of current must be reduced. A reliable guide as to when the needle is in the right place is that the patient states that he experiences the same kind of pain as that of which he complains; the position is then correct and the treatment continued for ten minutes. If not found at first, then the needle must be moved about under the skin until it is. During this ten minutes it may be necessary to increase or diminish the current according to the patient's sensations. After the current has been passing a few minutes the pain often diminishes and the current can be increased. After ten minutes the current is slowly turned off, the needle removed, and the puncture sealed with collodion. No after-treatment is necessary. The spots are treated on alternate days.

It is not possible to say beforehand what strength of current may be required, but the treatment should not be painful. If too much current is used, then considerable pain may be produced and a great deal of reaction follow; the more tender the spot, the less the current. The nerves in different parts of the body vary considerably in the amount of current they take; thus, the nerves of the scalp readily take up to 5 or 6 milliamperes and the sciatic and its branches are nearly as tolerant.

The number of spots to be treated in any given case of sciatica varies. There may be only one or two or there may be as many as seven, eight, or nine. The average is about five, but no case must be considered cured until every spot has been treated. This must be done systematically, beginning with the buttock and

following down the thigh, front or back, according to the distribution of the pain. Pain around the knee-joint is often troublesome, and spots for this are found about 3 or 4 inches above the patella on one or both sides of the quadriceps extensor tendon. For the pain below the knee, spots are sought for in the calf or front of the leg, also in the latter area for sensory disturbances over the dorsum of the foot.

Acupuncture will not cure the wasting that frequently accompanies long-standing sciatica, and it is important to warn patients of this. The treatment is introduced solely for the relief of pain. For the lameness, and wasting of muscles, the patient must be taught to walk correctly, and massage and electricity are used.

All the failures I have had have been in cases of very long standing in which probably the exudation has become organized or the nerve has been damaged by pressure beyond recovery. It is not possible to recognize these cases beforehand, for many cases of very long standing recover; one case I recall was that of a man of 50, who obtained complete relief of pain, although the nerve was so damaged that his patellar reflex on that side was absent.

The line of treatment described is applicable to any other accessible nerve with suitable modifications. The sciatic nerve is taken as an illustration only; equally successful results can be obtained in any other part of the body.

LIGHT METAL LIMBS IN ABOVE-KNEE AMPUTATIONS.

BY

EDRED M. CORNER, M.Ch., F.R.C.S.,

MAJOR R.A.M.C.(T.F.),

SURGEON TO ST. THOMAS'S HOSPITAL; CONSULTING SURGEON, QUEEN MARY'S AUXILIARY HOSPITAL, ROEHAMPTON.

THE wooden walls of Old England in their day did excellent service; they were replaced by metal because of its greater efficiency. So it will be with wooden limbs; they will only exist for particular purposes. Among artificial arms that made of duralumin for lightness more than holds its own. For amputations of the thigh above the

FIG. 1.—With the amputation at 1 there is little bony leverage to help the muscles. With the amputation at 3 there is much bony leverage against the muscles (like a high-gear machine going uphill). With the amputation at 2 the above two factors are more nearly balanced and the patient is best off.

—leverage and abduction.

At a discussion on the subject of re-education of the limbless, admirably introduced by Mr. Muirhead Little, at the Medical Society in March, 1920, the President, Mr. Warren Low, referred to the mental and moral deteriorations which follow the loss of a limb. These are sometimes great and sometimes small, but almost always present in some degree. The nearer to the trunk the amputation is, the greater would seem to be the change. This change is accentuated by the man's temperament and surroundings, being the greater with the larger mentality. To weight and handicap men who have gone through much with a limb which feels "too heavy" and,

though their capabilities may be great, exhausts them, is wrong. It is not clear whether these conditions result from the degenerative changes which occur in the central nervous system in association with the loss of the educative value of the limb. To remedy this the amputated man requires the lightest limb, a minimum of hospital life, and a rapid return to work and bright surroundings. At present this can only be obtained by the use of a light metal limb with quick fit, quick instruction and after-care. At present all these factors are lacking. Metal is chosen because in light limbs of wood the wood is so thin that it cracks and constant repairs militate against the original cheapness of the limb. A well-made metal limb needs a minimum of repairs, and thereby soon repays the initial outlay.

Owing to assistance given by the Red Cross and Sir Arthur Stanley, and to the kindness of Colonel Sir Lisle Webb and Sir Charles Kenderdine of the Ministry of Pensions, it has been possible to make experiments at St. Thomas's Hospital on these lines, and it is desirable that the results should be made as widely known as possible, since they bear out in practice all that has been prefaced in theory, and offer considerable hope of improvement to 90-95 per cent. of cases of amputation of the thigh. They are based upon observations made on over one hundred light metal limbs. The results of my experiences are shown in the following extracts.

FIG. 2.—As the amputation is done higher and higher up the femur more and more adductors and internal rotators are cut off. The adductors and external rotators are strengthened by the exercise of wearing the artificial limb, and hence its non-fit after a few months' wear. This is more felt by those men of greater mentality. It occurs in the use of both wood and metal limbs and is often shown by the roll of flesh on the inner side of the bucket top.

Reports to Sir Arthur Stanley.

The first point to come out was that, although the (metal) artificial limb gave the amputé satisfaction, the metal limb was only a few ounces lighter than specially constructed wooden limbs. The satisfaction could hardly, then, be in the weight. (Light wooden limbs weigh about 5½ lb.; light metal ones 4½ to 5½ lb.) About 90 to 95 per cent. of men suffering from above-knee amputations are greatly benefited by these limbs.

- The universal statement is that they can do more work with a fraction of the fatigue.
- Men supplied with light metal limbs can learn quicker and more than can men with wooden limbs.

- (c) The special light wooden limbs supplied by the Ministry of Pensions are a distinct improvement on the older type, but break and split more quickly, having reached the limits of what wood is capable. The hybrid limb of wood and metal supplied by the Ministry bids fair to be satisfactory. But it is too early to say much about it.
- (d) When conscription was introduced into the army all kinds of men were taken into it and some lost their legs. There is no doubt that men fitted with light metal limbs are happier, more useful men, who more easily learn and amongst whom there is a more generally high percentage of physical fitness than there is amongst the wearers of the wooden limbs. They cannot make C3 men A1 men!

Light metal limbs should not at present be given to all, but those to whom they are *not* given should be carefully selected. At least two refused to exchange their wooden limb for a metal one. At least one who has had a light metal limb prefers his wooden one. (He is stated to have had inadequate length of instruction.) Apparently the heavier wooden limbs are more apt to cause pain and necessitate operations than light metal ones, especially when the fit is imperfect.

Apparently the repairs necessary in metal artificial limbs are less frequent—but more difficult and costly—than they are in wooden limbs. This would be lessened in manufacture on a larger scale and would help to compensate for the larger initial outlay.

It is at present doubtful if there is advantage in having the artificial limb less than 4 to 5 lb. in weight, as the lighter the limb the more uncontrollable it becomes. This is not the theoretical statement it is often said to be.

It should be added that one insufficiently instructed man for urgent reasons was allowed to take away a metal limb in the rough, and it gave him so much trouble that he inquired of the Ministry who was responsible for its repairs. Both man and limb were half-fledged.

So much for the theory, the practice, and the immediate results. To ascertain the later results all officers were written to and replies were obtained from a large number. These replies have shown four chief points:

1. Those who had been given and had done well on a heavier wooden limb did most obviously better with metal. They had already shown that they could help themselves, and, supplied with lighter limbs, could do more.
2. A light metal limb should be fitted first of all, so avoiding the delay and learning to use the heavier wooden limb.
3. All men who had previously got about on a heavier wooden limb were for varying times "at sea" with the light metal one before they settled down to steady improvement.
4. The heavier wooden limbs caused far more trouble in painful breaking down and difficult stumps than did light metal ones.

In connexion with 4 it is necessary to say something about the pathology of the stump. The keynote to all the pathology of stumps that are painful and easily break down is the presence of infective inflammation in the tissues. All tissues can be affected. We can see the results in skiagraphs in new-formed bone, and if infective inflammation is found to be present in the bone its presence may be inferred in other structures—nerves, for example. In an amputation nerves must be divided, and being divided they must regenerate. In regenerating it has been shown that they carry down with them the infective inflammation in them, re-infecting and making painful a perhaps merely uneasy stump and producing the late onset of pain. Dr. Urquhart helped much in the bacteriology of these stumps and Colonel Sir Archibald Reid in the skiagraphs. The importance of skiagraphing many stumps that have worn one of the heavier wooden limbs before ordering a second is apparent. Skiagraphy is, in fact, one of the most valuable means there is of examining a stump.

In the concluding part of this paper I will quote what three of these officers say for themselves. There are many more replies which show—

1. That at times the light metal limb is badly made and fitted, requiring repairs (even then less so than wood).
2. Light metal limbs are an inestimable boon to many of those who have had thigh amputations.

CASE I.—H.

Daily Work.—The increased ease with which one gets through one's daily work is maintained.

General Condition.—Continues improved.

Athletic Value.—I am markedly able to get about with greater comfort and speed. I have recently been able to take part in boating, fishing, and shooting, all of which entailed considerable activity, and I was pleased with the way in which the light leg responded.

Stiff Ankle.—This slight obstruction is wearing off, and I hardly notice it as a hindrance now. It is preferable to a movable ankle, saves weight, and gives a bit of a spring off the foot.

CASE II.—R.

I am quite delighted with my light metal limb, and am much better in every respect. You will remember how my stump continually broke down with my heavier wooden,* now I can say I have completely got over all that trouble, which has been a constant source of worry to me. I am getting about much better now, and do not know what it is like to be exhausted. This had a great effect on one generally. My health has improved and my work is more of a pleasure and consequently better, and I am hoping to take up tennis again this summer.

In the early days—I mean 15-16—when the heavier wooden legs were good and well made, I had a comfortable leg, and got on extremely well and was satisfied as far as heavy legs were concerned, but I must say, with my short experience of a light leg, I wish I had gone in for one at first. It would have saved me a tremendous lot. I am quite convinced that light legs are the thing. I could do most things on a wooden one—dance, tennis, climb about rocks, etc., but at what an expense of energy, and I did too much and got overtired.

This officer hits the nail on the head by writing: "The whole secret of the light leg is the conservation of energy, and when one is exhausted one's brain is exhausted as well."

CASE III.—A.

I have had the light metal limb now for over four weeks, and cannot praise it too highly. Candidly, I never before imagined that an artificial limb could be so useful. My first leg was a wooden one, and, in fairness to Messrs. —, I liked their limb and its movement, and did very well with it.

As regards distance walking, one evening in London I walked on my wooden leg just over five miles—a good distance on a limb weighing over 9½ lb. (including shoe), but during the last two miles I was decidedly tired and found my foot scraping the ground very often. With my metal limb I have not tried a long distance walk, but feel sure that this distance could be doubled with less fatigue. A brief outline of my day's work will support this. I walk to the office in the morning (one mile). From 9.30 till 5.30 I am on my feet practically all the time; walk home in the evening, and very often later on I walk again perhaps for two, three, or four miles before bedtime. This does not fatigue me in the very least, and I come home feeling I have enjoyed an outing and could have done miles more.

As regards walking quickly I could do this on my wooden limb, but there was a great strain on the shoulders as the knee was controlled therefrom. The metal one has no shoulder control, and to my mind this is not necessary, as by a slight extra jerk of the stump forward speed can be increased at will. Timing myself in the ward when I had my light metal limb in the rough, I found that I did 136 paces to the minute, which, as infantrymen will know, is a very quick march. Walking uphill with the light leg differs very little from walking on the level. With the heavy leg there is a great difference, and it is very fatiguing and slow work. As regards loss of control in strong wind, in my experience the heavy limb is affected to the same degree as the light, and loss of control varies with length of stump. Personally I have had no trouble and have been in some very strong winds during the last few weeks.

To sum up, I think the light metal limb is far and away superior to the heavy, and I consider myself fortunate in possessing one; and I hope the time will come when I can forget that my heavy limb ever existed.

Light metal limbs having succeeded so well in some 90 to 95 per cent. of thigh amputations it was reasonable to try them on below-knee amputations, and this has now been done successfully. The percentage of those improved will be smaller, and it is possible that a better artificial limb may be made for a Syme amputation. It may be to the advantage of the amputated man to have a hybrid limb (wooden socket and metal shin), as tried by the Ministry; at present it is too early to say, but as most serious repairs are required to the sockets it may be doubted if wood should be used there.

* He was sent on from Dover House to St. Thomas's because of this.

At a meeting, on April 1st, of the West London Medico-Chirurgical Society, with the President, Dr. F. J. McCann, in the chair, a discussion took place on the diagnosis and treatment of colitis, in which were emphasized the importance of sigmoidoscopic examination, the influence of diet as a cause and in the treatment of the condition, bacteriological examination of the faeces and treatment by vaccines, and the influence of climate. Previous to this discussion a number of clinical cases were shown by Mr. Aslett Baldwin, Mr. B. Sangster Simmonds, Mr. Neil Sinclair, Dr. W. N. Goldsmidt, Dr. Clifford Ellingworth, and Dr. W. R. Marshall.