AMBULANCE WAGON. "MARK I. (LIGHT.)"

By Captain A. R. Tweedie.

Royal Army Medical Corps (T.).

The fact that at least three patterns of ambulance wagon are now being used in the Service affords sufficient reason to assume that no ideal type has yet been attained, which supposition, if admitted, is urged as adequate apology for this article.

Not that it is proposed to write any wholesale condemnation of all existing patterns, or to completely ignore all previous attempts towards the best and most comfortable transport of sick in the field, but rather, by a process of elimination, based on this previous experience, to point out that pattern along whose lines all further improvement should proceed.

As a preliminary proposition, everyone will, of course, readily concede that ceteris paribus the lighter vehicle should always be preferred to the heavier form of conveyance, on grounds of general economy; from the point of view of horse-flesh, at least, the more the load can be reduced compatible with efficiency, the more mobile the transport obviously becomes, and, next to the immediate comfort of the sick, mobility should certainly form the keynote of all attempts towards improvement, more especially when mounted troops have to be served.

No one who served in South Africa can have failed to notice (if he did not, indeed, actually experience) the cumbersome ambulance wagon then in use, the large drain on transport animals which its traction entailed, or the series of successive jerks with which, at the phlegmatic, though assertive, "Hek" of the Kaffir driver, the reluctant team discordantly "took the strain," and the lumbering conveyance eventually got under way, with a lurch which brought many a shudder to the more fortunate onlooker with visions in his mind of enteric ulceration perilously near perforation, of compound fractured femora, and of the various gun-shot wounds of the thorax and abdomen; it must, indeed, have caused many an unnecessary spasm of pain, if nothing worse, to the unfortunate occupants within.

Quite apart from any further modifications, which I think, however, would very considerably enhance its present value, I consider that "Mark I. (Light)" Ambulance Wagon is far superior to the other forms, and is the pattern which should be exclusively adopted and elaborated as found convenient; and this for many reasons, amongst which I would especially mention:—
That only two horses are necessary, as compared with either four or six in the heavier patterns.

That thus two horses are sufficient to transport eight men, whereas in the heavier wagons four horses, at least, are considered necessary for a load of only twelve men.

That its road space is only some 23 feet as against from 40 to 50 feet required with the heavier patterns and their teams.

That the facility with which a team can be uniformly brought into draught varies indirectly with its numbers—a pair of horses can be more easily started or halted together than four or six.

That similarly the smaller the team, the easier it is to manoeuvre the wagon, and where the "illimitable veldt" is not always available, this factor becomes of very considerable importance.

That one pattern of wagon would economise repair-equipment, and with one standard size and interchangeable parts the maximum amount of use could be made of partially damaged wagons.

For these main reasons "Mark I. (Light)" seems to far surpass the heavier forms; it is somewhat difficult to understand why any heavy wagon should have been devised since in civilised warfare the Geneva Convention obviates the necessity of anything approaching "a hospital on wheels," whilst under other circumstances the nature of the ground would probably prohibit the use of a more cumbersome conveyance, which besides creates a much greater demand on transport animals.

Three main postulates, I consider, should be kept in view in the elaboration of the ideal ambulance wagon, in addition to the various other details in respect of economy of space, weight, &c., which experience has taught to be practicable, and the carriage of sick in time of war demands.

The first of these—though they are all, perhaps, of equal importance—is that the wagon should be furnished with four wheels of as large a diameter as possible, and of equal size. From a fairly large experience of travelling on uneven ground, I am sure that under such conditions conveyance over rough country is rendered more easy than if the wheels are small and unequal in size. This requirement has already been carried into effect in "Mark I. (Light)."

The second object to be aimed at is to obtain as long a wheel-base as possible. This must always bear some constant proportion to the space necessary to accommodate a stretcher, plus what is required for the driver's seat, so that a certain maximal figure obtains for this item, any increase of which means some unnecessary
utilisation of material. Now, the length of the wheel-base in all
three patterns is approximately the same, viz., 90 inches ("Mark
VI." has 95 inches), but it would seem possible, in the case of the
light wagon, to increase this one foot by setting the rear axle farther
back, and, if required, furnishing additional support by inserting a
third spring between the forepart of the body and the rod con­
necting the two axles, just to the rear of the rollers on which the
fore-wheels engage when turning.

The third point is the value of the springs. This also must
bear a certain proportion to the maximal load, and from this
follows an extremely important corollary—viz., that the springs
must become of less and less value the more the wagon load is
decreased.

Now, "Mark V." and "Mark VI." accommodate twelve sitting,
or four lying down—that is, the springs must be up to the weight of
twelve men; thus it results that when carrying four lying cases,
only one-third of the load necessary to bring them into action is
available, so that then their value is very considerably reduced, and
just at that very time when it is most required, as presumably the
four lying-down cases will be more serious than those able to sit up.

Such a discrepancy at present occurs in all forms of wagon,
since lying-down cases require more floor space than those sitting
up; and, indeed, these conditions obtain in "Mark I. (Light)";
but it would appear perfectly easy to reduce the disproportion in
this case by at least one-half. This could be effected by furnishing
accommodation for two extra lying-down cases—that is, four in all—
in a manner similar to that adopted in the heavier wagons—namely,
by the provision of rails above the seats, which could be lowered
to support two extra stretchers above those on the floor; and I
would claim that besides the obvious extra utility, a considerable
gain in comfort for the patients would thereby be obtained.

In, addition, with a still further modification, the light wagon
could be adapted to accommodate an equal load under almost all
circumstances with varying combinations of lying-down and sitting-
up sick. This might be effected in one of several ways. Thus:—

(a) If the driver's seat were moved forward one foot (see sketch),
a space one foot and a half wide would be provided behind it which
would be ample room for two extra patients, one on each side, who
would sit facing outwards with their feet over the side of the
wagon, and in this way exactly the same total number of patients
could be carried with four lying-down cases inside. (Of course
these two extra seats could be utilised if the wagon were filled
with six sitting-up cases, thus bringing the maximal carrying capacity up to ten; but it might be advisable to regard this accommodation as "emergency seats," bearing in mind the remarks made above as to springs, and to restrict the maximal load to eight. Between these two patients a space about 18 inches square would be left in which patients' kit could be stowed.

This modification would not appear to necessitate any alteration of the under-carriage, but the fore-wheels might be moved forwards another foot if stability were not thereby sacrificed, and thus another foot in length added to the wheel base, which would constitute yet another argument in favour of this suggestion, if my postulate in this respect be admitted. Neither should it bring the footboard of the driving seat too near the quarters of the wheel-horses or affect the road space required or area necessary for turning, and the only material alteration would be in point of weight, an item which should not amount to more than some 50 lb.

(b) An alternative plan by which this extra sitting accommodation might be provided would be obtained by having a movable box-seat which could be shifted forwards when necessary so as to leave sufficient space for two extra patients sitting as above described, behind the driver's seat (in some such manner as the seat can be adjusted in a dog-cart in order to afford sitting accommodation at the back). The driving-box in this case would require very little alteration from the present pattern.

(c) A compromise between these two schemes might be carried out—e.g., by advancing the driver's box 6 inches and making the seat itself movable forwards as well.

(d) Finally, and this would seem to be perhaps the most simple method by which this extra sitting accommodation might be acquired, the existing ledge marked "A B" in the sketch, which is just 6 inches wide, could be extended backwards along the upper border of the back-rest 1 foot and so the requisite space be obtained for a side seat. Some further details as to the interior seats and tilt would then only have to be worked out to fit in with this last plan, but these would not appear to present any very great difficulty. Moreover, the existing pattern could be easily converted in accordance with this last method, and it is this plan by which particularly I would recommend that the extra accommodation should be obtained. The fact that the body is 2 feet narrower than the width of the wagon would allow for the provision of a rest 1 foot wide for the feet of patients occupying these side seats.

To recapitulate, I would suggest some such improvements in the light wagon as follows:
Lengthening the wheel-base as above described.
Furnishing accommodation for two extra stretchers and two extra side "emergency seats" as above described.
Inserting a third spring and support as above described.
Furnishing the cover with extra buckles to enable its forepart to be looped up.
The provision of an adjustable ventilating shutter in the fore-end of the "well" of the wagon.

OUTLINE ELEVATION OF "MARK I. (LIGHT)" AMBULANCE WAGON.
Continuous black line indicates the existing pattern.
Dash dot lines illustrate the modification of the driver's seat, as suggested under (a), (b), and (c).
Dotted lines represent the position and size of the side seat and tilt, as recommended under (d), and also how the hind wheels might be set back.
* Is the position of the extra-spring recommended.

That the method described under suggestion (d) is the best manner in which the main idea should be carried out.

The tables on p. 701 for purposes of ready comparison have been drawn up for me by Serjeant-Major Taylor, R.A.M.C., Instructor to the Notts and Derby Mounted Brigade Field Ambulance, to whom I am also much indebted for many points in the preparation of this article.

This second table has been worked out in order to form an example of the scheme and its resultant advantages. The result of this comparison may be summarised as follows:—
(1) A saving of six drivers and twelve horses with the necessary rations and equipment (but plus six wagon orderlies).

(2) Increased carrying capacity.

(3) Increased mobility and manoeuvring power, also 16 independent units (if required) in lieu of 10, against which must be placed a slight increase—viz., 12 yards of road space occupied in "column of route."

(4) With the wagon modified on the lines mentioned in the foregoing article, the number of patients it is possible to carry is the same in any combination—viz., 8 in each wagon.

Sixteen has been taken above as the probable total number of ambulance vehicles which would be issued to a cavalry ambulance with the adoption of this scheme—that is, the present equipment of four light wagons being retained, and each of the six heavy wagons being supplanted by two of the pattern recommended.

Under these circumstances this unit would be enabled to serve six additional centres at the same time, a very considerable gain in its ability to distribute its strength and a point of no small importance if one reflects for a moment on the mobility of the arm it has to serve, the possible very extended nature of operations and the chances of a number of simultaneous "calls" in different directions.

Indeed, the more one considers the question the greater the superiority of the modified light wagon appears, and under the headings of facility of loading and unloading, time occupied in hooking-in and unhooking, wear and tear to material and initial cost of wagons, gear, and team, a great deal more might be written; but quite enough has been said to accentuate the added value to the Service of this modification if the proposition is otherwise sound.

It is not claimed in any way that the idea has been worked out in detail, as that must be left to the practical wagon-builder, and the rough sketch of the existing type and its proposed alterations are only offered as an outline on which the principles suggested above might be carried out; it remains for a competent designer to say if such a plan is feasible.

If it is, then a brief survey of the tables alone should be amply sufficient to commend the project to serious consideration and to support the main thesis of this argument. That all further efforts in ambulance wagon construction should be developed on the lines of "Mark I. (Light)."
### TABLE OF COMPARISONS.

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Accommodation</th>
<th>Horses allowed</th>
<th>Length with pole</th>
<th>Width maximum</th>
<th>Bed max.</th>
<th>Track</th>
<th>Length with team</th>
<th>Weight</th>
<th>Minimum turning space</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Mark I. (Light)&quot;</td>
<td>2 lying and 2 sitting (a)</td>
<td>8 sitting (b)</td>
<td>1 lying and 5 sitting (c)</td>
<td>2</td>
<td>22ft. 4in.</td>
<td>6ft. 3in.</td>
<td>8ft. 1in.</td>
<td>5ft. 2in.</td>
<td>7 yd.</td>
</tr>
<tr>
<td>&quot;Mark VI.&quot;</td>
<td>4 lying and 3 sitting (a)</td>
<td>15 sitting (a)</td>
<td>2 lying and 9 sitting (a)</td>
<td>6 (c)</td>
<td>23ft. 1in.</td>
<td>7ft. 4in.</td>
<td>11ft. 2in.</td>
<td>6ft. 0in.</td>
<td>16 yd.</td>
</tr>
<tr>
<td>&quot;Mark V.&quot;</td>
<td>4 lying and 2 sitting (a)</td>
<td>8 sitting (a)</td>
<td>1 lying and 7 sitting (b)</td>
<td>4</td>
<td>21ft. 11 in.</td>
<td>6ft. 1 in.</td>
<td>9ft. 2 in.</td>
<td>5ft. 2 in.</td>
<td>11 yd.</td>
</tr>
<tr>
<td>&quot;Mark I. (Light),&quot; modified</td>
<td>4 lying and 4 sitting</td>
<td>8 sitting</td>
<td>1 lying and 7 sitting</td>
<td>2</td>
<td>22ft. 4 in.</td>
<td>6ft. 3 in.</td>
<td>8ft. 9 in.</td>
<td>5ft. 2 in.</td>
<td>7 yd.</td>
</tr>
</tbody>
</table>

* N.B.—Leaders must be unhocked to turn in this space.

[(a) These numbers include patients carried on the box seat.](#)
[(b) The number sitting should read 6—i.e., 4 in the wagon and 2 on the box.](#)
[(c) Only 4 horses are allowed for the heavy ambulance with a Mounted Brigade Field Ambulance.—(Ed.)](#)

### MOUNTED BRIGADE FIELD AMBULANCE AS AT PRESENT EQUIPPED COMPARED WITH SAME UNIT EQUIPPED WITH 16 "MARK I. (LIGHT)" WAGONS.

<table>
<thead>
<tr>
<th>Vehicles</th>
<th>Horses</th>
<th>Drivers</th>
<th>Road space in column of route</th>
<th>Accommodation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>44 (a)</td>
<td>22 (a)</td>
<td>164 yd.</td>
<td>(a) 28 (b) lying and 24 sitting</td>
</tr>
<tr>
<td>16 &quot;Mark I. (Light)&quot;</td>
<td>32</td>
<td>16</td>
<td>176 yd.</td>
<td>32 lying and 32 sitting</td>
</tr>
<tr>
<td>15 &quot;Mark I. (Light)&quot; modified</td>
<td>32</td>
<td>16</td>
<td>176 yd.</td>
<td>64 lying and 64 sitting</td>
</tr>
</tbody>
</table>

[(a) 36 horses and 16 drivers are allowed.](#)
[(b) Should read 32 lying down—i.e., 24 in heavy ambulance wagons and 8 in the light ambulance wagons.—(Ed.)](#)