural Botany, Technical Drawing, Heating and Ventilation, Practical Technical Work.

## 3rd YEAR'S COURSE.

Vegetable and Animal Fibres, Dyeing, Bleaching Colouring	4
Matters	1
Illuminants	1
Glass and Clay Wares	1
Practical Chemical Analysis	18

\* Optional.



	No. of Hours per Week	Appendix 17. Programme of the Zurich Polytechnic School.
Practical Chemical Technology	18	
Estimation of Minerals	8	
General Geology	4	

In the Summer Session the continuation of these subjects: Fibres, Dyeing, Bleaching, Food Stuffs, Paper-making, Practical and Technical Analysis. In the Third Year attendance at only one of the Laboratories is compulsory, the choice being left to the Student.

B.—*Pharmaceutical Branch* (Four Sessions).

Pharmaceutical  
Branch.

1st YEAR'S COURSE.

Inorganic Chemistry	6
Revision of the same	1
Analytical Chemistry	2
Practical Chemical Analysis	12
Preparation of Chemical Products, Part I.	3
Mineralogy	4
Revision of the same	1
Experimental Physics	4
Revision of the same	1
General Botany	5

In the Summer Session the continuation of these subjects: Organic Chemistry and Analysis, Practical Analytical Work, Experimental Physics, Preparation of Chemical Products, and Pharmaceutical Zoology.

2nd YEAR'S COURSE.

Practical Technical Chemistry	12
Study of Pharmaceutical Preparations	4
Analysis of Food Stuffs	2
General Geology	4

In the Summer Session these subjects will be continued: Technical Practice, Preparation of Chemical Products, Pharmaceutical Chemistry, and Special Botany.

V.—SCHOOL OF AGRICULTURE AND FORESTRY.

School of  
Forestry.

A.—*School of Forestry* (Course Five Sessions).

1st YEAR'S COURSE.

Mathematics, with revision	4
Experimental Physics, with revision	4
Inorganic Chemistry	6
Revision of the same	1
Zoology	4
Principles of General Botany	3
Principles of Forestry	3
Plan Drawing	2

In the Summer Session there will be additional teaching in Organic Chemistry, Special Botany, Petrography, Preservation of Forests, with Applied Zoology and Botanical Microscopic Work.

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Appendix 17.

2nd YEAR'S COURSE.

Programme of the Zurich Polytechnic School.	No. of Hours per Week
Plan Drawing	2
Topography	3
Road Making and Hydraulic Engineering	3
Agricultural Chemistry	2
General Geology	4
Fundamental Principles of National Economy	4
Theory of Climate as affecting Forestry	4
Adaptability of varieties of Timber Trees for Forests	2
Principles of Taxation	3
Excursions and Practical Exercises	1 day

In the Summer Session there will be Exercises in Land Surveying Vegetable Physiology with Experiments, Principles of Civil Law, Formation of Forests, the History of State Domains, and Statistics relating to the same, Business Principles, Excursions, and Practical Work.

5th TERM.

Principles of Business	2
Laws of Commerce and Valuation of Timber and Forest Trees	4
Practical Utilization of Forests	3
Excursions and Practical Exercises	1 day
Land Surveying, Use of Theodolite, &c.	3
Laws relating to Property	3

School of  
Agriculture.

B.—*School of Agriculture* (Total Course, Five Sessions).

1st YEAR'S COURSE.

In this division the Professors are entitled to allot to each Student a special course of study in accordance with his requirements and capacity.

Mathematics, with revision	4
Inorganic Chemistry	6
Revision of same	1
Experimental Physics, with revision	5
Zoology, with special attention to the Animals useful and destructive to Agriculture and Forestry	4
Principles of General Botany	3
Fundamental Principles of National Economy	4
Introduction to the Study of Agriculture, Theory of General Agriculture (Farm Management), Part I.	2
Plan Drawing (3 hours, optional).	

In the Summer Session the course will embrace Organic Chemistry, Experimental Physics, Anatomy and Physiology of Domestic Mammalia, Special Botany, Vegetable Physiology, Microscopic Work, Petrography, General Agricultural Management, History and Literature of Agriculture and Plan Drawing.

2nd YEAR'S COURSE.

Agricultural Chemistry, Part I. (Nourishment of Plants)	2
General Geology	4
Financial Economy (with special reference to the Taxation of Switzerland)	2

	No. of Hours per Week	Appendix 17. Programme of the Zurich Polytechnic School.
General Agriculture	5	
Drainage and Irrigation	2	
General Theory of Cattle Breeding	2	
Theory of General Farm Management, Part II.	3	
Diseases of Cattle	2	
Agricultural Machinery and Implements	3	
Microscopic Exercises (with special reference to the Diseases of Plants)	2	
Road Making and Hydraulic Engineering (3 hours, optional).		
Topography (3 hours, optional).		

In the Summer Term there will be Agricultural Chemistry, Exercises in the Agricultural Chemistry Laboratory, Microscopic Exercises, General and Special Cultivation of Plants, Breeding of Cattle, Diseases of Cattle (especially Murrain), Horse Management, Shoeing, and Breeding of Horses, Principles of Agricultural Machinery and Implements, Road Making and Hydraulic Engineering, Topography, Surveying, General Theory of Law, and Theory of Farm Management.

## 5th TERM.

Estimates of Agricultural Produce, and Book-keeping	2
Sheep Farming and Pig Keeping	3
Practical Agriculture	2
Agricultural Chemical Technology (Sugar Making, Distillation of Spirits, &c.)	2
Practical work in Laboratory of Agricultural Chemistry	6
Vine Growing and Production of Wine	2
Fruit Growing and Knowledge of Fruits	1
Planning of Farm Buildings	1
General Theory of Law	3
Utilisation of Forests (3 hours, optional).	
Critical Examination of the Rotation of Crops (2 hours, optional).	

## VI.—SCHOOL FOR TEACHERS OF MATHEMATICS AND NATURAL PHILOSOPHY.

School for Teachers of Mathematics and Natural Philosophy.

No special course is laid down for Students in this division, as the authorities will prepare individual plans of study adapted to the direction in which the training is required, and which plans may involve attendance at lectures in other departments.

## A.—Mathematical Section.

Mathematical Section.

A complete normal programme with a four years' course serves as the foundation of the plan of study.

Opportunities are generally given to take part in the Seminaristic practice in Physics in the Third Year, and in Mathematics in the last three terms. Notice must be given to the authorities.

## FIRST YEAR'S COURSE.

Differential and Integral Calculus	6
Revision of the same	1
Differential and Integral Calculus and revision (in French)	7
Analytical Geometry	3
Revision of the same	1
Technical Mechanics, Part I.	2
Revision of the same	1
Descriptive Geometry, with revision	4
Exercises in Descriptive Geometry	4

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Polytechnic  
School.

	No. of Hours per Week
Technical Drawing	4
Topography	3
Spherical Trigonometry	1
"          "    (in French)	1

THE THREE SUCCEEDING YEARS' COURSES.

Theory of Simple Differential Equations	2
Exercises on the above	1
Theory of Differential Equations (in French)	2
Exercises on the above	1
Descriptive Geometry, with revision	5
The Invariants of Curves and Surfaces of the Second Degree	2
Algebraic Space Curves	2
Technical Mechanics, Part II.	6
Revision of the same in groups, each	1
Analytical Mechanics	3
Revision of the same	1
Plane Curves	2
Technical Physics	3
Revision of the same	1
Analytical Optics	2
The Principles of Electricity	2
Practical Physical Work (including 1 hour's Lecture)	5
Introduction to the execution of Physical Work	Daily
Seminariestic exercises in the sphere of Mathematical Physics	1
Theory of Elasticity	3
Introduction to the Theory of Analytical Functions	4
Introduction to Astronomy	3
Mechanism of the Heavens	3
Revision in two groups, each	1
Selected chapters from the History of Mathematics, Physics, and Astronomy	2
Mathematical School	2

Natural  
Philosophy  
Section.

B.—Natural Philosophy Section.

A normal programme with a 3 years' course forms the model on which the study-plans are based. Opportunities will be given for specialisation of the studies in the direction either of Physics and Chemistry or towards Natural History. In the last three sessions Seminariestic exercises are given in Physics and Chemistry on the one hand and in Botany, Mineralogy, and Geology on the other, applications for which must be made to the authorities.

1st YEAR'S COURSE.

Higher Mathematics, with revision	5
Inorganic Chemistry	6
Revision of same	1
Analytical Chemistry, Part I.	2
Mineralogy	4
Revision of same	1
General Botany, with revision of same	5
Zoology, Part I. (Inferior Animals)	4
Revision of same	1

THE TWO FOLLOWING YEARS' COURSES.

	No. of Hours per Week.	Appendix 17, Programme of the Zurich Polytechnic School.
Practical Chemical Analysis	12	
Practical Chemical Technology	12	
Preparation of Chemical Products	3	
Chemical Physics	4	
Revision of same	1	
Practical Work in Physics, with 1 hour of Lecture	5	
Methods of distinguishing Minerals	3	
Exercises with the Microscope	4	
Chemistry of the Benzoline Derivatives	4	
General Geology	4	
Revision of the above, with demonstrations	1	
Technical applications of Geology	1	
Zoology of Pre-historic Times	1	
Examination of Food Stuffs	2	
Examination and study of selected species of Plants	2	
Human Anatomy and Physiology	2	
Stratification of Aqueous Rocks	3	
The Gymnosperms	1	

VII.—SCHOOL OF GENERAL PHILOSOPHY AND POLITICAL ECONOMY.

OPTIONAL COURSES.

1.—Natural Science.

	No. of Hours per Week.	School of General Philosophy and Political Economy.
The Principles of Applied Electricity	2	
Experimental Physics	4	
Revision of the same	1	
Exercises with the Microscope	4	
General Botany	5	
Mineralogy	4	
Revision of the same	1	
General Geology	4	
Technical Applications of Geology	1	
Zoology, Part I. (Invertebrate Animals)	4	
Revision of the same	1	
Zoology of Pre-historic Times	1	
Chemistry of the Benzoline Derivatives	4	
Pharmaceutical Botany	3	
Volatile Oils and Camphor, from the Pharmaceutical Chemist's point of view	2	
Coal Tar Dyes	2	
Technical Botany	2	
The Gymnosperms	1	
Chemistry and Investigation of the most important Food Stuffs	2	
Revision of Organic Chemistry	2	
Examination of Food Stuffs	2	
Physical Chemistry (selected Chapters) (gratis)	1	
Vertebrata	2	
General Zoology	4	
Human Anatomy and Physiology (Part II.)	2	
General Entomology	2	
Paleontology, Gasteropoda and Cephalopoda	2	
Stratification of Aqueous Rocks	3	
History of Natural Creation	1	

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School.

	No. of Hours per Week.
Critical Examination of the System of Botation	2
Manures, and Theory of Food-stuffs	1
Photography	1
Starch, Fat, and Soap Manufacture (gratis)	1
General Botany	4
Exercises with the Microscope	2
Exhibition and description of selected species of Plants in the Herbarium	2
Exercises in the Laboratory for examination of Seeds	2
<i>2.—Mathematical Sciences.</i>	
Algebra	4
Trigonometry	2
Special Mathematics (to be divided up into short courses, should the interests of the Students render the same advisable)	6
Selected chapters from the History of Mathematics, Physics, and Astronomy	2
The Invariants of the Curves and Surfaces of the Second Degree	2
Algebraic Space Curves	3
Theory of Elasticity	3
Theory of Curved Surfaces	2
Method of Least Squares	2
Determinants, with applications	2
Algebraic Analysis	2
Theoretical Kinematics	2
Telephones and Electric Lighting (gratis)	2
Geographical Mathematics	3
Manufacture and Testing of Building Materials, with Demon- strations on the Testing Machine	2
Selected chapters on subjects relating to Electric Telegraphy (gratis)	2
Some new applications of Electricity (gratis)	1
The methods of Absolute Measurement	1
Linear Geometry	2
Introduction to the Theory of Analytical Functions	4
Higher Algebra, continuation (gratis)	2
Design of Engines (sketching exercises)	2
<i>3.—Languages and Literature.</i>	
French Literature and Language	-
Italian Literature and Language	-
History of German Literature in the 19th century	2
Shakespeare's Life and Works	1
Elements of English Grammar	2
Exercises in English Grammar and Composition	1
Macaulay's Biographical Essays read and explained	1
<i>4.—History and Political Economy.</i>	
History of Civilisation and Manners in the Middle Ages	2
History of the period from 1830 to 1866	3
History of Ancient Art from Egypt to Pompeii	4
History of Modern Painting (15th and 16th centuries) with reference to specimens in the Cabinet of Engravings	2
Principles of Political Economy (introduction)	4
Financial Economy, with special reference to the Taxation of Switzerland	2

	No. of Hours per Week.	Appendix 17. Programme of the Zurich Polytechnic School.
Conversations on Political Economy . . . . .	3	
General Principles of Civil Law . . . . .	3	
Laws relating to Exchange . . . . .	2	
General Geology (gratis) . . . . .	2	
Africa, as influenced by Nature and Civilisation (gratis) . . . . .	2	
Public Legislation and Politics of Switzerland . . . . .	2	
History of Swiss Publications in the 19th Century . . . . .	1	
Main Considerations in Pedagogic Science, with reference to its Historical Development . . . . .	1-2	

5.—Arts.

Exercises in Modelling, Ornament, and Stone-Carving . . . . .	9
Drawing of Ornament, Study of Decoration and Colour . . . . .	4
Landscape Drawing in Water-Colour, Sepia, and Pencil . . . . .	4
Figure Drawing . . . . .	6

6.—Military Science.

Organisation of War Material :—	
(a) Army Organisation . . . . .	4
(b) Defensive Operations . . . . .	1
Revision of the same . . . . .	2
General Theory of Weapons . . . . .	2
Fortification . . . . .	1
Artillery . . . . .	1

APPENDIX 18.

PROGRAMME of the SPECIAL COURSE for INDUSTRIAL CHEMISTS  
at the TECHNICAL HIGH SCHOOL, MUNICH.  
(See Vol. I., p. 192.)

Appendix 18.

Programme of  
the Special  
Course for  
Industrial  
Students at  
Munich.

I.—For STUDENTS who have passed through a REAL GYMNASIUM or an  
UPPER REALSCHULE.

	Hours per Week.			
	Winter Term.		Summer Term.	
	Lectures.	Exercises.	Lectures.	Exercises.
<b>FIRST YEAR.</b>				
General Experimental Chemistry . . . . .	6	—	—	—
Experimental Physics . . . . .	6	—	4	—
Analytical Chemistry, Part I. . . . .	—	—	3	—
Mineralogy . . . . .	—	—	3	—
Crystallography . . . . .	—	—	2	2
Higher Mathematics, Part I. . . . .	4	2	4	2
Descriptive Geometry . . . . .	2	2	4	4
Practical Work in Chemical Laboratory . . . . .	—	—	—	16
Linear Drawing . . . . .	1	6	1	6

## Appendix 18.

Programme of  
the Special  
Course for  
Industrial  
Chemists,  
Munich.

	Hours per Week.			
	Winter Term.		Summer Term	
	Lectures.	Exercises.	Lectures.	Exercises.
<b>SECOND YEAR.</b>				
Organic Chemistry, including Theoretical Chemistry	—	—	4	—
Analytical Chemistry, Part II.	2	—	—	—
Quantitative and Volumetric Analysis	2	—	2	—
Geology and Mineralogy	5	—	—	—
Elementary Mechanics	3	—	3	—
Practical Work in Physical Laboratory	—	4	—	4
"    "    Mineralogical Laboratory	—	2	—	2
"    "    Chemical Laboratory	—	20	—	20
Optional: Botany and Zoology.	—	—	—	—
<b>THIRD YEAR.</b>				
Chemical Technology, with Metallurgy	4	—	5	—
Theory of Iron Manufacture	2	—	—	—
General Laws of Machine Construction*	3	—	3	—
Mechanical Technology, Part I. (Wood and Metal Working)	5	—	—	—
Practical Work in Chemical Laboratory	—	20	—	20
<b>FOURTH YEAR.</b>				
Materials used as Fuel, and Systems of Firing	2	Practical Work.	2	Practical Work.
Organic Colouring Matters	1	—	1	—
Theory of Building Construction, Part I.	1	2	1	2
Practical Work in Chemical Laboratory	—	30	—	30

\* Will be discontinued in the Summer Session of 1882.

## II.—For Students who have passed through a HUMANISTIC GYMNASIUM.

<b>FIRST YEAR.</b>				
Experimental Physics	6	—	4	—
Algebraical Analysis	3	—	3	—
Trigonometry	3	—	—	—
Descriptive Geometry	4	3	4	4
Linear Drawing	1	6	1	6
<b>SECOND YEAR.</b>				
General Experimental Chemistry	6	—	—	—
Analytical Chemistry, Part I.	—	—	2	—
Mineralogy	—	—	3	—
Crystallography	—	—	2	2
Higher Mathematics, Part I.	4	2	4	2
Practical Work in Chemical Laboratory	—	—	—	10
Linear Drawing	—	6	—	6
Optional: Botany and Zoology.	—	—	—	—

The work of the third, fourth, and fifth years will coincide respectively with the programme drawn up for the second, third, and fourth years for Students coming from a Real Gymnasium or Upper Realschule. (See Part I.)



## APPENDIX 19.

Appendix 19.

PROGRAMME OF THE MUNICH INDUSTRIAL ART SCHOOL.  
(See Vol. I., p. 159.)Programme of  
the Munich  
Industrial  
Art School.

## SUMMER TERM, 1882.—MALE DIVISION.

SUBJECTS IN PRELIMINARY SECTION.		Time.
1	Technical Drawing (Mechanical Drawing, Flat Washes, and Theory of Shadows)	Daily.
2	Architectural Drawing (Mouldings and Orders of Architecture)	"
3	Drawing of Ornament from Casts	"
4	Ornament painted from flat examples	"
5	Drawing of Figures, Animals and Drapery	"
6	Drawing from Flowers	"
7	Modelling from Ornament and Wood-carving	"
8	Modelling from the Figure and Wood-carving	"
9	Lecture, History of Art	Monday, 5.30 to 6.30.
10	" Styles of Ornament	Thursday, 5.30 to 6.30.
11	" Geometry and Projection	Tuesday and Friday, 6 to 8.30.
12	" Perspective and Perspective of Shadows	Thursday, 8 to 5.

SUBJECTS IN TECHNICAL SECTION.		Time.
I.	Architecture (Detail Drawings for Decoration of Buildings and Furniture)	Daily.
II.	Applied Ornament (Designing for Textiles, Carpets, &c.)	"
III.	Figure Drawing for Decoration (Vignettes, Medallions, &c.)	"
IV.	Decorative Painting (Wall and Ceiling Decoration)	"
V.	Glass Painting (Windows for Churches and secular purposes)	"
VI.	Modelling, including Carving (Internal Decoration, Furniture, &c.)	"
VII.	Metal Work (for decorative purposes, Furniture, Vessels, and Ornaments)	"
VIII.	Wood Engraving and Etching (special instruction only for Pupils of the above-mentioned technical classes)	"
IX.	Applied Art for Ceramics. General instruction, as also special exercises:— (a.) Drawing of Furniture and Vessels (b.) Flower Painting	Friday, Saturday, Wednesday and Thursday.

In addition to the above, the Students of the Art School have exercises in Time-Sketching and Time-Modelling, Studies in the Library. There are also competitions and excursions, on the results of which special designs are prepared.

## SUMMER TERM, 1882.—FEMALE DIVISION.

SUBJECTS IN PRELIMINARY SECTION.		Time.
1	Technical Drawing, I. Course. Linear Drawing and Flat Washes	Wednesday and Thursday.
"	" " " Geometry and Theory of Projection	Tuesday, 8 to 11.30.
"	" " " II. Course. Theory of Projection (continuation)	Friday, 8 to 11.30.
"	" " " Perspective and Theory of Shadows	Monday, 5 to 6.30.
2	Drawing from Ornament	Daily.
3	Painting of Ornament from the Flat	"
4	Figures, Animals and Drapery	"
5	Flower Painting	Wednesday, 8 to 9.
6	History of Art	Saturday, 8 to 9.
7	Style	"



## APPENDIX 20.

Appendix 20.

Programme of  
Polytechnic  
School, Paris.

## PROGRAMME OF THE POLYTECHNIC SCHOOL, PARIS.

## FIRST YEAR'S COURSE.

	Lectures.
Analysis: Differential calculus	25
Integral calculus	18
Descriptive geometry and geometrical drawing	32
Mechanics and machine construction	40
Physics: Comprising heat, electricity	30
Chemistry: The metals	30
Astronomy and geodesy	30
French composition and literature	25
History	25
German	25
Landscape and figure drawing	48

## SECOND YEAR'S COURSE.

	Lectures.
Analysis: Integral calculus	32
Stereotomy: Details of construction in timber and masonry	28
Mechanics: Dynamics, hydrostatics, and machinery	40
Physics: Acoustics, optics, and heat	30
Chemistry: Continuation of metals, and Organic chemistry	30
Architecture: Construction of roads, canals, and railways	40
French composition and literature	25
History	25
German	25
Military art	20
Topography	2
Landscape and figure drawing	48

## Appendix 21.

Programme of  
the Entrance  
Examination  
to the Ecole des  
Mines, Paris.

## APPENDIX 21.

ÉCOLE NATIONALE DES MINES, PARIS.

(See Vol. I, p. 185.)

## PROGRAMME OF THE ENTRANCE EXAMINATIONS TO THE ELEMENTARY CLASS.

*Arithmetic.*—Decimal notation. Division of integers. Division of prime numbers and of prime numbers by each other. Vulgar fractions. Exercises with fractions. Decimal fractions. Reduction of vulgar fractions to decimals. Weights and measures. Squares and cubes of whole numbers, and of the sum of two numbers. Squares and cubes of fractions. Concrete numbers. Simple interest. Use of logarithms.

*Algebra.*—Definitions. System of numeration. Multiplication. Simple equations. Compound equations with one unknown quantity. Arithmetical and geometrical ratios. The binomial theorem and its applications. General idea of the calculus.

*Geometry.*—Right line and plane. Triangle. Parallel right lines. On the circumference of the circle. Mensuration of angles. Use of ruler and compasses in constructing simple figures. Division of right lines and angles. Proportional parts of lines and plane figures. Relation between the perpendicular and the hypotenuse. Division of right lines into given parts or proportions. Regular polygons. Measurement of areas of plane figures. Proportion of the areas of 21 similar plane figures to each other and to the squares of similar sides.

*Solid Geometry.*—The plane and the right line. Definition and generation of dihedral angles. Ditto of trihedral angles. Polyhedral figures. The pyramid. Similar solids. The right cone with circular base. The sphere. The measurement of the volume of the figure generated by the rotation of a triangle on its axis and on one of its angles.

*Plane Trigonometry.*—Trigonometric lines. General idea of the formation of trigonometric tables. Solution of triangles. Any side and two angles of a triangle being given to find the remaining parts and the area. Applications of trigonometry to the solution of plane figures.

*Analytical Geometry.*—On geometrical equations and formula. Right-lined co-ordinates. Simple and compound equations with two solutions. Tangents and asymptotes to curves in general. The ellipse. The hyperbola. The parabola. Polar co-ordinates. On curves generally. On conic and cylindrical sections. Theory of projection. Rectilinear co-ordinates.

*Descriptive Geometry.*—Problems relating to the point, to the right line, and the plane. Problems relating to tangential planes. Intersections of curved surfaces.

*Physics.*—General outlines. Properties of solid bodies. Hydrostatics and hydrodynamics. The different states of matter. The thermometer. Capillary attraction. Static electricity. Magnetism. Geometrical optics.

*Chemistry of the Metalloids.*—General outlines. Oxygen, hydrogen, sulphur, chlorine, bromine, iodine, fluorine, phosphorus, arsenic, boron, silicon, carbon.



## Appendix 23.

Programme of  
the Delft  
Polytechnic.

## APPENDIX 23.

PROGRAMME OF THE DELFT POLYTECHNIC. (SESSION 1881-2.)  
(See Vol. I., p. 203.)

## MATHEMATICS.

a. Descriptive Geometry:		
IIa.	- 4 hours per week, 2 hours being devoted to drawing.	
IIb.	- 4 hours per week, 3 hours being devoted to drawing:	
	Course for beginners	- 1 hour per week.
b. Analytical Geometry:		
IIa.	- - - - -	- 2 hours.
IIb.	- - - - -	- 1 hour.
	Course for beginners	- 1 "
c. Spherical Trigonometry		- 1 "
d. Analysis (Calculus):		
IIa.	- - - - -	- 5 hours.
IIb.	- - - - -	- 4 "

## MECHANICS.

a. General Course:		
IIa.	Kinematics	- 2 hours.
IIb.	Continuation	- "
b. Theory of Engineering Construction:		
IIa.	- - - - -	- 3 hours (after Easter, 2 hours.
IIb.	- - - - -	- 1 hour.
c. Hydraulics		- 1 "
		1 hour, after Christmas.
d. Elementary Course:		
IIa.	- - - - -	- 2 hours.
IIb.	- - - - -	- "

## NATURAL SCIENCE.

a.	General, 2 years' course	- 3 hours.
b.	Special applications	- 2 hours.

## CHEMISTRY.

a. Theoretical and Inorganic Chemistry:		
IIa.	- - - - -	- 2 hours.
IIb.	- - - - -	- 1 hour.
b. Organic Chemistry		- 2 hours.
c. Chemical Analysis		- 1 hour, after Christmas.
d. Chemistry of Building Materials		- 1 hour.
e. Laboratory Exercises:		
	Qualitative and Quantitative Analysis	- 9 hours.
	Do. for Mining Engineers	6 "
	Analysis of Building Materials	- 2 "

## MINERALOGY.

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IIa. General Mineralogy	- 4 hours, before Christmas.	Programme of the Delft Polytechnic.
Special Mineralogy	- 4 hours, after Christmas.	
IIb. Special Mineralogy continued	- - - 2 hours.	
Geology	- - - "	
Mineralogical and Geological practical exercises	- - - "	
Introductory study of Mining	- - - "	

## CHEMICAL TECHNOLOGY.

Two years' course.

IIb. Chemical Technology of Organic Substances	- 3 hours.
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## MECHANICAL TECHNOLOGY.

IIIa. Metal Working	- - - 3 hours.
IIIc. Spinning, Weaving, and Paper Making	- - - "
Theory of Tools	- - - "
IIa. Motors	- - - "
Applied Mechanics	- - - "
Do.	- - - "
Exercises in connection with the foregoing subjects	- 5-6 hours.
Theory of Calorics	- 1 hour.

## MACHINERY for BUILDING CONSTRUCTION and DRAWING for ditto.

a. Elementary Principles of Construction:	
IIa. Machine Tools	- 1 hour.
IIb. Building Materials and their preparation	- "
b. Projection:	
A. Use of Tools—	
IIa. Mechanical Movements	- 1 hour.
B. Theory of Tools—	
IIb. Designing of Steam Boilers	- "
c. Exercises in the study of Working Drawings:	
IVa. Locomotives	- - - "
IVb. Marine Engines	- - - "
IVc. Pumping Engines and Water Wheels	- - - "
IVd. Factory and Mining Engines	- - - "
d. Exercises in Sketching and Drawing	- 4 to 6 hours.

## CIVIL ARCHITECTURE and ARCHITECTURAL DRAWING.

a. Building Materials and Principles of Construction:			
IIa. Lectures	- 2 hours.	Drawing	- 7 hours.
IIb. Lectures	- "	Drawing	- 6 hours.
b. Projection:			
		Part I.	
a. Lecture	- - -	- 1 hour.	
b. " " " "	- - -	- - -	
Exercises in Drawing	- - -	- 8 hours, before Christmas.	
" " " "	- - -	- 6 " after "	

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Programme of  
the Delft  
Polytechnic.

Part II.

a. Lecture	-	-	-	-	-	1 hour.
b. " "	-	-	-	-	-	-
Exercises in Drawing, for Architects	-	-	-	-	8 hours,	before Christmas.
" " "	-	-	-	-	6 "	after "
Drawing, for Civil Engineers	-	-	-	-	2 hours,	before Christmas.
" " "	-	-	-	-	4 "	after "
c. Exercises in Designing, &c.	-	-	-	-	2 "	after "
d. History of Architecture:						
IIa. Lecture	-	-	-	-	-	1 hour.
IIb. " "	-	-	-	-	-	" "
e. Architectural Decoration	-	-	-	-	-	4 hours.
f. Ornament	-	-	-	-	-	9 hours.

HYDRAULIC ARCHITECTURE and APPLIED DRAWING for same.

a. Elementary: Lecture, 1 hour; Drawing, 2 hours.
b. Special Hydraulic Construction 2 hours lecture, before Christmas.
c. Exercises in Designing - - - 4 hours, after "
d. Bridges - - - - 2 hours.
e. Roads - - - - 2 " after Christmas.
f. Exercises - - - - 4 "

NAVAL ARCHITECTURE and DRAWING for same.

Course B. - - - - - Lecture	1 hour.
Course C. - - - - - " "	2 hours.
Drawing Exercises for each section - - - - -	6 "

LAND SURVEYING and LEVELLING.

a. General course	-	-	-	-	2 hours.
b. Special designs	-	-	-	-	1 hour.
c. Practical exercises:					
Geodesy	-	-	-	-	1 hour.
Map Drawing and Military Sketching	-	-	-	2 hours,	from Christmas to Easter.
Theory of Measuring and Weighing	-	-	-	-	2 hours.
Practical exercises	-	-	-	-	4 "
Political Economy	-	-	-	-	1 hour.

CIVIL LAW.

a. Introduction	-	-	-	-	1 hour.
b. Laws relating to Water Supply and Public Works	-	-	-	-	2 hours.
c. Laws relating to Building.					
d. Laws relating to Factories and Workshops.					
e. Laws relating to Mining.					

COMMERCIAL LAW.

FREEHAND DRAWING.
2 hours, before Easter.
6 " after "



## APPENDIX 24.

Appendix 24.

Budget of Lyons  
Weaving School.

## BUDGET OF LYONS WEAVING SCHOOL.

(See Vol. I, p. 123.)

## EXTRACT from a LETTER from Dr. PENOT.

\* \* \* The aim of our section for weaving at the École Supérieure de Commerce is to train future manufacturers, or directors of works, for factories engaged in the production of pure or mixed silk fabrics. The number of our pupils must thus of necessity always be very limited, amounting at the outside to 20 in each year. If we had to educate workmen or foremen, matters would be quite different. The fitting up of this department cost us 3,400L, including purchase of looms, the cost of a gas engine, and the requisite preparing machinery. Towards this outlay we received a grant of 2,000L from the Chamber of Commerce and 1,200L from Government, in three annual instalments.

Our average annual expenditure is about 600L, which includes the salaries of the masters, the payment of the foremen, purchase of silk, heating, lighting and repairs, and maintenance. As we receive no subsidy from the State nor from the Chamber of Commerce, and no subscription of any kind for this portion of our instruction, our Weaving Department has to be supported by the fees paid by the pupils, and the sale of the fabrics woven on our looms; and up to the present time this has been accomplished. Accept, Sir, the assurance of my profound regard.

G. Redgrave, Esq., Dr. Penot (Director).  
Secretary of the Technical Instruction Commission.

## APPENDIX 25.

Appendix 25.

## SYLLABUS OF THE SCHOOL FOR SPINNING AND WEAVING, MULHOUSE.

Syllabus of  
the School for  
Spinning and  
Weaving,  
Mulhouse.

(See Vol. I, p. 133.)

## WEAVING DEPARTMENT.

This department comprises two sections; the one for the theory of weaving, the other for practical work.

The first division includes the study of the science of weaving, of industrial accounts, and of the cost of production, and deals chiefly with the decomposition and analysis of fabrics of all kinds, plain, corded and embroidered silks, velvets, and gauzes, with special attention to the textiles most adapted to the requirements of local industry.

The division for the practice of weaving comprises the course of applied mechanics of weaving and loom construction, the design and theory of weaving machinery, work at the loom, the application of fabrics to the looms after they have been previously decomposed and analysed, the fitting-up of the loom, the adjustment of the same and the system of work, and the weaving of the actual stuff, with all the preliminary details of manipulation, carried out by the pupil himself, under the guidance of experienced foremen.

The course of study in each section is terminated by an investigation of the best methods of dealing with new fabrics, the preparation of plans and estimates for plant and weaving-sheds, both those of one floor and those arranged in several storeys.

## Appendix 25.

Syllabus of  
the School for  
Spinning and  
Weaving,  
Mulhouse.

## SPINNING DEPARTMENT.

The theoretical branch of the instruction consists essentially of the course for the study of spinning operations, and for the drawing and design of spinning machinery. The course is terminated by the investigation of the best arrangement to be given to new spinning mills, on one floor or in a building of several storeys, the preparation of plans and estimates for the same, the calculation of the cost of production, the losses on waste, and general manufacturing accounts.

The practical course consists of work at the machines, the study of spinning machinery, of cottons, and of their waste, &c.

The verbal instruction begins after the summer vacation, and it is advisable for those students who were not able to be present at that time, either to make themselves acquainted with the subject by consulting the note books of their fellow-students, or to take up in the first instance the course of practical instruction, and to wait for the verbal tuition until the commencement of the following term.

The work of the students being from its very nature almost entirely of a personal description, which fact renders it possible to arrange for the admission of students at any time during the year, the instruction and help supplementary to the class teaching is given either in French, in German, or in English, in accordance with the requirements of the individual pupil.

It is to the pupils' interest that they should employ themselves during their leisure evenings in making a fair copy of their notes on their work, in order to obtain as complete a record as possible of the course of instruction.

In addition to the regular school courses, two new subjects have been arranged for, as they had become of recognized necessity.

*Course of Mechanics* comprising:—

- (1) The study of the different combinations of mechanical movements, of power, and of work;
- (2) Steam and hydraulic motors;
- (3) Steam machinery, heating, fuel.

*Course of Commercial Accounts* comprising, besides general principles of business, the explanation of the theory of book-keeping by single and double entry.

This course is terminated by the study of banking business, such as interest, exchange, courant accounts, &c.

These classes are condensed in such a way as not to occupy too much of the student's time, and still to give him a very clear view of these subjects.

## Appendix 26.

Prospectus of  
the Weaving  
School, Crefeld.

## APPENDIX 26.

THE ROYAL WEAVING, DYEING, AND FINISHING SCHOOL AT  
CREFELD.

(See Vol. I, p. 134.)

PROSPECTUS OF THE WEAVING SCHOOL under the superintendence of the  
General Director, MR. EMIL LEMBECKE.

This Government school has been in existence since 1855, but has lately been completely re-organized. The aim of the school is to educate, theoretically and practically, masters, designers, and manufacturers, in

all branches of weaving; as well as to train mechanics for textile industries. Also to give to young persons who wish to become merchants an exact knowledge of the manufacture of the goods in which they deal.

The department is divided into two sections, in which the following subjects are taught:—

Appendix 26.  
—  
Prospectus of  
the Weaving  
School, Crefeld.

**A. INSTRUCTION IN DRAWING, AND ESPECIALLY IN DESIGNING.**

Instruction in  
Drawing.

*a. First Year.*

A thorough instruction in drawing and painting from copies, models, and from nature, for weaving, printing, and other branches of textile industry. Geometrical drawing and machine drawing.

*b. Second Year. (Designing School.)*

The drawing is continued until the student is able to invent and produce original designs for textiles. Geometrical drawing. Machine drawing. Lectures on textile art.

The aim of this course of instruction is therefore to give to designers, engravers, &c. a thorough course in designing and artistic drawing, and especially to educate designers, who will be able to invent new and artistic designs for weaving and printing.

The students, after having gone through the second year's course, will, providing they have acquired a sufficient knowledge, be admitted into the different studios, where they can draw and paint from nature, and also produce new designs for the trade, under the special direction of the drawing masters.

**B. INSTRUCTION IN DECOMPOSITION, COMPOSITION, CALCULATION, AND WEAVING.**

Instruction in  
Decomposition.

*a. First Year.*

Lectures on the textile fibres and on the elements of weaving. The decomposition of fabrics. Arrangement of the loom for plain goods and for goods with simple designs. Practice in decomposing fabrics. Practical weaving of plain goods and velvets, also of goods with simple patterns on hand looms, in cotton, wool, linen, and silk. Book-keeping and calculation. Lectures on machinery.

*b. Second Year.*

The decomposition of fabrics. General arrangement of the loom. Composition and calculation of designed materials.

Practical weaving, on hand-looms, of velvets and fancy cloths from different materials.

Practical weaving of cotton, wool, half wool, linen, jute, and silk, also velvet, on power-looms.

Lectures on the construction, erection, and action of the different hand- and power-looms, and of other machines or apparatus used in weaving. Preparation of drawings for this purpose.

Lectures on power-producing machines, also on spinning and finishing machinery.

Unmounting and mounting of looms and allied machinery. Practical work at power-looms. Practical work at the forge, in the mechanical workshop and in the joiners' workshop.

The aim of this course of instruction is, on the one hand, to acquaint the student, both theoretically and practically, with the manufacture of textile fabrics of all kinds, in order to prepare him for the independent

Appendix 26.  
 ———  
 Prospectus of  
 the Weaving  
 School, Osnabrück.

management of a manufactory or of a commercial business dealing in these goods; on the other hand, the course is calculated to bring up mechanical engineers, more especially for the textile industry.

Conditions of  
 Admission.

CONDITIONS OF ADMISSION.

Such candidates only are admitted who have gone through a regular school training, and are at least 14 years of age. Candidates who do not wish to make designing their special study should be older still.

Candidates are admitted either on the strength of former testimonials, or by an entrance examination. The time of entering is at Easter; candidates may, however, be admitted at other times, but in such cases the admission depends upon the decision of the director. The complete course is of two years' duration, and begins and ends with Easter of each year.

Students possessing the necessary preliminary knowledge, and wishing to devote their study to a special subject, can be admitted for a shorter period. A special course will be arranged for such by the director.

The fees are as follows:—

*a. For Prussians.*

Per semester in the first year's course	- 60 marks	- (3 <i>l.</i> )
"    "    second	- 90	" - (4 <i>l.</i> 10 <i>s.</i> )
"    "    studios	- 50	" - (2 <i>l.</i> 10 <i>s.</i> )

*b. For all Germans other than Prussians.*

Per semester in the first year's course	- 90 marks	- (4 <i>l.</i> 10 <i>s.</i> )
"    "    second	- 120	" - (6 <i>l.</i> )
"    "    studios	- 75	" - (3 <i>l.</i> 15 <i>s.</i> )

*c. For all Foreigners.*

Per semester in the first year's course	- 150 marks	- (7 <i>l.</i> 10 <i>s.</i> )
"    "    second	- 200	" - (10 <i>l.</i> )
"    "    studios	- 100	" - (5 <i>l.</i> )

All fees are payable in advance.

Students of the Weaving School who wish simultaneously to take part in the classes of the Dyeing School will have to pay the following fee:—

1. Prussians, 100 marks (5*l.*) per semester.
2. All Germans other than Prussians, 150 marks (7*l.* 10*s.*) per semester.
3. Foreigners, 250 marks (12*l.* 10*s.*) per semester.

Special fees may be arranged for with the director, in case the student wishes only to take a partial course.

The patterns for decomposition, as well as the necessary weaving materials, are furnished by the school free of charge.

The costs of the woven material are covered by the sale of the same, and thus the students have the use of the materials free of charge.

Colours and other materials necessary for working in the studios will not be furnished by the school.

All applications for admission must be accompanied with the usual testimonials, and are to be made to the director, who is ready at any time to give further information.

Students who have attended the school for not less than one year, will receive a certificate on leaving. Certificates are also issued every half-year respecting the diligence, progress, conduct, and attendance of each student. On leaving, students may receive, in special cases, either prizes or written testimonials as a mark of distinction.

Non-resident students will find suitable lodgings with respectable families.

The school possesses the following machinery for the use of the students :—

- 6 hand-loom and 6 power-loom for cotton.
- 3 hand-loom and 4 power-loom for wool.
- 3 power-loom for half-wool.
- 4 hand-loom and 2 power-loom for linen.
- 3 hand-loom for half-silk.
- 11 hand-loom and 7 power-loom for silk.
- 6 hand-loom and 1 power-loom for velvet.
- 1 power-loom for jute.
- 3 power-loom for ribbons.

Appendix 26.  
Prospectus of  
the Weaving  
School, Crefeld.

Altogether there are 33 hand-loom and 27 power-loom, besides a large number of other machines more or less connected with weaving.

#### THE MECHANICAL WORKSHOP.

The Mechanical  
Workshop.

This workshop is adapted for making repairs, and for the use of such students who wish to become power-loom weavers or manufacturers of looms. It contains the following tools :—

- |                    |  |
|--------------------|--|
| 1 smithy.          | 1 emery wheel and apparatus for sharpening |
| 1 lathe.           | circular saws.                             |
| 1 shaping machine. | 1 lathe for wood.                          |
| 1 boring machine.  | 1 circular saw.                            |
| 4 vices            | 3 joiner's benches.                        |
| 2 grindstones.     |  |

And besides these the necessary small tools. The work is conducted by a master joiner and a master mechanic.

The looms in the weaving-shed, the dyeing and finishing machinery, and the tools in the mechanical workshop are driven by means of a 12-horse-power compound steam-engine and a 4-horse gas-engine. The steam is produced by two Cornish boilers. Leather straps, wire rope, and cotton rope are used for transmission.

All the rooms are illuminated by means of the electric light (Edison's incandescent lamps), the current being generated by means of a 12-horse gas engine, with double cylinders (Otto & Langen's patent) and two dynamo-electrical machines in the lower part of the building.

The greater part of the building is heated by means of Körting's patent steam radiating stoves.

The school possesses a library of about 1,200 vols., a collection of German patents and a large number of journals relating to the textile industries, for the use of the teachers and the students, and on certain days of the week also for the public.

#### COLLECTIONS.

Collections.

Besides the spun and woven materials, apparatus, models, and machines necessary for instruction, the school possesses a large collection of modern textile fabrics and a valuable well-arranged collection of patterns, embroidery, needlework, lace, tapestry and guard books filled with specimens of different eras, countries and materials. This is of great use to designers in making new designs and to weavers in making tastefully-figured fabrics. Most of the specimens are kept under shallow glass cases, so that they may be made use of at any time by students, designers, or those engaged in business.

The collection numbers about 5,000 specimens, which are arranged in order from the 10th to the 19th century.

Appendix 26. PROSPECTUS of the DYEING and FINISHING SCHOOL in connection with the ROYAL WEAVING SCHOOL at CREZFELD.

Prospectus of the Weaving School, Crefeld, Dyeing and Finishing School.

This department is connected with the Royal Weaving School, but is administered by a special director (Dr. Lange). It was commenced in the autumn of 1883.

The aim of the department is—

1. To give to such who wish to devote their whole time to the study of chemistry a complete education in this science and all its branches, as well as in its application to practical work.
2. To give to dyers, bleachers, calico-printers, and finishers a sound knowledge of the manufacture of dyes and mordants, to instruct them in the methods of examining and testing the value of both natural and artificial dyes, as well as other chemicals, and further to instruct them in carrying out these operations themselves; lastly, by means of practical work in dyeing, bleaching, printing, and finishing, to afford them opportunities for applying their knowledge to practice.

Besides the necessary class-rooms the department has—

1. Two chemical laboratories.
2. One large dyeing laboratory.
3. A dyeing and finishing shed, fitted up with the most recent and complete machinery.

The two chemical laboratories serve for carrying out qualitative and quantitative analyses, as well as for other practical work.

In the dyeing laboratory the dye-wares and mordants are tested, and all the operations of dyeing, bleaching, and printing by hand are here carried out on a small scale.

In the dyeing and finishing-house cotton, wool, silk, linen, jute, &c., &c. are bleached, dyed, printed and finished on a large scale.

All the laboratories are fitted up with the most recent arrangements; steam, water at high and low pressure, gas, electric light, &c.

During the course it is expected that visits will be made to some of the most important industrial establishments in Crefeld and the neighbouring towns.

The following subjects are taught:—

*First Year's Course.*

*1st Semester.*

- (a.) Lectures on inorganic chemistry (with experiments), physics (with experiments), Part I., and qualitative analysis.
- (b.) Practical work in the chemical laboratory and in the dyeing and finishing house.
- (c.) Machinery, drawing, textile fibres.

*2nd Semester.*

- (a.) Lectures on organic chemistry, physics (with experiments), Part II., and quantitative analysis.
- (b.) Practical work in the chemical laboratory and in the dyeing and finishing house.
- (c.) Machinery, drawing, and textile fibres.

*Second Year's Course.*

*3rd Semester.*

- (a.) Lectures on technical chemistry, including water, fuel, soap, the most important acids and salts for dyeing and printing, thickeners used in printing and finishing, artificial and natural dye wares, and the methods employed in testing them.
- (b.) Practical work in the dyeing laboratory and in the dyeing and finishing house.
- (c.) Machinery and drawing.

## 4th Semester.

Appendix 26.

- (a.) Lectures on dyeing, bleaching, calico-printing, and finishing.  
 Chemical technology of woven tissnes.
- (b.) Practical work in the dyeing laboratory and in the dyeing and finishing house.
- (c.) Machinery and drawing.

Prospectus of  
the Weaving  
School, Crefeld.

## CONDITIONS OF ADMISSION.

Conditions of  
admission.

Students wishing to attend the school must have attained their 16th year, and must have an elementary knowledge of chemistry and physics.

As a rule no student will be admitted without having passed an entrance examination. He is however exempt from this if he can show by certificate that he has obtained the necessary knowledge at a public school.

Those who wish to give their whole time to the manufacture of dyes, dyeing, and finishing may make special arrangements with the director, and in such cases exceptions are made as to the entrance examination and the time of study.

The complete course has a duration of two years, and begins every year at Easter.

The admission of a student at any time other than the beginning of a year's course depends upon the decision of the director of the school of dyeing.

On entering, the student is obliged to remain one semester.

The fee which must be paid beforehand is per semester—

100 marks (5*L.*) for Prussians.

150 „ (7*L.*) for all Germans other than Prussians.

250 „ (12*L.*) for foreigners.

Essential reductions may be made from the scholarship funds in case of diligent students with limited means.

In the laboratory the student has the use, free of charge, of a working bench, fuel, chemicals and reagents, with the exception of silver nitrate, platinum chloride, and gold chloride.

Further, for the payment of a caution-money of 30 marks (1*L.* 10*s.*) he has the use of all the apparatus, porcelain and glass vessels, &c. which he may need, but for which he is made responsible; missing, damaged, or broken apparatus being charged for at cost price. Each student is obliged to bring his own platinum crucible and blowpipe. The preparations made from the chemicals of the laboratory are the property of the department.

The laboratory is open daily, with the exception of Saturday afternoon, from 8 to 12 and 2 to 6 o'clock.

Students who have attended the department for one year at least obtain a certificate on leaving. Certificates are also issued every half-year recording the diligence, progress, conduct, and attendances of each student. In special cases students may receive on leaving, as a mark of distinction, either prizes or written testimonials.

## COLLECTIONS.

Collections.

Besides the utensils and apparatus necessary for teaching, the department possesses a well-equipped physical cabinet, extensive collections of chemical preparations and colouring matters, and a library. In the latter most of the journals relating to dyeing are kept for the use of the students.

## Appendix 27.

Prospectus of  
the Higher  
Grade Weaving  
School, Chem-  
nitz.

## APPENDIX 27.

PROSPECTUS OF THE HIGHER GRADE WEAVING SCHOOL, CHEMNITZ,  
SAXONY.

(See Vol. I., p. 142.)

This school, which has been in operation since Easter 1857, has, thank to the powerful support of the Minister of the Interior of the Kingdom of Saxony, and of the municipal authorities of the town of Chemnitz, set up looms, together with the necessary machinery for all branches of weaving in a special building used only for this purpose, possessing ample space and with excellent lighting. It has also a special steam engine, by means of which the various power-looms used for the purpose of instruction are set in motion.

In the power-loom shed are collected specimens of the chief varieties of looms in ordinary use, driven by machinery, together with the different machines for allied processes.

The institution is conducted by experienced teachers, under the direction of a committee of the Town Council, and the endeavour is made, by means of varied and sound instruction, as also by practical exercises, to train both manufacturers and overseers for all branches of weaving; as also to impart to young persons intending to become buyers or sellers of manufactured goods a sound knowledge of the processes of manufacture and thus to enable them to form a correct judgment of quality.

Each year at Easter and Michaelmas a course of training, which extends over an entire twelvemonth, is entered upon, so that students can begin work at either period.

The programme is so arranged that it is further possible to attend only certain special courses; but the directors reserve to themselves the right to decide in every such case whether permission shall be granted to take such specialized instruction.

The training is divided into two sections, and includes—

## A.—IN THE FIRST HALF-YEAR.

1. Lectures upon weaving materials.
2. Lectures upon the construction and design of the different kinds of looms and auxiliary machinery.
3. Decomposition of heald-work, and as far as possible also of jacquard fabrics. Preparation of the pattern drawings required for the same in connection with the necessary instruction in setting them in the loom and preparing the same.
4. Practical exercises in heald-work weaving.
5. Composition.
6. Lectures on principles of machinery and motors, together with drawings for instruction in power-loom weaving.
7. Instruction in sketching machinery and freehand drawing.

## B.—IN THE SECOND HALF-YEAR.

1. Lectures upon power-looms, as also on their preparation, and upon the auxiliary plant for power-loom weaving.
2. Practical exercises in power-loom weaving.
3. Composition.



4. Decomposition of stuffs woven on the jacquard—velvets, figured muslins, ribbons, &c.—together with the necessary instruction in arranging and preparing the looms. Appendix 2:
5. Lectures on the construction and management of the jacquard loom and other complicated looms. Prospectus of  
the Higher  
Grade Weaving  
School, Chem-  
nitz.
6. Practical instruction in jacquard weaving, including velvets, figured muslins, ribbons, &c.
7. Freehand drawing. Arrangement of coloured patterns. Introduction to designing.

The time to be devoted to each of these subjects is as follows:—

A.—IN THE FIRST HALF-YEAR.

- 4 hours for instruction:
- a. Concerning materials used for weaving; their cultivation as respects the mode of gathering them and their preparation; and
  - b. Concerning the treatment of the same for weaving, as also respecting the construction and design of looms and the auxiliary machinery; also on the preparation of the loom.
- 16 hours for the decomposition and description of heald work, and so far as possible also of jacquard fabrics, for the preparation of the requisite pattern-drawings and computations, in combination with the necessary instruction in transferring the same to the loom, and preparation of the loom.
- 8 hours for practical exercises in heald-work patterns on the hand-loom. In addition to the requisite auxiliary machines there are seven cotton and woollen looms, eight silk looms, two linen looms, two buckskin looms, and one carpet loom. Two looms for mounting. Where there are several looms they serve for the making of different materials on each.
- 2 hours for instruction in the various methods of twisting the warp and waft, and on the formation of patterns which can be produced by these means (theory of composition) specially as applied to.
- 4 hours for instruction in the theory of the construction of machinery and prime motors, as also for the preparation of drawings for the teaching of power-loom weaving.
- 4 hours for instruction in sketching parts of machinery, and for freehand drawing.

Total 38 hours.

B.—IN THE SECOND HALF-YEAR.

- 8 hours for lectures on power-looms, as also on preparing, &c. auxiliary machines.
- 8 hours for practical exercises in the power-loom shed. For this purpose, in addition to the requisite auxiliary machines, there are at their disposal 13 power-looms, all of them differing in design and intended for the manufacture of the most varied fabrics. In addition to the above there is a mechanical hand-loom, and a loom for setting up and taking to pieces.
- 2 hours for the theory of composition with respect to jacquard weaving, velvets, muslins, ribbons, &c. in connection with the requisite instruction in.

Appendix 28.

Prospectus of the  
Vienna Weaving  
School.

## APPENDIX 28.

## PROSPECTUS OF THE VIENNA WEAVING SCHOOL.

(See Vol. I., p. 148.)

This school, which is under the direction of the Vienna Trade School Commission, will open on the 9th October 1881.

The object of the school is to enable young men, intending to become manufacturers, to obtain instruction in all branches of their business; to train designers, factory managers, and foremen; and to impart to work people and apprentices the special knowledge they are likely to require.

Plan of instruction.

## PLAN OF INSTRUCTION.

The instruction is arranged under three principal groups—

I. Technical teaching in drawing and designing for manufacture and practical weaving.

II. Further instruction of a literary character.

III. Instruction in braid work and trimmings.

Group I. The technical teaching comprises:—

A. Drawing.

B. General weaving and practical work.

A. The drawing instruction is further subdivided into—

a. Drawing and painting from copies, from nature, from plaster casts, from fabrics, and preparation of designs for textiles.

b. Drawing and painting for printing on fabrics.

c. Drawing for embroidery purposes.

The principal aim of this instruction is to impart to those who intend to become designers a proper understanding of the special technical considerations imposed by the processes of printing on stuffs and weaving, and to enable them to obtain in the school-stelier the skill which is essential for their future calling. Those students who evince especial talent may enter the State art schools. There is no fixed limit to the course of instruction.

B. The department for general weaving and practical work. The course of instruction extends over two years, with ten months' work in each year.

1st year—

a. General. Special technology of fibres used in spinning, their microscopic and physical structure, chemical and physical investigation of same, also commercial examination of materials employed in weaving, explanation of the processes of spinning, system of numbering, trial of yarn as to length and number, calculations, manufacturing accounts, knowledge of machinery, machine drawing, knowledge of prime motors.

b. Theory of hand-weaving. Preparation of the warp and weft for weaving, combinations, mechanism of the simple hand-loom.

c. Practical exercises, warping, winding, weaving on common hand-looms, use of point-paper, decomposition.

2nd year—

a. Jacquard weaving for simple and mechanical weaving.

b. Special technology of the preparatory machines and looms, and of the various kinds of looms, factories for weaving, manufacturing estimates and calculations, special industrial technology of weaving.

c. Practical exercises. Setting up jacquard looms. Warping and winding for power-loom weaving. Erecting and fitting up power-looms, exercises in weaving and practical work, mounting.

pointing, pattern making, punching cards and decomposing for jacquard patterns. Appendix 28.

II. The department for literary instruction applied to trade purposes. This department is primarily intended to convey to foremen, workmen, and apprentices the theoretical knowledge needed for their occupations, and to complete their practical instruction; to render them thoroughly conversant with all mechanism connected with looms and weaving machinery; and to instruct them in freehand drawing. In addition to this the principal subjects comprised in sections A and B will be taught in so far as they apply to the degree of previous knowledge possessed by the students. The duration of this instruction is without definite limits.

Prospectus of the  
Vienna Weaving  
School.

III. The technical school for the trimmings industry.

In the school for trimmings attached to the training school for textile industries, in addition to a knowledge of the principles of weaving, special instruction will be afforded in:—

a. Ribbons.

b. Trimmings.

c. In the production of braids, gimps, chenilles, &c., as also in all manipulations and calculations relative to this department; also in special drawing and designing, for which purpose separate rooms are assigned to this division.

In order to facilitate a clear insight into the operations of dyeing, bleaching, and finishing for the students of the designing school and the weaving school, the school premises adjoin those of the second section of the trade museum, in which, on two evenings in each week, lectures are given during the first year in general chemistry and the theory of colour, and during the 2nd year in the chemistry of dyestuffs, dyeing, bleaching, and finishing.

The Commission for Trade Schools is prepared, in case of need, to introduce evening courses of instruction for manufacturers, merchants, or industrialists on payment of special fees.

The instruction in practical work is carried on, during the first five days in each week, from 8 to 12 in the morning, and from 2 to 4 in the afternoon.

The literary instruction and the work in the trimming and braid department is arranged to take place on Saturdays from 9 to 12 in the morning and on Mondays from 5.30 to 8.30 p.m.

#### CONDITIONS UNDER WHICH STUDENTS ARE ADMITTED.

Conditions of  
admission.

Students who desire to be admitted to the weaving school must have passed satisfactorily through an ordinary 3-class *bürger schule*, i.e., an 8-class elementary school, or at least three classes of the *Real Schule*, or the *Real Gymnasium*.

In order to be admitted to the trade continuation school it will be sufficient for the student to show that he has complied with the State regulations affecting attendance at the public elementary school.

The same conditions apply also to the trimmings and braid department.

The school fees in the practical division amount to 7 gulden per semester for Austrian subjects, with 1½ gulden extra for materials, and these fees are payable on entrance and at the beginning of each session. In cases where the student can prove his inability to pay fees, free instruction can be obtained.

Foreigners pay 25 gulden as school fees, together with 1½ gulden for materials.

The teaching in the *Fortbildungs Schule* and in the trimmings school is free.

## Appendix 29.

Time Table of  
the Vienna  
Weaving School.

## APPENDIX 29.

TIME TABLE OF THE VIENNA WEAVING SCHOOL.  
(See Vol. I, p. 149.)

## FIRST YEAR'S COURSE.

TIME.	MONDAY	TUESDAY.	WEDNESDAY.	THURSDAY.	FRIDAY.
MORNING.					
8-10	Decomposition of Twilled Fabrics.	Decomposition of Twilled Fabrics.		Theory of Composition of Fabrics.	
10-12	Machine Construction. Prime-motors.	Special Technology of Spinning Materials, Methods of Spinning and Yarns.	Drawing from Copies, Fabrics, Plaster-Casts, and from Nature.	Theory of Hand-loom Weaving. Mechanics of the Common Hand-loom.	Drawing from Copies, Fabrics, Plaster-Casts, and from Nature.
AFTERNOON.					
2-3			Drawing from Copies, Fabrics, Casts, and from Nature.		Drawing from Copies and Plaster Casts, and for Printed Patterns.
3-4	Machine Drawing.	Practical Work in the Weaving Shed.	Geometry and Theory of Construction.	Practical Work in the Weaving Shed.	
SECOND YEAR'S COURSE.					
MORNING.					
8-10	Decomposition of Jacquard Patterns.	Decomposition of Jacquard Patterns.	Drawing for Printed Patterns, Embroidery, and Woven Fabrics.	Decomposition of Jacquard Patterns.	Drawing for Printed Patterns, Embroidery, and Woven Fabrics.
10-12	Lectures on Jacquard Weaving.	Lectures on Power-loom Weaving.		Lectures on Preparing Machines.	
AFTERNOON.					
2-4	Machine Drawing.	Practical Work in the Weaving Shed.	Drawing for Printed Patterns, Embroidery, and Woven Fabrics.	Practical Work in the Weaving Shed.	Drawing for Printed Patterns, Embroidery, and Woven Fabrics.

No classes on Saturday.

## APPENDIX 30.

Appendix 80.

SCHEME for the ORGANIZATION of the CENTRAL INSTITUTION of  
the CITY and GUILDS of LONDON INSTITUTE.Scheme for the  
Organization of  
the Central  
Institution of  
the City and  
Guilds of London  
Institute.

(See Vol. I, p. 405.)

## GENERAL OBJECTS.

General objects.

The object of the Central Institution is to give to London a college for the higher technical education, in which advanced instruction shall be provided in those kinds of knowledge which bear upon the different branches of industry, whether manufactures or arts.

Just as the Royal School of Mines gives a technical training to mining engineers, so the Central Institution is intended to afford practical, scientific and artistic instruction which shall qualify persons to become—

1. Technical teachers.
2. Mechanical, civil and electrical engineers, architects, builders, and decorative artists.
3. Principals, superintendents and managers of chemical and other manufacturing works.

The main purpose of the instruction to be given in this Institution will be to point out the application of different branches of science to various manufacturing industries; and in this respect the teaching will differ from that given in the universities and in other institutions in which science is taught rather for its own sake than with the view to its industrial application. In order that this instruction may be efficiently carried out, the Institution, in addition to the lecture theatres and class rooms, will be fitted with laboratories, drawing offices, and workshops; and opportunities will be afforded for the prosecution of original research, with the object of the more thorough training of the students, and for the elucidation of the theory of industrial processes.

## STUDENTS.

Students.

It is probable that the students seeking admission into the Central Institution will belong to one or other of the following classes:—

1. Persons who are training to become technical teachers.  
These will be students entering the College by means of exhibitions under category 2 (b); or students selected at the May examinations in Technology who pass with special distinction in the Honours Grade; or teachers of the Institute, registered under the scheme of Technological Examinations, who, during certain months of the year, when they are disengaged, will receive gratuitous instruction, and will have the opportunity of using the laboratories, collections of machinery, instruments and apparatus with which the College will be provided.
2. Persons not under sixteen years of age who, having passed a matriculation or entrance examination, are prepared to take a complete course of instruction with a view to some professional or industrial occupation. These students will probably belong to two classes—
  - (a.) Persons paying full fees, who will receive in this Institution an education similar in many respects to that which they may acquire in one of the Technical High Schools of the Continent.
  - (b.) Persons will be received into the Institution from the Finsbury Technical College, or other similar Colleges in the provinces, by means of exhibitions, which will cover the whole or part of their educational and other expenses.

## Appendix 80.

Scheme for the Organization of the Central Institution of the City and Guilds of London Institute.

It is probable that many of the persons in sub-class (b) will be select pupils from the public elementary and national schools, who, having received a preliminary science training, and distinguished themselves at the Finsbury Technical College or elsewhere, will proceed to the Central Institution in the hope of qualifying themselves for some of the higher posts in engineering or manufacturing industry.

3. Persons who, having been engaged in industrial pursuits, desire to attend special courses, with the view of acquainting themselves more fully with the scientific principles underlying their work.

## Conditions of entrance.

## CONDITIONS OF ENTRANCE.

The matriculation or entrance examination for students intending to take the ordinary science curriculum, with the view of subsequently obtaining a diploma, will include mathematics, pure and applied; chemistry; physics; drawing, and modern languages. Whilst considerable freedom will be allowed to students entering the College as regards the courses of instruction which they desire to follow, a definite scheme of instruction will be drawn up for each of the different branches of industry, and students intending to spend two or three years in the College, and to devote their whole day to study, will be recommended to follow the scheme laid down. The fee for the courses to be pursued by a matriculated student will be about 30*l.* per annum, and a fee of about 20*l.* per annum will be charged to students wishing to take special courses and to occupy themselves for the greater part of the day with laboratory practice and research work. With the view of encouraging research work the Institution will be provided with separate laboratories, in which the students will have the opportunity of working without distraction or disturbance. The permission to use these laboratories will be reserved for the advanced students who have previously passed through the ordinary courses of the College, and for non-matriculated students under very special circumstances.

## Subjects of instruction.

## SUBJECTS OF INSTRUCTION.

As the object of this Institution is to train technical teachers, proprietors, and managers of chemicals manufactories and of other industrial works, as well as mechanical, civil, and electrical engineers, architects, builders, and persons engaged in art industries, the Institution will comprise five chief divisions, viz.:—(1) Chemical Technology; (2) Engineering, mechanical, civil, and electrical; (3) General manufactures; (4) Architecture and building construction; (5) Applied art; and the subjects of instruction may accordingly be grouped under the general headings of chemistry, engineering, mechanics and mathematics, physics, manufacturing technology and art. Inasmuch as the Royal School of Mines is already established as a training school for mining engineers, no provision will be made for the instruction of students in this branch of industry; and consequently the sciences of geology, mineralogy and metallurgy will not necessarily be included in the subjects of instruction at the Central Institution.

## Professorial staff.

## PROFESSORIAL STAFF.

*Chemistry.*—The main object of the instruction in this department will be to afford to students facilities for acquiring a knowledge of the highest branches of chemistry, and of its application to such industries as alkali manufacture, the manufacture of artificial colours, brewing, soap boiling, the manufacture of oils and varnishes, dyeing, &c. To provide the requisite instruction in this department, it will be necessary to have one chief professor, who shall devote the whole of his time to the work of the Institution, and who will be expected to direct and superintend the

students in his department and to train them in the methods of original research. In addition to this appointment it will be advisable to have two assistant professors, who shall respectively take charge of the research and of the technical departments. A separate laboratory will be placed under the direction of each professor, and the arrangements of the building, which provide three large laboratories, besides several smaller rooms which may be used as such, render possible this division of the work. Besides these professors, demonstrators, laboratory, and lecture assistants and attendants will be required to complete the staff in this department.

*Engineering.*—The instruction to be given in this subject will have for its object the practical scientific training of persons who intend to enter any branch of the engineering profession. The instruction will be adapted to those who have already spent some time in the office of a civil engineer or in engineering works, as well as to those who desire to obtain in the College a sound theoretical knowledge of the principles of science applicable to their future career, and an insight into the practice and manipulative work in which they will be subsequently engaged. The professor appointed to take charge of this department will be expected to devote the whole of his time to the work of the College, and to lecture on such subjects as the strength of constructive materials; the construction of docks, roads, bridges, and roofs, machine designing, hydraulic and other machinery, steam engines, gas engines, &c. He will also be required to give instruction in levelling and surveying, to superintend the laboratory practice of the students in the testing and engine rooms, and to direct their work in the machine shops and drawing offices. He will need the assistance of a teacher of machine drawing, and of a workshop instructor, besides one or two laboratory demonstrators, and the necessary attendants to look after the engines and machines. Later on, an additional professor will be required to take charge of some of the work of this department.

*Mechanics and Mathematics.*—Immediately connected with the teaching of engineering and physics is the instruction required by the students of a Technical College in mechanics and mathematics. There is little doubt that the student's progress in the several branches of engineering depends very much upon his possessing such a knowledge of pure and applied mathematics as enables him to use it as an instrument of his ordinary work, and for this purpose it is necessary that his knowledge should be in advance of such applications of it as he may at any time be required to make. The professor appointed to this post will be expected to give practical instruction in the application of mathematics and mechanics to the solution of engineering and physical problems. He will be required to devote the whole of his time to the work of the College, and to give courses of instruction, illustrated by laboratory practice, on the principles of dynamics and of mechanism, on graphical statics, on descriptive geometry, and on some of the higher parts of pure and applied mathematics. He will need the services of two demonstrators to assist in the mechanical laboratory and in the drawing office.

*Physics.*—In view of the present and future applications of electricity to engineering problems, considerable importance attaches to the character of the instruction to be given under this heading. The teaching of practical physics has only recently been introduced into schools of applied science, and the number of students receiving laboratory instruction in this subject in our own colleges, and in foreign Polytechnic schools, is still very limited. The large number of students in attendance at the courses of electricity in the Finsbury Technical College shows that there is already a strong demand for instruction in the practical applications of this important branch of physical science. In order to supply the requisite teaching staff in this subject, it will be necessary, in the first instance, to appoint a professor, who shall devote the whole of his time to the work of the College, and who shall be responsible for the work of his department. This appointment will be supplemented by that of an additional professor, whose duties will depend very much upon the particular branch of physics to which the chief professor may devote his attention. Whilst it is highly desirable that every facility should be afforded in the Central

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Institution to students desiring to become electrical engineers, of receiving practical instruction in the theory and application of electricity to such technical subjects as telegraphy, electric lighting, and the transmission of power, for experiments in which subjects special laboratories will be set apart, it will be the duty of the chief professor or of the additional professor to give courses of lectures on heat, light, and sound; to superintend and encourage laboratory practice in these branches of physics; and to take up from time to time the consideration of other technical subjects, such as the principles of thermo-dynamics in their application to the theory and working of steam engines, gas engines, ventilation, &c. To complete the teaching staff of this department the professors will require the assistance of one or more demonstrators, according to the number of students in attendance at their laboratories.

*Technology.*—Under this heading is included instruction in the processes and practical details of various manufactures, some of which will be treated of by the professors of the several departments already referred to, whilst others will need the assistance of specialists, who will be engaged to give lectures on these subjects. The gentlemen appointed to give these lectures will be either the Institute's examiners in Technology, or other persons equally well acquainted with the technical details of particular manufacturing processes. They will be appointed from time to time as required, and will not necessarily form part of the permanent staff of the College.

The lectures will probably be of two kinds, according as they are delivered during the Session or during the long vacation. The one course will form part of the curriculum of the ordinary students of the College, whilst the other course will be especially arranged for the instruction of teachers of the Institute, registered under the scheme of Technological Examinations. The lectures given during the Session will be attended by the matriculated students towards the close of their regular course of study, those delivered during the recess by teachers of technical classes in London and the Provinces, who will be invited to hear them without payment of fee. Arrangements will also be made by which other persons seeking information on technical matters may be admitted to these lectures.

The lectures will embrace several of the subjects included in the programme of Technological Examinations, such as Alkali Manufacture, Spirit Distilling, Glass Manufacture, Pottery and Porcelain, Printing, Weaving, the Manufacture of Cotton, Wool, Linen, &c., and will treat of the technical details involved in these and other industrial processes. For the illustration of the lectures, specimens of materials in various stages of manufacture, models, and diagrams of machinery will be required; and these should be found ready for use in the Museum of Technology, a room for which has been provided in the Institution. Facilities will be afforded to the lecturers and students for carrying on experimental work in explanation of the lectures; and considering the varied character of the work which may have to be performed in connection with this department, for which it is impossible to make provision at the outset, it is very important that here and there rooms should be left available to be fitted with such arrangements and apparatus as experience may show to be desirable. These lectures will form a special and characteristic feature of the instruction to be given in the Central Institution.

*Architecture and Building Construction.*—To give completeness to the instruction which this Institution should afford, a department of Architecture and of Building Construction should be added to those already enumerated. The establishment of a special school for Architects and Builders would not involve any great addition to the professorial staff which it is suggested should be provided for the other departments of the College. But as the funds at the disposal of the Institute are not sufficient to enable the Council to give effect at starting to a complete scheme of higher technical instruction adapted to all the different industries of the country, it would seem advisable at first to restrict within certain limits the work to be carried on in the Institution, and to defer for some little time the organization of this special school.



*Applied Art*.—Under this heading instruction might be given in decorative art and in several special branches of applied art, particularly in those in which artistic effects are produced by a combination of art with processes involving applications of science, such as Chromo-Lithography, Enamelling, Photo-Engraving on Metals, Photo-Lithography, and Photography. Lectures might be delivered on these subjects, and on the scientific principles connected with them; and the processes themselves might be practically illustrated under the direction of experienced teachers in the workshops of the building. Lessons might also be given in designing for, and in the execution of Glass Painting, Mosaic Work, Wood and Ivory Inlaying, the Inlaying of Metals into various substances, Wood-engraving and Wood-carving.

Instruction of this kind would be very serviceable in creating and developing Art industries in this country, and it would be especially valuable in the training of teachers; and it is hoped that means will be found, at a very early date, for giving such instruction.

*Modern Languages*.—In view of the increasing importance to students of applied science of being able to read foreign scientific and trade journals, so as to understand what is being done abroad in the particular branch of industry in which they are engaged, the students will have the opportunity in the Central Institution of pursuing their studies in the French and German languages. It is true that they might obtain these lessons elsewhere, but it is found, as a fact, that students very rightly object to the loss of time involved in going from place to place in pursuit of the instruction they require, and commonly neglect the lectures which they have not the opportunity of attending in the Institution in which they pass the greater part of their day. Moreover, students are attracted to a place of learning in which they can obtain all the instruction they need. For these reasons, it is thought desirable that teachers of French and German should, as soon as possible, be appointed. At the same time it is hoped that, as the teaching of modern languages becomes so far improved that students seeking admission to the College will be able to translate with ease passages from French and German into English, the necessity of supplementing the technical instruction, which the Institution is intended to afford, by providing for this branch of education, will cease to exist.

#### COURSES OF INSTRUCTION.

Systematic courses of instruction will be drawn up for matriculated students, which will be obligatory upon those who seek the Diploma of the Institute. These courses will cover a period of three years, and will be varied according to the branch of engineering or of manufacturing or art industry for which students are preparing. The details of these courses will be best settled in consultation with the several professors; but it is understood that, besides the general and special lectures and class work already referred to, the instruction will consist largely of laboratory practice in chemistry, mechanics and physics; and that for students who may not previously have acquired any manipulative skill, the workshops of the Institution will be available; whilst machine drawing will form an important part of the ordinary curriculum. It is hoped, too, that the professors will have opportunities of conducting their students to some of the different factories and works in and near London.

#### DIPLOMAS.

It is desirable that the Institute should grant diplomas, in accordance with the power conferred upon the Council by the Articles of Association, Sec. 51. The diplomas should be of two kinds, the Associateship of the Institute, and the Fellowship of the Institute.

The Associateship should be awarded to students of the Central Institution who shall have gone through the complete course of instruction as

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instruction.

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laid down for them, and have satisfactorily passed their several examinations. Of these examinations, the first would be the Matriculation or Entrance Examination, and candidates unable to pass it would be recommended to spend one year, at least, in some suitable College, in preparation for it. A subsequent examination would be held at the end of each year on the College work, and the final examination, at which external examiners would be selected to assist the Professors of the Institution, would be essentially practical in character. The diploma might be granted to students educated at any other College affiliated to, or associated with, the Institute, who should pass the Matriculation and other examinations.

The Fellowship would be conferred upon persons who, having obtained the Associateship, and spent at least five years in actual practice, should produce evidence of having done some original and valuable research work, or of having otherwise contributed to the advancement of the industry in which they are engaged.

Evening  
instruction.

#### EVENING INSTRUCTION.

Although, at the outset, the education of day students is all that can with advantage be attempted, it is desirable that, later on, the experiment shall be made of giving evening instruction in the Central Institution.

The instruction so given should consist of courses of lectures dealing with some of the applications of Science or Art to special branches of industry, and serving the double purpose of imparting information and of showing the importance of more systematic technical teaching. These lectures should be somewhat of the character of the Cantor lectures, periodically delivered at the Society of Arts, and somewhat similar to the well-attended and varied courses held at the Conservatoire des Arts et Métiers at Paris. Whilst differing from class lessons they would have a distinctly educational value; and, as distinguishing them from the Cantor lectures as well as from those given at the Paris Conservatoire, opportunities would be afforded to some of the students attending them of themselves doing laboratory work on one or more evenings of the week. It would be necessary that the evening instruction should be so arranged as not to interfere with the ordinary day courses.

Appointment of  
chief professors.

#### APPOINTMENT OF CHIEF PROFESSORS.

Before entering further into the consideration of the details of the scheme now proposed for the organisation of the Central Institution, it is desirable that the chief professors should be appointed, not with the view of their entering immediately upon their duties, but in order that the Sub-Committee may confer with them as to the courses of instruction to be given, and as to the fittings of the several laboratories and class rooms, the preparation of which will occupy some considerable time.

It is recommended, therefore, that the Committee should at once appoint—

- A Professor of Chemistry.
- A Professor of Engineering.
- A Professor of Mechanics and Mathematics.
- A Professor of Physics.

These gentlemen having been elected, the appointment of the other professors, the demonstrators and lecturers on technology may be deferred, it being understood that some of these additional posts must be filled before the opening of the first session. Meanwhile, however, the work of preparing the fittings and of arranging the courses can be advanced.

Management.

#### MANAGEMENT.

The following Rules have been drawn up for the regulation of the educational and administrative work of the Central Institution:—

1. There shall be a **BOARD OF STUDIES**, composed of the Professors of the Institution, for the consideration of all matters connected with the education of the students.

2. Any lecturer holding an annual appointment, and giving a separate course of instruction, may be appointed by Sub-Committee A. as a member of the Board. Appendix 30.

3. Subject to a general scheme of instruction to be laid down by the Institute, the Board shall arrange courses of instruction for students, and shall recommend to the Institute with respect to the appointment and removal of instructors, teachers, demonstrators and attendants. Scheme for the  
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4. The Organising Director and Secretary of the Institute shall have a branch office in the Central Institution, and shall have a right to visit its classes, laboratories and workshops, and to call for any information he may think necessary for the use of Sub-Committee A. He shall also have a right to be present at any time he may think it desirable at the meetings of the Board, and to take part in the discussions, but without a vote.

5. All communications from the Board to the Institute shall be made in writing, and shall be addressed to the Organising Director and Secretary.

6. The Institute, at the outset, shall appoint, for a period of a year or longer, from among the Professors, a Dean, who shall preside at the meetings of the Board, and who shall attend any meeting of Sub-Committee A. at the request of the Sub-Committee or of the Board for consultation on any special business.

7. The minutes of the meetings of the Board shall be recorded, and shall be laid on the table at the meetings of Sub-Committee A.

8. The chief clerk of the Central Institution shall act as secretary to the Board, receiving in that capacity his instructions from the Dean, and shall take minutes of the proceedings.

9. The Dean shall consult with the Organising Director and Secretary, who shall confer with the chairman of the Executive Committee, or, in his absence, with one of the honorary secretaries, with respect to any *ad interim* arrangement that may have to be made requiring the subsequent sanction of Sub-Committee A.

10. All the administrative work of the Central Institution, general questions of discipline and the superintendence of the library and museum, shall be in charge of the Organising Director and Secretary of the Institute, who shall act under instructions from Sub-Committee A.

## ESTIMATE OF ANNUAL EXPENDITURE.

Estimate of  
annual expen-  
diture.

For the efficient carrying out of the above scheme, it is believed that a sum of 15,000*l.* a year will be required, part of which would be provided by the students' fees. It is estimated that, as the Institution becomes known, these fees will amount to 4,000*l.* or 5,000*l.* a year, and, consequently, that an annual grant of about 10,000*l.* from the funds of the Institute will suffice, being the sum specified in the Report to the Livery Companies of 1878 as the amount per annum that should be set apart for the purposes of the Central Institution.

This estimate of the probable annual expenditure is made up of the following items:—

Salaries of Professors, Lecturers, and Demonstrators	-	8,700
Apparatus and Material	-	1,500
Clerks, Porters, Attendants, Servants, &c.	-	1,500
Printing, Advertising, Stationery, &c.	-	1,300
Repairs, Rates, Coals, Gas, Insurance, &c.	-	2,000
		<hr/>
Less Fees (from 150 to 200 paying students) say	-	15,000
		5,000
		<hr/>
		10,000
		<hr/>

## Appendix 31.

Programme of  
the Royal Indian  
Engineering  
College.

## APPENDIX 31.

THE ROYAL INDIAN ENGINEERING COLLEGE, COOPER'S HILL.  
(See Vol. I., p. 414.)

Course for  
engineer  
students.

## COURSE OF INSTRUCTION FOR ENGINEER STUDENTS.

The following table gives the subjects taught in each year of the college course, and approximately the average number of hours allotted weekly to class instruction on each subject; all being liable to alteration from time to time:—

## FIRST YEAR.

	Hours per Week.
Descriptive engineering (materials of construction)	1½
Geometrical drawing	8
Surveying (partly in the field during 1½ terms)	8
Freehand drawing	2
Chemistry	2
Chemical laboratory	3
Physics	1
Mathematics (plane analytical geometry, elements of the calculus, statics, kinematics, and the elements of dynamics)	13
Geology (during 2 terms)	2
Architecture (during 1 term)	2
French or German*	1½

The mechanical workshop is open for optional study to each student for one or more afternoons per week.

## SECOND YEAR.

	Hours per Week.
Engineering and applied mechanics	10
Geometrical drawing	4
Freehand drawing	2
Surveying (for 1½ terms)	10
Chemistry (for 2 terms)	2
Physics (during 2 terms)	1
Physical laboratory	3
Mathematics	12
Geology (during 2 terms)	2
Architecture	2
French or German*	1½

The chemical laboratory, or the mechanical workshop, or the free-hand drawing class are open to each student for optional study during one or more afternoons per week.

## THIRD YEAR.

	Hours per Week.
Engineering and applied mechanics	9
Accounts (during 2 terms)	2
Estimating (during 2 terms)	2
Mechanical laboratory (total 40 hours).	

\* Alternative with freehand drawing.

During this year, in addition to the class instruction, the students are employed in making a complete detailed survey in the field, with plans, estimate of quantities, &c. for a project for two or three miles of railway, road, or canal. This occupies about seven weeks. The students are then employed in working out three complete and detailed designs to conditions and data supplied to them. The subjects of these designs are chosen from civil engineering, mechanical engineering, and architecture. Each design occupies about seven weeks. The chemical or physical laboratory may be taken instead of the architectural design. The students are also employed for a limited time in the mechanical laboratory in testing the mechanical properties and value of iron, steel, cement, lubricating materials, &c.

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Instruction in photography is given during the afternoons of one term to a limited number of students.

## COURSE OF INSTRUCTION FOR TELEGRAPH STUDENTS.

Course for  
telegraph  
students.

## FIRST YEAR.

Telegraph students are nominated from amongst the engineer students at the end of the first year.

## SECOND YEAR.

	Hours per Week.
Applied mechanics	7
Chemical laboratory	3
Mathematics (during 1½ terms)	3
Applied mathematics	4
Mathematical physics	3
Telegraphy (in physical laboratory)	7
Telegraph construction (workshop)	10
Signalling	2
Accounts (during 2 terms)	2
Physics (lectures during 2 terms)	1

## SUBJECTS OF EXAMINATION AT THE END OF EACH TERM.

Subjects of  
examination.

*These arrangements are liable to be modified from time to time.*

## AUTUMN TERM.

*Third year.*—Applied mechanics (construction).

*Second year.*—Applied mechanics (construction); applied mechanics (mechanism); applications of the calculus; dynamics; optional mathematics, surveying, geology, physics, descriptive engineering.

*First year.*—Conics; differential calculus; statics; optional mathematics; geometrical drawing; drawing exercise; geology; chemistry; descriptive engineering.

## EASTER TERM.

*Third year.*—Applied mechanics (construction); optional applied mechanics (construction); applied mechanics (dynamics of machinery); optional applied mechanics (mechanism, machinery, and hydraulics); accounts.

*Second year.*—Applied mechanics (construction); applied mechanics (hydraulics); dynamics; application of logarithms; optional mathematics; geology; descriptive engineering; surveying; physics.

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Appendix 31. *First year.*—Differential and integral calculus; application of logarithms; hydrostatics; dynamics; optional mathematics; geology; drawing exercise; descriptive engineering; chemistry.

Programme of  
the Royal Indian  
Engineering  
College.

SUMMER TERM.

*Annual Examination.*

*Third year.*—Applied mechanics (construction); optional applied mechanics (construction); applied mechanics (mechanism, machinery, and hydraulics); optional applied mechanics (mechanism, machinery, and hydraulics); descriptive engineering (construction); descriptive engineering (mechanical and hydraulic).

*Second year.*—Applied mechanics (construction); applied mechanics (hydraulics and mechanism); analytical conics; statics; hydrostatics; mensuration; trigonometry; dynamics; differential and integral calculus; optional mathematics; descriptive engineering (construction); descriptive engineering (hydraulics); architecture; drawing exercise; chemical and physical laboratories.

*First year.*—Differential and integral calculus; statics and hydrostatics; analytical conics; dynamics; optional mathematics; architecture; descriptive engineering (construction); surveying; descriptive geometry; chemistry; physics; drawing exercise.

Appendix 32A.

The Woodwardian  
Museum,  
Cambridge.

APPENDIX 32A.

THE WOODWARDIAN MUSEUM, CAMBRIDGE.

(See Vol. I., p. 421.)

The Woodwardian Museum of Geology was founded by John Woodward, M.D., F.R.S., Associate of the College of Medicine at Cambridge, Professor at Gresham College, born 1685, died 1728.

On his death he bequeathed to the University of Cambridge his two cabinets of English fossils, and the University purchased his foreign collection. This was the nucleus round which has gathered the present large museum. The oldest part is the collection of Agostino Scilla, a distinguished Sicilian painter, which was acquired by Woodward. This contains specimens figured by Scilla in his work "La vana speculazione disangannata dal senso," and the original drawings made by him for the engraver previous to the publication of his work in 1670. There are some other small collections of about the same date.

The museum has, however, been raised to its present position chiefly by the labours of Professor Sedgwick, and it was owing to his influence in a great measure that the existing museum building was erected by a subscription commenced in 1835.

The economic collections are of recent date, and were made in illustration of the courses of lectures delivered by Professor Hughes on Economic Geology, by which Professor Hughes understands the application of geological knowledge to the obtaining of products of commercial value.

Thus, technical instruction is incidentally given, which could easily be expanded, and, in conjunction with the work of other departments, made to form part of a systematic course of instruction in—

Mining and Metallurgy;  
Architecture and General Engineering;  
Hydraulic Engineering;  
Agriculture.

In the case of mining and metallurgy, the questions of the mode of occurrence of the mineral, of its geological horizon, and the probability of its existence in any given district and at any workable depth, all belong to geology.

In illustration of this subject, collections exist showing the character and mode of occurrence of veins and lodes, and specimens of the various ores and fossil fuel. Thus, for example, there is a series from the doubtful and once wrongly classified red rocks of Whitehaven and other districts in the north of England, with enough evidence to prove that they occur below, and not above the coal. While in the general palaeontological series, there is abundant material for the identification and classification of the carboniferous and other coal-bearing deposits.

For instruction in metallurgy, the student would go to the chemical department and the department of mechanism and applied mechanics for the art of practically working in metals.

The architect or engineer has to deal with rocks and mineral products in his every-day calling, and whether for the purpose of ascertaining how and where to obtain them, or in order to know the causes of the variations which render selection necessary in a quarry or pit, he must acquire a knowledge of geology.

These points are dwelt upon in Professor Hughes lectures on economic geology, and in illustration of it, there is a small collection of slates and other building stones, often showing faces variously dressed; of marbles and other ornamental stones; and a very large series of rock specimens is available for reference in this connection.

On removal to the new museum, Professor Hughes hopes to be able to give much greater prominence to this collection than can be done in the limited space now available.

A small series of millstones, ranging from Neolithic to recent times, forms the nucleus of what will some day be a useful collection for the commercial public as well as for the archæologist.

The architect or engineer might at the same time study fine art in the Fitzwilliam Museum and the use of materials in the department of mechanism and applied mechanics.

In hydraulic engineering, which is becoming one of the most important branches of study, a knowledge of geology is essential. Whether a rock of a given character will prevail at a given depth over a given area; what is the amount of rainfall, and what proportion of that rainfall will reach a given stratum; the artesian and other springs, floods and the methods of mitigating their injurious effects, cannot be understood without a knowledge of the various conditions affecting the distribution and passage of the water, the outcrops, faults and other disturbances of the catchment basin; and these questions are all dealt upon in the lectures on Geology and Physical Geography.

Of appliances for this part of the work we have sections, diagrams, maps, and models; specimens of hydraulic and other limestones; cements; cores brought up from deep borings for water; pipes blocked and pipes coated by travertine, and the various specimens collected for teaching the principles of geology.

With regard to subjects bearing upon agriculture, the student is taught in the geological department the causes of variations of climate, of rain, floods, drought and the natural and artificial conditions which influence them—involving the questions of drainage and water supply. He learns the mode of formation of soils and the circumstances which affect their character; the association of rocks and the relative position of the limestones, freestones, clays, and drifts. Upon this naturally follows the inquiry into the sources of the mineral manures, such as lime, phosphates, &c.

Most of the material appliances for this part of the subject belong to the general collection, but there are some special series bearing upon it, as for instance, a series of phosphates from various geological horizons, limestones, &c.

The student of agriculture could at the same time learn in the chemical department, the laws of combination and assimilation of inorganic and organic matter, and in the departments of animal and vegetable morphology, the laws of development of animal and vegetable products.

Appendix 32A.

The Woodwardian Museum, Cambridge.

Appendix 82a.

## APPENDIX 82a.

Letter from  
Professor Stuart  
on Engineering  
Instruction at  
Cambridge.

LETTER FROM PROFESSOR STUART, F.R.S., having reference to the OPPORTUNITIES FOR LEARNING ENGINEERING afforded in the UNIVERSITY OF CAMBRIDGE. (See Vol. I., p. 422.)

SIR, Cambridge, June 9, 1883.

THE Engineering workshops which I established here have been gradually enlarged, and the system connected with them developed, so that we now can give a complete preparatory training to an engineer. That is to say, we can, besides theoretical work, give him drawing and design and practical work in fitting, turning, pattern-making, smithing and foundry; so that, when he leaves us, he will be in a position to go on to learn the special branch of engineering which he may intend to take up. We pay particular attention to the principles of designing, as the establishment contains several competent workmen besides the demonstrators or junior assistants, and is all under the superintendence of a practical engineer, who is also a University graduate and has had varied experience in different shops.

When a pupil leaves us we advise him, if he is to be a mechanic or engineer, to go into some shop or drawing office, where he can become familiar with the class of work which he is about to pursue, and all the while he can see larger work than we do. A year spent in this way should complete his engineering education, so far as education can be said ever to be completed; and as a rule we would advise him to go in the capacity of a workman and to get what wages he can earn during the time. We can turn a man out capable of earning wages; I have two of my pupils at present working for me at 25s. a week, and they are worth the money. I aim, in fact, at paying some of my best pupils wages when they are willing to stay on an extra year, as it gets them into workmanlike habits and the keeping of regular hours. Our training is distinct from that for a mechanical engineer, but we regard that as the true foundation also for the civil and for the electrical engineer; and, if a man were to leave us for either of these pursuits, we would advise him, as far as possible, to follow the same lines, namely, to get a definite job rather than to go in a general way as a pupil, except when, as pupil, he would distinctly have the advantage of seeing varied work in a comprehensive way, and details of that work which he might not otherwise have the opportunity of seeing. For the electrical engineer there is teaching of electrical principles in the Cavendish laboratory here, and we have also good chemical and geological teaching as well as in general physics principles. Whenever a man is a good mathematician we urge him to study mathematics with a tutor as far beyond the limits of our regular course as his ability will permit him to go; and, if he aims at taking a degree, we prefer to see him take one in mathematics. There are other allied means of taking a degree for those who are not mathematicians, such as physics and chemistry; and a degree can also be taken in the applied science special examination, which includes mechanism, heat and practical work.

The courses of lectures which we provide for our pupils are three in each term, thus forming a three years curriculum as follows:

1st year.	<i>Michaelmas Term</i>	Mechanism and Applied Mechanics (General and Introductory Course).
	<i>Lent Term</i>	Elementary Mathematics (Algebra and Trigonometry).
	<i>Easter Term</i>	Statics and Hydrostatics.
2nd year.	<i>Michaelmas Term</i>	Dynamics.
	<i>Lent Term</i>	Machine Construction and Heat.
	<i>Easter Term</i>	Conics and Differential Calculus.
	" "	Surveying and Levelling (Practical Class.)
3rd year.	<i>Michaelmas Term</i>	Integral Calculus and Solid Geometry.
	<i>Lent Term</i>	Theory of Structures and Strength of Materials.
	<i>Easter Term</i>	Rigid Dynamics.



The above list of lectures will be subject to modification as the progress of our experience may suggest. There will always be a number of pupils who will take only the first or only the last year's course, or otherwise select their subjects, owing to the particular state of their information.

Each term lasts for at least eight weeks, and we add a fourth term in the Long Vacation in July and August, during which, however, there are no Lectures.

Any person may attend the shops daily from 8 to 1, and from 2 to 6, including attendance at all lectures given, for the fee (covering eight weeks in each of four terms) of forty-eight guineas. The minimum fee charged is 3*l.* 3*s.*, which permits of attendance three forenoons or three afternoons for each week during eight weeks of one term, and a larger number of attendances is charged proportionally. A pupil pays for the materials he uses, but there are no other extra charges. He takes away his own work when finished, and in some cases this reimburses him for the greater part of the fee he has paid.

As to the practical work done in the shops, and the order of that practical work, we adapt this to the condition of each pupil. They all begin for a short time on a definite job in the fitting and turning shop to familiarize them with the tools; and, in all cases, from the beginning of their course to the end, they are engaged on real practical jobs, and not on toy work, and have to turn out everything in a thorough workmanlike manner. They work from drawings made by themselves, or similar to others which they have made or are about to make. Some pupils begin by designing, others do not go to designing till they have been some while in the shops;—this depends on their capabilities. We make a point of never copying a drawing; the pupils have to think out at the drawing board the practical application of their theoretical knowledge. As we do a good deal of work for the University and for others, there is always plenty of opportunity for the pupils to make designs, and we apportion that work among them in the way we find to be most educational. In fact the place is an engineering workshop, where the work is arranged and distributed with a view to give the pupils every facility for learning. To prevent our falling into the danger of omitting the economic aspect of our work, we lay it down as a principle that the shops must clear their own way; and they do so, paying five per cent. on the capital, and 10 per cent. to provide for deterioration on the machinery. As we have a regular system of book-keeping, which the pupils, I should mention, have the opportunity of learning in detail, we are able to keep the economic aspect always in view. What in another shop would be profit is with us practically absorbed in education.

The sort of work we do in the shops will be evident from the list of the principal jobs at this moment in hand.

1. Plans for a larger foundry with core-stove and furnace for malleable cast iron.
2. Shaping machine, 12" stroke 5' bed.
3. Circular saw bench, with rising table 3' by 2'.
4. Double geared fixed headstock for a 5" centre lathe.
5. Three lathes with 5' and 6' centres.
6. Pattern makers' lathe with 9" centres.
7. Pair of small horizontal engines, 3" diameter of cylinder, 6" stroke, to drive a dynamo machine.
8. Siemens' dynamo machine to absorb five horse-power.
9. Large gun-metal heliostat driven by worm-wheel gearing.
10. Four-jawed chuck 3' diameter.

For all these the designs, patterns, and castings have been made or are being made in the shops.

We have also an instrument-making department, chiefly for electrical work, such as galvanometer making. And we have a carpentry and cabinet-making department, and some of our pupils, especially a few who intend to emigrate, learn general carpentering.

There are at present about 40 pupils, the greater number of whom are intending to enter the engineering or allied professions. A great deal of time would be saved if they knew mathematics, including trigonometry,

Appendix 32a.

Letter from  
Professor Stuart  
on Engineering  
Instruction at  
Cambridge.

Appendix 32a.

Letter from  
Professor Stuart  
on Engineering  
Instruction at  
Cambridge.

and also elementary statics and dynamics, before they came to us, also if they had got some familiarity with the use of tools while at school. I find those who have had that training get on more quickly.

As to the number of hours a pupil actually works in the shops, that is good deal regulated from term to term by the University examinations which he may have to go through and the amount of preparation requires to make for these. From the point of view of my department do not much care whether a pupil goes in for a degree or not, but general the reading for a degree gives definiteness to his work. I do not however, confine the workshop at present to those reading for a degree. A good many pupils attend the workshops for three or four forenoons afternoons per week, each attendance generally being from three to five hours, and increase this in those terms when there are no University examinations, and then stay for a few terms after taking their degree, attending then during ordinary working hours. The amount of time which would advise a pupil to devote to reading for his degree and to his department respectively, would depend partly on his state of preparation partly on the future line of life he intended to pursue, and partly whether the subject of his degree was one in which he would be more less directly helped by his work with me.

The following is a list of the departments and the principal machines which we have:

- 1st. *Drawing Office.* This is capable of accommodating about 15 pupils at a time, and is fitted up with a large stock of drawing boards and instruments. All work done in the shops is first drawn, and the drawings traced on vellum cloth, and these tracings are sent into the shops for the pupils to work from.
- 2nd. *Machine shop.* This contains a three horse-power gas engine which drives three self-acting screw-cutting lathes with a number of smaller lathes, and drilling, shaping, slotting, and planing machines.
- 3rd. *Erecting shop.* In this shop the fitting and erecting is carried on there are a dozen vices and a cast-iron marking-off table, 6' x 6' for setting out work.
- 4th. *Smithy.* Containing a hearth fitted with water tuyere with power blast, and capable of welding a 4" shaft.
- 5th. *Foundry.* This contains a brass furnace and cupola for iron melt in which all the castings at present used in the shops are made up to 4 cwts. A new foundry is being designed, and will shortly be built, in which castings of upwards of a ton may be made and also a complete plant will be added for the conversion of castings into malleable iron.
- 6th. *Pattern and Carpenters' shop.* Circular saw, morticing machine and eight carpenters' benches, with sets of tools.
- 7th. *Instrument shop.* Containing four foot lathes, four vices, and a large assortment of small tools.
- 8th. *Office and stores.*

There is also a museum containing sectional and other models. I should not like to terminate this letter without saying that, though there may be special opportunities afforded to a pupil to learn, no one need come here with the expectation that there is afforded any royal road to engineering which he can follow without hard work. He must be willing to work hard and conscientiously, and must continually bear in mind that when he leaves he will be judged, and his success as an engineer will be determined, not by where he has been but by what he can do.

I am,

Yours faithfully,  
JAMES STUART.

## APPENDIX 33.

Appendix 33.

Educational  
Work in  
Manchester.

## EDUCATIONAL WORK IN MANCHESTER, LIVERPOOL, and OLDHAM.

(See Vol. I., p. 425.)

## MANCHESTER SCHOOL BOARD.

The following statement as to the working of the Manchester School Board was handed to the Commissioners by Mr. Sutton, the School Inspector and Organizing Master. Manchester School Board Statement.

The Manchester School Board District comprises only the City of Manchester. The attendance at elementary schools within the district has considerably increased since the Board was first formed in 1871, as the following table shows:

Date of Return.	Average Attendance at all Schools in the City.	Average No. present Weekly.	No. on the Books at all the Schools in the City.
Quarter ending December 30, 1881 -	43,486	50,855	58,641
Week " " 2, 1871 -	26,878	30,841	32,240
Increase - - -	16,758	20,014	19,401

In 1871 the average attendance was at the rate of 1 in every 13·17 of the population (351,361).

In 1881 the average attendance was at the rate of 1 in every 7·86 of the population (341,453)

The Board are now conducting 39 schools containing 104 departments, of which 13 schools (48 departments) were built by the Board, 1 school (3 departments) purchased by the Board from the late managers. 23\* schools (26 school buildings, 52 departments) have been transferred to the Board, and 1 school (1 department) is held in temporary premises. (The Board are erecting two additional schools.)

The number of children on the books at the Board schools on July 1st, 1882 was 23,530, of which number 2,009 or 8·5 per cent. had their fees remitted by the Board on account of the poverty of their parents.

The average attendance at the Board schools is best seen by the following table:

Month of	Schools.	Departments.	Average Attendance.
May 1875	5	9	1,151
" " 1876	13	30	3,682
" " 1877	15	33	5,126
" " 1878	25	53	7,974
" " 1879	29	69	10,159
" " 1880	29	72	11,743
" " 1881	38	98	14,899
" " 1882	38	102	16,249

The 13 schools built by the Board have cost 139,653*l.*, which is equal to an expense of 12*l.* 15*s.* 9*d.* per child accommodated, and is much below the cost of school buildings in other towns (see Table in Blue Book).

\* Two departments transferred on July 1st, hence average not included.

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Appendix 33. The following table shows the *per-centage* of children in each standard examined by Her Majesty's Inspector:  
Manchester School Board Statement.

Year.	I.	II.	III.	IV.	V.	VI and VII.	Total.
1876 - -	47	23	16	11	2.5	0.5	100
1877 - -	45	29	15	9	8	1	100
1878 - -	27	31	24	12	5	1	100
1879 - -	32	27	21	14	4	2	100
1880 - -	26	24	22	16	8	4	100
1881 - -	23	23	21	18	10	5	100

So that of all children examined in Standards by Her Majesty's Inspector in all the Manchester Board Schools, 33 per cent. were in the higher standards in 1881 as compared with 14 per cent. in 1876. (This year much higher per-centage is in the higher standards.)

The following table shows the results of the examination by Her Majesty's Inspector in the whole of the Board Schools.

Year.	Per-centage examined of those qualified.	Per-centage of Passes in			Average per-centage.
		Reading.	Writing.	Arithmetic.	
1874 - -	86	84	82	75	81
1875 - -	89	85	78	59	72
1876 - -	90	88	85	78	84
1877 - -	95	89	87	85	87
1878 - -	95	96	94	92	94
1879 - -	96	97	95	98	95
1880 - -	96	95	98	92	96
1881 - -	96	96	94	92	94

During last year (1881) 580 children in attendance at the Board schools were present at every meeting of their respective schools, that is, were not absent one half day during the year.

The Board schools are, as a rule, divided into four departments, viz.:-  
 Infants (children under 7).  
 Junior mixed (children in Standards I and II).  
 Senior Boys (Standard III. and upwards).  
 " Girls ( " " " " ).

Where several schools are close together, the Board are grading their schools. This is best noted in Hulme, where the Board have 7 schools (15 departments), with accommodation for 3,864 children. The schools are graded as follows:-

Infants departments	- - -	-	4
Junior	Standards I and II	-	3
Middle	Boys, Standards III. and IV.	-	3
"	Girls	"	3
Senior	Boys	V. and VI.	1
"	Girls	"	1

The schools are so arranged that the upper school is situated in the centre of the district. The infant schools are so situated that no child has far to go to school. The change is evidently appreciated, for the increased weekly attendance at the whole schools is 35 per cent., and this in a district where there is no building going on, as the land is already all built on.

Appendix 38.  
Manchester  
School Board  
Statement

The Board are just about to arrange for two other sets of schools in the same way.

The Board have a central school (Peter Street School) to which school scholarships are awarded by the Board.

The scholarships are open to children in attendance at all the public elementary schools in the city. The Board have at present:—

24 children at the school holding elementary school scholarships (annual value for one year of 10*l.*)

10 children holding science and art scholarships of the annual value of 15*l.*

At the examination this year for the award of the 24 elementary school scholarships, no fewer than 212 presented themselves for examination. The examination was conducted by H. E. Oakley, Esq., H.M. Senior Inspector of Schools.

At the Peter Street School the Board have fitted up a laboratory, and have special instruction in science given to boys and girls who have passed Standard VI. (For further remarks on the Peter Street School, see special account of the school).

In addition to scholarships the Board award, at various periods, exhibitions of the annual value of 25*l.* for three years. These exhibitions are tenable at any place of higher instruction approved by the Board. These exhibitions have hitherto been held at the Grammar School and the Girls High School.

This year at the examination the exhibitions were awarded to three girls and one boy. The age of candidates for exhibition is limited:—

Boys, 11 to 13.  
Girls, 11 to 14.

The fees at the various Board schools vary according to the locality.

The general fee is—

Infants, 2*s.* per week.  
Junior departments, 3*s.* a week.  
Senior " " 4*s.* a week.

At schools in good localities the fee is 9*d.* per week.

No child is allowed to attend a Board school without fee, unless an order for remission of fee from the Board, has been received by the teacher.

The Board have penny banks at 63 departments, and have on an average 2,500 transactions at them weekly.

*Evening Schools.*

In addition to the day schools, the Board each winter conduct elementary evening schools for providing instruction in reading, writing, and arithmetic, for such persons as had not the opportunity of learning when young.

This last year, 1881-82, the Board opened 19 such schools (32 separate departments), and in the second week no less than 2,690 pupils were present.

The schools meet on three evenings per week, for two hours.

In 1878-1879 37 per cent. of the pupils in attendance were in the Upper Standards.

„ 1880 70 per cent. were examined by H.M. Inspector in the Upper Standards.

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Appendix 88. In addition to the above the Board have also Science and Art and other classes as follows:—

Manchester School Board Statement.	Science and Art classes	No. of classes.
	French classes	14
	German "	5
	Latin "	2
	Spanish "	2
	Shorthand "	5
	Singing "	6

The number of pupils at the above classes for the winter season 1881-1882 is best shown by the following Table:

TOTAL NUMBER OF PUPILS attending the SCIENCE AND ART CLASSES conducted by the Board, 1881-1882.

No. of Subject.	Subject.	No. of Pupils.
I.	Geometry	118
II.	Machine construction	87
III.	Building construction	61
V.	Mathematics	640
VI.	Mechanics—Theoretical	17
VII.	" Applied	37
VIII.	Acoustics	473
IX.	Magnetism and electricity	589
X.	Chemistry (inorganic)	509
Xp.	" " practical	189
XI.	" " organic	83
XIp.	" " practical	14
XIV.	Physiology	384
XV.	Botany	47
XVI. and XVII.	Biology	10
XXII.	Steam	20
XXIII.	Physiography	81
XXIV.	Agriculture	25
	Drawing, 2nd grade	392
	" 3rd "	87
	" teachers	76
	Total	3,822
	French	229
	German	43
	Latin	29
	Spanish	33
	Shorthand	220
	Singing	254

The School Board rate of the district for the past five years has been 2d. in the s.

JOHN SUTTON.

Progress of Manual Instruction in Manchester Schools.

REPORT ON THE PROGRESS OF MANUAL INSTRUCTION in the MANCHESTER BOARD SCHOOLS.

The Board have arranged to give instruction in the use of tools in two schools.

Lancasterian Board School.  
Sharp Street Board School.

For this purpose tools, &c. have been purchased to the following amounts:—

	£	s.	d.
Benches	22	0	0
Set of tools	22	16	4
Lathes	24	0	0
	68	16	4

Manchester  
Board School,  
Manual  
Instruction.

Two boys work at each bench. The boys in Standard IV. and upwards work 1½ hours each per week. A lesson on timber and tools is given once a week to the boys, who work collectively. The cost of timber for the past three months has been about 2£.

A joiner, in the employ of the Board, superintends the boys at work, and a special teacher gives the lesson.

The work takes place at the latter part of each day, and takes a portion of the ordinary school time.

The boys like the work very much, and the parents appear to be interested. Cases have occurred in which boys have brought special wood to make special things for home.

The Board have also sent 140l. to Paris for the special purchase of models for the machine construction classes, and accepted a special tender for models to be made for the classes in building construction last winter.

It is proposed in September next to commence all the art classes conducted by the Board, and those in machine construction, on the plan of those in Paris.

A new art room is in process of erection at the Deansgate School, and this will, *I believe*, be fitted up on the model of the Parisian art schools.

The School Board, at the Science and Art Examinations now being conducted, have applied for 3,073 papers in art and science for the use of the pupils of their various classes in the town. I may also add, that in the estimates of the expenditure for the year 1883-1884 an amount was specially put down for manual instruction.

In practical chemistry the Board have 271 pupils sitting in May.

May 1883.

JOHN SURTON.

#### LLOYD STREET BOARD SCHOOL.

Lloyd Street  
Board School.

This school is attended almost entirely by the children of the operative classes from a poor neighbourhood, but the classes are arranged exactly the same as in the Ducie Street School (described hereafter), and, in fact, in all the Manchester Board Schools.

#### (1) Boys' School.

Boys' school.

On a register of 397, from 25 to 30 are half timers, who are taught along with the full timers, some attending in the morning, and some in the afternoon. They only receive half tuition in a course arranged for full timers, and have to keep up with the rest as best they can. It appears that the half timers are not very seriously behind the full timers in passes, which may be partly accounted for by their greater regularity of attendance, and by the desire of parents to get them forward to the Fourth Standard by the time they reach the age of 13, so that they may then leave school altogether and become full time factory workers. It was not explained to what extent the half timers drag down the general efficiency of the school, but something may be said on this score when the very low standard of the school is considered.

Out of the whole number there are but two boys in the Sixth Standard. At the examination there were 35 in the Fifth, but only two of these had

Appendix 38. remained, as the others had reached the age beyond which compulsion was no longer applicable. There are 80 boys in the school whose fees are remitted in consequence of the poverty of their parents. It was stated by Dr. Watts, who is a member of the Board, that 9 per cent. of the entire pupils attending Board Schools have their fees remitted.

Manchester Board School, Lloyd Street.

One hour per week is given to drawing in the Fifth and Sixth Standards, including geometrical and a little freehand. At the last examination 15 passed out of 70.

Girls' school.

(2) *Girls' School.*

Out of 262 scholars 55 have their fees remitted. There are 25 girls in the Fifth and one in the Sixth Standard.

Juniors' school.

(3) *Juniors' School.*

Standards I. and II.

There are 302 children in the school, of whom the fees of 117 are remitted. The poverty of the children may be ascertained from the fact that last winter it was found necessary to present them with free breakfasts, consisting of bread and coffee, and these cost less than one halfpenny per head.

Infants' school.

(4) *Infants' School.*

There are 220 on the registers, with an average attendance of 180, of whom 50 have their fees remitted.

Ages from three to seven. Inspected lesson on form in which blocks of wood are used. There are similar lessons given on colour.

Armitage Street.

ARMITAGE STREET BOARD SCHOOL.

This school has been open five years, and is one of the largest in Manchester, containing about 1,500 scholars.

There are five departments.

- (1) Infants' school.
- (2) Lower juniors' school.
- (3) Juniors' school.
- (4) Boys' "
- (5) Girls' "

All the boys in the higher standards learn drawing.

Among the girls 14 are in Standard VI. from a total of 390, and 12 have their fees remitted. A marked improvement has been shown during the last few years in the passes, a much larger proportion being presented in the higher standards at an earlier age than formerly.

In the first year of this school, when 106 were presented, 80 were in the First Standard.

Art night classes. Mr. Blacker, Art master in the Board schools, exhibited to the Commissioners drawings done in the adult night classes.

In reply to the chairman, Mr. Blacker stated, that the time required for an elementary student, beginning with freehand drawing, to get to drawing from the model or cast varies very much with the different students. Some will take two or three years, some only one session. Dyes outlines are principally used. These are employed in the form of large charts and worked at by a whole class at once. They are found to learn much more quickly in this way, and measurement is prevented.



## ST. MARY'S CHURCH OF ENGLAND SCHOOL.

Appendix 88.

This is a large denominational school, the master of which is Mr. Williams.

There are 500 names on the books, and in actual attendance on this particular afternoon there were 446. The master is aided by four pupil teachers and four assistant masters, of whom one is certificated.

A number of the scholars are extra sixths, and above half are above Standard III.

The scholars are taught mathematics, one language, and animal physiology. The work is for the special Whitehall subjects, and not for the Science and Art Department.

In answer to the chairman, Mr. Williams said: Many of the boys get scholarships at the grammar school, and others pass forward to the grammar school and pay the fees. The class-room system is preferable to teaching in general school. In a class-room, one assistant-master can take 60 to 80 boys. In a separate room the master can manage many more boys than in open school, and better results also are obtained by the class-room system. A model school building would consist of a large central room and class rooms off it, so that all could assemble for special occasions. Drawing is taught—one class on Wednesday and one on Thursday; chiefly from copies, and entirely freehand. But to do real good, drawing ought to be taken as a special subject. Now, we only get the Science and Art Department grant. If it were to be in all schools as a specific subject, it could be taught successfully, and more time and attention given to it. But now it is looked upon merely as something extra. Drawing could be begun in the Second Standard. At present drawing is often worked up before examination day, and then neglected for the rest of the year. As a matter of paying, teaching drawing in connection with South Kensington in elementary schools is not worth much. The grant varies from 12l. to 20l. in my own school. The average time given to specific subjects is (in the principal classes) six to eight hours per week. In this neighbourhood we have to teach several subjects which would not be taken account of by the authorities. Two specific subjects are allowed for under the code, whilst we have to teach three or four. The neighbourhood is rather a high class one; the parents are clerks and men of fairly high position. There is religious teaching in the morning. Quite half (almost two-thirds) of the scholars are the children of dissenters. There has not been one application for exemption this year.

Manchester  
Denominational  
Schools.  
St. Mary's School,  
Ruims.

Scholarships.

Specific subjects  
under Code.Religious teach-  
ing.

## ST. MARGARET'S, WHALLEY RANGE, CHURCH SCHOOLS.

*Infant School.*

This school was visited just after examination, and 100 of the best children had been taken away and gone to higher schools.

The schoolroom was new, well lighted, and clean; and the children very tidy, and evidently well taught.

St. Margaret's  
School, Whalley  
Range,  
Infants.

*Girls' School.*

There were about 200 girls in this school, and the fees paid are as follows:—

Second Standard, 6s. 6d. per quarter.

Third to Fourth Standard, 8s. 6d. per quarter.

Fifth to Seventh " 10s. 6d. "

The teacher is assisted by two assistant and two pupil teachers. Twenty-five of the girls are in Standard VII and from this school 40 to 50 went in for literature in the Upper Standard.

Girls.

*Boys' School.*

Strong points in the teaching here are: physical geography, physiology, and tonic sol-fa. The ordinary notation is not attempted.

Boys' school.

Appendix 88. — St. Margaret's School, Whalley Ramsay. Geography. Drawing.	A class in geography (Standard VI.) was inspected, and the boys were questioned on the river system of India, and answered well. Physical questions were also well answered. The teaching is oral; but reading books, containing similar information are used. Object lessons are not used. Drawings examined, both from the flat and from model, and considered fair average work, even when compared with continental schools. About one-third of the drawing is model drawing.
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Manchester  
Board School,  
Ducie Avenue.

#### DUCE AVENUE BOARD SCHOOL.

This is one of the newest and most carefully arranged of the Manchester Board Schools, with accommodation for about 900 children in four departments, (1) infants, (2) juniors, (3) upper boys, (4) upper girls. The complete buildings cost about 8,000*l.*, and with playgrounds, &c., about 10,000*l.* It averages from 8*l.* to 9*l.* per head for buildings, fittings, and furniture.

The school is built on the wide system, with a large open room and two class rooms for each department. The desks are arranged lengthways down the sides of the large room, in four groups of three deep, thus forming four classes on each side, a total of eight for the room. The centre of the room lengthways is kept clear of furniture (excepting moveable black boards) so that the teachers can draw out their classes into the open space when desirable. In front of each set of desks there is a long locker for books and other school material.

The school is situated in a neighbourhood of better class houses; the fees are high for all the departments; the children are well dressed, tidy, and thoroughly disciplined. In all respects the school seemed to be well conducted, and the exercise books, the answers to the questions put to the scholars, and many other evidences of efficiency impressed the Commissioners very favourably.

Girls' school.

#### (1) *Girls' School.*

There is one principal teacher, one assistant, 4 pupil teachers, and 2 monitors.

There are 230 names on the books, and about 200 scholars were in actual attendance on the occasion of this visit.

90 of the girls are in Standard VI. and VII. In the Third Standard the girls are about 8. Out of 43 only 20 were above 9. The oldest girls are 16, but very few are above 14.

The Commissioners inspected the girls drill and dumb-bell (1½ lbs. each) exercises, which were performed to music.

In this school there is a girl only 9 years of age who is in Standard VI., and there are several of 8 and 9 years of age in Standard IV.

The Commissioners inspected specimens of freehand and model drawing, and heard French reading lesson, the pronunciation being very good.

Boys' school.

#### *Boys' School.*

This department includes boys over 9 and such under 9 as are more advanced, and they pay 9*d.* per week. The lower forms pay 6*d.* and the infants 4*d.* per week. The scholars provide themselves with books.

Teachers in this and other schools expressed regret that there were not more class rooms.

Juniors' school.

#### *Juniors' School.*

Boys and girls in First and Second Standards. These have the dumb-bell (1 lb.) exercises like the others.

All Standards I. and II., taught by female teachers in the board schools. The mixed school not carried beyond Standard II. Thus a large number of female teachers are employed in the board schools.

There were good natural history diagrams on the wall, of German manufacture and with French inscriptions. This, however, is not of material disadvantage, as the teachers give the descriptions. They cost 4s. 6d. each, with 33 per cent. off.

There are 3 classes in each standard throughout all the subjects.

Appendix 33.

Manchester  
School Board,  
Ducie Avenue.

*Infants' School.*

Infants' school.

Infants can read lessons containing some words of 2 syllables, and add up numbers which in the total do not exceed 20.

The children pass from the infant school before 7 years of age.

## PETER ST. HIGHER GRADE BOARD SCHOOLS.

Manchester  
School Board,  
Central School.

Mr. James Scotson, the Head Master, submitted the following statement concerning the Schools to the Commission.

These Schools under the name of the Manchester New Jerusalem Schools, were established in the year 1827, for the purpose of bringing a sound elementary education within the reach of the poor of Manchester. The fees, at first, were small, amounting on the average to 4d. per week, and all books and necessary stationery were supplied to the scholars free of charge. At that early time, the education of the people received very little sympathy or attention from the religious denominations, and the public generally were disposed to regard it as rather a dangerous undertaking; yet in the midst of this general feeling of indifference and of considerable opposition, the influence of these schools soon began to make itself felt, and in a very short time they were acknowledged to be among the best of the elementary schools of Manchester. The numbers attending were limited only by the accommodation. At the outset there were but two small rooms, and in these there was an average attendance of 250. Twenty-two years passed before any aid was received from the Government, but in the year 1848 the schools were placed under inspection, and the first grant was received in 1849. The subjects of instruction at this time were those generally taught in purely elementary schools, and no attempt was made at teaching higher or scientific subjects. The money obtained from the Government grant enabled the managers to improve the methods and enlarge the basis of the education given, and so great was the success resulting from these endeavours, that it was found necessary to extend the premises devoted to the schools. In the year 1857 about 2,000l. was raised by the Swedenborgian Society, to whom the building belonged; this was expended in building two large commodious rooms in addition to those formerly used, and the career of the schools has since been one of uninterrupted success. The average attendance, which from 1827 to 1849 was about 250 boys, now advanced to 450, and a girls' school was also established with an average of more than 200. The character of the studies now began gradually to rise, the school curriculum was extended, and higher subjects taught. The teaching became so successful, and the numbers in the higher standards increased so rapidly, that the managers found it necessary to close the infant department, to make room for boys and girls in the higher standards. The gradual increase of the numbers in these standards went on, until, in the first place there was no Standard I., next year no Standard II.; and now boys are not admitted unless they have passed Standard IV., or are able to pass an equally difficult examination. The position thus gradually assumed by these schools led to their being regarded more and more as a kind of higher elementary school, and a large number of boys remained at school after passing Standard VI. The Science and Art Department in South Kensington make grants for instruction in Science, and boys and girls who have passed Standard VI. may be engaged in studying various science subjects during the ordinary school hours. The managers were thus enabled to introduce science teaching as part of the general

Appendix 38.  
 Manchester  
 School Board,  
 Central School.

work of the schools. In February 1880, the schools were handed over by the managers to the Manchester School Board, and were adopted by them as their higher grade school. One of the rooms was fitted up for science teaching, a good laboratory for 24 scholars was made, and a master engaged to devote the whole of his time to teaching science to boys who had passed Standard VI. The schools would not now, under these arrangements, accommodate more than 320 boys and 150 girls. At present they are full, and out of the 320 boys, over 200 have passed Standard VI, and are taught during the day, mathematics, physiology, chemistry (practical and theoretical), sound, light, and heat, magnetism and electricity, physical geography, and mechanics. French is taught throughout the school. The pupils are examined in physical geography, mechanics, and French by the Government inspector of schools, and in the other science subjects by the Science and Art Department at South Kensington. During the past year the following classes have been formed, and the pupils were examined May 1882:—

Mathematics, Stage II.	-	-	-	-	-	25
" " I.	A.	-	-	-	-	30
	B.	-	-	-	-	50
	C.	-	-	-	-	45
Physiology, elementary stage	-	-	-	-	-	50
" advanced stage	-	-	-	-	-	20
Chemistry, Practical, class A., advanced	-	-	-	-	-	20
" " " A., elementary	-	-	-	-	-	30
" " " B. "	-	-	-	-	-	50
" " " C. "	-	-	-	-	-	50
" Theoretical, class A., advanced	-	-	-	-	-	20
" " " A., elementary	-	-	-	-	-	30
" " " B. "	-	-	-	-	-	50
" " " C. "	-	-	-	-	-	50
Sound, light, and heat, class A., advanced	-	-	-	-	-	20
" " " A., elementary	-	-	-	-	-	30
" " " B. "	-	-	-	-	-	50
" " " C. "	-	-	-	-	-	50
Magnetism and electricity, class A., advanced	-	-	-	-	-	20
" " " A., elementary	-	-	-	-	-	30
" " " B. "	-	-	-	-	-	50
" " " C. "	-	-	-	-	-	50

The following are the results of the examination held by the Science and Art Department in May 1881:—

	1st Class.	2nd Class.
Mathematics	8	19
Physiology	11	42
Practical Inorganic Chemistry	17	49
Theoretical Inorganic Chemistry	15	44
Magnetism and Electricity	8	60
Acoustics, Light, and Heat	19	38
First Grade Freehand Drawing	11	43
" Geometrical Drawing	8	20
" Model Drawing	0	10
Second Grade Freehand Drawing	0	14
" Geometrical Drawing	2	25
" Model Drawing	0	2

The following time table, for the scholars who remain at school after passing Standard VI., shows the number of hours devoted to each subject from October 1st to the middle of May.

The school is open in the morning from 9 o'clock to 12 o'clock, and in the afternoon from 2 o'clock to 5 o'clock. The first half-hour each day is occupied with religious exercises and scripture history.

Appendix 33.  
Manchester School Board, Central School.

		Each Week.			Each Week.
1	Scripture - - -	2½ hrs.	9	French - - -	3 hrs.
2	Practical Chemistry -	1½ "	10	Geography - - -	2 "
3	Theoretical Chemistry -	1 hr.	11	Arithmetic - - -	2 "
4	Magnetism and Electricity.	1 "	12	Physical Geography -	2 "
5	Acoustics, Light, &c. -	1 "	13	Mechanics - - -	2 "
6	Physiology - - -	1½ hrs.	14	Drawing - - -	3 "
7	Mathematics - - -	3 "	15	Preparation - - -	2½ "
8	Grammar and Composition.	2 "			

The home lessons of the scholars include general and scientific subjects. Rough notes are taken at each science lecture, and these are carefully re-written at home. This home-work will take on the average one hour each night for four nights in the week, besides the half hour each day mentioned in the above table under the head of preparation.

TIME TABLE for the SCHOLARS who remain at SCHOOL after passing STANDARD VI. in use from the middle of May to October 1st.

Day.	Class.	9 to 9.30.	9.30 to 10.	10 to 11.	11 to 12.	2 to 2.10.	2.10 to 3.	3 to 4.	4 to 4.30.
Monday.	1	Open school. Singing, Prayer, Psalms, and Scripture History.	French	Arith.	Gram.	Open school. Register called and closed.	Mech.	French	Preparation.
	2		French	Math.	Mech.		Phy. Geog.	French	
	3		French	Phy. Geo.	Arith.		Gram.	French	
Tuesday.	1		Etyymology	Geog.	Math.		Phy. Geo.	French	Preparation.
	2		Geography	Mech.	Compos.		Reading	French	
	3		French	Mech.	Gram.		Phy. Geo.	Reading	
Wednesday.	1		French	Mech.	Gram.		Reading	French	Preparation.
	2		French	Gram.	Mech.		Phy. Geo.	French	
	3		Geography	Math.	Mech.		French	Phy. Geo.	
Thursday.	1	Drawing or Etyymology	Comp.	Arith.	Open school. Register called and closed.	Phy. Geo.	French	Preparation.	
	2	Grammar	Math.	Phy. Geog.		Mech.	French		
	3	Etyymology	Math.	Mech.		French	Geog.		
Friday.	1	Geography	Comp.	Math.	Open school. Register called and closed.	Examination or Mech.	French	Preparation.	
	2	French	Phy. Geog.	Math.		French	Arith.		
	3	French	Math.	Comp.		Gram.	French		

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TIME-TABLE for the SCHOLARS in STANDARDS V. and VI. in use all the year.

Appendix 33.  
Manchester  
School Board,  
Central School.

Day.	Class.	8 to 10.		10 to 11.	11 to 12.	2 to 2.10.	2.10 to 3.15.	3.15 to 4.15.	4.15 to 4.30.				
Monday.	4	Open School.—Singing, Prayer, Psalter, and Scripture History. Registers closed.		Arithmetic	French	Open School.—Registers called and finally closed.		Geography	Writing				
	5			Arithmetic	Geography			French	Writing				
	6			Arithmetic	Read. French			Writing	Geography				
	7			Writing	Arithmetic			Geography	French				
Tuesday.	4	Open School.—Singing, Prayer, Psalter, and Scripture History. Registers closed.		Arithmetic	Writing	Open School.—Registers called and finally closed.		French	Phy. Geog.				
	5			Arithmetic	Grammar			French	Pattern Exam.				
	6			Arithmetic	Reading			Writing	Grammar				
	7			Writing	Arithmetic			Grammar	French & Read.				
Wednesday.	4	Open School.—Singing, Prayer, Psalter, and Scripture History. Registers closed.		Arithmetic	Geography	Open School.—Registers called and finally closed.		Writing	French				
	5			Reading	Geography			French	Composition				
	6			Arithmetic	French & Read.			Writing	Geography				
	7			Composition	Arithmetic			Geography	French & Read.				
Thursday.	4	Open School.—Singing, Prayer, Psalter, and Scripture History. Registers closed.		Drawing or		Open School.—Registers called and finally closed.		Reading	Grammar				
	5			Arithmetic	French					French	Writing		
	6			Reading	Grammar							Grammar	French
	7			Arithmetic	Reading								
7	Writing	Arithmetic											
Friday.	4	Open School.—Singing, Prayer, Psalter, and Scripture History. Registers closed.		Arithmetic	Writing	Open School.—Registers called and finally closed.		Examination or					
	5			Arithmetic	Geography			French	Phy. Geog.				
	6			Arithmetic	Grammar			French	Composition				
	7			Composition	Arithmetic			Arithmetic	Geography	French & Read.			

Home Lessons.

In connection with these schools, the Manchester School Board has established elementary school scholarships, which are open for competition to all the elementary schools in the city, both board and voluntary. Various gentlemen subscribe 5*l.*, and for each subscription of 5*l.* the Science and Art Department at South Kensington, London, give another 5*l.*, provided the successful candidates attend the school regularly for 12 months, and pass in one or more of the science subjects named in the Science Directory. The sum of 10*l.* is given to the parents of the pupils to enable them to pay the school fees, and to keep their children longer at school than they would otherwise be able to do. The scholars who gain scholarships continue their education in these schools, and at the present time there are 16 boys and 7 girls who hold them. There is also another kind of scholarship, called a science and art scholarship, of the annual value of 15*l.* These are competed for by the scholars who during the previous year held a 10*l.* elementary science scholarship, the award being decided by the results of the May examination in science and art.

The following is a copy of a report received from H. E. Oakeley, Esq., H.M. Senior Inspector of Schools, this year (1882).

Peter Street Boys' School.

"This well-known school continues to maintain its reputation for first-rate teaching and organization. The results in the 4th Schedule subjects are excellent."

The Commissioners, in inspecting this school, were impressed by the high character of the teaching, and the enthusiasm which animated both teachers and scholars.

The accommodation was inefficient, several classes being crowded in one room, and the fullest concentration was required to sustain the attention of the scholars to the particular work of their own class. The head master did not consider the system of several classes being taught in one room as a serious waste of power or drawback to the general efficiency of the school, and it was also pointed out by Mr. Hughes that the Board favoured the open school system rather than a general adoption of the class-room system, on the ground that in addition to the open school enabling the head master to take a general surveillance of the work of the whole school, it also promoted a very useful discipline in inculcating a habit of concentration in the children at an early age. At any rate the school clearly illustrated the fact that a number of classes being taught in one room, under separate teachers, is not inconsistent with thorough teaching and very high results at the examinations.

All the boys in the Sixth and Extra Sixth Standards take a number of the science subjects of the Science and Art Department. A class of 20 were engaged in the second stage of mathematics, another in "sound" experimentally illustrated, and a large class in practical chemistry. Professor Roscoe questioned the boys on chemistry and other subjects, and their answers showed evidence of practical knowledge and intelligent training.

The Commissioners inspected the laboratory, which was fairly well appointed. It is extensively used by Mr. Taylor, the teacher of chemistry, for night classes.

Every boy in the school learns drawing under the South Kensington method, and French also is compulsory throughout the school. Singing is taught under the Tonic Sol-fa.

There are 20 scholarships held in the whole school by boys and girls from the primary schools. The method of obtaining these prizes is described in Mr. Scotson's report. It was explained that in nearly every instance the holders of these scholarships would have left school but for them. They do great service in enabling a number of poor boys and girls to continue their education to a higher general standard, and by placing within their reach the advanced education of the grammar school and subsequently of the university. The whole intention of the scholarship scheme is to provide a means whereby the talented boy may climb the educational ladder from the board school to the university without any cost to his parents.

The Commissioners inspected the girls' school held in the upper rooms of the same building, where under the same system as obtains among the boys, a superior elementary education is being given, supplemented by French and needlework.

Some excellent examples of freehand and model drawing were exhibited.

The singing was effectively rendered, as also were recitations by three of the girls from Act I., Scenes II. and III. of Shakespere's "As You Like It."

The Commissioners were informed that new premises for this school, with complete arrangements for secondary and scientific teaching, are about to be erected in Deansgate, one of the leading thoroughfares of Manchester.

MANCHESTER FREE SCHOOL.—STATEMENT BY MR. LEPPOC.

Manchester  
Free School.

The Manchester Free School owes its origin to the National Public School Association, by which body it was commenced in August 1854. It was intended as a model for a system of free schools to be established by law in England and Wales, to be supported by local rates, and to be managed by local committees elected by the ratepayers. The instruction was to be secular, and the inculcation of doctrinal religion was to be left to parents, guardians, and religious teachers, who were to be allowed the use of the schoolrooms at stated times for the purpose of giving this

Appendix 33. doctrinal instruction. For ten years the school continued its work as the "Model Secular School," and it was most completely successful in establishing the practicability of the scheme laid down by the National Public School Association.

Manchester  
Free School.

Of the 20 gentlemen who had advanced the means for establishing the school, only a few remained after it had been carried on under the superintendence of the late Mr. Benjamin Templar (a very successful teacher for 10 years, when the burthen of maintaining it fell upon a very few, and the want of funds in 1864 compelled them to seek Government aid and to modify the character of the school. Its name was changed to that of the "Manchester Free School," and its object was to provide a free education for the children of poor and struggling parents not actually destitute, but whose poverty was but one remove above actual pauperism. A grant in aid of a school was, at that time, conditional upon the daily reading of the scriptures to the scholars, and the committee were obliged to introduce the scriptures into the school. Great care was taken to make a selection of narratives and passages which were as nearly as possible identical in both the authorized and the Douay versions of the Bible, as these were read without note or comment. The passing of the Elementary Education Act released the managers from the obligation to have the scriptures read in the school, and they returned to their strictly neutral secular time-table. Lessons on such subjects, as the Providence of God, obedience to parents, honesty, truthfulness, charity, sobriety, thrift, &c., have, however, been constantly given.

The children attending the school are of a very low social grade, but their attendance is very remarkable, and their attainments, as far as the sixth standard of the education code are not inferior to those of the children attending the best schools in Manchester. The following table gives the particulars of both attendance and attainments:—

Number of boys admitted since August 1854, the date of the commencement of the school	-	-	-	5,189
Number withdrawn during the same period	-	-	-	4,857
Number of boys now in school	-	-	-	331

TABLE I.

## AVERAGE ATTENDANCE.

Year.	Average.	On Books.	Per-centage.
1876	291	out of 302	96.3 per cent.
1877	281	" 291	" 96.5 "
1878	304	" 310	" 98 "
1879	310	" 317	" 97.7 "
1880	326	" 331	" 98.5 "
1881	326.5	" 332	" 98.3 "
1882	329.4	" 336	" 98 "

TABLE II.

## BEST ATTENDANCES.

Year.	Attendances Possible.	Boys Thrice Absent.	Boys Twice Absent.	Boys Once Absent.	Boys Never Absent.
1876	452	12	16	15	51
1877	450	12	12	21	49
1878	462	13	15	26	69
1879	451	7	12	23	92
1880	450	4	18	29	136
1881	446	11	18	26	120
1882	450	10	15	29	130



TABLE III.  
RESULTS OF EXAMINATIONS.

Year.	*Qualified for Examination.	Pre-sented.	PASSES IN			Per-centage of Passes.
			Reading.	Writing.	Arithmetic.	
1876	- 259	235	221	224	203	92
1877	- 241	226	214	215	207	94
1878	- 254	240	237	233	232	97.5
1879	- 248	244	240	240	238	98
1880	- 283	274	271	269	267	98.1
1881	- 298	290	290	286	287	99.1
1882	- 315	299	289	297	298	99.6

Appendix 88.

Manchester  
Free School.

TABLE IV.

Year.	GRANTS EARNED.				per head on average attendance, including infants.
	£	s.	d.	s.	
†1876	-	-	189 13 0	or 13 0½	
1877	-	-	244 6 0	„ 17 4	„ „ „
1878	-	-	263 14 0	„ 17 4	„ „ „
1879	-	-	270 16 0	„ 17 5	„ „ „
1880	-	-	288 19 0	„ 17 8½	„ „ „
1881	-	-	294 2 0	„ 18 0	„ „ „
1882	-	-	298 16 0	„ 17 9½	„ „ „

The last official Report (Mr. H. E. Oakeley's) received from the Education Department is as follows:—

“The results of the Examination in elementary subjects are again excellent. The number of sums given was 1,106 of which 985 were worked correctly. The 299 boys examined made only 109 mistakes in spelling altogether. Grammar and Geography were most satisfactory. Thoroughness of work, intelligence, neatness, and accuracy were conspicuous in all the classes.”

In the blue book just issued by the Educational Department, Mr. Oakeley, Her Majesty's Senior Inspector for the Northern Division, gives a list of the Manchester Schools which have passed the best examinations, and in the list the “Manchester Free School” takes the best mark (E) and ranks in the foremost place. This notice ought not to be concluded without mentioning that the success of this remarkable school and the extraordinary attendance of the scholars (not to be found in any other school in the kingdom) is mainly, if not entirely, due to the present excellent head master, Mr. George E. Mellor, whose attention to his duties is most exemplary.

Much of the management and organization is in the hands of Mr. H. J. Leppoc, to whom the school is much indebted.

Mr. Mellor stated that he was aided by four assistant masters and two assistant mistresses, but that he had no pupil teachers. Few boys stayed at the school after the age of employment, and in the case of the few who did remain they were children of better class parents who knew the value of education. In some cases, however, the boys are kept at school because they are too little to obtain employment. The proportion of boys in the upper standards (4, 5, and 6) is about 32 per cent; in the two upper Standards (5 and 6) about 13 per cent. There are only two boys in the Sixth Standard out of 300. The School Board inspection has been found to be of very considerable service.

\* Children under seven excluded.  
† The grant actually earned was 222.2s. or 15s. 3d. per head; but 221.9s. was deducted under a regulation of the committee of council, a regulation which is now abolished.

## Appendix 33.

## MANCHESTER GRAMMAR SCHOOL.

Manchester  
Grammar School.

The Commissioners were received by Mr. Dill the High Master, who made the following statement:—

The school was founded in 1515 to give free instruction in grammar and the course of study seems to have been exclusively classical till 1844 when, by a scheme framed by the Court of Chancery, provision was made for the teaching of modern languages and science.

Another scheme of the year 1887 permitted, in addition to 250 free scholars, the admission of others at a fee of 12 guineas annually. Since then the total number of boys has risen to 900. Between 1870 and 1890 about 80,000*l.* have been spent in providing additional class-rooms, together with a gymnasium, drawing hall, library, laboratories, and dining room; the new chemical laboratory is arranged to accommodate more than 7 boys. The drawing hall admits of about 180 pupils being taught at one time. The gymnasium is large enough to allow of nearly 200 exercising together. The modern and science sides of the school have been developed within the last 10 years, and are becoming more and more popular with parents. The numbers are now—

Classical side	-	-	-	-	-	450
Modern and science side	-	-	-	-	-	428
Miscellaneous forms	-	-	-	-	-	28
Total	-	-	-	-	-	906

(*Chairman.*) Do you give any science on the classical side?—In some of the forms. We are trying to expand the teaching of science on the classical side, but there is a great difficulty in point of time to deal with all the subjects. My hope is that in the end, every boy on the classical side will have learnt some science before he leaves us. Wherever science is taught on the classical side at present it is obligatory.

What does the modern side mean, as distinct from the science side?—There is a threefold division of the school, classical, modern, and science. On the modern side the basis is French and German, to which are added mathematics, physical science, and English. In the science division of the school, science is the basis; languages, ancient or modern, are accessory. The science teaching is always combined with a training in languages. Boys on this side are usually over 16 years of age, and have been for some time either on the classical or modern side. Boys are not allowed to go on the science side unless they have had a certain discipline in classics or modern languages. This means that a boy will generally have got as high as the remove or fifth form. That is, on the classical side, he will have done some Caesar, Virgil, and Xenophon, or Euripides. In the case of a boy being transferred from the modern side to a science form (which occurs less frequently than from the classical side) the boy will usually have attained the standard of the fifth form, that is he will be tolerably advanced in French and English subjects, and less so in German. (*Professor Roscoe.*) Are classics then taught on the science side?—Yes. A boy in a purely science form must take either an ancient or modern language in the first hour of every day. The remainder of his day will be spent at mathematics, science, and drawing.

(*Chairman.*) What is the arrangement for the teaching of mathematics?—For the purpose of mathematical teaching, five or six forms are thrown together into one section and redistributed into five mathematical forms. That is, there is a separate division of the boys for mathematical teaching.

Do the boys on the modern side learn science before entering the science forms?—A certain amount of science is taught in every form on the modern side. In the lowest forms, of course the teaching is very elementary, the ages of the boys varying from 10 to 13. In these forms such books as Roscoe's primer of chemistry are used.

How much science is a boy on the classical side supposed to have learnt before joining a science form?—Boys have often passed from the classical side to a science form without having had any regular instruction in

science, because on the classical side the teaching of science has not yet been fully organised. But within the last two years, chemistry has been regularly taught in the classical fourths and removes, so as to prepare boys for entering the laboratory.

Appendix 33.

Manchester  
Grammar School.

What mathematics will a boy have done before passing to the science side?—As a rule, three books of Euclid, algebra to the end of quadratic equations, and some trigonometry, an amount perhaps corresponding to the second stage of the South Kensington examinations.

Which preparation is the better of the two for a boy going into the science division, the preparation in science with modern languages or the classical training?—Does not that depend somewhat on the object the boy has before him after leaving school? If he is going to be an engineer or a practical chemist, for instance, I have no doubt that he would be better on the modern side from the beginning. But there are other lines of life and departments of work of a less technical character, for which I should certainly wish him to have more general preparation in literature on the classical side, at any rate up to the age of 16. Of course, if a boy is to be prepared for a university life, it is necessary that he should have the preliminary classical training.

Do you attach much value to the more advanced science training which a boy coming from the modern side has had as compared with a boy coming from the classical side, as a preparation for the work of the science forms?—Our experience here hardly enables us to determine that. In the highest science form, the great majority of the boys, and all the best boys, have had a classical training, and are going to the university. The boys of the modern side who are going to business, seldom stay so long as those intended for academic life. In a few instances, however, of late, boys with a purely modern training are staying with us to the age of 18, and I believe they have shown themselves not inferior in science to the classically trained boys.

The Commissioners were then conducted over the library, and next visited the chemical laboratories and heard, in the lecture-room, a portion of a chemistry lecture delivered by Mr. Francis Jones, the chemistry master.

In reply to the Chairman Mr. Jones stated that in the chemical classes there were several scholars from the elementary schools. They had lost a number recently. Some had gone to the universities, and others had gone into business. These boys compare well with the other scholars. Scholars from the elementary schools had gone to the Universities of Oxford and Cambridge through the grammar school. Three have recently gained university scholarships, and of these two have taken first classes in the final schools. Their parents were in a humble position in life, warehousemen, mechanics, &c.

Mr. Dill informed the Commissioners that the school has entrance scholarships of its own, numbering 40 every year, given 20 each at two entrance examinations. Half of these have to be offered to boys from the elementary schools. As a matter of fact, 15 to 17 out of the 20 are taken by boys out of the elementary schools, and about four from the middle-class schools. Thus, whilst half have to be offered to elementary school candidates, usually three-fourths to four-fifths are really awarded to such.

Mr. Jones stated that in teaching the boys analysis the substances for examination are given out by number, and the students' work is returned on a specially ruled and printed form. The laboratory contains accommodation for 70 students working at one time, but generally only about half that number forms a class. 185 boys at present do practical chemistry. (Chairman.) Have you any boys from the classical side who come to chemistry?—(Mr. Jones.) Yes, a few for one hour per week in elementary chemistry, and in this way those boys not getting on well in classics, but who may give promise of doing well in chemistry, may be selected to join the science side.

In your experience, are boys ever found to turn from the science to the classical side?—No.

Are we to understand that boys, say at 15, who have become utterly dull and stupid under the old classical discipline, when turned over to a new study, get fresh life?—That is so in many cases.

Appendix 33. The Commissioners next proceeded to the physical lecture room, where they heard a portion of a lecture on elementary magnetism by Mr. Angell, and thence to the drawing school, where drawing was being taught under the master, Mr. Pritchard. Drawing from the flat and from cast, and object drawing was going on.

(*Chairman.*) Do all the boys who learn drawing go through mode drawing?—(*Mr. Pritchard.*) Yes. Every boy in the first year will do more or less model drawing.

Is designing also taught?—Yes, and boys with talent in drawing are picked out, and if they wish they may devote special time to designing.

If boys wish to come to any department specially, are they allowed to do so?—Yes, after they have passed through a certain elementary course.

What method is pursued in teaching design?—The boys take simple geometric designs, to be filled with ornamental arrangements of leaves &c., first, and then they are allowed to design for special material.

What special method do you think best in teaching design?—I would like them first to make botanical studies from nature for themselves and then make use of these conventionally.

How many designs were sent up to South Kensington last year for examination?—About 20 or 30.

Are any students professional designers?—Only one.

Can you tell what will be the future of the boys studying design?—I can hardly do so, but some certainly will not become designers.

Have any of your students distinguished themselves specially at the South Kensington examinations?—Several have gained medals and prizes and there is one evening-class student, who is about 17 years old, who got the national gold medal for applied design.

How many students have you in the evening class?—About 100 to 120. The most advanced work is done in the evening class, which largely consists of boys who have left the day school and wish to keep up the subject.

What is the class in life of the students at the evening classes?—Chiefly artisans.

How many in the evening class, then, are qualified to earn Government grant?—A large number; about 90 per cent.

Do the boys attend well?—They make many more attendances than are required for the grant, or they would not get through the necessary work.

Are the mechanical drawings which we see here exhibited from actual measurement from the machine?—Yes, and the shading is also projected geometrically.

Are there any materials for teaching that you find you require that you have not got?—Yes, we require some mechanical models.

Are there boys in the school who can give sections of parts of their drawings of machines?—Several in the evening class can do so.

Do all the boys take up the same course of drawing?—Every boy has to go through freehand, model, and geometric drawing, and the boys must take freehand and model, before taking mechanical, drawing. We make mechanical drawing a speciality. Some instruction is also given in machine construction.

With regard to fine shading, is not perfection of work what they reward at South Kensington?—Yes.

How long have the boys been engaged in the preparation of single drawing from casts?—Some have been occupied a couple of months coming once a week. Some would take perhaps four or five months. But the labour is well spent if the perfection exhibited in some of the drawings is attained. I prefer thoroughness in everything.

Do you think it then better to spend four or five months thus, rather than that they should use a piece of charcoal and execute the work in a few lessons?—I believe that the boys who have learned with the fine point could do the rough work quickly.

But is it not likely that this slow working makes the boys work slowly?—I do not think so, and it must be remembered that the boys do work with the stump also. All the boys begin with the stump.

## MANCHESTER GRAMMAR SCHOOL.—APPENDIX.

Appendix 33.

Manchester  
Grammar School

## SCIENCE and ART EXAMINATIONS.—Results for five years, 1877-1881.

## PRIZES and PASSES in SCIENCE.

Year.	Prizes.	Passes.
1877	311	799
1878	270	632
1879	310	579
1880	328	709
1881	316	720
Total	1,535	3,439

Year.	Third Grade Prizes.	Second Grade "Excellent."	Second Grade Pass.
1877	15	67	204
1878	17	81	302
1879	27	54	286
1880	34	67	313
1881	33	49	261
Total	126	318	1,366

## SOUTH KENSINGTON HONOURS in SCIENCE.

Year.	First.	Second.
1877	2	3
1878	6	3
1879	3	13
1880	7	16
1881	4	18
Total	22	53

## SOUTH KENSINGTON HONOURS in ART.

Year.	Gold Medal.	Silver Medal.	Bronze Medal.	National Prize.
1877	1	—	—	—
1878	—	2	1	1
1879	1	1	1	1
1880	—	1	3	4
1881	—	—	—	2
Total	2	4	5	8

## MANCHESTER HIGH SCHOOL for GIRLS.

High School  
for Girls.

A most excellent institution, accommodating 600 girls, housed in a fine building, with every requisite for the supplying of a superior secondary education.

## Appendix 83.

Manchester  
Mechanics'  
Institution.

## MANCHESTER MECHANICS' INSTITUTION.

The following account of the history of the institution, its present position, and of the proposals for converting it into a technical school was submitted to the Commission by Mr. J. H. Reynolds, Secretary to the Institution.

The Manchester Mechanics' Institution was established in 1824, and is formed," so runs the preamble, "for the purpose of enabling mechanics and artisans, of whatever trade they may be, to become acquainted with such branches of science as are of practical application in the exercise of that trade, that they may possess a more thorough knowledge of their business, acquire a greater degree of skill in the practice of it, and be qualified to make improvements and even new inventions in the arts which they respectively profess."

It was proposed to accomplish this by means of lectures on the various sciences and their application to the arts; and when the principles of the more important sciences had been made known, to give more minute and detailed instruction upon particular branches of art.

In accordance with this scheme, connected courses of lectures on scientific subjects, especially in mechanics and chemistry, were organised and it was in contemplation to establish a school of design in addition to the drawing classes, in which weavers and other workmen might have an opportunity of improving their taste in the invention of patterns and the means of executing them in their respective manufactures.

The average annual number of students, day and evening, in connection with the institution since its foundation has been upwards of 1,400.

The classes in mechanical and architectural drawing have always been a very strong feature in the educational work of the Institution.

Day schools were established in the Institution on the plan of the Edinburgh Seasonal Schools, as well as evening classes in languages, music, &c., and in elementary subjects. In December 1837 was organised the first of a series of exhibitions of objects illustrative of *science, art, manufactures, and natural history*. During the thirty-five days that the first of these was open, upwards of 50,000 persons attended, and the great success of the experiment, continued through a series of years, greatly assisted the movement which culminated in the Great Exhibition of 1851.

The exigencies of these exhibitions, and the adoption of the Edinburgh Seasonal School system by other institutions in the town, led to the abandonment of the day classes in 1838.

In 1845 day classes for the higher education of females were established, and have continued until the present time; and in 1857 day classes for boys were re-commenced, in which systematic instruction in the principles of natural science under Mr. John Angell (now Science Teacher at the Manchester Grammar School) formed a most important feature.

The reports of the Institution from its foundation bear constant evidence to the desire of its promoters to devote it to the inculcation of science in its application to the arts, and not the least of the difficulties which have prevented the fulfilment of this aim satisfactorily has been the want of even a moderate amount of elementary knowledge on the part of many of the artisan students attending the institution.

The extension of the Society of Arts' scheme of Examinations to the Provinces in 1857, and the establishment of the Government science and art examinations in 1861, assisted by the payment on results which shortly accompanied the latter examinations, powerfully influenced the formation and organisation of classes in the Institution in subjects of science and art.

The growing desire for what is termed *technical knowledge*, and the stimulus afforded by the establishment of the examinations of the City and Guilds of London Institute for the advancement of technical education,

with its accompanying offer to pay upon results, led to the formation in 1880 of classes in special subjects of technology, namely:—

Mechanical Engineering	with 34 students.	Manchester Mechanics' Institution.
Iron and steel	" 9 "	
Telegraphy	" 74 "	
Fuel	" 5 "	
Cotton manufacture	" 39 "	
Carriage building	" 73 "	
Bleaching, dyeing, and printing,	58 "	
	292	

With the view of providing efficiently for sound practical instruction in bleaching, dyeing, and calico-printing, the directors, aided by the valuable co-operation of Mr. Charles O'Neill, F.I.C., provided a specially constructed laboratory at a cost of upwards of 350*l.* and accommodating thirty-six students. In connection therewith a small museum containing the contributions of various English and foreign firms has been formed.

Though a large number of circulars were issued to various firms interested in these industries asking for co-operation and pecuniary support, the response was extremely meagre, only some 70*l.* being promised.

It is important to mention that the master carriage builders, from the firm conviction that the great want of their young workmen was a knowledge of scientific principles as applied to their particular trade, formed themselves into a committee, subscribed funds, and engaged and paid teachers to conduct classes in the Institution in connection with coach-building, and generally evinced the heartiest interest in the educational welfare of their employes.

The success, however, of the technical classes has been greatly hindered by want of money for proper equipment, the ordinary resources of the institution being quite inadequate to their efficient establishment and maintenance.

Sufficient evidence has, however, already been given that, provided these classes are thoroughly well equipped and organised, there is no question of their value and success.

At Christmas 1881 the numbers in attendance at the technical classes were as follows:—

Mechanical engineering	-	-	-	28
Iron and steel	-	-	-	18
Telegraphy	-	-	-	15
Cotton manufacture	-	-	-	47
Carriage building	-	-	-	34
Technical joinery	-	-	-	10
Bleaching, dyeing, and printing	-	-	-	53
Modelling	-	-	-	2
Design for calico printing	-	-	-	5

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Since that date some of these classes have increased, and the falling off in the telegraphy class, which numbered 74 in the previous session, and consisted chiefly of employes from the Head Telegraph Office, York Street, is to be attributed to merely temporary causes.

In addition to these there were in the evening science classes 578 students, and in the evening art classes 103, making a total of 893. Besides the laboratory of the school of dyeing, there is also a fairly equipped laboratory for the practical study of pure chemistry, accommodating 40 students.

The fees charged to students are in all cases very low. The membership fee of 5*s.* per quarter admits to a large number of elementary classes, held on four nights of the week, of two hours each, and to the library and news room. The extra fees for instruction in science average 1*s.* for each class per session of eight months, and for those in technology 2*s.* In no case are the fees adequate to the cost of maintaining the classes. The teachers are generally paid upon the results of the science examinations; in some

Appendix 33.  
 ———  
 Manchester  
 Mechanics'  
 Institution.

cases, however, the directors pay a sum varying from 8*l.* to 40*l.* per annum in addition to the grant or a portion of it. The fees in the language classes vary from 2*s.* 6*d.* to 5*s.* per quarter, and the teachers are usually paid fixed sums for tuition. Under ordinary circumstances, and without any attempt to develop the classes or add to the efficiency of the teaching by means of apparatus and models, or by extending the time given, the income of the institution, with the aid of the surplus from the day school and from honorary subscriptions and other extraneous sources, might suffice to meet its ordinary expenditure. The annual income of the institution averages upwards of 3,000*l.*

It is found that in order to get satisfactory teaching in technological subjects exceptional payments must be paid.

With the view of utilising the institution exclusively for the purposes of a technical school, the directors have under consideration a scheme embodying the following features:—

1. (a) A school of applied science, with especial reference to mechanical engineering, building construction, bleaching, dyeing, and printing, cotton manufacture, telegraphy, carriage building, &c.
- (b) A school of art and design as applied to house decoration, furniture, printed goods, &c.
- (c) A school of commerce.
2. A technical library and museum.
3. A new governing body, which shall comprise—
  - (a) Ex-officio members representing certain public bodies, such as the Owens College, the Town Council, the School Board.
  - (b) Nominated members representing certain subscribing public bodies.
  - (c) Representative members elected by annual subscribers and students of a certain standing.

It is proposed to organise the evening school with especial regard to artisan students. Rooms will be arranged and expressly fitted for technical drawing. In addition to the present laboratories for the study of pure chemistry and of chemistry as applied to bleaching, &c., one for the practical study of metallurgy will be fitted up.

With the object of giving draughtsmen and others an opportunity of closer and more practical acquaintance with mechanical details, provision will be made in connection with mechanical engineering for the practical study of pattern making, moulding, founding machine and smithy work, and so with building construction in its departments of joinery, brick-laying, plumbing, &c.

The department of textile fabrics will embrace instruction in the theory of spinning and weaving and of pattern designing as applied to figured cottons, &c. A room will be furnished with looms and a large designing board, whereby the students may obtain practical acquaintance with the construction of the loom and the methods of working, and of the application of the designs to the special fabrics.

It is proposed to give greater significance to the department of electrical engineering so far as concerns the needs of telegraphic and telephonic employes.

It is intended to extend the art room so as to give special facilities, under competent teachers and with a fuller supply of models and apparatus, for acquiring a knowledge of design as applied to printed goods, house decoration, stone and wood carving, furniture, and modelling.

The needs of so important a class of subjects as commercial studies will be met by the further development of the classes in the French, German, and Spanish languages, book-keeping, shorthand, commercial history and geography, commercial arithmetic and correspondence, and in social and political economy.

The establishment of a technical museum comprising natural products, processes of manufacture, designs, models of machines, tools, examples of fracture, corrosive action, and of a technical library available for constant reference, are also contemplated.

It is proposed to modify the organisation of the boys' school as follows:

1. A lower school having two divisions:

(a.) A primary school for boys from 8 to 11 years of age, in which will be given courses of instruction in English, freehand drawing,



vocal music, elementary science, and the French language for all those who have mastered the rudiments of English. Appendix 88.

- (b.) A secondary school for boys from 11 to 13, in which in addition to the subjects taught in the primary school, there will be taught Latin, French or German, mathematics, model and geometrical drawing, natural philosophy, elementary chemistry, physiology, and botany. Manchester Mechanics' Institution.

An upper school for boys from 13 years of age upwards, comprising—

- (a.) A commercial school in which, in addition to the ordinary subjects of instruction, there will be given special tuition in English and foreign commercial correspondence, commercial geography and history, commercial calculations, book-keeping, shorthand, social and political economy.
- (b.) A technical school in which will be given special courses of instruction in such subjects as machine construction, applied mechanics, steam, mechanical engineering, iron and steel, building construction, workshop practice, inorganic and organic chemistry, chemistry of dyeing, &c., cotton manufacture.

Plans have been prepared showing how the various rooms may be utilised in connexion with the scheme.

Mr. CHARLES O'NEILL, the teacher in bleaching, dyeing, and calico-printing, submitted the following observations with respect to the last year's working of these classes established at the Manchester Mechanics' Institution. Mr. O'Neill's Statement.

The teaching consisted, for the evening classes, of one lecture per week, illustrated by experiments, and one evening per week of practical work in the laboratory. The course ran from the first week in October to the last week in June, and averaged 32 lectures and 32 evenings of practical work. The lectures were essentially the history of a piece of calico, from its first entry into a bleach works until it was delivered as finished by the calico printer, the various styles, mordants, and colouring matters being treated of as fully as the time permitted. In the practical work of the laboratory the students followed, as well as could be done, the matter of the lecture preceding, made various experiments on bleaching, on mordants, dyed up colours, printed colours by hand, &c.

The fees for lectures alone were 2s. 6d. for a term of three months, and for the practical class 10s. per term of three months, all materials being found, together with the use of the necessary apparatus.

The laboratory was opened for day students who might work from 10 to 4; the terms were fixed the same as those at the Metallurgical Laboratory of King's College, London; on a basis of 37l. 6s. for nine months, working every day. About eight students entered at various times and for short terms in the day class.

In the evening lecture class there were, to commence with, 53 students, all adults; about 20 of this number were practically engaged in works as bleachers, dyers, and colour mixers; of the remainder all were connected with the trade, but not directly, some were makers of dyers' chemicals, some drysalts, and several were engaged in the commercial departments, and were desirous of knowing something of the manufacture of the articles they were accustomed to see and handle every day.

In the practical evening class every bench was occupied at the commencement of the session, and some applications for places had to be refused. The attendance was good, and much interest was shown by the students in the work laid out for them. It is scarcely necessary to say that in the course of two or three hours in an evening, very little can really be done in the way of experiments in dyeing; in order that anything might be done and finished in one evening much preparation was necessary, and many things had to be done beforehand for the students which, if there had been time, they should have done themselves. But still some useful illustrations were possible each evening, and the students were encouraged to pursue their experiments at home. It is to be regretted that the employers in the trade have not taken interest in these classes in the way of assisting by pecuniary help, for though the directors have provided all that was essential to work in a modest way, many things are still needed. At the same time the teacher acknowledges with pleasure

Appendix 33. that various firms have readily supplied materials for use in the laboratory, and amongst other things a nearly complete set of diagrams of the machinery used in the trade.

Manchester  
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Twelve of the students in the evening class sat at the examination of the City and Guilds of London in the subject of calico printing at the last examination, May 24th, the results of which are not yet known.

Manchester  
School of Art.

#### MANCHESTER SCHOOL OF ART.

The following statement was made by *Mr. Muckley*, the head master of the school :—

The Manchester School of Design was founded in 1838, and was the first school of art established out of London, the intention being to give instruction in all branches of drawing, the use of colour, perspective, geometry, modelling, and in pattern drawing for calico-printing and weaving; also to have lectures given on various subjects, such as painting, sculpture, anatomy, zoology, botany, &c., and the formation of a museum for exhibition of casts, models, paintings, designs, &c., &c., and of a library of books and engravings. Until the completion of the new buildings in 1881 no steps were ever taken to carry out the italicized portion of the original project.

Established in the first instance in the old Institution it migrated to Brown Street, but returned to the Institution in 1854, where it remained until the completion of the new building. The head master since 1861 has been *Mr. W. J. Muckley*. The number of students rose from 141 in 1864 to 377 in 1880. The income is partly derived from fees, partly from local subscriptions, and partly from the Government grants. The subscriptions average from 26*l.* to 300*l.* per annum.

The students fees were in 1843	-	-	-	-	£	54
"	"	1844	-	-	-	165
"	"	1850	-	-	-	327
"	"	1880	-	-	-	932

The Government grants, beginning in 1842 with a donation of 250*l.* per annum, subject to a similar sum being raised locally, were increased in 1850 to 600*l.* (the salary of the head master). In 1855 the grant was reduced to 380*l.*, the teachers being no longer compelled to give all their time to the school. In 1862 payment on results commenced, and the grants earned have ranged from 60*l.* to 250*l.* per annum; in 1880 the grant was 241*l.* In 1853 the title of the school was changed from "School of Design" to "School of Art." The new school buildings were opened in April 1881 by the Earl of Derby. An excellent exhibition of works of art was held in the school, which remained open for eight weeks, but entailed a loss to the building fund of 180*l.*, though visited by upwards of 15,000 people. The total cost of the school, including land and fittings, was 28,200*l.* The school occupies an area of about 1,200 square yards, and contains, in addition to the necessary class rooms, space available for a museum.

The male and female antique rooms and exhibition hall were inspected and specimens of the students' work here exhibited examined. No work was being done, there being no classes held at the time of the Commissioners' visit.

*Mr. Muckley* had visited all the best schools on the continent, and the arrangements here are, in his opinion, better than in any of the continental schools.

Machine drawing is taught, and by actual measurement from the object; but the students do not make sections. No permanent collection of objects exists. These, when obtained, could be exhibited in the corridors and in the exhibition room; and, if necessary, the committee would, in all probability, build a new wing.

In reply to the chairman, *Mr. Muckley* said: The chief object for which the school was formed is the teaching of industrial art; but, inasmuch as there is in Manchester a demand for all kinds of art, the doors must be thrown open to everybody, and, as far as possible, the teaching applied to their special wants. It is a vital point that the paying classes are those who do not want design at all; they belong to the upper class, and want help in every direction. If teaching in design is required this is given. Grants from South Kensington are received on about 200 out of the 300 pupils. If the paying classes were to withdraw and the place to be filled with designers proper, the school could not be kept open. The artisans pay 10s. per quarter; the upper class 2½ guineas per quarter; and it is therefore necessary to be careful to provide such teaching as the paying classes require.

Appendix 38.  
Manchester  
School of Art.

OWENS COLLEGE (Victoria University).

Owens College.

The Commissioners were received by *Dr. Greenwood*, Principal of the College, who made the following statement. *Dr. Greenwood's statement.*

The attention of the council and senate has been for many years given to the best way of so directing the strictly scientific instruction of the college as, without impairing its thoroughness, to foster the interests of the great manufacturing industries of the district.

In the year 1868 our professor of chemistry, *Dr. Roscoe*, and I visited, at the request of our council, some of the principal technical schools of Germany and Switzerland, with the view of ascertaining in what directions the higher education could best promote the interests I have mentioned, and at the same time of inquiring into the form of building and the appliances which had been found most effective.

Accordingly, when our new college buildings were erected in 1870, we were able to make very complete provision for the teaching of chemistry, and less complete but still considerable provision for other branches of technical instruction, and that without, as we believe, in the least interfering with the prosperity of the teaching in arts and (pure) science which is the proper business of the college.

The details of those efforts, as well as of some further extensions which we are now contemplating, will no doubt be supplied to the Commissioners by my colleagues, the heads of the several departments concerned. I will only state here that two clear principles have been kept in view by us all along—(1) that a sound knowledge of principles ought to precede this practical application; and (2) that in teaching the applications we shall not aim at superseding that practical training which can only be gained in the manufactory or the workshop. We do not see any reason to doubt the soundness of these principles, and, so far as our experience goes, no difficulty need be found in drawing the line between those applications which may, and those which may not, be with advantage introduced into our instruction.

On the one hand we believe that, so far as the absence of endowments for this special object has allowed, we have been able to contribute important services to our district by way of sending out a number of well instructed young chemists and engineers, and on the other hand that we have not suffered from the danger, which was not unreasonably anticipated by many, that the strictly scientific character of our teaching in these branches might be sacrificed to the needs, or fancied needs, of students that came to us to study science with an eye mainly to its applications. To illustrate my meaning I will venture to say that no chemical laboratory in the kingdom has sent out a larger number than ours has sent of young chemists, qualified to take important parts in factories and chemical works, and yet it will, I think, be admitted that our laboratory has also not been unsuccessful in the contributions it has made to the progress of chemistry as a pure science—contributions, too, made not by the professor and lecturers only, but by not a few of its students of chemistry who are under training.

Appendix 33. In conclusion I can confidently assure the Commissioners that the authorities of Owens College are desirous, so far as its funds allow, of adding to the efficiency of this side of our operations.

Biological Department.

Visited the *Biological Department* (Prof. Marshall).

(Chairman to Prof. Marshall.) How are the evening classes in connection with your department conducted?—The evening classes in practical biology are carried on exactly in the same manner as the day classes. The practical standard of the evening work is that the men can and do get through the London University practical biology examination. But still this is rather by way of exception.

What is the social status of the evening students in your classes?—Very various indeed. Some men are of somewhat high standing; medical practitioners in the town, teachers, one or two clergymen, and young men working for their degrees. There are also one or two working men.

You would not object to have many working men because the subject is not of technical application?—Not in the least.

Engineering Department.

Visited the *Engineering Department*.

Prof. Osborne Reynolds, F.R.S., made the following statement to the Commissioners respecting the method of teaching engineering in the Owens College.

The two courses of study in engineering (day and evening) are arranged to meet the requirements of two very different types of students. The day students are for the most part between 18 and 23 years of age, and devote their whole time to the work of the college.

The evening students are generally engaged during the day in works or drawing offices.

The course of study arranged for the day students extends over three years, and includes engineering and drawing, practical surveying, mathematics, chemistry, physics, and geology, the students' time being divided nearly equally between engineering with drawing, and the other subjects. On the completion of the course, certificates of proficiency are given to those students who have passed an examination in all these subjects.

The number of students attending the day classes in engineering varies between 35 and 50, something like half those who enter remaining to complete the course.

Many of these students are very clever fellows, and come with a good preliminary education, and generally some of the engineering students are amongst the first in the mathematical and other classes.

Besides these scientific subjects, the students are encouraged to, and largely do, avail themselves of the classes in modern languages.

The course of study followed in the engineering and drawing classes has been determined by experience as that best suited to the requirements and capacity of the students, a considerable proportion of these having been in the works before they come, and the rest intending to serve their time in the works or offices after they leave. Thus no attempt has been made to provide a substitute for the workshop, and the course of study in the drawing-room is intended to fit a student to derive immediate advantage from the work he sees on entering a drawing-office, and give him a better understanding of the work, rather than to serve as a substitute for the drawing-office, great care, however, being taken to keep up the art standard of the work both in accuracy and style, as in these respects lies most of its educational value. The course in practical surveying is offered as much from its advantage as a matter of education as for its technical value, though one reason for this course is that opportunities of acquiring this knowledge systematically are very rare even to the pupils of civil engineers.

In the engineering classes a certain amount of technical information is given, but this is not the primary purpose of these classes.

The principal object is to teach the application of science to the purposes of engineering, to teach the scientific method of dealing with the problems of engineering, much after the manner of Professor Rankine's works on surveying, applied mechanics, and prime movers.

Appendix 33.  
Owens College,  
Engineering  
Department.

The first year's course is surveying, estimating, the art of measurement, and descriptive engineering (in earthwork, masonry, and timber). The second year's course is applied mechanics (as far as the theory of simple structures, and strength of material, and the geometry of machines). The third year's work is dynamics of machinery, and hydraulics, and the steam engine. In the second and third years' subjects there is opportunity of introducing a good deal of descriptive engineering by way of illustration; but all through the effort is to give the students a thorough hold of what is brought before them, rather than to give them an imperfect acquaintance with a great deal. Thus the examples and illustrations are generally the simplest which serve. For this diagrams and illustrative models are used, but what is mainly depended upon are actual experiments made before the class. In every case, by some means or another, the calculations are verified by actual experiment; for this purpose a considerable number of instruments and testing machines have been constructed, and use is also made of the engine which works the ventilator of the college. Visits are also paid to engineering works. I consider that too much trouble cannot be taken to familiarise students with the actual circumstances of the problems, instead of depending mainly on a quantitative statement.

The teaching strength of the engineering department has not as yet been more than sufficient to deal with those branches of the subject which are important to every engineer, and thus has not admitted of the detailed study of any special branches of engineering. But plans for extending the course and introducing more technical lectures on such branches, particularly mining and metallurgical engineering, have long been under the consideration of the Council of the College.

As compared with the parallel courses given in the polytechnic schools on the continent, I consider that our course aims at a much smaller range of bookwork; that we leave the student to acquire by observation and experience much which they attempt to teach him; that our course is rather to teach him to understand what he sees, while theirs is to teach him how to produce things which he has not seen. This difference arises mainly from the fact that in England there are much greater facilities afforded for the acquirement of technical knowledge in the works. Where such facilities exist, the college training should be determined rather with a view to general education than to the acquirement of technical knowledge. Although, where the subjects are of equal educational value, it is clearly best to choose those which have the closest relation to the professional work.

The educational value of such a subject as applied mechanics, with the necessary substratum of mathematical and scientific knowledge, is as high, if not higher, than that of any scientific subject; so that whilst the student has acquired a knowledge of this subject which will in all probability be highly useful to him in after life, he has not in any way sacrificed his education in the acquirement of this knowledge. But the subject is too large to be mastered in three years, or indeed in any length of time, except by master minds, so that the question of pressing this subject beyond the point which can be attained in the time which can be spared for more general education from professional or technical training should be determined by the value of such teaching as compared with the more direct technical knowledge. It is true that there are some things for which a high general scientific knowledge is necessary; but these things are only to be accomplished by the master minds. In an ordinary way success in practical life depends on intimate familiarity with some narrow branch of knowledge, and to spend many of the years applicable for the acquirement of knowledge, on the generalities of a very large subject, must prevent or defer to a late period of life the acquirement of sufficient familiarity with any branch, in all its detail, to be useful in a practical sense.

Appendix 33.  
 ———  
 Owens College,  
 Engineering  
 Department.

Our course in Owens College is directed rather to the education of engineers, choosing the most useful subjects, having regard to their educational value, than to the technical instruction of engineers in all branches of the subject.\*

(*Chairman.*) What is your course of evening classes?—We follow the same course as we do in the day classes, leaving out somewhat of the principle and putting in more of the application.

What is the length of the evening course?—20 lectures a year for four years.

What number of young men go in for these courses?—They average 70 to 120 during the year.

Do they attend pretty regularly?—About two-thirds attend regularly.

Have you any means of knowing the occupations of the students?—They are mostly men engaged in the profession in the town, largely as pupils, and otherwise as draughtsmen.

Do you find that the employers take any interest in the courses?—A very distinct interest. Many of the students are pupils sent and paid for by their employers.

Then we may say that a fair proportion of the employers send promising young men here?—I think it may be said that most do so.

Do you think this method of attending evening instruction the best course to pursue for a young man who is obliged to earn his living during the day, or could you suggest any other way in which he could combine practice with the acquisition of a competent amount of theory?—I think that evening classes giving him plenty of time for the acquisition of theoretical knowledge is the main means, if the students be not hurried too much.

How many evenings per week do the students take?—One evening per week, but they have the option of taking two courses simultaneously, so that the complete course may be taken in two years if the student has ability. The teaching is divided into civil and mechanical engineering, and parts of the two courses are given in the same evening.

There is also a class of mechanical and geometric drawing in the evening, but it is quite distinct from these courses. Very much the same men go to both.

Have you tried giving the engineering courses on Saturday half-holiday or the evening of Saturday?—They have been tried, but do not answer at all.

(*Prof. Roscoe.*) Do you find that the young men coming from the works have a sufficient knowledge of mathematics, or that they are willing to work up mathematics?—In the evening class lectures very little of mathematics is brought in, and the practical application of the subject is chiefly dealt with. Those who go in for examination and take prizes work up the mathematics with the text-books.

Do they understand sufficient of mathematical language to understand ordinary formulæ?—They soon get that if they have not got it. I do not use very much trigonometry, but mainly give methods and the application of the formulæ. I do not give much of the rationale of the formulæ, and content myself in these classes in pointing out where this knowledge may be got.

Then in the day classes the teaching is of an altogether different character, being theoretical, and including the higher mathematics?—Yes. The young men who come to these classes are in the first year, students who have studied mathematics as far as quadratic equations, and sometimes solutions of triangles, &c., and a great portion of the best of them are Whitworth scholars and other men who have passed through workshops.

Most of the Whitworth scholars have been students of yours?—Yes, I think so. We have had 50 or 60 altogether.

(*Chairman.*) Do they take practical mechanics and machine construction as a part of an academical course or as special subjects?—They are our most regular students, as a rule taking our three years course.

\* See published syllabus of the Owens College engineering courses (Cornish, Fouldry, Manchester.)

(*Mr. Slagg.*) What is the nearest approach to the artisan class that the pupils come?—Well, for example, a carpenter came to me the first year of the Owens College and has attended regularly to last year, that is 13 years successively. We have a good many men approaching to the artisan class, but I do not think as a rule that they make very much of it. They are not the class of students that one expects to lay themselves out for that, or who would benefit by the work. They have not sufficient education, and what they require is elementary education as a preliminary. A good many of the students are men already engaged in earning money.

Appendix 33.  
Owens College,  
Engineering  
Department.

(*Chairman.*) What is the status of the Whitworth scholars in the day classes, and what was their origin?—They vary; but a majority of them are very clever boys who have by industry and evening work got on at the primary schools, and in connexion with the Science and Art Department. Very many of them have previously been boys who have been picked out by Whitworth exhibitions of 20*l.* to the Owens College. They have come here for a year or two, and have then got the scholarship. The exhibitors who have come to Owens have mostly got scholarships, and then they have come here with the scholarships.

In most cases are they boys without means?—The majority are men of slender means, and entirely of the artisan classes.

With respect to the engineering course of the Victoria University (as contained in the calendar) am I to understand that, following this course and passing the examination of each year, a man who satisfies the examiners may take the degree of Bachelor of Science?—The student has first to pass a preliminary examination, and then he may do this. The preparation for this preliminary examination is the students first years work at the University.

After he has passed the preliminary course he takes the course specified, containing no chemistry?—The preliminary contains chemistry.

The student then goes in entirely for engineering, including mathematics and some experimental physics in the first year?—Yes.

And after that only mathematics and engineering and geometrical and mechanical drawing?—Yes, that is so for the ordinary degree. For the honours degree in engineering and applied mechanics he has done with everything except engineering after having passed the preliminary. But it must not be supposed that the preliminary is an easy examination. It corresponds to matriculation in the London University.

Then is it the case that a man by alleging he is going in for honours can get rid of the other subjects?—There are two examinations, an intermediate and a final, for the ordinary degree. For the honours he must simply take the preliminary and the honours. The honours degree is intended to be of a different stamp, and is a much more comprehensive and difficult examination than the one for the ordinary degree.

#### Visited the *Engineering Drawing Room.*

*Mr. Miller, M.E.*, the teacher in this subject, stated that there are three courses going on at the same time. Some models are used, but the chief thing is to get the students into the way of drawing. In the third year they design altogether. The written data simply are given, and the drawing is to be made from these numbers. Example:

"*Third Years Students.*—A non-condensing horizontal mill engine is to use steam with an initial pressure of 80 lbs. (above atmospheric pressure), to make 100 revolutions per minute, and cut off at half stroke. The size of the cylinder is to be such that the piston passes through 160 cubic feet per minute, the stroke being 174 times the diameter of the cylinder.

"I. Make working drawings of the piston, cylinder, slide-valve, eccentric, connecting-rod, and crank. Scale=4.

"II. Draw a plan and elevation of the engine in working condition."

None of the work is simply copying. Drawings are worked from in most cases, from which the men make rough sketches, and then work from the written dimensions.

There is accommodation for 45 working students.

Appendix 33.

Owens College,  
Geology and  
Mining Depart-  
ment.Visited the *Geological Museum* (Prof. Boyd Dawkins, F.R.S.).

*Prof. Dawkins* made the following statement on the projected formation of a *Mining School*.

I take it that the Mining School in a place like Manchester should be for the instruction of the colliery viewiers, and also of those who have the charge of the large metal industries in Lancashire, a metal industry that extends on the one end into North Wales and on the other into Cumberland and Westmoreland. My idea is that the class of instruction should be mainly for the managers, &c., but also of such an informal nature that it might be available for the lower people employed in the mine.

(*Chairman.*) Would the same course be applicable to both?—No, not altogether. I think our system of evening classes may be applied to the one, and the day classes to the other.

Would you make a distinction between the two courses?—I think I should have two distinct courses of the same sort as the day classes compared with the evening classes in the college in chemistry and engineering.

Is the scheme already distinctly formulated and under the consideration of the college authorities?—The case is simply this, that eight or nine years ago a number of people in this district felt the desire of establishing some centre of education for the mining people, and some of them subscribed 3,500*l.*, and I believe that Lord Derby promised 1,000*l.* if any practical scheme was put before him. Up to the present time we have not been able to put any practicable scheme before the public which would satisfy the requirements of a mining school, and the matter has been in abeyance for some six or seven years. That is as things stand now, but some of us hope that, under the present conditions, we may be able to meet a want which is undoubtedly felt in this district.

When you say that you have been unable to lay any scheme before the public, has this been for want of funds?—Yes, for want of funds. But I am not able to give distinct information respecting the amount of funds. That in the nature of things would not come before me, but before the council of the college.

Could you give an approximate estimate of the amount that would be required for the maintenance of such a school?—About 500*l.* to 600*l.* a year, but this would leave a small margin.

You would distinguish the expenditure into two heads of capital and annual outlay?—We do not require capital. What is required is income.

What with regard to building and apparatus?—The condition of things is simply this. In the college we have most of the elements necessary for a mining school, but not the necessary mining instruction, and some of the existing courses would have to be adapted and enlarged to meet the establishment of a mining school.

Speaking of capital, have you what is necessary for a metallurgical laboratory?—We have the commencement of a metallurgical laboratory. We possess a large collection of metallurgical apparatus and specimens purchased by the college from the late David Forbes, and for some time the metallurgical laboratory was conducted by Dr. Roscoe and a skilled assistant, but owing to the want of union with a scheme of the kind under discussion the teaching has fallen through; metallurgy could not stand alone without the mining.

Then it is a question of income and not of capital?—It would be a matter of capital to some extent, but we are going to build, and the matter of capital would not prevent the adoption of a mining school.

Would not some portion of the outlay required be recouped by the fees?—We should require 500*l.* to 600*l.* per year extra, beyond what would be obtained in fees.

Have you communicated with the large metallurgical and mining proprietors with regard to your scheme?—The colliery proprietors about Wigan tried to get up a school of mining there, and that took away the sympathy and destroyed our enterprise.

Can you describe your scheme?—The kind of scheme I should be inclined to propose would be that all the subjects which are necessary to mining should be first of all taught to the students, and that then they should have lectures on theoretical mining from a man who is acquainted with practical



mining, that is a man who had real practical experience in mining pursuits; but this kind of instruction should not be considered to do away in the least degree with the necessity for actual experience in mines, and the provision of that practical experience we could not undertake to give. It might be arranged with the coal-owners about here, but that is the only possible solution of the difficulty of uniting theory with practice. The same difficulty has occurred in the engineering school in much the same way.

Do you think the difficulty could be got over by any kind of half time system?—I think it might be, but should not like to give a distinct opinion. I have been collecting all the information I can, and the material requires some consideration. I should be glad to give you an analysis of the information collected by me in America and England.

I should like to say that one point has been very forcibly brought before me by Mr. Warrington Smyth of Cornwall. He said that one great obstacle would be the present system of instruction of colliery viewiers and mining surveyors. The system is one of apprenticeship; they get premiums from apprentices, and at present they are the only avenues to this profession.

In my present evening classes in geology I have a good many practical coal viewiers, &c. who are aiming to get what they can, applying to practical mining, out of the evening classes.

(*Professor Roscoe.*) At the Mechanics' Institution we saw a class on geology taught by one of your pupils. Do many of your pupils afterwards become science teachers?—A certain number have, but the influence of my evening classes is felt more in the more generalised form. Philosophical and literary societies have sprung from my lectures. For instance the ones of Blackburn and Accrington.

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Visited the *Physical Laboratory* under the direction of Professor Stewart, *Physical F.R.S.* *Laboratory.*

*Prof. Stewart* stated: We wish if possible to divide our practical classes so as to correspond with our theoretical classes. When the theoretical course is well fixed for the ordinary and honours course, we shall probably have a set of practical courses in the physical laboratory corresponding to these; a more simple course for the lower students, and a more complex course for the upper class students, the one course requiring a little and the other a fair amount of mathematics. We have simply at the present moment a course in which the student attends one or more days per week, and is treated individually, and a course in class where instruction is also given individually, but not so much so as in the former case.

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*Professor Schuster, F.R.S.*, gave the following particulars of an evening class on the technical applications of electricity, which he, with the assistance of Mr. Gee, proposes to commence next session. The class is intended to give to persons occupied during the daytime instruction in the scientific principles involved in terrestrial and submarine telegraphy, telephony, the construction and use of dynamo-machines, electric-lighting, &c. The instruction given will be partly theoretical but chiefly of a practical nature, special stress being laid on the method of exact electrical measurement. It is expected that officials employed in the telegraphic department of the post office will make use of these classes. In reply to a question, Dr. Schuster added that students entering such classes ought to be acquainted with the elements of geometry, but that a knowledge of the higher branches of mathematics is not absolutely necessary to the understanding of a large portion of the subject.

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Resumé by the *Chairman* of a conversation between himself and Mr. Thoman of Paris, a student in the Chemical Laboratory in Owens College.

*Mr. Thoman* having finished his full course at the Ecole Centrale des Arts et Manufactures in Paris has come over to Manchester to study chemistry under

Appendix 33. Dr. Roscoe. His father is a manufacturer of wood extracts for dyeing and was anxious that his son should come over here to learn English, and avails himself of the opportunity of at the same time continuing his study of chemistry. He is not sufficiently acquainted with English to follow the courses of lectures, and is not therefore able to express an opinion on them but as far as the laboratories are concerned his opinion is that there is nothing that can be compared with them in the public institutions of Paris. I had very little laboratory practice at the Ecole Centrale, and he finds it useful to continue his practice in the laboratory here.

Owens College,  
Physical  
Laboratory.

Chemical  
Laboratory.

Visited the *Chemical Laboratories.*

These laboratories directed by Professor Roscoe are very complete their fittings and general arrangements. They accommodate 100 working students, 60 in the junior or qualitative, and 40 in the senior or quantitative laboratory. Plans and description of these are published by Mr. Cornis Piccadilly, Manchester. The chemical department of the college is one of its most important features; organic chemistry is professed by M. Schorlemmer, F.R.S., and three demonstrators and assistant lectures supplement the instruction given by the Professors. The aim of the Director has been to impart a sound knowledge of the theory and practice of chemical science and to fit students either for a purely professional career or for the practical requirements of the trades and manufactures which have their foundation in chemical science. In order to point out more clearly the course of study which should in the latter case be pursued Professor Roscoe has drawn up a systematic course for technological students, and this scheme has been sanctioned by the senate of the college. It is arranged on a liberal basis in order to secure not only a satisfactory knowledge of chemistry but to give sufficient training in the allied sciences, in mathematics, physics, mechanical drawing, and the no less important subject of modern languages.

Professor Roscoe handed in the following prospectus of courses of technological chemistry:—

OWENS COLLEGE, MANCHESTER.

SYLLABUS OF THE COURSE OF TECHNOLOGICAL CHEMISTRY.

PROFESSORS AND DEMONSTRATORS.

Professor of Chemistry and Director of the Chemical Laboratories	-	{ Henry E. Roscoe, B.A., LL.D. Ph.D., V.P.R.S.
Professor of Organic Chemistry	-	C. Schorlemmer, F.R.S.
Demonstrators and Assistant Lecturers in Chemistry	-	{ W. Carleton Williams, F.C.S. Watson Smith, F.C.S. Harry Baker, F.C.S.
Professor of Mathematics	-	Thomas Barker, M.A.
Assistant Lecturers in Mathematics	-	{ J. E. A. Steggall, M.A. R. F. Gwyther, M.A.
Professors of Physics	-	{ Balfour Stewart, LL.D., F.R.S. T. H. Core, M.A.
Demonstrator in Physics	-	W. W. Haldane Gee.
Professor of Geology	-	W. Boyd Dawkins, M.A., F.R.S.
Lecturer in Mineralogy	-	C. A. Burgbarth, Ph.D.
Lecturer in French	-	H. Lallemand, B. ès Sc.
Lecturer in German	-	H. Hager, Ph.D.
Lecturer in Mechanical Drawing	-	J. B. Millar, M.E.

Syllabus of the  
course of  
Technological  
Chemistry.

Persons desiring to attend this course will be required to enter the College under the ordinary conditions of studentship. See Prospectus of the Arts and Science Department, which may be obtained on application to the registrar; or the College Calendar, which may be purchased from Mr. J. E. Cornish, Piccadilly, Manchester, price 3s.

The object of this course is to offer to students intending to devote themselves more especially to applied chemistry as complete a training as the College can provide in those branches of instruction, which form the scientific foundation of the subject.

The complete course of instruction extends over four years, and embraces the following subjects:

FIRST YEAR.—Chemistry Lectures, Junior and Tutorial classes.

Preparatory Chemical Laboratory, 2 days per week, and Analytical Courses.

Chemistry Lectures class.

Mathematics class, Section I.

Experimental Mechanics.

Geology (Stratigraphical).

\*French or German.

Geometrical Drawing Lectures (Evening class).

Mechanical Drawing, Practical (Evening class).

SECOND YEAR.—Chemistry Lectures, Junior†, Senior, and Tutorial classes.

Chemical Laboratory, 3 days per week.

Technological Chemistry Lectures (First Course).

Experimental Physics or Mineralogy Lectures.

\*German or French.

Geometrical Drawing Lectures (Evening class).

Mechanical Drawing, Practical (Evening class).

THIRD YEAR.—Chemistry Lectures, Senior† and Tutorial classes.

Organic Chemistry Lectures.

Chemical Philosophy.

Chemical Laboratory, 3 days per week.

Technological Chemistry Lectures (Second Course).

Physical Laboratory, 1 day per week or

Practical Mineralogy and Technological Mineralogy.

Mechanical Drawing, Practical (Evening class).

FOURTH YEAR.—Organic Chemistry Lectures.†

Technological Chemistry Lectures (Third Course).

Chemical Laboratory, 4 days per week.

Chemistry of Colouring Matters, Dyeing, and Calico.

Printing (4th Evening Course).

Mechanical Drawing, Practical (Evening class).

#### FEEs.

	£	s.	d.
First year (including college admission and library fees)	-	29	5 0
Second year	-	27	13 0
Third year	-	23	10 6
Fourth year	-	23	19 6

The aggregate of the fees in each year will vary slightly according to the particular class selected in French or German, or to the choice made in respect of the other alternatives proposed.

When a student is excused a second attendance on any of the chemistry lecture courses the fee will be reduced accordingly.

Certificates will be granted to students on the successful completion of this course. Attendance on the full course of four years is expected of candidates for the certificate, but students may obtain exemption (on cause shown) from the first or the first and second year's course. Students so excused will nevertheless be required to undergo examination in all the subjects specified.

\* It is desirable that the student should have gained a knowledge of the elements of both these languages by the end of the second year.

† Students who gain a place in the First or Second class in the annual examinations will be excused a second attendance on these classes.

Appendix 33. The certificate will state in which subjects the candidate has gained honours, and in which he has merely satisfied the examiners.

Owens College,  
Course of  
Technological  
Chemistry.

SYLLABUS of the CLASSES.—Session 1882-3.

The Session begins on the 3rd October, 1882, and ends on the 22nd June, 1883.

The following subjects will be treated of in this course:

FIRST YEAR.

SYSTEMATIC CHEMISTRY.—*Junior Lectures*.—Laws of chemical combination. Description of the physical and chemical properties, and the mode of preparation of the non-metallic elements and of their compounds.

The *Tutorial Classes*, for recapitulation and the correction of the written exercises given out in the lectures.

ANALYTICAL AND PRACTICAL CHEMISTRY.—*Laboratory Course*.—The methods and practice of Qualitative Chemical Analysis.

*Lecture Course*.—On the methods of Qualitative Analysis, supplementary to the instruction in Practical Chemistry.

MATHEMATICS.—*Section I, Geometry*, Euclid I.—III., and VI., props. 1-19 and 33, and *Elementary Algebra*, as far as Progressions (inclusive).

EXPERIMENTAL MECHANICS.—The Properties of Bodies, the principal propositions in Statics, Kinetics, Hydrostatics, Geometrical Optics, and Heat; explained by the aid of models and experiments.

GEOLOGY.—The first portion of the Course, comprising—*Stratigraphical Geology*: The Physical Structure, Classification and History of the Rocks.

FRENCH or GERMAN.—The class best suited to the requirements of the student.

GEOMETRICAL AND MECHANICAL DRAWING, including Lectures and Practice (Evening Classes).

SECOND YEAR.

SYSTEMATIC CHEMISTRY.—*Junior Lectures*.—See First Year.

*Senior Lectures*.—Chemistry of the Metals, and of their most important compounds. Elements of Organic Chemistry, giving the composition and the relations of the best defined groups of organic bodies and the laws regulating their formation.

ANALYTICAL AND PRACTICAL CHEMISTRY.—*Laboratory Course*.—Quantitative Chemical Analysis. Monthly examinations in Qualitative Analysis. Quantitative Analysis of a prescribed series of Salts, Minerals, Alloys, &c. Volumetric Analysis.

TECHNOLOGICAL CHEMISTRY LECTURES.—Sulphuric Acid and Soda Manufactures; Bleaching Powder and Liquor; Potassium Chlorate.

Also, time permitting, Utilisation of the Burnt Cupreous Pyrites as bye-product of the Sulphuric Acid Manufacture, with Extraction of Copper and Silver, &c.

[Through the courtesy of several of the principal Manufacturers, the students will have the privilege of inspecting, with the Lecturer, extensive Works, where the processes described in the lectures will be seen in actual operation.]

EXPERIMENTAL PHYSICS.—The chief phenomena of Sound, Heat, Light, Electricity, and Magnetism, illustrated by experiment.

MINERALOGY.—Introduction to the study, the Chemical Properties of Minerals, Classification of Minerals, Descriptive Mineralogy.

GERMAN or FRENCH.—See First Year.

GEOMETRICAL AND MECHANICAL DRAWING.—See First Year.

THIRD YEAR.

SYSTEMATIC CHEMISTRY.—*Senior Lectures and Tutorial Classes*.—See Second Year.

ORGANIC CHEMISTRY.—Chemistry of the Carbon Compounds. History of the Old and New Theories, and of the most recent important discoveries in Organic Chemistry, &c.

- CHEMICAL PHILOSOPHY.—Sketch of the History of Chemistry: Development of Modern Chemistry; Chemical Laws and Theories; Relation of Chemistry to Physics. Appendix 33.
- ANALYTICAL AND PRACTICAL CHEMISTRY.—*Laboratory Course*.—Water Analysis. Organic Analysis. Vapour Densities. Gas Analysis. Coal Gas. Photometry. The preparation and analysis of various pure Chemical Substances, or series of these. The extraction of various pure Chemical Substances from certain Crude Commercial Products, their identification and analysis. Owens College, Course of Technological Chemistry.
- TECHNOLOGICAL CHEMISTRY LECTURES.—Destructive Distillation of Wood and Products derived.
- Destructive Distillation of Coal.
- Distillation of Coal Tar, and separation of the Crude Tar products.
- Ammonia and Ammonium Salts from Gas Liquor.
- Visits to Works. See Second Year.
- PHYSICAL LABORATORY.—(1) Instruction in performance of the experiments seen in the Lecture-room, and
- (2) In the use of the instruments of precision in the Physical Laboratory.
- PRACTICAL MINERALOGY.—Practical determination of Minerals by their crystalline form, measurement of the interfacial angles of their crystals with the Hand Goniometer or Reflecting Goniometer and their reactions with the Blowpipe and Reagents.
- TECHNOLOGICAL MINERALOGY.—Treatment of the Minerals used in the Arts and Manufactures (specially those treated in the foregoing courses of Technological Chemistry) with regard to occurrence, recognition, composition, and properties.
- MECHANICAL DRAWING.—See First Year.

## FOURTH YEAR.

- ORGANIC CHEMISTRY LECTURES.—See Third Year.
- TECHNOLOGICAL CHEMISTRY LECTURES.—Manufacture of pure Coal Tar products, of the commercially useful intermediate derivatives, and of the Coal Tar Dyes, Colouring matters, &c.
- Visit to Works. See Second Year.
- ANALYTICAL AND PRACTICAL CHEMISTRY.—*Laboratory Course*.
- If at this stage the student evince inclination or capacity in certain special directions, this will be duly supported and encouraged in those directions of practical chemical study which he will be required to pursue.
- Preparation or extraction of pure chemical substances with their analysis.
- Original investigation and research.
- The solution of various problems arising in the processes of the Chemical Industries.
- [As an example of one branch of study may be specified:—  
For *Calico Printers, Dyers, and Colour Manufacturers*.  
The analysis and valuation of the entire series of Printers' and Dyers' Chemicals.  
The Qualitative determination and detection of Colouring Matters.  
Technical determination of the tinctorial value of Alizarins.  
The Preparation of pure Coal Tar products, and Coal Tar colours and other derivatives.]
- CHEMISTRY OF COLOURING MATTERS, DYEING, and CALICO PRINTING.—(4th Evening Course). Series of Lectures illustrated by experiment.
- MECHANICAL DRAWING.—See First Year.

EXAMINATION of *Mr. Watson Smith*, demonstrator in the chemical laboratories of the Owens College. Mr. Smith's Evidence.

(*Chairman*.) What is the general character of the course on technological chemistry recently adopted by the Senate of Owens College?—It is almost analogous to that adopted in the Zurich Polytechnic School.

## Appendix 33.

Owens College,  
Course of  
Technological  
Chemistry,  
Mr. Smith's  
Evidence.

Have you got the necessary staff of professors, for carrying on such a course as the Zurich one, and as you would like to see carried on here?—Yes.

Are you satisfied you can give as good a course?—I see no reason why we should not be able to do so.

Have they not a more numerous staff at Zurich?—Yes, they have a more numerous staff, and there are many points of development which must be attended to. This is the first and experimental year of the technological courses with us, and it is impossible to launch out at once into the full.

Are you satisfied you have the means of doing justice to the students in the technological course you have commenced?—I am quite satisfied of this. Let me make a comparison with the Zurich course. There is there a preliminary course *i.e.* a general preparatory science course, and according to our plan this preparatory course also exists. In the next year the scientific subjects are more specific and more advanced. We do not believe in chemistry merely being studied; the course is a general scientific one, and in all respects equal to that given in the Zurich School. The object of this is to ensure that each student has the requisite knowledge, which should have been gained by the previous ordinary school education, and if they can pass an equivalent examination, they can enter at once on the first year of technical study, provided sufficient proficiency is shown.

You begin technological chemistry in your second year, which is your first year proper?—Yes, exactly as is done at Zurich.

You would take the simpler manufactures first?—Yes, those involving a knowledge of inorganic chemistry, *e.g.*, we take the Alkali manufacture, and Sulphuric acid. It is understood that these students have already passed through Professor Roscoe's systematic course of lectures on inorganic chemistry. This gives a foundation of inorganic chemistry, which should enable them to understand the more technical lectures.

It is, however, most important to mention that laboratory practice and practical work at chemical analysis is made a *sine qua non* in the first as well as in the later years.

In the third year you still continue your theoretical chemistry and also take some physics, mineralogy and mechanical drawing?—Yes, but in some of the cases the evening classes are used because we have not at present day classes for the purpose. The evening class in mechanical drawing is most suited to the requirements of students in chemical technology.

As regards technology, what do you take in the third year of the course?—We expect third year men to have some acquaintance with organic chemistry, and take therefore a course of manufactures involving a knowledge of this part of the science, but not to such an extent as is the case in the fourth year. For example, the distillation of coal tar, and the separation of the coal tar into the different crude products which afterwards are employed by the colour manufacturers and others, to be worked up into the most complex colouring matters by processes which require a still more complete acquaintance with organic chemistry, and this subject we therefore take in the fourth year. We take also wood distillation, which is a simple separation of a complex organic substance into wood-tar, wood-acid, and the separation of naphtha.

In the fourth year you dismiss all subjects except chemistry and mechanical drawing?—Yes. Mechanical drawing we keep through from beginning to end, and theoretical organic chemistry is still continued.

Would you give some example of the fourth year technological chemical studies?—In the fourth year the most important part of the student's work will be done in the laboratory, in which he is supposed to spend 24 hours per week.

Would you give an account of the way in which he employs his time?—The subject which the student takes in his fourth year will greatly depend upon the nature of the occupation to which he ultimately wishes to direct his chemical studies. Thus, for example, a young man who desires to enter a calico print works would naturally devote himself to the study of organic colouring matters such as the different artificial colouring matters known as the alizarines, or to the artificial production of indigo &c., and the application of these, such for example as ascertaining the dyeing power of commercial alizarines and the like. If on the other hand he wishes to obtain a knowledge of tar-products he would prepare a number of derivatives from the crude

materials. Again, should the young man desire to become an alkali-maker, his attention would rather be directed to the examination of problems bearing on his future industry, as for example the constitution of bleaching powder or an experimental discussion of the newer processes introduced into the alkali manufacture. In the same way the brewer, or cement-manufacturer, or manure-manufacturer, would carry out scientifically some of the processes involved in his special trade.

Appendix 33.

Owens College,  
Course of  
Technological  
Chemistry.  
Mr. Smith's  
Evidence.

In these courses you include no mechanical engineering?—My belief is that in the further development of the course, the student ought to have time allowed to go more deeply into engineering than he does at present. But now we can only venture as far as mechanical drawing; one reason is the generally existing want of mathematical knowledge in our students, and that is only to be met by compelling them to go in for the preparatory course of mathematics.

In the Polytechnic course at Zurich a much higher amount of mathematics is required? As far as differential calculus?—Professor Lunge of Zurich considers this too high, too great a tax, and we have endeavoured to reduce this to what we thought would be practically sufficient, that is as far as progressions.

What is your object in including mathematics in the course?—Mathematics is absolutely necessary in such a branch as natural philosophy which again is necessary to a thorough knowledge of chemistry. But the amount required in every day life work, in the pursuits of technological chemistry never come so high as differential calculus.

Is there any further statement you wish to make?—I should like in conclusion to state that Professor Roscoe and the authorities of the college in drawing up this scheme, whilst desirous of affording every facility for the acquirement of these special branches of scientific knowledge which bear upon the great chemical industries of the county, were determined at the same time to adhere to the principles upon which they have always acted, namely, the necessity of a careful and extended purely scientific education as a basis.

## OLDHAM SCHOOL OF SCIENCE AND ART.

Oldham School  
of Science and  
Art.

Mr. Phythian (C.E. of Glasgow University), head master of the school, submitted the following statement of the origin and rise of the school.

As far back as 1840 science and art evening classes were commenced in connexion with the Oldham Lyceum when that institution was in embryo. Superior workmen, such as draughtsmen, in the employ of Messrs. Platt, were in the habit of teaching some science subjects of importance to their trade. As a development of these classes the late John Platt, Esq., M.P., in 1865 built at his own cost the first school of science and art, adjoining the Lyceum. Mr. Platt also provided a fine set of art casts, and the firm of which he was head gratuitously supplied the internal fittings of the institution. About the same date the school was incorporated with the Science and Art Department, South Kensington, funds for its maintenance being provided by annual subscriptions, class fees, and payments on results from the department. In a few years, the desire for a chemical laboratory having arisen, Wm. Richardson, Esq., supplied the funds for apparatus and chemicals; this was followed by the furnishing of a physical laboratory for experimental work by the students in heat, steam, light, sound, magnetism, and electricity. The establishment in 1874, by the Society of Arts, of technical examinations, was taken up with successful results. Since then students of these classes have gained 17 prizes, 4 in honours with 6 medals, value 85*l.*, and several full technological certificates. Five years later the school was incorporated with the City and Guilds of London Institute for the advancement of technical education.

Introductory  
statement by  
head master.

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The growing success of the school encouraged the president, R. S. Platt, Esq., and other sons of the late John Platt, Esq., to erect at their own expense the present handsome and commodious edifice, which contains 9 main rooms, 42 feet by 28 feet, 16 feet high, chemical and physical laboratories, with masters' rooms. The land was given by Wm. Richardson, Esq.

There are three local exhibitions of 50*l.* per annum, tenable at the Owens College, Manchester, given by Mrs. Platt and Chas. C. Lees, Esq.

The school has a small library of scientific books, presented by various publishers.

The gross total of prize money received since 1867 is 6,066*l.* This amount, being awarded to the students, forms no part of the revenue of the school. All grants, fees, and subscriptions are received by the Committee, who pay the masters fixed salaries.

There are now (1882) in attendance 678 science and 110 art students, varying from 13, the minimum age of admission, to 40 years; the average is about 19. Most are young men in training to fit themselves for their after career. Effort is made to know the subsequent position of the students, and a register is kept. The majority of them now hold responsible positions in the town and elsewhere and many join the "Old Students' Association," assisting by subscriptions and otherwise towards the support of the school.

In the classes the science subjects are as far as possible treated experimentally by the students, in accordance with the suggestions made by Dr. Roscoe, Mr. John Platt, M.P., and Mr. Wm. Richardson, as contained in the Report of the Royal Commission on Scientific Instruction, published 1872.

Literary subjects are taught in the Lyceum night classes.

The science course is chosen with special reference to the principal trades of the district, namely, machine making and cotton manufacture. The subjects are embraced in the prospectus of Sir Joseph Whitworth's scholarships for mechanical science, and are practical geometry, machine drawing, building construction, mathematics, theoretical mechanics, applied mechanics, sound light and heat, magnetism and electricity, inorganic chemistry theoretical and practical, geology, steam, freehand and model drawing, with technical classes for mechanical engineering, tools, and cotton manufacture.

In 1865 there were 114 students on the books, in 1881 there were 549 students, a progressive advance having taken place during the whole interval.

The following is a summary of the successes of the school since it was opened in 1865 :—

11 of the Whitworth scholarships, and 11 prizes	- { Total value of Whitworth grants, 4,060 <i>l.</i>
8 Whitworth exhibitions and 2 studentships	

1 Bremner exhibition.

4 gold, 7 silver, and 6 bronze medals; grant of these medals discontinued since 1876.

10 national medals for honours.

5 medals for technological examinations.

In addition to these particulars Mr. Pythian handed in a complete set of forms, showing the system of organisation.

Mechanical  
Drawing Rooms.

The Commissioners inspected a collection of mechanical drawings (the work of the students) exhibited in one of the mechanical drawing rooms.

(*Chairman to Mr. Richardson, of the firm of Messrs. Platt.*) Are you satisfied with the mode in which mechanical drawing is taught in this institution?—I can answer that by saying that we carry off many prizes from South Kensington, and they say that we excel.

But are they the best judges?—Well, we can make use of the people after they have been here.



(*Professor Roscoe.*) Are the young men who come here mainly from your works?—Only about 25% from the works, the rest are young men from Oldham generally. Nearly every mechanical trade is represented, and some textile trades. Appendix 33.  
Oldham School  
of Science and  
Art.

(*Chairman to Mr. Phythian.*) With respect to the mechanical drawings that are now on the blackboard, are these made in the presence of the students?—Yes.

What is the system you adopt in teaching?—The master has models and works sketches on the board. The students sit in front and take freehand sketches from the diagrams. From these the pupils work their sheets. Where we have no models the master makes a rough sketch on paper. From this only the corresponding freehand sketch can be worked, and from their own sketch and the necessary memoranda they work out their sheet. The blackboard and the students' sketch books are ruled with squares to facilitate the freehand sketching. (*Mr. Robertson, assistant master.*) Thus when they have no model they have a sketch and work the freehand at the same time as they work the machine drawing. (*Mr. Phythian.*) We wish particularly to combine the two.

What number of students attending these classes in mechanical drawing also attend the mechanical engineering?—The older students in mechanical drawing also attend mechanical engineering.

Do you pursue the teaching in the two systems simultaneously?—According to the advancement of the pupil. For instance Saturday afternoon is devoted to the blackboard and freehand sketch, and in the following week they work out the sketches. The blackboard is not taken so much as the freehand sketches from smaller sheets, and for this reason that a student may come on Monday say and miss Tuesday and come on Wednesday again for machine drawing, and we can keep the student going on in any state of advancement and get them on more quickly. By taking the blackboard very much, and having so many classes, a student misses one portion and his progress is thus impeded.

Do all the students work from models?—(*Mr. Robertson.*) Yes, each man in his turn, but we have not enough models. We want many more models very much.

Do you get your models from South Kensington?—Some, and others I have made myself. The models from South Kensington are very fairly satisfactory.

(*Mr. Magnus.*) Do you get a sufficient quantity from South Kensington?—We could do with a great number more, with greater variety of objects.

(*Chairman.*) What assurance have the South Kensington people that the sheets you send are not simple copies?—(*Mr. Richardson.*) I do not know that they have any assurance except the word of the teacher and committee, and the visits of the inspector.

In point of fact are your drawings liable to be put in competition with drawings which are simply copies?—(*Mr. Phythian.*) Yes, and that is one of the great difficulties with which we have to contend. I believe if we were to send ten copies pricked off and five worked sheets the ten copies would get the best grant.

(*Chairman.*) What work do the most advanced pupils of your classes take up?—They take the drawings on a small scale contained in the different weekly engineering publications and work them out as working drawings [examples shown].

Do the students merely enlarge or work out the details?—They work out the details as much as possible and insert anything that is omitted in the drawings. The drawings are not made for copying and are not always correct, and then the student has to correct the drawing and put in the details.

Do the students make sections where sections are not given?—Yes [examples shown].

Then they must be acquainted with what the construction ought to be, in order to draw the parts of which there are not indications in the drawing?—Certainly. The students are continually overlooked by the master and corrected if necessary.

Have you not some specialities in your lighting of these drawing rooms?—Yes. Each student is provided on the desk with an upright gas standard.

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Oldham School  
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Art.

which can be adjusted at pleasure to any angle to obviate cast shadows. Each standard has a reflecting tin cone and tin tube to carry away products of combustion. The tube rises to a height of 5ft. 7in. above the floor, thus being beyond the breathing level, and the cones radiate sufficient heat to warm the rooms, thus avoiding the necessity for a large amount of heating apparatus. No lights are necessary when the students are not working. These lamps have been found to be very efficient.

(*Mr. Woodall.*) Are you acquainted with any other school of a similar kind in Lancashire generally to the one we are now visiting?—I cannot say that I know any which devotes itself only to science and art, which is so fully developed.

Are there any in which mechanical and geometrical drawing is carried on to the same extent?—There are several large night schools. The Manchester Mechanics' Institute is a very good one. Then there are the Crewe Institute and the Bolton Church Institute; also the Wigan School, supported largely by the colliery proprietors of that district.

(*Chairman.*) Are there any science and art classes in Oldham besides these?—The Werneth Mechanics' Institute and the Co-operative Society's classes.

Do you find the splitting-up of the teaching in one town injurious?—We have had a continual increase. I prefer as much competition as we can get. All the assistant masters have been former pupils, and the masters at other places are all old pupils.

Is there any science taught in the board schools in Oldham?—(*Mr. Ingham,* School board member.) There are no science classes in connection with the board.

Do the children in the board schools, during their ordinary school hours, devote any time to elementary drawing?—Yes, they are taught freehand drawing in connexion with South Kensington. I cannot say definitely in what standards, as the teaching is of quite recent introduction, and is not yet systematised; but the whole of the children are not taught.

Is elementary drawing taught in the denominational schools?—Yes, in all the schools connected with the Wesleyan Methodists. I do not know in what standard, but it is about Standard three.

Have you had scholars from the elementary schools Mr. Phythian?—(*Mr. Phythian.*) The elementary schools are assisting us generally as regards drawing, as well as other subjects.

(*Professor Roscoe.*) Can you give any information respecting the action of the Co-operative Societies?—(*Mr. Richardson.*) The co-operative classes are distributed throughout the town, and they give instruction a deal nearer home. This is a very great advantage to the smaller boys. (*Mr. Ingham.*) So far as the co-operative movement is concerned, one of the societies has science classes in one of the board schools. They pay rent and teacher, and the grant comes out of the funds of the society. Another society, which pays over 1,000l. for educational purposes, including news-room and libraries, has no science classes, and no elementary school in connexion with it.

(*Chairman.*) Do any of the large works in Oldham have elementary schools attached to the works?—(*Mr. Richardson.*) I do not know of one.

Class on Cotton  
Spinning.

The Commissioners next visited rooms in which elementary geometrical drawing was being taught by Mr. Armitage, and solid geometrical drawing by Mr. Philip, M.A., and then inspected the class on COTTON SPINNING, taught by Mr. Isherwood, Manager of the Tonge Vale Spinning Company.

*Mr. Isherwood* stated that almost all the students present, numbering fully 90 (say 19 out of every 20) were engaged working in factories, and the remainder working in machine shops. It was found on putting the question to the class that eight of the students were shareholders in the limited mills. One lecture per week is given.

(*Mr. Magnus to Mr. Isherwood.*) You have worked with the City Guilds, I suppose. Have you any remarks to make with respect to the questions set for last year?—They were fair and proper questions.

Do you think they were set by a practical man?—I think so.  
How many of the men here this evening will be qualified for the full technological certificate?—Something over 20.

Do many of the men work at pure science; for instance applied mechanics?—About one-third to one-half. (*Mr. Pythian.*) The technological work was taken up in 1874 when inaugurated by the Society of Arts. In 1879 the City Guilds made awards, and a master of cotton was then paid by the committee. There is also a mechanical engineering class and one for tools.

(*Chairman.*) Do you draw a broad line of distinction between applied mechanics and mechanical engineering?—There are two distinct classes. Are the two classes generally followed by the same students?—Yes; and the same students take mathematics also, and most of them theoretical mechanics.

(*To Mr. Richardson.*) What do you believe to be the value of these technological classes?—The students here give attention to the practical element of the business followed by them. They have to answer practical questions. The theoretical instruction they get in the other classes is developed into practical instruction in the technological classes. This seems to me to be the great object of the technological classes, and I believe the object is attained.

Is a man who is engaged in your works in the manufacture of cotton machinery any better for knowing something which is quite at the opposite pole of machine construction, say a marine engine?—I suppose the men may come across the marine engine in a works where they are engaged in other sorts of engineering. But I think technology takes another course. It teaches a man to understand the nature of the materials with which he is going to work. For instance, a man being examined in steel, it makes him study the nature and qualities of steel. I think it is valuable for the students to learn more of the nature of the materials with which they work than they would do were they only to learn applied mechanics, engineering, chemistry, mathematics, &c.

Are the technological courses of any service to the students who are not connected with the industries to which the lectures relate?—We cannot allot minds to subjects. Thus I have been surprised that Oldham has got prizes for dyeing, a trade that is not carried on in Oldham. The attendance in the classes shows what are the special talents of the student. We may say that the influence of the technological classes may be economical or educational, or both, and in any case useful.

Visited the PHYSICAL LECTURE ROOM and LABORATORY, working at Physics in connexion with the Science and Art Department.

Physical Lecture Room and Laboratory.

*Mr. Pythian* stated that two students working together perform a series of experiments in chemistry similar to those of the department. The black board and students note books are divided into squares as in the other departments, and thus the quick preparation of correct drawings is facilitated. By means of this system very complicated drawings are readily copied. The instruction in the practical class is conducted by means of written sheets describing the details of the experiment, and drawings of the necessary apparatus; these are then copied by the students and used by them in the practical work. The same system is carried out in the teaching of practical chemistry.

(*Professor Roscoe.*) Is the use of this set of Professor Guthrie's experiments common in Science and Art classes?—Yes it is general, but I think it is carried out more fully here than elsewhere. We try to make the science section as practical as possible. We also take practical questions given in previous years, and these have to be worked out with the apparatus. Each student comes one hour per week, and the latter portion of the hour is spent in copying out the details of the experiment ready for the next week's working.

Inspected class in BUILDING CONSTRUCTION taught by Mr. Ashton, about 50 students being present. The ART SCHOOL, in which young men and young women were occupied in freehand drawing from copies, and in drawing from the cast, was also visited.

Building Construction. Art School.

Appendix 83.

Oldham School of Science and Art, Class on Cotton Spinning.

Appendix 33. The Commissioners next inspected the CHEMICAL LABORATORY which is excellently fitted. Each student has a swinging seat and a drawn desk fitted with ink, &c., with cupboards beneath. There is one gas chamber to every four students and this has Bunsen flames inside. There are about 28 working benches, and these are used, at different times, by 60 students. All the students work experimentally in chemistry, going through the experiments mentioned in the Science and Art Directory. The more advanced students work at qualitative and quantitative analysis. In addition to the practical work, there are chemical lectures and the students work out chemical calculations. All are evening class students.

Oldham School  
of Science and  
Art,  
Chemical  
Laboratory.

(*Chairman to Mr. Phythian.*) When the students have gone through the system here in physics and chemistry, do they understand what they are doing?—They cannot go on unless they understand.

Then the system is not rote teaching?—It is as practical as we can make it. As far as they go, they have a real amount of precise scientific information?—That is so.

Do you attribute this to practical laboratory instruction?—In a great measure.

Could you do the same thing without laboratory instruction?—(*Mr. Richardson.*) We attempted it and failed.

(*Mr. Magnus.*) You could not do it without sufficient apparatus?—No. (*Chairman.*) Do the students attend regularly?—(*Mr. Phythian.*) So regularly that I have difficulty in arranging the double numbers, because I want to give the analysis students as long as possible.

(*Professor Roscoe.*) What have you to say about the practical examinations of the Science and Art Department?—I consider them a very great improvement; we have had here the practical examination in the advanced course conducted under the supervision of the local committee.

Have you any suggestions to offer respecting the working of this system?—I can only suggest a development of it, and a change every few years so that we are not kept to one ground. I myself have worked the directory arrangements to the minimum. The system we have of teaching practical chemistry and physics has been developed from the machine drawing.

Are you satisfied with the system of questions on practical work that is in vogue in the elementary stage in chemistry, or would you like actual practical examination?—I should prefer a practical examination in the elementary stage if possible.

Would it be possible to ensure a fair and honest report of the work?—That depends upon the watchers of the examination. We have a most rigid secretary and should feel able to undertake the practical examination in this institution. There would be no possibility of collusion here. The strict letter of the instructions is followed.

(*Chairman.*) What is the influence of the establishment of these Science and Art classes on the industries of the town?—(*Mr. Jas. Taylor, of the firm of Buckley and Taylor.*) Very beneficial I think. In the case of pattern makers, for instance, they understand their work better than they did previously. It has caused the men to be more intelligent workmen and to understand better the instructions given them and the object had in view in the work performed and they understand the working better. Our foreman draughtsmen are now all taken from the institution. Before the institution existed we used to get Swiss and French and Germans principally. Now there is hardly a foreigner in the town.

(*Mr. Richardson.*) I can confirm this statement. The working mechanics are much more intelligent. Now a man can be sent out to work and can transmit his views to the firm in writing, give sketches, and reason about matters; formerly the man would have had to return to the works and get personal instructions in all cases of difficulty.

Are the suggestions that they make to remedy defects more practical than before?—There is no doubt of that. Every man is equal in intelligence to what the master was before the school was established.

What proportion of your men attend these classes?—About 25 per cent. of the students are employed in our works. Almost all the young men of the works

attend. There are also older men, who could not go to Owens College Appendix 23.  
because too old.

(*Mr. Swire Smith.*) Are any special inducements offered to the young men of your works to attend these classes?—The only inducements are the South Kensington prizes and the Whitworth Scholarships. No pressure is put on the students; that is, only a moral pressure. If a man wants advancement he is asked questions bearing on his work at the science school, and the matter becomes one simply of qualification.

*Mr. Ernest Raynor* (manager at J. Braddock's Globe Meter works) stated that they had found since the establishment of the science school that it was a good deal easier for foremen to take charge of men than it was formerly. The men could be more readily trusted with a job and they understood what they had to do with less explanation.

Oldham School  
of Science and  
Art,  
Chemical  
Laboratory.

#### MESSRS. MATHER AND PLATT'S WORKSHOP SCHOOL.

Messrs. Mather  
and Platt's  
Workshop  
School.

Under the guidance of Mr. Mather, the Commissioners inspected the school room and examined specimens of the students' drawings there exhibited.

*Mr. Mather* stated that there are 68 scholars in the school, which is designed to provide science teaching for the apprentices employed in the works. No strangers are admitted. The drawings are of work actually in progress in the foundry. The teacher lectures upon them and explains and makes calculations, and the lads the next day at the works see the very thing they have heard about here. They are allowed to go through the shops in all directions with the teacher from time to time.

For the purpose of practical illustrations from work in process of construction, patterns, models, and details of machines are brought into the school from the workshops. The great feature is that technical instruction is imparted by the aid of objects being actually constructed in the workshops under the observation of the apprentices, and which are manufactured for sale. The parts of machines which are brought to the school for class instruction are seen by the students afterwards in their proper places in the whole machines.

(*Chairman.*) Can you give us your opinion as to the best method of combining instruction with actual experience in the workshop?—Undoubtedly the school should be part of the workshop, and form a department in which the apprentice must be compelled to serve a portion of his time every week after the ordinary hours in the workshop as a condition of his apprenticeship. A school incorporated thus in the workshops affords facilities for the acquiring of technical knowledge which no science school of the ordinary kind, apart from workshop practice, can possibly offer. The teachers here are draughtsmen in our own works, duly qualified, who by this teaching add to their ordinary income. Schools of this character are simple and inexpensive, and such as every large employer can establish.

*Chairman (to Mr. Jones, the teacher.)* Do we understand that the students make sketches from the objects themselves, or that they avail themselves of diagrams?—Sometimes from the pattern, sometimes from the object itself in the works, and sometimes from diagrams which I prepare of objects which are being made in the works. Where we have the sketches we have the patterns here, and sometimes ask the students to measure the patterns and see whether there are any mistakes in the dimensions.

The diagrams are not allowed to be copied?—No. The drawings have to be made to a different scale. The drawings serve only to give the student a general idea of what the thing is like, the students have to work from the dimensions given.

Do they make sections also?—Yes, they make sections of everything. There are in the sketches two views, and they have to make a third deduced from the two.

Appendix 58. You let them make a view, either a section or elevation, which is not shown at all in the drawing, and which they have to devise from what is on the sheet?—Yes. [Mr. Jones then exhibited a pattern and stated that he considered it an advantage to make the boys work to scale from the pattern as it teaches them to understand pattern making and moulding as well.]

Messrs. Mather and Platt's Workshop School.

These are patterns of casts actually made in the works?—Yes. The use of this collection of patterns is to show how the whole objects are cast with the use of cores, and it forms a part of our course of machine construction and applied mechanics. The pattern and the finished object are here placed together, so that the student can see the mode in which the finished cylinder is to be cast from the pattern by the use of the cores.

Do you think that the South Kensington models are behind the time?—No, I think that the models for the illustration of geometry are very good. We have never had that collection. We have never made application for it. With respect to colouring and finishing, I consider this a sort of luxury, and it must not be indulged in until the scholars can draw details well and understand them. This is the reverse of the practice followed in the ordinary schools. [Examples were shown of a student's work done in the class, where he had drawn incorrectly a bolt and nut in a plummer block; by the side of this drawing was placed one of a marine engine, coloured and shaded, which he was supposed to have done three or four years previously at a high-class boarding school. Since he became a draughtsman, he had been repeatedly shown the correct method of drawing a bolt and nut.]

(Mr. Squire Smith.) How many nights a week do the students come?—Two nights. Three hours on Monday, principally for lectures on applied mechanics, steam, and engineering. [Handed in to the Secretary copies of class examination papers and other papers]. I have test examinations once a session. Out of 25 students in applied mechanics I passed at the last examination 12 first class, and 12 second class.

(Chairman.) Will you allow me to ask you what your own education has been?—I was educated at Peter Street School till 11 years of age. Then worked at the bench as a photographic instrument maker. I attended the Salford Working Mens' College, learning drawing and mathematics at night, and obtained the gold medal there for geometry. This institution is similar to the Mechanics' Institution but smaller. The Secretary asked me to attempt the teachers' examination and after I had passed the examination I was induced to take a class by the agent of the Union of Lancashire and Cheshire Institutes. I have now been teaching 17 years. I taught at various institutions about Lancashire and Cheshire, until I found that under the South Kensington system of payment by results you cannot live by teaching alone, so I had to do something else in addition.

You are now employed as a draughtsman by Messrs. Mather & Platt, and you are remunerated for the instruction given here, by the grant from the Science and Art Department and the class fees?—Yes.

It has been alleged that there is no great inducement to take the upper standards, and that to pass students in the lower stage is more remunerative than to pass advanced and honours students. What is your experience?—My experience is that the elementary stage is the only one that pays for the labour expended.

Therefore, there is a tendency on the part of teachers to cast off those who have passed in the elementary stage, and to bring forward a fresh set of students?—Yes, that is the tendency of the present system. The honours stage is purely honour, both to student and teacher, and does not pay at all. In the last year I passed two in honours in geometry.

In your case this tendency is counteracted by a sense of duty to the firm?—I confess I never felt this tendency, not from any sense of duty to the firm particularly, but from a sense of duty to the earnest student. I feel proud to teach an honours student, and am at the present time teaching about 12 such students.

What is the advantage of the students being persons employed in the works, and being trained here rather than in science classes?—The advantage is that I know what each person is working at every day, and have the opportunity of pointing out something connected with the work he is doing. I make the teaching have an actual bearing on his every day work. The students are rewarded not only for proficiency in drawing but for regular attendance, and actual proficiency in their manual work. It is also a condition of employment that they should be regular in their attendance here.

Appendix 33.

Messrs. Mather  
and Platt's  
Workshop  
School.

(*Chairman to Mr. Mather.*) What advantage have the works derived from the establishment of these schools?—An incalculable advantage. We have to send out abroad yearly, one, two, or more, thoroughly competent men, who shall not be simply mechanics in the ordinary sense of the word, but who shall be able to turn their attention to any kind of mechanical work coming within their duties, whether they have done the work before or not. We had the greatest difficulty in finding such men, until we began to take them from this school, and since the school has been established we have been able to send boys at 20 to 21 to long distances from England, and to place in their hands work which they have not had much to do with before, and by their own intelligence they have made competent teachers of others, and given the greatest satisfaction. We have had cases of students not yet of age holding positions with wages of 4*l.* per week.

Do you apprentice your young boys?—We do not legally apprentice them. We have only their promise. They are earning wages all the time.

Do you find that they become good workmen at an earlier age because of their training in the school?—Undoubtedly. Little as I come into contact with the various individuals in the works, I have seen during the last few years a vast improvement in all the work these young fellows do, and more responsible work can be given them. Lads at 17 and 18 have work which before we would not have given to men under 25.

(*Mr. Woodall.*) Is this resented by the other mechanics?—Not in the least.

Do you employ a large number of men who are members of the Amalgamated Society of Engineers?—They are almost entirely so.

And they show no jealousy in any way of the systems you adopt, either of tuition or of giving early employment to boys when they are fit for putting on good jobs?—On the contrary, they seem to like it, and are pleased at the lads' progress.

Can you say the same with respect to the trades generally that are employed in your works?—Yes.

(*To Mr. Jones.*) Do you find that the foremen have any jealousy of you as a teacher?—There is no jealousy whatever. They are always ready to give me assistance as a teacher.

(*Professor Roscoe to Mr. Mather.*) Are you aware of any other works in the neighbourhood of Manchester, or even in Lancashire, where this teaching method is adopted?—I do not know of any.

The Commissioners were then conducted over the works by Mr. Mather, and the Chairman obtained the following statement from Mr. Thorp, general manager.

(*Chairman.*) What is the effect upon your workshop of the training which your boys receive in the school?—(*Mr. Thorp.*) Instead of requiring draughtsmen to look after every separate job, the young fellows who are growing up now, can make their own drawings, make their own patterns, and fit them together and erect them, where it used to require a separate man for each department. The men are most intelligent, and understand and can execute their work much better and at a much earlier age. We form thus our own foremen from the boys who have been in the school. We do not find any dissatisfaction or awkwardness with the trade union.

Appendix 88. MANCHESTER AND SALFORD BUILDING TRADES INSTITUTE FOR TECHNICAL EDUCATION.

Manchester  
Building Trades  
Institute.

The evening classes of this Institute were inspected by Professor Roscoe. The following is a concise statement of the rise and progress of the Institute, made by *Mr. Parnell* :—

During the year 1867 Professor Jevons brought forward the Scheme of Technical Education and laid it before the various trades of this country.

It was taken up by the Amalgamated Society of Carpenters and Joiners of Great Britain, and in various towns there was a strong movement made to inaugurate classes for teaching the technical portion in connexion with the various branches of the building trade.

In February 1868, the Executive Council of the Society decided to lend small sums of money to members in localities where a class could be commenced with a probability of success.

At the latter end of the month of February 1868, 12 members of the Society from the branches in the Manchester District, of whom the writer of this Report was one, formed a working Committee and canvassed the remainder of the building trades of this district for their support to the movement. The promises were such that a public meeting was called in April 1868, and was held at the Hulme Town Hall, Manchester, the mayor, Alderman Robert Mill in the Chair, supported by Mr. Jacob Bright, M.P., Mr. Scott Russell, the Rev. Page Hopps, Dr. Pankhurst, and other influential gentlemen who took part in the proceedings, at which resolutions were passed strongly approving of the step taken by the carpenters and joiners of Manchester, and promising their favour and support in carrying out the work suggested.

In the meantime a teacher had been engaged, and a class was started, which before the close of the first session, which covered a period of eighteen months, numbered 200.

In October 1869, the Institute became affiliated to the Lancashire and Cheshire Union of Institutes, which led to the classes being placed under the Inspection of the Science and Art Department at South Kensington.

The results of the first session as might be expected were not so favourable, (viz. 1869-70, 10 certificates), all the working parts of the machinery not being complete. But this did not daunt the Committee, who went to work with a thorough determination to succeed, and the results of the examination in May 1871 were more satisfactory, 60 per cent. of those presenting themselves for examination passing. The position of the members of this Institute being first in Building Construction and Drawing in this district, second in Plane and Solid Geometry, and first in 2nd Grade Practical Geometry. The results of the yearly examination held in May in each year are as follows :

1870-71, 18 certificates, 3 Queen's prizes, and 1 medal.				
1871-72, 22	"	8	"	1 honours certificate.
1872-73, 47	"	9	"	"
1873-74, 45	"	9	"	"
1874-75, 26	"	2	"	"
1875-76, 25	"	12	"	2 honours "
1876-77, 26	"	5	"	1 " "
1877-78, 19	"	3	"	"
1878-79, 21	"	4	"	"
1879-80, 10	"	1	"	"
1880-81, 14	"	2	"	"

The students of this Institute have also been four times successful in winning the special prize for Building Construction, given in connection with the Union of Institutes (viz., three first-class Advanced and one first-class Elementary).



The number of students who have joined the classes in each year are as follows: Appendix 3.3.

1868-69	-	-	200	1875-76	-	-	76	Manchester Building Trades Institute.
1869-70	-	-	100	1876-77	-	-	89	
1870-71	-	-	80	1877-78	-	-	69	
1871-72	-	-	82	1878-79	-	-	59	
1872-73	-	-	88	1879-80	-	-	79	
1873-74	-	-	107	1880-81	-	-	35	
1874-75	-	-	84	1881-82	-	-	40	

The number of those who have remained in the classes the whole of the session and were examined has been on an average one-third of those who have entered the class each session. Among many causes operating to effect this diminution of numbers is the uncertain state of the building trade at Christmas and New Year; it is also found that the interest in the class work diminishes after the first three months, many do not like to start at the bottom of the ladder and climb steadily up, forgetting that there is no royal road to learning. The name of "examination" as the time draws nigh also frightens others. This class draws all its members from the building trade solely, among which many are young men from country villages, where education has until recently been of a very poor kind, many not being able to spell or write in an ordinary way, so that it will be seen that it is an heavy up-hill task that this Institute has been doing with the limited amount of means at hand.

For the first six years the Master Builders' Association gave an annual subscription of 10*l.* which they then discontinued. Several other gentlemen gave a guinea a year for the first four years.

The Manchester Society of Architects have come forward and given prizes to be competed for yearly since the first year of its commencement. Other gentlemen have done likewise, but have dropped off one by one, and now the Society of Architects as a body, and two individual members, alone are donors of prizes.

This Institute was the first in this district to take up technical education in its entirety, by having a teacher who was practically and theoretically qualified to teach the subject of Building Construction. There have been a goodly number of students gone from this Institute who have taken up positions as foremen and clerks of works, and even become master builders.

It will be seen that this Institute has been in the field of technical education long before the City and Guilds of London, who are not only late in commencing their work, but go about it in a very clumsy way, spending more money on the students and examiners than on the teachers, who find the brains and do the work, besides unduly raising the standard without giving timely notice, and not only that, but requiring answers to questions that neither the teacher nor the workman student has heard anything about; in many cases putting an easy question in Honours and a more difficult one in the Advanced. The City Guilds profess to go on the lines of the Science and Art Department, but very soon turn the corner in their anxiety to save a little of that they make so much show of in their list of prizes, but of which they take care that those who do the work shall have a very small share for their labour.

The question may be asked why this Institute has fallen off so in the numbers attending, and in the number of certificates earned at the examinations.

The falling off takes place in the years 1877-78, when the building trades of Manchester and district had the prolonged and disastrous strike, since which the continued depression has acted to the prejudice of the Institute; nevertheless the turning point seems to have been reached, and with a steady trade this Institute will again take a leading position in this district.

When comparing the work of this Institute in its earlier days and the work it is doing now, and the competition it has to contend with, it is also to be remembered that the Science and Art Department has raised the standard year by year, and the majority of its members do not remain in

Appendix 33. the classes more than one session; this is an item which must be taken into account. It not only acts as a heavy drag on the Institute, but is a discouragement to the teachers in their efforts to impart a sound practical and technical education, yet with all these drawbacks the improvement in trade will cause an improvement in the attendance at the class, and aid the progress of the Institute.

Manchester  
Building Trades  
Institute.

Several of the master builders in Manchester (Mr. Edward Johnson, R. Neill and Sons, Mr. Southern, Mr. Tickle) have assisted the Institute materially since the year 1870 by sending some of the apprentices to the school and paying the fees for them. If the same course were taken by the other builders of the district the success of the Institute would be rendered certain. It is also to be regretted that although the master builders must of necessity be benefited by the education given to the students, they do not (with the exceptions above-mentioned) take more interest in the welfare of the Institute by visiting it at different times. Their presence even for a few minutes must be very useful and act as an incentive to the students, who would I feel sure feel more satisfaction if they thought their efforts to gain information were appreciated by the masters.

LIST OF MEMBERS of this INSTITUTE who have become Foremen, Clerks of Works, Science Teachers, and Master Builders.

		Trade.
W. Parnell	- Teacher and Clerk of Works	- Joiner.
W. Sharpe	- General foreman	- "
G. Burnett	- Shop	- "
J. W. Wilson	- Clerk of Works	- Mason.
A. Black	- Master Builder	- Joiner.
J. Graduki	- " "	- "
G. Barker	- " "	- "
B. Charlton	- " "	- "
J. Knight	- " "	- "
J. Wilson	- Science Teacher	- "
J. Atkinson	- " "	- "
L. Benson	- Master Builder	- "
A. Brooks	- Clerk of Works	- "
M. Marks	- Foreman Mason	- Mason.
W. Bigby	- " "	- "

In reply to questions put by Professor Roscoe, it was stated that the master builders do not patronise the Institute as well as they might do. More encouragement ought to be given to their apprentices to attend these classes, indeed the opinion was expressed that attendance should be made obligatory on the apprentices.

Out of 30 apprentices employed by one large firm, only five attend these classes, and two more attend the classes at the Mechanics' Institute. In another case, out of a total of 15 only six attend; in a third instance, four out of 10; and in a fifth case two out of six attend. Some of these are paid for by their employers, others pay the fees themselves.

Rooms of the Manchester Chamber of Commerce.

Friday, 3rd February 1882.

Mr. T. C. Horsfall's Evidence.

EXAMINATION of MR. THOS. COGLAN HORSFALL, Card Maker, Bridgewater Works, Pendleton.

(Chairman.) You are prepared to give evidence to the Commission on those branches of art which have a bearing on technical instruction?—  
Yes.

We shall be glad to hear any evidence you have to give on the subject?— Appendix 33.

May I first mention the branches of trade with regard to which I desire to speak? I am thinking especially of designers for pottery, for woven and for printed textile fabrics, and for what is known as art metal work. In all these businesses recourse is constantly had by designers to organic form. We find both in ancient work and in work of our own day, that designs consist mainly of reproductions and of combinations of the lines of organic form, especially of plant form, but often also of animal form. Now, the people of our large towns who form the majority of our population are evidently living under great disadvantage, as they have no beautiful organic forms before them, in their early years when taste is formed, when intellectual habits are created also, they very rarely see any of those beautiful forms which, throughout all ages, have been reproduced in design. Of course we know that not simply the familiarity with organic forms which the eye gains by resting on them is needed for training the taste and giving the knowledge which can afterwards be used for making designs, but that the eye must also be made perceptive of beauty of form. The Art Museum, on behalf of whose committee I have asked to be allowed to give evidence, sees the immense difficulties our people labour under, and it is trying to meet them in this way: it proposes to lend to every primary school in Manchester and Salford, and to every Sunday school, collections on loan of the best representations which can be got of those natural objects which the people of towns have opportunities of seeing on their occasional visits to the country, and if they choose to cultivate plants, which they have before them in their own houses. The committee do this, because they are convinced that observation of art and observation of nature are constantly interactive; that if you train a child to look with attention and with pleasure on the representation of any flower, when it sees that flower it will look at it with far more pleasure and closer attention than it would have done if its attention had never been brought to the representation of the flower; and after seeing with interest any natural object, it will look with increased attention at the picture when it is again asked to attend to that. The committee is forming collections of representations not only of flowers and the foliage of flowering plants and trees, and of the different grasses, but also of the animals, birds, and insects which are to be found in this country. They give especial attention to the commoner plants and the commoner animals, because these are, of course, the kinds the children have the most frequent opportunities of seeing. They have found the greatest difficulty in meeting with representations at once accurate and beautiful, and they believe it is very desirable that, under Government supervision and with Government aid, collections of drawings of the kind I refer to should be formed and offered, either at cost price or less than cost price, to the promoters of art museums and picture galleries throughout the country, and, independently of these, to the managers of schools.

Have you been in communication with gentlemen holding similar views in other parts of the country?—Yes; we have communicated with Birmingham, but not in a way that I think deserves record; nothing has come of our communications. We have placed our papers in the hands of several bodies and gentlemen who are now forming art galleries elsewhere, for instance, Mr. Nicholson, who is building an art gallery at Leek.

(Mr. Woodall.) What has been the result of these communications with Mr. Nicholson?—Two of Mr. Nicholson's sons came over here with their architect and saw the collections we have formed for the Manchester Art Museum, and we have had correspondence as to the choice of objects for the museum; but these communications have not been of a very definite character. No particular class of information has been carefully sought, inasmuch as Mr. Nicholson at present is confining his work to the building of the gallery, and he looks to other people to fill it.

(Chairman.) Have you met with any general response to your communication?—We have received expressions of approval and of desire to be informed of what works we find most suitable for our purposes.

Mr. T. C. Horsfall's Evidence

Appendix 38.

Mr. T. C. Horsfall's Evidence.

Have you held any communication with others on the subject of State aid towards the formation of these collections?—No. There is one plan that has often occurred to us, and by which we think that, in absence of State help, much good might be done, and that is, co-operation between managers of different art museums. We, for instance, have obtained some good original drawings by Mrs. Allingham and other artists, of common English wild flowers, and we should be very willing to have these copied either by chromolithography or any other process, and to exchange copies with the managers of other museums who have formed similar collections and are willing to give us similar aid.

(*Mr. Swire Smith.*) What number of these flower drawings of Mrs. Allingham's have you?—Only two by her; but we have also 181 by Miss E. Redgrave, and 20 by Miss E. G. Thompson.

Have you distributed any of these drawings in the district?—Not yet. We are much hampered for want of room, and have hardly room to turn over our collection. We are now forming collections for a few schools. I should like to mention, as an example of very useful work for our purpose, that we have a drawing by Mr. Burns Jones showing the decorative treatment of the common cherry, in which the foliage and the fruit are so arranged as beautifully to cover a paper which might represent a panel. Examples of that kind would be especially useful in schools, as showing how skilful decorative artists pass from the perfectly natural arrangement of flowers to conventional treatment.

(*Chairman.*) Can you suggest any means by which the Commission can be of service in promoting the objects you have in view?—Yes, I think you would help us greatly by suggesting that either the authorities of the British Museum or of South Kensington should be instructed to prepare large size plates containing representations of English flowers and foliage and English birds and insects.

Are you of opinion that the managers of art collections in various parts of the country would co-operate with you in laying similar views, either before the Commission or before the departments named?—I am strongly of that opinion. But this opinion is an opinion merely, and is not based upon a knowledge of the wishes of similar bodies elsewhere.

Would you undertake to correspond with them?—Yes, with pleasure.

You will readily understand that, if your views met with the approval of the managers of art galleries and of museums in various parts of the country, that these views would have more influence than representations from a single committee merely?—Certainly.

(*Mr. Woodall.*) Are you aware that collections of insects, &c. of this kind are already in preparation at South Kensington, and are being reproduced by chromolithography, for schools of art and local museums in connection with schools of art?—I was not aware of that; but, though parts of the collection would have some value for our purpose, I think they would be the least valuable, as the insects would not be selected for the beauty of their form. Our object is to train the children to perceive beauty and to delight in it.

(*Chairman.*) Would it be sufficient for your purpose if, from amongst these objects of which representation has been undertaken, and of which copies are to be prepared, a selection could be made suitable for the object you have in view?—Yes, if the collection contains suitable material for selection. But we should require to prepare a very large number of representations, as we desire that every school should be provided with a permanent collection of representations of common English flowers.

For that purpose it would be necessary that they should be reproduced in a very cheap form. Have you any suggestion as to how this could be accomplished?—Chromolithography is not a very costly process. If that were carefully done I think it would answer the purpose.

In point of fact, a selection of common and beautiful forms from amongst those which we are told are being prepared in South Kensington would answer your purpose?—Yes. Flowers and foliage would be very valuable to us.

(*Mr. Swire Smith.*) Is Mr. Horsfall aware that already, under the arrangement of the 50 per cent. grant made by the Department, a variety

of flowers can be purchased, not only as original specimens, mounted and described botanically, but also in representation, through Chapman and Hall, and probably other publishers? I know cases where certain specimens not included in the South Kensington catalogue have been granted by making special representations.—I was not aware of this.

(*Chairman.*) That would have to be in connection with local museums, and not with schools?—(*Mr. Swire Smith.*) Yes. I remember once an instance in which a grant was asked of something which had been seen at Paris. I believe one model was sent to the Department, and they accepted this and gave the grant, although the model had to be bought from a Paris publisher.

(*Chairman to Mr. Horsfall.*) In what way could the State ally itself with these committees? Would not the place of application be the Committee on Education rather than the Science and Art Department, because you want them to be for the use of the elementary schools?—That would be so.

Would you propose that the special regulations for the custody of objects furnished by the Department of Science and Art at a reduction of 50 per cent. should be so far modified as to enable you to circulate these objects amongst the primary and Sunday schools of the district?—Yes. The art museum would be willing to hold itself responsible for the custody of the materials.

Mr. Horsfall then withdrew.

#### VISIT TO LIVERPOOL, Monday, February 6th, 1882.

The Commissioners met at the Picton Reading-room at half-past nine.

The Commissioners were received by Sir James Picton, Mr. Edward Samuelson, and the officers of the Library Committee.

Sir J. Picton handed in the following statement:

#### CITY OF LIVERPOOL.

STATEMENT of the INSTITUTIONS for the promotion of LITERATURE, SCIENCE, and ART supported by the CORPORATION.

#### FREE LIBRARY.

This was initiated in 1850, when a committee was appointed by the Council, which reported favourably, and at a public meeting the sum of 1,650*l.* was subscribed to make a commencement. The library was opened in October 1853 in a building in Duke Street, purchased and altered by the Corporation at a cost of about 3,500*l.* In 1851, an Act of Parliament was obtained establishing the Free Public Library and the Derby Museum, and authorising the levy of a rate of 1*d.* in the pound for their support.

Sir William Brown then undertook the erection of the building, which cost about 40,000*l.*, including the fittings. The land appropriated by the Corporation for the Library, Museum, and Gallery of Art cost about 20,000*l.*

The present Library was opened in 1860.

The condition of the Reference Library is as follows:

Volumes in the Library	-	74,830
Issues during the year	-	577,772 vols.
Periodicals	-	292,944

Total issues	-	870,716
Per week, 16,744.		

Appendix 22.

Mr. T. C. Horsfall's Evidence.

Liverpool,  
Sir Jas. Picton's  
Statement.

Appendix 33. The accommodation being insufficient, a new reading room, called by vote of the Council the Picton Reading Room, has been erected by the Corporation at a cost of 25,000L.  
 Liverpool,  
 Sir Jas. Picton's  
 Statement.

LENDING LIBRARIES.

Of these there are two, one in the north, the other in the south district of the city.

The number of volumes is 43,285.

The volumes issued during the last year were 423,051.

DERBY MUSEUM.

The natural history collection, said to have cost over 50,000L, was bequeathed by the 13th Earl of Derby, and has been very materially augmented since.

MAYER MUSEUM.

This collection of historical art, in many respects unique, was presented by Mr. Jos. Mayer, F.S.A., and is located in a building adjoining the Derby Museum.

More recently an ethnographical collection has been added, and a separate building provided attached to the Walker Art Gallery.

WALKER ART GALLERY.

This building was erected and presented to the City by Sir Andrew Barclay Walker at a cost of 36,000L.

It now contains a valuable permanent Gallery of Paintings, and is the locale of the annual exhibition of Works of Art. The amount of sales of pictures exhibited in the Autumn of 1881 was 12,210L, and the amount for admissions and catalogues 3,044L.

The profits are devoted to the purchase of works of art.

An extension of this building is now in progress, at a cost of probably 11,000L to 12,000L.

FREE LECTURES.

These have been in existence many years, and usually consist of a series of scientific lectures at the commencement of the winter, followed by a course of popular lectures on a variety of subjects.

The attendance has been so large and increasing that the Corporation have constructed, under the Picton Reading Room, the Rotunda Lecture Room, so called from its circular form. It is calculated to hold 1,100 persons all comfortably seated, but it has frequently accommodated 2,000. Since its opening on January 4th, 1882, it has been exceedingly popular and has been crowded sometimes to excess.

There has been expended in buildings and land connected with the institution about—

	130,000
The Derby Museum - - - -	50,000
The Mayer Museum - - - -	50,000
	<u>230,000</u>
Outlay on the whole - - - -	<u>230,000</u>

The annual expenditure on the staff and purchase of books and specimens is 13,000L.

Besides the primary objects of the Institution, accommodation is provided for other kindred organisations:—

The School of Science.

The Civil Service Examinations.

The Oxford and Cambridge Examinations both Male and Female.

The Numismatic Society.

And occasional meetings for various purposes.

## THE NEW UNIVERSITY COLLEGE.

The Corporation have recently voted the sum of 30,000*l.* for the purchase of land and buildings for this purpose. Appendix 33.

Liverpool,  
February 6th, 1882.

J. A. PICTON,  
Chairman.

Liverpool,  
Sir Jas. Picton's  
Statement.

The Commissioners first proceeded to inspect the Brown Museum and the Picton Reading Room.

Sir James Picton explained the system on which the library and reading-rooms are conducted. The Picton Room, which is 100 feet in diameter, of circular form, is supplied with the electric light.

They next proceeded to the Walker Art Gallery, and thence to the Rotunda Lecture Room, underneath the Picton Reading Room, which is used for popular science lectures and cognate purposes. The room is peculiar in design, having been excavated mainly out of the solid rock.

The following statement respecting the introduction of science teaching into the elementary schools in Liverpool, was made to the Commission by Mr. Edward W. Hance, clerk to the Liverpool School Board.

## SCHOOL BOARD STATEMENT.

With a view to the provision in the curriculum of their schools of some subject specially calculated to awaken and exercise the observing faculties of the children, the Liverpool School Board, acting on the advice of several eminent scientific gentlemen, in March 1877, resolved to introduce the systematic teaching of elementary science into their schools. The branches of instruction were selected from the limited number of science subjects included in the fourth schedule of the New Code of that date, viz., mechanics (or, the principles of natural philosophy) for boys, and domestic economy for girls. The instruction given is necessarily based on the syllabus of each subject as set out in the schedule, in order to qualify the scholars to earn grants under the Education Department; but in each case the subject, as arranged in the code, has been modified and extended so as to enable it the more readily to be taught by experimental demonstration to large classes of children. Liverpool School Board Statement.

The method of teaching the subjects, which has been found by experience to be capable of producing very beneficial results to the scholars, is to combine ordinary lessons by the teachers of the school, with a system of experimental demonstrations given by means of specially appointed demonstrators. The apparatus required for the demonstrations is kept at a central laboratory, and is transferred from school to school as required, by means of a light hand cart. In this way each demonstrator is able to give from 18 to 20 demonstrations per week. And in order to simplify the arrangements for the demonstrations as much as possible, by providing for the same demonstration to be given in several schools in succession, the Education Department were, at the commencement of the scheme, requested to provide for the school-years of the different schools to end as nearly as possible at the same time; and this was carried out so far as to admit of the schools being arranged in two groups, the annual examinations of which fall in the autumn and spring respectively. In the case of domestic economy, the demonstrations are given only every alternate week, and the same is the case in the second stage of mechanics (taken by the Fifth Standard), but to the Fourth Standard, just commencing the subject of mechanics, one demonstration is given every week. In the intervals between the demonstrations, the teachers of the respective classes, who are required to be present at the demonstrations, are expected to go over with the children the subject of the demonstration; and in many instances their lessons are illustrated by simple experiments. And in order to enable the teachers (the larger number of whom have unfortunately had no special training for the subject) to perform their

Appendix 33.  
 Liverpool School  
 Board State-  
 ment.

portion of the work the more satisfactorily, a simple text book has been specially prepared, containing reading lessons on the subjects of the demonstrations, and exercises to be worked by the scholars. The demonstrations have been given in several of the other elementary schools of the town, not under the Board, on payment by the managers of the schools, of a proportion of the expenses.

At the present time there is one chief demonstrator, who has also to organise the instruction, and two assistants.

The cost of the apparatus used in the school demonstrations for the five years during which the scheme has been in operation amounts to about 120*l.*, many of the articles having been provided in duplicate in consequence of the large number of classes.

That the introduction of this additional teaching into the schools has not, to say the least, been attended with an injurious effect on the ordinary subjects of instruction, is shown by the per-centage of passes in those subjects for the last few years:

In 1873-4 the per-centage of passes in reading, writing, and arithmetic, was	74.4
1874-5 " " " "	74.5
1875-6 " " " "	74.4
1876-7 (the year in which class-subjects were introduced)	79.0
1877-8 (the year in which science instruction was introduced)	85.59
1878-9 the per-centage was	87.1
1879-80 " " " "	88.4

The examinations in mechanics and domestic economy as held by H.M. Inspector consist merely in the answering in writing of three or four questions, and do not, as the inspectors themselves remark, adequately test the work actually done. This is especially the case in Standard IV., where the inability of the children to express themselves satisfactorily in writing is a great disadvantage to them in these examinations. Notwithstanding, however, these drawbacks, the per-centage of passes in the last examination in mechanics was, in Standard IV.—58.6, in Standard V.—75.2, and in Standard VI.—76.3.

Professor Stuart of Cambridge, who in December 1879 examined the scholars for the Liverpool Council of Education Scholarships remarked in his report.—“In two or three of the essays an amount of accurate scientific knowledge was manifested sufficiently considerable to attract my attention; and on further inquiry I found that the boys in question came from schools in which special scientific instruction has been given by the School Board. It seems not only to have been accurate and useful, but also to have laid hold of the boys’ imaginations and interested them.” In 1880, the School Board requested Professor G. Forbes, of Glasgow, to examine the scholars in mechanics, with a view to ascertain whether the system of instruction pursued was producing good results. Professor Forbes, after a very careful examination, reported to the Board as follows:—“In all stages a great deal has been done, and the intelligence of the boys developed by the system pursued. With some boys I was quite surprised to find so much clear intelligence and comprehension of the subject in boys so young \* \* \* I can positively assert, that by the present system some good results have been obtained, a few being quite remarkable.” Of the first stage he says,—“The boys in these classes being very young, and having had little previous opportunity of educating their faculties, have improved their minds greatly by the study of mechanics.” Of three particular schools, by no means attended by the best class of children, he says,—“These three schools quite surprised me; if the schools could all be brought to this state of perfection, the School Board would have very much on which to congratulate themselves.” At the same time, he pointed out several details needing further attention, and gave many valuable suggestions as to the mode in which the system might be improved.

In addition to the instruction given to the scholars, special science



classes in connexion with the Science and Art Department have been arranged for the pupil teachers, so as to gradually train those to take an intelligent part in the work in the schools. About 70 male pupil teachers attend the central classes in mathematics acoustics light and heat, and electricity and magnetism; and about 100 female pupil teachers are under instruction in animal physiology. A short course of lessons in mechanics is also given each year to the male pupil teachers.

Appendix 29.

Liverpool School Board Statement.

Mr. Hance was questioned in detail as to some of the arrangements of the School Board. He said: We have in Liverpool a conference of school managers, representing all kinds of elementary schools of every denomination. The conference was established in the first instance, to prevent that removing of children from school to school, which was so detrimental to their effective education and so unsatisfactory as to the condition of the schools themselves. It is quite clear that if you have a number of fluctuating children, they get no good by going from school to school, and they interfere very much with the continuous progress of those who do remain. To bring the improvement about required uniformity in hours of instruction, uniform holidays, and so on. Having secured uniformity in these various directions, other steps were taken to secure punctuality. At first, all the schools in union closed their doors at half-past nine o'clock; now it is a quarter past nine; and it is remarkable how few children are now shut out on that account. Then the conference has promoted the introduction of penny banks into many of the Liverpool schools. This is a distinctive feature of Liverpool school work. They have also introduced arrangements for instruction being given in the schools with a view to the prevention of cruelty to animals. To-day they held a meeting and passed a resolution with a view to check the spread of contagious and infectious diseases in schools, by mutual arrangement and by communicating with the medical officer of health. This, we hope, will induce some considerable improvement.

Mr. Hance's Statement.

Are you introducing uniform teaching?—We are trying to do so. For instance, last year there was a resolution brought forward in favour of introducing class subjects on the same scheme throughout the town, so that if any child went from one school to another it would drop into its place, and what had been done would not be lost.

Are the teachers included in your conference?—Representatives of the teachers' associations are included. There are three teachers' associations here and they are invited to send two teachers each. Then the collective instruction of the pupil teachers has received great assistance by means of this conference.

Are the denominational schools joining with you in the instruction of pupil teachers?—The Council of Education has established a college for the instruction of pupil teachers in voluntary schools, similar to that which the board has had in operation for some years past. The subject has been ventilated so often at the conference of school managers that the managers have got stirred up to utilizing the College which has now been provided.

Then has the board managers for each school?—All but one. They always keep one school in their own hands, the newest school, under the control of the school management committee.

For the others then they appoint managers?—Yes.

Being members of their own body?—No very few. The management and considerable powers are delegated to these managers, and they give a great deal of assistance.

What kind of powers?—The selection of teachers, for instance, that is the most important.

They select teachers although not members of the Board?—Yes sir, but the board's inspectors are always present when they make their selections, and assist them in their selection.

In fact they would have no control over the schools unless the teachers knew that they were amenable to them, but they would act on the board's recommendation?—Yes on their recommendation generally.

The Board, in fact, delegates its functions to them?—Yes.

## LIVERPOOL COUNCIL OF EDUCATION.

MR. CHRISTOPHER BUSHELL, examined.

(*Chairman.*) What is the name of the institution of which you are the president?—The Liverpool Council of Education.

What are the objects of the Council of Education?—To associate the elementary schools with the secondary schools; we begin by a system of prizes and awards, which end in scholarships, by means of which we connect public elementary schools with the secondary schools.

What are the secondary schools which receive your scholars from the primary schools?—The Liverpool College and the Liverpool Institute, each of them having a girls' school.

And have you a system of prizes and exhibitions by which scholars from the elementary schools become students at the secondary schools?—

Yes; first of all we begin by securing by every means in our power thoroughly general and punctual school attendance. That was the first object we had in view, because, when we began our work—I was the first chairman of the first School Board—we felt that it would be impossible by compulsion to secure our object, because we found the system almost broke down in consequence of the number of persons we had to prosecute and therefore we established this scheme of attractive awards, which am thankful to say has been extremely successful.

Besides this, then, you have a system of exhibitions?—We have; by competitive examination a certain number of the boys and girls are sent to the secondary schools. We have no limitation as regards the school or the number of candidates they send up for competitive examination. These are first subjected to a paper examination, and then afterwards a certain number of selected candidates to a *viâ voce* examination. The examiner, who is always a distinguished man, is always thoroughly independent, belonging either to Oxford or Cambridge. We always aim at having an independent man who knows nothing at all as to where the children come from, and they are examined by number. Sometimes we have been indebted to Manchester for this assistance.

Are your scholarships held at schools out of Liverpool?—No, they are connected simply with the secondary schools of Liverpool.

Then do you go on to the universities?—We have now two boys at Oxford, but we do nothing beyond putting them into the lower school of the Liverpool College or the Institute, and then by their own industry and ability they receive their promotion to the upper school, and thence to the universities. The authorities of New College, Oxford, were so struck by the ability which one of our boys exhibited in the Oxford and Cambridge examination—he having gained the Geography gold medal—that they presented him with an exhibition unsolicited.

But it was through your instrumentality that they passed through the secondary schools?—Yes, those boys' circumstances were such that they never would have passed beyond the elementary school but for our help.

(*Professor Roscoe.*) I think you sent one of your pupils to Owens College, Manchester?—Yes; because we had no institution in Liverpool where the boy could receive that higher instruction which it was desirable that he should have, and so we sent him to your college.

(*Professor Roscoe.*) I can report on his being a most intelligent and hard-working man.

(*Mr. Bushell.*) He was first in all England in one subject, if I remember rightly.

(*The Chairman.*) Will there be any connection between the new University College that you are now establishing and your schools?—Well, we hope that instead of having to send those boys whom we now send to the great Universities of Oxford or Cambridge, London or Manchester, they will many of them pursue their higher education at our new University College, while resident at their own homes. They will now have the choice of the higher teaching which before they were obliged to obtain elsewhere.

That will be done by means of scholarships to the secondary schools, and thence to the University College; that will all be done by your aid?—When

the boy passes; the scholarships are for three years, and at the end of those three years the Council of Education determine whether the boy has shown such ability and industry as renders it desirable that his education should be continued longer, and if so we go on until the boy is ready for the University.

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Liverpool  
Council of  
Education.

Then do you propose to retain him at the University or the University College?—The Council itself does nothing beyond the supplying of the scholarship; but we have the means of giving further voluntary help.

There is one more question I wish to ask you, Mr. Bushell. You were the first chairman of the School Board, you say; the attendance at the board schools has increased enormously through your exertions?—No, I did not say that; I said by the united efforts of the School Board and the Council of Education, the Council of Education offering attractive awards, and the parents having the knowledge that the school board has compulsion at its back. These two things combined have had the most wonderful effect.

## BUTLER STREET BOARD SCHOOLS.

MR. S. G. RATHBONE (Chairman of the Liverpool School Board) received the Commission at the School.

Butler Street  
Board Schools.

(*Chairman to Mr. Rathbone.*) What is the total number of children on the books of the school?—About 850.

And to how many of these do you teach science?—We teach science in the Fourth Standard.

Throughout the school, to all the children?—To all the boys.

To the girls at all?—Only animal physiology.

The Commissioners were then conducted to a class-room where Mr. Hewitt, the science demonstrator to the School Board, was giving a lesson to boys of the Fourth Standard on the thermometer, and they listened to the mode of imparting instruction. At the conclusion of the lesson Mr. Hewitt, the science demonstrator of the school board, was examined as follows:—

(*Chairman.*) When had the boys this examination last, Mr. Hewitt?—They never had this same lesson before. We are coming to the end of their work, and revising a little. It would probably be last September or October when they had the thermometer, but it was then given only as a part of a general lesson on the expansion of liquids.

Then how have they gained the information on the thermometer which they have now exhibited?—Partly by the teacher's recapitulation of the subject of the experimental lessons, and partly by a little book-reading.

Is the teacher present during your demonstration?—Yes, as a rule.

And after your demonstration is over the teacher repeats it in your absence?—Yes, in the course of the week, and he has a little apparatus to help him.

The same as you bring here?—A little different.

This apparatus belongs to you?—Yes.

You go round to the schools giving lessons to the boys?—Yes.

How many do you give a week?—Four a day, or 18 a week.

Similar in character to those that we have heard?—Yes.

Are you satisfied with the system of tuition? Do you think that the masters are able, after seeing your demonstration and learning the way in which you bring the subject forward, to repeat it satisfactorily?—In the majority of cases.

But it requires some special education, on the part of most people, to teach in science?—We are under a disadvantage in having a number of new teachers just come from a training college, and it will be some little time before they can help us.

Do they use the science classes now being held in the town?—Some do. But it is not made compulsory by the school board?—No; but in some of the cases the head masters almost make it a condition with the assistants that they should qualify themselves.

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Liverpool School  
Board, Butler  
Street Schools.

Will these boys be presented at the Science and Art Department examinations?—No, at the Government (Whitehall) examination of schools.

They will take science as a specific subject?—Yes.

Can you give any opinion as to the science instruction given in the training colleges?—The science instruction given in the training colleges does not correspond to what I give here.

How does it compare?—They take chemistry, physiology, and other subjects, but very seldom mechanics.

What do you call this lesson?—Natural philosophy I should call it, but it is called mechanics in the code.

Do you mean to say that mechanics is not taught in the training colleges?—In scarcely any.

Although it is a main subject in the Code regulations?—Yes.

And yet it is not taught in the colleges which have for their object the preparing of elementary teachers?—No, it was taught in the Borough Road training college for some time. They make it almost compulsory to have some science teaching.

You say that your masters generally are not well trained in science; what steps are you taking to supply that defect? I believe you are training your pupil teachers?—Yes, we are training the pupil teachers.

Will you state what is the system you pursue to secure that?—We require the pupil teachers to attend a science class one evening in each week, and the subjects we have taken so far have been physics, with a short course of special mechanics; in the case of the girls they take animal physiology; and they are as far as possible presented at the May examinations of the Science and Art Department.

Do you begin with that in the first year of their apprenticeships?—Yes, with the boys, but with the girls not until the second year.

Do you continue it with the boys throughout the course?—Throughout the course of the four years.

By whom is the instruction given?—By myself.

By yourself exclusively?—We have a class in mathematics which is taught by a master from the Liverpool College, who has been specially appointed.

To pass away from that, there is one other question I want to ask you; you are teaching science in the Fourth Standard?—Yes.

And taking it as a specific subject?—Yes.

The Commission would be glad to know what is your opinion as to the lowest standard in which science teaching can be efficiently introduced?—I should like to introduce it in the very lowest standard in the schools.

By a system of object lessons I presume?—Yes.

Leading up gradually to some specific subject?—To some specific subject, yes.

There would be no difficulty in taking the children when they left the infant school and giving them some rudimentary teaching in science?—I do not think there would be any difficulty whatever.

Is that system conducted in the Liverpool School Board?—No; but we are hoping to do it when the New Code is settled.

(*Professor Boscoe.*) Can you tell us what influence this teaching has had on the boys?—I have no hesitation in saying that it quickens them, and makes them sharper and more intelligent.

And the teachers are of that opinion?—Yes.

And as regards the teachers, is science a favourite subject or a difficult one with them?—I have never found any difficulty in any teacher taking the lessons.

Then as to the boys, do you find it a popular subject with them?—There is no doubt about that.

Is there any difficulty in finding time for the science teaching, or does it trench at all upon the literary and other subjects, so as to make it more difficult for them to advance from standard to standard?—Not with the amount of science teaching that we give; not at all.

The Commissioners were next taken to a room where boys of the Sixth Standard were examined by Mr. Hewitt on the principles of the pulley.

(*Professor Boscoe.*) How many lessons on the pulley have these boys had?—Three lessons on the pulley.

From the master here?—I have given them one lesson first; their own master has given them the others.

(*Chairman.*) When you stated before, that you gave 18 lessons a week, you meant that those were the number given by yourself, personally, not the entire number of lessons given by the central department?—No, sir; there are three of us, and I may say that we give from 40 to 50 lessons a week.

That is in addition to the tuition given by the ordinary masters of the classes?—Yes.

Your system is to give a section of the science teaching by means of the central department which supplies teaching to all the schools?—Yes, supplementing the teaching of the masters of the schools, by special experimental demonstrations.

Now as regards apparatus, what is your system? Is there apparatus at each school?—No. We have one set of apparatus which we transfer from school to school; and in the fourth standard there is a small set of apparatus for each master to use with the lesson at each school, and we have found that so valuable that we shall probably supply a little for all the standards.

Can you give us the cost of the transferable and stationary apparatus?—The stationary apparatus per school has been about 25s., the apparatus we transfer has cost, I should think, about 50l. to 60l.

Chemistry will be made one of the specific subjects in the New Code?—It cannot now be taken as a specific subject. Chemistry is not at present recognised. You cannot take it now except as a class subject; and as a class subject they propose to put elementary science in along with grammar and geography, and only one can be taken, so it might almost as well not be in at all.

But then under the proposed New Code you may take science as a specific subject in the fourth standard?—No, not as a specific subject. Under the proposed New Code we shall not be able to take it until the Fifth Standard.

Then under the present code can you?—We can take it in the Fourth Standard.

And you object to excluding it from the fourth standard?—Yes, as far as the teaching is concerned. Our difficulty is as to the examination.

How do you mean?—The inspectors inspecting the Fourth Standard children expect them to give their answers on paper almost equal to the higher standards. Although they are difficult things to explain, they expect them to explain on paper.

Your difficulty then is that the examination is written instead of oral? You contend that these boys who have answered so well should not be expected to write them down in proper language?—That is so.

Do you believe that that view has been the cause of their excluding it from the Fourth Standard?—No. I do not know what is their reason for it, but that is the difficulty according to my experience.

When are the pupil teachers taught?—On Friday evenings.

(*Professor Boscoe.*) What is the average number of your class of the Sixth Standard?—The Sixth Standard boys form a small class, but in one class we have 40 or 50.

In the Sixth Standard?—Yes, 40 to 50. In one or two cases we have less than that, but they are increasing in numbers every year.

(*Mr. Magnus.*) I should like to ask whether in any of the board schools any handicraft is taught, any carpentering or joinering, or in any way in which the hands are employed?—No, nothing whatever.

Nothing except drawing?—Nothing except in the infant schools with the Kinder Garten system, which is forgotten after they leave the infant schools.

Do you think it feasible to introduce handicraft training in the board schools, or that they should have a few hours a week in learning carpentering or joinering or other handicraft?—I do not see how we could do it until they have passed the Sixth Standard.

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 Liverpool School  
 Board, Butler  
 Street Schools.

But apart from the regulations of the code, do you think it a good thing yourself?—No, not as part of the school course; if we could keep them at school after the sixth standard there would be ample opportunities for training of that kind.

But up to that time do you think there is time, or would it interfere with their literary studies?—I think that lessons of this kind with common objects would be more valuable.

If Standard IV. is withdrawn in the New Code, what proportion of your science teaching work will fall to the ground?—More than half of the children would be withdrawn from the instruction. We had at the beginning of this year about 3,900 children under this instruction, and of these there were 2,300, I think, in the Fourth Standard, and these children will not now receive science instruction in consequence of the alteration in the Code.

That is unless the board arrange to have it, and sacrifice the grant?—I mean that of course, we shall have no recognition from the department.

That is, no recognition will be paid to it?—No.

Then actually the New Code, so far as science instruction is concerned, is a retrograde step?—Yes, as regards Standard IV. For it will be observed that more than half of the children are in Standard IV., and will therefore by the provisions of the New Code of 1882 be excluded from the specific subjects of the code. In many of the schools the great majority of the children leave school soon after passing Standard IV., and not more than one-sixth remain until they have passed Standard VI. This new regulation of the code will have the effect of allowing many children to leave school before they have even had the opportunity of commencing to share in this systematic science instruction, and the great majority of the remainder before they have fairly started with the subject. Experience shows that the results of such teaching are eminently cumulative, that a scholar for example makes much more rapid progress in his second than in his first year.

That is so?—Yes. The object lessons are somewhat strongly emphasised in the infant schools. I think that is a decided advantage.

But will the object lesson take the place of the lessons that you have been giving?—No; that is only in the infant school.

Then the children after having passed the infant stage, and until they have passed the Fourth Standard, will not receive any science instruction?—No special science instruction, unless something is done in connexion with the physical part of their geography.

Or object lesson instruction?—The object lesson instruction is supposed to be carried through the school, but the department take no notice of object lessons in schools (except in infant schools) and then until we get to the specific subjects in the Fifth Standard, there will be no recognition of science teaching at all, unless they sacrifice grammar or geography.

Which they are not likely to do?—No. It might be possible, however, to arrange a system of science instruction which should be commenced by means of suitable object lessons in the infant school, continued either as advanced object lessons, or as simple experimental demonstrations on such subjects as evaporation, condensation, &c. in connexion with the physical geography in the lower standards, and leading up to a specific science subject in the upper standards.

Granny Street  
 Schools.

#### GRANNY STREET SCHOOLS.

These schools are situated in the south district of Liverpool. They are the latest, and considered to be the best in general design, under the supervision of the Liverpool School Board. They have a nominal accommodation for 1,154 children and they have been built at a cost exclusive of land of less than 10*l.* per head of the accommodation stated.

## PLEASANT STREET SCHOOLS.

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Pleasant Street Schools, situated in a central district of the city, where the transferable scientific apparatus was ready for inspection.

Liverpool School Board,  
Pleasant Street Schools.

Mr. HEWITT met the Commissioners, and was further examined.

(Chairman.) Is this your laboratory?—Yes.

Is it where you teach the teachers?—Yes, mainly pupil teachers.

What course of instruction do you go through per day or per week?—One lesson per week, on some subject of physics.

How many have you under instruction?—At the present time about 70, divided into two classes.

What length of time do they undergo instruction?—Two hours per week.

That is during the winter?—From September to May.

For two hours during what period of time?—They come during the whole of their course of four years.

So that at the end of that time they get the advanced certificate of the Science and Art Department in two or three subjects?—Three subjects, acoustics, light, and heat one subject; electricity and magnetism another.

And mathematics; mathematics including mechanics?—No; we only teach mathematics.

Have you any machinery for teaching mechanical drawing to the pupil teachers?—None whatever. There is only mathematics, except my own teaching.

Mathematics are taught by a gentleman from the Liverpool College, I understand?—Not at present; but the present teacher is a wrangler.

Do you teach acoustics, light, and heat by experiment?—Yes; the Department insists upon having a certain minimum of apparatus for experiments in connection with the lessons.

Then it is under Departmental inspection?—Yes.

## PUPIL TEACHERS' COLLEGE.

Mr. S. G. RATHBONE examined by the Chairman.

Will you kindly tell us what aids you have to the instruction of pupil teachers?—With a view to give their pupil teachers, by means of collective classes, the benefits of a broader kind of instruction than they could otherwise receive, the Liverpool School Board, by the advice of H.M. Inspector, established early in the year 1876 a college for its female pupil teachers; and about two years later extended similar advantages to its male pupil teachers. The college is managed by a Council appointed by the Board. The premises for the female teachers consist of two private houses, which one of the members of the Board has placed at the Board's service free of rent; the male teachers are accommodated in rooms specially set apart at one of the Board schools. The subjects taught are arithmetic, grammar, music, history, and (for males only) Latin, mathematics, magnetism and electricity, and acoustics, light, and heat, and (for females only) the art of teaching, French, domestic economy, and animal physiology. The lecturers were at first selected without regard to their being certificated teachers, but owing to recent changes in the wording of the Education Code, they are now chosen from the certificated head teachers of the Board and other schools in the city. For music, Latin, and science subjects, however, the choice is not limited to such persons.

The classes meet for instruction as follows, viz. —

Females.—First year pupil teachers. On Wednesday afternoons from 2 to 6.30, including 1½ hours for tea and recreation.

Others.—On Tuesday evenings from 5 to 8, including one hour for tea and recreation; and

All meet on Saturday mornings from 9.30 to 12.15.

Males.—All meet on Friday evenings from 6 to 8.45, including three-quarters of an hour for tea and recreation, and on Saturday mornings from 9 to 12.30.

## Appendix 33.

Liverpool School  
Board,  
Pupil Teachers'  
College.

For facility of their instruction the pupil teachers are divided into two groups, according as the schools to which they respectively belong are examined in the spring or the autumn, and in each group are classified according to the years of their apprenticeship. Out of private funds tea is provided at both centres for the pupil teachers, so that the inconvenience and loss of time is avoided, which would necessarily occur if the teachers had to go to their homes for this purpose before coming to the classes. Central reference libraries (including a valuable collection of scientific works presented to the Board by a local science committee) have been provided for the pupil teachers, and a small sum per head per annum is devoted by the Board to their extension. The female pupil teachers have the privilege of practising upon the pianos which are provided for the use of the teacher of vocal music. Omnibus tickets are given from a private source to those pupil teachers who come from a distance, but only on condition of their regular attendance at the classes. By means of these college classes the following advantages are secured :

1. The lessons, being each of about one hour's duration, give an opportunity of treating the subjects more broadly than is possible in the very limited time at the disposal of the ordinary teachers.
2. The emulation and interest produced by collective oral teaching.
3. The pupil teachers receive instruction from teachers specially selected for their proficiency in their respective subjects.
4. The influences of social intercourse.

The responsibility of the head teachers for the instruction of their respective pupil teachers is not removed or interfered with in any way by the college training, such training being held to be merely supplementary to the head teachers' instruction.

The results of the system, as shown by the position taken by the Board's pupil teachers in the scholarship examination, are very encouraging. Last year the proportion of the successful female candidates from all England and Wales who gained a first-class was only 29.6 per cent. In Liverpool the proportion was about the same, say 30 per cent., for the candidates who had not had the advantages of class instruction, while for those from Roman Catholic schools it was 42.8 per cent., and from the Board schools 52.3 per cent. Among the successful male candidates the contrast is still more striking; the proportion of candidates securing places in the first class being, for all England and Wales, 25 per cent.; for Liverpool voluntary schools, 28 per cent.; and for Liverpool board schools, 57 per cent.

The expense to the Board (without rent of premises) of carrying on the college is about 450*l.* per annum, being at the rate of about 2*l.* 8*s.* for each pupil teacher.

(*Mr. Woodall.*) Are any negotiations proceeding in regard to the establishment of a training college enabling you to educate your pupil teachers in Liverpool, instead of sending them to other colleges away from the town?—The Department have intimated that they would sanction the establishment of a training college here under certain conditions.

Then what do you expect to gain by having a college established here instead of sending your pupil teachers away?—Well, one reason is the difficulty as to the amount of accommodation in the other training colleges, which is not equal to the number of persons who wish to become students in them.

And, apart from that, you expect that you would keep your pupil teachers together better, and not run so much risk of losing teachers who have been trained well?—There would be that motive, no doubt; but, in the first place, the accommodation elsewhere is insufficient; in the second place, many parents would rather have the pupil teachers in a college nearer to their own homes; and, thirdly, we could have more direct supervision over the instruction given in the college. Those are the three chief motives.

(*Professor Boscoc.*) I should like to ask Mr. Rathbone, with regard to the teaching of science, is this system which you have adopted here one



which has arisen gradually in Liverpool, or by whom has it been introduced?—It was introduced by the School Board under the advice of Colonel Donnelly, I think, of the South Kensington Museum.

Are you aware of any other School Boards which have this system of itinerant lectures?—The Birmingham School Board have, I believe, commenced it.

Having had considerable experience now for several years, can you express yourself satisfied with the system as now carried out here?—We are very well satisfied with it. We had Professor Forbes recommended to us by Professor Huxley to examine the results carefully, and he has been and has given in his report, which on the whole is very favourable to the continuance of this science teaching.

Appendix 83.

Liverpool School Board.  
Pupil Teachers' College.

## SOUTH CORPORATION INDUSTRIAL SCHOOLS.

The Commissioners visited these schools in the course of the afternoon. These schools have been established under Lord Sandon's Education Act, with the object of providing a suitable education and training for the very lowest class of children, whom it is found impossible to make attend the ordinary Board schools. The children are admitted from 6 o'clock in the morning and are kept till 6 o'clock in the evening. They are subjected to a good course of elementary education, but a portion of their time is utilised in the teaching of some useful occupation, and they are fed plainly, but well, during their attendance in school. There are 200 children in daily attendance, about equally divided as to sex. In cases where parents have means, they are required to pay for the food and education of their children. The food costs about 1s. 6d. per week per child, and each child receives three meals per day. Many of the children have neither shoes nor stockings, and a large proportion are in rags. It would be difficult to find a similar number of children, seemingly more deprived or destitute. The children are examined each morning when they come to the school. There are warm and cold baths on the premises in which they are subjected to a cleansing process, when necessary, and their clothing frequently requires to be disinfected.

There are two skilled workmen who superintend the industrial operations, such as the making of door mats, &c., and who also seek up the children when absent. Under the discipline of the excellent matron and her staff, the children make marvellous progress in their school work, and in general civilization. They like the school as is testified by the fact that 95 per cent. of those on the register are in average attendance.

The Commissioners were shown over the building and the various departments by Mr. Oulton, Chairman of the School Management Committee of the School Board; by Mr. Hanco, clerk to the Board; and by Mrs. Parry, the matron.

## LIVERPOOL INSTITUTE.

The Commissioners then proceeded to the Liverpool Institute, a large middle class institution in Mount Street, consisting of Boy's Day Schools (High and Commercial), a Girls' School, and a School of Art. They were received by the Rev. John Supton, M.A., Head Master of the High and Commercial Schools, and by Mr. Finnie, the Master of the School of Art. They inspected some of the boys' class-rooms, and then proceeded to the school of art, where students in various classes were at work. Mr. Finnie stated that in the school of art 676 pupils are taught drawing, of whom 107 are ladies, and of these one third are training for teachers.

MR. FINNIE was questioned as follows :

(Professor Roscoe.) I believe a new school of art is being built for you? —Yes.

By whom is this school being built?—By the committee of this institution. And is the money obtained by private subscription?—The money is found by the institution.

Liverpool School of Art.

Appendix 33.

Liverpool School  
of Art.

Aided by a building grant from South Kensington?—No, no building grant whatever. We did not apply for that.

All the money has been found by private subscription?—Call it private subscription.

Have you any life classes?—Yes, a life class is now at work.

How many have you attending the life class in the evening?—We have an average attendance in the evening of about 20.

Male or female?—Male.

In the life class do you have drawing or painting from the nude figure or both?—Both.

From the nude and from the draped figure?—And from the draped figure.

You say you have about 20 students attending the life class?—We have 20.

Have you any modelling?—No, no modelling.

What is the Liverpool Academy?—A very old institution. It was the Art Academy which was founded by William Roscoe, who was one of the original members, and exhibited his engravings. I have seen his name in old catalogues to his own works.

Have you any classes for design here?—We teach what can be taught design here, but we have very few students attending that class; you see we have no manufactures in Liverpool. If upholsterers or cabinet-makers wish to have instruction of that kind, we give it to them.

How do you conduct classes of that kind?—We conduct them by giving the students instruction in the general principles of design, as laid down in the authorised works; the history of ornament, and the kind of ornament in use at different times, of which we have plenty of examples; and we show them how to adapt this to their own ends.

How do you do that?—Must be done individually.

How?—I do it myself.

You show them the description of ornament applicable to cabinet-making and upholstering?—Yes.

How many pupils of that kind have you had?—We have had a good many from time to time.

How many now?—We have one now who is going in for the Plasterers' Company's prize and another, but this kind of instruction is not sought for frequently or sufficiently to form a class.

Do you think that if developed it might be sought for more?—I think not, here.

(Chairman.) You do not think that this is the kind of place for the application of art to industrial objects?—No.

But you have got a good deal of ornamental iron founding? Mr. Bennett has extensive works?—Yes, but I do not think there is much artistic work.

But there would be a very good opportunity for artistic work; there is no reason why it should not be done there?—There is no reason why it should not.

And you have extensive buildings going on in this town, and a great many iron railings and balustrades and things of that sort; if there were any attempt at that sort of thing there is nothing to prevent them getting the instruction here?—Nothing whatever, but I can tell you that the general instruction received in this school will enable youths to make these designs for themselves, without any special teaching.

That is your opinion, is it?—Yes, we have no frivolous work here, no landscape drawing; it is all severe study, drawing from the figure, and a severe course of ornament has to be passed through, so that the whole thing is a sort of preparation for design.

Do you do painting from still life?—Yes; a supply of flowers is sent down every Monday from the Botanical Gardens.

Are any drawing or painting from flowers at the present moment?—Not at the present moment.

Do you send your drawings to South Kensington?—They all go to South Kensington, I can tell you the number if you like. Last year there were 1,991, nearly all artisan's drawings. We have an average attendance

in the evening of over 100 artisans; the majority study mechanical drawing with us; we do not insist on having highly finished drawings, all that is necessary for them is to understand the subject. We show them building construction and the like. My assistant, Mr. Garland, teaches that, such as it is, from copies, but where we have advanced students they do it from actual measurements, but this is only occasionally. Geometry is taught to nearly all students of the school.

Do you teach it to the young ladies who come here for class instruction?—Yes. We try to induce them all to go in for the second grade examination of the Science and Art Department.

Do they do anything in drawing from geometrical models?—There is a group upstairs drawing from them now.

You have not much provision for that?—No, but it is one of the subjects we teach a short time before the examinations. I get to know all those who are going in for the examination, and give them perhaps a week or a fortnight's training beforehand. It is more to enable them to do the work in the time, to give them the requisite facility, because all would pass the examination well enough if they could get it in in the time.

Appendix 33.

Liverpool School  
of Art

Rev. J. SEPHTON, M.A., Head Master, examined.

Mr. Sephton then stated that the Boys' Schools are divided into a high school and a commercial school. There are about 800 pupils in the commercial school and 360 in the high school. Over 200 boys enter the institute every year from the elementary schools, of whom about two-thirds have passed the fourth, fifth, or sixth standard. The bulk of them stay from six months to a year to finish (as they term it). This is one of the schools into which boys are drafted who have obtained scholarships from the Council of Education in the elementary schools. The institute has no entrance examinations; all that is required is that a boy shall be able to read and write, if so there is a class suitable for him. Only the two highest forms in the commercial school are taken to laboratory practice. In the commercial school there is elementary laboratory practice, but the highest class of the high school, numbering 12 to 15, have advanced laboratory practice. There are about 40 pupils from the commercial school and 30 from the high school who have elementary practice. Magnetism and electricity are taught as well as chemistry, and the most successful pupils are sent up for the South Kensington examinations. The best masters are found to be those who have been boys educated in the building. The institution was formerly the Mechanics' Institute and a few of the old mechanic members of that institute still remain sharing some of the privileges of the institution. Mr. McAlister, the senior wrangler in 1877, was a pupil of the institute.

Liverpool Insti-  
tute, Principal's  
Statement.

The principal handed in the prospectus of the institution and of the various departments. He was then questioned as follows:—

(Chairman.) What is the grade of the girls' school?—Practically the same as that of the two boys' schools. The pupils are sisters of boys who may be in the commercial school or in the high school, but I should say more likely of the boys in the high school. The fee paid is about six guineas a year, but there are one or two extras.

What class of the population are your pupils taken from?—In the commercial school the class of population is chiefly that of commercial clerks, shopkeepers, foremen, and people generally whose incomes I should say would average between 150*l.* and 300*l.* a year. Then in the high school they may be supposed to vary from about 250*l.* to 500*l.*

That is the higher grade of clerks?—Yes, and the middle-class generally; merchants, medical men, solicitors, professional gentlemen generally, clergymen and ministers.

You have about 1,100 boys in the school?—800 in the commercial or lower school, and 360 in the high school.

And you think that about 700 of those boys in the commercial school are the sons of parents engaged in commercial pursuits?—You may

## Appendix 33.

Liverpool  
Institute,  
Principal's  
Statement.

reckon even more than that. We take the two best boys every year from the commercial school and put them in the high school.

Very few of those boys go in to manage manufacturing businesses?—I should think so. Very little manufacturing is done in Liverpool. A great number of them must go into shopkeeping and commerce.

(By the Chairman). Now what about the Royal Institution?—It is a first-grade school of about 100 boys, and gives a classical education.

Have they any science teaching?—Just as in all first-grade schools; a master who lectures, but little more is done for the whole school. It is merely a lecture, and possibly the head boys try experiments.

How should you class a school now as to grade?—It seems that the difference in the grade is this—if 10 per cent. of the boys are over 16 the school is called a first-grade school; if 10 per cent. are over 14, then the school is second grade. This definition is the one of the Schools Enquiry Commission, 1864-5.

That is, it is only a definition which you adopt?—Practically speaking it is a real definition, because in every commercial school, for instance, hardly any of the boys stay until 16. They go to business, and it is no use teaching those boys the classical languages; they have no time to learn them properly.

Do you teach physical geography?—Yes; and that which the department calls physiography.

(Professor Boscoe.) As to the teaching of chemistry, what is the relative amount of science taught in your different schools?—Our standards are practically decided by the Science and Art Department.

Will you explain how that is done?—We prepare the boys to pass the first stage in chemistry, and then when they have passed the first stage we prepare them to pass the advanced. In the commercial school very few boys can be got to pass the advanced; they leave school before they are fitted for it; but in the high school, the highest form, that is the 6th form, boys stay, as I told you, from 18 to 18, and they are prepared for the advanced examinations in chemistry and the advanced laboratory examination.

What is the lowest age at which you admit them into the laboratory at all?—We never ask a boy's age when he attains the top of the school. We put a boy into the class most suitable for him when he comes to us, and if he works himself up to the top by the time he is 13 all the better.

Will you give us the science subjects you teach in the school besides chemistry?—Well, electricity and magnetism is one subject, and sound, light, and heat is another. We have theoretical mechanics also and physiology and physiography.

Are all the boys taken through all those subjects?—Yes, in the commercial school; we do not go so far in the high school, in electricity and magnetism, and in sound, light, and heat. In the commercial school no time is given to the study of languages; but in the high school much time is devoted to that, and therefore the boys do not get instructed in electricity and magnetism as they do in the commercial school.

What is the lowest class in which you teach science in the lower school?—Down to the lower division of the 4th class, nearly 400 in all; when they begin algebra and Euclid.

You still take Euclid as the text-book for geometry?—Yes.

Is your school full?—Crowded; we have too many already.

Now, about elementary physics?—As to magnetism and electricity a clever boy may begin about 18 months after he begins his mathematics. In chemistry he may begin much earlier; we begin that almost as soon as mathematics.

Are you on the whole satisfied with the system of examination in South Kensington, and with the results of that examination on your teaching?—Yes.

You have no complaint to make to us?—No, no complaints at all; I think sometimes, though that can scarcely be called a ground of complaint, that they have raised the standards rather arbitrarily, and we have fancied that that has been when they have received word from the Treasury

department that they must keep the pay down. It is the same for all the schools over the kingdom, and it is no use grumbling. Appendix 33.

But the question is whether it is good?—Yes, it is good; they ought to raise the standard from year to year as education improves, provided it is done gradually. Liverpool  
Institute,  
Principal's  
Statement.

Does it test the knowledge of the boys fairly?—As well as any examination can; *viva voce* would do better, perhaps, but that is not perfect.

Have you sent up any of your students for the practical examination in chemistry?—Yes, we send up a certain number each year.

Do you value that?—It has only been for two years yet, but I think it is on the right lines.

(*Chairman.*) Into what class do you usually place your boys who come from the elementary schools after having passed the Sixth Standard?—About half-way up the commercial school.

Do you receive grants from South Kensington?—The masters do. The inspector comes down and goes through the list of students and marks them right and left M. C.; and we get no money for those. In the commercial school he marks a large number M. C.

(*Mr. Squire Smith.*) How does your high school differ from the modern side of the Manchester Grammar School?—We have the bifurcation principle; we do allow a boy to learn Greek, but on their modern side there is no Greek at all.

You consider that your high school takes about the same level?—As the modern side of a good public school. The commercial school contains about 800 boys whose school education will finish at the age of 15 or thereabouts. About 370 of these study mathematics, and the subject ranges from algebra and Euclid in the lower classes to trigonometry and theoretical mechanics in the first class. About 320 learn the elements of inorganic chemistry, and the highest class (consisting of 40 boys) has one lesson a week of laboratory practice. These subjects are so taught as to qualify the boys for the elementary science examinations of the Science and Art Department in chemistry, and for the three lower stages of the examination in mathematics. The two highest classes study electricity and magnetism and sound, light and heat; and the four highest classes take drawing in the School of Art, physiography, and physiology.

(*Chairman.*) Is there any science teaching, beyond that which you have described, at the Royal Institution, or at the Liverpool College?—Yes, there is a little more in the lower school of the Liverpool College, which is on a level with our lower school. They teach chemistry as an educational subject just as much as we do.

Have you an estimate of the number of boys learning science?—No, I have not. They have about 350 in their lower school.

What is done for the teaching of drawing in your commercial school?—In the lower part of the school the writing master teaches a little drawing but not much, and in the upper part of the school they go to the School of Art. Both schools go to the School of Art.

They do not go through a serious course of drawing?—Not in the lower, but they do in the upper classes.

#### NEW UNIVERSITY COLLEGE, LIVERPOOL.

The Commissioners next visited the buildings of the New University College in Ashton Street, originally occupied by a public institution which has been removed to other quarters. The buildings, which at the time of the Commissioners' visit were in process of alteration, occupy a very considerable space of ground, which has been transferred to the University College by the Corporation of Liverpool on exceedingly liberal terms. The Commissioners were received by Professor Rendall, the Principal of the College. Professor Rendall conducted the Commissioners through the various departments of the college. Liverpool  
University  
College.

## Appendix 38.

—  
 Liverpool  
 University  
 College.  
 Prof. Rendall's  
 Evidence.

(*The Chairman to Professor Rendall.*) I should like you to state generally what are the objects of this institution?—The first object that we put before us was to supply a higher education on the standard of the London University examinations. We undertake to teach any students who come forward for the Degree Examinations in Science or Arts, and also for the London Matriculation. Of course, at the same time, we do not insist on students going in for any examinations at all. We are ready to take any who wish to work, on the most elastic principles that we can, allowing them to attend one, two, three, or more classes, as they like. We make no restrictions. What we expect to do most effectually is the teaching of science. Other subjects are supplied at the Liverpool College and the Royal Institution, whereas there is no other institution in the town, with the exception of the popular classes in the evenings, that undertakes thorough and general science instruction.

(*Professor Roscoe.*) From what source do you expect to draw your students in science?—I hardly know; we take them from wherever they may come.

Still you must have some prospect?—Well, in chemistry we expect that we shall develop a large school. Runcorn and Widnes are very close to us. Students of the medical school require physics and biology.

But will you take students here who are positively ignorant of chemistry?—Yes, we take any students over 16.

Your regulations are very similar in that respect to Owens College?—We take none under 15; but we are not anxious to take students at 15, and we impose a preliminary examination of a tolerably high standard.

I should like to ask you whether you contemplate developing your scientific instruction in a technical direction; whether you intend to teach the applications of natural science?—No, we shall make our teaching more scientific than technical. At present we have no apparatus for technical teaching, such as workshops.

You propose to ground thoroughly in the theory, and that will be sufficient work for a long time to come?—Yes; for a long time to come.

Therefore your reply is that you are not prepared for it; not that it is of no use?—That is so.

(*Chairman.*) Now will you tell us something about the origin and foundation of the institution?—There was a general wish in Liverpool to found a college; several attempts were made, and it culminated I think about four years ago, when the medical school, unable to provide an education here in some parts of their curriculum, had to send away students to Edinburgh and other universities. They agitated amongst some leading men. Mr. W. Rathbone and others took the matter up very warmly, feeling that Liverpool ought to provide education of a university character. Towns meetings were called, which appointed committees; and large sums were promised. Among the first, Col. Brown, M.P., gave 5,000*l.*, Mr. W. Rathbone, M.P., and his two brothers 10,000*l.*, Lord Derby another 10,000*l.*, Mr. Whitley, M.P., and another gave 10,000*l.* from a certain trust fund in their hands, the Roger Lyon Jones Trust Fund, and Mrs. Grant added another 10,000*l.*, which gave substantial endowments. This was augmented from various sources, sometimes bodies of people, sometimes nationalities; the Scotchmen founding the philosophy chair, the tradesmen providing a large fund devoted to chemical laboratories, and others providing for other chairs. The art chair was taken up by Mr. Philip Rathbone and others. Several chairs have been fully endowed with 10,000*l.* each. The Roscoe art chair has been formed with another endowment of 10,000*l.* now completed, to which we shall proceed to elect almost immediately. Then there is a surplus to meet working expenses, from which comes the additional salary which I have as principal. I have an endowment as professor of classics, and a further one as principal. The whole endowment now comes to about 105,000*l.*

That includes your building fund?—I should mention the building fund separately; that includes the endowments of professorial chairs, but

when those special sums are appropriated, they leave a very small sum per annum, something under 300*l*. actually, to meet the working expenses. The working expenses, including care-takers, porters, demonstrators, laboratory maintenance, and such items as rates, taxes, coals, gas, stationery, and the like, have all to come out of this 300*l*.

But against that, you expect to get some fees?—Against that we have the fees, one-third of which goes to the college.

Then you mean that two-thirds go to the professors, and one to the college?—Yes.

You have other sources for raising funds in contemplation?—Yes.

Now about your building fund?—This plot of land was bought from the railway company for 19,000*l*. or 20,000*l*.; one of the members of the college council came forward and lent that sum of 20,000*l*., to meet the immediate need, at 4 per cent. interest, and the Corporation have now a Bill before Parliament by which they propose to take over this site, with some portion of the site adjoining, and we hope for a grant of this site.

They will purchase a portion of your site?—The whole of our site, and an additional block of houses, part or all of which is to be eventually handed over to the college. The total grant is 30,000*l*.

And do they give it you for nothing, or do you give them value for it?—They give us the land as it is, reserving certain rights, enabling them, if it ceases to be a college conducted to their satisfaction, to recall the grant.

It includes the building?—The building was charged nothing for; the building went with the land.

What do you expect to spend on the building?—About 2,000*l*. has been spent on actual structural conversion; with apparatus it will be considerably more. The structural alterations cost about 3,000*l*., which does not include the fittings of the lecture-rooms; it will run up to 6,000*l*. with the fittings of the lecture-rooms, and Mr. Muspratt has given 1,000*l*. for the apparatus of the physical laboratory, and special grants have been made for the natural history laboratory.

Then the Corporation give you the land and the buildings?—Yes, and we hope the alterations also; but that remains to be determined. It may depend on what residue there is of the 30,000*l*. after the block of houses is purchased.

Does the money come from the Corporation through the rates?—No, from the surplus fund the Corporation have, not from the rates.

(*Professor Roscoe*.) You will not have any yearly grant from the Corporation?—Not the least; I do not think there is any probability of our doing so.

(*Chairman*.) Do you propose to teach art?—Yes, we have an endowment just made for it, but of what character the chair will be I do not know; whether there will be practical teaching or critical lecturing on art I cannot say.

#### *Physical Department.*

The Commissioners then visited the physical department under the direction of Professor Lodge, who described to them the various arrangements which he was making for teaching physics, both practical and theoretical. In explaining the scope of his intended classes he said, "I have been already authorised to expend 630*l*. in apparatus, but practically I have 1,000*l*. to expend as a first grant. It is no secret that this amount has been provided through the munificence of Mr. E. K. Muspratt. The fittings of the lecture hall, the laboratory, and the demonstration rooms are furnished by the college. We can seat 150 students in the lecture room." Professor Lodge then proceeded to explain in detail the construction of the demonstration table, which embraces all the latest improvements.

(*Chairman*.) Will you be kind enough to tell us what your ideas are upon the subject of teaching the applications of physics?—I have got

Appendix 38.

Liverpool  
University  
College.  
Prof. Rendall's  
Evidence.

Appendix 38. already a small dynamo-electric machine, also a gas engine, and a moderate supply of electrical measuring apparatus for a course of lectures to telegraphic engineers. In addition to the methods of cable testing, and various processes of that kind I want to work at the theory of dynamo-machines, measuring the strength of currents, &c., such as are used for electric lighting.

Liverpool  
University  
College,  
Physical  
Department.

Is this of your own initiative or from representations made to you?—I had it from my own initiative. I have great ideas of its utility. I believe that a course of practical electricity is wanted very much, and I should be glad to establish such a course here.

Are you favourable to passing from pure science to its applications in schools of this kind?—Yes; but I do not think it is exactly passing from pure science, because when practical science begins to be applied, it helps the pure science itself very much. One gets much more acquaintance with the effects in many cases than if we were simply to confine ourselves to the laboratory experiments.

You think that the two things help each other?—Yes.

But what do you consider to be the essential teaching of the institution?—Pure science, certainly.

(*Professor Koscoe.*) Do you anticipate any difficulty from the small amount of pure science knowledge that your students possess? That is, what course of pure science do you anticipate to be necessary before a man can understand the course that you have marked out?—I have not considered this fully, but every pupil who understands principles tolerably well will be admitted, but unless they know the principles, and have some acquaintance with mathematics, and some acquaintance with the work, the privilege of admission to the more technical courses would have to be withdrawn. I should prefer students, in cases where they come ignorant of the subject, to go first through the theoretical course of the college and then into the physical laboratories. There is an idea of having a practical class in the evening, somewhat on the plan of Professor Ayrton's classes.

Are you proposing to have any connexion with the science instruction given in Liverpool by the School Board, and by the Science and Art classes?—Not as yet.

Do not you think it would be desirable to have some connection between the higher classes of the Board schools and the Science and Art Department, so that they should pass from one to the other?—I do certainly. There are scholarships given to the School Board children here by the Council of Education. They are sent to the College or the Institute, the higher schools. I do not know that we have any connection with either the Board schools or the science classes at present, but for my own part I should be extremely desirous to further connection; though at the same time we are anxious not to compete in any way with the science classes which are very numerous and flourishing in Liverpool.

Exactly; not to compete with these classes, but to help the students on still further?—Yes, but we have no means of doing this except through their becoming ordinary students of the college.

Shall you require any mathematics from your students before you admit them to your course?—No, not to the lower physical courses.

Shall you require a course of mathematics before you admit them to the laboratory?—That I do not know. I should have to consider each case specially by itself. I think we should grow regulations like that, rather than commence with them. My idea at present is to admit any who wish to come and who are at all painstaking; giving them easy or more difficult things to do according to their previous training and capacity.

What is in your mind as regards the necessity of mathematics for a course of physics?—The more the better; for advanced physics there are no limits. Sometimes a man wants to enter the laboratory for a short time to work up for an examination. Those are not the most satisfactory



kind of students. Still we have some of them, and they must be provided for. Appendix 33.

(*Mr. Swire Smith.*) Are you obtaining any apparatus from Germany for teaching physics?—Yes, about 400*l.* worth; half from Chemnitz and half from Leipsic. They are far superior for teaching purposes, besides being cheaper than any we can get in this country. Liverpool  
University  
College,  
Physical  
Department.

(*Chairman.*) In what respect are these German apparatus better than the English?—Well this little model dynamo-machine, for instance, is only about 2*l.*, and it would cost twice the money here. Besides the difference in price, however, there is the further more important difference that as a rule cheap measuring instruments are not to be obtained in England. There is nothing between rude and mainly qualitative apparatus, intended to illustrate elementary lectures (such, for instance, as the collections recommended by the Science and Art Department), and the highly finished and expensive instruments in use for technical and for research purposes. There is a great want of well-made and simple measuring instruments with which students can really perform quantitative determinations and obtain fairly accurate results. The designing of such apparatus is a matter requiring time and skill, but it has been carried out to some extent in Germany, and this is the kind that I have thence mainly obtained. Of the more highly finished instruments here many are of English make, but a good proportion come from Paris.

#### EVENING INSTRUCTION.

##### LIVERPOOL SCHOOL OF SCIENCE, FREE LIBRARY, AND MUSEUM, WILLIAM BROWN STREET.

The following statement of the origin and present condition of the evening science classes connected with the above school was given to the Commission by Mr. S. Leigh-Gregson, one of the honorary registrars. Evening  
Instruction in  
Liverpool,  
Liverpool School  
of Science.

The school owes its origin to the Free Public Library and Museum presented to the town in 1857 by the late Sir Wm. Brown. A few years later it was found that the building would not be complete until (to use the words of Sir W. Brown) "it had attached to it a school of science for the benefit of all classes, but especially the artizans. That lectures should be delivered and classes held where students could obtain, at a small charge, scientific information of the contents of the museum, and also receive technical instruction respecting the various trades in which they were respectively engaged." The school was formally inaugurated in 1861 by Earl Granville, Lord President of the Privy Council. The first enthusiasm of its founders gave way in a few years, and at one time it was contemplated to abandon the scheme; but with the exercise of patience and toil, the students slowly but gradually increased, until the numbers now reach 834, and the grant earned from the Science and Art Department, South Kensington, reached last year 704*l.* for science, 36*l.* 1*s.* 6*d.* for art; being the largest grant yet claimed for "payments on results."

The subjects of instruction are as follows:

Number of Students in the several classes:—

	1881	1882
Practical, plane, and solid geometry -	37	26
Do. advanced classes	13	9
Machine construction and drawing -	79	74
Do. advanced classes	17	15
Building construction -	43	60
Do. advanced class	10	12
Mathematics—Stages 1 to 3 -	205	248
Do. Stages 4 & 5 -	7	10
Theoretical mechanics -	22	16
Do. advanced class	9	5
Applied mechanics -	67	70
Do. advanced class	17	25

Appendix 33. Evening Instruction in Liverpool, Liverpool School of Science.	1881	1882
Sound, light, and heat	56	60
Magnetism and electricity	115	183
Do. advanced classes	18	16
Inorganic chemistry	133	180
Do. advanced classes	40	48
Do. laboratory	15	25
Geology	19	11
Mineralogy	10	14
Animal physiology	39	27
Do. advanced class	6	4
Steam	70	74
Do. advanced class	18	23
Agriculture	11	14
Phonography	24	30
Technical drawing for carpenters and joiners	68	43
Metallurgy	—	8
Alkali manufacture	—	10
	1,174	1,338

Art classes—

Freehand, geometry, perspective, and model 486 288

These numbers probably have never been equalled by any other science school in the kingdom, and the foregoing list at once shows the scope and nature of the work undertaken.

The students are drawn from all classes of the community, and are nearly all engaged in business during the day.

Their ages are as follows:—

	Under 15 years	- 44
	Over 15 and under 18 "	- 192
Advanced Apprentices	Over 18 and under 21 "	- 219
	Over 21 and under 25 "	- 147
	Over 25 "	- 168
	Unknown	- 29

There are 721 males and 78 females.

A special feature of the system of instruction is that, as far as possible, the teachers are practical men, drawn from the ranks of our own students according as they display special fitness for the work. Another feature is the removal from our prospectus of the term "artizan" on account of its ascertained unpopularity. We use instead the terms "Students A" and "Students B." In former years the opinion prevailed that "artizans" referred exclusively to labouring mechanics of humble origin; but in the present day we find the youth of the better classes working in the foundries, workshops, mills, &c., side by side with, in many cases, their fathers' workmen; and these better class students join more readily to an educational institution which appeals to all classes alike, instead of appealing specially to "artizans."

Our present system of instruction appears to answer well, but could be improved by aid of specimens specially prepared for tests, such as iron or wood for strains, ductility, &c., compounds for chemical analysis, &c., and by the erection of a model workshop, with working models.

The following facts have come under our notice since the founding of the School of Science.

- (a.) Employers find that the apprentices attending to the science classes comply more faithfully to the terms of their "Indenture," and bring greater intelligence to bear upon their handicraft.
- (b.) Marine and other engineers have adopted the certificates of the Science and Art Department as a standard of theoretical knowledge for all applicants for employment.
- (c.) Some employers reduce the term of apprenticeship for youths possessed of the science certificates. For instance, a shipbuilder

informed me last week, when inquiring for a lad to enter his drawing-office, that for a lad acquainted with mathematics and mechanics he would take off two years from the usual term.

(*Professor Roscoe.*) Would you kindly give us a list of the localities in the city of Liverpool where the science classes of your school are held?

1. Free Library and Museum Building, Wm. Brown Street.
2. Liverpool College, Shaw Street.
3. Board Schools, Stanley Road.
4. Do. Granby Street.
5. Brunswick Schools, Erskine Street.
6. Collegiate School, Picton Street, Wavertree.
7. Grammar School, Garston.
8. Grammar School, Withens Lane, Liscard.
9. College of Chemistry, Duke Street.
10. Royal Institution, Colquitt Street.

Your classes are all held in the evening, I presume, and are all registered under the Science and Art Department?—Yes; sometimes we have a few courses on Saturday mornings.

Having had much experience in the working of the Science and Art examinations, have you any suggestions to make to the Commission as to improvements or additions which might with advantage be made in the system?—I do not know of any material improvement that could be made.

#### EVENING CLASSES HELD IN THE LIVERPOOL COLLEGE.

The Commissioners visited the evening classes conducted at this institution by Mr. Cooper, who stated that the class he was then conducting was an advanced class in electricity, but that he also took an elementary class. He believed this was the only special advanced class in the town; the others were combined, elementary and advanced.

(*Professor Roscoe.*) Do you send up any for honours?—No, this is only our second year.

How many students have you in your elementary class?—I have about 25.

Have your pupils any scientific education before they come?—As a rule none, but the engineering students have a fair mathematical training.

Where do they get that?—In the science classes, by attending the mathematical classes.

What is the occupation of these students?—Most of them are engineers; some are schoolboys. There are six engineers now present, I think.

Do you work entirely with South Kensington?—Entirely with South Kensington.

(*Mr. Woodall.*) Have any of these students passed in the elementary stage?—All have passed the elementary stage.

I believe you have a Whitworth scholar present?—Yes.

Where did he receive his education?—In the School of Science.

And he is engaged in practical engineering work during the daytime, I believe?—Yes.

The Commissioners also visited the mathematical classes, being held in the same building, and Mr. Gregson, who accompanied the Commissioners to the classes, presented them with the prospectus and other documentary information.

#### STANLEY ROAD SCHOOLS.

The Commissioners next proceeded to these schools, where a numerous mechanical class was being conducted by Mr. Sloan.

(*Professor Roscoe.*) Have these gentlemen passed any examination in science and art, Mr. Sloan?—Very few of them. Some few are old students.

But to understand what you have been saying, they must have had a good training in preliminary subjects?—The great bulk of them are employed in engineers' shops, and I assume a certain amount of knowledge which they necessarily possess.

Appendix 33.

Evening  
Instruction in  
Liverpool,  
Liverpool School  
of Science.

Liverpool  
College.

Stanley Road  
Schools,  
Evening Classes  
on practical  
mechanics and  
steam.

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 Evening  
 Instruction in  
 Liverpool,  
 Stanley Road  
 Schools.

Where have they gained that knowledge?—In the workshops. These matters that I have been putting on the board only involve an elementary knowledge of arithmetic, and I explain it as I proceed, as far as possible.

What class of work are you yourself engaged with?—Principally marine engineering. I served my apprenticeship six years with Messrs. Laird Brothers, and then I served a certain period with Sir Joseph Whitworth, part of which was in their foundry and part in the pattern shop, and then I completed my apprenticeship with Messrs. Laird Brothers as a draughtsman, and I have been in their employ ever since.

Have you yourself passed the Science and Art examinations?—Yes, I am a Whitworth Scholar.

Did you get your knowledge for the Whitworth in the science classes?—The bulk of my knowledge I obtained in the Liverpool Institute as a day scholar, and the remainder principally myself. At that time the science classes were not so fully organised, but I obtained considerable assistance from the School of Science in some respects. I had a good mathematical training at the Institute, which stood me in very good stead.

Do you consider that the problems which you set your pupils are all the better understood because they have practical work to do in the day time of a similar character?—Yes.

So that that is really combining the workshop with the class room work, and you consider that this sort of training is a good form of technical education?—Practically it is, provided that they have the necessary practical training elsewhere.

Of course you extend the course over several years; the one course that you are giving these gentlemen now would not be sufficient, in your opinion?—Certainly not. We have an advanced course in connexion with these subjects, and I always expect the students to pass the elementary course and then to go through the advanced, though it is not always the case that they do so.

You induce them to do so with all the means in your power?—Yes, certainly.

How many classes do you teach?—Ten classes.

Do you recommend all your students to take other classes as well as this in the same year, or do they chiefly attend to you? Do you find this one course that you give them is sufficient work for them?—It depends a great deal on the students. A great many of the students join several classes.

I mean, in connexion with this particular subject, is there any other that you advise them to take along with it, on a related subject?—Yes, I advise a student, if he has not had an elementary knowledge of mathematics, to take a mathematical class.

What subjects do you teach?—Practical mechanics and steam: practical, plane and solid geometry, and mechanical drawing.

You have certificates in all those?—Yes, sir, honour certificates in all.

What are your fees?—Six shillings for each subject for the whole session.

Do you think you could do more, if you had a more complete set of models?—Yes, I could do with better models.

What models would you have if you had your own selection?—My views are rather ambitious. I should like what I might call a mechanical laboratory, in which we might have the means of extemporising models to suit our own wishes. I have got a few models in the college in Shaw Street, which I never use, because they are not sufficiently exact for my purpose. For instance, I take a model valve gearing and crank motion, which I go into in considerable detail in the advanced classes, but the model is utterly useless, because it is not sufficiently exact. If I had models of my own I should have them prepared accurately to my own drawing.

What do you think it is essential that you should have as models for an ordinary class?—For an ordinary class; it is rather difficult to make up my mind all at once. I should be happy to let you know.

Will you write a letter stating what you would consider necessary for your teaching on the subject of mechanics and so forth?—I will do so. (Mr. Redgrave.) You have not seen our circulating collection of models?—No, I have not; probably they are something superior to what I have seen.

Appendix 33.

Evening  
Instruction in  
Liverpool,  
Stanley Road  
Schools.

Letter from Mr. SLOAN, Science Teacher, on the Technical Instruction of Mechanical Engineers.

Mr. Sloan's  
Letter.

PROFESSOR ROSCOE,

17, Elgin Street, Birkenhead.

March 15th, 1882.

ON the occasion of the visit of the Royal Commission on Technical Instruction to my classes in "Applied Mechanics" and "Steam" on 7th ult., you asked me to send you an account of the apparatus, diagrams, etc., which I thought necessary for teaching these subjects, and I have much pleasure in doing so.

I will first answer, at greater length than before, some of the questions which were put to me at that time.

1. Does the method of teaching evening classes in Applied Mechanics and Steam, as encouraged by the Science and Art Department, form a good system of technical instruction in Mechanical Engineering? I answer that (in the hands of a really competent and practical teacher) I think it is as good as is practicable for elementary work.

As I stated before, mechanical engineering cannot be learnt at any kind of school; it must be acquired in the shop, and the function of the school is to supplement the practical experience gained in the shop, i.e., to impart a sufficient knowledge of theoretical laws or principles, to point out their application, and to explain those things in a learner's experience which would hardly be understood without assistance.

The great bulk of the students who attend my classes are at work all day in engineering or other workshops, and therefore, the conditions I have laid down above (of practical shop experience combined with school training) are fulfilled. Of course, it must be borne in mind that these students have been at work for about nine and a half hours before coming to class; that both body and mind are wearied and unfit for any hard mental work; and that therefore very great achievements cannot be reasonably looked for, without continued study for some years. I find it quite impossible to cover the whole of the syllabus laid down by the Department in one session, either in the elementary or the advanced classes.

Nevertheless, I believe, on the whole, that the present system of evening instruction is as good as is practicable for the mass of artisans and apprentices.

2. As to the class of students, I find that nearly all of them are either apprentice engineers, or young men who have shortly before completed their apprenticeship.

Out of 115 students registered in my classes, I find—

13	whose ages lie between 16 and 19 years
88	" " " " " 19 and 23 years
10	" " " " " 23 and 30 years
and 4	" " " " " are over 30 years.

3. As regards the general education of the students, I find that the majority of them, especially the apprentices, have had a sound elementary education, and, in a good many instances, they have some knowledge of mathematics.

I find again, amongst the older students (more especially), a lack of elementary education as evidenced in their attempts at composition in their written exercises.

As I teach each class collectively, I am necessarily obliged to suit the instruction to the capacity of the most ignorant of the students, and therefore, in the elementary classes, I work all problems by purely arithmetical methods, except in very rare instances where I may introduce a simple equation. In the advanced and honours classes a considerable knowledge of mathematics is indispensable, and is therefore taken for granted.

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Instruction in  
Liverpool.  
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Letter.

4. In answer to the question, "what other subjects should the students take up in conjunction with, or previous to, the course in Applied Mechanics and Steam?" I would say that a knowledge of mathematics, as far as Stage 2 of the Departments' syllabus, is most desirable, not only as giving the power of mathematical analysis, but on account of the mental discipline and methods of accuracy which it imparts. I can generally tell a student who has had no kind of scientific training, by the loose and inaccurate way in which he takes down and applies the instruction given.

In addition, a knowledge of freehand, geometrical (plane and solid), and mechanical drawing is absolutely essential to the proper education of the engineer.

A course of instruction in several other branches of science (*e.g.*, Heat, Higher Mathematics, Theoretical Mechanics, Chemistry, Metallurgy, and Electricity) would be of much service, but cannot be expected of the great bulk of artisans and apprentices, who are to receive the technical instruction.

It follows that the course of instruction is at present necessarily "self-contained," very little knowledge in other branches of science being taken for granted.

For a class of students such as above, who have had little or no scientific training, the experimental method of instruction seems the one most likely to succeed.

I have not been in the habit of using much apparatus, and have contented myself with stating clearly, and explaining with the aid of the black-board, the principles involved.

However, abstract statements, no matter how clear and vivid, fail to produce as sharp and permanent an impression (upon an unscientific mind) as a simple and striking experiment. Again, a few experiments make the lesson much more attractive, and may in many cases encourage the students to persevere to the end of the course, when otherwise they might not have done so.

I append a list of apparatus, models, and diagrams that would, I think, be suitable.

I would insist upon accuracy in the construction of these models, and as will be seen, would, where possible, have them made so as to yield quantitative results. All working surfaces should, as far as possible, be metallic and nicely fitted. The diagrams should be boldly drawn and clearly coloured, especially in section, so as to show the different materials used. They save a good deal of time otherwise used in black-board sketching.

LIST OF MODELS, APPARATUS, DIAGRAMS, etc., for teaching  
APPLIED MECHANICS.

1. A few levers or rigid bars, straight and bent; some small pulleys with fine cords and weights: together with a large vertical board with movable hooks, or other suitable means of support.

These would be used to illustrate the composition and resolution of forces, parallel and oblique; also, to demonstrate the principle of the lever, and the rule for its mechanical advantage. For this purpose not only should the actual weights to produce equilibrium be shown, but means should be taken to measure accurately the actual displacement of each for a small movement of the lever. This remark applies to all cases where mechanical advantage is investigated, and is intended to demonstrate to the students, that in all cases (so far as friction will permit) the principle of work is rigorously fulfilled.

The pulleys could be combined to represent any of the systems of pulley blocks in use, and their mechanical advantage determined.

2. Model of wheel and axle as a modification of the lever.

3. Toothed Gearing.—An assortment of small spur wheels of different sizes and uniform pitch (something like a screw-cutting set of change-wheels). These could be geared together into trains of any description, either to show the mechanical advantage of a train, or as examples of mechanism, such as screw cutting trains, epicyclic trains, sun and planet wheels, etc.

Models, &c.  
needed for  
instruction in  
applied me-  
chanics.

A set of four equal mitre wheels should also be provided, as some important and interesting principles and inventions can be illustrated by them. Appendix 33.

4. Large smoothly planed cast-iron hinged plate, that can be set to any inclination by means of a graduated index, and provided with some weights in the form of rollers. Evening instruction in Liverpool, Mr. Sloan's letter.

5. An arrangement of levers, known as the Stanhope levers; and also a toggle-joint, arranged to shew the variable mechanical advantage and velocity ratio.

6. Endless screw and worm wheel, combined with wheel and axle.

7. Chinese windlass, or Weston's pulley.

No experiments can be made on the mechanical advantage of screws, on account of their excessive friction, but a diagram should be provided showing the various kinds of screw threads in use.

8. Some simple apparatus for demonstrating the laws of fluid pressure and jets should be provided and should comprise, amongst other things, an air and a compressing pump, and mercurial and other pressure gauges.

9. The large hinged plate of planed cast iron, with a graduated index to show its inclination, before referred to, and provided with several heavy planed blocks of known weight, will be useful to show the laws of friction, angle of repose, effects of lubrication, advantages of large bearing surfaces, to compare rolling and sliding friction; also, in the case of a flat pivot, to deduce the mean moment of friction, etc.

10. One or two pulleys with belts or bands should be provided, in order to show the laws of coil friction. Upon these laws the whole action of belt and rope gearing depends.

11. Model to show harmonic motions and their compositions, as also the effect of a short connecting rod. A model, so arranged as to show side by side a true harmonic motion and a second motion derived by a connecting-rod from same crank pin, would have a good effect.

12. A few cams of different shapes, to show that a cam can be made to produce almost any desired motion.

13. A pair of thin wooden spur wheels, with teeth of true cycloidal shape, and of very exaggerated depth. The object of this model is to show that, in correctly shaped gears, the velocity-ratio is perfectly constant; that the teeth might be made without clearance, and that they would work without backlash. To prove this, the axes should be provided with pointers and accurately divided circles. For the sake of comparison, a similar pair of wheels, with teeth shaped according to some of the "rule-of-thumb" shop methods should be provided.

14. A model with two shafts, not parallel, carrying a pair of pulleys to be connected by a belt, either with or without the aid of guide pulleys.

15. A common, and also a conical pendulum; the latter being used to show that the angular velocity depends upon  $\frac{1}{h}$  only; also, the effect of loading the pendulum, either by a spring or extraneous load.

All the preceding are representative of mechanical principles of universal application, and are therefore of primary importance.

In addition, some models of special contrivances or inventions might be provided, if circumstances will allow.

The number of such contrivances is so great that it is difficult to make a selection; however, I will name a few.

16. Model of quick-return motion (Whitworth's) as used in shaping and slotting machines.

17. Hooke's joint (single and double), each shaft being provided with indexes, to show the inclinations of shafts and the effect upon the velocity-ratio.

- Appendix 33. 18. Model of Oldham's Coupling.  
 19. Model to show action of elliptic chuck and trammel.  
 20. Model of friction paul, paul and half-paul, and of masked ratchet.  
 21. Small model of Warren girder, so arranged that struts and ties may be interchanged, to show influence of method of loading.

Evening instruction in Liverpool, Mr. Sloan's letter.

## LIST OF DIAGRAMS.

- Diagrams needed for instruction in applied mechanics. 22. Pulleys for belt and rope gearing. Round of rim; section of Vee rim for cotton and for wire ropes; curved arms; speed cones.  
 23. Spur-gearing. Cycloidal curves and their generation. Methods of arranging spur and bevel gearing. Rim and cogs of mortice-wheels.  
 24. Quick return gearing for planing machine table.  
 25. Crane or winch train.  
 26. Section of lifting and plunger pumps.  
 27. Centrifugal pump and blowing fan.  
 28. Hydraulic accumulator; hydraulic press; hydraulic cranes.  
 29. Water-wheels and turbines.

A few specimens should be provided as under.

30. Specimens to show fracture of (a) grey, (b) white, (c) mottled, and (d) chilled cast-iron; (e) good fibrous, and also (f) poor and crystalline wrought-iron; (g) mild, and (h) hard steel, tempered and untempered; (i) also a bar of wrought-iron after being pickled in acid, so as to render apparent its fibrous structure.  
 (j) Specimens to show reduced area of very ductile material when drawn asunder by tensile stress.  
 (k.) A series of specimens of hardened cast-steel, polished and "drawn" to various "tempers" or colours, to show the gradations from extreme hardness to softness.  
 (l.) A few light wooden laths of different sections, to show laws of transverse strength of beams.

## STEAM.

Models, &c. needed for instruction in steam.

For teaching "Steam" of course a great many of the articles already named would be used.

It is necessary that the students should have clear ideas of the laws of heat, so far as they affect steam or other heat engines, and sufficient apparatus should be provided to give experimental illustrations of the following:—

31. Expansion of solids; force of expansion; distortion of form produced by expansion.  
 32. Expansion of liquids.  
 33. Calorimetry; unit of heat; specific heat; temperature of mixtures.  
 34. Latent heat; condensation of steam and formation of partial vacuum thereby.  
 35. Radiation; conduction; convection of heat.  
 36. Boiling temperature of water; saturated and superheated steam; boiling of salt water.  
 37. Boyle's and Charles's laws.  
 38. Spheroidal condition.

The apparatus would be much the same as is used in physical laboratories for a similar purpose; but as the course is strictly elementary, and only a comparatively short time can be devoted to it, no elaborate or expensive apparatus would be required, the object being rather to demonstrate *facts* than *figures*.

39. A trough to show the corrosive effects of galvanic action should be provided. In connection with marine engineering, this is a very important matter.



The following additional models would be required:—

40. Sectional, wooden, moving model of some form of condensing engine, as complete in detail, and as large in scale as possible. If large enough, most of the details would be sufficiently clearly shown not to require separate models.
41. Strap, gib, and cotter; and
42. Box-ended rod, with brasses and cotter.
43. One arm and float of feathering paddle-wheel.
44. Salinometer.
45. Apparatus to show the action of jets in inducing currents.
46. Model of link-motion slide-valve gear.

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Evening  
instruction in  
Liverpool,  
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letter.

Also the following diagrams—

47. Early pumping engines.
48. Cataract and its valve motions; Cornish and equilibrium valve.
49. Details of pistons.
50. Details of stuffing-box; section through stern-tube of screw vessel.
51. Large double, or triple-ported, balanced slide-valve.
52. Arrangement of compound engine with 2, 3, or 4 cylinders.
53. Section through surface condenser, showing also, on a smaller scale, the whole course of steam and water through engines and boilers.
54. Section through locomotive.
55. Indicator, and some typical diagrams.
56. Feathering paddle-wheel.
57. Section through a rectangular and a cylindrical boiler, showing methods of staying.
58. Boiler mountings; safety valve (spring and weight), water-gauge, &c.

#### Requirements for a MECHANICAL LABORATORY.

All the articles that I have enumerated in preceding pages would be required for lecture room use in elementary teaching.

Although it is not practicable nor perhaps desirable to attempt a higher scheme of technical instruction than that sketched, so far as the mass of operatives is concerned, yet I do think that in large commercial or manufacturing centres, some facilities (in some degree analogous to our colleges and universities) should be provided for a higher grade of technical instruction.

These institutions would attract advanced students of ability from surrounding districts, and would serve for the training of teachers and others who have to occupy positions of responsibility.

In such a technical school or college, a mechanical laboratory would form an important feature. The object of the laboratory would be to enable both lecturer and students to carry out experimental work, as confirming or demonstrating well-known facts and laws, or as suggested by the advance of mechanical science, so that, while its chief use would be in the routine work of technical instruction, its appliances would doubtless foster a spirit of invention and research amongst the students, that might lead to valuable results. The arrangement of such a laboratory would of course depend upon the amount of money that could be spent upon it, and on the number and nature of the students who might be expected to attend it.

(1.) The room should be thoroughly dry, well heated and ventilated, and well lighted; accurate work cannot be done in a dark room.

It should have a firm, steady floor, and should have a black board and dais.

(2.) Immediately adjoining the laboratory, there should be a class or lecture-room, properly fitted and furnished as such.

(3.) The most important work to be done would be the testing of the strengths and properties of materials used in the constructive arts, and for this purpose a testing machine is essential.

Requirements  
for a mechanical  
laboratory.

## Appendix 33.

Evening  
instruction in  
Liverpool,  
Mr. Sloan's  
letter.

For ordinary lecture demonstrations, a small machine (capacity 10 tons) as used by the Liverpool School of Science is very suitable, being small and handy, and therefore easily manipulated. But for a really systematic course of experiments, a more powerful machine is desirable, and I would suggest one with a capacity of 25 to 30 tons, worked by hydraulic pressure, either hand or power. Engineers do not place much faith on small tests.

The machine should, if possible, be capable of testing for tensile, compressive, shearing, cross-breaking, and torsional strengths.

A great deal of useful work could be done with this machine.

The ultimate strengths of all the materials in common use would be tested under different conditions, and the effects of various processes, such as annealing, hardening, hammering, forging, welding, machining, brazing, &c. could be studied.

The machine should have tools for testing cements.

Having had some practice in using the machine for tests of ultimate strength, the student might now proceed to test for elastic and permanent deformation. For this work, some delicate and accurate measuring instrument would be required.

Tests could also be made of beams of various sections,—rectangular, round, and flanged, solid, and hollow: and of solid and hollow shafting and columns.

The strength of rivetted joints is a very important branch of inquiry, and one in which there is room for investigation, but for this purpose, a heavier machine is required than any the laboratory is likely to possess, as otherwise the specimens are on a much smaller scale than occurs in practice.

The strength of cylinders and stayed plates to resist bursting and compressive stresses might also be experimented on. For this purpose, a strong force pump and a few pressure gauges of different ranges would be required. The latter would be of use for many other purposes. In conjunction with above, a small hydraulic press would be generally useful.

(4.) A small smith's hearth and bellows, with anvil and set of tools would be required; its principal use being, as indicated above, the treatment of specimens for testing. It would be advisable to have it in a separate room.

(5.) A 6" Whitworth screw cutting lathe. This is required for turning specimens, and is in fact indispensable where constructive work in metal is carried on. Overhead motion, dividing plate, and wheel-cutting gear would increase its general usefulness.

This could be driven quite well by foot, but if a gas engine could be provided to drive it and the testing machine, and any other machines requiring power, so much the better.

(6.) A small shaping machine, driven by hand or foot. This, in conjunction with the forge, lathe, and hand-tools, would place it within the power of the lecturer and students to make or alter special apparatus as required.

(7.) A set of hand tools (vice, hammers, chisels, files, &c.), as used by an engine-fitter, are of course necessary; as also a set of pattern-maker's or joiner's hand tools.

(8.) A true cast-iron surface plate or table about 6' 0" x 4' 0", and of the height of an ordinary table, set firmly and truly level. It need not be scraped to a true surface, but left from the planing machine. This table is used for lining out dimensions that do not lie in one plane, and affords a true base upon which models or machines can be arranged or built. Along with the table there would be an assortment of marking blocks or scribers, right-angled and vee-blocks, a square and straight edges, standard steel rule, and spirit level and plumb rule.

(9.) A  $\frac{1}{100000}$ " measuring machine would be a valuable addition to the furniture of the laboratory. Accurate measurement is the basis of science, and it is in the highest degree desirable that the students should be familiar with the most accurate methods of lineal measurement.

The machine would be of use in the following way.—Say we have a truly turned shaft of steel 4" diameter, and it is desired to bore a hole to receive it. The fit may be (1) a clearance fit; (2) a working fit free from shake; (3) a driving fit, and (4) a shrinking fit.

Now it is easy enough to make two dimensions *identical* by means of callipers, but when we have to make two dimensions to *differ* by a small but exact difference, the comparison by callipers becomes uncertain, and a proper fit can only be made by a turner of great experience, and then not with positive certainty. By means of the measuring machine a series of experiments could be made, by ascertaining exactly in ten thousandths of an inch, how much difference is required to produce any kind of "fit" desired.

By this systematic method, a turner could acquire more ability and confidence in such work than he could in a comparatively long time at a lathe in the ordinary way.

It is in view of its employment in this way that I have specified a "Whitworth" lathe. A lathe of equal size might be obtained of some other maker for perhaps  $\frac{1}{2}$  the cost, and for some purposes it would serve almost as well, but for accurate gauging, such as I have just referred to, the very best obtainable tool is necessary. It is of little use trying to gauge to  $\frac{1}{1000}$ " the diameter of a shaft that is not truly cylindrical.

10. Amongst the apparatus there should be a model of slide-valve gear. This model should be thoroughly well made, and capable of ready and accurate adjustment; otherwise it is useless for quantitative experiments. It should have four independent eccentrics on the one shaft, each provided with a lineal and angular index, so that it can be set to any required throw and angular advance. Each eccentric rod should be adjustable in length, and links of appropriate size and shape could be fitted as required.

By this model the action of all kinds of slide and expansion valve gears could be studied; as *e.g.*, the effects of opening or crossing the eccentric rods; various ways of suspending the link; unequal lead or lap; angularity of connecting rod, etc.

11. In the investigation of friction, there is scope for useful and instructive work; as for instance, in comparing the value of different kinds of lubricants, and in experimenting on the friction of slide valves exposed to steam pressure.

12. There should be provided an assortment of links, bolts, and nuts, pins, brackets, &c., by means of which models of parallel motions and link work in general could be built to prescribed dimensions, and the resulting motion accurately observed and measured.

13. Much of the apparatus and models which I have before specified for elementary instruction would be advantageously transferred from the lecture room to the laboratory, if such were provided, and the apparatus might be of a more refined description.

14. The students would not be altogether dependent upon the articles already in the laboratory. Being possessed of mechanical ability and the necessary tools, they might employ themselves in designing and making the necessary apparatus to suit their purpose.

For example, a student might design and make, or get made, a compound cam and arrangement of link-work similar to that shown in Goodeve's "Elements of Mechanism," which would write the letters R. The exact methods necessary to achieve such a result would be far better training than could be afforded by a mere perusal of a general method.

It will be observed that in connection with this scheme of higher instruction, I have throughout laid particular stress upon the value of precise and definite information, for when knowledge comes to be applied to actual work, it is of little value unless it is accurate and definite.

In elementary teaching it is frequently quite sufficient to tell a student that a certain effect is produced by a certain cause. For example, it is a good thing to know that "a difference of diameter of one or two thousandths of an inch makes all the difference between a good and a

Appendix 33.

Evening  
instruction in  
Liverpool,  
Mr. Sloan's  
letter.

Appendix 33.  
Evening  
instruction in  
Liverpool.  
Mr. Sloax's  
letter.

"bad fit," but it is of far greater value (when we come to a case of actual work) to know *exactly how much* difference in tightness is produced by a difference in diameter of say *exactly 1/1000*."

Again, although it is a useful thing to know that tempering steel in oil increases its elasticity very much, yet it is of much greater value to be able to say *how much* the elasticity is increased by a certain degree of tempering.

I think that the want of exact quantitative information runs through a good deal of science teaching, and detracts very much from its usefulness (at least when considered as a *technical* subject).

To take an example from electricity—many students know perfectly well that a galvanic battery yields a current, which, when sent through the coils of an electro-magnet, gives it the power of lifting iron, but how many of them, if required to make an electro-magnet to lift a certain weight at a certain distance, would know how to determine the particulars of battery, or the size of cores and the size and length of wire?

In passing, I might say that electricity promises to take a prominent part in the mechanical engineering of the future, and the mechanical appliances of the laboratory might be used in making experiments on some of the more purely mechanical portions of electrical engineering.

In conclusion I may say that I have had no experience of a laboratory such as I have just described, and I know that I have by no means exhausted the matter, either as regards the appliances required or the nature of the work to be carried on.

In the course of the work new pathways would be continually opening up, and would of course suggest any necessary additions to the laboratory.

If any of the preceding remarks are not quite plain I shall be happy to give any further explanation or information in my power.

I am, Sir,

Your obedient Servant,  
ROBERT A. SLOAX.

#### LIVERPOOL SCIENCE AND ART CLASSES.—WILLIAM HENRY STREET SCHOOLS.

Liverpool  
Science and Art  
Classes.

The Commissioners visited the art classes conducted in these schools, which are under a Committee of Management separate from that of the Liverpool School of Science. There were some 75 pupils present. They examined the geometrical and frechand drawing, all of which was of an elementary character. The drawings were neatly done, but there had been no drawing from the cast or models, except from plain geometrical blocks. No figure or ornamental cast of any description. This class, however, is considered to be quite above the average of evening classes, and some of the students consider it to be the best evening class in the town.

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#### APPENDIX 34.

##### SCIENCE TEACHING UNDER THE BIRMINGHAM SCHOOL BOARD.

(See Vol. I., p. 458.)

Science  
Teaching at  
Birmingham.

DEAR SIR,

I HAVE much pleasure in sending you the following replies to the questions asked in Professor Roscoe's letter:—

I. There is no doubt that the School Board of Birmingham does consider it desirable that the teaching of elementary science should be more widely introduced into primary schools than at present. It is difficult, however, to see how we can accomplish much more than we do at present.

with children who have not passed Standard VI; while the special education of those who are beyond that standard is at the present moment under the consideration of the Board.

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Birmingham  
School Board.

II. The teaching of science in our ordinary elementary schools to children in Standards V. and VI. involves three lessons per fortnight. The first of each set of three is a lesson given by an itinerant science demonstrator, or by one of his assistants, which lesson is amply illustrated by experiments. The second consists of the substance of the same lesson repeated, but without the experiments, by one of the ordinary teachers of the school; the third is a composition exercise, in which the lesson is reproduced by the pupils.

This teaching is given to all the children in Standards V. and VI. and the subjects hitherto taken have been elementary mechanics, including general physics, and also, in a few cases, elementary chemistry with the boys, and those parts of the subjects of chemistry and physiology which bear upon the subject of domestic economy for the girls. It is quite clear that no more time than is now given could be spared by the girls, and it seems equally clear that no other subjects could be taken which would be so practically useful. The boys cannot spare more time either, but it will, of course, be possible to vary the subject. Up to this point, i.e., to the time of passing the 6th Standard, all the other subjects required by the Government Code have been taken, and will continue to be taught. Coming, however, to the question of those who have passed Standard VI., I have to state that the Board is very seriously considering the possibility of extending the means for teaching science to such boys, and of making their school time at this stage more practically useful than it has been hitherto.

The number of boys remaining in our elementary schools after passing Standard VI. is certainly increasing, owing to the fact of the ordinary standards being passed at earlier ages than formerly, but it is nevertheless true, and must continue to be so for some years to come, that the number in any one school is far too small to engage the special attention of a separate teacher, or to be taught to any great extent separately from the boys in Standard VI. Hence, it has occurred to the Chairman, and to some other members of the Board, that it would be desirable to collect the boys who are at this stage into one or more central schools into which no children should be admitted who have not passed the previous standards. If this idea should be carried out, the time which is now spent in the elementary subjects of reading, writing, and arithmetic will be devoted to technical scientific instruction, calculated to prepare the boys for the Birmingham workshops, and for this purpose such subjects as chemistry, metallurgy, mechanics, machine construction and drawing, geometry, &c., would receive a considerable share of attention.

If such a seventh standard school should be established, the subjects which would be omitted from the time-table would be what are technically known under the Code as class subjects, and we should also be careful to select, as specific subjects, such branches as would assist our main object. Thus, while in the seventh standard a boy might learn the amount of mathematics required as a specific subject, and in the following year, if he should still remain in the school, he might work for Stage I. of the Science and Art Department.

The Chairman of the Board, who takes a great interest in this particular question, has recently made a proposal which the Education Committee has resolved to recommend the Board gratefully to accept. This proposal is to place at the service of the Board an extensive set of premises, nearly in the centre of the town, rent free for five years, and the Chairman not only offers to forego the five years' rent, but to make all the necessary structural alterations (which will be very considerable), and to supply heating apparatus, &c. at his own expense. These premises will provide an excellent chemical laboratory, a workshop in which the boys may be taught the use of tools, a lecture room for scientific lessons to be illustrated by experiments, a room to be lighted from the roof for teaching drawing, and four other class rooms for immediate use, besides teacher's

Appendix 34.  
Birmingham  
School Board.

room, cloak room, &c., and a large dining room for the use of the scholars who, in consequence of their being collected in the centre of the town from somewhat distant homes, will require to stay on the premises during the mid-day recess. The premises are also of such a character that further accommodation can be provided if it should hereafter be found necessary. This school will provide ample accommodation for 300 boys. There is very little doubt that the Board will be only too glad to accept this offer of the Chairman, and that the school will be opened about the end of May.

III. The present position of science teaching has been fully stated in my previous answers. I have only to add that a very large proportion of the children taught pass in the several subjects under the specific subjects schedule, and that several boys hold elementary school scholarships from the Science and Art Department, and receive additional instruction from the Science Demonstrator with the pupil teachers, and also at the laboratory.

IV. We have one small laboratory at our Birmingham Icknield Street Board School, which is fitted up in accordance with the Science Directory of 1882, and in which a few of the more advanced scholars are taught practical chemistry. It is almost certain that further laboratory accommodation will be provided.

V. I am not well able to compare the condition of the science teaching in our Board schools with that of the schools in other towns, or with the country at large. To do so satisfactorily would require both statistics and an actual knowledge of what other towns are doing. So far as I am able to judge personally, Liverpool appears to be doing similar work, and I am not aware that any other town is doing so much. I know that at Sheffield there is a central school in which there are a number of boys who have passed all the standards, who are learning several sciences, including both theoretical and practical chemistry, but I am not aware that any towns except Liverpool and Birmingham have attempted the teaching of science in the ordinary public elementary schools in the way in which Liverpool and Birmingham are doing so by their itinerant demonstrators and circulating apparatus.

If I have omitted any points upon which you require information, I shall be only too happy to supply them, and if the Board should desire to carry out the idea to which I have alluded in reference to the boys who are beyond the 6th Standard, I will send you an early intimation of it.

I am, dear Sir,

Yours truly,

GEORGE B. DAVIS,

Clerk of the Board.

Birmingham,  
February 1st, 1884.

G. B. Redgrave, Esq.,  
Secretary to the Royal Commission on  
Technical Instruction,  
South Kensington Museum, S.W.

## APPENDIX 35.

## BEDFORD GRAMMAR SCHOOL.

(See Vol. I., p. 481.)

## Appendix 35.

Bedford Grammar School,  
Laboratory and Workshop Instruction.

## LABORATORY AND WORKSHOP INSTRUCTION.

Besides the classical forms there is a Civil and Military Department, in which Modern Languages, Mathematics, and Science mainly take the place of Latin and Greek.

There are chemical and physical laboratories. The chemical laboratory is well equipped, contains 13 working places and accommodates 26. Boys are here taught qualitative and quantitative analysis; the quantitative is taken up by those only who are working for scholarships and other high examinations. There is a good lecture room, in which lectures, illustrated by experiments, are given. In the physical laboratory the junior classes have lectures, illustrated by experiments, and the seniors are introduced to physical measurements, chiefly in heat and electricity. All who take electricity and magnetism are sent in for the South Kensington examination, and during the past two years, out of the 50 sent in, seven-ninths of those taking the advanced paper and eight-ninths of those taking the elementary passed. There are workshops for carpentering and engineering. In the carpenter's shop, special attention is paid to the use of tools and to plain work. In the engineering shops there are wood lathe, sliding and screw cutting gap lathe, planing machine, two vices, forge, and anvils. Instruction is here given in the use of the various tools connected with brass and iron work. At the end of every year prizes are competed for, and the competition includes the following:—Forge.—Forging round one inch bar square, and square, round, welding round and square, chain of four links, nut and bolt. Lathe.—Knowledge of parts of screw-cutting lathe and tools, centering, turning iron parallel, spindle with collar, pin and collar, right and left hand screws, all worked to gauge. Filing.—Squaring and finishing, carpentering, planing, squaring, dove-tailing, morticing. Geometrical and Machine Drawing is taught to those in the engineering workshop, and great stress is laid upon drawing to scale.

Having temporary workshops only, much inconvenience is felt; at the same time much good and lasting work is done in the small space allowed. Many boys after leaving school for the Colonies and railways and other workshops have written of the immense value the knowledge which they have gained in these workshops has been to them, one having made the whole of his furniture for his home in the Colonies.

The following may be mentioned as having been made in the workshops: model engines in brass and iron, screws of various kinds, physical apparatus, book cases, chests of drawers, sofas, tables, fishing punts, body of a pony carriage in birch, ratchet presses, tool chests, &c., &c.

Every boy in the school (except the highest divisions) is taught drawing.

## APPENDIX 36.

## ANDERSON'S COLLEGE, GLASGOW.

(See Vol. I., p. 490.)

## Appendix 36.

Anderson's College, Glasgow.  
The Chair of Chemistry.

## MEMORANDUM by Professor DITTMAR.

The laboratory is the most important part of my establishment, not only in the obvious sense in which a similar remark would hold for any other school of chemistry, but also on this account, that it is it which

Appendix 86. substantially brings me my income, partly through students' fees, but principally through fees for analytical and other chemical work done by me for the public.

Anderson's  
College, Glasgow.

Without it all the rest could have no existence. The organization of this branch, in its educational aspect, is sufficiently explained by my syllabus, of which I beg to enclose a copy.

The attendance at my laboratory, when I came in 1874, was but small, and remained small until Autumn 1879, when it all at once, ran up to 23, to remain pretty steady at this figure for the winter sessions; during the summer months the attendance generally falls to about 15.

The laboratory at present is attended by 23 students, all working full time. (I admit no day students to the laboratory on other terms.)

It is needless to add that the majority do not come for the sake of a general education, but to be prepared for professional positions as chemists. In addition to the day laboratory, I am conducting the following courses of instruction:—

#### 2. *The Day Course of Lectures,*

regarding which, see Syllabus.

Attendance this session 34, of whom 21 are medical students. Last year I had an attendance of 50, the balance consists of medical students, who, this year, instead of coming to me, have gone to the Infirmary School.

#### 3. *The Freeland Course of Popular Evening Lectures on Chemistry.*

A course of 25 lectures given on Fridays, from 8 to 9 p.m. For this course I receive a fee of 100*l.* out of the Freeland Fund.

Attendance this session about 150.

The Committee keep the register.

#### 4. *The Three Months Course of Practical Chemistry,*

conducted specially for medical students in summer, and (if a sufficient number of such students present themselves) also in spring. With these classes I have completed the list of my duties as occupant of this chair. But, in addition to these courses, I have organized, of my own accord, the following courses for the benefit of clerks in offices, working men, &c. who cannot afford to come to me during the day:—

##### I.—*An Elementary and an Advanced Tutorial,*

for members of the "Freeland" Lecture course (restricted to such students as bind themselves to come forward at the Government examinations in May), conducted by Mr. Joseph Sayers. (Mondays from 7.30 to 8.30, and from 8.30 to 9.30 respectively.)

##### II.—*Two Courses of Instruction in Practical Chemistry,*

meeting on Tuesdays from 7.30 to 9.30; the elementary, under Mr. John McArthur, in the lower laboratory; the advanced, under Mr. James B. McArthur, in the upper laboratory. The attendance at these classes this session is as follows:—

Elementary Tutorial	-	-	-	13
Advanced	"	"	"	10
Elementary Practical	-	-	-	17
Advanced	"	"	"	7



## THE CHAIR OF CHEMISTRY.

Appendix 36.

Professor, W. DITTMAR, F.R.S., F.R.S.E.

Anderson's  
College, Glasgow.  
Chair of  
Chemistry.

A course of 100 experimental lectures on Chemistry.\* Daily (Saturdays excepted), from 10 to 11, commencing on Wednesday, 1st of November.

The lectures, up to the end of the year, are devoted to the elements of Chemical Philosophy, and to the Chemistry of the Non-metallic Elements. After New Year the course divides into two branches, viz., the Chemistry of the *Metals* (on the Mondays and Tuesdays), and *Organic Chemistry*, select chapters (on the Wednesdays, Thursdays, and Fridays). Six written examinations are held during the session, which all the members of the class are required to attend.

Fee, 2*l.* 2*s.*

The following prizes are awarded to students who take the highest positions at the class examinations:—

- |   |  |
|---|--|
| (1st) <i>The Laboratory Scholarship</i> , consisting of a free ticket of admission to the laboratory for a winter and summer session—obtainable only by such as bind themselves to attend the laboratory regularly. | } Money prizes of 2 <i>l.</i> 10 <i>s.</i> each. |
| (2nd) <i>The Arts Students' Prize</i> .   |  |
| (3rd) <i>The Medical Students' Prize</i> .  |  |

A course of tutorial lectures, in connection with the above lectures, will be given by the class tutor. Saturdays from 10 to 11.

The laboratory is open daily (Saturdays excepted) during the winter session from 10 to 5; during summer from 9.30 to 5. Advanced students may obtain permission to work privately on Saturdays also until 1 p.m.

Of the several duties which the *prestige* and traditions of this chair impose upon its occupant, the first and foremost is to offer to young men, of even limited means, the opportunity of receiving a training in Chemistry sufficient to prepare them fully for positions in chemical works, or as professional chemists.

Such training is possible only within the walls of a completely-furnished and well-organised Chemical Laboratory, which enables the student, under the eyes of an expert, to actually *practise* the various methods of experimental Chemistry, and more especially those of analysis, and its applications in Assaying.

Hence Mr. Dittmar has from the first always looked upon his laboratory as forming, so to say, the pivot of his establishment, and has laboured hard and spared no expense to bring it up to the requisite standard of efficiency.

The teaching is conducted on the tutorial system, each student working by himself, at a separate place, and on his own subject. Hence students of any grade of advancement may enter at any time, and the courses of instruction can be adapted to the special requirements of the individual. The usual programme, for those who attend the laboratory with the view of preparing for a professional position, is as follows:—

*1st Stage*.—A series of laboratory exercises, constituting a *preparatory* course of qualitative analysis. Text-book, Dittmar's *Analytical Chemistry*, W. & E. Chambers, Edinburgh. During this stage the student is expected to acquire, by lectures or private study, a sufficient knowledge of scientific Chemistry, inorganic and organic, to be qualified in the

*2nd Stage* to enter upon a systematic and more exhaustive study of the *qualitative methods* for the Analysis of *Salts* and for the ultimate analysis of substances generally. Text-book, Dittmar's *Manual of Analysis and Tables*, Douglas & Foulis, Edinburgh.

*3rd Stage*.—A course of exercises in *quantitative methods* of analysis and synthesis; combined with exercises in the preparation of pure chemical substances. Gas Analysis.

*Text-book*.—A manuscript book, compiled by the Professor, supplemented by Fresenius' and by Rosa's Handbooks, of which copies are kept in the laboratory for the students' use.

*4th Stage*.—Applications of qualitative and quantitative analysis to the investigation of substances of all kinds. Examination of articles of

Appendix 36. food, &c. Examination of vegetable and animal juices, urine, &c. Assaying of Ores, &c. Original researches.

Anderson's College, Glasgow. As Mr. Dittmar has for many years made a specialty of laboratory teaching, and is in the habit of working in his laboratory beside his pupils throughout the day, the laboratory offers exceptional opportunities for obtaining a thorough training in all branches of practical Chemistry. Special advantages are offered to *advanced students*.

Fee for the month, 2*l.* 2*s.*  
 Fee for the winter session (middle of October to middle of April), 10*l.* 10*s.*  
 Fee for the summer session (May, June, and July), 6*l.* 6*s.*  
 Fee for the two sessions, if paid together in advance, 15*l.* 15*s.*  
*The laboratory is open for students throughout the year, except during August.*

The fees include the use of all the ordinary reagents, and of the resources of the laboratory generally; but the student has to find his own small apparatus (test tubes, beakers, &c.), and also a few of the more expensive reagents—*e.g.*, chloride of platinum, nitrate of silver, molybdate of ammonia.

A special practical class for medical students, meeting twice a week, for two hours each time, is conducted during the *summer session*. In this course the students work together as a class, under the immediate direction of tutors, who are superintended by the Professor.

ATTENDANCE DURING 1881-82.

	Winter.	Summer.
Lectures - - - - -	51	—
Laboratory - - - - -	25	15
Practical Medical - - - - -	} 24	

Evening Department.

EVENING DEPARTMENT.

The FREELAND POPULAR LECTURES, on Friday evenings, at eight o'clock, commencing 29th September.

These lectures will be amply illustrated by experiments, and so arranged as to adapt themselves to the wants of a *popular* audience. They will comprise the histories of the non-metallic and of a selection of the metallic elements, and the rudiments of Chemical Philosophy.

When taken conjointly with one or other of the two *tutorials* referred to below, they will be found to fully cover the programme of the Government Department of Science and Art from the "elementary" and "advanced" stage respectively. Students wishing to prepare for the corresponding Government examinations are recommended (though not bound) to join the respective tutorials.

Special Courses.

SPECIAL COURSES FOR SCIENCE STUDENTS.

*Notice.*—Students wishing to join these courses as "science students" must bind themselves to attend with absolute regularity, to take part in the work of their classes, and to present themselves as candidates at the examinations to be held by the Government Department of Science and Art in May, 1883.

MONDAYS (commencing October 2nd).

1. Elementary Tutorial, 7.30 to 8.30.
2. Advanced Tutorial, 8.30 to 9.30.

Only open to science students who have enrolled themselves for the Appendix 36.  
 "Freeland" lectures.  
 Fee for either course, 10s. 6d.

Anderson's  
 College, Glasgow.

TUESDAYS (commencing October 3rd).

1. A course of Elementary Practical Chemistry—meeting the requirements of the Government Department for the "elementary stage." Class meets in the lower laboratory from 7.30 to 9.30.

Only science students admitted.

Fee (including expenses), 1l. 10s.

2. A course of instruction in Qualitative Analysis—adapted to the requirements of the Government Department for the "advanced stage." Class meets in the upper laboratory from 7.30 to 9.30.

Fee (including expenses) to science students, 2l. 2s.; to others, 3l. 3s.

3. A systematic course of exercises in Quantitative Analysis—as employed for the determination of the value of ores, commercial products, etc. In the upper laboratory from 7.30 to 9.30.

In this class each student receives a set of apparatus for his own use and a press to preserve it, but has to pay for what he may break or damage.

Fee, 3l. 3s.

At the examinations held by the Science and Art Department, in May, 1882, 99 papers were wrought by students of Mr. Dittmar's classes—32 gaining first-class, and 42 second-class certificates.

YOUNG CHAIR OF TECHNICAL CHEMISTRY.

Young Chair of  
 Technical  
 Chemistry,  
 Glasgow.

MEMORANDUM by Professor E. J. MILLS.

The Young Chair was founded in 1870 by Mr. James Young, LL.D., F.R.S., of Kelly, one of the earliest advocates of technical education, for the promotion of all branches of technical chemistry. It was the first of its kind in Great Britain. During the last twelve years its object has been diligently pursued, and many students trained in the laboratory now occupy important situations in works and elsewhere, several of these students having received the advantages of the institution through the aid of bursaries hereafter referred to.

All the more important industries in connection with Glasgow and the district have been made the subject of special courses of lectures.

During the last session sufficient success has been obtained in connection with special subjects to warrant the formation of a dyeing school and an iron and steel school; both of which are in active operation, and well attended.

The work in the day laboratory has led to the publication of an extended series of investigations, about 26 in number, connected with chemical industry in various departments.

Private laboratories, for the prosecution chiefly of patent and other private industrial research, have also been arranged and occupied.

The entries during the present session amount to 139, mostly for evening instruction.

At an early stage of the history of the Chair it was proposed by parties interested in the practical study of chemistry to provide bursaries for the instruction of young men of limited means and whose wish it was to follow some branch of manufacturing chemistry. The bursaries are of the amount of 50l. each per annum, tenable for three years, during which the bursars are required to give their whole time and attention to the lectures

Appendix 35. and laboratory duties of the Chair, paying the ordinary fees. The sum subscribed to the present date has been 2,795*l.*, and through this instrumentality 17 students have passed through the full curriculum of study, and four others to a partial extent. No other extraneous assistance has been provided for the Chair.

Anderson's  
College, Glasgow.

The following is a schedule, necessarily very incomplete, of students who have taken day instruction at the laboratory, and have obtained the positions indicated.

—	Name.	Destination or Appointment.
1871-2	John Miller - -	Glasgow Smelting Company.
	Andrew Richardson - -	St. Rollox Chemical Works.
	Ralph Melvor - -	Lecturer on Agricultural Chemistry, Balarat.
	R. H. Steedman - -	Connah's Quay Chemical Works, Flintshire.
	Wm. McCowan - -	City Analyst, Greenock.
	George McCowan - -	Student in Germany.
1872-3	Robert Ritchie - -	Chrome Works, Rutherglen.
	A. C. Thomson - -	Dalmeny Oil Works.
1875-6	J. J. Hood - -	Queen's Scholar, South Kensington.
	George Thomson - -	Eglinton Chemical Works, Glasgow.
	J. W. Pratt - -	Annfield Chemical Works, Glasgow.
	D. Stewart - -	Messrs. Bailey & Co., Wolverhampton.
	J. McNab - -	Duncan's Sugar Refinery, London.
	Lewis Campbell - -	Private technical research.
	James Hogarth - -	Annfield Chemical Works, Glasgow.
1876-7	T. U. Watson - -	Scott's Sugar Refinery, Greenock.
	J. B. Robb - -	Calico Print Works, Busby.
	— Shiry - -	Japan.
	J. J. Smith - -	Younger's Brewery, Edinburgh.
	John Kerr - -	Glasgow University.
1877-8	J. Stevenson, M.A. - -	Broxburn Oil Works.
	J. M. Reid - -	Dawholm Gas Works.
	C. Siebert - -	Tar, &c. work, Glasgow.
	H. B. Conbrough - -	Calico print work.
	D. Wilson - -	Landed proprietor.
1878-9	Wm. Mackey - -	Iron Works, Maryport.
	C. W. Meauwell - -	Messrs. De La Rue, London.
	George Donald - -	Gray's Distillery, Glasgow.
1879-80	J. Pettigrew - -	Clippens Oil Company.
	— Gardiner - -	Civil Engineer, Glasgow.
	— Tullis - -	Leather Factory, Glasgow.
	W. McFarlane - -	Monckbridge Iron Works, Leeds.
	E. Chester - -	Chili Gold Mining Company, Venezuela.
	J. Takamine, of Japan - -	Student, St. Rollox Chemical Works.
1880-1	W. Mellon - -	Mannre Works, Howdendyke.
	A. G. Perkin - -	Leeds Dyeing School.
	R. Scott - -	Monckbridge Iron Works, Leeds.
	N. McInnes - -	Orr Ewing & Co., Alexandria.

EDMUND J. MILLA.

Glasgow, March 15th, 1883.

APPENDIX 37.

LIST of PERSONS employed in the CHEMICAL DEPARTMENT of ST. ROLLOX CHEMICAL WORKS from 1870, showing the Institutions in which they were trained.

(See Vol. I., p. 492.)

Names.	Where Chemical Education was obtained.	St. Rollox, Highest Position.	Present Employment.	Remarks.
D. McCalman	Andersonian University & Mechanics Institution	Chemist	Chemical Manufacturer	Evening Classes.
A. Campbell	Do. do. do.	Do. do. do.	Do. do. do.	Do. do.
W. Boyd	Do. do. do.	Manager	In St. Rollox	Do. do.
W. Donald	Do. do. do.	Assistant Chemist	Manager in Dynamite Works	Do. do.
C. Hope	City Analysts' Laboratory	Chemist	Chemical Manufacturer	Regular Student.
W. Rennoldson	Newcastle College of Science and Arts	Do.	Manager of Chemical Works	Do. do.
A. Richardson	Andersonian University	Assistant Chemist	Do. do. do.	Do. do.
D. Playfair	Glasgow University	Do. do.	Do. do. do.	Do. do.
W. Obeirne	Mechanics Institution*	Do. do.	North British Chemical Co.	Evening Classes.
J. Park	Glasgow University	Do. do.	Chemist in Print Works	Regular Student.
A. Carmichael	Dr. Milne, Andersonian & University Mechanics Institution.	Do. do.	In St. Rollox	Evening Classes.
P. Hamill	Andersonian University & Mechanics Institution	Do. do.	Do. do. do.	Do. do.
N. McKelvie	Andersonian University	Chemist	Do. do. do.	Regular Student.
W. Brown	Mechanics Institution	Assistant Chemist.	Do. do. do.	Evening Classes.
S. Elliot	Andersonian University & Mechanics Institution	Do. do.	Do. do. do.	Do. do.
A. Dodds	Mechanics Institution	Do. do.	Do. do. do.	Do. do.
F. McCrae	Do. do.	Do. do.	Do. do. do.	Do. do.
A. McQueen	Do. do.	Boy	Do. do. do.	Do. do.
B. Fullarton	Andersonian University	Assistant Chemist.	Chemical Manager, Manure Works	Regular Student.

\* Mechanics Institution now goes under the name of "College of Science and Arts, Glasgow," having been changed a little over 2 years ago.

APPENDICES, &c.

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Printed at  
the  
Press of  
James  
McRae,  
St. Rollox  
Glasgow.  
Appendix 37.

Appendix 38.

Classes in connection with Rochdale Co-operative Society.

## APPENDIX 38.

## EDUCATIONAL WORK OF CO-OPERATIVE SOCIETIES.

(See Vol. I., p. 513.)

## ROCHDALE EQUITABLE PIONEERS' SOCIETY.

The co-operative societies of the North of England, originally established for the economical distribution of provisions among their members, have in some cases added educational work to their functions, and not only possess libraries, lecture theatres, and reading-rooms, but also conduct classes in science, art, and literature for the benefit of their constituents, and place within their reach numerous facilities for scientific and technical training. As an example of the work of this character, undertaken by one of the most celebrated societies of Lancashire, we give a short sketch of the work of this nature carried on in connection with the Rochdale Equitable Pioneers' Society, Limited, established in 1844, which has a fully organised educational department. This section is under the management of a committee, who, in presenting their eleventh annual report in 1883, are able to speak of a great increase in the number of pupils, the art classes having increased 34·5 per cent., and the science classes 18 per cent., while in the technological classes, only established in 1882, there were 92 pupils. The total number of pupils in the science classes were 222, in the art classes 78, and in the French classes 119. The classes are open to both male and female students. The entrance fee for the classes is 5s. for members of the society, and 6s. for non-members, payable in advance. The students of one class wishing to join another may do so on payment of one-half the fees in addition for each class. Money prizes are given by the society to the two most successful pupils in each stage of each subject; 10s. to the best and 5s. to the second best. The classes are maintained at a very small expense to the society. The teachers have half the fees and all the Government grant. As there is no grant for the language classes the teacher receives 20l. from the society for the session of six months. The annexed time-table will show the subjects taught in the various classes, as also the hours of study. Another feature of the educational work is the library with its numerous branches, 18 in all, distributed about the town and suburbs. The circulating library consists of 13,591 volumes; the reference library and branches contain 1,924 volumes; total 15,515 volumes, with a circulation of about 40,000 volumes annually. The public lectures formerly provided have been discontinued, as they were not much appreciated after the science classes were instituted.

A somewhat peculiar feature of the educational department is a collection of scientific instruments, which can be hired out at very small charges. Thus, telescopes, 4d. per diem or 1s. per week; field glasses, 2d. per day or 9d. per week; microscopes, with four dozen slides of objects, 2d. per day, and 1d. per day extra for each additional four dozen slides; stereoscopes, galvanic batteries, zoetropes, &c. are lent at equally low charges.

## SCIENCE, ART, TECHNOLOGY, AND FRENCH CLASSES.

Time of Meeting.	Subjects taught.	Place of Meeting.
Monday, 6.45 p.m.	Practical Plane and Solid Geometry; Machine Drawing, Building Construction, and Applied Mechanics. Teacher - Mr. J. E. E. GREAVES.	Over Oldham Road Store.
Monday, 7.30 p.m.	Cotton Manufacture. Teacher - Mr. ISHERWOOD.	Assembly Room, Tord Lane.
Tuesday, 7 p.m.	French, Elementary and Advanced. Teacher - Mr. A. BRATFE.	Assembly Room, Tord Lane.

Time of Meeting.	Subjects taught.	Place of Meeting.
Tuesday, 7 p.m.	Practical and Inorganic Chemistry. Teachers - Messrs. C. TOPPER and W. H. PENNINGTON.	Under the New Tailor's Shop, Toad Lane.
Wednesday, 7 p.m.	Physiology, Magnetism, and Electricity. Teacher - Mr. JOHN WILD.	No. 2 Board Room, Toad Lane.
Thursday, 8.45 p.m.	Practical, Plane, and Solid Geometry, Machine Drawing, Building Construction, Steam. Teacher - Mr. J. E. E. GRAVES.	Over Oldham Road Store.
Thursday, 7 p.m.	Mathematics. Teacher - Mr. E. R. GREY.	Corn Mill Meeting Room, Weir Street.
Thursday and Friday, 7.50 p.m.	Freehand, Model, Geometrical, and Perspective Drawing. Teacher - Mr. THOMAS WAUGH.	Assembly Room, Toad Lane.
Friday, 7 p.m.	Botany and Biology. Teacher - Mr. JOHN WILD.	No. 2 Board Room, Toad Lane.
Saturday, 2.15 p.m.	Mechanical Engineering and Tools; Principles of Agriculture; Sound, Light, and Heat. Teacher - Mr. J. E. E. GRAVES.	Over Oldham Road Store.
Saturday, 7 p.m.	Geology and Physicography. Teacher - Mr. B. LAW.	Assembly Room, Toad Lane.

## Appendix 38.

Classes in con-  
nection with  
Rochdale Co-  
operative Society.

## APPENDIX 39.

SUGGESTIONS ON ART EDUCATION BY M. WILLMS.  
(See Vol. I., p. 521.)

## Appendix 39.

Suggestions on  
Art Education  
by M. Willms.

DEAR SIR,

WHEN I saw you, in London, a short time ago, you asked me to put the few suggestions I had to make touching fine art education into writing. I should have done so much earlier, but pressure of business has prevented me.

I will now take the liberty—de vous parler à cœur ouvert—and will tell you what I think to be the truth in reference to the important subject of art education in England, and what, in my opinion, are the impediments in the way of progress.

As, I believe, you know, in France, for a long time past, industrial artists have accorded to them a social position and respect which their talents and acquirements deserve, and no expense is spared in providing museums, schools, libraries, &c. to assist them in their studies.

But in England this is not so.

Your Kensington Museum is in many things superior to anything of the kind in Paris, and your art schools are working moderately well, and have already produced some very good men. But I think your object should not be to form good and clever artists, and then, as soon as they are formed, to abandon them; particularly as good practical industrial artists being so few in England, are, in proportion much more valuable than in France.

For this reason, something should be done to enable the few good men you have to acquire a position, for, as it is, there is neither encouragement nor security for them.

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 ———  
 Suggestions on  
 Art Education  
 by M. Williams.

I, therefore, in the interest of English industrial art, say, that as you have now a certain limited number of English artists, clever and practical you should give that body the importance it deserves by its usefulness—that is to say, that these men, many of whom have acquired a thorough practical knowledge of the requirements of the country—for it is on them that you must rely to make a design for a piece of work, which may look well on paper but it is a very different thing to make a design which, in addition to looking well on paper, shall be thoroughly practical and capable of execution, and this is a knowledge which very few of your art teachers possess—these men, therefore, I say should be appointed to the first positions connected with decorative and industrial art, and as teachers both at Kensington and in the art schools of the country; and these also are the men most fitted to be the jurors to award prizes in the various art competitions.

In reference to competitions, as it is at present, if a prize is offered for a design or a work in silver, or indeed any material, as a centre-piece for the table, or a candelabrum, chandelier, &c., as in the Goldsmiths' annual competition, an Academician is most generally selected to judge the work. Now, a Royal Academician may be an excellent judge for a picture, a statue, or a work of architecture, and yet know little or nothing of the merits of a design for a piece of metal work, and, perhaps carried away by a pleasing drawing, will award the first prize to a design, which it is absolutely impossible to carry out in metal. Why even, Mr. ——— who has acquired some reputation as an industrial artist, having had some experience by the side of ———, and also at ——— I say that even he is not in the spirit of the art movement of the present day; and I say again, with all respect, that these men are not fit guides in the art education of the day. Of course, architects, sculptors, and even painters may judge a competition for a public monument, or a piece of plate of great sculptural disposition, but they are not able to judge the merits of a design for a work of manufacture, which should have the quality of originality combined with practicability; and this is what only the class of industrial artists I have mentioned do understand.

As a proof of what I advance we have only to notice the awards of the prizes in the Goldsmiths' competition made during the last three or four years by a Royal Academician. I may say that these awards have been in my opinion, most extraordinary, really good designs having been returned to their owners, and prizes awarded to works entirely devoid of merit, the natural result being that artist-student competitors are puzzled to know what is considered to be the standard of merit, and the more experienced have discontinued competing from sheer disgust.

I think the South Kensington people also are somewhat to blame in this matter, exhibiting the prize works and sending them to provincial towns without first ascertaining, more carefully, the grounds on which the selections have been made, and the character of the rejected works.

Again, if you could see the programme for the present year, made principally, I presume, by ———, you would, I think, agree with me that it is altogether a mistake.

The subject for the casting prize is a plaster head of Ariadne, which, now it is cast, weighs nearly 70 ounces of silver, and required the melting of 100 oz. to ensure a good cast, and when done the most successful casting will not be worth one shilling over and above the value of the metal. Again, the subject for repoussé chasing—two children singing, by Donatello. The work is quite unsuitable for execution by repoussé, and one which would never be executed by that mode of work. There is an utterly useless difficulty of manipulation of the metal, which would be in the way of the most clever chaser, and, like the casting prize, is useless for any purpose when finished.

This uselessness of itself renders it impossible for a large number of people to compete, as they cannot afford to purchase so large a quantity of silver as is necessary to execute the work, particularly the casting, and then, when all is done, to have to melt it again.

While upon this subject, I may just glance at another fact which has frequently come under my notice, viz., that frequently important compe-



titions have been decided by, perhaps, two, and sometimes only one, person; the other members of the committee, I suppose, not having thought it worth while to attend. This has happened several times when I have been a juror myself. Appendix 39.

There is another great impediment in the way of art progress in England, and that is, the extreme apathy of the great majority of those who will ultimately profit most by it, viz., the manufacturers. Very few of these will pay a reasonable amount for a design or model or for good chasing. A manufacturer seems to think that every pound he pays for designing or modelling is so much money lost, and, as a rule, he prefers to go to Paris, or elsewhere, to buy a few fresh articles in plate, bronze, or any other line of business in which he may be engaged, to bring them home, cut them up, and ring the changes on them, or else to copy them in their entirety. And here stands out boldly a great difference between an English and French manufacturer, the one spending large sums in his endeavour to procure good and original designs, and the other grudging every penny so spent.

I know, for a fact, that several very talented artists have abandoned the fine arts, and turned their attention to other sources of income, entirely on account of the difficulty of obtaining a respectable living. So long as this is the case, an English manufacturer cannot expect to compete with the Continental manufacturer in any branch in which fine art is an essential. This might to some extent be remedied, if in the art schools good practical art masters were to teach the workmen, who will be, perhaps, masters themselves in time, and who largely attend these schools, and whose number would increase if they felt that the teacher knew something of the practical as well as the theoretical, for, as I have said before, a designer is nothing if not practical.

The above remarks represent the spirit of an article I prepared some little time ago, intending to publish it in the form of a pamphlet, but I think the subject will derive more benefit in your hands; and so I think it will be best to leave it. In conclusion permit me to urge the desirability of placing in the art schools of manufacturing towns, as teachers, those clever and practical artists of whom I have spoken before, without troubling them about the Kensington art masters' certificate, which is of very little real value, and, I think, you will then have more sound useful teaching and valuable results than you have ever before had, or than can be hoped for under the present system.

Sir,

I have the honour to remain,  
Faithfully yours,

B. Samuelson, Esq., M.P., F.R.S.,  
Chairman of the Royal Commission on  
Technical Instruction.

A. WELLS.

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#### APPENDIX 40.

REPORT of the FRENCH COMMISSION on ART MUSEUMS for SCHOOLS  
to the MINISTER of PUBLIC INSTRUCTION and the FINE ARTS.

(See Vol. I., p. 523.)

Appendix 40.

Report on Art  
Museums for  
Schools.

Sir,

By a decree dated July 20th, 1882, you appointed a Permanent Commission, empowered to consider the questions relating to the establishment of small museums of works of art in schools, colleges and lycées, which, as you pointed out in 1880, would not fail to contribute to the intellectual culture of the pupils, familiarising them from the outset with the appreciation of choice examples, and with the knowledge of refined forms.

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This Special Commission had not to examine afresh the principles which must govern the formation of these scholastic museums, and the selection of the specimens required to constitute these simple collections. The operations were determined beforehand, for it could but avail itself of the deliberations already come to by the General Commission charged, by virtue of the decree of May 27th, 1890, to examine in what way art might best be introduced into the school, without interfering with the due requirements of instruction, and without following to the extreme limits the chimerical results which would tend to convert the students into actual artists. This is not the aim; but sound thinkers have concluded that the intelligence of the child may be aroused and stimulated by the beauty of the examples placed before his eyes; that the ugliness and the vulgarity of the objects, by which he is frequently surrounded constitute bad guides for his taste; and that the moral advantages would be certain if it were possible to add to the instruction given by the master to attractive and fruitful lessons conveyed by the contemplation of works of art. Out of this consideration arise three classes of ideas, the realisation of which ought to be coincident, in that they have been conceived in view of the same ultimate object. In the first place the school building, instead of being as dreary as a prison, may be decorated in a simple fashion; secondly, it is easy to give to the child, in the shape of prizes, art objects which may appeal to his intelligence; and lastly, it is not impossible to find places in the school, the college, or the lycée for fitting up small museums, which, although economy has to be studied, would serve to initiate the pupils and to lead them onwards towards the beauties of art.

The questions respecting the decoration of the school building and the necessary ornaments having been made the subject of a special report, I have only, Sir, to bring under your notice the labours of the Commission charged with the organisation of School Museums. Faithful to the programme with which it was entrusted, the Commission has drawn up a preliminary list of original works, reproductions of which in the form of casts, engravings, or photographs appear to possess undeniable advantages for the instruction of the pupils. This list comprises the most beautiful and characteristic conceptions of the sculptor, the medallist, the painter, the engraver, and the etcher. In conformity with the wish expressed by the former Commission, we have included in the list a selection of portraits of eminent personages, and the representation, by means of photographs or engravings, of a few monuments of architecture. The catalogue also comprises a small number of works of decorative art, which are inserted by way of specimens.

It is not necessary that I should add that this list is not a final one. Although it contains the chief masterpieces of all periods and all styles it would be easy to add to it further. This is a task which the Commission will not fail to attend to in its future meetings. The Commission is a permanent one, and nothing shall be neglected to render its work complete. But for the present it has been desirous to bear in mind the smallness of the means at the disposal of the school authorities, and has been considered that the works of art included in the schedules which have been prepared would amply suffice for a preliminary experiment. Indeed, among the examples selected, there is not a single one which does not commend itself, either by the beauty of its form, the thought it expresses, or the charm of skilful or intelligent execution. Moreover, as these works have a value historically, and from this point of view the choice has been made in such a way that if a college were able to acquire the whole of the examples named, the teacher would find in this little museum the materials for, and a brief epitome of, the history of art, from the period of Ancient Egypt down to modern times.

Valuable opportunities were offered to the Commission to complete as far as possible the collection, the specimens comprising which, have been deemed worthy to be included in school museums. Sculpture and drawing only being capable of being represented by means of casts, we found at the *École des Beaux-Arts* and in the atelier of the Louvre very satisfactory reproductions of nearly all the works that we should be ambitious to include in our collections. As respects painting, it could only take



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History intervenes, to a very incomplete extent, doubtless, but not without significance. Together with the casts from the antique are several examples borrowed from the middle ages and from modern art. As respects painting, represented by engravings and photographs, the choice has been made in such a way that the student may become acquainted with the special character of all the great schools. In another direction it has been deemed necessary to add to the collection a view of certain famous monuments which are, as it were, a *résumé* of the history of architecture in its various phases. Lastly, the normal school museum is completed by a selection of portraits of eminent personages. These likewise, being for the most part produced by famous painters, are at the same time works of fine art, as well as possessed of iconographic value. It is well that the masters-in-training should be familiarised with the physiognomy of the celebrated men about whom their teachers are daily discoursing. We have considered in choosing these portraits that the principal portion should be from French examples.

It was at the request of the Director of Secondary Instruction (at the meeting of 14th March 1881) that the General Commission recognised the necessity for the organisation of museums of art works in colleges and lycées. Here the area is wider. Schedule D. contains the list of reproductions which it has appeared to us advisable to place in these establishments. Without losing sight of the question of art taste, we have been desirous, and moreover it was necessitated by the programme adopted two years ago, to allow history to take its due place. We have admitted works of the archaic style, and even works of those periods which are regarded by purists as belonging to the decadence of art. As respects sculpture the catalogue opens with the statue of *Rameses II* and closes with the works of modern sculptors. In painting the list includes the names of the principal masters from *Giotto* to *Delacroix*. In fact, Sir, there are here names and works which ought to be known and glorified in secondary schools. As do the poets, the politicians and the captains, so also do the architects, the painters and the sculptors give excellent lessons, and youths will lose nothing by a knowledge of the history of the ideal.

The President of the Commission for School Museums,  
PAUL MARYZ.

### SCHOOL MUSEUMS.

#### SCHEDULE A.

#### Primary Schools for Boys.

#### SCULPTURE.

Statues (reduced in size)	{ Sophocles } { Aristides }	École des Beaux-Arts.
Busts	{ Hermès of Praxiteles } { Venus of Arles } { Plato }	École des Beaux-Arts.
Bas-reliefs	{ The Thinker, by Michael Angelo } { The Horsemen from the Parthenon } { The Lion, by Barye (Bastille Column) }	
Capitals	{ A Corinthian capital } { A Composite }	
Medallions	{ The medal of Syracuse } { Henry IV., by Dupré }	
Photographs	{ Juno (Athens) } { Augustus (Louvre) }	Ravaisson (Hachette).

#### PAINTING AND ENGRAVING.

Leonardo da Vinci. Young man with laurel wreath. Photograph by Ravaisson.  
Lorenzo di Credi. Head of a young man. Louvre.

Titian { Old man with black beard } Photographs by Ravaisson.  
 " { " " white " }  
 Holbein { Lord Vaux } Photographs by Ravaisson.  
 " { Thomas Elliot }  
 Van Dyck. Two portraits, etchings } A. Durand.  
 Paul Potter. The Cow-herd, etching }  
 Claude Lorrain { The Neat-herd } Etchings by A. Durand.  
 " { The Rising Sun }  
 Four portraits of French Celebrities.

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## SCHEDULE B.

*Primary Schools for Girls.*

## SCULPTURE.

Busts { Joan of Arc, by Rude (Louvre). } Ecole des Beaux-Arts.  
 " { Bust of Child. Donatello } " "  
 " { Head of an Angel. Nanna di Banco } " "  
 Bas-relief. St. John. Mino da Fiesole.  
 Photographs { Peace (Munich) } Photographs by Ravaisson.  
 " { Young Girl (Naples) }

## PAINTING AND ENGRAVING.

Leonardo da Vinci. Portrait of a Woman. Chalcographie.  
 Raphael { The Holy Family, Francois I. } "  
 " { The Virgin with a Veil } "  
 Prud'hon { Four Muses } Photographs by Ravaisson.  
 " { Head of a Young Girl }  
 Four portraits of French Celebrities.  
 A lace book of the XVI. Century.

## SCHEDULE C.

*Normal Schools.*

The Museum of the Normal School comprises or may comprise:—

- (1) The works of art which form part of the museum of the primary school.
- (2) The following works which ought as far as possible to be arranged in historical order.

## SCULPTURE.

Demosthenes } Statues reduced in size. Ecole des Beaux-Arts.  
 Achilles\* }  
 Germanicus\* }  
 Augustus } Busts  
 Lucius Verus }  
 Alexander }  
 Hadrian } Medallions  
 Trajan }  
 Marcus Aurelius }  
 Head of an Apostle (XIII. Century). Louvre cast.  
 Two mediaeval seals { A Chevalier } Ecole des Beaux-Arts.  
 " { A Prince }  
 Virgin in Ivory (Timbal collection)  
 Filippo Strozzi. Bust by Benedetto da Maiano. Louvre cast.

\* In Female Normal Schools one of these Statues is to be replaced by the Amazon.

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Bust of Michael Angelo.	
Leo Battista Alberti	} Medallions. École des Beaux-Arts.
Sigismond Malatesta (Pisanello)	
Ludovic le More (Caradosso)	
Lorenzo de Medicis (Pollaiuolo)	
Milo of Croton. Bust (Puget).	Louvre cast.
Mary de Medicis. Medallion (Dupré)	} École des Beaux-Arts.
Anne of Austria. " (Warin)	
Rotrou. Bust by Caffieri.	Comédie-Française.
Franklin. " "	Houdon. Louvre cast.
Marceau. " "	Dumont. Terra cotta. Louvre cast (to be made).
Condorcet	} Medallions by David d'Angers.
Goethe	
Madame Roland	
Kléber	

## PAINTING AND ENGRAVING.

*Italian School.*

Leonardo da Vinci	{ The Virgin among the Rocks. The Last Supper.
Michael Angelo	{ The Creation of Man. Woman.
Raphael	{ The Belle Jardinière. Poetry. The Vision of Ezekiel. The Departure from the Ark.
Titian.	The Martyrdom of St. Peter (Verona).

*German School.*

Durer.	Melancholia. Heliotype by Armand Durand.
Holbein	{ Virgin at Darmstadt. Two portraits (photographs by Ravaisson).

*Dutch School.*

Rembrandt	{ Raising of Lazarus Death of the Virgin Abraham's Sacrifice Christ healing the Sick } Etchings by Armand Durand.
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*Flemish School.*

Rubens	{ The Descent from the Cross. The Wild Boar Hunt.
Lebrun.	André Chenier, after Suvée.
Puget, engraved by Jeausat, after F. Puget.	Hoche. General Buonaparte, after Gros.
Mignard.	Napoleon I.
Montesquien, engraved by Ficquet.	Chateaubriand.
Voltaire.	Lamartine, after Gérard.
Buffon.	David, after Langlois.
J. J. Rousseau, after La Tour.	Ingres.
Bameau.	Gros.
Turgot.	Géricault.
Gluck, engraved by Miger, after Duplessis.	Cuvier.
Mozart.	François Arago.
Van Dyck	{ Four Portraits. Etchings by Armand Durand. Bentivoglio, engraved by Morin.

*Spanish School.*

Velasquez.	The Surrender of Breda.
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*French School.*

Poussin { The Will of Endamidas.  
Triumph of Truth.  
Lesueur. Death of St. Bruno.  
Watteau. Embarkation for Cythera.  
David. Death of Socrates.  
Gros. Plague of Jaffa.  
Prud'hon. Justice pursuing Crime. (Drawing from Louvre).  
Géricault. Shipwreck of the Medusa.  
Ingres. Apotheosis of Homer.  
Delacroix. Dante's Boat.

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## ARCHITECTURE.

An Egyptian Temple (Philæ).  
The Parthenon.  
The Coliseum.  
The Arch of Titus.  
The Cathedral of Notre Dame, Paris.  
" " Chartres.  
The Court-yard of the Louvre.

## COLLECTION OF PORTRAITS.

The museum of the Normal School comprises a series of portraits of eminent personages, selected from the following list:—

Francis I.	Villars.
Catherine de Médecis.	Bossuet, engraved by Drevet, after Rigaud.
Coligny.	Cornelle, engraved by Ficquet.
L'Hospital.	La Fontaine.
Henry IV.	Boileau.
Sully.	Molière.
Shakespeare.	Racine.
Galileo.	La Bruyère.
Descartes.	Madame de Sévigné.
Richelieu.	Colbert.
Mazarin.	Louvois.
Le Grand Condé.	Louis XIV.
Turenne.	Poussin, engraved by Pesne.
Vauban.	

## SCHEDULE D.

## LYCÉES and COLLEGES.

*Egyptian Art.*

Portrait of Rameses II. Published by École des Beaux-Arts.

*Greek and Roman Art.*

Statue of Demosthenes (Reduced).	Published by École des Beaux-Arts.
" Sophocles.	" " "
" Aristides.	" " "
" Achilles.	" " "
" Germanicus.	" " "
Amazon, by Phidias.	" " "
Wingless Victory (Bas-relief).	" " "

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Bust of Hermes, by Praxiteles.	Published by	École des Beaux-Arts.
" Venus of Arles.	" "	" "
" Plato.	" "	" "
The Minerva of Turin.	" "	" "
Cup from the Hildesheim Treasure.	" "	" "
Bust of Wreathed Augustus.	" "	" "
" Antinous.	" "	" "
" Lucius Verus.	" "	" "
A Corinthian Capital.	" "	" "
Two Composite Capitals.	" "	" "
Juno (Athens, photograph).	"	Hachette.
Mercury (photograph).	"	"
Peace, type of face (photograph).	"	"
Young girl, Greek marble (photograph).	"	"
Augustus (photograph).	"	"
Tetradrachma of Syracuse, with the Victory on a quadriga and reverse.	Published by	École des Beaux-Arts.
Alexander the Great (Trésor de Numismatique Greek Kings, plate XXII.)	}	" " "
Demetrius Poliorcetes (Trésor de Numismatique Greek Kings, plate XXIII.)		
Achilles (Trésor de Numismatique, Greek Kings, plate XXII.)	}	" " "
Augustus (Fröhner, plate II, the front only)		
Trajan (Fröhner, plate XXI, the front only)	}	" " "
Hadrian (Fröhner, plate XXI, the front only)		
Marcus Aurelius	"	"
Constantine	"	"
Ivory of the Symnaques	"	"

MIDDLE AGES.

Seal of a Knight	"	"	"
" Prince	"	"	"
Virgin of the Timal Collection (Ivory)	"	"	"
Statue from Rheims	Trocadéro Museum.	"	"

RENAISSANCE.

I.—Italy.

A. SCULPTURE.

Artist.	Description of Work.	Published by
—	Medallion of Leo-Battista Alberti	École des Beaux Arts.
Ghiberti	Shrine of S. Zenobio	" " "
Donatello	Bust of a Child	" " "
"	St. George. (Bas-relief)	" " "
Mino da Fiesole	St. John	" " "
Lucca della Robbia	The Singers	" " "
Nanni di Banco	Head of an Angel	" " "
"	Head in Wax (Museum of Lille)	" " "
"	Bust of female unknown (Florentine School, X.V. Century)	Louvre.
Benedetto de Maiano	Bust of Sirozzi	École des Beaux Arts.
Michael Angelo	" the Thinker	" " "
"	Michael Angelo	" " "
"	The Flagellation (Bas-relief)	Louvre.
Pisanello	Alfonso of Aragon	" " "
"	Bisizmund Malatesta	" " "
Caradoso	Ludovic le More	" " "
"	Galassa Visconti	Medals
Pollainolo	Lorenzo de Medicis	École des Beaux Arts.
Bevenuto Cellini	Francis I.	" " "
"	Clement VII.	" " "



I.—Italy—continued.  
B. PAINTING AND ENGRAVING.

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Artist	Description of Work	Published by
Giotto	Entombment (Padua)	Photograph, Nava.
	Portrait of Dante (Florence)	" Alinari.
Mantegna	Entombment	Amand Durand.
"	The Virgin and Child	"
"	The Resurrection of Our Lord	"
Fra Angelico	The Coronation of the Virgin (Engraving by François).	Louvre.
Botticelli	Calumny of Apelles (Florence)	Photograph, Brogi.
Ghirlandajo	The Visitation	Louvre.
Bellini	Venetian Noble (Drawing)	Hachette.
Luca della Robbia	Head of a Young Man (Drawing, engraved by Butavand).	Louvre.
Leonardo da Vinci	The Virgin, among the Rocks	"
"	Portrait of a Woman	"
"	Head with a Wreath (photograph by Ravaisson).	Hachette.
"	of an Old Man	"
" (after the drawing of Gaillard).	The Last Supper	École des Beaux Arts.
Michael Angelo	Creation of Man	Louvre.
Raphael	Alexander causing the Works of Homer to be locked up (Engraving by Marc Antonio)	Amand Durand.
"	God ordering Noah to quit the Ark (Engraving by Marc Antonio).	"
"	The Sleep of Jesus	Engravings by } Louvre.
"	The Virgin with Veil	Desoyere
"	The Belle Jardinière	"
"	The Holy Family of Francis I. (Engraving by Edelinck).	"
"	Study for the same Picture (Drawing)	"
"	The Dead Christ (Drawing, engraved by Alph. Leroy).	"
"	Psyche (Drawing, engraved by Butavand)	"
"	Allegorical Figures (eleven figures)	Hermet.
"	The Vision of Ezekiel	Hachette.
"	The Virgin with Book (Photograph by Ravaisson from Drawing in the Louvre).	Amand Durand.
"	Lucrèce (Engraving by Marc Antonio)	"
"	Poetry	"
"	Maddalena Doni (photographed by Ravaisson from Drawing in the Louvre).	Hachette.
"	St. Paul at Athens	Amand Durand.
"	The Massacre of the Innocents	"
"	St. Catherine (photographed by Ravaisson from Drawing in the Louvre).	Hachette.
Andrea del Sarto	The Madonna with Bag	Braun.
Correggio	Saint Jerome	Hermet.
Titian	The Assumption	Louvre.
"	Old Man with White Beard (Photograph by Ravaisson from Drawing in Louvre).	Hachette.
"	Black	"
"	The Entombment	Louvre.
"	The Martyrdom of St. Peter of Verona	Hermet.
"	Portrait of Titian	Amand Durand.
F. Veronese	The Wedding at Cana of Galilee	Goupil.
"	Portrait of Galileo (Florence)	"

## II.—Germany and the Low Countries.

Martin Schoen	Three Engravings (Nos. 27, 53, and 108)	Amand Durand.
Memling	St. Ursula arriving at Rome (Shrine of St. Ursula)	"
Lucas von Leyden	Portrait of Maximilian	"
Durer	Four Engravings, Nos. 41, 53, 70, and 85	"
Holbein	Portrait of Erasmus (Engraving by Bruegel)	Louvre.
"	The Darnestadt Virgin	"
"	George of Cornwall (Ravaisson's Photograph)	Hachette.
"	Lord Vaux (Ravaisson's photograph)	"
"	Thomas Elliot	"
"	Individual unknown	"

## Appendix 40.

Report on Art  
Museums for  
Schools.

## III.—France, Renaissance.

## SCULPTURE.

Artist.	Description of Work.	Published by
—	Portrait of Commynes	Louvre.
—	Statue of Chabot	"
Jean Goujon	Bas-relief from the Fontaine des Innocents	École des Beaux Arts.
Dupré	Dish of Briot	"
"	Medal of Henry IV.	"

## PAINTING AND ENGRAVING.

Jean Morin	Portrait of Francis I.	Rapilly.
"	" Bayard	"
Thomas de Leu	Catherine de Médicis	Louvre.
"	Henry IV.	Bernard.
"	Coligny	"
"	Chancellor de l'Hospital	Louvre.

## XVII., XVIII., AND XIX. CENTURIES.

## I.—France.

## A. SCULPTURE.

Dupré	Mary de Medicis (Medallion)	École des Beaux Arts.
Puget	Milo of Croton (bust)	"
Warin	Anne of Austria and Louis XIV. (Medallion).	"
Caillier	Bust of Rotrou	Théâtre de Comédie-Française (to be cast).
Pigalle	Mercury fastening on the Wings to his heels.	Louvre.
Houdon	Bust of Franklin	"
"	" Diderot	"
"	" Mirabeau	"
"	Pilaster decorated with Laurel	École des Beaux Arts.
Dumont	Bust of Marceau (terra cotta)	Louvre.
Rude	Joan of Arc (bust)	"
David d'Angers	Medallion of Etcher	"
"	" Bonnet de l'Isle	"
"	" Goethe	"
"	" Condorcet	"
"	" Madame Roland	"
Barye	The Lion (bas-relief).	"
Guillemme	The Gracchi (Luxembourg).	"
Chapu	Youth (Engraving by J. Jacquet)	Louvre.
Mercié	Gloria Victis	"
Paul Dubois	Charity (Engraving by Bellay)	"
"	Military Heroism (Engraving by J. Jacquet)	"

## B.—PAINTING AND ENGRAVING.

Poussin	The Triumph of Truth (Engraving by G. Audran).	Louvre.
"	The Oath of Eudamidas (Engraving by Fessel).	"
"	The Plague (Engraving by Etienne Picart)	"
Claude Lorrain	Diogenes	Amand Durand.
"	The Nest Herd (Etching)	"
"	The Rising Sun	"
"	The Tiber (Photograph by Ravaisson from Drawing in the Louvre).	Hachette.
Leueur	The Death of St. Bruno	Brun.
"	Portrait of Sully	Louvre.
Lebrun	The Defeat of Porus (Engraving by G. Audran).	"
Nanteuil	Portrait of Richelieu.	"
"	Mazarin	Bernard.

Artist.	Description of Work.	Published by
Nanteuil	Portrait of the Grand Condé.	
"	" Turenne.	
Rignaud	" Vauban.	
"	" Villars (engraved by Drevet).	Bernard.
Piequet	" Bossuet ( " P. Drevet).	"
Edelinck	" Corneille	Braun.
"	" La Fontaine	"
Mignard	" Boileau	"
Edelinck	" Molière	"
"	" Racine	"
Nanteuil	" La Bruyère	"
"	" Madame de Sévigné	"
"	" Colbert	"
"	" Louvois	"
"	" Louis XIV.	"
Poussin	" Poussin (engraved by Pesne)	Amand Durand.
Edelinck	" Lebrun	Louvre.
François Pujet	" Pierre Pujet (engraved by Joubert).	"
Mignard	" Mignard (engraved by Schmidt)	"
Watteau	The Embarkation for Cythera	"
Picquet	Portrait of Montesquieu	"
"	" Voltaire	"
"	" Buffon	"
Latour	" J. J. Rousseau	Braun.
Saint-Aubin	" Rameau	"
Suvée	" André Chénier	"
"	" Turgot	"
Gérard	" Hoche	"
Duplessis	" Gluck (engraved by Miger)	"
"	" Mozart	"
David	The Horatius	Bernard.
"	The Death of Socrates	Braun.
Gros	The Plague of Jaffa (engraved by Langier)	Hermes.
Prud'hon	Justice pursuing Crime (drawing)	"
"	Head of a Young Girl (drawing)	Hachette.
"	Four Nudes (drawing)	"
Géricault	The Shipwreck of the Medusa	Braun.
Ingres	Marcellus	"
"	The Apotheosis of Homer (engraved by Marinic).	Louvre.
Delacroix	Dante's Boat	Braun.
"	The Entry of the Crusaders into Constantinople.	"
P. Delaroche	The Death of the Duc de Guise	"
Gros	Portrait of General Buonaparte	Louvre (to be executed),
"	" Napoleon I.	"
Girardot	" Chateaubriand	Braun.
Gérard	" Larmartine	"
Langlois	" David	"
François	" Ingres.	"
"	" Gros jeune.	"
Cognot or Colin	" Géricault.	"
"	" Cuvier.	"
"	" François Arago.	"

## II.—Low Countries and England.

Franz Hals	Portrait of Descartes	Louvre.
Rembrandt	The Annunciation to the Shepherds (etching).	Amand Durand.
"	The Death of the Virgin (etching)	"
"	Abraham's Sacrifice	"
"	The Raising of Lazarus	"
"	The Man with a Hat (drawing)	Louvre.
"	Blind Tobit (etching)	Amand Durand.
"	Dr. Faustus	"
"	Portrait of Rembrandt's Mother (etching)	"
"	Christ healing the Sick (etching)	"
Paul Potter	The Cow-herd (etching)	"
Rubens	The Descent from the Cross	Hermes.
"	The Wild Boar Hunt (engraved by Paul Pontius).	"
Van Dyck	Portrait of Bentivoglio (engraved by Morin).	"
"	" Van Dyck	Amand Durand.
"	" Philippe le Roy	"
"	" Adam van Noort	"
"	" Paul Pontius	"
"	" John Spillius	"
"	" F. Snyders	"

## Appendix 40.

Report on Art  
Museums for  
Schools.

Artist.	Description of Work.	Published by
Van Dyck	Portrait of Lucas Vosterman	Amand Durand.
"	" Paul de Vos	"
"	" John de Wael	"
"	" John Breughel	"
"	" Peter	"
"	" Justus Suttermans	"
"	" William de Vos	"
"	" Antony Cornelissen	"
"	" Francis Francken	"
"	" Josse de Momper	"
"	" John de Waverius	"
"	" Shakespeare	"

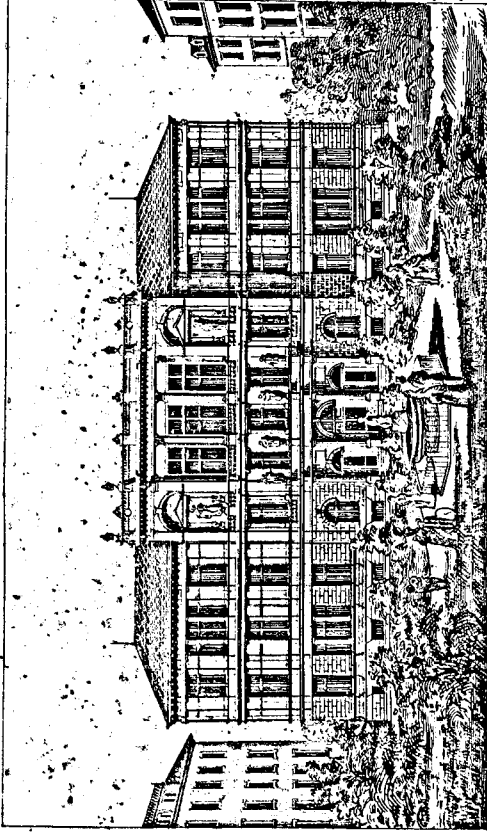
## III.—Spain.

Murillo	St. Antony of Padua.	
Velasquez	The Lances (Surrender of Breda)	Braun.

## ARCHITECTURE.

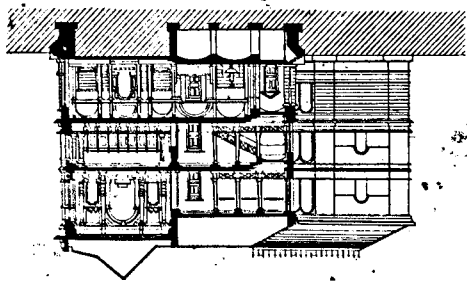
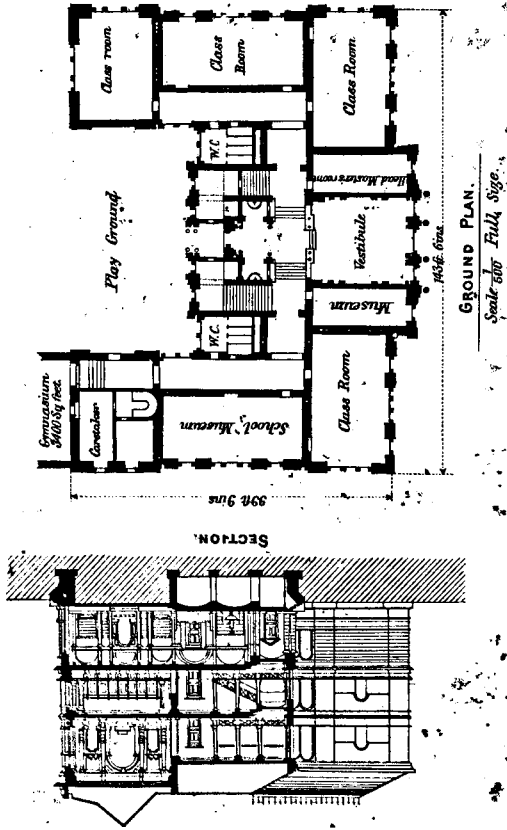
An Egyptian Temple (Phils).  
 The Parthenon.  
 The Coliseum.  
 The Arch of Titus.  
 The Cathedral of Chartres.  
 " " Notre Dame, Paris.  
 The Courtyard of the Louvre.

LONDON: Printed by **EXRE and SPOTTISWOODS,**  
Printers to the Queen's most Excellent Majesty,  
For Her Majesty's Stationery Office.



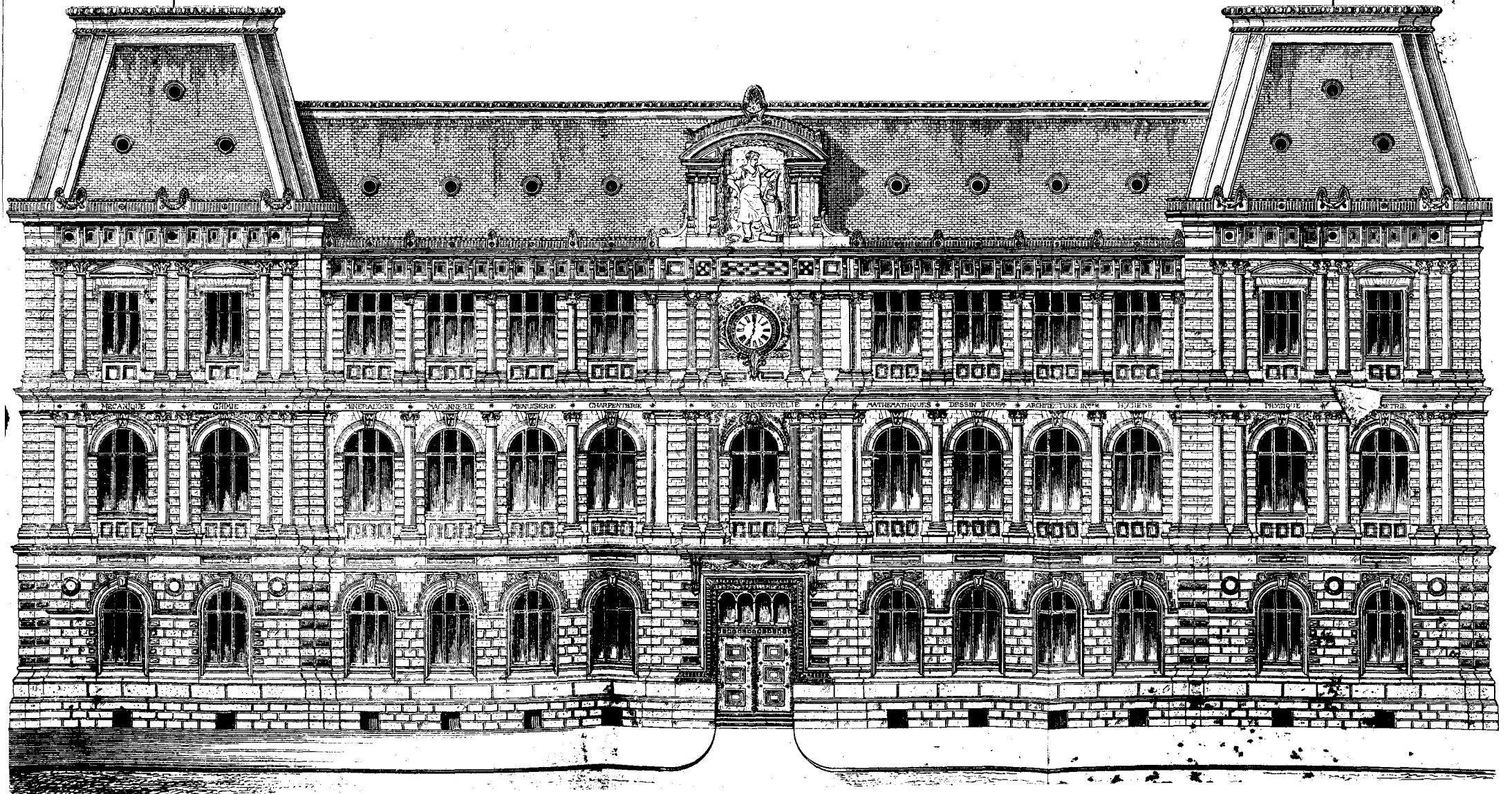
ELEVATION OF PUBLIC ELEMENTARY SCHOOL AT ZURICH.

GROUND PLAN AND SECTION OF ELEMENTARY SCHOOL, ZÜRICH.



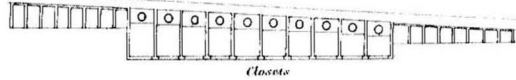
INDUSTRIAL SCHOOL BUILT BY THE MUNICIPALITY OF THE CITY OF LIEGE.

PRINCIPAL FACADE.



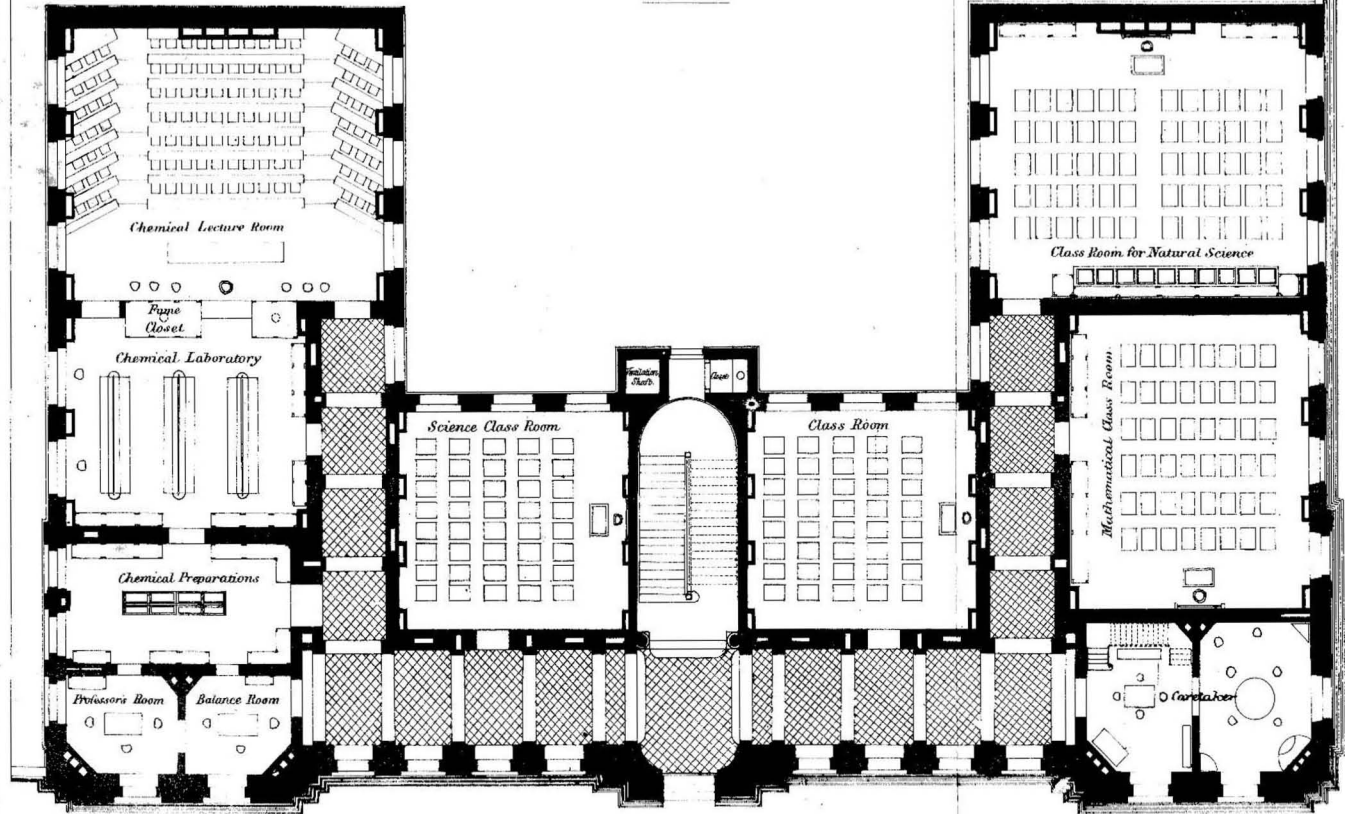


# INDUSTRIAL SCHOOL, BUILT BY THE MUNICIPALITY OF THE CITY OF LIEGE.



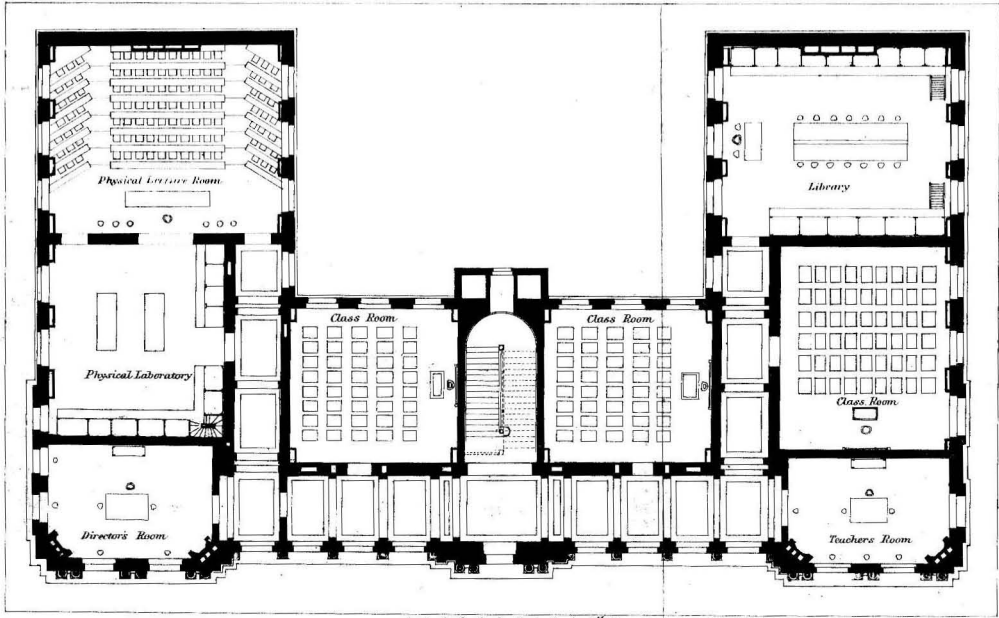
Clasets

## PLAN OF GROUND FLOOR.

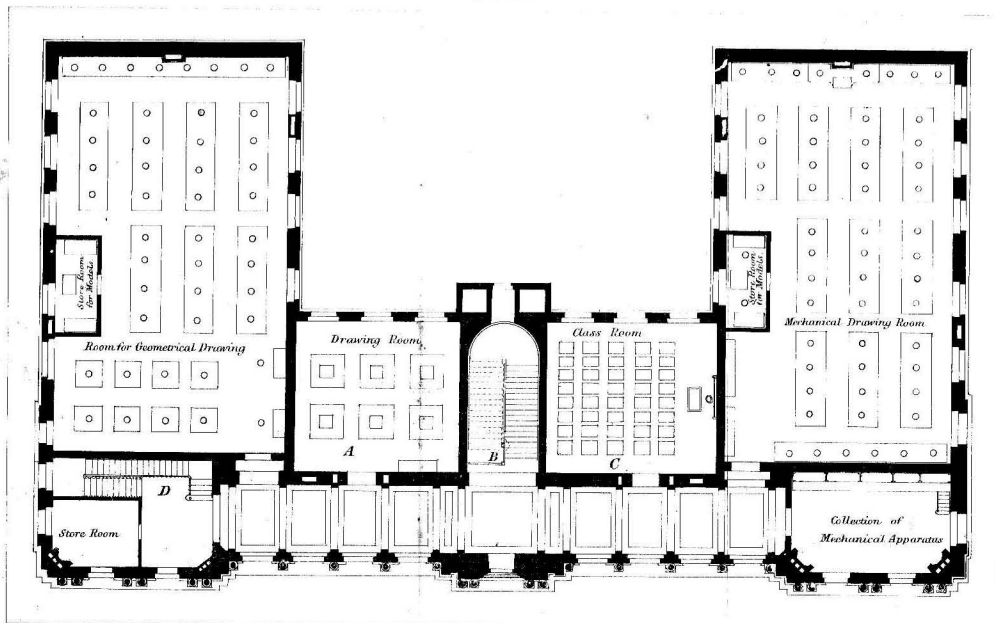


# INDUSTRIAL SCHOOL, BUILT BY THE MUNICIPALITY OF THE CITY OF LIEGE.

## PLAN OF THE 1<sup>ST</sup> FLOOR.



INDUSTRIAL SCHOOL, BUILT BY THE MUNICIPALITY OF THE CITY OF LIEGE.  
PLAN OF THE 2<sup>ND</sup> FLOOR.

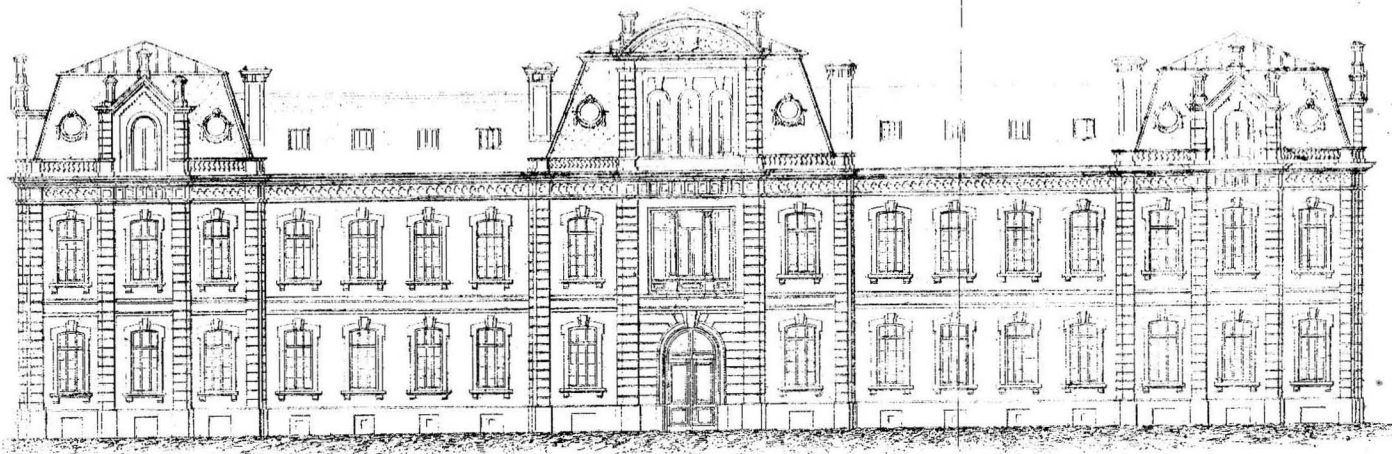


NOTE. The Staircase D gives access to the 3<sup>rd</sup> Floor which contains the rooms for Freshhand Drawing situated over the rooms marked A B C, with a total area of about 1935 sq feet

ELEVATION OF THE INSTITUT INDUSTRIEL AT LILLE, FRANCE.

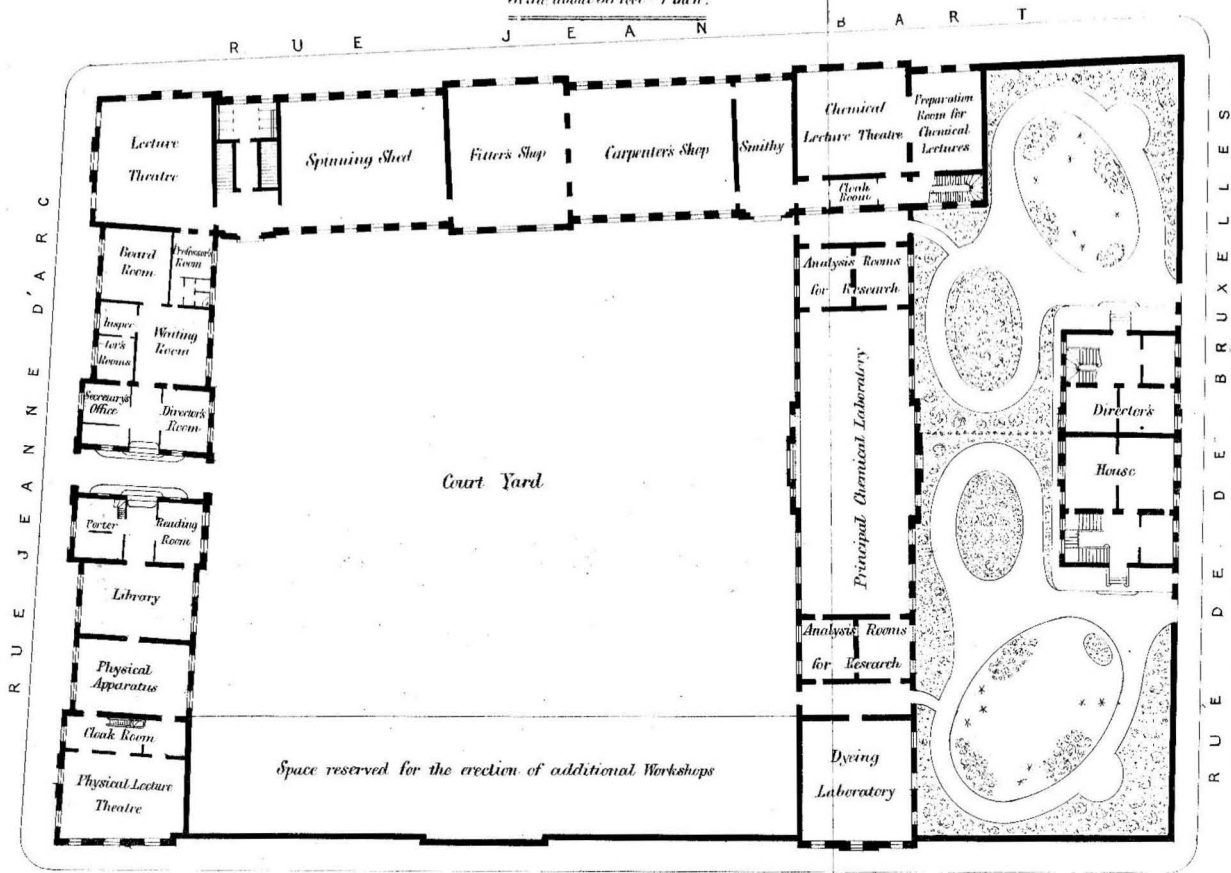
PRINCIPAL FRONT TOWARDS THE RUE JEANNE D'ARC.

*Scale about 30 feet = 1 inch.*



INSTITUT INDUSTRIEL, AT LILLE, FRANCE.

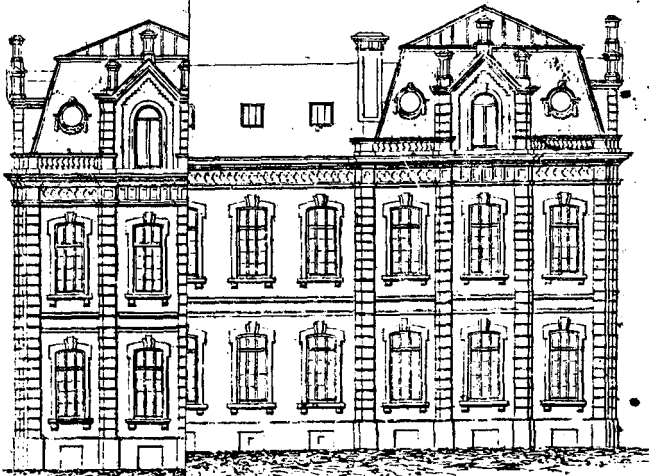
Scale about 55 feet = 1 inch.



The first floor contains the Lecture Halls, Class Rooms, Preparation Rooms, and a large Workshop for Weaving. On the upper floor the Industrial Museum is arranged in excellent lighted rooms.

FRANCE.

ARC.



INDUSTRIAL SCHOOL BUILT BY THE MUNICIPALITY OF THE CITY OF LIEGE.

PRINCIPAL FACADE.

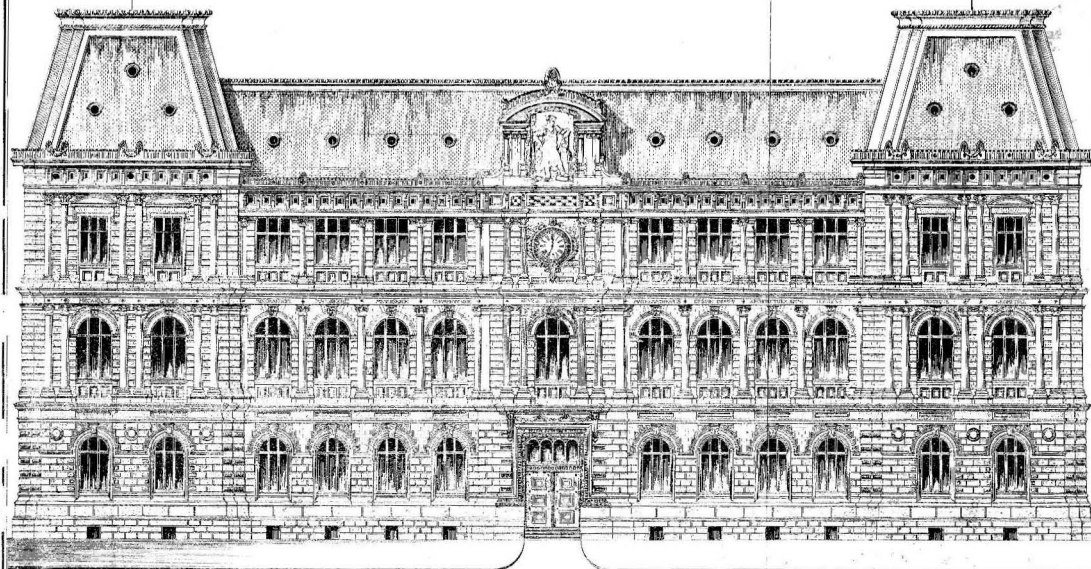
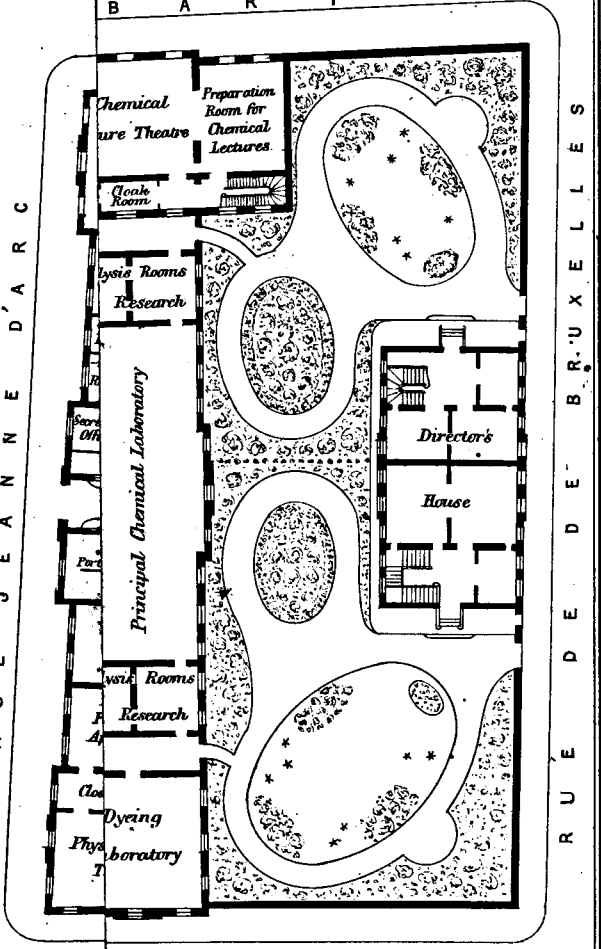


Plate III. E.

B A R T

R U E J E A N N E D ' A R C

R U E D E B R U X E L L E S

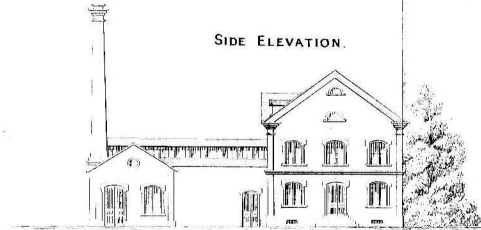
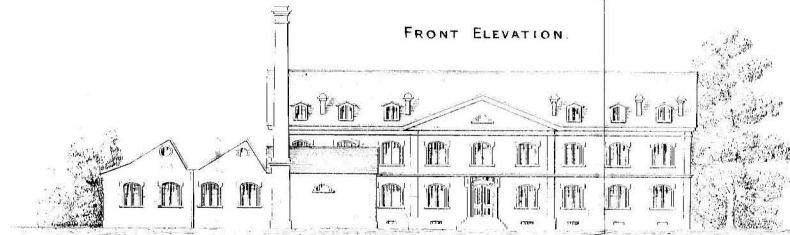


and a large  
rooms.

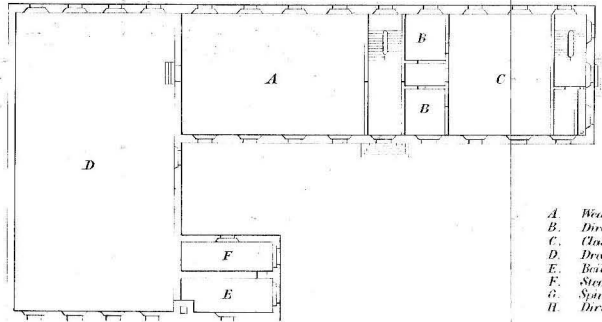


# SCHOOL FOR SPINNING AND WEAVING, AT MULHOUSE, (ALSACE.)

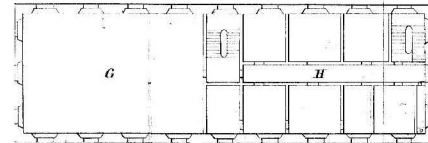
Scale 3 Millimetres = 1 Metre.



GROUND PLAN.



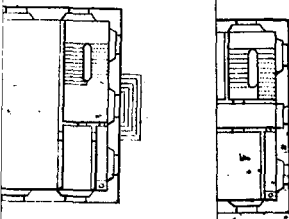
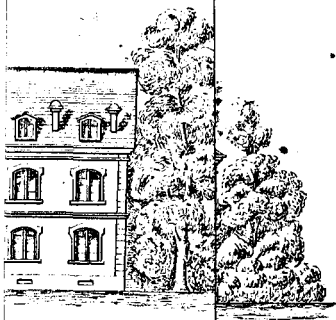
1ST FLOOR PLAN.



- A. Weaving Shed.
- B. Director's Rooms.
- C. Class Room.
- D. Drawing Office and Machine Shop.
- E. Boiler House.
- F. Steam Engine.
- G. Spinning Shed.
- H. Director's Residence.

SPINNING AND  
LOOM HOUSE, (AL)

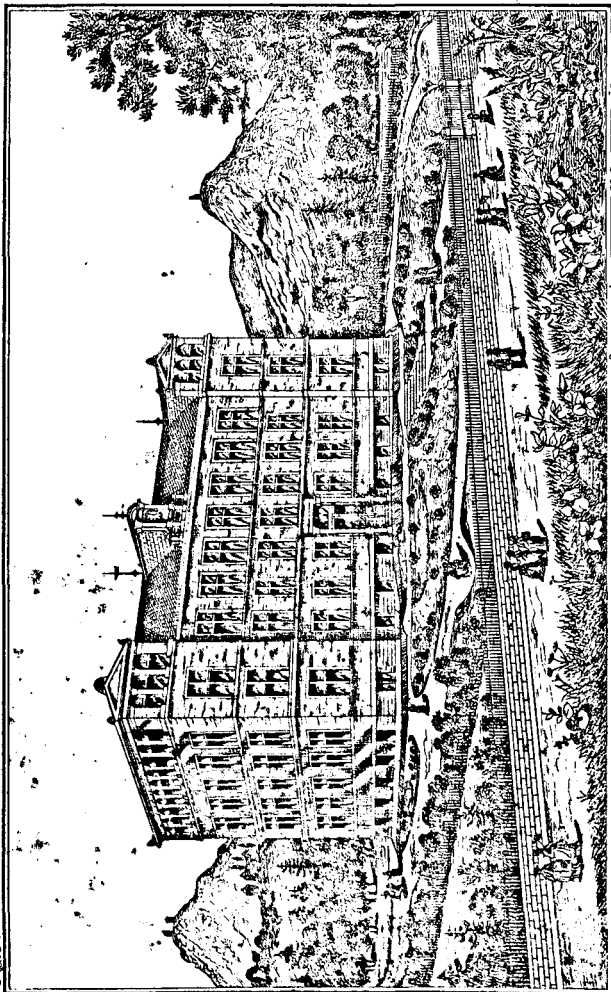
3 Millimetres - 1



- A. Weaving Shed
- B. Director's Room
- C. Class Room
- D. Drawing Office
- E. Boiler House
- F. Steam Engine
- G. Spinning Shed
- H. Director's Res

AT REUTLINGEN.

Plate V

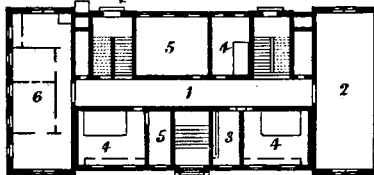


(See Vol. I, p. 69.)

Wackerhausen, Erbk. Beford. St. Gevart. Gaden. 7. 18. 1822

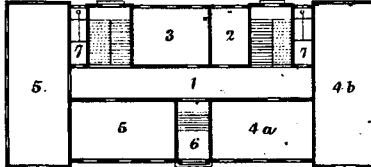
PLANS OF THE WOMEN'S WORK SCHOOL.  
AT REUTLINGEN.

BASEMENT.



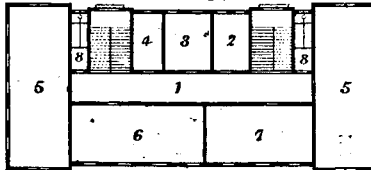
1. Corridor
2. Ironing Room.
3. Ironing Stoves.
4. Heating Apparatus.
5. Wood and Coals.
6. Caretaker's Rooms.

GROUND FLOOR.



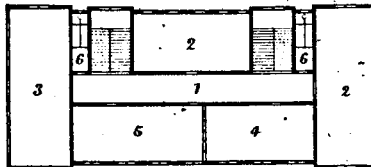
1. Corridor.
2. Director's Room.
3. Library
4. a & b. Drawing Room
5. Sewing Machines
7. Closets.

1ST FLOOR.



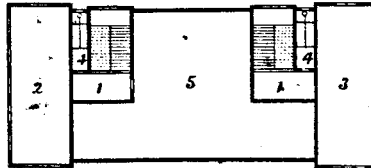
1. Corridor.
2. Head Mistress's Room.
3. Teachers Room.
4. Ironing Room.
5. Dressmaking Rooms.
6. Sewing Machines.
7. Embroidery Room.
8. Closets.

2ND FLOOR



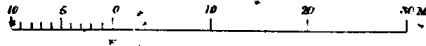
1. Corridor.
2. Plain Sewing
3. Knitting.
4. Crochet etc.
5. Trying on Room for Customers.
6. Closets.

ATTICS



1. Corridor
2. Exhibition Room.
3. Lecture Hall
4. Closets.
5. Storage space in roof.

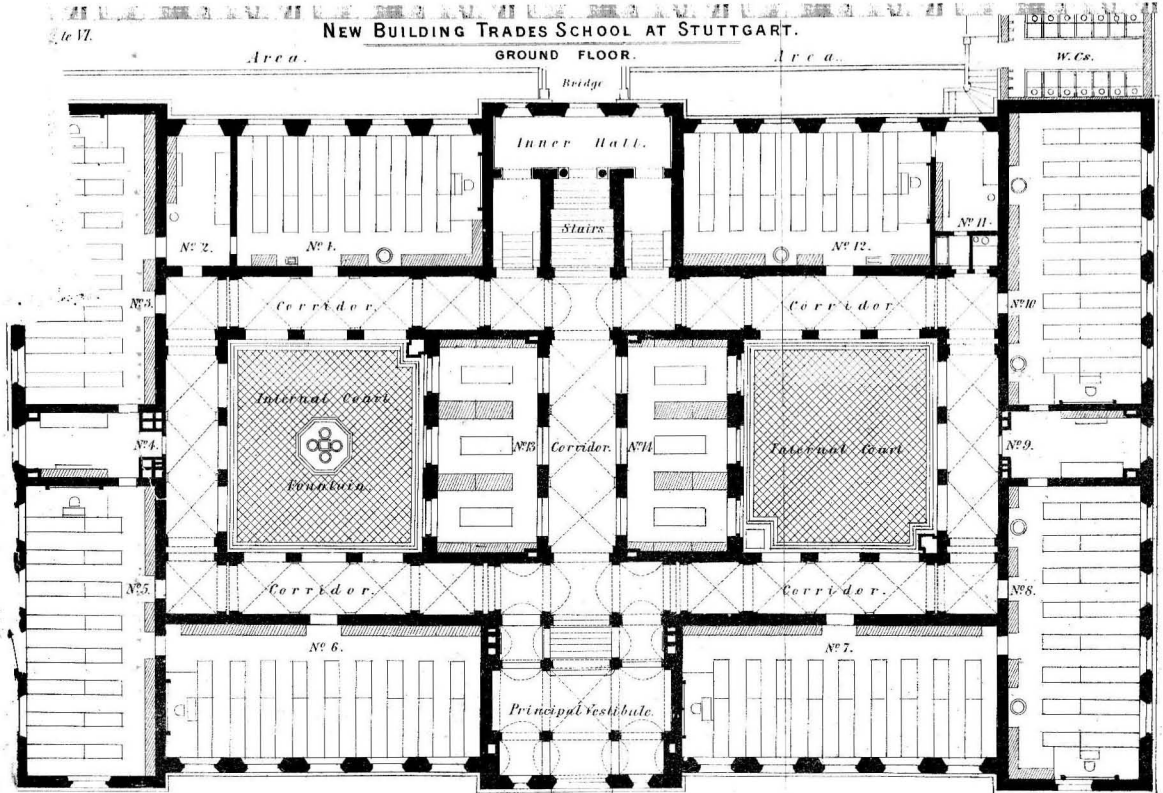
Scale of Metres.



le 17.

# NEW BUILDING TRADES SCHOOL AT STUTTART.

GROUND FLOOR.



*N<sup>os</sup> 1, 3, and 2 Lecture Halls and Drawing rooms for the 3 Divisions of Class I.*

*N<sup>os</sup> 5, 6, 7, 8, and 10 Lecture Rooms and Drawing Rooms for the 3 Divisions of Class II.*

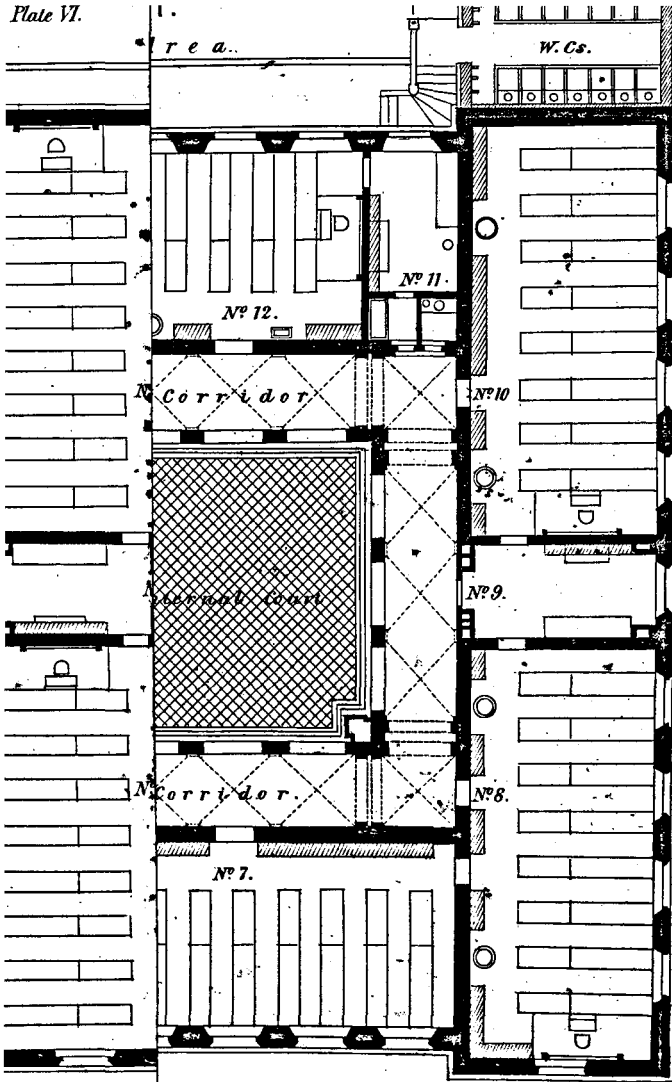
*N<sup>os</sup> 13, and 11, Rooms for the Collection of Models for teaching.*

*N<sup>os</sup> 2, 4, 9 and 11 Rooms for Teachers Stoves, etc.*

*Scale of Feet*

*Scale*

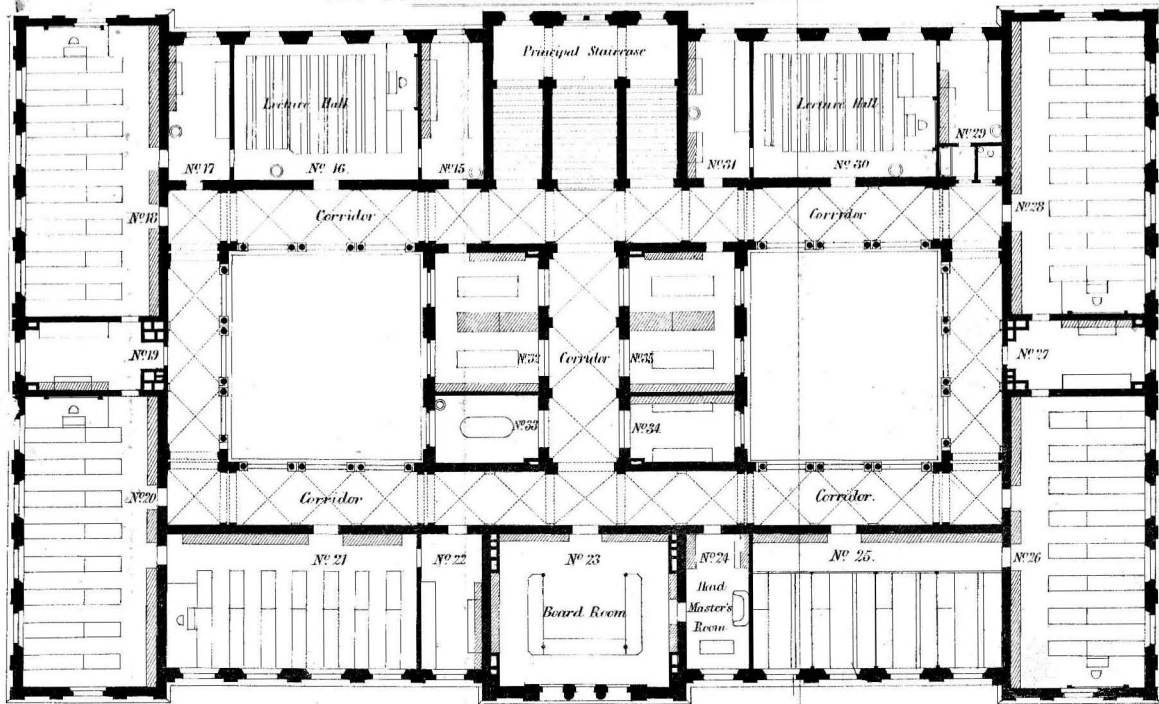
Plate VI.



for the Nº 2, 4, 9 and 11 Rooms  
teaching. for Teachers Stores, etc.

1 Metre

NEW BUILDING TRADES SCHOOL AT STUTTART.



1ST FLOOR.

Nos 16 and 30 Lecture rooms for Natural Sciences etc.  
Nos 18, 20, 26, and 28 Lecture Halls and Drawing rooms for the I

divisions of Class III.  
No 21 Lecture Hall and Drawing room for the IV class in Land Surveying.  
No 25 Model Drawing room.

Nos 15 and 29 Rooms for apparatus for the teaching of Natural History.  
No 22 Teacher's room and apparatus for instruction in practical Geometry.

Nos 17, 19, 27, and 31 Rooms for Teachers and for Teaching Apparatus.  
Nos 32 and 35 Rooms for Models and for Collection of Building Materials.

Scale of meters 1 2 3 4 5 6 7 8 9 10

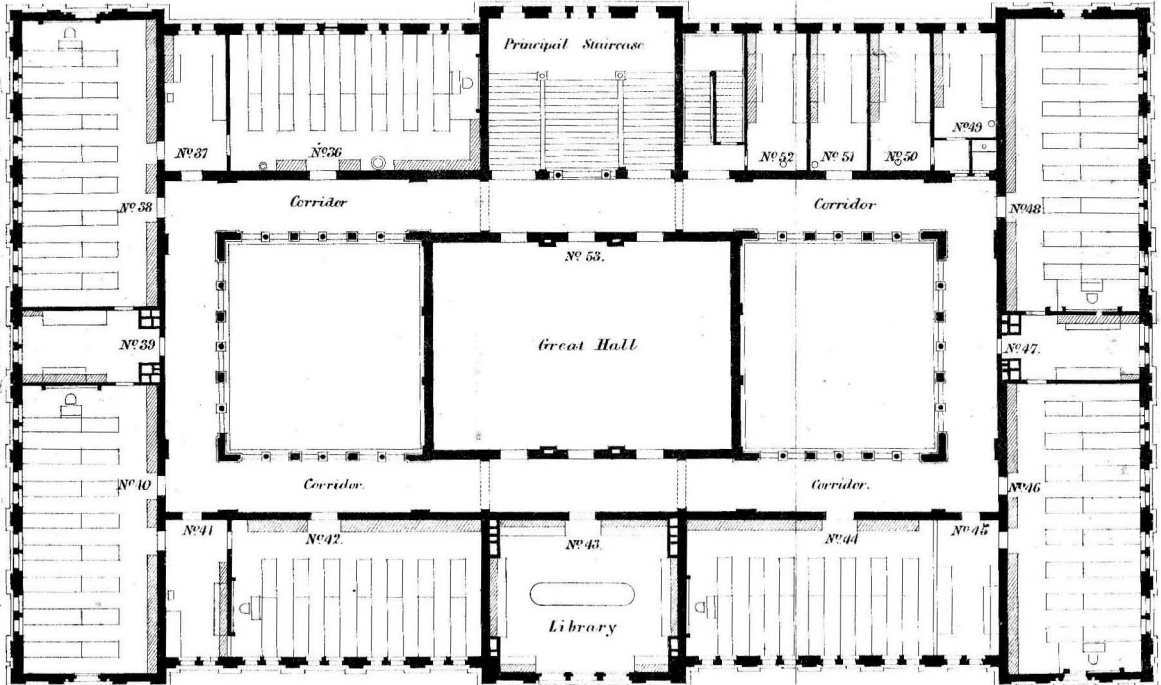
30'

30'

30' METERS

(See Vol. I. Pl. 103.)

Plate II. b.



NEW BUILDING TRADES' SCHOOL AT STUTTGART.

2<sup>ND</sup> FLOOR.

No. 36 Lecture Hall, and Drawing Room, for the 4<sup>th</sup> and 5<sup>th</sup> Classes of the Machine Construction Section.

Nos. 38, 40, and 42, Lecture Hall, and Drawing Rooms for the 3 divisions of the 7<sup>th</sup> Class of the Building Trades School.

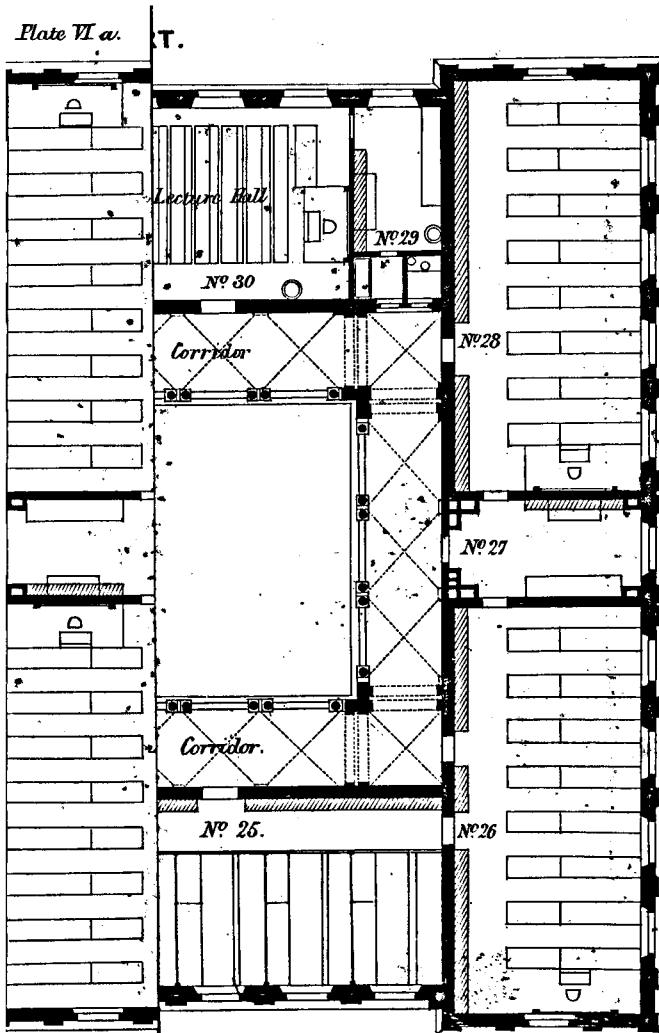
Nos. 44, and 46, Lecture Hall, and Drawing Room, for the 2 divisions of the 5<sup>th</sup> Class of the Building Trades School.

Nos. 37, 39, 41, 45, 47, 49, 50, 51, and 52, Lectern for Teachers and Teaching Apparatus.

Scale of 1:100

in Metres





N<sup>os</sup> 16 and 30  
 for Natural Sci.  
 N<sup>os</sup> 18, 20, 26, 27  
 and Drawing r

N<sup>os</sup> 17, 19, 27, and 31 Rooms for Teachers  
 and for Teaching Apparatus.

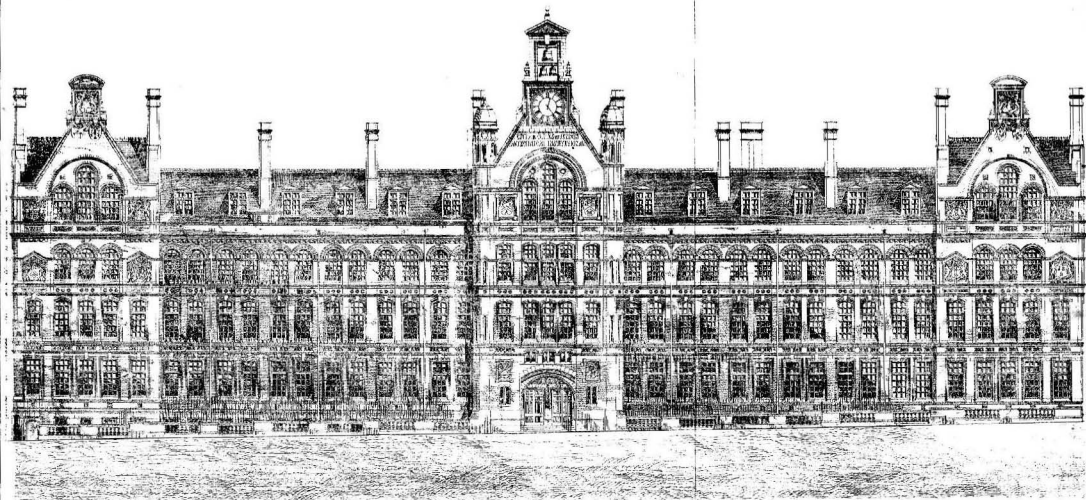
N<sup>os</sup> 32, and 35 Rooms for Models and  
 for Collection of Building Materials.

40 Metres

(See Vol. I. P. 103.)

THE CITY AND GUILDS OF LONDON TECHNICAL INSTITUTION .

FRONT ELEVATION .



# THE CITY AND GUILDS OF LONDON TECHNICAL INSTITUTION.

## GROUND FLOOR PLAN.

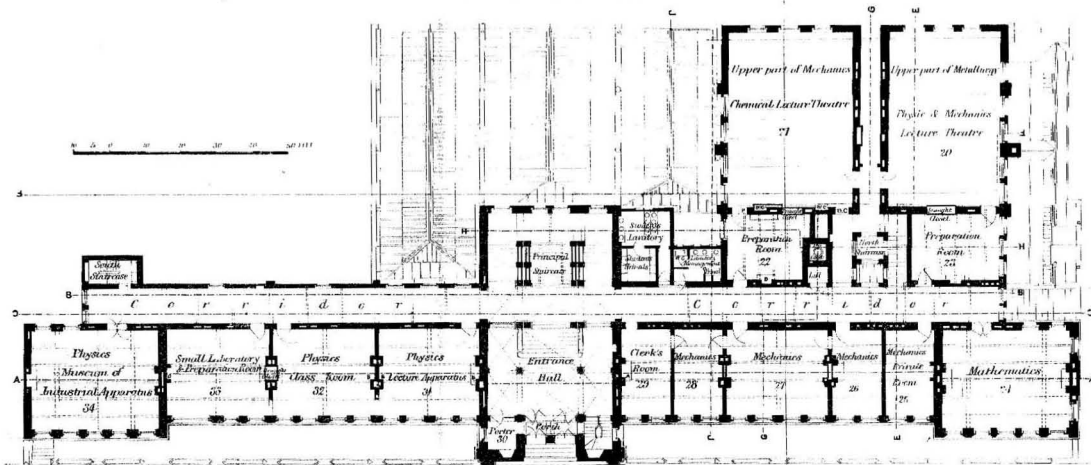
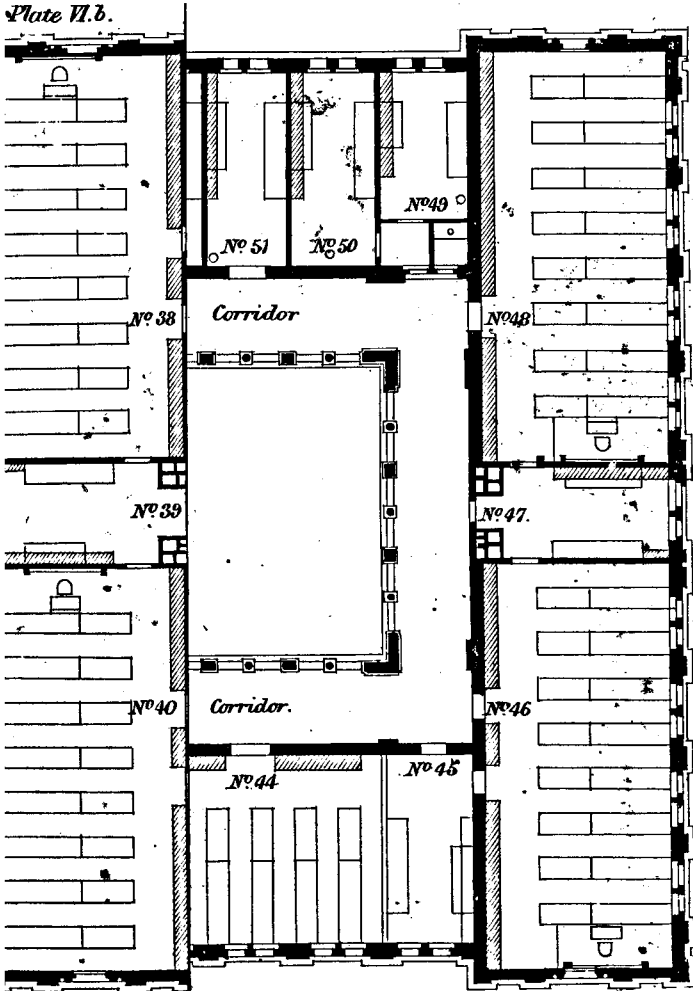


Plate VII. b.

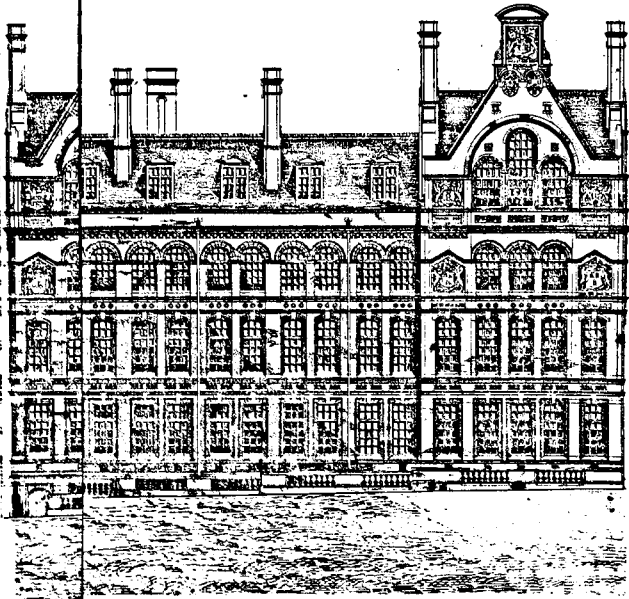


RT.

No. 36 Lecture Hall, Drawing Nos. 37, 39, 41, 45, 47, 49, 50, 51, and 52  
 for the 4<sup>th</sup> and 5<sup>th</sup> Class of Rooms for Teachers and Teaching  
 Construction Section Apparatus.

Scale 1:1000 Metres

L INSTITUTION .



(See Vol. I.)

UTION.

