

MODIFICATION OF THE REGULATION ARMY STEEL HELMET AND BOOTS.

BY K. VERNON BAILEY, M.C., M.D., M.R.C.P., F.R.C.O.G.,
LATE CAPTAIN, R.A.M.C.

SINCE the War 1914-18 I have pondered this matter with constant interest. As an officer in the line I saw enough during those days to instil into me the beliefs and convictions which I now endeavour to present. In writing of them my mind is constantly carried back to those incidents which engendered these beliefs and from which my facts are derived. Such incidents have remained steadfastly in my memory—as when during the winter of 1917 too many of the highly-trained men of my battery were lost as the result of leg and foot disability and some by head wounds below the rim of the helmet. Apart from the published facts it is obvious that the minor but none the less vital details mentioned later must also have been the experience of very many others and, now that one phase at any rate of the present war is to be enacted under similar conditions, I make this my reason for the presentation of views thus acquired.

In the main I have set out to show :—

(1) That the equipment of our fighting forces—in respect of the head and foot gear—is not only definitely inferior to that of their opponents, but is lacking sufficiently in general adequacy as to represent a direct menace to the efficiency of our armies.

(2) That this lack of adequacy can be rapidly and easily remedied—even in time of war—by simple alterations to the existing equipment. Entirely new equipment is not necessary.

That there is no reason for our troops to be equipped with anything but the best goes without saying, particularly so when anyone laying claim to experience in war will admit that only by allowing to our men every possible facility can they be expected to cope with the highly organized and efficient enemy they have to face.

A. THE STEEL HELMET.

The regulation steel helmet as worn by our troops to-day is identical with that which first made its appearance some twenty-four years ago, except with regard to an improved interior fitting. In the beginning it was produced as a "shrapnel helmet" for head protection against shrapnel directed downwards from above. During the years that have intervened no improvement has been effected in this form of head-gear, which was notorious to those who wore it on active service as uncomfortable—a headache-producer—difficult to control and interfering with efficiency as well as lacking in adequacy with regard to its qualities of protection.

(1) *Comfort*.—Naturally at the time of its inception and for the years during which it was worn on active service it was accepted as being more protective than the regulation soft service hat, and as time went on a degree of tolerance was developed towards it by most—assisted by practice in the art of wearing it at various angles (or wearing it as little as possible). Ultimately one's head appeared to fit more accurately or vice versa, as one became gradually used to the chronic discomfort it produced. To-day this is perhaps the least of the criticisms which I have to advance with regard to the steel helmet. The improved internal fitting certainly solves this problem to some extent. No longer has the art of balance to be acquired by the soldier in order to keep his helmet in place—that is to say when he is in the upright position. Nevertheless there is no doubt that even with the new type the *balance* due to the shallowness and flat shape is incorrect, with the result that time alone (and not even that in many instances) will accustom the wearer to the belief that he is not being called upon to balance a pile of plates on his head. The modern fitting also does much in taking the weight of the helmet from the vault of the skull. It does much but not everything. In the old type, of course, the whole weight was borne by the top of the head as the original internal fitting soon failed to grip the sides of the head, and many there were who never became accustomed to the consequent headache produced by wearing this helmet for hours on end. The flared shape, however, throws the whole weight on to the fitting itself, which eventually will ease sufficiently to bring about the old state of affairs. A fitting which is loose to begin with will accelerate this.

These details definitely mitigate against the comfort of the helmet even when worn under the best conditions and, as I shall again mention later, there is no doubt that the actual *comfort* of the head-wear of the troops is of vital importance to their efficiency. This detail directly influences not only their tempers but their endurance on parade and on the march, and particularly their fighting ability. No soldier can give of his best if he has even to *think* about his head-gear.

(2) *Adequacy of Protection*.—In this respect the regulation helmet leaves much to be desired. As I have said, it was devised primarily for protection against shrapnel sprayed from above. There is no doubt that it should be so designed as to give at least some protection from splinters or bullets reaching the head from a lateral direction or from below upwards. Much more frequent than shrapnel from above in modern warfare are nearby bursting shells at ground level. These send splinters and debris upwards. Machine-gun and rifle bullets proceed more or less laterally to the target. Protection from glancing blows in both these respects is lacking. The shallow flared shape gives little or no protection to the sides of the head and base of the skull. The umbrella effect of this shape is quite unnecessary to the further protection of the top of the head. In fact it is just the shape which produces unwieldiness. The flanged edges are considerably more of a danger than a protection as besides contributing to a lack of balance they

make for dislodgement of the helmet when struck. The rim as at present constructed even has a tendency to deflect splinters which strike it downwards to the face and neck. On many occasions I have seen men killed or wounded by bullets or shell fragments piercing the skull in the exposed temporal and occipital regions by entering below the flanged edges. Expecially are these regions exposed in many cases by the habit commonly acquired of wearing the helmet at an angle to one side of the head. Therein lies one of its chief disadvantages in so far as the tendency must naturally exist for *comfort's* sake when wearing a shallow flat type of hat. The analogy is universally seen in civilian head-wear of the flat type. I consider it essential that the helmet should give adequate protection to the vault, sides and base of the skull equally. Without this the soldier enters the combat at a 50 per cent disadvantage to the enemy.

(3) *Interference with Efficiency.*—From what has been said above the interference with fighting efficiency in consequence of wearing an uncomfortable and ill-protecting helmet is obvious. From the practical point of view the lack of close fit of the helmet with its liability to dislodgment (even with the new internal fitting) is a definite handicap to the mobility of the soldier. Advancing to the attack, in the dark over rough ground, falling into shell-holes, jumping into and out of trenches, running, dropping flat and getting up dozens of times, colliding, being jarred and knocked over—all in full battle kit with both hands occupied—calls for a head-gear which will stick under all conditions and in all circumstances close to the head of its wearer.

The flanged edges of the helmet strike the edges of a trench or other obstacle in advance of the head and the helmet is knocked off if the chin-strap is carried at the back of the head or uncomfortably dislodged if the strap is under the chin. In which case it has either to be found again (in the dark), done without, or readjusted. In any case the soldier's mind is taken off his job. In this connexion I remember many occasions where men preferred their soft hat for use in night raids or attacks for these reasons. From this point of view also it is essential that the side of the helmet should fit closely to the head. It is essential that a man should feel full and complete *control* over his helmet. It should be as much a part of his head as a glove is of the hand. Only by this knowledge will the man feel that degree of safe comfort and confidence which is essential to his freedom of movement and consequent efficiency.

One cannot overstress the *psychological effect* in action which can be exerted by the soldier's helmet. If it has the right "feel" and he knows that it will stay with him whatever he does in the way of acrobatics during those moments in which all his concentration and nerve are required elsewhere he will not have to think about it and he will be able to produce his best. Alternatively his *morale* will be adversely affected as the result of an uncomfortable uncovered or bruised head at the time when it is necessary for this morale to be at its highest.

(4) *Appearance*.—Whilst perhaps not entirely axiomatic—"What looks right is right"—can usually be taken as representing sound judgment in the assessment of mechanical efficiency. In this respect one has only to encounter any familiar figure in civilian dress wearing a regulation steel helmet to notice immediately the detraction from that particular person's standard of appearance. Nor does this detraction owe itself merely to the strangeness of the head-gear, but rather to the fact that a suggestion of bizarre discomfort is conveyed which produces a faint incongruity of effect derogatory in turn to the personality, smartness, and military appearance of the wearer. This effect is strikingly observed in those instances in which the helmet is worn with civilian clothes. Now a Service helmet should not detract from the military personality of the wearer. On the contrary, it should add to it if possible. The German helmet certainly does this. I feel quite sure that much of the terror of the Gestapo would be removed if its members could be persuaded to wear our steel helmet. When worn in conjunction with Service uniform the effect is not so bad, but it is far from good. The flat shape prevents the helmet from being always worn straight on the top of the head. The British face and features are not sufficiently oriental to deal with the San Pan. The result is that a soldier soon "trains" his helmet to accommodate itself to a particular angle which suits himself. This angle is by no means uniform. On parade a line of men will sometimes exhibit a variety of angles of helmet. The result does not make for smartness or soldierly appearance. It makes for sloppiness and irregularity and, notwithstanding the fact that the helmet is essentially an active service head-gear, these effects should not be condoned. It is essential from the point of view of appearance that the helmet should be worn centrally over the head. The British helmet does not lend itself to wear in this way. This is bad from a disciplinary point of view and in this respect will hamper the training of recruits to the new armies. Moreover, the British helmet gives the impression of a temporary unfinished product which does not do justice to the appearance of our men. Again from a military point of view, the qualities of strength and fierceness calculated to instil fear into the enemy are detracted from by its use. There is no doubt that this is a big factor in the attack, and anything which helps in this way in relation to equipment should receive very careful attention. The enemy sees the heads of the approaching attackers—psychologically he is influenced thereby. It is essential that he should be influenced in our favour—or at any rate not the reverse.

A friend recently described a lacrosse match in which he was playing against a team who were largely equipped with a well-known type of American head protection. His comment was to the effect that these players appeared to "put the wind up" the opposition successfully.

In the same way there is no doubt that most continental helmets succeed in conveying this effect to some extent, and certainly a line of advancing German troops *looks* more formidable than it would do if dressed in the British helmet.

In the time to come it appears that this country will have to train large numbers of men to bear arms. These men, unused as they are to any previous military training or discipline, have to be made to *look* like soldiers. Their head-wear is an essential factor to this end. The present helmet does not help them to either look or feel like soldiers. It is not necessary or suggested that the German helmet should be copied. Individuality and distinctiveness must be preserved, particularly for ease of identification, but by comparison with any continental type it is poor. Developed during an emergency a quarter of a century ago, no notable improvement has been effected since. Its use is a handicap to the troops who wear it. There is no necessity for this handicap and our Army should not have to bear the burden of it.

ALTERATION TO THE HELMET.

With the above consideration in view I have had straightforward alterations carried out to the regulation helmet which I believe give the results aimed at.

The main reason for this presentation of my views is the fact that these results can be obtained by alteration alone and that completely new models are not necessary. From the practical point of view, therefore, it would be possible without undue difficulty to alter the existing stocks of these equipments before issue and to recall already issued stocks in batches for alteration and re-issue. After the requisite die is made for the helmet and the leather extensions manufactured for the boots, the change could be quickly effected without upsetting the rhythm of manufacture.

I would not suggest that the British should directly copy any one of the continental types. Indeed, as far as the helmet is concerned there is so little difference between these types wherein to effect another possessing a distinctiveness of its own that almost any modification is apt to encroach to some extent upon one or the other. Nevertheless, I consider that the helmet as modified possesses individual features of sufficient number and importance to render it distinct. If the effect is inclined rather more to the continental type I would nevertheless assert that it is in no way an admission of direct copy if a modification is effected which is obviously aimed at fuller protection and adequacy, even if these factors have already received greater consideration by the more military continental nations.

I have had the following alteration carried out to a Service helmet :—

The posterior half of the circumference of the brim is bent downwards so as to form practically a continuous line with the lower part of the dome of the helmet. This is not quite possible on account of the diminution of the circumference of the actual outer rim. The effect is a slight flair only of the brim when bent down. The brim at the sides is bent vertically downwards so as to present a flat aspect at the sides of the head. This flattened area runs smoothly into the posterior rounded portion. The



Regulation and Modified Helmets, side view. Protection of the temporal regions of the head. The improved appearance is apparent.



Regulation and Modified Helmets, front view. The closer lateral fit, protection and neatness of the modified form is apparent. The improvement in the "balance" is shown.

brim at the front of the helmet is unaltered and merges at its lateral angles with the anterior parts of the flattened side-pieces.

The resulting helmet, with its increased depth affecting the posterior two-thirds of the circumference, is still sufficiently distinctive. It remains much shallower than the German type—of which it has not the high dome, the wide flanged brim, or the cut-away and shaped sides. It is also distinct from the French, Polish, Dutch, or Belgian types.

The protective effect is to give approximately a further inch of "covering" to the base of the skull and neck and one and a half inches to the temporal regions of the skull and upper aspects of the face. Apart from this the modified shape mitigates against deflection downwards on to the face, neck, and shoulders of splinters striking the helmet obliquely—a danger which I consider is definitely present in the regulation type. The modified shape also gives much-improved protection to the face and neck from rain and wind—a factor of importance as anyone with experience of marching in heavy rain will agree. In general the improvement in the effect of military smartness, competence, and protection is demonstrated by the comparative photographs. The improvement in the psychological and moral effect to the wearer must vary directly as these factors.

B. THE BOOTS.

Much has been written during the last few years about the mechanization of our Army. Much also about the fact that the men will be carried from one battle zone to another by means of mechanized transport and that no longer will they need to "foot-slog" as in the days of old. I am quite sure, however, that the Army commanders know full well that the ability of the infantry to effect forced marches may be put to the test in this war equally as much as in the last. In this connexion one learns of marches of over 30 miles per day by the highly mechanized German forces in the Polish campaign. The famed marching ability of the German infantry is due not only to the physique of the men and their training, but to the relative efficiency of their foot-wear, which combines comfort with protection and freedom of action to the leg.

(1) *Constriction of the Leg.*—Most British infantry officers with experience in the last war will remember the "casualties" on the march produced as the result of the boot-and-puttee combination. The top of the boot frequently caused a chronic "fridge" at the front of the foot—unless it were left so loosely tied as to not only look extremely untidy, but to be incapable of control by the lower end of the puttee. More than this, the constriction of the calf brought about by the puttee inevitably caused muscular cramp which ultimately forced men out of the ranks.

Where marching ability or freedom of action is necessary, it is essential to so clothe the leg as to leave free play for the constant contraction and relaxation of the muscles of the calf and shin. Any leg-wear which constricts not only negatives efficiency in this way, but in the long run produces a

chronic dilatation of the veins of the foot and lower part of the leg which renders the soldier a permanent casualty. How many cases of varicosity of this type were produced during the last war is a fact which was then well appreciated, but one from which we have failed to derive a lesson.

Some modification in the puttee has certainly been made. The short gaiter has made its appearance in conjunction with the "battle dress." This apparently is not uniform, and the half-puttee as well as full puttee are still much in evidence with the regulation trouser. In fact, from the photographic evidence one occasionally sees troops on the march dressed with a lack of uniformity in this way.

Each gaiter is fastened by two straps with metal buckles. These buckles are exposed, so that ultimately they will be rendered unserviceable and even dangerous by rust and corrosion. As regulation equipment the gaiters are not without obvious disadvantages. The mechanics of buckles is such as to be incapable of withstanding the constant rough usage to which they must be subjected. The breaking of one buckle only means that one gaiter cannot be satisfactorily used and that the pair may thus be lost to the soldier until replacement can be effected.

(2) *Protection against Damp and Cold.*—The main danger, however, in the boot-cum-puttee or "battle" dress as foot and leg wear, is the effect of chronic damp. One fact irrefutably stands out, and that is that in spite of all mechanization and the presence of permanent fortifications, the fighting troops are sure to encounter *mud*. Indeed, at the time of writing it has already arrived following the first rains, and now that our men have to live in it the full handicap of the boot and puttee as well as the "battle" dress with gaiter will be understood. The massive casualties produced by the effect of the mud alone in the last war are still to be remembered. The full puttee kept a certain amount of damp out for a short time. After becoming soaked it contracted on the leg, and unless it could be regularly removed and dried—which was not the case—varicose veins, rheumatism, and "trench feet" were the inevitable results. To those with experience of the Ypres Salient, the losses from these causes were as devastating and dangerous to the morale as those produced directly by the enemy. The "battle" dress with gaiter or short puttee will afford even less protection. The lower end of the trouser will remain soaked and will become caked with mud which will infiltrate through the top of the boot to the foot inside. The efficiency, the health, and the morale of the troops thus affected are destroyed.

To combat this extreme danger it is essential that the foot and leg be uniformly protected as far as possible from damp and cold and that there should be no constriction of the leg itself. A leg wrapped tightly to the knee by a cloth puttee has no protection from continuous damp and cold. In fact this is the way to ensure that the more distal part of the limb, viz. the foot, will become as embarrassed as possible by cooling the arterial circulation to it. This fact, in conjunction with the effect of wet, produces that form of localized gangrene associated with "trench feet."

The protection under these conditions given by the gaiter is inadequate, as it is not sufficiently a part of the boot at the instep and does not cover the leg to a sufficient height. Nor does the gumboot answer the question of adequate protection against damp and cold. The rubber gumboot causes the foot to "sweat" owing to imperfect ventilation, and this fact, coupled with the ineffectiveness of relatively thin rubber in keeping out the cold, results in a footwear which may be useful for short spells of duty in trench warfare, but which is obviously unhealthy and uncomfortable for continuous use. The gumboot therefore must be restricted for use in front-line positions. It is of course useless for marching purposes. As I have said, not only do these forms strongly mitigate against efficiency in marching, but also against protection in resting or working under wet conditions. Moreover, the consequences produced are largely permanent. The men involved become permanent casualties from the active view-point and large numbers are crippled for life.

One can go further and say that the puttee was first universally produced for use by the British Army as a protection against snake-bite and sand-flies in the Boer War. Even then it was recognized as bad wear for marching purposes. Since then it has extraordinarily enough persisted through a European War of four years' duration notwithstanding the disasters consequent upon its use.

The puttee—in full or half—or gaiter may be comfortable and fairly smart for wear on parade, and may be adequate enough for training at home under ordinary conditions where marching is controlled and warm barracks with a change of clothes greets the end of the day, but as equipment for constant use under all conditions of continental warfare it is a definite handicap and menace to the efficiency and lives of the men who have to wear it.

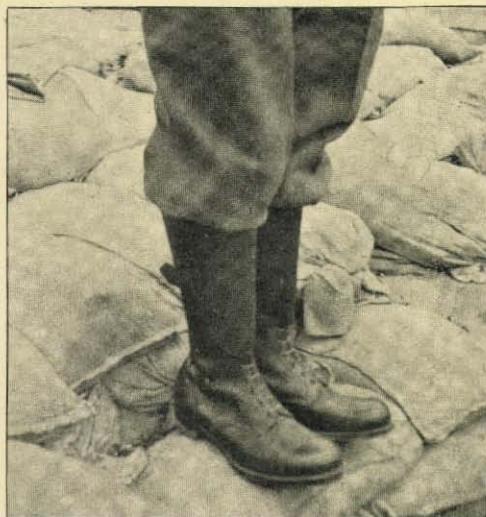
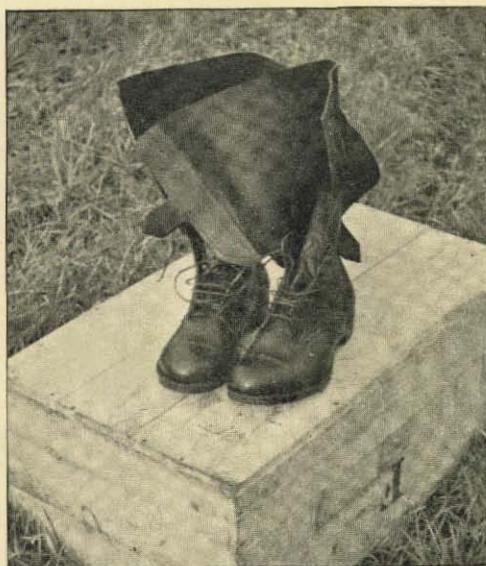
ALTERATION TO THE BOOTS.

I consider that these should be modified: (1) To relieve all constriction of the limb itself—to allow free action to the muscles and freedom of circulation; and (2) to give as good a protection as possible under wet conditions, especially that type of wet associated with constant contact with mud. Here again we must maintain individuality, and I consider that in its details and appearance this modification differs essentially and sufficiently from any other type.

I have had the following alterations with additions carried out to the regulation Army boot:—

An extension of the same type and strength of leather as that of which the boot itself is made, is sewn to its upper margin. This extension covers the leg to the level of the upper bend of the calf. The inner aspect is carried round as a flap to the outer side of the leg and is fixed neatly over and to its counterpart by a single leather "strap" fixture which fits firmly through a strong surface slot made from the same material as the latter. The upper

and lower edges of the outer flap are cut on the straight and the line of the flap is vertical. The effect, therefore, is not that of a legging but of a flap-



Modified Army boot, "heavy" pattern. Leather extension 9" in length. Single reinforced strap and slot fastening. Reinforced inner flap. Extended tongue. Smart, protective and weatherproof. One-piece and easily adjusted and removed.

over extension to the boot of strict military appearance. The tongue of the boot is elongated and affixed to the level of the instep to maintain waterproof quality.

The result of this alteration is to provide a weatherproof covering to the foot and leg up to the top of the calf. The construction of the leather flaps at the instep, together with the affixed tongue, renders the boot waterproof at this vital point. The height of the extension, whilst providing complete protection, is not so high as to prevent free access of air to the limb and at the same time maintains an optimum weight and balance of freedom in marching and manœuvre. The additional weight of the extension is negligible. The foot is easily put into or pulled out of the boot when the laces are loosened. The ends of the laces are readily concealed beneath the extension and the over-riding flap is rapidly secured by the single "strap" fixture which, owing to the relative pliability of the leather used, has no tendency to loosen itself. This fixture may be pulled tight for neatness on parade. On the other hand, for comfort on the march and so as to allow ease of action to the leg muscles, the "strap" can be partly pulled through the "slot," thus loosening the whole extension without in any way mitigating against the appearance.

The fact that the lower part of the boot is laced in the ordinary way makes for firmness in heavy going—a point which is troublesome in the jackboot or gumboot, and the fact that the whole structure is of stout leather makes for warmth in cold conditions (long socks can be worn) and adequate ventilation under hot conditions—points which again are not covered by those types.

An alternative model has also been prepared which differs in two respects only: (1) The extension is $\frac{3}{4}$ inch less in length, and (2) "twin" strap fastenings are used—one $1\frac{3}{4}$ inches from the lower end and the other 1 inch from the upper end of the extension. Perhaps this may be considered firmer and lighter, but in principle it differs in no way from the former type.

In contrast to the use of puttees or gaiters the protection against wet which this boot gives to the lower end of the trousers is of great importance, particularly where men have only one pair of trousers issued or available. In this respect, therefore, the boot effects an economy.

The modified boot is quickly and easily put on and taken off. It is in one piece—therefore speedily found under emergency conditions or in the dark. This cannot be said of the boot-cum-puttee or gaiter combination, parts of which are easily mislaid in billets or dug-out, particularly when emergency intervenes. The modified boot, apart from being more rapidly adjusted, is also more easily and rapidly removed. This is of great importance following a wound, especially in that part of the leg clothed by the boot. The soldier himself can, without effort, remove the whole covering to the leg. The danger which is present with the puttee—namely the carrying into the wound of the dirty or muddy cloth which is tightly wrapped round it with the consequent contamination—is also negated.

The modified Army boot is thus comfortable, weatherproof, and can be made waterproof by the use of dubbin or other oil to the extension. It also provides much greater protection against obstacles such as barbed wire than does the standard equipment. Its essential features make it an improvement on the German form. It represents efficiency in military leg-wear.

CONCLUSION.

My object in presenting this dissertation is based upon my belief that nothing short of every possible facility should be afforded to those many thousands of men who in the months or years to come will be transferred from one form of living to a diametrically opposed form under which they will be expected at all times to produce their utmost efficiency.

My views are, of course, deduced from experience of the last war. During that time the infantry spent the years in conditions and situations as dictated by the current state of the campaign. If the present war on land develops, such a state is again likely to become established. Even pending this stage, however, the troops have to maintain a constant existence under conditions which may approximate in great degree to the more exacting ones of active warfare.

If these modifications in the essential and vital equipment of our fighting troops were accepted by the War Office, it would not be a matter of too-great difficulty, even under the present war conditions, to alter existing stocks and to recall equipment in stages for alteration and re-issue. Moreover, the cost of these alterations and additions is relatively little.

From my own experience I can well imagine the relief with which the re-issue would be received by the men directly concerned, as well as the approval of the officers who command them.

Without bias, I am convinced that not only would these modifications, if adopted, be directly and indirectly the means of saving many lives and much suffering, but also, as the result of that feeling of being efficiently equipped, would tend to bring a heightened morale to our troops generally.