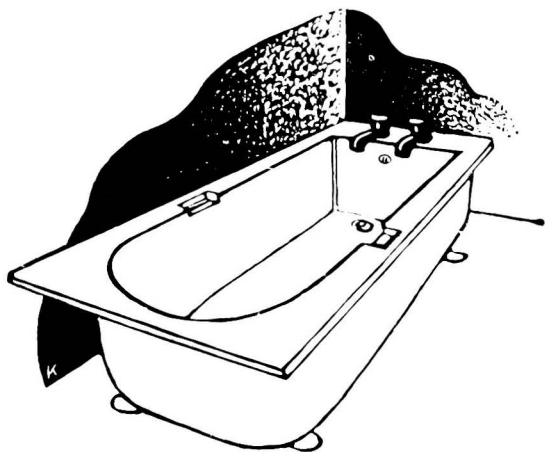


EXERCISES IN THE BATH

The Togna System of Home Gymnastics
to Promote Health, Prevent Disease
and Prolong Life



T. R. Togna

With an introduction by
Sir Leonard Hill, M.B., F.R.S., LL.D.

Exercises in the Bath

The author of this book has been experimenting for twelve years with a system of simple exercises that has the supreme merit of keeping the body fit and shapely without strain or fatigue. He has proved, as anyone can prove for himself, that exercises can be performed *in water* with practically no increase in the pulse rate, and hence no strain on the heart. Moreover, not only may prolonged and vigorous exercise thus be taken without any of the fatigue that ordinary exercise induces, but exercises in the bath actually remove fatigue; they are restorative.

The importance of Mr. Tognà's discovery is obvious. For the ordinary man and woman it means an easy and enjoyable method of keeping the body fit, muscles in condition, and adipose tissue at bay. For elderly people, and those whose health debars them from athletics, the new system is even more important: it means renewed health without risk of strain to heart and blood vessels.

In addition to the general advantages of the author's system, experience has shown that it is of immense benefit in specific cases of nervousness, insomnia, abnormal blood pressure, varicose veins, rheumatism, obesity and constipation.

EXERCISES IN THE BATH

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*The Togna System of Home Gymnastics
to Promote Health, Prevent Diseases and Prolong Life*

By

T. R. TOGNA

*with an Introduction by
Sir Leonard Hill, M.B., F.R.S., LL.D.*

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TO
MY WIFE
AND
MY SISTER
AMALIA

INTRODUCTION.

By Sir Leonard Hill, M.B., F.R.S., LL.D.

Mr. Tognà has worked out on himself a useful system of exercises taken in the bath which help to keep the body in a fit condition without undue strain or fatigue. I had the pleasure of seeing Mr. Tognà perform these exercises in a bath at the St. John Clinic. Such exercises are very suitable for city people who wish to keep at bay the disabilities which arise from sedentary occupations.

His book is put in simple and clear language and the illustrations show the principles of his methods and make it easy for anyone to carry them out.

Chalfont St. Peter,
Bucks.

October, 1938.

PREFACE.

In his foreword to my pamphlet published in 1928, Sir W. Arbuthnot Lane, Bt., C.B., states: "Mr. T. R. Togna has made a very intelligent study of health exercises. He has devised a sequence of movements which afford a stimulation to every muscle in the body, so that they are kept constantly in a state of healthy activity.

"Since the exercises are carried out in the bath, they make a minimum demand on the nerve and muscle energy. They can be performed by those of a delicate and feeble physique, as well as by others who are more robust."

I have now, after ten years of further experience, enlarged my original pamphlet into the book which follows.

My justification for presenting to the public yet another system of physical training, lies in the fact that exercises performed in the bath involve a smaller expenditure of energy than those performed in the air. This has been proved, not only by

my own personal experience, but by direct scientific determination of the oxygen consumption in both cases, as shown in the Appendix. Experiments carried out at the London School of Hygiene, University College and the Red Cross Clinic, established that the oxygen requirement in water is from one-third to one-half that in air.

It follows that less strain is placed on the heart by water than by air gymnastics, though the same movements of muscles, limbs and joints are performed. Also my exercises offer the means of carrying out, in the privacy of the home, a treatment which is a useful extension of those commonly followed in special Clinics. It should be clearly understood that although frequent reference is made in the book to the treatment of diseases, I do not advocate the use of my exercises by sick persons without previously consulting a Medical Practitioner.

I am illustrating the exercises with photographs of myself, and the reader will be able to judge how well I have main-

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tained my physical condition and the tone of my muscles generally.

I wish to take the opportunity to inform all those who may try my system that I should be very grateful to them if they will be good enough to inform me of the help secured. Such information will always be treated confidentially and used only for scientific purposes.

T.R.T.

Tuscan Hotel,
Shaftesbury Avenue,
London.

October, 1938.

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EXERCISES IN THE BATH

CHAPTER ONE.

THE VALUE OF BATHING IN HEALTH AND DISEASE.

FROM the day when some primitive ancestor licked his wounds in a glade of the primeval forest, Man has recognised and held in reverence the powers of water to heal and purify.

Later, when his intellectual stature increased and he learnt to worship, water yielded place only to the sun as the especial object of his adoration. He associated its presence with abundant crops, with spiritual and physical purification, and with miraculous healing. Bearded god and white-limbed nymph delighted to take up their abode in the rivers and streams.

Very early records speak of bathing in the Ganges, still held sacred, and in the Nile, whose mud and water were considered to have healing properties. The ancient Jews bathed in running water, made use of hot and cold baths, and employed ointments and oils. Christian

baptism perpetuates their rite of bathing for spiritual purification. Remains of baths in connection with temples have been found in India, Persia, Egypt and Assyria. Mohammedans, Arabians and Egyptians have made use of mineral waters in the treatment of the sick. A thousand years before the birth of Christ, Japanese doctors included gymnastics, bathing and anointing in their practice. Among the Greeks, the earliest bathing took the form of swimming in the rivers of their country. Homer records that hot baths were employed after strenuous exercise. Baths, public and private, came to be quite common in Athens and other cities.

It was under Roman civilisation that bathing reached its highest peak of elaboration and popularity. At first no more than a simple plunge after exercise into the cooling depths of Father Tiber, it took the form, as soon as ample supplies of water were made available in the city, of swimming in artificial, cold-water pools. With the Empire, more sumptuous baths were constructed. Emperor after emperor,

in his desire to please the populace, vied with his predecessor in the erection of huge and magnificent establishments. They contained cold-water swimming baths, warm baths, hot-air baths, vapour baths, oiling-rooms, gymnasia, and even libraries, gardens and shops. It is recorded that the baths of the Emperor Caracalla covered a square mile, and that those of Diocletian had seating facilities for over three thousand bathers in one room.

Among the early doctors to make use of water in the healing of disease was Cicero's physician, Asclepiades. Hippocrates likewise used it, in combination with friction, in the treatment of muscle spasm and various diseases of the joints. The famous Galen gave first place to water in the treatment of his patients. It was widely recommended for the reduction of fevers.

With the growing decadence of the Roman Empire, the public baths, from being resorts of healthy recreation, gradually took on a licentious character. The sexes, which at first were segregated, now bathed together. Finally the standard of

sanitation fell, the pools became centres for the spread of epidemics, and were closed. In A.D. 453 the Huns cut the great aqueducts that supplied them, and fifty years later only their colossal ruins remained to tell of the magnificence that had been Rome.

The Dark Ages appear to have brought about a decline in personal cleanliness, though it is doubtful whether this was as great as is generally supposed. But later the Arabs, the Turks and the Crusaders once more spread the practice of bathing throughout Europe, and hot vapour baths were recommended for the leprosy so prevalent in those days. At the time of the Reformation there were few European cities without them.

One of the earliest treatises on the curative effects of water came from the pen of Hahn, an eighteenth - century German physician. He advised patients with leg sores to remain in water for several days, and advocated similar treatment for the itch. This latter is a forerunner of Hebra of Vienna's treatment of various skin

complaints in a continuous bath. Other authors recommended the use of cold water, internally and externally, in the reduction of fevers. The founder of Methodism, John Wesley, published a book on water treatment. As the popularity of this treatment grew, so did the range and methods of its application. Vincent Priessnitz, a German peasant who flourished during the nineteenth century, probably originated the douche, sitz-bath, wet compress, sheet pack, and so forth. Bulwer Lytton, author of *The Last Days of Pompeii*, recommended the water cure for gout, dyspepsia, rheumatism, paralysis and a variety of other diseases. Towards the end of the nineteenth century, Winternitz put hydrotherapy on a scientific basis by stating that water exercised its curative effects primarily through its beneficial action on the nervous system.

. The growing understanding of the therapeutic uses of water has led in modern times to a steady stream of pilgrims to the spas of Europe, and to the establishment of many hydrotherapeutic clinics in the

principal towns throughout the world. An example in London of such a clinic is that of the Red Cross, which embodies all the latest forms of treatment. As for natural spas, one of the most famous in England is Bath, the use of whose healing waters was recorded as far back as 800 B.C. In the first century A.D. the Romans showed their appreciation of these waters by constructing one of their finest bathing establishments there. The original baths are still used, the main one receiving its water through the ancient conduit.

Until fairly recently, at any rate, spas exhibited a certain characteristic common to one another, and to the old "water cures" of Europe whose history I have briefly reviewed. They all tended to place great stress on the healing value of water as such, or of their own waters in particular, and very little on remedial exercises *performed at the time of bathing*. Often such exercises were entirely absent.

Dr. Charles Leroy Lowman, of the Orthopædic Hospital, Los Angeles, U.S.A., in his recently published book,

Technique of Underwater Gymnastics, states that of the famous European spas, he had been able to find only a few that named, in their replies to a questionnaire, the use of remedial gymnastics in their baths. Among such he mentions Wiesbaden, Germany, whose municipal enquiry office replied that they gave infantile paralysis cases exercises, first in a large tub, then, as their strength increased, in a swimming pool. The Guide of another spa, that of Aix-la-Chapelle, said: "Supplementary measures are fango packs, vapour douches, light baths, and above all, massage, carried out manually, active and passive movements, either in the bath, or ordered as Swedish manual exercises." Numerous other renowned European spas wrote of pools which were at the disposal of patients for swimming, but did not place emphasis on prescribed water exercise.

Modern treatment, Dr. Lowman points out, proceeds on the theory that specific under-water exercise prescriptions, carefully regulated as to dosage, character,

frequency and duration, are of direct value in restoring function and correcting deformities after many diseased conditions. In other words, while the great value of the warm water in which remedial gymnastics, directed at the cure of the above conditions, are performed at modern hydrotherapeutic institutions is fully recognised, the emphasis is placed on the gymnastics themselves.

While there are no allusions before the present century to the use of specially prescribed under-water exercises, the practice of placing in water those who had largely lost the use of their limbs was common, with the idea that the buoyancy conferred by the water would largely free them from the obstacle of gravity, and enable them to make such movements as they could with greater ease. In May, 1924, Dr. Lowman combined the theory underlying a system of exercise devised for infantile paralytics by the late Robert W. Lovette, of Boston, and the knowledge of the buoyancy conferred by water, into a single technique of healing, by establish-

ing in the grounds of the Orthopædic Hospital, Los Angeles, a large pool for the carrying out of therapeutic under-water exercises.

Three years later a second great centre for the treatment of infantile paralysis arose at Warm Springs, Georgia. One day a young boy crippled by the disease fell out of his bath chair into the warm pool. In his terror he churned about with his legs, which all had thought to be paralysed. The incident was brought to the notice of President (then Mr.) Roosevelt, who happened to be in Florida recovering from an attack of infantile paralysis, and who came, swam, and received benefit. From that time the fame of the Georgia Warm Springs Foundation was secured. Although such institutions were founded in the first place for the treatment of infantile paralysis, it was not long before doctors discovered that a great many other conditions, notably chronic arthritis, could also be benefited by under-water gymnastics. Should the reader be desirous of further information on this subject, he is referred

to the chapter entitled *Hydrotherapeutics* included in the Appendix.

Here I am more particularly concerned with exercises in the water performed with the object of maintaining health, or with clearing up those minor defects which, although hardly themselves meriting the name of disease, are nevertheless, when allowed to develop, the source of endless suffering. At the present day the practice of bathing is almost universal in all civilised countries. Could people but be persuaded to use that period in the bath, often spent in mere "soaking," to carry out the few, simple movements which I have devised, I am confident that we should see an enormous reduction in the appalling amount of illness and semi-invalidism, and that the individual would do much to retain his fitness and youth to an advanced age.

CHAPTER TWO.

THE EXERCISES IN THE BATH.

IT is often with a sense of profound shock that, after the lapse of years, we meet some friend of our youth, and note how the spring has departed from his step and the light from his eyes. The experience is made the more bitter by the reminder it affords us that we too are getting old.

Must we grow old so sadly and so soon? In the circumstances under which most of us live, the answer appears to be in a particularly uncompromising affirmative. The cells, of which all our tissues are composed, are nourished by the blood stream and the blood is pumped to them by the action of the heart assisted by the contraction of the muscles. During exercise the large quantity of blood in the big abdominal vessels, is pressed out of them. This blood becomes available to nourish the different parts of the body reaching the cells through the capillaries, a mesh-work of fine thread-like vessels. . These tiny vessels, using the

lymph, a watery blood solution that bathes the cells, as a middleman, convey to the cells water and food material from the organs of digestion, and oxygen from the lungs, and free the cells of their waste products. Here the three stages of life's daily cycle, activity, fatigue and recovery take place through a continuous process of combustion by the oxygen of the air breathed.

Unless complete recovery from the state of fatigue or diminished capacity for work is possible, the individual will not be able to balance his budget day by day. As we do not succeed in maintaining evenly these processes in all parts of the body, we observe the three ages of man.

First there is youth, with its normal proportions, fresh complexion, warm skin and exuberant vitality. At 21, the body stops growing in height, but not in bulk. As we approach 30, the muscles increase in size and robustness, at the expense of elasticity. Thus action demands greater expenditure of energy and thereby an inborn inclination to avoid it. Gradually,

the natural activity of youth fades into the sedentary round of middle age.

Owing to the curtailment of muscular activity, the blood is no longer brought sufficiently to the limbs and to the surface of the body, but is left to stagnate in the large vessels of the stomach and intestines. As a consequence these organs tend to grow in size through absorbing an undue share of nourishment, while the limbs, surface structures, and skin are partially starved. The muscles begin to lose their quality and become puny and inelastic, the skin grows colder and lacks tone, and even the bones undergo a process of decalcification with a consequent loss of robustness. The chest, because its internal organs are not exercised by physical activity, likewise diminishes in size and strength.

Finally comes old age. The processes of physical degeneration have proceeded to extreme lengths. The abdominal organs are larger than ever and sag under their own weight, or else are starved through inability to absorb nourishment. The elasticity of the muscles is practically

destroyed, and movement is difficult. The bones are brittle. The function of the heart is impaired, and its reserves of power with which to meet emergencies are greatly reduced. The head is starved, there is loss of mental vigour, and the face exhibits the signs of senescence.

These degenerative processes can be resisted only by exercise which calls the entire body into activity, thus ensuring an even distribution of the available nourishment and, at the same time, the adequate removal by the blood of the waste products produced by the cells during the nutritive processes. But as the quality of the muscles becomes reduced through sedentary habits, so does exercise entail a correspondingly bigger effort. The inevitable consequence is that physical activity is avoided whenever possible. The muscles undergo a further degeneration, and a vicious circle is set up. There is the further consideration that movements, such as those performed in the usual systems of physical training in which the muscles are for the most part exercised group by group,

are not those best calculated to rehabilitate the organism. The circulation is increased only in the part actually being moved, with the result that there is a local distention of the blood vessels, due to the increase of blood supply and lymph in the part concerned. The establishment of a general, free-flowing circulation can only best be brought about by exercising all the muscles at the same time. The athletic sports do not fulfil this condition and would prove too strenuous for the heart and blood vessels of many of those weakened by a sedentary existence.

Efficient muscles relieve the heart of much of its work. If a trained and an untrained man were to perform a similar piece of activity, the untrained man would expend more energy and make a greater demand on his heart than would the other. Training immediately increases the efficiency of the body as a whole and the muscular apparatus in particular.

The same can be said of all other forms of activity. When not accustomed to a certain work, we tire sooner; as we grow

accustomed to it, we tire less and do the work better and more quickly. This is because from the usual amount of air breathed, the groups of working tissues extract a larger quantity of the oxygen they need, and the lungs and heart supply this increased quantity with greater ease. But as, for the different kinds of work and sport, different groups of muscles are used, we tire when the kind of work or sport is changed. It follows that the work or sport most beneficial to health is that which by employing the largest number of muscles increases the efficiency of the body as a whole, so that there is a greater economy in the expenditure of energy.

Lack of exercise not only throws a greater burden on the heart through the loss of efficiency in the muscular apparatus, but the heart itself, also a muscle, becomes puny and may seriously degenerate. It is a notable fact that an extraordinary number of people with no specific disease die from heart failure between the ages of fifty-five and seventy. Others have the action of that organ severely impaired.

At the same time the arteries generally lose their ability to expand and contract, and become hardened. A further burden is thereby thrown on the heart, for the elasticity of the arteries greatly assists in propelling the blood round the body. High blood pressure ensues, and the physical activities are perforce curtailed until the heart can barely maintain life.

My exercises in the bath offer the ideal solution to the problem of breaking through the vicious circle of growing decadence, by enabling everyone to make better use of the oxygen in the air breathed. (See Appendix Table II.) By their means the weakest person is enabled to secure the requisite amount of exercise, and thus restore as far as possible the normal equilibrium of the life's processes, without fear of strain or bodily injury. This will become obvious when the nature of the gymnastics are considered.

Each exercise takes the form of a rhythmic movement, which brings every muscle of the body into a concerted action. Thus the condition is fulfilled of bringing the

entire body into a state of activity at the same time. But, unlike other forms of activity the bath movements are not strenuous. One is amazed to find that even when performed vigorously the pulse rate goes up only a few beats. This is due to the nature of the exercises and the fact that the buoyancy of the water almost entirely overcomes the force of gravity. The specific gravity of water is about the same as that of the body. In other words, the natural weight of the latter, or any part of it, is reduced to a minimum, being largely sustained by the water. I have weighed my own body in both air and water. In air I found myself to weigh eleven and a half stones, while in water I was no more than twelve pounds! Each individual part of my body was correspondingly lighter. Further, the fact that the exerciser occupies a horizontal position in the bath lessens the work of the heart, for it is thereby largely relieved of the task of raising the blood against gravity. Those whose heart and blood vessels are unable to stand up to all-round exercise in the air are able to do

so in water. In contrast with swimming, my movements have no water resistance to overcome and do not increase the size of the bigger muscles at the expense of the weaker.

As a result of the general circulation promoted by my movements, the nourishment is evenly distributed to the tissues. The blood in the big vessels of the abdomen is squeezed out of them by the rhythmic contraction of the trunk and brought to the limbs and surface of the body, and the congestion in the abdominal organs is relieved. The warmth of the surrounding water causes the capillaries of the skin to open, with the result that the skin becomes better nourished and more youthful in quality. At the same time the excretion of waste products from the blood stream through the skin is increased.

The general cleansing of the blood stream which is promoted, not only through the skin but also the bowels, kidneys and lungs, has another most important aspect. The body is composed of billions of cells, each of which forms a

unit of life. Indeed the simplest forms of life consist of only one cell, and are known as unicellular organisms. Experiments in the laboratory have shown that small groups of cells, when removed from the body, can be made to live indefinitely so long as they are nourished, and have their waste products periodically removed by washing. If their waste products are not removed, they grow old and eventually die. Further experiments suggested that the reason why our bodies do not live for ever is because the blood gradually becomes silted up with the waste products it has removed from the cells, until it finally becomes an unsuitable medium for their continued existence. He would be a bold man who would suggest that the day will ever arrive when human beings will live, physically, for ever, but it is at least beyond all reasonable doubt that if we ensure by the performance of the bath movements that the circulation is efficiently removing the waste products from the cells, and that the circulation in its turn is enabled to void them through the lungs, kidneys, skin and

bowels, both youth and life will be very greatly extended. As no fatigue is felt however long the bath exercises be continued, the body is not forced to preoccupy itself with the excretion of excess fatigue toxins, but has all its energies available for dealing with the removal of the ordinary waste products of living. Indeed this phenomenon of the absence of fatigue is so striking, that its cause and some everyday advantages and applications of it will be considered in the succeeding chapter.

CHAPTER THREE.

THE BATH EXERCISES AS A PICK-ME-UP.

MANY experiments have been carried out and text books written on the subject of fatigue. Here it is not possible to enter into any abstruse technicalities. But it is a common experience of most people that there are two kinds of fatigue; that of the healthy, normal variety induced by a walk or open-air exercise, and that of the unhealthy, abnormal variety brought about by many of the more or less sedentary occupations of civilisation, such as those of the office and the factory worker, and the housewife. This latter type is due to worry, rush, poor ventilation, monotony, failure to get rid of waste matter through the bowels, kidneys, lungs, and skin, and so on.

The bath exercises will be found extraordinarily refreshing after a tiring day of sedentary employment. The entire circulation is stirred into action, washing away fatigue products before its revivifying

current. The organs of excretion are kept in an active and healthy condition, and so the blood is rendered pure. The business or working man wishing to recuperate, prior to going out for an evening's entertainment, will find twenty minutes of the movements ample. When circumstances make it necessary to over-work, the exercises will to a great extent take the place of sleep. I have often been enabled by their means to work far into the night for long periods, without experiencing any evil consequences. The same results can apparently be obtained from the excessive use of such common brain and nerve stimulants as alcohol, tea and coffee, but in reality the effects are very different. These stimulants succeed only in driving a tired organism beyond its capacity, while at the same time concealing the symptoms of fatigue, so that the person concerned is unawares living upon his vital resources. With my system, the capacity of the body for work is genuinely extended, and, when sleep becomes really desirable, the necessity for it is at once felt. The terrible

penalty of insomnia is the price often paid for mental and nervous fag. The simple movements in soothing, tepid water before going to rest will ensure that the sweetness of slumber is not sought in vain.

The healthy fatigue experienced after muscular exertion is due to the conversion of a chemical compound, normally present in the muscles, into lactic acid. When the lactic acid reaches a certain quantity, the muscle in question is able to work no longer. During the ensuing period of rest the lactic acid is converted back into the original chemical substance from which it came, and the muscle is once more able to perform work. This is a simple statement of a complex and not completely understood process, but it will serve its purpose. My exercises assist and hasten the processes of recovery, and where there is any stiffness and soreness due to the accumulation of blood and lymph in the part, the congestion is rapidly relieved. The bath movements will therefore be found most restful and refreshing after a game of football, cricket, tennis, or any other sport.

CHAPTER FOUR.

DISORDERS OF THE HEART AND BLOOD VESSELS.

I HAVE already called attention to the extraordinary number of people, not sufferers from specific diseased conditions known to damage the heart, who die from failure of that organ between the ages of fifty-five and seventy, while yet others have its function seriously impaired. There can be no doubt that physical exercises such as mine, avoiding as they do all risk of placing too great a strain on the weakened circulatory system, would have done much to restore strength and normality to the hearts of such people, and as a consequence would have saved their lives.

The heart, as well as pumping blood through the various members and organs of the body, does so through its own private circulatory system. As is only right and proper, it gets first choice of the fresh, oxygenated blood. Exercise improves the efficiency of the circulation through the walls of the heart, just as it does that of the

circulation through any other structure. As a consequence the heart becomes well-nourished and grows in size and power, preserving its youthful condition and helping to preserve that of the body as a whole. It is a matter of common observation among doctors and scientists that the muscle of the heart tends to be in the same condition as the muscles of the rest of the body. Fatty degeneration of the heart, not due to a specific diseased condition, is a disorder not unseldom manifested by the Great Unexercised.

Apart altogether from the general effect of my exercises in improving the function of the heart, there are certain disorders of the circulation which have been found to respond to them in a manner often quite astonishing. Notable among such are high and low blood pressure.

High blood pressure can accurately be detected only by a competent physician, who will take the pressure by means of an instrument known as a sphygmomanometer, which is held in contact with the arm by means of an armlet wound round

the limb. The physician naturally makes the necessary allowances for the emotional state of the person concerned at the time of the test.

The symptoms to which high blood pressure may give rise are headache, giddiness, noises in the ears, nose bleeding, breathlessness, heart pain, rapid fatigue, and so on. Two of its most unpleasant consequences are apoplexy and heart failure. Its causes may be roughly divided into three classes. The first of these is the emotional. The disorder may arise from constant worry and nervous strain. The second is the toxic. The chronic rise of pressure may be due to the absorption of poisons from the digestive tract in the case of those constantly suffering from constipation; or to the absorption of poisons introduced from without, such as excessive alcohol and tobacco; or to the failure of the kidneys to rid the body of its waste products, as is the case with those suffering from nephritis. The third cause of high blood pressure is arterio-sclerosis, more

generally known as hardening of the arteries.

Arterio-sclerosis may be due to a number of factors, some of a temporary nature and others more or less permanent. Among the former we may list passing cramp of the tiny muscles in the walls of the arteries (which may be relaxed by a hot bath), and also the deposition of lime in the arterial walls. This latter state is due to the activities of two small glands, placed just above the kidneys. These glands secrete adrenalin, which it makes available to the body during periods of fear or excitement or anger. It is a stimulant to action. Adrenalin appears to have the power of taking lime from the bones and depositing it in the walls of the arteries. During periods of quiet and relaxation this lime is gradually removed again, but where there is continuous physical, mental and nervous strain, as is so often the case in this high-speed civilisation of ours, the calcium deposits assume a permanent form, and the walls of the vessels become hard and brittle. The cure for this condition, always

provided that actual disease of the glands is not present, must be sought in whatever will conduce to mental and physical relaxation.

Hardening of the arteries may also result from a thickening of their walls, due to irritation and inflammation set up by the poisons carried in an unhealthy blood stream. The presence of these poisons may be attributed to habitual constipation, to dining and wining not wisely, to rheumatism, to certain acute infectious diseases, or to over-indulgence in tobacco. Usually the disorder is brought on by a combination of several of these factors, for instance, drinking and smoking to excess. Thickening of the arterial walls is by far the most common form of hardened arteries, and is a condition essentially due to over-indulgence rather than to stress, emotional or physical. By this thickening of the vessel walls the calibre of the tube or conduit is lessened, and the heart has greater work in forcing the blood through the reduced space. Also, in arteries hardened by

thickening or by lime deposits, the elasticity is necessarily lost. Owing to this loss the blood stream is no longer converted into a fairly regular flow, but proceeds down the rigid tubes in a series of fierce spurts, causing damage to the delicate tissues of the body. Should the pressure be raised unduly by excitement or physical exertion, there is always the possibility present of a vessel's being ruptured.

My exercises in the bath will be found most efficacious in the treatment of chronic high blood pressure, where not due to organic disease. Even should disease be present, it would be difficult to imagine a situation in which they could do anything but good, but in all such cases I consider it advisable that the advice of a doctor should be taken. Where the arteries are lime-hardened, the easy, rhythmic movements in the tepid water will induce just the necessary relaxation of mind and muscle, while the general briskening up of the circulation will gradually over a period of time dissolve and wash away the deposits. The extent to which improvement may be

expected naturally depends on how far the condition has been allowed to develop. It cannot be emphasised too strongly that prevention is better than cure. The time to begin to take measures against the development of hardened arteries is in youth, or at least before the condition has begun to assert itself.

Where thickening of the walls has occurred, it is essential to take measures to rid the blood stream of its excess toxins. The most important item of the cure is the removal of constipation. Type 2 exercise of my system will soon achieve this. By its means all the abdominal muscles which assist in the function of bowel evacuation are thoroughly exercised and strengthened, while at the same time a powerful and invigorating internal massage is given to the digestive and genital organs and to the prostate gland which is subject to early degeneration in the male. The warmth of the surrounding water encourages the threadlike, surface capillaries to open and become engorged with blood, which excretes much of its toxins through the skin.

Incidentally, this opening up of the skin capillaries in itself produces a slight fall in blood pressure in people suffering from high blood pressure when the temperature of the water is about 94 degrees Fahrenheit, and no movements are made.

Dr. M. B. Ray in his work on *Hydrotherapy and Climotherapy* tells us " that a neutral warm or sub-thermal immersion bath is usually given about skin temperature, i.e., 93 F. Such a bath has a most soothing effect on the nervous system and if prolonged, is beneficial in cases of mental excitement, anxiety neurosis, etc. When this sub-thermal bath is given for an hour or two, the difficulty of maintaining the water at an even temperature arises. It is then necessary to place a vessel containing very hot water between the feet of the patient, but not touching them, or keep adding hot water."

When exercises in the bath are carried out, this difficulty is largely overcome; because the water is maintained at its original temperature for a much longer

time and the body increases its internal heat by the mild exertion.

While much can be achieved by improving the body's eliminative functions in the ways described, it is almost equally necessary that the absorption of toxic matter should cease, or at least be much curtailed. Over-indulgence in alcohol, tobacco, and the pleasures of the table should be eschewed. Should rheumatism be present, it is essential that steps be taken to clear up the condition. For this purpose the reader is referred to the chapter on rheumatism.

Like high blood pressure, low blood pressure may also be a temporary condition, or may be regarded as a chronic state requiring treatment. The pressure falls below normal after sustained physical exertion, or during the period of exhaustion after a long illness. Certain emotional states which cause flushing of the skin, such as shame or embarrassment, will bring about a temporary drop.

The symptoms of chronic low blood pressure are lack of mental and physical

energy, rapid fatigue, and a sensation of cold. Anything which lowers the power of the heart, such as the poisons of certain acute diseased conditions or the effects of chronic wasting disease; or which brings about a lack of tone in the walls of any of the blood vessels, causing them to relax, will establish the condition of low blood pressure. My exercises will be found to bring back the body to normal in ordinary cases, the power of the heart being gradually built up and the tone of the vessels restored. Once again it is most advisable to consult a doctor if there is any reason to believe that actual disease is present.

In a recent clinical experiment it was found that sufferers from high blood pressure experienced a return to normal after a quarter of an hour of my exercises. On the other hand, those with low blood pressure had it brought up to normal after about the same period, whilst normal people underwent no change whatsoever. Details of actual cases, in which high blood pressure was reduced by my exercises, will be found in the Appendix.

My movements influence these results by increasing the working number of the tiny arteries that regulate the blood flow to the tissues through the capillaries. This is an astonishing fact, because normally, during exercise, blood pressure shows an increase and not a decrease, more especially so in people suffering from high blood pressure. It must be understood that, in the case of those people naturally possessing a pressure higher or lower than the normal, no change can take place however long the exercises be continued.

A very common condition nowadays is varicose veins, and its kindred complaint hæmorrhoids (piles). The weakness in the vein walls which results in these conditions appears more often than not to be congenital. Young people are much prone to them. Nevertheless they become commoner as life advances.

Varicosities, when they occur in the limbs, are more often found in the legs, where the veins have to return a great load of blood to the heart against gravity. The condition is more likely to appear in the

left leg than the right, the circulation being poorer in the former, and may in part be due to the wearing of tight garters, which impede the circulation. Work involving long hours of standing is also likely, by causing stagnation of the blood in the legs, to develop varicosities in those who have inherited a weakness of the vein walls. These latter lose their elasticity and become permanently distended. The valves, which prevent the blood from flowing backwards, are no longer able to act, with the result that the condition tends to become steadily worse. There is often a long history of constipation prior to the development of the disease.

Exercise of the limbs, such as that provided by my Type 1 exercise, is excellent for breaking up stagnation and assisting the return of the blood to the heart. This return is largely dependent in the legs upon the pumping action provided by the alternate contraction and relaxation of the muscles of the legs and trunk during exercise. When a given muscle contracts, it

squeezes the blood out of neighbouring sections of the veins. As, in normal persons, this blood is prevented from flowing backwards by the valves, it is forced to do so towards the heart. In veins which have become much distended, the valves no longer act, because they are unable to close. Nevertheless exercise will assist in returning the blood to the heart through the sound veins, while, when performed in the horizontal position in the bath, even the afflicted veins will carry out their function better, being relieved of the effort of attempting to return the blood directly against gravity. Gentle stroking with the hands, from the ankles upwards, will also be found most efficacious in restoring tone to the vein walls and assisting the return of blood. If constipation is present, it will clear up, when persevering with my exercises, provided an adequate amount of vegetables in the diet is present.

The formation of hæmorrhoids (piles) can be much promoted by constipation and the habitual use of strong purgatives. If

not due to actual disease, this unpleasant and common condition will be much benefited by the bath exercises, which will assist in increasing the efficiency of the venous circulation in the rectum, and in removing the condition of constipation.

A common complaint in middle-aged people in these days of feverish excitement and rush is the disorders of the liver popularly known as a liverish feeling. This is characterised by a state of irritability and depression, loss of interest, drowsiness during the day and unsatisfactory sleep at night. This condition is favoured by worry, excitement and lack of adequate exercise. It is caused by the overtaking of the liver through excesses in food or alcohol and by constipation. If a careful diet is followed when this condition is present, my exercises will do the rest by effecting an internal massage of the liver and by stimulating the abdominal functions and the bodily chemical processes in general.

The endocrine glands, in their turn, cannot manufacture the powerful internal secretions, which control the physiological

economy of our system, without the material brought to them by an efficient blood circulation. Hence my exercises, by permitting the individual to make better use of the oxygen in the air breathed, can only be helpful in influencing beneficially the chemical changes taking place in these glands.

The reader will perhaps find it a source of encouragement if I tell him that at one time I myself suffered from both hæmorrhoids and varicose veins. To-day I am absolutely free of the former complaint, while no more than a slight trace of varicosity remains in my left leg.

The varicose condition developed as a result of an attack of double pneumonia at the age of twenty-two, which left me afflicted with phlebitis. For thirty years, although I wore an elastic bandage, my leg became engorged with blood and I was compelled to reduce my stride after walking fast for only two or three hundred yards. Whenever I attempted to leave off the bandage, a swelling took place which increased the size of the limb by as much

as two and a half inches. I also suffered from eczema in the leg as a direct result of my affliction, and employed ointments and lotions to soothe the irritation. After a year of the bath exercises, these conditions subsided, and I have now been free from them for the past eight years, nothing more than some slightly relaxed skin remaining to show where the varicosity once existed. Now, whatever I do, my leg maintains its normal size although I have left off wearing any sort of bandages for all these years. I have also been free of hæmorrhoids for a similar period.

CHAPTER FIVE.

SKIN AND COMPLEXION.

WOMAN has seldom shrunk from taking any course, however drastic or temporary in its effects, which held out promise of increasing beauty or prolonging the appearance of youth. She has, cheerfully, submitted herself to painful operations and to the administration of dangerous drugs. The papers recently reported a case of a woman who claimed damages from the vendors of a cheap preparation, which purported to make the eyelashes grow longer. It had, she alleged, succeeded only in seriously burning her eyes. The doctor who attended her remarked in court that she was but one of a great number of women whom he attended every year for injuries sustained from cosmetics.

Such injuries are doubtless comparatively rare, when it is considered how widespread is the use of make-up. Nevertheless it is a matter of common observation how quickly the free use of even better-

quality cosmetics tends to age the appearance. I would suggest that the use of proprietary creams, pigments and powders should be reduced to a minimum, and that a fuller exploitation should be made of the aids to beauty offered by Nature herself. I can guarantee that my simple system of exercises in the bath, by mobilising the natural resources, will do more than any beauty treatment to maintain the youthful, smooth and elastic quality of the skin until late in life, and to keep the face free of the characteristic wrinkles and degenerative changes of age. As my own sex, if the truth be known, is also not indifferent to the possibility of securing such happy results, this chapter should prove of interest to all.

The skin is not a mere covering for the body, but is also one of its most vital organs. In the first place it forms our chief barrier against the micro-organisms of disease, which are unable to make their way past it, provided that it is not broken by a wound or scratch. Nevertheless these are always present on its surface in countless numbers, particularly when cleanly

habits are not observed, and it is known that should the skin be broken, the germs quickly congregate in the neighbourhood of the injury. I cannot over emphasise the importance of the habit of bathing daily, where this proves practicable, particularly in view of the additional fact that the pores can easily be clogged by the cuticle and scales continually shed by the skin and by the oily secretions of the body.

In the second place, the skin fulfils the functions of regulating the temperature of the body, and excreting many of its waste products. As these functions are somewhat bound up together, I shall consider them at the same time.

The waste products are voided, by way of the pores, in the form of invisible perspiration. In the ordinary way the normal person gets rid of about a pint and a half in the twenty-four hours. When a great amount of heat is generated in the body, as during physical exercise, the organism maintains its regular internal temperature partly by sending blood up to the capillaries of the skin, where it is cooled by

proximity with the external atmosphere, partly by the increased evaporation of sweat from the surface of the body. Thus exercise, especially when carried out in a tepid bath, is peculiarly well suited to increase the excretion of toxins from the blood stream by the skin, and by so doing relieve the kidneys of a great deal of work.

It is partly owing to its excretory function that the skin is so sensitive to the condition of the blood stream and intestinal tract. If the blood is constantly being fouled by matter putrefying in the digestive tube owing to constipation, it is useless to hope for a blemishless complexion. Even if there are no actual eruptions, the skin will advertise the inner conditions of the body by its unhealthy appearance and "muddiness." The perspiration acquires in many cases an abnormally pungent odour, due to the high concentration of toxins present in it. A clean intestinal tract will go far in maintaining a clear and youthful skin until an advanced age.

My exercises, besides promoting frequent bowel action, will assist in preserv-

ing the condition of the complexion in another most important way. The outer covering of our body consists of a great number of layers. The outermost of these is composed of flat, horny cells. These are being constantly worn off by friction, and are constantly replaced, during health and youth, by fresh cells forced up from the layers below. As the individual grows older there is less blood in the skin, which as a consequence becomes less well nourished and begins to lose its youthful smoothness and pliability. The processes of repair are no longer so active, the worn-off cells are not replaced, and in some old people we witness the phenomenon of the skin's having become so thin and transparent, that the underlying blood vessels and other structures appear almost uncovered. This appearance is furthered by the fact that the layer of fat normally present beneath the skin has gradually disappeared. The formation of the wrinkles of old age is in no small part due to this disappearance.

The skin is well supplied with elastic fibres, which enable it to accommodate

itself to such conditions as obesity and pregnancy, and later to regain its normal form when the conditions have been removed. Fine muscle fibres are also found in it, particularly in the face. They make possible the various facial expressions of anger or amity, joy or sorrow. When, through the degenerative processes of advancing age, these muscular and elastic fibres gradually lose their quality, the skin is no longer taut and elastic, and pouches and wrinkles form easily.

The face movements included in my system will be found ideal for combating the physical changes which I have enumerated above. Being performed as they are in combination with movements of the trunk and limbs, there is no local congestion of blood and lymph, the circulation flowing freely throughout the entire body. The skin cells are vitalised, the blood stream bringing them nourishment and removing their waste products.

While in the long run no fatigue will be experienced in the muscles of the face, and no congestion in the local circulation, it is

possible that the reader may have either or both of these reactions during the first few times of performance. But after a while, as the metabolic processes become educated, the fatigue toxins formed in the working muscles are oxidised as fast as they are produced. I myself can perform the face movements for hours on end if need be, without undergoing any discomfort. As an example of local distention in the blood circulation, I experienced this in the form of bloodshot eyes during the first two or three occasions. But as the blood channels became free-running and clear, this condition no longer took place. Should it appear, a little cold water poured over the face and head will provide the best remedy. I can assure the reader that both my complexion and eyesight have benefited, to a marked degree, from the regular practice of the face exercise.

CHAPTER SIX.

OBESITY AND CONSTIPATION.

I PROPOSE in this chapter to deal with the twin subjects of obesity and constipation, not because they need of necessity have any connection, but because movements, which more especially involve the region of the waist and abdomen, are particularly suited for clearing up both conditions.

The term obesity implies an excessive storage of fat in the body tissues, resulting in a weight which may be regarded as abnormal for the height and age of the person concerned. This excessive storage chiefly takes place in the tissues least disturbed by exercise, such as the chin, neck, waist, stomach, hips and buttocks. The working of the vital organs, such as the heart, lungs, liver and intestines, is clogged and impeded. Fatty degeneration of the heart is a not unusual complication. As the abdominal muscles become flabby and lose their strength and elasticity, they

are no longer able to hold back the heavy organs of the abdomen, which sag forward and become displaced. This displacement may be so extreme as to lead to the most serious consequences.

Obesity may be due to a number of different causes. It may be due to some disturbance in the glands of internal secretion—such glands as the thyroid, the genital, the pituitary, or the supra-renal. If actual disease of a gland is suspected, the matter must of course be referred to the physician, but since the natural means of reaching the seat of disease is through the blood stream, the sufferer will not go far wrong if he purifies and invigorates his circulation through the conscientious performance of my exercises.

Obesity may be constitutional, or hereditary. The person in question puts on flesh however little he eats. He would continue to do so even though he were to consume less food than was necessary for his needs. Sometimes he remains apparently perfectly healthy. There is little that can be done for him through dieting,

as there is obviously some disturbance in the chemical exchanges of the body, or the mechanism which controls these. As in all constitutional conditions, treatment must be directed at the individual cells which form the tissues of the body, where these exchanges take place. The vital cell processes are best promoted by a good, general circulation such as that instituted by my exercises.

By far the most common type of obesity, and fortunately that which most readily responds to treatment, is what is known as the alimentary. The person in question exercises too little and eats too much. Or he may be guilty of only one or other of the two above-mentioned hygienic offences. It would be sufficient for him to cut down his nourishment, or increase his exercise, to secure release from his living burden of fat.

The wise man will make assurance doubly sure by attacking the condition on both flanks, for excessive fatness is a dangerous state requiring energetic measures, leaving its victim as it does an easy

prey to every sort of disease, and shortening his life. Chief place should be given in the diet to those articles of food, such as green vegetables and fruits, which present bulk combined with comparatively little nourishing power and which efficiently promote the frequent action of the bowels. Milk and milk-produce are also beneficial, and should be taken with lean meat and bread in moderation. Carbohydrates (starches and sugars) must be in particular reduced. They will be sufficiently represented by a moderate amount of bread and potatoes. Any doubts on the proper diet to follow will be cleared up by a doctor.

At the same time my exercises, particularly Types 2 and 3, will be found to reduce the excess deposits of fat gradually and certainly, bringing into activity as they do the muscles of the neck, back, waist and abdomen. Types 3, 4 and 5 are excellent for the waist and buttocks. While never obese myself, I was nevertheless enabled by these exercises to acquire much better proportions, and to maintain them up to the present day. The reader is

referred to the table of measurements in the Appendix.

For muscles which are thin, weakened and overloaded with fat, exercise in the air means discomfort, which inclines us to avoid it. In the water, thanks to its buoyancy, the muscles are relieved of this handicap, their mechanical activity is promoted without fatigue and discomfort, and they grow strong at the expense of the useless fatty tissues. At the same time, as I have indicated in a previous chapter, the condition of the heart is also improved in sympathy with the general improvement in the muscular condition.

Obesity may actually assist in the development or furtherance of the common and highly dangerous condition of constipation. The act of defæcation is to a large extent dependent on the abdominal muscles, which exert powerful pressure on the bowel, thus squeezing out its contents. When the wall of the abdomen is flabby and inelastic, it is inadequate to carry out its function. It is true that the bowel itself, being a muscular tube, is capable of moving

on its own contents, but where the efforts of the bowel are alone depended upon, the processes of digestion are accompanied by flatulence, distention, and almost certainly an incomplete emptying of the bowel itself. The above remarks apply equally, of course, to thin and medium people possessing slack abdominal muscles.

It cannot be assumed that, because the once-a-day habit is observed, constipation does not exist. In fact I would go so far as to say that anyone performing the function of defæcation but once a day is almost certainly constipated. The large intestine consists of a tube with a series of pouches in its walls. The divisions between these pouches act like small dams, slowing up the progress of the matter passing down the tube from pouch to pouch, and better enabling its fluid parts to be absorbed into the blood stream as nutriment for the tissues. Thus the contents of the large intestine gradually attain a firmer and firmer texture, until finally they enter the rectum as a soft mass ready to be voided from the body. When the bodily functions

are inefficient, there is a tendency for the matter passing down the digestive tube to stagnate in the pouches, and eventually the greater part of the large intestine may be coated with a layer of half-dried fæces. A track often remains in the centre of this putrefying mass, through which the bowel contents continue to make their way down to the rectum, so that the victim of constipation imagines that he is free from that condition, when in reality his blood is being steadily poisoned by the contents of his gut. The toxins set up by the fast-multiplying putrefactive and other harmful micro-organisms in the rectum and large intestine soon pass into the small intestine, from which they may eventually set up a condition of chronic irritation. Indeed constipation may be said to lie at the root of most bodily evil. If anyone wishes to assure himself that he is not suffering from intestinal stasis, he must cultivate as the absolute minimum a twice-a-day visit to the closet. The ideal consists of a voiding of the bowels after each meal,

but the achievement of this will prove difficult of attainment to anyone trained from early infancy to the pernicious once-a-day habit.

The attack on the condition of constipation must take two forms. In the first place the diet must be augmented in foods, such as fruit, greens, and cereals and breads containing plenty of bran, which will provide the necessary waste material, or roughage, upon which the bowel can act, and these must be flushed with liberal intake of water between meals. The gut was evolved to deal with natural foods, which include much indigestible material which must be voided. It is quite incapable of maintaining a healthy condition of affairs when asked to act upon the highly processed and refined foods of civilisation, which, to mention but one factor, often consist of almost entirely digestible matter.

Dietetic reform should be accompanied by an attempt to re-educate the apparatus of evacuation. To this end the Types 2, 3, 4 and 5 exercises will be found especially

efficacious, in that they thoroughly recondition all the muscles and their attachments which form the abdominal wall. I can above all recommend Type 2, instituting as it does a particularly powerful massage of the digestive tube, apart from exercising every single relevant muscle group. Its conscientious daily practice will gradually, and without any painful stiffness, tighten up the abdominal muscles and increase the bowel motions.

CHAPTER SEVEN.

RHEUMATISM.

RHEUMATISM is a term which is loosely applied to cover a great number of maladies which, notwithstanding their many resemblances to one another, are recognised to-day as forming distinct and separate disorders. Among such, I may enumerate here rheumatoid arthritis, gout, fibrositis, lumbago, osteo-arthritis and stiff neck. This catalogue, though not inclusive, embraces all the commoner conditions belonging to the rheumatic group.

Rheumatic affections not only fall into various groups, but are attributed to various causes. It is no part of my purpose to discuss these various and, at times, conflicting attributions.

Nevertheless, out of the scientific welter certain clear principles emerge upon which successful treatment can be based. I believe that the system of exercises, whose claims I am advancing in this book, is thoroughly in harmony with these principles, and that it is going to prove a real

and most tremendous asset in the fight against the most widespread and one of the most disabling conditions known to civilised men. Naturally it will be understood that the best time to begin to take measures against rheumatism is before it has advertised its presence, but even after it has made its appearance my exercises in the bath will be found suitable for the treatment of most forms of chronic rheumatism. In its acute form the disease must be referred to a physician, while at all times an examination is advisable. Should anyone reading this be so unfortunate as to suffer from the extreme crippling which some advanced rheumatic affections entail, he is referred to the chapter on hydrotherapy included in the Appendix, where he may find matter of interest and profit to him. This chapter, though somewhat outside the scope of a book designed primarily for the ordinary, fairly healthy individual, has been included because the author believes that it will strongly recommend itself to those entrusted with the care of sufferers

from chronic arthritis, infantile paralysis and other disabling conditions.

For the purposes of this discussion, I propose to divide the rheumatic affections into two groups, namely, those which show a marked involvement of the joints, and those which do not. In my first group I shall include rheumatoid arthritis, osteoarthritis, and gout.

Undoubtedly the commonest types of rheumatism are those embraced under the generic names of rheumatoid arthritis and osteoarthritis. The joints and surrounding tissues show swelling and pain, and, if this state of affairs is allowed to continue, a considerable amount of inflammatory destruction of the joint may take place, while muscle wasting is a symptom which may become very extreme. A family history of joint troubles, whether rheumatic or gouty, will predispose an individual to suffer from the above disorders, so it is well for such a person to take all precautions in plenty of time against the onset of the disease. If he performs my exercises daily, I am prepared to guarantee that he

will keep the dread symptoms effectively at bay.

Once the condition has taken root, it is best attacked by the observation of good hygiene, together with the eradication of any focus of infection in the teeth, tonsils, or bowel. Only the dentist or the doctor is equipped to deal with bad centres of infection in the teeth or tonsils, but the other items lie largely in the individual's own hands. The first essential is that any tendency to constipation and intestinal putrefaction should be thoroughly removed, in the manner indicated in the previous chapter.

The sufferer is usually advised to apply heat in the form of Diathermy, Ultra short wave therapy, Medicated hot water bath, Foam or Vapour bath, Hot water Fomentations and Massage which are all passive activities. The aim of these applications is to promote the elimination of toxins by a local distention. When self activity is not possible, these treatments may prove the best alternative but, when possible, there is no doubt that the best treatment is

to let nature increase its power of elimination by movement. Nothing but movement can create an increased demand of oxygen, and the efficiency of man's chemical processes can only be maintained or increased by an adequate consumption of oxygen. It is not always possible to take plenty of exercise in the open-air, even when our condition would permit it, and at the same time avoid the risk of chill. Neither is it possible for the sick, with the present forms of treatment, to use their limbs when they are wholly incapacitated. It is only with my exercises in the bath that these disabilities can be overcome in the privacy of the home, while an open window will provide all the fresh air needed. Thus a perfect means of fully exercising every muscle of the body is offered, while the risk of chill is avoided. This is so because the water, which surrounds the body whilst in action, maintains it throughout at an even temperature and the body itself is not artificially overheated. During other forms of treatment, it is difficult to avoid expos-

ing momentarily, that part or parts of the body which are locally overheated, to an abrupt change of temperature. Such general exercise is best calculated to prevent the accumulation of toxins in the joints, or to wash them away in a free-running blood stream when once they have collected.

So long as it is remembered that a hot joint should not be moved it must be impressed on the reader that he should never give way to the tendency not to use a painful joint. Such a course will only render the circulation in the affected part worse than ever, with the result that the formation of inflammatory exudates will proceed at an ever-accelerating pace. Also there will be a forfeiture of both strength and mobility, accompanied by a certain amount of atrophy, in the part, because the circulation is charged with the task of nourishing the tissues, and when it becomes poor the tissues are less well nourished. We may put it another way by saying that nature supplies a tissue with enough, and only enough, nourishment to supply its

immediate needs. If the part remains idle for long, the nourishment is correspondingly curtailed. This does not apply merely to muscles which, as most people will have observed in their own persons, tend to become larger and more powerful with exercise, and to atrophy and diminish in size from the lack of it; it applies equally to ligaments. In bone, decalcification has been observed in X-ray photographs after comparatively short periods of immobilisation.

I have already mentioned that the movements in the water under the name of Under-Water Gymnastics were devised by Dr. Lowman in 1924 and have since been recommended by leading authorities for the treatment of rheumatic conditions, and infantile paralysis. These movements which are carried out in large pools permit the patient to walk and move his limbs in the water without pain. To his great relief and surprise he finds that he is able to move limbs over which he thought he had lost control; the effect on his nervous system is enormous. It is the first step to recovery.

Although the aim of my exercises is the prevention of disease, they can be followed with advantage for the treatment of rheumatic affections and infantile paralysis in the privacy of the home. Their object then is not merely of maintaining the condition of the healthy tissues by giving them movement but of re-educating and stimulating the weakened muscles and nerves to resume their normal activities; while the augmented volume of blood, circulating with a less rapid flow, increases the elimination of toxic products.

When the affection of the patient is not severe and his condition permits it, a few minutes stationary running carried out before leaving the bathroom will prove useful. So long as the body is kept moving, not even the most delicate person runs any risk of chill. On the contrary, the daily exposure of the bare skin to the air will so harden the organism as to enable it to offer a remarkable resistance to colds.

Much of the foregoing may be applied to the condition of gout, in which the joint most often attacked is that of the great toe.

The disease is particularly likely to afflict those from a gouty stock. It is much less prevalent than was the case, doubtless as a result of the simpler living habits of the present day.

Degenerative changes in the heart and blood vessels, such as have been described in detail in a previous chapter, are very likely to afflict at an early age anyone who has inherited the gouty taint. The high blood pressure, so often present, leads to hardening of the smaller arteries, while the nutrition of the heart suffers.

The term rheumatism is also applied, as I indicated at the beginning of the chapter, to many conditions in which the joints are not affected. Fibrositis, resulting in stiff neck and lumbago belong to this group. They are affections of the fibrous tissues—the muscles, tendons, and fascia, alone. The fibres are painful and stiff, and movement becomes difficult.

Ordinary stiff neck, so often acquired from sleeping or sitting in a draught, is a form of fibrositis. There is a swelling and hardening of the fibres of the neck muscles,

accompanied by some congestion of blood and lymph in the part. The condition yields rapidly to my exercises, the blood and lymph channels being opened up and the congestion relieved. In the process the stagnant waste products, which are the cause of much of the mischief, are washed away. Excretion of toxins from the body by way of the bowels, kidneys, skin and lungs is much speeded up. In all forms of fibrositis there is certain to be a very toxic condition of the blood stream.

In lumbago it is the muscles of the loin and back, on one or both sides, that suffer. The same general principles apply in its treatment as in that of the other rheumatic affections. Deep massage, at a later stage to disperse the inflammatory nodules formed in the muscles concerned, is one of the steps taken to combat the condition. This will be rendered much less painful if carried out under tepid water. The sufferer will usually find himself able to massage the area himself, while performing the movements of the exercises. The second variation of Type 2 exercise, and

the variation of Type 3, are particularly brought to his attention. The various other massaging movements are recommended for dealing with rheumatic conditions in other parts of the body. As a general rule, when the condition is located in a joint, pressure should not be such as to cause pain. When the condition is located in the muscle fibres, the pressure applied should be as strong as can be borne.

I believe that my wife's experience will prove of general interest to sufferers from rheumatism. She inherited a tendency to arthritis, and, at thirteen years of age, suffered from a slight attack of muscular rheumatism in her knee. At twenty-three she contracted rheumatic fever, and at various times afterwards suffered from muscular rheumatism, arthritis, and a slight attack of gout. She underwent treatment at spas and therapeutic institutions both in England and elsewhere, but her condition nevertheless became slightly worse, her knees and hands exhibiting degenerative changes. Since taking up the bath exercises, her knees have gained

a normal mobility and appearance, and are no longer painful. Her fingers have also improved, although they still show signs of degeneration. Whereas only a year ago she was often awakened at night by pains in her arms, shoulders, back and buttocks, she now seldom suffers from these symptoms. It is her experience that by far the best results are obtained when the exercises are performed before retiring, the dispersal of toxic products being furthered by the ensuing night's rest.

As for myself, I am not a rheumatic subject in the same sense, but on the other hand have not by any means been free from muscular rheumatism. For twenty-five years I periodically suffered from back-ache, but during the last few years this condition has disappeared. I owe this happy result in particular to the variations of exercises 2 and 3.

CHAPTER EIGHT.

STRENGTH AND IMPROVEMENT OF THE FIGURE.

A BOOK on exercise would not be complete did it not contain some reference to the important twin-subjects of strength and figure improvement. There is hardly a person, from the young girl anxious to slim, to the middle-aged business man desiring to lower his golf handicap or to refit himself to take part in games again, who is not interested in the problem of how best and most speedily to improve the quality of the muscular apparatus.

Muscle is the great contractile tissue of the body. Clothing the bones of the trunk and limbs, it is the means whereby all movement is brought about. It enters largely into the structure of the walls of the hollow internal organs, such as the heart and digestive tube, and provides the machinery by which they propel their contents. It acts as a support to many structures, such as the abdominal organs. In

brief, when youthful and elastic, it provides its possessor with health, with vigour and with grace.

The quality of the muscle ultimately depends on the efficiency of the circulation passing through it. When a muscle is at rest, many of its capillaries are not in use or have shifts of service, one opening here for a time and then closing down so that no blood runs through it, while another nearby capillary opens and serves its neighbourhood. When the body becomes active, a most remarkable expansion takes place in the capillaries. The capacity of this irrigation system may be increased by as much as seven hundred and fifty times. As a consequence the flowing blood is brought nearer to every muscle cell, carrying nourishment to it and washing away its waste products. The muscle thrives, and grows in strength and quality. This beneficial result can be prolonged indefinitely with my exercises, because no state of fatigue is encountered to put an end to the movements.

The general movement, which forms the

basis of my system, will produce that harmonious and all-round development so desirable and so generally admired. A good carriage will follow automatically from the cultivation of the muscles of the back and waistline, and the spine will be strengthened and benefited. The deep breathing engendered by the movements will greatly increase the power and capacity of the lungs, improving their resistance to disease and, incidentally, the appearance and size of the chest. My exercises in the bath allowed me to improve my own measurements at an age when such improvement is normally unlikely.

Results after Half an hour's Continuous Exercise

		Blood Pressure with Tycoos.	Pulse Rate	Water Temp. per Min.	No. Ex.
Before Exercise	...	125/85=40	72	94	—
After 15 min.	Exercise No. 1	125/85=40	72	91	72
After 15 min.	Exercise No. 2	125/80=45	80	94-90	54

Pulse rate during action slightly above normal.

Increase in the heat of the skin in all parts of the body.

Immediate reaction to changes of temperature, such as to render sensation hardly noticeable when exposing the body to a temperature below zero.

Absence of stiffness in the muscles.

Absence of any sense of tiredness.

Sensation of well-being, not experienced with any other exercise.

Sensation of a renewed elasticity, through the body.

Sensations of heat perfectly distributed, totally different from the one experienced after other exercises.

Results after 18 Months of Half-hour Daily Exercises.

			Body Measurements		
			October, 1922	June, 1926, 3 months after Exercise	January, 1928
Weight	...	...	11.3 stone	10.13 stone	11.4 stone
Chest	normal	...	36 $\frac{1}{4}$ inches	36 $\frac{3}{4}$ inches	38 $\frac{1}{2}$ inches
	Contracted	36	„	35	„
	Expanded	38	„	38 $\frac{1}{2}$	„
Waist	...	...	34 $\frac{1}{2}$ „	32 „	32 „
Abdomen	...	...	37 „	35 „	34 „
Hips	...	...	37 $\frac{1}{2}$ „	37 $\frac{1}{4}$ „	36 „

Attention is called to the greatly altered

proportions of the body, leaving weight unchanged.

Clearer complexion.

Improved elasticity of the body all round.

Absence of muscular pains.

Absence of stiffness.

Freedom from colds or coldness of the extremities.

Increase in the action of the bowels.

Feeling of well-being.

Immediate reaction to change of temperatures.

Improved digestion.

Absence of muscular flaccidity.

These improvements were made after I was past the fifty mark. Should the reader be sufficiently interested, he will find a more detailed list in the Appendix.

Women should disabuse their minds of the impression that the exercises will produce a muscular bulk which they do not desire. The movements can be performed with any degree of strength desired, according to the muscular development sought. They will vastly improve the figure by producing flexibility, and by

restoring extensibility to the muscles. In ordinary life the muscles are much more often contracted than extended, with the result that they tend to lose their length and become short or knotty. Short muscles are ugly. The ideal figure owes its graceful contours to long, firm, full and elastic muscles.

The bath exercises will be found excellent for re-educating the body to a point where it is possible to resume games again, in the case of those obliged to relinquish their favourite sport on account of degenerative changes in the heart and blood vessels. The exercises are equally useful for bridging the gap between one weekend's sport and another, with its attendant risk of strain to an organism suddenly asked to undergo more or less violent effort after five or six days of sedentary living. How many cases of sudden death of middle-aged business-men on the golf course could be traced to an untrained cardio-vascular system, abruptly asked to face a burden too great for it! It is regular activity of the muscles every day of the week which

prolongs youth and maintains the efficiency of the body. Violent exercise at long intervals not only does little or no good, but may prove really dangerous.

Should stiffness and soreness be felt after unaccustomed exercise; the movements in the bath are ideal for breaking up the local congestion of blood and lymph in the affected muscles. In this way a rapid return to normal may be secured. When the body is tired, the exercises will be found extremely refreshing, causing the fatigue toxins to be washed away in an invigorated circulation. In short, my system will be found equally good as a method of physical training, and as an adjunct to all sorts of sporting activities, increasing the physical capacity of one and all, whether young or old, male or female, champion or "rabbit."

CHAPTER NINE.

HINTS ON THE PERFORMANCE OF THE EXERCISES.

ALMOST certainly the first question which will spring to the reader's mind will be, "For how long must I perform the bath exercises?" And the answer is, "For as long as you can." There are some good things of which you can have too much, but the exercises are not among their number. Let me explain.

In the ordinary process of living, as we have seen, toxins are produced which gradually silt up the body, impairing its function and shortening its life. These toxins tend to accumulate more rapidly as age advances, or during disease. As my system is particularly well adapted to stimulate the processes of elimination, and so to oppose the silting up of the blood stream and tissues, it can be performed with nothing but benefit, however long continued. For some young men and women, five or ten minutes a day may be

all that is required, while older persons should aim at a minimum of twenty or thirty minutes daily, in order to oppose the increased tendency towards toxæmia. Those of really advanced age will probably require an hour or more to cleanse the body of its by-products, as will those suffering from disease. In the case of old people, such persistency will be rewarded by increased well-being and a lengthening of the span of life. Once again I repeat, there can exist no risk of strain or fatigue. It sometimes so happens that the exigencies of business or pleasure will not permit of an extended stay in the bath. In such circumstances it is better to perform the exercises even for two minutes, rather than not perform them at all.

The exercises are divided into six different types, each with its variations, which have been devised in order to help the performer to add self-massage of the different parts of the body while exercising. Types 1 and 2 may be considered the basic movements of the system, and should be performed when there is no time for the

others, unless there is some particular rheumatic condition present, which demands a movement with or without self-massage included in the other types.

In disease, and when fatigued by an unusually strenuous exertion or after a day of hard work, the exercises should be carried out if possible before the evening meal or before retiring, when the resulting dispersion of toxin will not be followed by fresh accumulations. The ensuing night's sleep will not only then assist in the processes of recovery, but will prove all the sounder. My system, if persisted in, will be found the best possible cure for insomnia. As to the strength and speed with which the movements should be performed, it is advisable to commence them very gently and very slowly until they have been learnt, and then later to increase them in vigour rather than speed. The ultimate vigour with which they are performed will depend upon the degree of physical strength desired.

At first the bodily movements will be found to be awkward and unco-ordinated,

but after a few days' practice they will assume smoothness and rhythm. When this happens, the tendency to splash water over the side of the bath will disappear. Experience will prove the best instructor in the art of avoiding splashing. Indeed it can be taken as a sign of incorrect performance when the water passes in miniature waves over the top and bottom ends of the bath. If this cannot be avoided by the beginner, a small board placed on each end of the bath and kept in position by a weight will stop the miniature waves from going over. A wire basket, which can be bought anywhere, when rested on the end of the bath with a sponge on it, as shown in one of the illustrations, will prove a surprisingly efficient anti-splash device. The hair may be kept dry by wearing an ordinary rubber bathing cap, while anyone who is inconvenienced by water in his ears should plug them with cotton wool slightly soaked in olive oil.

The temperature of the water, unless otherwise prescribed by a doctor, should be tepid, that is, between ninety and

ninety-four degrees Fahrenheit. The amount should be sufficient to cover the body when in a recumbent position. With too much water it is difficult for some people to hold themselves firm enough to carry out the movements; with insufficient, the exercises demand more exertion. It is immaterial that parts of the body are not covered completely during the course of movements, provided that the body as a whole is sufficiently supported.

The twin duties of internal and external cleansing can be conveniently combined if the body be soaped all over either before or after getting into the bath to perform the exercises. Should the bath be found too short, the movements can be carried out in a half-seated position. When it is too long, two or three ordinary glazed bricks placed at the end of the bath will reduce its size to a convenient length.

These bricks will prove equally useful to assist a disabled person into the bath. They are placed in the centre one on top of the other, to act as a seat. Then, when the invalid has been helped to take up a

position on them, they are removed one by one, so that he is gradually lowered into the water. The buoyancy of the latter will assist him to take up a recumbent position. On getting out of the bath, the process is reversed, the bricks being replaced one by one and the invalid helped to sit on each in turn. Bricks covered by a rubber mat, as used in cash desks, when conveniently placed at the bottom of the bath, are useful as an adjunct in massaging the back and sides of the body when the latter rubs against them.

Three sponges, as will be explained in the next chapter, are recommended for comfort in the performance of the movements. It is preferable that these should be rubber, the softest and largest being the best. Their cost is not more than a few shillings, but where even this price proves prohibitive, a little ingenuity will suggest alternatives.

And finally, it is of the utmost importance that the window, if at all possible, should be wide open.

CHAPTER TEN.

THE EXERCISES ILLUSTRATED BY THE AUTHOR.

Type I: *Leg and Arm Bending with or without Face Movements.*

TAKE up the commencing position shown in Fig. 1 without strain or contracting the trunk unduly, the lower part of the spine resting comfortably relaxed on a soft rubber sponge, in order to prevent the body from slipping. Rest the head on another rubber sponge. The right knee and the heel are drawn up towards the body without strain, the toes well extended. The right arm is bent close to the body with the fingers clenched and looking up. Have the left leg stretched towards the end of the bath, either the heels or toes extended to touch the bottom of it, and the left arm stretched towards the knee with the palm of the hand looking down. It is to be noted that when the end of the bath is touched with either toe or heel quite different sets of muscles are brought into play.

While the water is supporting the body, there is a natural tendency to increase the action in the water much beyond its proportion in the air. To do this is not always

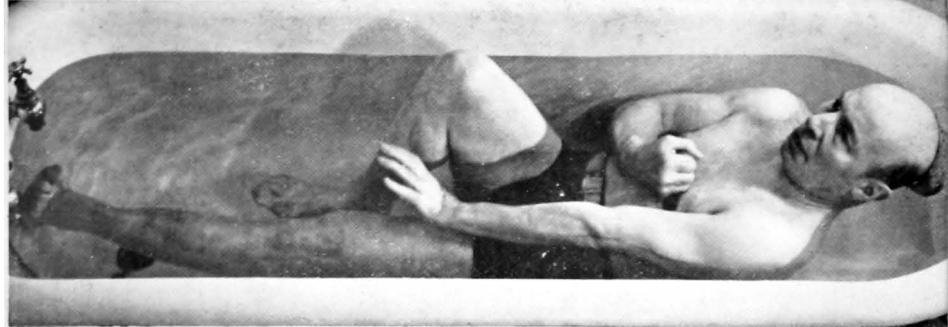


FIG. 1.



FIG. 2.

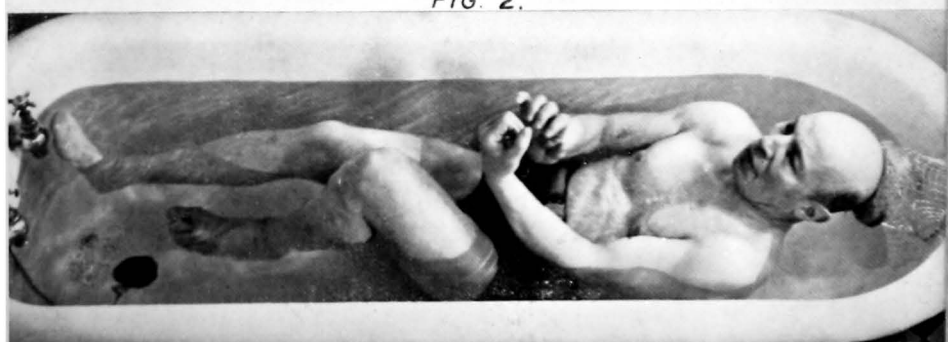


FIG. 3.

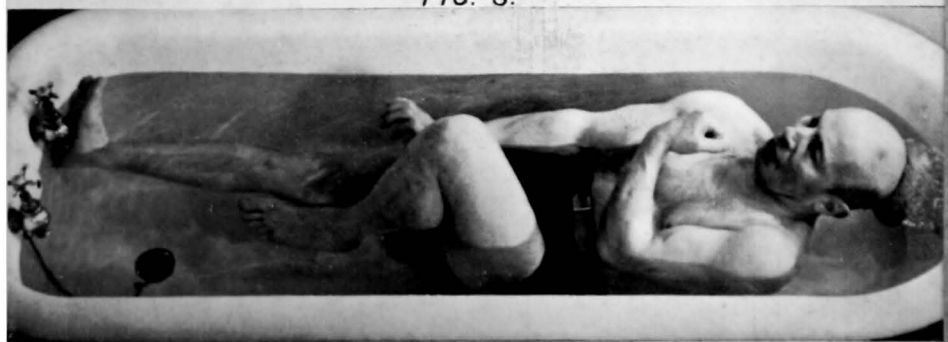


FIG. 4



FIG. 5.



FIG. 6.



FIG. 7.



FIG. 8.

advisable, and to a certain extent unnecessary, unless one wishes to train for a special sport. The illustrations show all movements to their maximum extent in order to make them easier to describe and follow.

The action in Fig. 1 to 4 is exactly the same as in Fig. 5 to 8. The latter shows the position to be taken when the bath is short or the performer is a woman wishing to avoid getting her hair wet.

The exercise consists in inverting the above position as shown in Fig. 1 or 5 into the opposite one shown in Fig. 4 or 8 by alternately extending the limbs of one side of the body while the limbs of the other side of the body are contracting.

The movement itself is started by the turning of the wrists as shown in Fig. 2 while the fingers of the right hand, which are clenched, are opened. This action is accompanied by the simultaneous extension and contraction of the hands, arms and legs, as shown in Fig. 3, until they are fully extended and contracted while following the centre line of the body as shown in Fig. 4. The knees may be drawn towards

the body more or less, the strength used in contracting and extending the arms and legs can best be regulated by the condition and fitness of the performer.

It is of the greatest importance that the starting action of the wrists shown in the period of transition by Fig. 2 and 3 or 6 and 7 should be followed with care, because here lies the key to regulate the movement and its rhythm. Moreover by this action additional groups of muscles of the shoulders, chest and arms are brought into activity. It is during this period that the tension is relaxed. The wire basket shown in the illustrations is the anti-splash device mentioned in a previous chapter.

Fig. 9 to 12 show again the same movement but with the facial muscles stretched while the arm and leg are contracted. The stretching of these muscles should be started when each arm and leg are about to complete their contraction and relax as they relax. This additional movement should not be attempted until the body movement is mastered. Then it will help the rhythm, excite the function of the skin and tone the muscles of the face and neck.



FIG. 9.



FIG. 10.



FIG. 11.



FIG. 12.



FIG. 13.

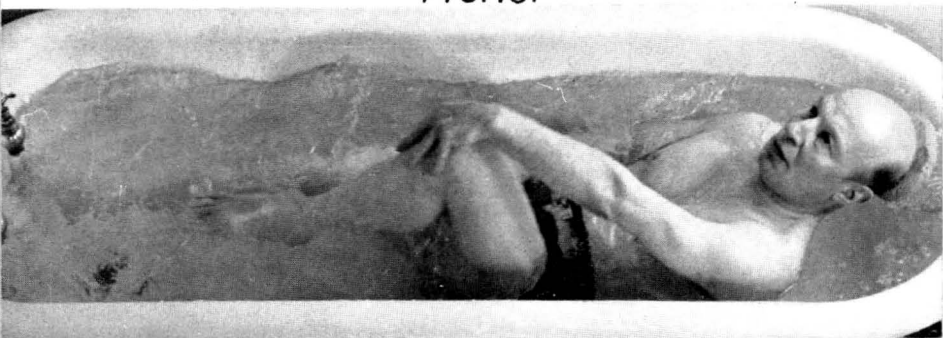


FIG. 14.

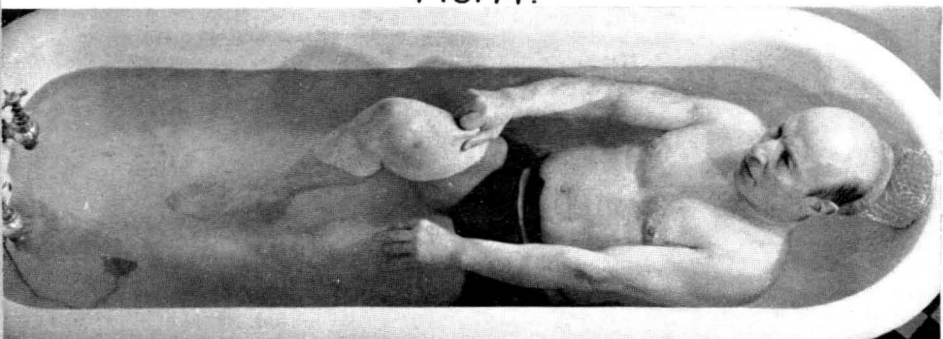


FIG. 15.

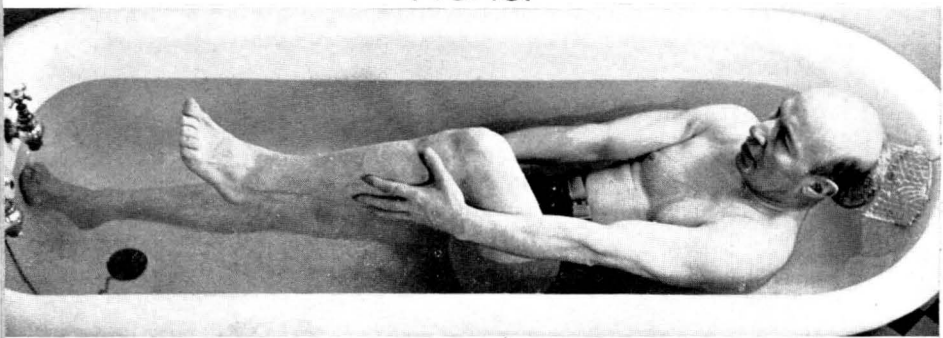


FIG. 16.

Variations of Type I.

*Legs Bending with Hands Massaging
Knees.*

Fig. 13 & 14. Take the same commencing position. The legs are raised and lowered as before, but the arms remain by the sides with the palms extended towards the knees. As these latter descend during the extension of the legs, they are gently stroked by the hands from below upwards.

*Legs Bending with Hands Massaging the
Thighs.*

Fig. 15. As before, except that the hands massage the thighs. This massage can take the form of gently grasping and releasing various portions of the thigh muscles.

*Legs Bending with Hands Massaging the
Calves.*

Fig. 16. As before, save that this time the hands are extended towards the calves. As the legs descend during the extension they are gently stroked by the hands from below upwards.

*Legs Bending with Hands Massaging
Legs and Thighs.*

Fig. 17 & 18. As before, except that the hands massage legs and thighs in their descent.

*Legs Bending with Hands Massaging
Buttocks.*

Fig. 19 & 20. As before except that the hands massage the thighs and buttocks.

Sponges and Bricks.

Sponges and ordinary building bricks, these latter covered with a cash-desk rubber slip for the exercises, have different useful applications. In the first place the sponges as already explained are to rest the head, prevent the body from slipping and protect the elbows from irritation. The bricks when placed at the bottom of the bath are to rest the feet on when the bath is too long, to help a disabled or weak person to take a recumbent position in the bath when placed in a suitable position in the centre of the bath, one on top of the other as already explained ; to rest on them, when conveniently placed, any part of the back or sides of the body which needs massag-

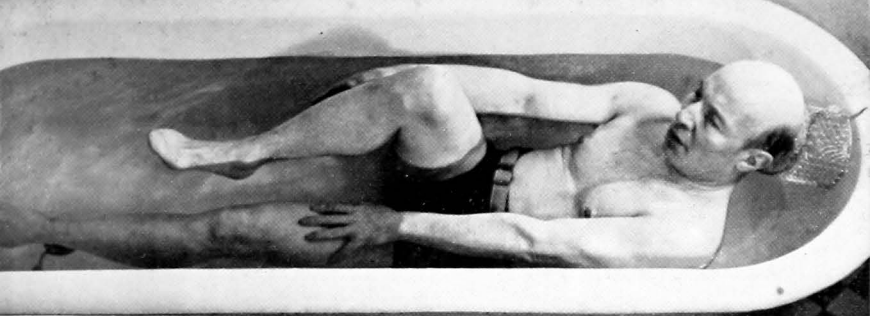


FIG. 17.

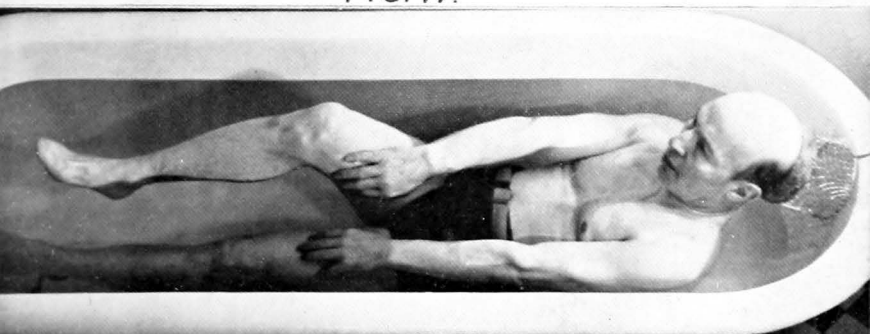


FIG. 18.

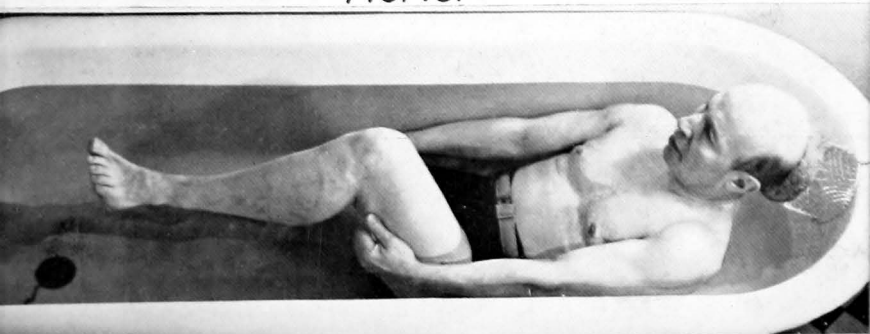


FIG. 19.

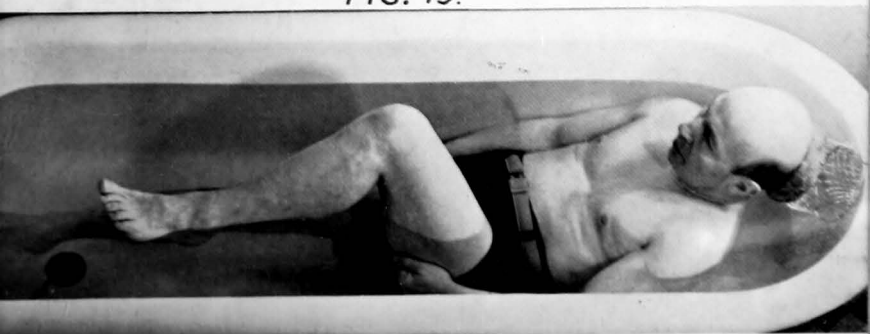


FIG. 20.

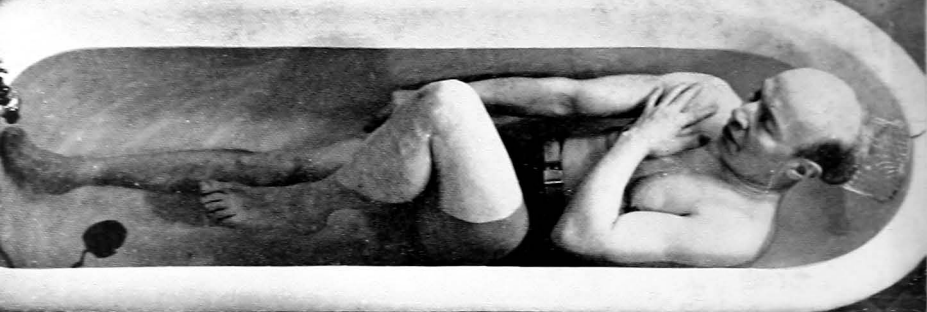


FIG. 21.

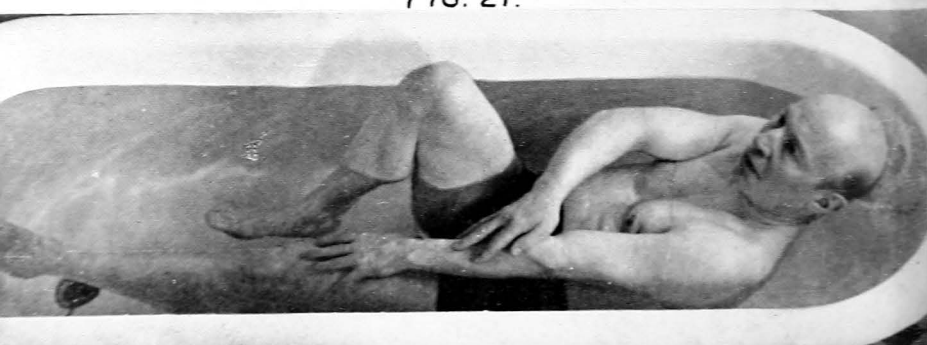


FIG. 22.

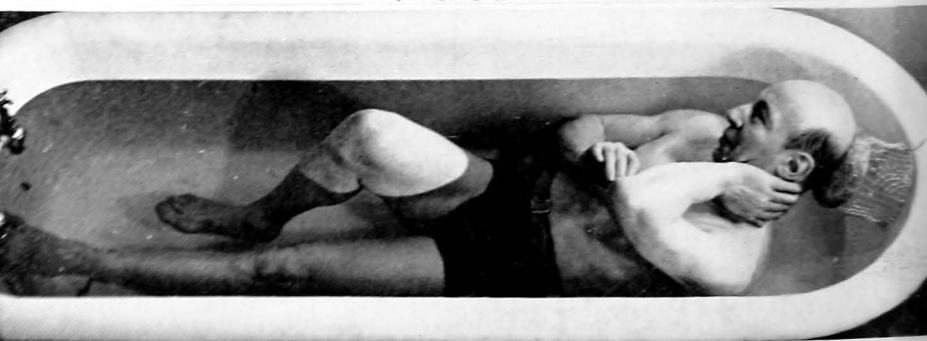


FIG. 23.

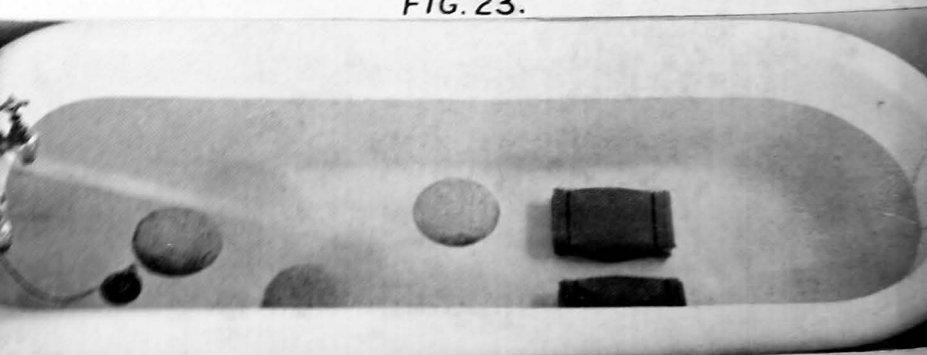


FIG. 24.

ing. Then the action of moving the legs and arms automatically determines a friction of the part or parts resting on the bricks. For the purpose the so-called Roman bricks which are half the thickness of an ordinary brick are the most suitable. The sponges and bricks covered by a rubber mat are shown in Fig. 24.

Variation of Type I.

*Legs Bending with Hands Massaging
Chest and Shoulders.*

Fig. 21. The movements of the legs are as in Type I but each hand strokes the opposite shoulder and side of chest with a downward movement. Women should direct the strokes round the breasts.

*Legs Bending with Hands Massaging
Arms.*

Fig. 22. As before, except that each hand strokes the opposite arm from wrist upwards.

*Legs Bending with Hands Massaging
Head, Face or Neck.*

Fig. 23. As in the last variation, save that in this instance the head, face or neck is substituted for the chest.

Type II.

Trunk Raising with or without Face Movements.

The position shown in Fig. 25 is taken by slightly pressing the elbows against the sides of the bath whilst the palms of the hands support the body at the buttocks; the toes resting lightly at the bottom of the bath and the head resting on a soft rubber sponge. The trunk must feel loose, the legs flexible at the knees and toes.

From this position of inhalation a rotary movement is started by drawing in the stomach, as in the act of exhalation Fig. 26, whilst slightly drawing in the knees and playing on them and on the balls of the feet and toes. This rotary movement which is meant to describe a circle is continued by the relaxation of the stomach and chest in Fig. 27, while inspiration starts to take place and is continued by the action shown in Fig. 28, which completes the rotary circle while representing the transition period to full inspiration in Fig. 25.

Fig. 25 and 28 represent the top and the

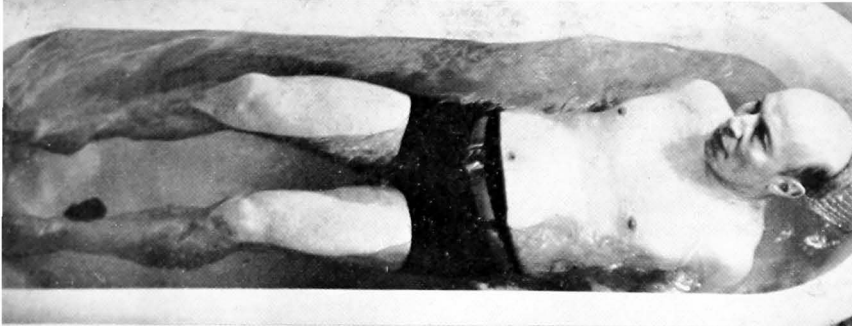


FIG. 25.



FIG. 26.



FIG. 27.



FIG. 28.



FIG. 29.

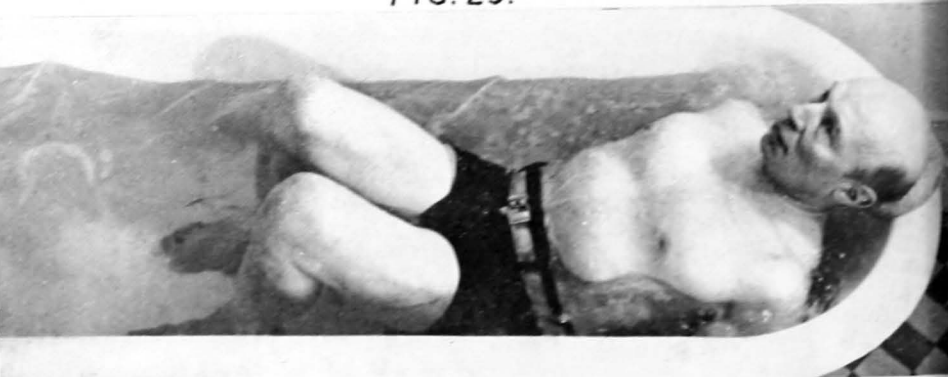


FIG. 30.



FIG. 31.



bottom of the circle which is not made from side to side of the bath, but in the direction of its ends. The movement must not initiate from the head, otherwise the neck will become stiff, but from the abdomen, hips and buttocks in co-operation with the play of the toes and knees. Throughout, the body must be kept loose and flexible except when the stomach is drawn in, and contraction takes place. This contraction need not be vigorous to be effective. When gentle and the timing of the movement is slow, its performance is untiring, very easy and splashing is avoided. The general movement will at first be found clumsy and difficult, but after a few times will become smoother and more rhythmic. The reader will quickly discover for himself how to perform it. This exercise and the ordinary version of Type I are the basic exercises of the system.

Fig. 29 to 32, show the same movement as Type II, but with legs retracted and the head resting on the top edge of the bath. This half-seated position can be taken

when the bath is short or the performer is a woman who wishes to avoid her hair getting wet.

Fig. 33 to 36 show again the same movement as in Type II but with the facial muscles stretched while the stomach contracts. This additional action should fit in rhythmically with the contraction of the stomach, relaxation of the face taking place during the remaining part of the movement.

This facial exercise is not only useful in preserving the youthful appearance and complexion of the face, but considerably strengthens the eyesight and the gums by maintaining a good circulation through the head.

Rubber sponges should be used to protect the elbows from friction against the sides of the bath, but they are not absolutely essential unless irritation takes place.

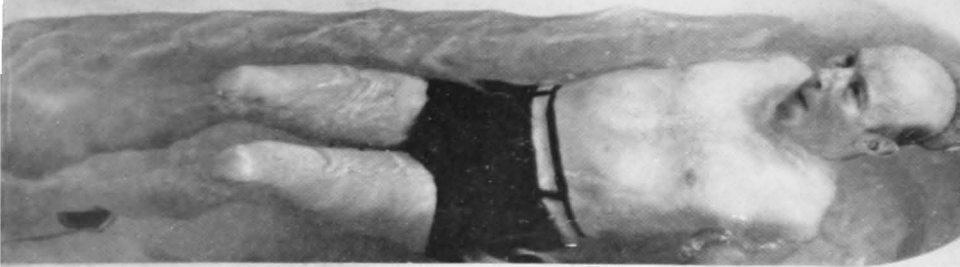


FIG. 33.



FIG. 34.



FIG. 35.



FIG. 36.



FIG. 37.



FIG. 38.



FIG. 39.



FIG. 40.

Variations of Type II.

*Trunk Raising with Hands Massaging
the Abdomen.*

In Fig. 37 and 38 the movements are precisely as before, save that the hands instead of grasping the buttocks, are left free to massage the abdomen during each contraction of it.

*Trunk Raising with Wrists Massaging
the Spine and Back.*

In Fig. 39 and 40 the movement as before, but the hands instead of supporting the body at the buttocks, are placed at the bottom of the bath, palms downward. The back of the body rests relaxed on them, on the wrists and forearms. From this position when a slight pressure is exerted on the tips of the fingers against the bottom of the bath, the body is raised. The movement is then continued as described in Type II, the back and spine being in constant friction with the wrists and forearms. Thus a vigorous massage is automatically performed while the whole body is in action.

Type III.

Waist Twisting.

Take up the commencing position shown in either Fig. 41 or 42 by pressing with the left elbow and forearm against the side of the bath, pivoting on the toes and following the movement with the hips, buttocks and abdomen. From this position transfer the body into its reverse position from side to side of the bath, by pressing on the elbows and forearms alternatively and pivoting on the toes while performing a rotary movement with the hips, buttocks and abdomen.

Variations of Type III.

Waist Twisting while Wrist and Forearms Massage Back.

The movement as before, but instead of the elbows pressing against the sides of the bath the arms are placed behind the back alongside the bath palms downwards as shown in Figs. 43 and 44. From either of these positions by pressing alternatively each arm and hand against the sides of the



FIG. 41.



FIG. 42.



FIG. 43.



FIG. 44.

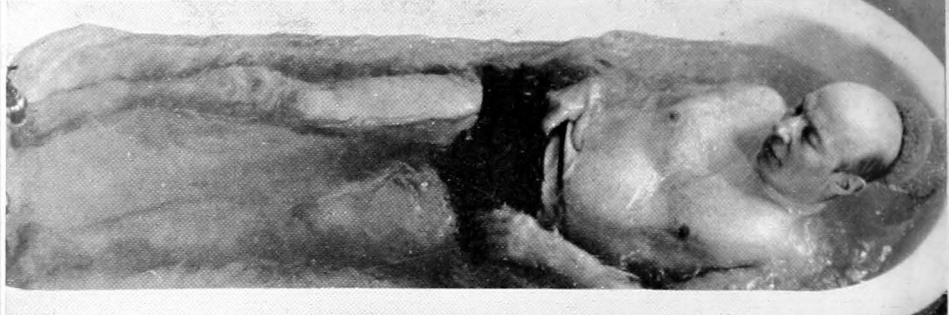


FIG. 45.



FIG. 46.

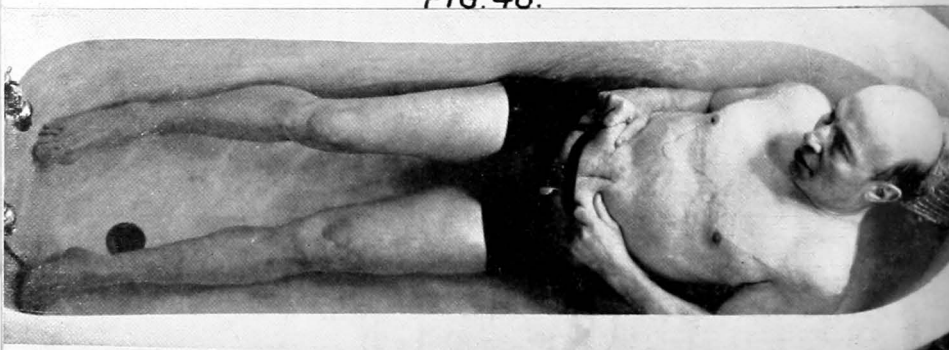


FIG. 47.



FIG. 48.

bath the body is transferred from one side of the bath to the other. While the body is thus moved, the back necessarily rubs against the backs of the wrists and fore-arms and automatically is self-massaged.

*Waist Twisting while Hands Massage
Waist or Abdomen.*

The movement shown in Fig. 45, 46, 47 and 48 is precisely the same as in Fig. 41 and 42, but the hands instead of freely following the movement of the body are used to massage the waist or stomach.

Type IV.

Waist Rolling.

Take up the commencing position shown in Fig. 49. The head rests on a rubber sponge, the elbows and forearms are similarly protected. From this position the body rolls in the opposite position as shown in Fig. 50 with the help of the ball of each foot playing on the toes which alternatively pivot at the bottom or side of the bath. When turning to the right, the pivot is on the right foot and the left leg is drawn up. When turning to the left, the pivot is on the left foot and the right leg is drawn up.

Variations of Type IV.

*Waist Rolling while Hands Massage**Waist and Abdomen.*

Same general movement as shown in Fig. 51 and 52 but when twisting to the left, the left hand is used to massage the left side of the waist and abdomen or any neighbouring part of the body; while twisting to the right the right hand is used to massage the right side likewise.



• FIG. 49.



FIG. 50.



FIG. 51.



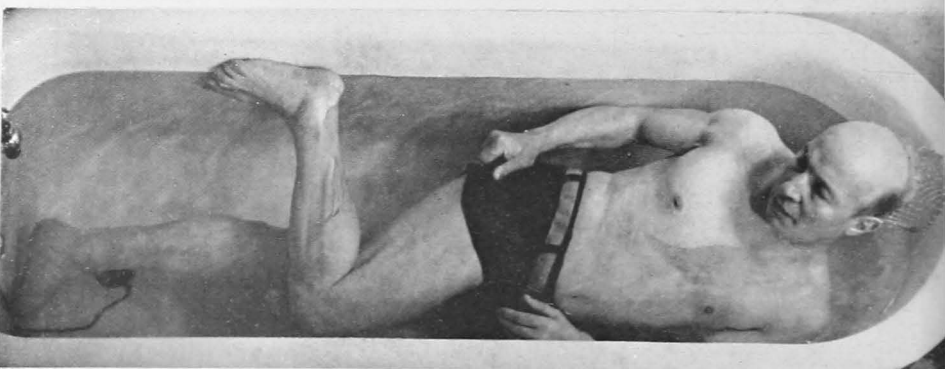


FIG. 53.

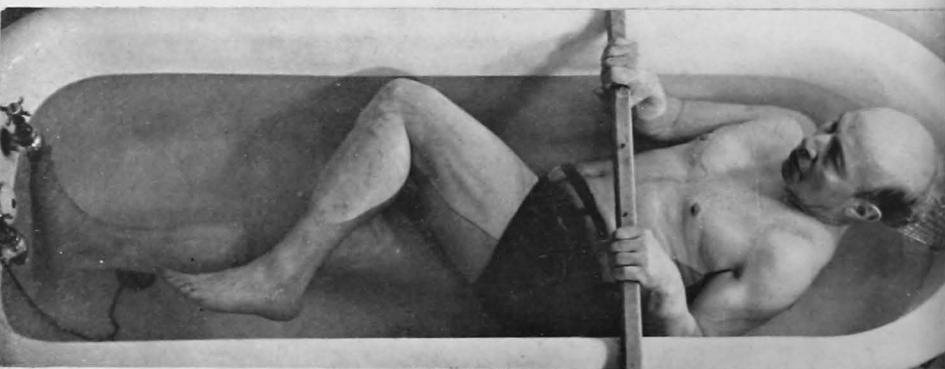


FIG. 54.

*Waist Rolling while Hands Massage
Buttocks.*

The same general movement as before is shown in Fig. 53, but in this instance the right hand is used to massage the right buttock as the body twists to the left, and the left hand to massage the left buttock as the body twists to the right likewise.

*Type V.**Waist Twisting with Hands Holding Rod.*

Take up the commencing position as shown in Fig. 54. The head rests on a rubber sponge, while the hands grip a rod laid across the top of the bath. The body is now twisted in the same manner as in Type IV. The advantages of using a rod are that: immediate confidence in the exercise may be acquired; one is not bound to follow any hard and fast line of movement, but the body can be exercised in all kinds of ways; women will find it easier to keep their heads above water and their hair dry.

Type VI.

In this group I include exercises performed with two steel strands, or spiral springs, hooked at one end to the wall at the foot of the bath, and with handles at the other end to be grasped by the exerciser. The body is then lowered from the seated to the recumbent position while, at the same time, the arms are flexed, so that the hands are drawn against the chest. The exercise is then completed by the return of the body to the seated position, the arms being simultaneously straightened.

These movements, which are usually performed by young athletes in the air, are outside the scope of my system, because even when performed in water, the effort is not equally distributed over all the muscles of the body. I refer to them only to suggest that performing them in water would mean a saving of energy and a beneficial increase in the blood circulation through the skin.

CHAPTER ELEVEN.

SOME PERSONAL EXPERIENCES.

THE following is a brief account of how the exercises in the bath came to be evolved, and the personal benefits which I myself have received from them.

Both my parents died young, my father at fifty-four from cancer of the throat and my mother at thirty from tuberculosis. My mother, her sister and two cousins, and my own sister, died at very early ages from tuberculosis, in the house in which I was brought up. I, along with a brother and a male cousin, was fortunate enough to escape the disease, possibly because I was for the most part out-of-doors, whereas the women caught it while nursing one another. I well remember my great-grandmother signing to us with her eyes not to approach too close to the invalids.

Before the age of twenty-eight I suffered twice from pneumonia of the right lung, and three times from double pneumonia. Through one of these attacks I contracted

phlebitis in my left leg, while on numerous other occasions I suffered from bronchial catarrh, eye troubles, catarrh of the nose and throat, digestive disturbances, and pains and slight varicosity in my left leg followed by eczema and hæmorrhoids. Notwithstanding these disabling conditions I always had a bent towards athletics, and when well would occasionally practise weight-lifting and running. I was not able to train systematically for either of these sports, my occupation as an accountant allowing me insufficient time. Up to early middle-age, although my general health was good, I often felt unwell for one reason or another. During the twelve years that have passed since I first started my exercises, I can honestly say that gradually but surely all the troubles of my younger days have passed.

I have always been interested in works of a scientific nature, of which I have read many in various languages during my life. I have thought deeply on problems of diet and exercise, and followed Metchnikoff's sour milk cure for fifteen years up to the

age of fifty-four, when, having obtained great benefit from my exercises, I thought it no longer necessary to persevere with it. I read with avidity Metchnikoff's essay on the prolongation of life, Voronoff on rejuvenation through the grafting of monkey gland, and Steinach's work on his operation for rejuvenation.

Amongst others, I read Sandow's book on exercise. Sandow derived his method from a very keen study of human nature. He made it an object to exercise equally all the muscles of the body, in order to secure a harmonious and well-balanced physique. Himself a delicate boy at ten years of age, his imagination became fired by the statues and pictures of ancient and classical heroes which he saw in the art galleries of Europe, and he determined to become as strong and as well-developed as they. In this he certainly succeeded, for he became one of the strongest and best-developed men of his time. His book, *Life is Movement*, is a very comprehensive study of physical culture. He himself became a Professor of Natural Therapeutics, Instructor on

Physical Culture to His Majesty King George V, and the most outstanding figure of his time in the world of athletics.

His early death at the age of fifty-six was reported to have been due to a broken blood-vessel, in other words, I presume, to a hardening of the arteries which is common in senile decay, and which was probably precipitated in his case by the strenuous nature of the training which he had followed during his younger days. He grew a tremendous musculature which, I feel confident, disappointed in his latter years the expectations he had founded on it. Such an enormous development is brought about by exercising the muscles group by group. This occasions a temporary inflation of the part exercised through the large quantity of blood and lymph rushed to it, with a consequent local hypernutrition at the expense of the equilibrium in the dynamic processes. I do not say that this fact in itself would have caused Sandow's death, but, in conjunction with an inherited predisposition to weakness of the vascular system (blood vessels), it very

well might. It seems to me highly improbable that a really sound man could have met his death in the manner that Sandow is said to have met his. This occurrence, which amazed me not a little at the time, was one of the factors which drew my attention to the shortcomings of the usual systems of exercise.

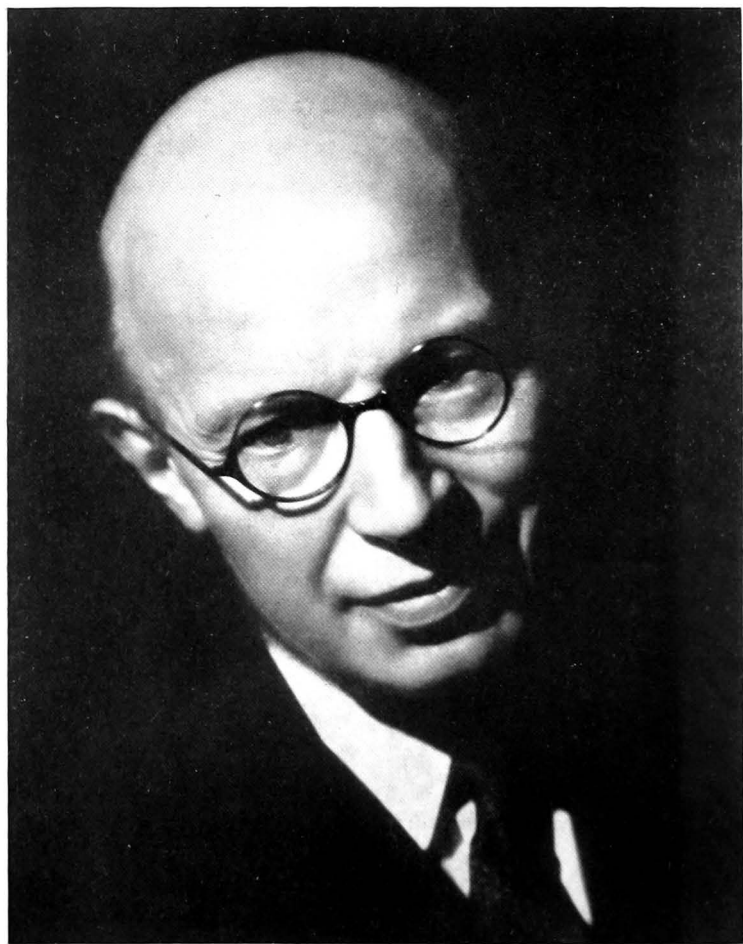
One morning early in 1926, while I was in my bath, the idea came to me of attempting to evolve a form of exercise in the water. I performed some rudimentary movements, and was struck by the ease with which I was able to perform them. I gradually increased their number and the regularity of their performance, and after a while noticed that however vigorously I carried them out, I failed to experience the usual feeling of fatigue associated with ordinary athletics and indoor gymnastics.

This phenomenon more and more seized hold of my imagination, and I began to turn over its implications in my mind. When I discovered that my pulse did not materially increase during my under-water movements, I considered it worth while to

acquaint first my own doctor, then other doctors, with my idea. All of them thought it excellent, but when questioned as to its scientific value their answers were not sufficiently definite.

Feeling sure that tremendous possibilities lay in my discovery, simple as it was, I determined to get to know more about it. I began to study the principle of exercise, its reaction on the organism; on the blood circulation; on the bodily processes; its value in promoting the activity of the glands of internal secretion; its biochemical and biological meaning in view of the discovery made on the cell by Leo Loeb in 1907.

In 1926 I was fortunate enough to secure the interest of Sir William Arbuthnot Lane, and was encouraged by him to write a pamphlet which was published in 1928. In 1932 I had the privilege of acquainting Professor C. Lovatt Evans, of University College, with my exercises, and by him was introduced to Dr. G. P. Crowden. In November, 1933, Dr. Crowden carried out



THE AUTHOR

at the School of Hygiene of London University, the first of his experiments on the relative energy expenditure of my exercises in the water compared with that of similar exercises in the air, myself being the subject. Through the kindness of Dr. Ray further experiments were carried out at the British Red Cross Clinic for Rheumatism. On March 16, 1935, Dr. Crowden communicated his findings to the Physiological Society. The paper recording them will be found in the Appendix. In September, 1936, I was asked by Sir Leonard Hill to give a demonstration at the St. John Clinic, London, and in September, 1937, Dr. E. Poulton asked me to give a demonstration at Guy's Hospital. I trust that my anticipations will be confirmed by further scientific experiments in the near future.

In the meantime I can truthfully say that I am a healthier man now than on that day twelve years ago when I first conceived my notion of performing movements in the bath. This statement I do not make on the vague grounds upon which such statements

are usually made, but after an accurate comparison of my physical condition and attributes now and twenty years ago. My bodily measurements have improved, as will be observed from the statistics furnished in the Appendix; my complexion, my endurance for work and exercise, and my strength have remained unimpaired. The whole year round I am able to produce the same physical performances, without any training other than my exercises and some stepping and running in my bedroom.

Without hesitation, and without experiencing any ill-consequences, I am ready to submit to efforts which would be considered too strenuous by the average man of forty. My powers of recuperation permit me without the least discomfort to run for half an hour or more at a rate of a mile every eight minutes, to sprint a hundred yards in thirteen and a half seconds, and to cover a quarter of a mile in eighty-eight seconds. Only a few months ago I lifted a bar-bell of a 180 pounds to the shoulder in one movement, and raised four hundred-

weights clear from the floor. I performed these feats to give an idea of my present condition but not to recommend their practice. When I try my strength against young athletes, it is not often that I come across one who can beat me, whether he be a twelve- or fourteen-stone man. After running, my pulse comes down to normal within a minute or two. Both scientists and doctors have told me that I am in an exceptional physical condition, and this tribute is based on no casual grounds. During the experiments carried out on myself in 1935, the highest blood pressure registered was 140. The basal metabolism, which means the work of the body when at complete rest, was not taken, but the measurements of metabolism during exercises were found to be such as would have done no discredit to a man between forty and fifty.

I have no particular dietetic fads, eating and drinking in moderation whatever I like so long as I follow a mixed diet. I smoke rather heavily, usually three or four cigars a day, sometimes three or four more.

I do not believe in wrapping myself up in cotton-wool, it being most unusual for me to wear an overcoat in the winter. Nor do I hesitate to pass directly from a heated room into the outer atmosphere. Though I personally avoid all excess, I do not consider that an occasional departure from the rules of moderation hurts anyone, because the reserves possessed by the organism are fully capable of repairing any damage which may have been done. It is only when excesses begin to become habitual that gradually our bodily reserves are worn out by the continual efforts they are called upon to make to re-establish the equilibrium.

The reader will appreciate that I have not enumerated such personal particulars as I have given above with the object of interesting him in my own welfare. My object has been solely to set before him a concrete example, namely, that provided by myself, of what may be achieved living a life free from excess, coupled with the daily performance of my exercises in the bath.

APPENDIX.

HYDROTHERAPEUTICS.

MODERN under-water remedial exercises are based on those originally conceived by the late Robert W. Lovette, of Boston, U.S.A., in 1912. Lovette devised his exercises for the treatment of infantile paralysis, and they were performed, not in the water, but on a surface rendered practically frictionless by the use of talcum powder. Thus movement was made as easy as possible for the partially paralysed limbs of the patient. His movements were assisted by the operator, who supported the limb being exercised, in order to counteract gravity.

With the object of discovering the type of exercise to be given to each group of muscles, a thorough physical examination was carried out, and a chart made showing the degree of paralysis present in each group. Regular re-examination and the correction of the chart allowed progress to be noted. While in the early stages the

movements of the patient were almost entirely due to the efforts of the operator moving his limbs and body, it was the whole essence of the treatment that the paralytic should actively will them himself. Thus the object was achieved not merely of rehabilitating the muscles themselves by giving them movements, but of stimulating the weakened nerve cells to resume control over them. This was a clear advance on the old methods of massage and passive exercises, in which little more was gained than the regeneration of the muscles by the fillip given to the local circulation. Lovette's gymnastics aimed at reviving that intimate connection between brain and muscle which controls movement. It was hoped not only to stimulate the weakened nerve cells, but even possibly to excite dormant cells to action and encourage them to take over the function of those that had been destroyed by the disease.

While there are no allusions, before the present century, to the use of specially prescribed under-water exercises, the practice

of placing in water those who had largely lost the use of their limbs was common. In May, 1924, Dr. Lowman, one of the greatest authorities on infantile paralysis, combined in the manner already mentioned the theory of Lovette and the knowledge of the buoyancy conferred by water into a single system of healing, by establishing in the grounds of the Orthopædic Hospital, Los Angeles, a large pool for the carrying out of therapeutic under-water exercises.

The idea came to him, he relates, after a visit to the Spaulding School for Crippled Children of Chicago, where he noted paralysis cases being given muscle training in a wooden tank. As he had himself employed bath tubs in the treatment of spasms since as early as 1911, the broader application stimulated his mind to the idea which resulted in the construction of the large pool in the garden of his own hospital in Los Angeles, California. Three years later the second great centre for the treatment of infantile paralysis arose at Warm Springs, Georgia.

Under-water gymnastics were first

evolved for the treatment of infantile paralysis, but it was not long before doctors began to discover that other conditions, notably chronic arthritis, could also be benefited by them. The mechanics of the production of the deformities, resulting from chronic infantile paralysis and chronic arthritis, are much the same. It is a well-known fact that a person suffering from either of these diseases makes his movements with the strong, contracted groups of muscles, the weaker, stretched groups being permitted to remain idle. The result is that these latter groups atrophy and become progressively weaker. Free, unregulated exercise, even swimming, tends to accentuate deformities, for the stronger muscles continue still further to grow at the expense of the weaker. Only properly prescribed gymnastics, directed at the weak muscles and at the correction of faulty bodily mechanics, can hope to resist this process.

The primary intention of my exercises is to maintain health, but at the same time they are capable of accomplishing any-

thing which may be accomplished at a clinic, except in the most extreme cases of distortion, or when the loss of joint and muscle function is so complete that all movement has become impossible without the assistance of a nurse.

Under-water gymnastics, whether they be those practised in hydrotherapeutic institutions or those in accordance with my own system of exercise in the bath, utilise what Dr. Euclid Smith has characterised as the fundamental agencies of physical therapy: heat, exercise and massage. To these three may be added that other valuable healing agency, immersion in water. The combination, as Dr. Olsen has pointed out, of the bath at a proper temperature, with various manipulations and exercise carried out under water, is very effective in stimulating flabby or semi-paralysed muscles to resume their normal functions.

But the greatest advantage of performing the gymnastics with the body immersed is that buoyancy of the water almost entirely overcomes the force of

gravity. What this means to the weakened or paralysed muscles of an invalid can well be imagined. Free movement in every direction is permitted, the buoyancy of the water at all times sustaining the part being moved. (This buoyancy can be still further increased by the addition of common salt to the bath.) The psychological effect on the patient is enormous, when he finds himself able to move limbs over which he thought he had lost all control. Thus the first steps to recovery have been firmly taken, for it is of the utmost importance that *any* voluntary movement should be secured, in order that the patient's idea of movement should be restored to him. It is sufficient later to secure increased strength in the muscles and nerve impulses.

The fact that the body, at the time of exercise, is constantly receiving warmth from the surrounding water, is another favourable characteristic of under-water therapy emphasised by doctors with experience of the technique. This warmth imparts its beneficial effects in a number of ways. In the first place, as Dr. Euclid

Smith, among others, has pointed out, the temperature is sufficient to produce a marked dilation of the capillaries in the skin. This augments the flow of blood and lymph to the parts under treatment, stimulating the nutrition of the muscles and promoting the breaking down and washing away of the toxins in and around the muscles and joint. The amount of work the muscles can do without becoming fatigued is greatly increased. The importance of the continual application of warmth to the body *at the time of exercise*, facilitating as it does the breaking down and excretion of toxic matter, must be emphasised. The above method may be contrasted with that whereby superficial heat is first applied to the part under treatment, followed by exercise in the air. The dilation produced by the dry heat is not constant, the part cooling as the exercise in the air progresses. The capillaries contract, toxic waste material is retained, and the amount of exercise which the muscles can perform becomes reduced, due to fatigue.

As to the temperature of the water, some

conditions have been found to respond better when it is relatively cool, and some when it is relatively warm. Within the limits of each disease there are further fluctuations in the ideal temperature, corresponding to the individual idiosyncrasies of the patients. Dr. Currence has pointed out that the flexibility of temperature control in a large tank intended for the treatment of infantile paralysis is inadequate for the satisfactory treatment of chronic arthritis, while Dr. Gaenslen has stated: "It is doubtful whether the great sacrifices, financial and otherwise, made in many instances to provide pool treatment are justified by the results. The ordinary tub in the average home will answer very well, except in unusual cases. It has the advantage that the temperature can be regulated to suit the individual and that the water is renewed for each bath."

The effect exercised by water on the central nervous system has been emphasised in recent times by Dr. H. G. Scholtz, of Berlin. He points out that the characteristic of a bath is that simultaneously a

large number of sensation points and warm points of the skin are stimulated, whereby a reciprocal increase of stimulation is produced. There is no doubt in his mind that central nervous functions are affected. Experience has shown that the power of concentration and the general nervous excitability can be changed by a bath. Whether the effect be bracing or relaxing depends, to a certain extent, upon the temperature. A spasm of a spastic patient, he says, must not be considered as a disturbance arising from the central nerves, but must be assumed to be maintained reflexively by irritations coming from the skin. Such spasms can be soothed by a warm or lukewarm bath.

Having briefly reviewed the favourable features shared in common by the underwater gymnastics carried out at hydrotherapeutic institutions, and by my own exercises and massage in the bath, I shall now attempt to point out the additional advantages of the latter.

Each of my exercises, as I have already pointed out, takes the form of a rhythmic

movement, which brings every muscle of the body into a concerted action. They are carried out in the recumbent position in an ordinary bath, a pool or tub being unsuitable for the purpose. Unlike the usual forms of under-water gymnastics, where movement is more or less confined to the part under treatment, with a resulting local distension in the vascular system, my aim is to restore normal function in the joint or muscle group by promoting a general regularisation and increase of the circulation. This idea may be contrasted, not only with the under-water gymnastics of hydrotherapeutic institutions, but with the usual systems of physical culture, in which the muscles are exercised only in groups.

When mobility has been restored to a joint by a course at a clinic, it not unseldom happens that a relapse occurs after treatment has ceased. The same is true of the patient actually in process of attending a clinic, who tends to retrogress between treatments. As Dr. Currence, speaking on chronic arthritis, has pointed out: "The

maximum benefit in increasing muscle and joint function and in the prevention and correction of joint adhesions in chronic arthritis, can be attained only by regular, systematic treatment, preferably daily, because the benefits are definitely cumulative if the therapeutic efforts are sufficiently systematic. Unless the treatments are given daily, the tendency to retrogress during the interval is too marked to achieve noteworthy success."

I myself would go further and state categorically that a tendency to retrogress occurs even when the treatment is carried out daily, unless the time chosen is before the evening meal or before retiring. This is due to the fact that when under-water exercise is carried out during the day, the dispersion of toxins is immediately followed by fresh accumulations, whereas, when undertaken later, the ensuing night's rest assists the processes of recovery. I may add that with my exercises the attendance of an expert operator is rendered unnecessary in the majority of cases, because the very nature of the exercises excludes all risk of an overdose.

The Relative Energy Expenditure in Muscular
Exercises Performed in Air and in Water.

BY DR. G. P. CROWDEN,
M.Sc., M.R.S.C., M.R.C.P.

(Reprinted, by permission, from the Proceedings
of the Physiological Society, March 16th, 1935)
Journal Physiology. Vol. 84.

The subject of the experiments recorded below was an Italian, Mr. T. R. Togna, who had devised a system of muscular exercises which could be carried out in an ordinary bath, with the body submerged in the water up to the neck. He claimed for these exercises that they involved very little exertion. Having regard to the fact that graded exercises in water often form the routine treatment of stiffened joints and muscles in cases of chronic rheumatism in hydrotherapeutic institutions, and that although initial benefit may be derived, relapses are common after the patients are discharged, it appeared worth while to investigate the type of exercise devised by Mr. T. R. Togna as it might prove a convenient form of home treatment which would enable the patient to maintain mobility of muscles and joints without undue exertion.

Appendix

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Increase in Oxygen Requirement Per Min. Exercises.

Type I.

Exercise	Air c.c.	Water c.c.	
Arm and Leg bending	2178	1130	First 5 min. of exercise in water.
	2117	1215	After 10 min. of previous exercise in water.
Mean	<u>2147</u>	<u>1172</u>	

	Air	Water
Relative O ₂ Cost of Type I Exercise.	1.83	1

Type II.

Exercise	Air c.c.	Water c.c.	
Trunk Raising	3080	980	First 5 min. of exercise in water.
	3860	1401	After 20 min. of previous exercise in water.
Mean	<u>3470</u>	<u>1190</u>	

	Air	Water
Relative O ₂ Cost of Type II Exercise.	2.91	1

A preliminary experiment with Mr. Togna as subject, showed that he was practically exhausted after a period of 2 minutes' exercise in the air, but in water he could carry on the exercise almost indefinitely at the same rate.

In the previous table, which gives the results of experiments carried out at the British Red Cross Rheumatism Clinic, the relative increase in oxygen requirement over the resting level, either in the air or in the water, is given, and it is seen that with a simple arm or leg bending exercise, the increased oxygen requirement per min. of exercise is about twice as great in the air as in the water, while in another type of exercise, in which the trunk is raised and lowered, the increase in oxygen requirement in water is only one-third of that for the same exercise performed in the air. It is thus possible that individuals whose respiratory and cardio-vascular systems are not able to stand the strain occasioned by even moderate exercise in air may be capable of the same movements of muscles and joints provided the buoyancy of the water is used to lessen the work done against gravity in lifting the limbs and trunk. Regular exercise of muscles and joints is essential if mobility is to be maintained by individuals who have suffered from rheumatism in some of its forms.

Dr. G. P. Crowden, M.Sc., M.R.S.C., M.R.C.P.
London School of Hygiene,
Keppel Street,
London, W.1.

30th September, 1936.

Dear Sir,

Mr. Togna is going to show you some observations which I made on his behalf on two men.

These people were well over middle-age and in past years had been very heavy drinkers. Their systolic pressure was much above normal but both had a comparatively low diastolic. There was no evidence of aortic incompetence. The readings will show you that in both cases there was a considerable decrease in the B.P. figures after 10 minutes' immersion in lukewarm water. This decrease was accentuated by 10 minutes of exercises No. 1 and No. 2. Further observations were taken of case No. 1.

This man underwent the exercises No. 1 and No. 2 for several months; his initial B.P. readings were 220/120. Fortnightly control of his blood pressure showed a gradual decrease of these readings which, after six weeks' exercises, were 198/102, and since then were almost stationary at such a figure.

Together with this, the patient reported a general improvement of his health and better sleep, no headaches, no exertion when climbing stairs.

Mr. Togna intends to follow these observations and forward their result to you in due course.

I am, dear Sir,

Yours truly,

(Signed) O. GALLI, M.D.

Exercises in the Bath

October 21st, 1935.

SUBJECT A.F., AGE 65.

	Blood Pressure	Pulse Rate	Respirations
Normally	220/120	... 84	... 20
After 25 mins.'			
lying on bed	210/110	... 80	... 20
Further 10 mins.'			
lying in water 91 F.	178/ 95	... 70	... 18
Further 10 mins.'			
exercises Nos. 1 & 2,			
in water, 91 F.	170/ 90	... 80	... 18

October 7th, 1935.

SUBJECT L.N., AGE 59.

	Blood Pressure	Pulse Rate	Respirations
Normally	180/100	... 92	... 20
After 15 mins.'			
lying on bed	174/ 96	... 86	... 20
Further 10 mins.'			
in water, 91 F.	160/ 86	... 86	... 20
Further 5 mins.'			
exercise No. 2	150/ 78	... 82	... 20

SUBJECT G.D.M., AGE 62.

	Blood Pressure	Pulse Rate	Respirations
Normally	146/81	112 Arrhythmic	34
After 10 mins.'			
lying in water, 91 F.	138/80	86 ,,	28
Further 10 mins.'			
exercise in water,			
91 F.	140/84	88 Normal	28

SUBJECT G.D.M., AGE 62.

	Blood Pressure	Pulse Rate	Respirations
Normally	130/60	... 78	... 20
After 15 mins.'			
exercise in water,			
91 F.	132/50	... 75	... 16

OPINIONS OF EMINENT DOCTORS ON THE
TOGNA SYSTEM

R. Università di Roma
Istituto di Clinica Medica

Rome, 8th November, 1928.

I have seen Signor Togna in London executing muscular exercises in the bath. I consider that this type of exercise constitutes an ideal type of indoor gymnastics. These exercises are also advantageous from the practical point of view.

(Signed). PROF. ASCOLI.

Conf. Dr. Dumitrescu-Mante,
Medic Primar al Spitalului Brancovenesc,
Strada Brezoianu N. 34.

Bucarest, Sept., 1928.

Dear Mr. Togna,

After a long voyage in France, following my agreeable stay in London, I am now back in my country, and hasten to answer your very interesting leaflet.

I have read it with great attention, and find in it many points well in harmony with human physiology.

The exercises in the bath that you prescribe will, in fact, promote muscular circulation without fatigue. That is what I should call an internal massage.

The effect on the cellular vitality remains to be seen, but it is more than obvious.

I congratulate you on the happy ideas of your leaflet, and wish you every success.

When returning to London I shall allow myself the pleasure of paying you a visit.

With kindest regards,

(Signed). DR. MANTE.

TABLE I

The following Table shows the measurements which were first taken in October, 1922, before I had thought of the Exercise in the Bath; in September, 1926, after six months of exercise; and later at the dates mentioned.

T. R. TOGNA	Oct., 1922	Sept., 1926	Nov. 2, 1926	Nov. 22, 1926	July, 1927	July, 1928	Oct., 1932	Feb., 1933	Oct., 1934	June, 1938
Neck ...	15	15	15½	15½	15½	15½	16	16	16	16
Chest, Normal ...	36½	16½	37½	37½	37	38½	38	38	38	39
" Contracted ...	36	35	34½	34½	34½	35	36	36	35½	35½
" Expanded ...	38	38½	39½	39½	39½	40	40	40½	41	41
Biceps, Right ...	13	13	13½	13½	13	13½	13½	13½	13½	13½
" Left ...	12	12	12½	12½	12½	12½	12½	12½	13	12½
Fore Arm, Right ...	11½	11½	11½	11½	11½	11½	11½	11½	12	12
" Left ...	10½	10½	11	11	10½	11	11	11	11½	11½
Waist ...	34½	32	32½	31½	31½	31½	32	32	32	33
Abdomen ...	37	35	34½	33½	33½	34 3/4	34½	34½	34	35
Hips ...	37½	37½	38	37½	35½	36	36½	36	36	37
Thigh, Right ...	21½	21½	21½	21½	21½	21½	21½	21½	21½	21½
" Left ...	21½	21½	22	22	21½	22	21½	22	22	22
Calf, Right ...	13	13½	14	14	14	14	13½	14	14	14½
" Left ...	15	15	15	15	15	15	14½	14½	14½	15½
Height ...	5'5½"	5'5½"	5'5½"	5'5½"	5'5½"	5'5½"	5'5½"	5'5½"	5'5½"	5'5½"
Weight (stones) ...	11/3	10/13	10/12	10/10½	10/10	11/4	11/6	11/10	11/6	11/8

TABLE II

VENTILATION OXYGEN REQUIREMENTS AND CARBON DIOXIDE—PRODUCTION PER MINUTE EXERCISE
EXERCISE TYPE II—TRUNK RAISING

The idea of this Table is to show in the first place the great cost of energy which is required by the performance of Exercises Type 2 in the air, and its correspondingly lesser cost in the water.

In the second place a comparison is made between the cost of the same exercise in the water with the cost of other forms of exercise performed in the air by other subjects. This second comparison is made to show that the air breathed in the exercise in the water is about 5 litres less than for other exercises in the air; whereas the oxygen requirements are about equal in both cases. This result goes to prove that a greater proportion of oxygen can be absorbed from air breathed when exercising in water than when exercising in air.

It should be noticed that on account of the reduced effort in water, the pulse rate increases only a few beats.

T. R. TOGNA	Body Weight	Air Breathed	Oxygen Requirements	Carbon-Dioxide Production	Movements	Respirations	Pulse Rate Increase above rest	At Rest	Blood Pressure
Air	160 lbs.	119,200 c.c.	3,080 c.c.	4,320 c.c.	70	34	108	72	176/86
		124,070 c.c.	3,860 c.c.	4,669 c.c.					
	Mean	121,630 c.c.	3,470 c.c.	4,494 c.c.					
Water at 94°F.									
Lying at rest ...	12 lbs.	—	—	—	—	—	—	—	—
1st 5' moderate ...		22,800 c.c.	980 c.c.	958 c.c.	54	20	12	72	130/70
4th 5' vigorous ...		27,210 c.c.	1,401 c.c.	1,197 c.c.	60	20	16	72	130/66
1' max. speed		Not taken	Not taken	Not taken	80	24	28	72	132/70
1' max. effort		" "	" "	" "	66	28	56	72	138/70
Mean		25,000 c.c.	1,190 c.c.	1,077 c.c.					156/74
In Air (1)									
Other Forms of Exercises by other subjects									
W.C. ...		33,100 c.c.	1,413 c.c.	—	—	—	53	72	
L.H. ...		30,370 c.c.	1,425 c.c.	—	—	—	58	86	
R.G. ...		35,830 c.c.	1,487 c.c.	—	—	—	57	75	
Athlete de Mar ...		32,000 c.c.	1,500 c.c.	—	—	—	40	58	

(1) These latter data were assembled by E. C. Schneider and Henderson & Haggard.
The abbreviation c.c. means cubic centimeters.

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THE author has made an exhaustive study of anatomy and physiology and the principles of physical exercises, and he has consulted distinguished scientists and medical men, in order to test his theories and to ensure the efficacy of his system. In 1926 he secured the interest of Sir William Arbuthnot Lane, who encouraged him to write a pamphlet on his exercises, which was published in 1928.

In 1932 Dr. G. P. Crowden carried out at the School of Hygiene, London University, the first of his experiments on the relative energy expenditure of these exercises in the water compared with similar exercises in the air. Later, he conducted further experiments, through the kindness of Dr. Ray, at the British Red Cross Clinic for Rheumatism. In 1936, the author was asked by Sir Leonard Hill to give a demonstration at the St. John Clinic, London, and in 1937 at the request of Dr. E. Poulton, the author gave a demonstration at Guy's Hospital.

The author trusts that, with the publication of this book, his exercises will receive further attention from scientists and from the medical profession to whom, in his estimation, the public rightly look for guidance on all such matters of hygiene.

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