and arrows of outrageous fortune." However perfect the organization, however meritorious the ideals of the management, and however "scientific" the wage system in vogue, some at least of these 30 per cent. are potential misfits, and sources of dissatisfaction to themselves and those around.

The control of dissatisfaction at work, whatever its source, demands essentially an individual approach to each case, irrespective of the presenting symptoms. Increased irritability, frequent absences, and prolonged illness of indefinite type are all manifestations that the person is making an inadequate adjustment to the demands of life and environment. This method of approach is comparable to that utilized in child guidance work and in the therapeutic approach to adult neuroses. Each case must be considered as a total entity against a varying mental and physical environment, and it follows that the treatment must be equally individualistic in character. Each case must be examined physically and psychiatrically, so that a suitable programme may be mapped out. In addition, equal attention must be paid to the work environment in which the individual is placed and to the processes of production and the type of supervision with which he is faced. Only in this way is it possible to see the individual as a whole, and to obtain a real understanding of the presenting problem that will lead to real and lasting results.

Conclusion

Surely it is somewhat ironical that although every individual is seeking the greatest possible happiness in life compatible with the discharge of his social and moral obligations, nevertheless those very factors which are most antagonistic to happiness in the industrial setting—physical and mental health—have been almost completely ignored until very recently. What chance of happiness, for instance, has the individual who is constantly troubled with excessive fear, worry, "nervous indigestion," anxiety, uneasiness, or with some one of a host of other ailments of a similar nature? How much can the "right job" mean to the man who is constantly obsessed with thinking about a certain number or other irrelevant fact?

At last, however, the problem of emotional dissatisfaction is forcing itself on the attention of many thinking men who are concerned with the industrial structure. In the coming years, industry must once more broaden its perspective towards the individual upon whose labour it depends. Just as it has come, through increased good will and the various Factory Acts, to improve and augment the physical environment, it must now give equal attention to the securing of the proper orientation of mind, as it affects the individual's work, health, and behaviour.

F. Wise and J. Wolf (*Arch. Derm. and Syph.*, July, 1936, p. 1) deprecate the popular haphazard method of diagnosing all vesicular eruptions of the hands associated with a fungus infection of the feet as epidermophytids, moniliids, or trichophytids. A very large proportion of the adult population of the U.S.A. have or have had at some time a fungus infection of the feet, therefore intradermal or patch tests with trichophytin are of little value in the differential diagnosis of these cases. Careful history-taking is important, and occupational dermatitis, dermatitis venenata, and eczema must be carefully excluded. Finally, a diagnosis of epidermophytid should not be made without strong corroborative evidence, chief of which is the demonstration of fungus either microscopically or by culture from the focus of infection in the skin or nails. They admit, however, that a great many cases of vesicular eruptions of the hands are dermophytids.

ELECTROTHERAPY AND ITS FUTURE*

BY

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It is a most remarkable fact that, among the many and varied agents employed in combating disease, the most powerful, the most easily regulated and controlled, the most fundamental in its action, and the most universally called for, is almost entirely neglected by the medical profession.

Electricity is steadily invading every other sphere of our daily life, but, so far as the human body is concerned, in the activity of which every phase has an electrical basis, its action and application are almost entirely overlooked. It can be confidently asserted that no other form of treatment has a more definite physiological basis or requires for its efficient administration a more intimate and extensive knowledge of the fundamental principles of the vital forces both in health and in disease.

If we wish to apply electrical treatment in a scientific manner and with its maximum therapeutic effect, we must do so in regard to this fundamental action rather than administer it in a purely empirical manner, merely asserting that such or such a treatment is good for such or such a disease.

Methods of Electrotherapy

Let us consider the various forms in which electricity is available for therapeutic purposes. Its primary and fundamental action is that of a blow or impact. Professor Jellinek has demonstrated how, provided that the voltage is sufficiently high, it is possible to drill a hole in paper, wood, stone, or metal without the edges of these holes showing any detectable signs of heat or chemical action. It is the impact of the electrons emitted from the heated cathode of a Coolidge tube which, when they strike the anti-cathode, gives rise to the x rays. In the tungsten arc, it is the electrons thrown off from the heated carbon cathode which, impinging on the positive tungsten electrode, initiate the specific ultra-violet radiation characteristic of the metal upon which they strike.

THE STATIC BREEZE

In electrotherapy, the high voltage of the static spark striking upon an oedematous surface immediately produces a pitted white mark from which the blood and oedematous fluid has been temporarily forced out. When the static breeze is directed upon a raw surface which has been freely dusted with such a relatively non-toxic substance as boric powder, very severe toxic symptoms may develop from the absorption of the particles of the drug forced in at this high voltage.

If the static breeze is directed upon a small pustular papule, the scattered infection will give rise to an areola of similar papules—an unfortunate occurrence which clearly demonstrates the dispersal action of this current. When the static charge is administered, the patient's high-voltage negative charge is attracted to the whole surface of his body by the positive charge induced in his surroundings. In this manner, the electrostatic tension on the cutaneous nerve endings reflexly stimulates the endocrine glands, results in a rise of blood pressure, and is followed by a most invigorating reaction. By means of the Morton wave-current obtainable from this instrument we are able to excite such powerful muscular contractions that by their

* Read in opening a discussion in the Section of Physical Medicine at the Annual Meeting of the British Medical Association, Oxford, 1936.

means both peri- and intra-muscular adhesions may be broken down and, when applied to the prostate, far more effective drainage ensues than can be obtained from any form of digital massage. So effective indeed is this method that it must be applied with great caution in cases of acute infection of the prostate.

THE CONSTANT GALVANIC CURRENT

The galvanic current affords the choice of a variety of electrotherapeutic methods. In the form of the constant current it is mainly utilized to deposit ions either on the surface, or upon the lining of accessible cavities, or within the subcutaneous area of the part treated. The procedure is an electro-chemical one, and the effect depends upon the salt employed. When salts of a caustic or destructive action are applied, septic membranes upon the surface or within accessible cavities may be speedily and effectively destroyed. When salts of merely stimulating action are utilized, a reflex stimulation of the cutaneous nerve endings results in a prolonged increased blood supply—hence increased nutrition and resisting power in the region treated. If such a treatment is continued in cases of chronic rheumatoid and osteo-arthritis for a period of six months, relief of pain, reduction of swelling, and increased power of locomotion will be obtained to a far greater degree than can be approximated by any other method. Unfortunately, the need for prolonged treatment in these chronic conditions is not fully realized, and the application is carried on for far too short a time for the full benefits to be achieved.

By the interruption or reversal of the electrical current at rates varying from 1 to 100,000,000 times a second we are able to obtain most remarkable and valuable therapeutic results of a very diverse character, and we are able to adjust the voltage and amperage to meet the different demands at these varying frequencies.

THE INTERRUPTED GALVANIC CURRENT

When we interrupt the galvanic current at a low rate we obtain isolated muscular contractions which are of value for electro-diagnosis and re-education. By the interruption and reversal of the current at relatively high voltage by means of the faradic coil we elicit contractions of a physiological type which quickly restores to a muscle the normal tone that it may have lost from injury or other cause. By employing currents of lower voltage and greater amperage, such as the sinusoidal or preferably the Watteville currents, we are enabled to stimulate all the tissue cells within the interpolar path, according to the rate of interruption, fifty or more times a second by the recurrent hydrogen and hydroxyl ion concentration which occurs at every interruption and reversal of the current. The benefits derived from these currents are essentially different from those obtained from the higher voltage and lower amperage of the faradic coil. In the former case, owing to the greater number of ions involved, the nutritional effects are much increased. It is the method of choice for the treatment of ununited fracture and for oedematous extremities.

The Leduc Current.—In my opinion, one of the methods of the greatest scientific interest, and in a limited number of cases of the greatest value, is that form of the interrupted galvanic current known by the name of its discoverer as the Leduc current. It will be remembered that Leduc, of Nantes, claimed some years ago that he was able, by means of a current of about 12 volts and only 2 mA., interrupted 100 or 200 times a second, to produce local and general anaesthesia. In the treatment of the intense burning pain which characterizes that most distressing condition known as causalgia (καύσος, burning heat, ἀλγος, pain) the

Leduc current is one of the most certain remedies that I have witnessed in any disease. The neurologists have admitted their failure in the treatment of this condition by advocating section of the sensory nerves. The action of the current is speedy, and the relief afforded lasts for about twelve hours, so that by administering the treatment twice daily the pain is kept in subjection and the patient makes a rapid recovery. The physiological explanation of the action of this current is, I think, to be found in the theory of the absolute and relatively refractory periods of nerve stimulation. The combined refractory period following nerve stimulation corresponds closely with the rate of interruption which has been found to be most effective with the Leduc interrupter. In the treatment of acute neuritis I have found the Leduc current most useful in the class of case which high frequency currents fail to relieve.

Lapicque's Interrupted Current.—Another scientific and most interesting form of interrupted current of low frequency we owe to the distinguished physiologist Lapicque. By this method we are enabled to graduate the make-and-break stimuli so that the paralysed muscles are stimulated to contract without exciting any contraction in the healthy muscles. This method is of special value in the treatment of Bell's palsy and infantile paralysis, since it entirely removes the objection to muscle stimulation in these cases on the ground that it leads to the over-stimulation of the healthy muscles.

Interrupted Low Frequency Currents

All the interrupted currents of low frequency owe their action to the fact that the hydrogen ion possesses a velocity five times faster than any other cation, and two and a half times faster than any anion. The result of this is that, at the make of the current, a concentration of hydrogen ions occurs at the negative pole, causing an acid stimulation of the nerve endings in this region, which excites both a muscular contraction and an unpleasant sensation. At the break of the current the more rapid hydrogen ion, rushing away more quickly from the positive pole, leaves a temporary preponderance of hydroxyl ions which exert an alkaline reaction in the neighbourhood of the positive pole and thus give rise to a muscular contraction proceeding from this pole.

Thus the phenomenon is an electro-chemical one; the chemical reaction, however, requires a very brief but yet a measurable time to take effect; if the current is reversed with sufficient rapidity for the hydroxyl ion to neutralize the hydrogen ion, and *vice versa*, before either has time to become effective, no muscular contraction will be excited and no sensation will be experienced. This constitutes a clinical high frequency current.

High Frequency Currents

In 1888, d'Arsonval, when experimenting on the effect of interrupting the alternating current from a Ruhmkorff coil at various frequencies, found that muscular contraction diminished in vigour when a frequency of 2,500 was approached. Two years later by employing the wireless apparatus of Hertz he obtained a frequency of a million or more a second, and found that at this high frequency all muscular contraction and sensation were abolished. In this way he realized his great discovery of the clinical high frequency currents, which have already added so much to the value of electrotherapy; they promise even greater benefits in the future when we shall have developed their technique, and understand more fully their mode of action.

In their original form the high frequency currents of d'Arsonval (*d'Arsonvalisation*) were currents of relatively high voltage and low amperage. It would not be surprising if, when the basic action of high frequency currents is better

understood, that these original currents of d'Arsonval were not found to be still the most suitable for certain conditions. By certain alterations in the design of the instruments, high frequency currents of lower voltage but higher amperage were obtained, namely, the high frequency currents of quantity or diathermy.

In recent years, by increasing the frequency of the oscillations fifty or even one hundred times, the currents of capacity have replaced the currents of conduction which predominated in the diathermy currents, and in this way the high frequency currents of capacity or resonance, the short or ultra-short high frequency currents, have been obtained. For this last development we are indebted mainly to the work of Schliephake and Esau. Since these currents form the subject of a later discussion, it would be out of place to refer to them at greater length.

General Claims

Even from this brief and inadequate review it must, I think, be evident in what manner we are able to harness Nature's most powerful force to the requirements of the healing art. We may employ electricity in the form of the most violent blow or the gentlest impact; we can induce chemical changes on the surface or within the cavities, and we can modify the reaction of the whole body; we can set up polarization, orientation, and vibration of the molecules with which the body is built at inconceivable frequency. Bony structures no longer offer an impediment to the action of our currents, for, owing to their leaky condenser action, we can effect them by the short waves within and on their outer and inner surfaces with equal facility and effect. This, I think, offers an explanation of the claim for the deep action of these currents.

If electricity is of no use in the treatment of disease, it is surely not the fault of the agent, but of the neglect with which it has for so long been treated by the medical profession. It is owing to neglect and indifference on the part of the medical profession that the suffering public have for so long and so regrettably been deprived of the curative action of electricity.

Earlier and More Modern Views

Let us see how the more enlightened of the distinguished medical men of the past regarded the value of electrical treatment at a time when the appliances for its application were undeveloped and its action but little understood. John Birch (1745-1815), one of the most distinguished surgeons of his time, surgeon to the Prince of Wales and to St. Thomas's Hospital, thus wrote, some time before 1780 (*Considerations on the Efficacy of Electricity in Removing Female Obstructions*):

"The present medical reputation of electricity has been acquired by a gradual course of experiments, first upon such cases as medicine and surgery were insufficient to relieve, and afterwards on many, where the cures remained imperfect, or where the habit wanted its peculiar influence to remove particular symptoms, or to give action to deficient powers. During my education at St. Thomas's Hospital, I had seen so many remedies fail of their promised success, after a candid trial, and among the rest electricity, that on resuming practice I proceeded slowly, and doubted much, cautious of being misguided by false appearances, till experience taught me that, when I was unsuccessful, it more often proceeded from want of judgement in the application, than want of power in the remedy. But by a diligent attention to every circumstance which occurred, and an impartial examination of facts, I was led by degrees to extend its practice more generally; and I have the pleasure to find my endeavours have not been misapplied, because the terrors of the knife have been frequently prevented, and some of the common suffering of humanity much alleviated."

In a later paper, Birch alludes to the greater attractions of surgery rendering it difficult to get the students of his hospital to take up electrical treatment:

"An operation is often more admired than a cure by other means, as it is at once both splendid and lucrative. I am therefore obliged to limit the hospital practice to particular cases, which I attend myself, because I can so seldom prevail on a young student to take the necessary pains which are required to become an able electrician." (*Essay on the Medical Application of Electricity*, London, 1802.)

Among all the writers on electrotherapy no one has approached the subject in a more logical, scientific, and practical manner than Dr. Golding Bird (1814-1854), physician to Guy's Hospital, in the lectures which he delivered to the Royal College of Physicians in 1847. Allowing for recent advances, his remarks apply equally to-day as when they were uttered:

"Electricity has been by no means fairly treated as a therapeutic agent; for it has either been exclusively referred to when all other agents have failed—in fact often exclusively, or nearly so, in helpless cases—or its administration has been carelessly directed, and the mandate 'Let the patient be electrified,' merely given, without reference to the manner, or mode, of the remedy being for an instant being taken into consideration."

The value of Golding Bird's work is demonstrated by the influence that it had on his colleagues at Guy's Hospital, which at that time had an exceptionally distinguished staff. Among others, Richard Bright (1789-1858), Thomas Addison (1793-1860), and Guy Babington (1794-1866) sent patients to Bird's electrical department. The writings of Thomas Addison reveal him as a converted sceptic:

"It was whilst brooding over the humiliating failure of a host of remedies employed in such cases (chorea), and which will be described in the sequel, that, as a last resource, I determined upon giving electricity a fair trial. I was perhaps, in some measure, induced to do so, in consequence of having an opportunity of securing the assistance of Mr. Golding Bird, in its application. The effect produced by it at once gratified and surprised me: and led to further trials, the results and particulars of which will not, I trust, be deemed altogether unworthy the attention of the profession."

He further adds:

"It is much to be feared, that many persons, like myself, have been led greatly to underrate its efficacy, either in consequence of its vague and indiscriminate recommendation, or from the inefficient and careless manner in which it has been applied. Certain it is that, although I have often ordered it myself, and have more frequently witnessed its employment by others, I had never for a moment entertained the belief that it possessed the power over the disorders alluded to, which I am now inclined to concede to it." (*Guy's Hospital Reports*, 1837, vol. ii.)

Medical and Lay Electrotherapists

When we turn to more recent times, we must acknowledge the great debt that electrotherapy owes to the late Dr. Lewis Jones. For a period he almost alone carried on the fight for the recognition of electrotherapy in this country. In the immediate pre-war period, largely as the result of Lewis Jones's enthusiasm, an increasing number of general practitioners were induced to give a trial to such simple measures of galvanism and, impressed by the very favourable results that they obtained, were led step by step to employ more advanced electrical methods. In this way a small band of enthusiasts, well grounded in the basic principles of medicine and surgery by the experience they had gained as general practitioners, were practising electrotherapy. By keeping in touch with the modern methods of this rapidly developing science, they were slowly but surely securing for it increased recognition.

After the outbreak of war, as the value of electrotherapy in the treatment of the wounded received more recognition, the number of medical men capable of administering it became totally inadequate, and the Chartered Society of Massage and Medical Gymnastics most opportunely provided an increasing number of trained electrical assistants.

I am very anxious to avoid depreciating in any way the valuable services of the members of the Chartered Society.

They belong to an admirably administered organization; the course of instruction which they undergo, though far too brief, is as good as is obtainable under existing circumstances. Their examinations are thorough and excellently conducted. Among their members there are, of course, as among any other body of practitioners, the good, bad, and indifferent. But, when all has been said in their praise, it must be admitted that they have distinct limitations.

Possessed of no clinical knowledge of disease, their administrations can only be of an empirical character. Indeed, as I have frequently stated, under existing conditions, electrical treatment is prescribed by medical practitioners who have no knowledge of the remedy that they are prescribing, and the treatment is administered by those who are entirely ignorant of the nature of the disease which they are treating. Moreover, despite his entire ignorance of electrical matters, the medical man frequently prescribes a definite form of electrical treatment, usually "radiant heat," to which the technical assistant is bound to adhere, although her experience may teach her that it is far from being the most suitable form.

Again, the first treatment may be of a tentative character from which we learn the most suitable procedure, and in the course of the case we may have to vary our treatment as the patient progresses; in these respects the masseuse is handicapped by fear of giving offence to the doctor in charge of the case. As Bergonié rightly pointed out, the success of electrical treatment depends upon the spirit which directs and the hand which applies it—in the same way that in a surgical operation the prognosis depends to a large extent upon the technique and the manual skill of the operator. The treatment rooms of these technical assistants engaged in private practice are as a rule very inadequately equipped.

Now, a very curious position has recently arisen. Although the British Medical Association numbers many electrotherapists among its members, the Association is now publishing lists of these mere technical assistants, giving their names and addresses and advising medical men to send their patients to them, at the same time entirely ignoring the claims of its own fully qualified members. Apart from its manifest unfairness, this procedure is having a most serious effect upon the progress of electrotherapy in this country. In the past, most of our most competent electrotherapists were recruited from the ranks of medical men who, after years of experience of the principles of medicine and surgery gained in general practice, were desirous of taking up the specialty of electrotherapy. Now such a course is no longer practicable for financial reasons, owing to the competition of the 9,000 or more members of the Chartered Society to whom medical men are recommended by the British Medical Association to send their patients.

The effect of this regrettable procedure is clearly shown in the attitude of the instrument makers. Before the war, when it was held that electrical treatment should only be administered by medical men, the instrument makers concealed, as much as possible, their dealings with the unqualified, and looked to medical men for advice on the development of their instruments. At the present day, the instrument makers recognize that it is on the technical assistants that they must rely mainly for the sale of their wares, and they turn their attention to the manufacture of the instruments which these assistants have been accustomed to employ at the hospitals at which they were trained, and they devote any inventive genius which they may possess to improvement in the chromium plating or bakelite finish of their apparatus.

Time will not permit me to develop this argument further, but I think that I have said enough to make it plain that

electrical treatment cannot develop fully, nor can its great possibilities be adequately realized under such deplorable conditions. What is the remedy for this unsatisfactory state of affairs, and what will be the future of electrotherapy? I would submit for your discussion the following points.

Future Developments

Neither of these questions, it appears to me, is difficult to answer. The obvious solution clearly is that electrotherapy should be included in the medical curriculum and in the schedules of the various examination boards throughout the country. Michael Faraday, when appearing before a Royal Commission for the Advancement of Science, is stated to have said, "If you want Science, you must begin by creating science teachers." Similarly, if you want scientific electrotherapy, you must begin by creating teachers who will deal with electrotherapy on a physical and physiological basis.

No science or art can develop to its full extent on the lines upon which electrotherapy is practised to-day. As the great Greek philosopher said: "If we wish to master any art, or to gain a scientific knowledge of it, we must study its general principles, and make ourselves acquainted with them in the proper manner." But the mere appointment of teachers would be insufficient. Attendance at a course of lectures on the subject must be made compulsory for students, and they must be made to submit themselves to an examination on the general nature of the treatment and the kind of case likely to be benefited by it before they become fully qualified medical men.

To illustrate the recent growth of electrical treatment and massage may I be allowed to quote from the annual reports of our Oxford Hospital. The number of attendances in 1914, when the department was first opened, was 8,593. The number has steadily increased each year, until last year, 1935, it reached 32,554, compared with 52,823, the aggregate attendance at the thirteen other special departments of the hospital. In 1935, 1,009 patients attended the electrical department and were treated for 120 different diseased conditions, though this classification includes some cross classification. In these days of overcrowding can the medical profession allow a method, so generally called for, to pass from its hands into those of unqualified practitioners? But the more important question is, ought the suffering public to be deprived, as they are so largely at present, of so powerful a remedy which strikes directly at the basis of the trouble and in many cases produces a cure in a few days of conditions which have resisted for weeks or months the indirect action of drugs, liniments, and ointments?

Electrical treatment is another instance of a fact which is often mentioned, that in many respects the poor at the present time are better off than the well-to-do. The poor and needy can always resort to our modern and well-equipped hospitals, and there receive the most recently developed treatment and the benefit of the most recent appliances.

Nearly every branch of medical practice is tending steadily towards specialization and institutional treatment. In no branch is the need for institutional treatment more evident than in that of electrotherapy. The reason for this is twofold: (1) the very high cost of adequate equipment, and (2) the time occupied by the treatments. In the future, it will only be the large clinics and hospital departments that can afford to install a complete or even adequate equipment. The interests of patients, medical practitioners, and technical assistants alike will be best achieved by such a plan. Whole-time medical men, with adequate salaries, will be required to order and supervise the treatments, and many technical assistants will be needed to

administer the treatments under the direction and supervision of these qualified specialists. The cost of such treatments will be only one-tenth that of those administered in private practices, and will be often ten times as efficient.

It is thus that I forecast the future of electrotherapy. Golding Bird said, "Electricity has been by no means fairly treated," but I am confident that, as we become more fully acquainted with Nature's basic principles in health and disease, so we shall tend more and more to utilize her most fundamental, powerful, readily controlled, and most universally called for agent, namely electricity.

"*Naturam expellas furca, tamen usque recurret.*" Attempts have been made in the past to expel electrotherapy with the pitchforks of prejudice, ignorance, indifference, or even of ridicule, but nevertheless this form of treatment has always returned with renewed vigour. At the present time it occupies a firmer position in the healing art than ever before in its 200 years of history. Its future, however, rests very largely in the hands of those who direct medical education and research.

REDUCTION OF SICK WASTAGE AFTER ATHLETIC INJURIES

BY

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In the care of sports injuries, unnecessarily prolonged sick wastage and expense to the patient will continue until the treatment of injured muscles and joints is put on the same functional basis as the modern (Böhler) methods for the treatment of broken bones. Practically all injuries to muscles and ligaments—for example, "pooped" thighs, sprained ankles, etc.—thrive best on firm support and immediate use, even where this involves weight-bearing. I have proved this in seventeen years' practice amongst undergraduates whose athletic ambitions demand a return to the competitive arena in the shortest possible time. Indeed, with the co-operation of a pioneer patient, it was discovered some four years ago that even the knee-joint, hitherto sacrosanct when afflicted with severe traumatic synovitis, really benefits equally strikingly by application of these principles. Thus, one patient gained his rugger blue within fourteen days of sustaining a "ballooned" knee-joint; other cases have responded equally well to this treatment.¹ Correct treatment promptly carried out will:

1. Shorten sick wastage.
2. Obviate many of the indications for massage and other forms of physiotherapy.
3. Avoid the atony and atrophy of disuse, and keep the patient in comparative training, so important for early competition.
4. Maintain his general health and morale on a much higher plane.

Böhler's Methods

In treating injuries of bone, the essential features responsible for Böhler's success are:

1. Accurate reduction.
2. Complete immobilization of the fractured fragments by non-padded plaster splints until union has occurred.
3. Natural use of the injured part—for example, weight-bearing where possible—from the beginning.

Considerable experience in fracture work is necessary for the assurance of uniformly good results and the avoidance of risks in the early stages, when much swelling is present.

¹ *Injuries of Athletes*, by R. Salisbury Woods; *Modern Treatment*, vol. ii, edited by C. P. G. Wakeley.

When revisiting Mr. K. H. Pridie's fracture clinic at Bristol recently, I was fortunate enough to see a pregnant woman brought in at full term from a street accident with comminuted fractures of the tibia and fibula. She refused admission as she was anxious to return to her own accoucheur at Cheddar. The fractures were forthwith reduced, immobilized by suitable light plaster-of-Paris splinting, the toes being free to move; and she was sent home in comfort for her imminent confinement. Contrast this with the agony and clumsy impediment of the old "back splint and foot-piece," which would have allowed considerable movement of the fragments in the course of labour.

As another graphic instance, mention may be made of a 12-stone Cambridge resident, aged 29, who broke her leg by torsion while skating last February.

There were six oblique spiral fragments in the middle third of the tibia, one piercing the skin and causing external haemorrhage; the fibula was also fractured in its upper third. The skin edges were excised under novocain, and "primary suture" carried out. The fractures were reduced by manual traction, and the leg was "put up" in a non-padded plaster splint with a "window" for the wound. The latter healed by first intention, but the position of the fragments was imperfect, and, moreover, it was desirable to make ambulatory treatment possible. Therefore, under a general anaesthetic the leg was suspended in a Böhler extension frame, and traction up to 45 lb. exerted from an ice-tong calliper gripping the os calcis. Two stout transfixion pins were then bored through the tibia just above the ankle-joint and below the tibial tubercle respectively, and left with their ends projecting. The traction (and thereby the reposition of the fragments) being maintained, the limb was now stoutly encased in a non-padded plaster splint in the ordinary way, from the sole to the mid-thigh. The pins were thus embedded in an irregular cylinder of rigid plaster, which made approximation and "telescoping" of the oblique fragments impossible. A walking stirrup was applied, and *two days later the patient bore weight and walked three times round her bed with sticks*. In four days she was able to walk about thirty yards thrice daily, and she left the nursing home in six days. Meanwhile, she had been made to move her toes, to contract her quadriceps femoris, and to carry out "rowing exercises" regularly. She never used crutches at all. The splint and pins were removed after eight weeks, and an ordinary plaster splint was reapplied for a further fortnight, during which time she was walking about two miles a day. When this splint was finally removed and an "Elastoplast" "puttee" substituted she walked with confidence, no pain, and *no oedema*. Moreover, she has full, free, and painless movement of the knee-joints and ankle-joints, and, of course, no shortening.

It may fairly be claimed that Böhler's principles saved her about ten weeks in bed, an incalculable degree of disuse atrophy of her muscles, prolonged sick wastage and tedious training back to proper strength, and a staggering bill for months of massage, which her own function obviated almost entirely, for oedema disappeared in a few days on carrying the "Elastoplast" "puttee" well above the knee.

It is also probable that the essential object of any treatment—namely, a perfect result—would not have been achieved in a limb so severely injured except by using Böhler's technique of screw traction and absolute retention of the accurately reduced fragments.

Permanent Disability

Anyone interested in fracture work must be appalled from time to time by the cases he sees in which the fragments have never been properly reduced, and where after prolonged disuse and long-continued massage a high percentage of permanent disability results.

The following is perhaps an extreme, but is nevertheless a true example of a report upon a man who had sustained comminuted fractures of the tibia and fibula.