when contact is made. When the blades are brought into the correct relationship with the foreign body—that is, with the longer blade alongside and the shorter blade

FIG. 3.—Diagrammatic view of the instrument. A. Screen holder and contact of the insulated blade; C. insulated blade; D. block of fibre on insulated blade; E. connexion bell circuit.

touching the top of the fragment—contact is made and the bell rings. This indicates that by raising very slightly and opening the blades the foreign body can be picked up without any intervening structures being also caught.

Protection, additional to that of the diaphragm, tube, box, etc., is afforded by a sheet of heavy x-ray proof rubber with a 3-in. hole in it that is placed either above or below the patient.

FIG. 4.—Large view of the points of the blades of the extractor, showing how contact is made by foreign body across the points.

The use of this instrument is not easy; like other surgical instruments, it requires practice. It also requires experience in the interpretation of x-ray shadows. When the foreign body can be seen, it looks so simple to pick it up with the points of the extractor, which can also be seen in the fluorescent screen. And it is simple, provided that the operator recognizes that it is absolutely essential to make an *exact start* directly over the foreign body and move the points of the extractor *exactly* in the line of the rays—that is, straight

to the foreign body, correcting his direction as he proceeds towards it.

Only certain cases are suitable—that is, those in which access can be had to the foreign body directly in the line of the rays, and through soft structures, or with the assistance of a trephine, as in this case. Old-standing aseptic cases, surrounded by a fibrous capsule, are not suitable for extraction.

It is not an instrument for anyone to use—it involves exposure to x rays, and must be used by or in co-operation with a competent radiologist, who is experienced in radio-therapeutics, and who knows where the danger zone from x-ray dermatitis begins, and how to protect not only the patient but also the operator.

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ON THE INFLUENCE OF MUSCULAR EXERCISE ON LONGEVITY.

BY

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To promote longevity all the systems and organs of the body ought to be kept in a healthy condition, and prevented from decaying as long as possible. We must not attend to one of them alone, but to each and all of them, must endeavour to keep them all sound and vigorous, make them assist one another, and work together in harmony.

In the present paper I intend to show the principal features of the influence of the muscular system on the functions of the other systems and on the life of the whole organism.

The contraction of the muscle, as shown by Professor Ludwig, Sir Lauder Brunton, and Dr. Oliver of Harrogate,

causes dilatation of the arterioles, capillaries, and lymph spaces, allowing more oxygenized blood to flow to the muscular fibres, which abstract from it what they require for their nutrition and let the remainder, together with the used-up material, pass partly into the veins, partly into the lymph spaces and the lymphatic vessels. By this process the muscle is nourished, the products of decomposition are removed, metabolism is promoted, and heat is produced. In addition, the small blood vessels, through their increased action, are kept in a healthy condition. We may go further and say that the spheres of the brain which initiate the contractions of the different sets of muscles, are likewise favourably influenced, for an increased flow of blood is attracted to them by their work and the blood vessels are forced into greater activity, by which their own coats as well as the brain substance are nourished.

Walking Exercise.

The most natural of all muscular exercises, as pointed out by Hippocrates, is walking exercise. A great part of all the muscles of the body is activated by it; the action of the heart and respiratory organs is increased; the blood is passed with greater force from the heart into the blood vessels of the body, which are obliged to contract more vigorously, carry more blood to the different organs of the body, nourish the latter, and are themselves nourished through their work. By the contraction of the muscles of the legs more blood is attracted to them, and is squeezed out from them into the veins and lymphatics and carried to the heart, which is forced to contract more vigorously. The pumping action of the heart thus induced strongly assists the circulation of the blood and lymph in the abdominal organs, and is helped in this by the more powerful contraction of the diaphragm and abdominal walls which accompany the increased respiratory movements forced on by the more rapid and more energetic contractions of the heart. The more powerful breathing leads to improved oxygenation of the blood and increased metabolism. All the organs in the abdominal cavity are favourably influenced by active walking; the appetite, the digestion, and assimilation are remarkably improved.

Thus walking exercises a favourable influence on the whole organism. We must therefore take daily walks and, if possible, in the open country, and do so in all weathers. The amount of walking required by different persons varies according to personal conditions and the manner of living; we may say between half an hour and two or three hours. It depends not only on the constitution of a person, but also to a great degree on the varying state of health and strength, on habit, on occupation, on the meteorological conditions—heat or cold, dryness or humidity, strong or light wind, or stagnation of air.

The walk ought not to be extended to actual fatigue, but ought to lead to exhilaration and agreeable warming of the whole body. The pace of walking, too, must vary in different persons, from less than a mile to three and four miles an hour, according to the condition of the walker and to habit, and ought not to be changed all at once from an accustomed slow to an unaccustomed very rapid pace.

With increasing age the power and the inclination to walk diminish, and this coincides with the diminution of the creation of warmth. Friar Roger Bacon, in the thirteenth century, stated that the body heat decreases after the age of 40. His statement agrees with the experience of many others as well as myself, though the exact age varies in different persons according to their general condition, their manner of living, and especially their activity. To prevent this decrease of heat production persons advancing in years must continue to walk or take other muscular exercises as much and as long as they can, and must not allow their friends to dissuade them from doing so, or yield to their own inclination to give it up. Even if it rains or snows, or the weather is otherwise disagreeable, they must continue to take their accustomed exercise; since, if they neglect it, and stay at home engaged in reading or some other occupation, they have great difficulty in resuming the necessary exercise. Great is in this respect the difference between the young and the old; the former can easily return to active muscular work after long rest, not so the latter. They must not regard their number of years but their physical capacity. If those advanced in years neglect muscular exercise their muscles waste, their metabolism fails, their body heat

diminishes, and their path to premature senile decrepitude is rapidly paved. On the other hand, it is to the majority of people almost incredible how much can be done by energy and will power to postpone this decay.

A matter which is not sufficiently considered is the mode of walking. A walk of three or four miles with half-bent knees and back is not as useful as one of the same length with firmly contracted muscles of the legs and thoroughly erect spine.

Persons with a sound circulation derive more benefit from walking uphill than from walking on level ground. Even to those with slight dilatation of the heart gentle ascents at a slow pace are very useful.

The benefit of walking is much enhanced by taking once or twice a week a longer walk in the country, and infinitely more so by walking tours of some weeks in mountainous or hilly regions. Marvellous is the improvement effected by them in the physical and mental condition. Old people need not be quite debarred from the benefit of such tours; they ought not to climb high mountains and glacier passes, but with judicious limits they can, with great benefit to themselves, do much more than is generally admitted.

Many other forms of muscular work can be advantageously substituted for walking, such as riding on horse-back, hunting, shooting, cricket, football, golf, fishing, etc., some of which not only benefit the body, but also the mind and the character.

By walking we employ principally the muscles of the legs and the spine; we must also put into action those of the arms and the thorax. Those of the thorax we exercise through deep inspirations and expirations, which we effect by the contractions of the intercostal muscles and the diaphragm. In so doing we massage the ribs, expand the thorax and the lungs, keep up their elasticity, powerfully influence the contractions of the heart, and compress the organs in the abdominal cavity. By the massage of the ribs we keep them in a healthy condition, the bone substance as well as the marrow, with its blood-forming function.

With the respiratory movements we ought to combine exercises of the arms in various ways, extending them, for instance, vigorously with a deep inspiration, contracting them with a full expiration; raising them perpendicularly with deep inspirations, so as to allow the air to pass freely into the apices, which, with shallow breathing, are often insufficiently expanded, and are apt to become seats of disease. The habit of shallow breathing ought to be entirely avoided, and that of full breathing, which can and ought to be substituted for it, can and ought to be acquired by every one.

The effect of these arm gymnastics is, however, not restricted to the muscles of the arms alone, but extends to those brain centres which initiate their movements. As soon as they become active, an increased amount of blood rushes to them, the small blood vessels are forced to work, and the work keeps both the blood vessels and the brain substance in a healthy condition.

The muscles of the trunk we put into action by moving the trunk upwards and downwards with deep inspirations and full expirations; or by turning the body in the erect position as much as possible around its axis, with deep inspiration from the left side to the right, and with full expiration from the right to the left. There are many other methods of exercising the different sets of the muscles of the trunk.

All the muscular actions of the body have a certain action on the bones. Each contraction of a muscle causes a pull on the bone to which it is attached; this pull acts as a kind of massage on the periosteum, the bone substance, and the bone marrow. The nutrition of the different parts of the bones is through this process maintained; the well-known brittleness of the bones in old age is prevented, the bone marrow is kept healthy, and by improving the composition of the blood increases its power to combat hostile bacilli, and thus prevent disease.

After this short discussion of the muscular actions on different parts of the body, I venture to point out the following effects:

1. Increased afflux of blood to the muscle with each contraction.
2. Increased nutrition of the muscle, combined with improved metabolism and production of body heat.

3. Increase of exchange of fluid between blood and tissues.

4. Facilitation of the removal of waste products.

5. Preservation of the elasticity of the thorax and lungs.

6. Abundant supply of oxygen for the blood and the metabolism.

7. Maintenance of a healthy condition of the organs of circulation, from the heart to the smallest arteries, capillaries, and lymphatics.

8. Massage of the bones, keeping up the healthy condition of the bone substance and the bone marrow, and through this the formation of a sufficiency of blood-efficient for the fight with hostile bacteria entering the blood.

9. Increase of the resisting power of the body against disease.

10. Persistence of the working capacity of the brain centres, which initiate the action of the different sets of muscles.

I add to this short paper a personal note regarding my view of the influence which muscular exercise has had on my longevity. I do this in the hope that some of my professional brethren may accept this view, and may induce their friends and patients to act on it in order to prolong their lives. I take no gloomy view of the conditions of old age, but think it a privilege to obtain a long life. It has not, I concede, all the pleasures, nor the powers—mental and physical—nor the imagination of youth; but it need not be helpless, useless, cheerless, and friendless if the aged person endeavours to be in harmony with the aims of the younger generations; and happily the mental faculties, especially intelligence, often survive the physical powers for many years, and enable the aged sometimes to give useful advice to his younger friends.

Although I know that it is not the exercise of the muscular system alone to which I owe the satisfactory condition of health and strength which I retain in my 95th year, but that the attention to hygienic conditions in general, to the digestive functions, to the mental work, and the tenor of the mind as I have explained in my little book on *Prolongation of Life*, has a great share in it, yet I am sure that the keeping up of the muscular system has played a prominent part in it, and does so still. The facts of my spending daily two to three hours in the open air, walking, as a rule, thirty, more frequently forty or fifty, miles a week and enjoying the beauties of nature, have not only an exhilarating effect on my mind, but keep up the whole organism and the resisting power to a considerable degree for my age. The possibility of heredity might be suggested, but this suggestion will probably be discarded, when I state that both my parents died in the 60th year—my father from cerebral apoplexy (a frequent cause of death amongst his forefathers), my mother from inherited weakness of the heart, leading to frequent bronchial attacks, anasarca and effusion into the pleural cavities. One might rather say that I had inherited a tendency not to long life, but to these life-shortening morbid conditions. If so I have been able to counteract them by energetic fighting against them from an early period of life.

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THIGH STUMP EXTENSION SPLINT.

BY

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THE stumps following flapless or flush amputations of the thigh that have come under my notice after transport from the seat of war have all apparently suffered from having been unprovided during their treatment with some continuous extending force to counteract the natural tendency to retraction of the soft parts that in these cases leads to conical stump formation in a short time to a serious degree.

The nature of the injuries has necessitated, as a life-