was split vertically at about the junction of its outer and middle thirds and the outer portion, fashioned into a tube, was drawn through the tunnel in the biceps and fixed in a small skin incision, as at D. Though primary union has occurred in the skin tube in spite of a septic focus at the back of the stump, it is too soon as yet to speak with certainty, but I hope in this case to combine the large range of movement of Vanghetti's peg motor with the advantage of his loop.

I have recently seen again a man whose stump muscles I treated as described some six months ago, and two months after amputation above the elbow. The resulting range of movement in the biceps, as shown in the photographs, is fairly satisfactory—that is, $1\frac{1}{2}$ in.; that of the triceps is not more than $\frac{3}{4}$ in. Care was taken here to canalize the muscles as close as possible to their cut ends. The detrimental influence of the muscle sheath is less in the arm than in the forearm and increases as the muscle is canalized further from its cut end. In the special plate Figs. 1 and 2 show the extremes of relaxation and contraction of the biceps under elastic traction; *a* is the grafted surface from which the flap for the anterior skin tube was raised. Fig. 3 shows a simple contrivance kindly made for me by Mr. Peacock, of the Dan-y-coed Auxiliary Hospital (associated with the 3rd Western General Hospital), the object of which is twofold—namely, (1) to provide exercise for the muscles pending the fitting of the artificial limb, and (2) to supply as far as possible the normal degree of tension of the muscle at rest, the elastic traction being easily graduated. I had hoped that the latter might, with care, have been maintained continuously—that is, by night as well as day—but find that in this case the skin tube will not tolerate the continuous pressure however slight. This may after all not be essential.

REFERENCE.

¹ BRITISH MEDICAL JOURNAL, July 20th, 1918, p. 68.

HYSTERICAL TREMOR.

BY

W. JOHNSON, MAJOR R.A.M.C.(S.R.).

THE tremor which I propose to deal with here is not the ordinary fine tremor affecting hands and head, so commonly seen in neurasthenia, but a coarse, severe form, somewhat resistant to treatment, exhibited by soldiers, and described by them as "shaking all over." The importance of studying this group of cases—one of the many distinct groups into which so-called shell shock is clinically divisible—will be seen when the question of treatment comes to be considered; unless carefully treated, there is a great tendency in these cases to develop an intractable state by the time they reach England. In the early days thorough treatment yields excellent results.

ETIOLOGY.

Judging purely from the clinical side and from the severity of the condition in the first few days, it was felt that there must be some organic injury responsible. Investigation of individual patients has, however, shown definitely that this is not so. Some, indeed, have come on immediately after the explosion of a shell at such close proximity that aerial concussion cannot be absolutely excluded as an etiological factor. These cases form a minority, and I have found that most of those I have seen have resulted from severe emotional shock, with no shell-burst near enough to have produced any physical effect. Often it has occurred in a man who has undergone the prolonged strain of heavy fighting, with its consequent loss of sleep and irregular food, simply from the "sights he has seen" or the fact of casualties occurring amongst his friends. The condition falls, therefore, under the heading of "manifestations of fear," hysteria being the cause of the clinical establishment and persistence of the symptoms.

A noticeable feature is that I have not found the condition become established in the case of any officers or senior non-commissioned officers. Rather it seems liable to occur in young poor-looking individuals and to attain a more resistant stage in them than in the few who were older. Therefore, not only is the temperament of the patient

concerned, but his "ego," as influenced by rank, seems to play an important rôle. This I have observed amongst many other types of hysterical disorders.

SYMPTOMS.

Seen within a few hours of the onset the tremor is often general all over the body, and coarse, almost clonic, in character. The patient often has a trick of keeping his head covered by the blanket, and of blinking spasmodically if this is removed. He is also extremely emotional, and any attempt to question him may result in an outburst of weeping. He should therefore be handled and troubled as little as possible on admission. In a large number of cases two or three days in bed with a dietary not erring on the meagre side brings the patient to the stage when it is obvious that his tremor is not going to persist. In other cases (those with which I am dealing here) it is found that while the tremor has diminished in the legs the patient presents a violent coarse movement of the head and upper extremities. Altogether I have had thirty such cases. When reckoned in ratio of the total number of psychoneuroses admitted, they indicate that the condition is fairly rare. In common with other hysterical disorders, the patient's general state improves all round the while his hysterical symptom becomes worse. He soon walks comparatively well, but the shaking of his head and shoulders seems to become more hopeless each day. The movement chiefly affects the muscles of the neck, shoulder girdles, and pectoral regions. When lying undisturbed the shaking becomes less coarse, and it disappears entirely during sleep. In the waking state it never entirely ceases, and any slight suspicion of danger may aggravate it to an extreme degree. These relapses, however, I have found fairly amenable to treatment.

Examination of the muscles affected brings out a few points of great importance. The patient gradually assumes a "fixed attitude," varying with the severity and distribution of the tremor. The head may be turned to one or other side, or bent backwards, and the shaking carried on from this position. The shoulders are slightly raised, and the movement of the points of the shoulders during the shaking is often considerable. The arms are flexed at the elbows, and the hands in a position between pronation and supination; the tremor is a slight up-and-down movement of the forearm.

These positions, which I have referred to as "fixed attitudes," are the result of a state of mild tonic contraction of the muscles concerned. This condition is readily recognized on palpation with the hand, especially in situations like the neck and forearm, where the hands can loosely encircle the anatomical part. It can also very readily be demonstrated in the trapezius and cervical spinal muscles. This tonic condition of the muscles tends to diminish during the first three or four days, giving place to an increased coarseness in the tremor. It may be of interest to remark that the normal person is able to assume voluntarily this tonic state, but one finds more difficulty in performing, for even a short time, the extensive coarse movement which these patients are able to keep up continually in the later stage.

Irregular Types.—The head, shoulder, and arm movements form the common type. In a few cases these cease rapidly, and leave an irregular movement of the facial muscles—chiefly of the orbiculares palpebrarum and oris—associated with slight head tremor. In one case the movement became localized to the left platysma, the whole of which could be plainly seen contracting beneath the skin; this patient had had a slight twitching in this position years before. He improved under treatment, but relapsed badly after a fright. Major T. T. Higgins, who saw him eventually, from the point of view of surgical treatment, pointed out that there was a marked hypertrophy of the platysma on the affected side. I have remarked neither muscle wasting nor hypertrophy in any other cases. More rarely the tremor has become localized to one or other arm, but these cases are of a fairly mild type.

TREATMENT.

(a) In the first few days, before the general shaky condition has settled down into the definite coarse hysterical tremor, the patient is kept in bed, fed fairly generously, and, purgatives excepted, no drugs are given. On the second or third night a mild hypnotic may be called for, if the patient shows any insomnia, but my experience is

that this is seldom needed. The change from trench life to a comfortable bed is usually sufficient to induce sleep, and I hold there is strong reason to avoid the administration of soporifics in these cases. Much more important than drugs at this stage is psychic treatment. The patient finds himself in a ward where the "atmosphere" of cure is strong. He sees other men rapidly recovering from conditions similar to his own. His medical officer visits and talks to him daily, and tries to obtain his intelligent co-operation. I have found that the least hysterical type of patient is able voluntarily to relax his muscles more or less completely. He is told to let himself go as "though he were dead"; and if this is done with any success it is then demonstrated to him that his limbs can be "flopped" about and that at the same time his tremor practically disappears. This mild exhibition of suggestion I have found of great value. On the fourth or fifth day he is got out of bed and enters on a course of mild graduated physical exercises under a special instructor.

(b) Once the typical uncontrollable tremor has been thoroughly established, rigid intensive treatment will alone give good results. Psychic treatment again plays the greater part, and in its name most of what follows is used.

Each case is placed in a cubicle, the lines of treatment explained to him, and his co-operation enlisted. He is kept lying down in as relaxed a position as he can assume, although, as a rule, he does not succeed too well in this. He is seen daily and his efforts commended. The diet is light and given at stated intervals. A mixture containing valerian is given night and morning, or, where indicated, iron and arsenic. Active local treatment of the muscles involved is given twice daily and consists in five minutes' rubbing, followed by five minutes' exercises. Odorous liniments are more successful than the inodorous. The rubbing is done by a professional rubber who used to train men for athletics, and whose methods accordingly are singularly applicable to this type of case. The exercises to follow this are valueless unless the "fixed attitude" of the patient is forcibly corrected while they are being carried out. For instance, where the shoulders are habitually kept raised (that is, in the shrugged position) the patient should be seated near two handles by grasping which he is able to pull his shoulders well down. If necessary, an assistant can aid him by pressing down on his shoulders at the same time. In this position the patient is instructed to perform strong head turning, bending, and rolling movements in regular sequence.

Suitable exercises and suitable positions in which they are to be done must be devised for the individual case. If the shoulders are carried forward, as in marked pectoral tremor, a long stick under the arms will serve to restore their position. If there is a wrong position of the head, this can be counteracted by an assistant pulling the head in a diametrically opposite direction. The resistance experienced in counteracting these attitudes will be found to diminish with each occasion the patient is treated.

As an adjunct in aiding a patient to correct his "fixed attitude," a mirror may be placed in front of him. By this means visual reinforcement is supplied to the voluntary effort, which, as is well known, is deficient in these cases. A looking-glass, too, will be found essential for the performance of the facial exercises in face tremor.

Finally, patients must never be allowed to lose heart during their treatment. A slight modification in routine may be found to suit the mental kink of a particular patient, and this short road to recovery should always be kept in mind.

I have had no failure amongst my cases with the exception of the one case with a pre-war history. If treated from the commencement little trouble is to be anticipated. The average time in the cubicle has been ten to fourteen days. In one or two instances, where the desire for recovery has not been the most prominent point in the case (*les malades invétérés* of the French), treatment has had to be extended up to three weeks and then suddenly the malady has vanished. Here there must be no misplaced sympathy: their treatment should consist, in the aphorism of Sir George Savage in a recent article, of "sympathetic but judicious neglect."

At the annual meeting of the American Surgical Association held at Cincinnati in June (6th to 8th) Dr. Lewis S. Pilcher was elected president for the ensuing year.

PRELIMINARY NOTE

ON

THE COMPLEMENT DEVIATION IN CASES OF MALARIA:

A NEW AID TO DIAGNOSIS.

BY

J. GORDON THOMSON, CAPTAIN R.A.M.C.(T.C.).

This preliminary note is published in advance of the full paper being prepared on the subject, because the details as to technique which it contains may enable other workers to make collateral studies on an aid to diagnosis in malaria which may prove important. It is especially required to find if possible a test sufficiently delicate to indicate complete or nearly complete recovery from infection.

War Office,
28th November, 1918.

RONALD ROSS, Colonel,
Consultant in Malaria.

This research work was undertaken under the direction of Colonel Sir Ronald Ross, K.C.B., K.C.M.G., F.R.S. The difficulty of definitely diagnosing chronic cases of malaria in which parasites cannot be found in the peripheral blood has always been a serious one; and considerable doubt is often held whether a patient has ever had malaria or not.

The effect of treatment by quinine after the disappearance of the parasites from the peripheral blood is gauged by the continued improvement of the patient's health; but there is really no accurate means of determining a permanent cure.

The fixation of complement depends on the presence of antigen and antibody; if either of these is absent the complement remains untouched. Until the present research was undertaken investigators were unable to obtain a satisfactory specific antigen for malaria, without which it was impossible to examine serums by these methods.

After a large number of experiments a specific antigen for malaria has been prepared in the following manner: Make a culture of malaria parasites from as heavily infected a case as possible according to the method described by J. G. and D. Thomson (1913).¹ After twenty-four to forty-eight hours' incubation, pipette off the supernatant serum, and add an excess of distilled water to the remaining corpuscles. Shake up and centrifuge, removing the supernatant fluid each time. This process can be repeated until the fluid is quite free from haemoglobin. The sediment at the bottom of the centrifuge tube consists of the bodies of malarial parasites, the washed envelopes of red cells, and leucocytes. Dissolve this sediment in as small a quantity of decinormal sodium hydrate as possible, and a straw coloured viscid fluid is obtained. Neutralize this by adding normal hydrochloric acid solution drop by drop. The more numerous the malarial parasites and the less fluid used in dissolving them, the stronger the antigen will be. Dilute this solution ten times with normal saline and test its anticomplementary action by titration with varying dilutions of guinea-pig's serum. Carry out further dilutions until an antigen is obtained which does not of itself prevent the action of complement.

The best antigen obtained in these experiments acted well diluted 1 in 30 with normal saline. Experience has shown us that the anticomplementary powers of this antigen varies enormously, and it has been found necessary sometimes to dilute our original antigen one hundred times before it could be used. The higher the dilution of course the weaker the antigen becomes, and it should be the aim of the experimenter to obtain as strong an antigen as possible which is not too anticomplementary. Recently we have used an antigen composed of ten different strains of benign tertian malarial parasites with satisfactory results, and this gives a positive reaction with known cases of benign or malignant tertian malaria.

The antigen must be titrated before use to estimate the minimum dose of complement we require to use in the test. The patient's serum is diluted 1 in 10 with normal saline. Put up for each serum four tubes, three of which contain antigen, the fourth being the serum control.