A manual of saddles and collars, sore backs and sore shoulders / by F. Smith.

MANUAL
OF
SADDLES & SORE BACKS.

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A MANUAL

OF

SADDLES AND COLLARS,

SORE BACKS AND SORE SHOULDERS,

BY

VETERINARY-MAJOR F. SMITH,

Army Veterinary Department.

THIRD EDITION, 1897.

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Price One Shilling.

PREFACE TO THE THIRD EDITION.

Another Edition of this Manual being called for, the opportunity has been taken of embodying the principal points contained in the last Army Order (Oct., 1895) on Saddlery, and of excluding some paragraphs of minor importance which appeared in previous editions.

F. S.

Woolwich,

February, 1897.

PREFACE TO THE SECOND EDITION.

A REVISION of this Manual has been rendered necessary by changes in the system of saddlery employed.

One or two extra sections have been added to the book, an important one being that dealing with Collars and Sore Shoulders.

Though I have endeavoured to render all directions for fitting and altering saddles and collars as clear as possible, yet I must impress upon those determined to master a very simple and most useful subject, that they should carry out practically all that is laid down if they wish to render the information of any value to them in the future.

F. S.

ALDERSHOT,

October, 1893.

INTRODUCTION TO THE FIRST EDITION.

THE subject of saddles and sore backs is such an important one that I have considered the lectures delivered by me on the subject, in this school, might be of more permanent value if printed.

Every officer, non-commissioned officer and man, should be instructed in saddle-fitting, to recognise the various causes of injury, and how to remedy them.

I have divided my subject under four heads:—

The Anatomy and Physiology of the Back.
The Sadde.
Fitting the Saddle.
Sore Backs; how they are caused, prevented, and remedied.

The manual is freely illustrated, but no thorough grasp of the subject can be obtained unless it be studied practically with both saddle and horse. Any experience in the saddler's shop, such as an observant officer could readily obtain, is of the greatest value.

The book is written in almost the same language in which the lectures were delivered.

F. S.

ARMY VETERINARY SCHOOL,
ALDERSHOT,

4th March, 1891.

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SECTION I.

The Anatomy and Physiology of the Horse's Back.

No accurate conception of the fitting of a saddle and the requirements of the horse can be formed, unless we have some knowledge of the structure on which the saddle rests. This section is therefore devoted to a consideration of the anatomy or structure of the back, and the physiology or function of the parts composing it.

Backs vary in shape and size.

The shape of horses' backs will vary as much as the shape of their bodies. There are very few backs of the same make, shape, and size. We once measured 72 horses for their saddles and only found four of this number of exactly the same size.

The size of a back depends upon the size of its bones and muscles, and upon its shape. Some horses are hollow in the back, they rise high at the withers and loins, and are generally broad and hollow over the centre; this breadth is due to the ribs being full and very arched. Others, again, are straight, the withers being low and thick, the outline of the back being like that seen in the mule. Some run very high in the withers, which are lean and razor-shaped, the back rising from the rear of the withers to the loins; others, in opposition to the hollow back, are arched at this part, and such are spoken of as "roach-backed." Some will present a fairly level bed for the saddle to rest on; others are so deficient in chest capacity, and the ribs so narrow and straight, that the backs are shaped more like the roof of a house, there being really little or nothing to sit on. Such conformation is also attended by narrow loins, and forelegs placed close

together. Some horses are very long in the back, and others so short that with a military kit on nothing is to be seen but a head and neck standing out of a sheep-skin in front, and a tail behind. All sizes and shapes are met with, and each requires dealing with on its merits. We need not say that the saddle which fits a horse with low thick withers is not suitable for the one possessing long razor-like withers and the saddle for a roach-back will not fit a hollow back.

Best shape of back.

The most desirable shape for a horse's back is moderate height and leanness of the withers, the back rising slightly from the rear of the withers to the loins, the part wide and flat and increasing in width to the loins, the muscles full and well developed.

The shape of a back is due to the shape of the bones and muscles covering the part, and to these we must now refer.

Structure of the back.

The back is made up of a chain of bones composed of no less than eighteen pieces (Fig. 1), each piece, like the links of a chain, has a limited movement on the bone in front and behind it; to each bone of the back is attached a rib. Growing from the upper part of each bony link is a process or projection, and we observe that the process of each link is of a different

Length.

size; for example, they increase in length from the 1st to the 4th or 5th, from here (the summit of the withers) to the 13th link they rapidly decrease in length and increase in width, and from the 13th to the 18th they are of uniform length. Not only do these projections vary in length, but they do not all assume the same direction. From the 1st to the 12th or 13th they incline backwards, the 13th or 14th is upright, from the 15th to the 18th they incline forwards. The back is arranged in the form of an arch, and the 12th, or in some backs the 13th, bone forms the keystone (Dwyer).* The most important practical point to be learned from the bony projections is *their perfect inability to bear weight;* if any pressure, no matter how slight, be imposed upon them either on their top or sides, they resent it by becoming

* *Seats and Saddles.*

inflamed and the back swollen. This, though a well-known practical point, does not always receive that attention it deserves.

Coming out at almost right angles to the spine are the ribs; as it is indirectly on the ribs the saddle actually rests, it is essential that we should study them somewhat closely.

The ribs form a case called the chest, this case is narrow in front and wide behind. The ribs in front (those situated under the foreleg) are short, straight, wide, and fixed both above into the spine and below into the breast bone; as we pass backwards we find they become more arched, narrower, and flexible, and they are not fixed below into the breast bone, but only attached to each other.

The arching or fulness of the back ribs produces a very remarkable change in size, which can only be appreciated by looking down on a horse as he is being led past with nothing on his back. In no position can it be better seen than from the driver's seat of a London omnibus, as the horses wear no harness other than collar and traces. From this position a careful study of the action of the muscles and parts of the back may be obtained; the use of the loins and the action of the shoulder blades can also be distinctly seen, and to these we will shortly draw attention.

If a vertical section be made through a horse's body just behind the play of the shoulders, it is found that the part is egg-shaped, whilst if the cut passes behind the last rib the section is nearly circular (Fig. 2). The difference in shape is due to the arrangement of the ribs.

If the ribs be carefully examined (and we need only look at the last eleven as the others are concealed from view by the shoulder blades) it is found that those behind the play of the shoulder are wide, comparatively straight, and attached to the breast bone below which affords them great support; their upper surface (which with the spine forms the back) is narrow. As, however, we pass backwards it is found that the ribs have a gradually increasing width of upper surface; the difference between that in front of the loins and that behind the play of the shoulders

being as much as three inches in favour of the former (Fig. 3). On the width of these level surfaces depends the width of the back, and on them rest (indirectly) the side-bars of the saddle.

If we depended upon the flat upper surface of the eighth and ninth ribs (those behind the play of the shoulders), to afford sufficient surface for weight-bearing it would not be enough; here advantage is taken of the ribs being fixed firmly below to impose weight not only on their upper surface but on their side. On the other hand, those ribs under the seat of the rider, and as far back as the commencement of the loins, can only support weight on their upper surface and none on their sides. This is due to the fact that they receive no support from below, and would be bent inwards and seriously interfere with the to-and-fro movement of the back ribs in breathing.

To recapitulate, the side-bar behind the play of the shoulders bears on the top and side of the ribs, whereas, that under the man's seat bears only on the top of the ribs. It is clear, therefore, that the surface of a side-bar is not a perfect plane; the sweep which the bar takes in its course is one-ninth the turn of a screw. In order that this surface of the side-bar may readily adjust itself to the various shapes of back met with, and the variations of each individual back, it would be necessary to have side-bars which by some mechanical means should be self-adjusting.

To revert, however, to the anatomical description of the back. Behind the back (which terminates at the last rib) are found the loins, and it is a remarkable fact that the loins, strong as they are, cannot bear pressure; the reason is that there are no ribs at this part to support the weight; moreover, here we have situated the immense muscles which assist in locomotion, and to sit on these would be to impair their action. Owing also to the increasing width of the animal's body from front to rear, there is a peculiar rolling motion occurring in the loins every time the horse advances its hind legs; this motion can easily be felt in the saddle by placing the hand on the loins; it causes such a side-to-side move-

ment that friction is readily set up, and if anything rests on the skin the part rapidly becomes inflamed and tender.

Filling in the space between the ribs and the spine we have an immense amount of muscle; these muscles help to raise the fore part of the body, and assist in lashing the parts of the spine together and so renders it firm but flexible; moreover, they act the part of a buffer, and prevent the saddle from bruising the ribs beneath. We may speak of this muscle as so much elastic substance, placed there to prevent injury to the dense structures below. When this elastic substance is large in quantity sore backs are infrequent; where it is deficient or wasting sore backs are common. The explanation is obvious.

To complete this rough account of the anatomy of the back, we must describe the position of the blade-bone and the various movements it performs. The blade-bone is the structure which, to a great extent, gives the shape to a horse's shoulder; it lies obliquely on the side of the chest to which it is attached by a large number of muscles; It is a fan-shaped bone, and forms at the lowest part, or handle of the fan, one of the largest joints in the body, viz., the shoulder joint. If a horse be watched walking it is observed that the blade-bone is moving backwards and forwards on the side of the chest; at every movement of the limb this backward and forward motion takes place (Fig. 4). If the shoulder blades are compressed at their upper part near the withers, so as to limit or interfere with their movements, the horse is unable to fully extend his legs, he goes short, he cannot pick his feet up, and is liable to stumble or even to fall.

The movements of the blade-bone.

The lesson we learn from the physiology of the blade-bone, is that both it and its enveloping mass of muscle must not on any account be pressed upon or interferred with, or we risk the safety of the horse and rider. This may be demonstrated by observing the effect of putting a plain saddle on a troop horse which is stumbling from no apparent cause; if it be due to blade-bone pressure the stumbling will gradually but surely disappear as soon as the animal finds its shoulders released.

Blade-bone pressure causes stumbling.

Covering over all the bones and muscles of the back is the skin, a structure which presents certain peculiarities. The most prominent of these is its inability to sustain continuous pressure for any great length of time; the effect of dead continuous pressure on the skin is to cause it to die. The tendency of the skin to die as the result of pressure is a feature common to both the horse and ourselves. A tight bandage or knee-cap will cause the same thing; anything, in fact, which presses the blood for a length of time out of the skin, no matter how limited its area, will cause the part to ulcerate and die.

The most perfectly devised saddle in the world will not admit of a horse carrying crushing weight every day, for hours together, without the skin resenting it, no matter how hard the condition of the animal may be. A better recognition of this fact would save much suffering and inefficiency, and we shall revert to it again.

Distribution of the weight on the limbs.

The last point in the physiology of the back which has to be alluded to is the distribution of the animal's weight on its limbs. The centre of gravity of the horse is ascertained by dropping a vertical line behind the withers, touching the ground five or six inches to the rear of the heels of the fore feet. If this vertical line be intersected by a horizontal one drawn on a level with the point of the shoulder, the place where the lines cross is approximately the centre of gravity. The position of the centre of gravity will vary with the conformation of the horse, but the one indicated is not far from the truth.

Rather more than half the weight of the body is carried on the forelegs; more weight is carried on the forelegs when the head is depressed than when it is raised (which explains the advantage of keeping a stumbler well in hand); from sixty-six to sixty-eight per cent. of the rider's weight is carried on the forelegs. This is the explanation why horses break down more frequently in front than behind. It is obvious that the work the forelegs have to perform is increased by letting men ride on their horse's blade-bones.

It has been said that the weight should be carried

over the forelegs, for it is the natural position in which a jockey places his body in racing. The argument is fallacious. The position assumed by the jockey is not in order to throw his weight forward, but to offer as small a surface as possible to the resistance his body experiences passing rapidly through the air. This view is supported by one of the most celebrated trainers in England, who has told me that if he could put the jockey further back the reduction in cases of "breakdown" would be considerable.

It is right to say that there are other views about the position of the jockey, one being that by leaning forward it enables the rider's body to go in unison with the horse; the other is that it allows of the centre of gravity of the rider being thrown forward, a position apparently necessary in travelling rapidly, as seen in the bicycle rider, but this latter is probably another way of stating the resistance theory just mentioned.

SECTION II.

The Saddle.

Saddle-tree. The saddle-tree is composed of a front and rear arch and side-bars. The front arch is often spoken of as the pommel, the rear arch as the cantle; the side-bars are the two pieces of wood lying on either side of the back to which the arches are securely fixed. The following are the measurements (Fig. 5) of the sizes of saddle found in the service:—

Saddles, Universal.

Sizes.	Angle iron arch.	Steel arch.			Remarks.
		Pattern, 1884.	Pattern 1890.		
			Mark I.	Mark II.	
	Inches.	Inches.	Inches.	Inches.	
0 A to B	—	—	$5\frac{15}{16}$	$5\frac{15}{16}$	The first three saddles have a seat $17\frac{1}{4}$ inches in length; Mark II. of 1890 has a seat $16\frac{1}{4}$ inches in length. 0 size is for Mounted Infantry cobs. The three patterns of steel-arch saddles, viz., 1884, and Mark I, and II, 1890, have high cantles.
0 C to D	—	—	$13\frac{1}{2}$	$13\frac{1}{2}$	
1 A to B	$5\frac{7}{8}$	$5\frac{7}{8}$	$6\frac{1}{8}$	$6\frac{1}{8}$	
1 C to D	$14\frac{1}{2}$	14	14	14	
2 A to B	$6\frac{1}{8}$	$6\frac{1}{8}$	$6\frac{3}{8}$	$6\frac{5}{16}$	
2 C to D	$14\frac{7}{8}$	$14\frac{1}{2}$	$14\frac{1}{2}$	$14\frac{3}{8}$	
3 A to B	$6\frac{3}{8}$	$6\frac{3}{8}$	$6\frac{3}{8}$	$6\frac{1}{2}$	
3 C to D	$15\frac{3}{8}$	15	15	$14\frac{3}{4}$	
4 A to B	$6\frac{5}{8}$	—	—	—	
4 C to D	$15\frac{3}{4}$	—	—	—	

Size of trees.

The number of the size of the tree will in future be marked upon the near side of the front arch.

In the saddlery instructions issued for the guidance of mounted services October, 1895, it is stated that in future manufacture only three sizes of steel arch saddle will be made, the sizes being those of Mark I, 1890, in the above table.

Front arch. *Front arch.*—The material of which a saddle-tree is constructed is wood and metal; angle iron or steel for the arches, wood for the side-bars. The front arch is tested up to about 700 lbs., which, con-

sidering the strain imposed on it, seems a very severe ordeal, but the early metal arches were found to open. The reason why an arch opens is not always fully understood. The explanation is that the front arch of the saddle is placed upon or over a wedge-shaped portion of back, and unless the side-bars on which the arch rests have a perfectly level and even bearing, there is a continuous strain on the arch the whole time the saddle is on the horse, whereas, if the side-bar rests upon a perfectly even bed on the back, the strain on the arch is reduced to a minimum. Moreover, when the front arch has not a level bearing on the back (through the intervention of the side-boards), it is exposed to the strain imposed upon it by the military method of riding, and by the considerable weight carried on it. Saddles too narrow between the side-bars also cause a perpetual strain on the front arch. Finally it suffers through accident, such as a saddle falling off the rack, &c.

Causes of front arch expanding.

The Rear arch.—Changes in the shape and direction of the rear arch are well-nigh impossible, excepting as the result of rough use or accident. The strain imposed upon the rear arch is principally caused by the men sitting too far back, many of them in the low-arched saddle actually sitting on the edge of the arch.

Rear arch.

The distance from front to rear arch measured in the central line of the saddle is at present from $16\frac{3}{4}$ to $17\frac{1}{4}$ inches, according to the pattern of saddle.

The Side Bars are made of beech wood; they are given a certain curve in the making, and that curve with slight modifications, they retain for ever. In other words, it is assumed that the curve given to a side-bar will correspond to all horses' backs.

Side bars.

The careful inspection of fifty backs will satisfy us that the lines on which they are built, though approaching each other, are yet distinct; and in detail they vary considerably. The curves given by the saw indicate roughly the curves of the back, and the saddle-tree maker has to shave the bars down without any reference to the animals they are intended to fit. We might just as well have boots made for us

to wear, for which we are neither measured nor fitted.* This is unavoidable where saddles are made in thousands and issued made up; the point is dwelt on to impress upon officers the necessity of *fitting the tree*, and selecting that size of saddle which approaches nearest to the lines of the back.

The reason why the curves of the side bar should correspond to the curves of the back, is that when these two surfaces do not agree, perfect fit between the saddle-tree and back is not ensured, an uneven bearing will result and injury must follow, not necessarily at once, but immediately the horse is put to severe work with heavy weights up.

We have indicated in our description of the structure of the back where the side-bars should rest, viz., *from behind the play of the shoulder to the last rib;* if the curve of the side-bars corresponds to this surface, no sore backs will result so long as the horse is in condition. When, however, a horse loses flesh his back alters in shape, the muscles become concave, and the side-bars which originally fitted no longer has a level bearing on the back, but a most irregular one. To this condition we will return again.

Where the side-bars should rest.

The greatest desideratum in a military saddle is a self-adjusting side-bar. A self-adjusting saddle is one where side-bars will vary in position according to the amount of condition of the horse; no matter whether the muscles grow large or waste, rise or fall, the same intimate bearing is placed on them by the saddle above, because the bars are no longer rigid but hinged to the tree, and readily adjust themselves to the surface on which they rest. In this way the man's weight instead of being distributed on two or three points to the ruination of the horse's back, is distributed in a perfectly even manner over a large surface. The nearest approach to such a saddle is that brought over from Austria, by the late General Keith Fraser.

* It is no uncommon thing to hear people, when speaking of the shoeing of horses, compare the structure of the foot and action of the shoe to some imaginary parallel condition of the human foot. The comparison is erroneous; the nearest parallel to our foot and boot is the horse's back and saddle.

The "Burrs."

One of the difficulties in our present saddle is to deal with the portion of the side-bar known as the "burr" which projects in front of the front arch, and the use of which is to afford attachment to the wallets. Some years ago we pointed out that the effect of these "burrs resting upon the blade-bones was to interfere with the movements of the horse's fore limbs.

We have shown that the blade-bones move backwards and forwards on the side of the ribs at every movement of the fore limbs; if this action be interferred with—which it is most seriously by pressure upon them—the horse steps short, his stride is interferred with, he does not open and close the angles of the limbs sufficiently, and is liable to trip and stumble. We are satisfied that one cause of broken knees amongst troop horses is blade-bone pressure; this pressure, be it remembered, is not simply that of the saddle being girthed down tightly to the back, but added to it is the weight of the rider and of his kit and arms. We often hear of horses reported as unable to keep up in the ranks and constantly stumbling; in such cases we advise careful attention being given to the fittings of the saddle, so as to take the pressure off the blade-bones, and this simple manœuvre is often attended by the happiest results. If the blade-bones are confined in a vice we cannot expect horses to move freely. Blade-bone pressure can be entirely avoided by care in fitting.

The side-bars should rest behind the hollow of the blade-bone in what may be called the pit of the shoulder, and to admit of this all saddles should have the blanket folded so as to keep the "burrs" off the blade-bones. If pannels are used they should have the stuffing under the "burrs" removed, and the pannel stitched across to keep it empty and so avoid any pressure on the part (see Fig. 10).

Rear Fans.

We have still another portion of the side-board which needs attention, viz., the rear fans, or the portion of bar which extends beyond the rear arch. These rear fans are placed there for a special purpose, namely, the carriage of the rear pack; they

are given an upward curve to carry them slightly clear of the loins, but in many cases this upward curve is insufficient, and the rear fans press into and rest upon the muscles of the loins unless care be paid to the fitting. The shape of back has much to say in rear fan injury; rising loins are especially liable to become damaged.

When speaking of the structure of the back we were careful in pointing out that the loins present some elements of weakness, and one is that they are quite unable to endure pressure. There are many reasons for this, but we must accept the practical result that such is the case, and that it is chiefly due to two important factors: 1st, The muscles which raise the fore part of the body in locomotion exist here in enormous masses, and to impose weight on them interferes with their function. 2nd, Owing to the hind limbs being set on wider apart than the fore, there is a peculiar rolling motion in the horse's hind quarters, which can be readily felt when in the saddle if the hand be placed behind. This rolling motion produces a considerable amount of friction between the loins and anything which may rest upon them, and, as a result, injury occurs. We see this very well shown where the blanket or pannels have become thin, and the points of the rear fans press into the loins, particularly with horses inclined to a hollow back. The injury in the first instance consists in the hair being shaved off a surface of skin the size of the palm of one's hand; hardly a hair is left. Next, the hairless surface becomes covered with pimples, these get rubbed, and a sore quickly follows. The manner in which this injury can be dealt with and prevented will occupy us later on.

Where the weight is carried.

We have seen now that the only portion of a horse's back on which the saddle should rest is that part behind the play of the shoulder and the last rib.

The weight is not carried on the spine or backbone, but upon the top of the horse's ribs, a part which, from its make and strength, is perfectly calculated to bear it; but if this weight is to be carried with the greatest comfort and security to the horse,

it must be imposed through the medium of a surface which exactly corresponds to the parts on which it has to rest.

The width between the side-bars must be sufficiently great to enable the saddle to come on to the ribs and not press against the side of the withers; saddles narrow between the side-bars are a prolific source of trouble.

The essence of saddle fitting consists in avoiding blade-bone, wither, and loin pressure, and seeing that the side-bars exactly correspond to the surface on which they bear. Assuming the arches are high enough and sufficiently wide to clear the withers and spine, we may look upon nearly everything else with indifference and composure. This statement must be qualified by saying that it is fair to assume the horses are receiving sufficient food and are not being worked to death. The best saddle fitting in the world will not save sore backs where living structure is exposed for days and weeks to dead continuous pressure, and the horses on half rations.

The essence of saddle fitting.

The Pannels.—We must next consider the pannels of a saddle. By this time we have learned that saddles are not, or should not be, made to fit either through the medium of the blanket or pannels, but that these latter are put under the sadle simply to make it soft.

Pannels.

The recognition of this fact, though simple, is a mater of considerable importance. We will show in dealing with fitting, both of healthy and sore backs, that blankets or pannels are our last, and not our first consideration. If the tree does not fit, or if it has not had remedied the cause producing the injury, then pannel stuffing or blanket folding will be nearly useless to effect this object. It is necessary to be clear on this point, we do not say that horses' backs are not bruised through the pannels or blankets becoming thin, and that the obvious remedy in such a case is to increase the protection none will deny, but we do say that *to alter the folding of blankets or stuffing in pannels to make saddles fit can only be regarded as a temporary expedient*, and to alter either without first seeing how far the

tree is to blame, can lead to nothing but disappointment.*

Military saddles are so arranged that the tree can readily be exposed for inspection. In the case of sore backs the careful study of the upper surface of the pannel (where these are used), or even of the blanket, will, in the majority of cases, reveal to us in unmistakable terms the cause of the injury; to alter the stuffing of pannels without seeing them off the tree is a proceeding which cannot be too strongly condemned.

Though pannels are no longer regulation, yet a manual of this kind would be incomplete if no reference were made to them, especially as so many are still in use in various branches of the service.

Pannels are stuffed with horse-hair, or flock and horse-hair mixed; many saddlers are in favour of flock alone, my prejudice is in favour of horse-hair alone (this is regulation), as forming a more elastic cushion than flock.

The portion of the pannel next to the tree is of basil, and the part next to the horse of serge. The amount of hair in a pair of new pannels is 1 lb. 4 oz.; and when the pannels are issued ½ lb. additional for each pair is allowed for completing and fitting the stuffing (vide para. 203, Part I, Equip. Regl., 1895). When pannels are properly stuffed their surface should be flat instead of being like a bolster; this will ensure that the stuffing takes the shape of the horse. When great loss of flesh exists, much more than the regulation amount of stuffing is required.

A great prejudice has arisen in recent years against thick pannels, and we have gone to the other extreme of hardly stuffing them at all, in many cases not even putting in the regulation quantity; this is a fatal mistake, for the back gets bruised when the horses are required to perform work. On the other hand, heavily stuffed pannels, particularly if the animal be full in the back, places the man at some distance above his horse, instead of being close to it, and causes an amount of oscilla-

* These remarks should be carefully read in conjunction with those on p. 31.

tion which is harmful. We must endeavour to obtain the happy medium; if the horse is low in flesh he requires more stuffing in the pannels, not only to keep his saddle off the spine, but also to prevent his ribs being bruised; in other words we must replace artificially in the pannel the amount of condition lost. On the other hand, if the animal be in good condition much less stuffing suffices. When new pannels are placed on a saddle we must be prepared for great changes to occur in them in the course of a few weeks, or even days. The chief change is that the stuffing settles down, the hair becomes closely compressed, and the pannel loses in bulk; at the same time it takes to an extent the shape of the horse. At the end of a period, varying entirely with the amount of work performed, the pannels are reduced in thickness, even to perhaps half their original amount, and the stuffing may become hard and lumpy. In this condition they are readily restored to some of their former bulk by being "pricked up" with an instrument like a skewer, and in course of time they settle down again.

Changes occurring in new pannels.

All this teaches us a practical and useful lesson: we must not depend upon pannels retaining their original shape and bulk, and if horses are doing severe work not only are they losing flesh off their backs, but the pannels of the saddle are becoming thinner through severe compression, and bruising of the back will result; in other words, horses at hard work require the pannels looking to regularly, "pricking up" or even more stuffing adding if necessary.

In fitting a saddle, as we shall have occasion again to point out, it must be remembered that the fitting is not complete until we have seen it in a man completely accoutred; parts appear well out of harm's way when the saddle is simply girthed down to the back, but when a weight is imposed on it, such compression of the pannel or blanket has occurred that the saddle may sink as much as an inch nearer to the back.

Theoretically speaking, stuffing is not put into a saddle to make it fit, but to make it soft. It often happens with this latter object that we order more

Extra stuffing in pannels.

stuffing to be placed in the pannels particularly when horses are losing flesh, but we may find that our alteration is not very satisfactory; particularly do we observe this when a saddle is chambered. In such a case we may find that in spite of all our care the chamber is resting on the sore, though we have taken every precaution to press stuffing well up against it to avoid this accident: we now add more stuffing, still it is unsuccessful, and we go on day after day trying an increase or a decrease as the fit takes us and all to no purpose.

The explanation of our failure is simple, we have been trying to make a bag the capacity of which, we will say, is one-eight of a cubic foot, to hold one-quarter of a cubic foot. There is a limit in the capacity of every pannel, that limit is soon reached; if we wish to place more material in the pannel than it was originally intended to hold, we must make the pannel larger. Saddlers dislike enlarging pannels; it is done by ripping up the stitching on the top edge, and inserting a fresh piece of serge; in this condition it will hold more than before, and our chamber, or whatever may be the object of its introduction, is now rendered safe.

With regard to the pannel flaps, the most recent views are to have no stuffing in them at all, in order that the rider's knees may have a close grip of the horse; thin pannel flaps mean a bruised side from girth buckles or other fastenings. Sufficient stuffing must be placed in them to avoid this, and no more.

Lastly, pannels which have to undergo the process of pipe-claying are ruined, for in the first place the hair is rotted by the frequent moisture, and secondly, to remove the extra pipe-clay the pannels are knocked together, which completely alters the fit of the saddle by destroying the impressed shape of the horse's back.

Numnah Pannels.—Experience having shown that a blanket does not always afford sufficient protection to a back, numnah pannels have been introduced. These are furnished with a front and rear pocket, and slip on to the side-bars.

Numnah pannels employed in this way, with a blanket and numnah, should prove a valuable

addition to the material beneath a saddle where horses are in poor condition.

In previous editions of this manual the numnah pannel was condemned. This condemnation still holds good if they are employed as they were in the 1884 saddle, viz., nothing but numnah pannels and a numnah beneath the saddle; used as now proposed, *with a blanket* as an additional protection, they should be found valuable.

The Seat should be roomy, and certainly have something to spare between the end of the man and the rear arch. As to the shape of the seat, its height in front and behind, &c., this is a question of equitation with which we cannot deal, but the man should sit in the centre of his saddle if his weight is to be evenly distributed. The seat.

The whole seat may rest on the spine through sinking; it is a great support to a seat to have webbing beneath it. Few parts of a saddle receive greater strain than the seat, owing to the military method of riding; to avoid this strain as far as possible, the webbing under the seat should be found most useful. Webbing soon gets slack unless well stretched before being put on.

Numnah.—Some very erroneous notions exist as to the use of a numnah, the general impression is that it is put under the saddle to make the latter soft to the back. This is not its use, though the felt numnah, no doubt, gives protection to the back, yet its real use is to absorb the sweat, and prevent it from passing into and rotting the blanket or pannels. leather numnahs have been tried, but the objection against them is the difficulty in keeping them soft; the sweat hardens them, and the leather perishes unless carefully attended to. Moreover, the sweat cannot be absorbed by leather as it is by felt, and the back being bathed or fomented with sweat must have a tendency to weaken the skin and induce abrasion. Numnah.

No doubt the felt numnah answers its purpose very well, but there are certain points which require attention: 1st, It should not be cut too large, particularly behind, as it causes horses to sweat unnecessarily. 2nd, The attachment to the arches,

which is needful to keep it off the withers and loins, must be strong, or else the strain on the numnah is such that the felt tears away. The injuries produced by numnahs and their prevention, &c., will be dealt with later.

Blanket.

Blanket.—The question of a blanket to be carried by cavalry under the saddle, appears to be one over which much difference of opinion will always exist. Even those who are decided on the value of a blanket cannot agree about its weight; light and heavy blankets have their advocates; it would not be strictly in accordance with facts to say the former are useless, but they are very nearly so.

A blanket is the only means of immediately replacing artificially the amount of flesh a horse loses, and so it enables us not only to prevent the ribs from becoming bruised through the whole weight being brought closer to the body, but also to keep the arches of the saddle clear of the spine. We must not forget that every ounce of flesh lost on the back brings the saddle nearer to the delicate parts below, and increases enormously the liability to injury.

The blanket question requires more working out, its weight, size, and method of folding all need attention, and though imbued with the value of a blanket we do not disguise from ourselves some of the difficulties attached to its adoption.

Those in favour of a blanket say :—

(1.) Its thickness can be increased whenever desirable, as in the case of a sore back, and thus afford additional protection.

(2.) It affords a warm covering to the horse at night.

(3.) It replaces the condition lost on the back, and so saves bruising the ribs and injuries to the withers and spine.

The opponents of the blanket say :—

(1.) It is difficult to keep in its place, and it works out behind.

(2.) It requires two men to fold it properly.

(3.) If the horse lies down in wet or mud the blanket as a protection to the back is destroyed, it now takes up the offensive.

(4.) If horses have to be saddled up in the dark, or in cases of sudden alarm, the extra care required with the blanket is not bestowed, and injury results.

Some of these objections we can meet, others are beyond our province to answer, but the most decisive blow is always considered to have been delivered when objections 3 and 4 are stated.

We must assume that it is not always raining on a campaign, whereas sore backs stare us in the face from the moment we mount at the base of operations until we return. Moreover it takes a lot of rain to go through a good blanket, and there is no necessity to put that side which is covered with mud next to the horse's back; further, the wet and muddy blanket always has the numnah between it and the skin Still, the mud-covered blanket is no doubt a difficult problem.

An objection we have never heard urged and yet one much stronger than the above, is the way blankets get torn through getting under horses' feet at night, and otherwise destroyed. We cannot altogether meet this difficulty, though greater attention paid to the way men put their blankets on would prevent many of them from being torn.

Our present saddle blanket is 5 feet 6 inches in length, 4 feet 8 inches in breadth, and weighs 4 lbs. 6 ozs. to 5 lbs. It is intended to be used as a cover for the horse as well as a saddle blanket.

We believe that a good thick blanket of 9-lbs. weight, measuring at least 5 feet square, will be found the great stand-by in future campaigns. The object of having a thick blanket is to save wrinkling when folding, and so prevent injury; a thick blanket like a piece of carpet felt cannot wrinkle.

How to retain the blanket in its place when pannels are worn.

The blanket may be kept in its place when pannels are worn, by a process which is simple and most effective. We were shown it in a Cuirassier regiment in Germany, where the greatest value is placed on this protection.

The method is as follows:—The front bottom corner of each side of the blanket is turned back, and pasing over the "points" of the front arch is kept down in its place by passing under the strap of the girth, which the Germans attach to the front arch; this flap of the blanket is therefore fixed tightly between the point of the tree and the front girth strap, and the grip is so good that the blanket

never shifts. A study of Fig. 6 will make this method clear. The means employed in our service when a blanket only is worn, of keeping it in its place by means of the numnah straps is effective, though it will not prevent the blanket wrinkling. Every blanket has a tendency to work out behind.

Girth.

Girths.—A soldier's saddle differs from all others in being longer, and having to carry much dead weight, and it may be laid down as a rule which has no exception, that the saddle should be kept on the horse's back by a double attachment to the girth, and this double attachment should come from the front and rear arch in much the same way as suggested by the Saddlery Committee. We believe nearly all the continental nations use a V-shaped attachment, and its advantages are obvious—viz., the weight is kept steadier, and oscillation prevented. A loose girth to a hunter may be an advantage, in a troop horse it is objectionable and a source of serious injury; the reason is too obvious to need comment.

Girth Dee.

The injury caused by girth tabs described in the first edition of this manual is now abolished owing to the introduction of the V-shaped girth, but the D on this, and leather attachment of the same, may cause an injury on the side at Fig. 11, No. 8, due either to insufficient material between the skin and the D, or to a tight overgirth pressing it into the side.

This may be prevented by using a V attachment devised by Veterinary Captain Pringle, by which the D is abolished, the girth straps being sewn on to the sweat flap. This V attachment may be seen in Fig. 7.*

The service girth is leather, and appears to answer its purpose very well when kept in good condition, though many would probably prefer a string or hide girth. The girth is 48 inches long and $3\frac{1}{2}$ inches in width; split into four laces, each $5\frac{3}{4}$ inches in length and $\frac{1}{2}$ inch in width, a solid piece 6 inches in length being left in the centre.

Breastplate and cruppers.

Breastplates and cruppers need no notice, especially as the latter are to a great extent abolished.

* It has not up to the present been found possible to introduce this article into the service.

Stirrup Leathers.—These are let into the saddle by means of a hole cut in the side-board; this hole is termed a mortise. It often happens that the mortise is not deep enough for the leather, and the latter projects on that surface next to the horse's back, producing injury (Fig. 11, No. 3). This may be prevented by deepening the mortise. Stirrups.

In the more recent patterns of saddle the mortise is abolished, and an iron square fitted to the side-bar takes the leather. By wearing the buckle of the stirrup leather near the stirrup iron, the injury produced by it, described in the first edition of this manual, has been abolished.

Shoe Case.—There is little to say about this, excepting to point out that it sometimes does injury when the case bangs up and down with its two shoes in. The strap of the shoe case should never pass under the side-bars or injury results to the back; the same remark applies to the carbine bucket strap. Shoe case.

Wallets present nothing of importance; we have previously dwelt on the interference with the horse's action, caused by the projections of the side-bars (intended to take the wallet) resting on the shoulder blades. Wallets.

SECTION III.

Fitting the Saddle.

Fundamental principles to be observed in fitting a saddle.

From our anatomical description of the back we are in a position to form some idea where the weight is best carried, and what parts of the back should have no weight imposed upon them. We may briefly recapitulate these facts:—

1st. The withers must not be pinched nor pressed upon.

2nd. The central line of the back must have no pressure imposed upon it.

3rd. The blade-bones must have free and uncontrolled movement.

4th. The loins are not intended to carry weight.

5th. The weight must be imposed upon the ribs through the medium of the muscles covering them.

6th. The weight must be *evenly distributed* over a surface which extends from the play of the shoulders to the last rib.

If we bear these six axioms in mind, no difficulty will occur in fitting saddles on what may be termed physiological principles. Our chief difficulty will arise in making saddles conform to these principles while we have "burrs" which cover the blade-bone, rear fans which project over the loins, and side-bars which do not fit. There is no doubt that everything is against correct fitting; in fact, this latter sometimes becomes well-nigh impossible.

This is no reflection on our equipment; it must be so where saddles are made up in thousands. Perfection in anything is impossible; we would still have sore backs in spite of self-fitting saddles. In this section I do not propose to consider how saddles should be fitted when built on the most approved scientific principles, but how we are to fit and utilise

the thousands of saddles now in use and in store, and learn to make the best use of the material placed at our disposal.

Where a saddle should be placed on the back.

The regulations say: "The saddle should be placed in the middle of the horse's back, the front of it about the breadth of a hand behind the play of the shoulder." Perhaps it would be clearer to say a saddle is in its correct place on the back when the *front arch* is placed opposite to the hollow behind the blade-bone.

Having selected that size of saddle which approaches the nearest to the shape of the horse we are about to fit, the bare trees is first placed on the back, and the following points attended to:—

1st. That the front arch is wide enough and sufficiently high to clear the withers, and that the point clear the sides.

2nd. That the width between the side bars is sufficiently great to enable them to come well down over the ribs, and not to press into the side of the withers.

3rd. That the side-bars bear evenly on the horse's back from the play of the shoulders to the last rib, and that the rear fans are clear of the loins.

Fitting the side bars.

If the horse possesses a full back—that is, one with plenty of muscle and no great hollow behind the blade—we may be able to ascertain all these points with ease, but if he be at all hollow at the pit of the shoulders, the "burrs" rest on the blade-bone, and the side bars do not even touch the back at the most important of all parts, viz., the hollow behind the blade.

In some backs it will be found that a portion of the bar, viz., its upper edge, is touching the back, whilst the lower edge is so far distant from it that the fingers may easily be inserted between it and the skin.

In other cases, as explained before, the distance between the side-bars is not great enough, and the upper edge of the latter rests on the side of the withers and pinches them. The side-bars should rest on the ribs and be absolutely clear of the withers; if they are not, severe injury follows situated at No. 3, Fig. 11.

In carrying out this fitting of the side-bars, we must remember that when fitted bare to the back they may appear wide enough apart not to pinch the withers, whilst the introduction of a blanket and numnah may so narrow the channel as to cause injury. *Everything in fact introduced under the saddle narrows the space between the side bars and may cause them to press into the thick part of the withers.* This should be thoroughly understood, as injury from this cause represents the bulk of the sore backs of the present day.

Some of the misfits in the bars can be altered by the saddle-tree maker; he can flatten the bearing surface by shaving it down, and prevent the edges wearing into the sides by bevelling them; if too much pressure is on the loins he can shave the bar at this part from its lower surface, and so curve it upwards. If the saddle be narrow so that the bars are too close together, and no larger size of saddle is available, he can in a very simple manner (see p. 33) widen them to fit any horse.

The main principle is that the side-bars should rest everywhere on the weight-bearing surface of the back in a perfectly even and level manner. To effect this recourse can be had to numnah pannels, and if necessary additional pieces of numnah felt. The intention of the pieces of numnah felt is to fill up spaces that may be found to exist between the side-bars and the back.

As the secret of fitting a saddle rests with the tree, it is essential that step by step this examination should be carried out with the greatest exactitude.

Side bars, fit of.

If side bars are so difficult to fit, it is fair to assume that very few comply with the conditions laid down, and yet all horses do not get sore backs. The explanation is simple; with a very badly fitting saddle a sore back will result even with light work; with a badly fitting saddle the effect of uneven pressure is only demonstrated when severe or continuous work is expected from the horse; under these circumstances thin pannels settle down and blankets become thinner, muscle is lost and bruising results. Those horses which escape injury do so because they have maintained their condition, or

their pannels or blankets being thicker have not allowed unequal pressure to be directly imparted to the skin.

Stuffing fitted saddles.

If such is the case, cannot we protect horses' backs from injury, in spite of side-bars imparting unequal pressure, by increasing the folds in the blanket or the stuffing in the pannels after remedying, if possible, the defect in the side-bars? Undoubtedly, and this is the only practical means we have at our control. Blankets or pannels are to make a saddle soft, and not to make it fit—but necessity knows no law, by increasing the stuffing we raise the man above his horse, but we protect the animal's back.

So long as we are without saddles possessing self-adjusting side-bars, unequal pressure will be imparted to the back; this may be corrected very largely when horses are entering on a campaign or peace manœuvres, by providing an extra blanket to be placed under the saddle when occasion arises, viz., when the loss in condition is not compensated by the ordinary blanket, and the saddle is approaching too close to the bones of the back. This scheme intelligently carried out will prevent scores of sore backs. Thin blankets (with the view of bringing the man closer to his mount) are a great mistake for a soldier's horse; we cannot compare his saddle with a hunting saddle until we are prepared to throw away eight stone of weight, and even then the dead continuous pressure caused by long hours and hard work day after day, would preclude us turning out a soldier's saddle with as little beneath it as is found in a plain saddle. The advantage of bringing the man nearer to his horse none will dispute; it is only a question of many sore backs or few sore backs.

The way to examine the fit of a saddle.

To return, however, to the fitting of the tree. The saddle-tree should be placed on the back with the numnah and blanket on, and the horse girthed up. We observe whether there is any oscillation indicating uneven bearing, and a man is then placed in the saddle. We cannot impress too strongly the importance of this. *No saddle has been fitted unless a man has been seen in it.*

The man sitting in the centre of his saddle, the

hand is passed under the numnah to the play of the shoulders, and the fore limb fully extended to the front by an assistant (Fig. 8) By this means we readily ascertain whether the shoulder blade has unlimited movement, for if it has not the fingers will be squeezed between the blade-bone and the saddle. This manœuvre must be carried out with both forelegs.

The hand is now passed through the front arch, over the *top* and *sides* of the withers *under* the numnah, to ascertain that the whole of this region is free from pressure; the man must at the same time lean forward to increase the severity of the test, and the person conducting the examination must not be satisfied with anything less than the introduction of the entire open hand. Walk behind the horse, and, standing at his tail look forward under the seat to ascertain that the latter be well raised above the back, and the numnah above the spine. Next, examine the rear fans by passing the hand under them, this they should freely admit when the man is leaning back in his saddle. Have the horse trotted up and down and then cantered; the man should now dismount, and the position of the saddle and girths looked at to see whether they have slipped forward. The surcingle is examined to see that it is not too tight; the saddle flap is lifted up, and the girth buckles and D examined to see that they are not pressing into the side; also that the numnah and blanket come down low enough to prevent the sides being bruised by them.

Undo the girths and numnah straps and have the saddle lifted off the back *without disturbing the blanket;* the imprint of the side-bars will be left on the blanket, and a glance will tell whether the bearing is even over the centre surface or greater in some places than others; in particular we should look at the upper edge of the bar behind the front arch.

The man should now be turned out in marching order, the full weight being placed in the saddle. The eye is cast over the parts previously noted, while the rear pack is particularly looked at, in order to see that not only is it firmly strapped, but

also that its centre is carried up to the cantle and well above the spine; further that no baggage straps are loose or tucked in under the side bar. Lastly, we observe whether the weights are so arranged that the saddle is balanced, and keeps its place in the middle of the back.

Alterations to the side bars to make them fit.

By this time we have made ourselves acquainted with the defective points in this saddle, and prepared to apply a remedy should the horse be called upon to perform severe work. For example, if the side-bars are too curved, we prevent injury by utilizing the numnah pannel, extra pieces of felt being inserted at each end until the deficiency is supplied. If the bar has no level bearing on the back in front of the rider's thigh, we know it to be resting either on the upper edge of the side-bar, or on the "burrs"; we therefore fill up with numnah the space where the bar is defective, and so help to distribute the weight.

How to make a saddle wider.

Where a saddle is too narrow between the side-bars and no larger size is obtainable, it is possible to alter the smallest service pattern to suit the largest size of horse with very little trouble. The front arch is removed from the side-bars, and the elbows of the "points" heated and flattened out, still preserving the angle shape of iron. The bars are now forced apart to the required distance, the rear arch readily bending for this purpose; the saddle is placed on the back and examined to see that the bars are wide enough apart; if this is found to be the case, the front arch is marked for two rivet holes corresponding to the holes in the side bar; these are drilled or punched, and the whole re-riveted.*

In this way it is possible to increase the distance between the side bars at the front arch from six inches to as much as nine inches, which is large enough for any purpose. The rear arch is not interfered with.

How to make side bars fit.

The following method enables the side bars of a saddle to be adapted to the shape of any horse. The

* It need hardly be remarked that this course is not admissible in peace time, when no existing patterns can be structurally altered without authority. The new steel arch saddles should not be altered as described.

bare tree having been placed on the back all spaces between the bars and the skin are filled in with any plastic substance, such as rather dry putty. In this way a "putty" mould is obtained of the exact deficiency of misfit of the bars; the tree is removed from the back, and with it comes the putty. Pieces of numnah corresponding to the size, shape and thickness of the putty model are now cut, and each piece of numnah placed in its proper position on a numnah pannel and there secured by stitches.

In this way, no matter what shape of back we have to deal with, the side bars may be made to take nearly the same curves as the part on which they rest.

Saddles, and backs, daily inspection of.

We must remember that no matter what care we take in the first instance with the fitting of a saddle, that this will not see a horse through a six weeks' manœuvre or a twelve months' campaign. Under these conditions saddles and backs require looking to EVERY DAY; they should be inspected in just the same way as the horse's shoes are to see that they are fit and serviceable; we know, or should know, the weak points in the fit of every saddle in a squadron, and with this knowledge we can stave off trouble and disaster.

It may be asked what are the practical advantages to be derived from this excessivse amount of care? The reply is that sore backs will promptly be reduced fifty per cent., and when the instructions are carried out with the greatest exactitude, even a reduction of seventy-five per cent. may be anticipated. A certain proportion of sore backs must occur for reasons which we have yet to mention; we might just as well expect no sickness ever to arise amongst horses kept under the best hygienic conditions. He have not yet arrived at the state when disease is rendered impossible; vast strides have been made in this direction, and amongst others we indicate those measures laid down here for the prevention of sore backs.

SECTION IV.

Sore Backs: How they are Caused, Prevented, and Remedied.

Under the term sore backs is included all injuries inflicted on horses by the saddle, whether such injury affects the back proper or the withers; we must, however, for the purpose of description, draw a clear line between these, as the causes operating in producing injuries to the withers are not causes which injure the back and *vice versâ*.

Every sore back is produced by a definite cause.

The first thing which we have to learn is that the position of a sore back is not an accidental circumstance, but is the outcome of a definite and evident cause. If we appreciate the value of this axiom, and know the causes operating in producing the various injuries, we are able to recognise almost by glancing at a sore back the actual cause operating in its production (Fig. 11).

The moral satisfaction of knowing that in nearly every case of injury brought to one's notice, the cause can be clearly defined, is priceless information which those who have studied the subject have only obtained as the result of bitter experience. *If we remove the cause the effect ceases:* this is a maxim much truer in saddle fitting than in medicine. If we know the cause of a sore back and can remove it that sore back will not recur, and, moreover, in the majority of cases if the cause be removed, the horse may continue at its duty (under conditions which it is the object of this Section to impart), and thus hardly lose a day in the ranks.

Every sore, every injury, every abrasion on a horse's back is due to a certain definite cause, which if removed produces no further effect. Teach this to non-commissioned officers and men, encourage them to bring every rub to light, and never punish

a man for giving his horse a sore back, for not in one case in a hundred has he had a hand in the matter.

What has been our position in this respect? A horse has a sore back or a girth gall, a man is told that the fault lies with him, bad saddling, rolling in his saddle, &c., and he has, as a punishment, to walk until his horse is well. We do not hesitate to say that the fault lies with the saddle and not with the man, and to punish him for what he has never committed is causing men to conceal injuries which, if taken in time, will lead to little or nothing, but if neglected or hidden through fear of punishment will certainly be disastrous. It may be necessary for a man to walk if his horse is injured, but he should walk as a necessity and not as a punishment.

Bad saddling.

Again we may ask, what constitutes bad saddling (a term which is so constantly being used), what does it imply? It is seldom that one obtains a satisfactory answer. The only bad saddling a man is capable of performing lies with his numnah and girth, and if kit is carried, with his centre baggage strap. If the numnah rests on the withers, if the man rides with a loose girth, or does not strap his baggage up off the spine, then that man is guilty of carelessness and bad saddling, and as all these causes can be readily determined, there is no difficulty, as a rule, in fixing on the man the exact amount of injury he has been instrumental in producing. We make no mention of vice on the part of the soldier, such as purposely introducing a stone or buckle between the back and the numnah, or between the latter and the blanket, for we do not think that such a case would be met with in a lifetime.

In saddling hurriedly or in the dark the sweat or pannel flap sometimes bend on themselves, and in this way the horse is girthed up; the turning in is productive of considerable harm to the horse's side, and under certain conditions the man might be held to be responsible for the injury.

We hope in the interests of the men and horses, it has been made clear that bad saddling is the

exceptional cause of sore backs and not the rule. ENCOURAGE MEN TO REPORT EVERY HAIR WHICH IS RUBBED OFF THEIR HORSES; this is the true step towards efficiency.

It will be impossible to understand all the causes of sore back (and in this term is included sore withers and sore sides) unless we point out the injury which each part of the saddle or its appendages is capable of producing; that the causes are numerous may be gathered from the fact that with the exception of the wallets and saddle flaps, we know of no other portion of a man's saddle which is not capable of producing more or less injury. Each piece of the saddle will, therefore, be taken separately, and its injury-producing cause described; the parts will be taken in the following order:—numnah front arch, rear arch, seat, side-bars, blanket, stirrup leather, girth-straps, girth, surcingle, carbine bucket, shoe case, sword and rear pack. For position of these injuries see Fig. 11.

Numnah injuries.

Numnah Injuries.—A numnah injures a horse in two places,(viz., on the top of the withers, and on the middle of the spine over the loins. (Fig. 11, 2, 6.) These injuries are preventible, and can be avoided by careful saddling. The numnah of a saddle should be placed well up in the fork before girthing, and secured there by the strap. There is always a tendency for it to work down, and the strain consequently becomes very great, and in course of time it tears. Horses worked with the numnah resting on the withers or spine always have the hair at that part standing erect like a paint brush, or turned forward and curly; they are consequently easily recognised. The injury caused over the loins is produced by the numnah being pulled too tightly over the spine in girthing up, aggravated by heavy weights in the saddle and loss of condition; the hair first becomes erect and then removed, and finally the skin covered with small pimples and inflamed. It can be prevented by strapping the numnah higher up to the rear arch of the saddle.

Front arch injuries.

The Front Arch causes injury if too low and too narrow. Some of the most severe injuries to the

withers are caused in this way (Fig. 11, 2, and between 2 and 3). A great deal of front arch injury depends upon the shape of the horse; high withers and thick fleshy withers are particularly obnoxious. The only remedy is to have a saddle with a higher or wider arch, or an ordinary arch with the side-bars set on low (p. 33, para. 3). The blanket may also be folded in such a way as to put but few folds under the arch, and thus increase its width.

The rules previously given for fitting a front arch (see p. 32) should be carefully carried out; particularly must it be remembered that a man should be placed in the saddle, this brings the whole structure nearer to the bony framework than one who has never tried the experiment would be inclined to believe.

Rear arch injuries.

Rear Arch, if too low causes injury when baggage is carried behind the saddle, through not allowing the kit to be strapped high enough off the spine.

In the old pattern wooden driver's saddle, of which many are still in use, the most common injury produced by them, is under and behind the rear arch. This is caused by the men sitting so far back in its short seat, concentrating the weight in one place, and pressing the facing of the pannel into the back.

Injuries produced by the seat.

Seat.—This produces injury by sinking under the weight of the rider and resting on the spine. It may take a long time to stretch the leather work sufficiently to bring the seat down on the backbone, but such accidents are by no means uncommon especially when the horse loses flesh.

The strain on a seat is something considerable. When seats sink they are brought nearer to the spine, and in consequence they rest on or touch the withers, producing an injury at one particular place the cause of which is not always recognised. No difficulty will, however, be felt in determining the cause of the injury if the following point be attended to. Should the seat of the saddle be touching the back, or more correctly the blanket, wherever it touches, the leather straps obtain a polish as if they had been varnished or smoothed over.

Many seats sink through the stitching giving way. No class of injury is easier to deal with than that

produced by the seat. They only need the seat to be taken up by shortening the straps beneath it.

The injury caused by the buckle under the seat, described in the first edition of this manual, no longer exists, as the buckles are abolished.

There is an injury to the central line of the spine behind the withers (Fig. 11, 4), which might be attributed to the seat, but which is more often caused by a piece of webbing which passes across the saddle from side-bar to side-bar. The use of this piece of webbing is seldom known; it is generally supposed to keep the side bars together, whereas its whole and sole use is to prevent the seat being altered in shape when the saddle is placed on the saddle rack. This webbing sometimes rests on the spine through loss of flesh or other causes, and severe injury results. Webbing injury.

The cause can be detected by the position of the injury (Fig. 11, 4), and seeing the saddle on the back without a surcingle; on lifting up the seat of the saddle after the horse is girthed up, and webbing will be seen resting on the spine. The remedy is to cut it out and make it longer.

Side-bars.—The injuries produced by side-bars are caused by irregular pressure, viz., the curves in the bars do not correspond to the curves of the back, and undue pressure occurs at certain places instead of being evenly distributed all over the saddle. Side-bar injuries.

The whole secret of the fit of the saddle lies with the side bars. These must conform to the lines of the back in such a way that the most perfect adaptation between the two surfaces results, if possible, as perfectly as that obtained by one sheet of paper being placed on another. What is generally found is that certain portions of the bar are resting on the back, while others have no bearing whatever, and easily admit the fingers beneath.

The injuries produced by side bars are numerous, and extend from front to rear. Roughly, we can divide them into two classes, those just behind the front arch, and those in front or immediately under the rear arch. The first as a rule is caused by the saddle being too narrow, viz., the side bars

being too close together and only bearing on the upper edge, whilst the second is caused by the bars not being level on the back.

It is not possible for any one to thoroughly appreciate these facts, unless he places a side bar on different backs and studies it with reference to the curves of the part. He will find that no matter how he may try he cannot without alteration make it fit perfectly level all over the back, and it will be observed that there are two places which are most commonly ill-fitting, viz., at the lower edge of the side-bars just behind the front arch and at the upper edge of the side-bars just under the rear arch. At either of these places the fingers can be readily introduced between the bar and the skin, showing that there is no bearing on these surfaces, due to too great a twist being given to the bar. Where there is no bearing there is no pressure, and the neighbouring parts suffer where extra bearing is being inflicted.

The injuries produced by the side-bars are aggravated by defects in balancing the weight carried; for example, the carbine causes a heeling over of the saddle to the off side; mounting and dismounting cause a heeling over to the near side. Some men ride with one stirrup leather longer than the other (generally the near for facility in mounting). This must produce a defect in the balance of the weight on the back.

The position of the injury on the back indicates whether the side bar is at fault. To discover the exact position of the defect the bare tree is placed on the back, and the part of the bar corresponding to the injury is the part where the great pressure has been inflicted. In connection with this it is necessary to remember that as there is nothing under the tree of the saddle, the latter will occupy a lower position on the back than it occupied when the damage was done, so that a sore produced by the upper edge of the side-bar just in front of the stirrup leather, will appear when the *bare tree* is placed on the back to be an inch *above* the portion of side-bar which produced it; this may lead us into the error of

believing that the side-bar was not the cause of trouble.

The way to protect these injuries, once they have been produced, is to take for the time being the pressure off the part and distribute the weight over the sound surface. This distribution may be managed by altering the side-bars in the manner described on p. 34, taking care that the portion of the bar opposite to the wound is not allowed to touch the back until the part is healed.

Stirrup leather injuries.

In many saddles there is a groove or mortise in the side-bar for the stirrup leather; in a large number of saddles the mortise is not deep enough for the leather, and the latter consequently projects from the surface of the bar producing injury to the back. The injury can be readily determined from its position (Fig. 11, 3), and from the deep impression which the projecting leather produces on the upper surface of the blanket or pannel (Fig. 12, 2). The remedy is simple, deepen the mortise and the trouble disappears.

Girth-strap and surcingle injuries.

The injuries described in the first edition of this manual as due to girth tabs, are now abolished by the introduction of the V-shaped girth attachment; but even this is capable of producing injury through the metal D and its attached pieces of leather being pressed into the sides by a tight surcingle, or by their being insufficient protection between them and the skin. The front girth-strap which passes through a slot in the sweat flap also produces an unevenness next the skin; this has been found to gall. The best means of prevention so long as the D is maintained, is a slack surcingle and a deeper numnah. (See also p. 26, para. 4.)

Pannels.

Pannels are abolished from the Universal pattern saddle, but they are such an important feature in saddlery that we have retained the remarks made on this subject in the first edition, as they may be found useful.

Pannel injuries.

Pannels do not produce injury to backs (excepting in the obsolete driver's saddle with brass-bound cantle), though they are commonly blamed for doing so. If they be thin, and horses hard worked, sores will result for the reason that the pannel

affords insufficient protection, but if kept with a sufficiency of stuffing we cannot trace any cause directly due to the pannels. Lumpy and hard stuffing may be spoken of as causes, but these only occur when pannels get thin and compressed, and injury is therefore more likely to be due to bruising of the back by the ill-protected side-bars. All we intend doing, therefore, is to describe how a pannel should be altered to protect a sore back from pressure, and what to do with thin and flattened pannels .

Chambering pannels.

Whenever an injury has occurred to the back it is usual to leave the saddle off until the part has healed, although the cause may have been completely removed. When, however, we are pressed for horses in time of peace or active service, there is no harm done in working animals with sore backs if the pressure of the pannel be directly removed from the injury. This is known as "chambering," and consists in making a hollow in the pannel by removing the stuffing, and stitching the part down in such a way as to exclude the hair.

The size of a chamber must depend on the size of the wound it has to cover; it should always be larger than the wound, so that the margin of the chamber rests upon perfectly sound skin.

To determine the exact position of a chamber.

The position of a chamber is most important; nothing is more common than to see it put above, below, in front, or behind the injury it is intended to protect: this is because the man judges the place for the chamber by the eye; *nothing is more deceptive.* The only way to ascertain the correct and exact place for the chamber, is to touch the wound with a mixture of vaseline and wood charcoal (mixed to form a black ointment), the saddle is placed on the back *by the man who rides the horse*, and an indelible impression is left on the pannel corresponding to the position of the chamber .

The stitches put in a chamber must lie close together, about one quarter of an inch in length. Saddlers to save themselves trouble put in very long stitches, which are worse than useless, as the hair finds its way in between them and the chamber becomes obliterated.

The chamber having been emptied and stitched

down, the hair is brought up against the stitches by means of the pricker, and pressed up with sufficient firmness to resist the weight of the rider *which tends to obliterate the chamber by flattening the pannel.* Sufficient stuffing must, therefore, exist in the pannel, and this is the most important point to attend to when a chamber is ordered to be made. If sufficient stuffing does not exist to form a deep cavity for the chamber, extra material forced in with a stick will not always meet the requirements. We must not forget that a pannel is a bag, and, like all other bags, has a limit to its capacity; if, therefore, we wish for more stuffing in a pannel (and such is always required when we commence "clambering"), it will generally be found necessary to increase the capacity of the pannels by opening them along their upper edge, and sewing in a fresh piece of serge. Saddlers dislike this greatly, and will never do it unless compelled.

The chamber having been made, we test it by covering the wound again with the black ointment, placing the saddle on the back (of course without a numnah), girthing the horse up, and trotting him up and down for some little time, and then a canter to finish with. If the chamber be well made and correct in size, &c., not a particle of black should be found on it, showing that every ounce of pressure is off the injured part; if, on the other hand, the chamber is blacked we know at once it is worse than useless, it *is not deep enough.* When horses are doing severe work the chamber requires looking to *every day* to keep it in order, owing to the rapid manner in which stuffing settles down; if this be not done the results will be disastrous.

Never let a horse wear a chamber in his saddle longer than is absolutely necessary, as it represents so much loss of bearing surface.

When a saddle is chambered *no numnah should be worn* under it. We have seen scores of good chambers rendered useless from this cause. It is clear a chamber cannot act when a numnah is on the back, and the latter will keep up nearly as much irritation in the wound as if the saddle were resting on it. We do not believe in cutting holes in the numnah, they are seldom cut in the right

place, the numnah edge soon gets flattened from pressure, and a numnah has so much movement on the back that the piéce to be cut out must be very much larger than the sore. A numnah once cut is ruined.

When pannels settle down and get lumpy they only need "pricking up," or the hair teasing out, to revivify them completely.

Pannels are less understood than any other part of the saddle, and are often blamed when they do not deserve it.

In the old pattern driver's saddle the lower edge of the pannel flap is very thick; this when girthed into the side frequently produces injury (Fig. 13, c.). The remedy is simple, the stuffing at the edge of the pannel has only to be removed.

Girth galls.

The next injuries to be described are those arising from the appendages of the saddle, viz., the girth, carbine bucket, shoe case, and baggage or kit.

Girth-galling arises from want of condition, bad conformation, and bad saddling. Any horse soft in condition will gall, and will continue to do so until he improves, but this improvement is very rapid, a few marches work wonders.

A horse possessing a brisket which runs upwards towards the elbow (instead of downwards) will gall, for there is nothing to keep the girth in its place particularly if the rear ribs are very arched, as these constantly push the saddle forward. Girths hard, inelastic, and rigid from sweat or water, are liable to gall from their very rigidity, the edge cutting like a knife.

A horse that girth-galls from bad saddling is caused by the man not drawing his girths tight enough. Some animals blow themselves out on first being girthed up; these should always have their girths finally tightened before starting, and all horses require their girths looking to after they have been out an hour or less. A loose or slack girth with a soldier's horse is a very serious matter, for it allows the whole of the weight to oscillate and shift forward on to the neck, with the result that the girth catches behind the elbows and chafes them.

Many contrivances are adopted to prevent horses

from galling, such as splitting the girth, or the introduction of hide or string girths. All these act in the same way, viz., they give the girth a grip on the skin, by the hair and skin passing between the strands, and they are most useful expedients to adopt; covering the girth with sheepskin, or making it half round, are other contrivances. We do not approve of the latter, as the surface of girth applied to the horse is too narrow for such a bulky thing as a military saddle. As previously stated, a soldier's saddle should be girthed from a front and rear attachment as in the V-shaped girth, and not from a single central one; the advantage of the double attachment is that the weight on the back is kept steadier. When girth-galling arises from defective conformation the saddle shifts bodily forward and rests on the blade-bones, and the man appears to be riding on his horse's neck; for these there is only one prevention, and that is a contrivance which we have termed "strapping the girth back." It is strongly recommended in all cases of malformation, and with all horses which are girth-galled and yet are required for work; it is a specific for girth-galling. The method of strapping the girth back is as follows:—

Strapping the girth back.

The surcingle is put under the seat towards the rear arch, and passed obliquely under the belly and buckled, the buckle being under the shoe case; the saddle girth being loose, the centre cloak strap is taken and passed between the girth and the skin covering the brisket, and then under the surcingle, which should be about a foot from the rear of the girth or even further back than this (Fig. 9). The saddle girth can now be drawn back as far as we think necessary to avoid the injured surface; when this is accomplished the girth is drawn tight. The surcingle is also tightened, but only sufficiently to prevent it from being drawn forwards. With this contrivance it is impossible for a horse to girth-gall, and impossible for a saddle to slip forward. We have heard one or two theoretical objections raised against it, such as the compression produced on the horse's belly by the surcingle, &c. All that need be said is that it has been used some hundreds of

times with the best effect, and it is better to compress a horse's belly if the man can only sit on his back in the proper place, than compress his bladebones by riding on his neck.

Girth buckle injuries.

When thin blankets and short numnahs are worn the buckles on the girth or girth D cause injury to the sides from the pressure which they exert. To detect this cause, the position of the injury corresponds to the hole in which the man girths and the position of the D. The remedy is to put a piece of numnah under the D and girth buckles, and girth two holes or so lower down on the injured side. If no numnah can be had a rubber neatly folded may be placed under the girth buckles with good effect. Girth buckles are very likely to be productive of harm when horses are losing flesh. In all cases the surcingle must be left slack. Vetry.-Captain Pringle's non-regulation girth attachment, described on p. 26 (see Fig. 7), is a specific for this class of injury.

Shoe-case galls.

Shoe-case galls are caused by the case being left with a long strap, and then banging up and down on a horse's side. The remedy is to fit the case so high against the rear arch that it has no movement left in it.

Carbine bucket galls.

Carbine bucket galls are frequent with horses in soft condition; they also occur from the carbine bucket getting loosened from its attachment to the surcingle and banging up and down.

Rear pack injuries.

Injuries produced by the kit or rear pack are caused through not raising them up sufficiently high in the centre so as to clear the spine (Fig. 11, 6). This is a great argument in favour of the high cantle saddle, which is now regulation, for some of the injuries produced by the rear pack are most serious. Before a horse moves out of barracks or camp, every rear pack should be carefully inspected to see that it is high enough in the centre *to admit a closed hand beneath it* when the man is leaning back in the saddle, and further that it is securely strapped down to the arch at each end so as to prevent oscillation as far as possible. The long loose end of straps should also be looked for; men are sometimes careless in this respect; the loose end of

a baggage strap if it gets under a side-bar will produce a sore back.

Injuries from continuous pressure.

The last cause of sore back we have to describe is that produced by dead continuous pressure; it shows itself, as might be expected, on that part of the back covered by the side-bars.

It is a well-known surgical fact that if continuous pressure be brought to bear on a part for any length of time the part dies. A leg may be amputated by an elastic cord continuously applied. A tight bandage on a horse's leg will cause the skin to die and come away, leaving an open sore. It does not matter how dense or how soft the living structure is pressure will destroy it, the only factor which will differ being the length of time occupied in completing the destruction.

When horses are overworked and underfed their vitality and resisting power are lowered, and they are immediately placed under the most favourable conditions for sore backs to arise from continuous pressure.

If horses are hard worked and well fed, in spite of loss of flesh, we can prevent injury, or stave it off for some time, by increasing the material beneath the saddle.

If, in addition, we adopt a well-known precaution about to be mentioned, there is no reason why the appearance of sore backs from continuous pressure should not, in the majority of cases, be indefinitely postponed.

The precaution is this: *Dismount the men on every possible opportunity, if only for five minutes an hour;* the relief which this produces is considerable, the circulation of the blood through the skin of the back is re-established, for we must remember that the weight of a man in the saddle prevents the blood vessels from being properly filled, in the same way that if we press on the back of the hand with the forefinger of the other, we leave a temporary white mark indicating the absence of blood; where blood is absent from a tissue for any length of time the part dies. Men and horses become tired after a few hours continuous marching; this is the time to dismount the men to prevent rolling in the saddle, to

let them bring other muscles into play by walking, and so ease themselves as well as their horses' backs.

A singular notion exists in cavalry that it is a dishonour for a man to walk or be seen off his horse; the sooner we get rid of such ideas the better for horses' legs and backs. There is no reason at all why it should not be a recognised thing in our service for men to lead their horses for a part of the way, in order to afford the animal (looked upon generally as a machine, instead of so much living flesh and blood) the needful rest it requires.

Injuries from exposing bacts to the air.

Backs may also be eased in marches by varying the pace. A trot is an excellent means of refreshing both man and horse as it brings other muscles into play; but if this trot is to do any good, the men must not bump in their seats.

Backs exposed to the air, through the saddles being removed while they are wet and hot, is a time-honoured source of injury in the British Service. We also believe it to be a cause; horses treated in this way are liable to come out in swellings the size of a sixpence all over the back. The singular thing is that the swellings go down almost as soon as they come up, so that by the next morning they have completely disappeared, to come up again after the next day's march if the back be exposed. In course of time, if the backs are still exposed, the lumps do not disappear so rapidly, in fact they remain permanent, and are liable to rubs and abrasions, eventually leading to more severe injury. Why exposure to the air produces this eruption is not clear; checked perspiration is an easy way out of the difficulty, but is obviously incomplete. We are informed that in South Africa no care was taken to prevent off-saddling before the backs were cool, and that no harm arose from the practice.

Backs liable to these swellings should not have the saddles taken off for two or three hours, though of course the girths should be loosened.

Shoulder blade injuries from the "burrs."

The side-bars of a military saddle are made to project beyond the front and behind the rear arch; the "burrs" rest on the shoulder blades, the "fans" on the loins. All this has been dealt with before, and the evils described; we have here to describe a

simple method of preventing the injury. If a panneled saddle be so long that it rests on the shoulder blade, have the pannel emptied of stuffing in front to a level with the front arch, and stitched across in such a way as to prevent the stuffing from finding its way back again (Fig. 10). The saddle can now be bedded behind the blade bone, but care should be taken that the pannels are fairly full, or else there will not be sufficient stuffing to keep the now exposed front "burrs" off the blade bones. To ascertain that everything is in working order have the horse saddled *and the man mounted*, pass the hand under the front "burrs" (Fig. 8), and have the leg extended. If this can be performed without the "burrs" pressing on the hand the stuffing is satisfactory, if not, more must be put in to raise the saddle higher. Where the blanket is used, we may raise the "burrs" off the shoulder by increasing the folds under the bar.

Injuries by the rear "fans."

In dealing with the rear "fans" the same rule applies. To keep them off the loins press the stuffing forward so as to empty the pannel for the required distance, have the latter stitched across, press the stuffing well up against the stitches and try the saddle on (Fig. 10). When the man is leaning back, the hand should still find ready admission beneath the "fans."

It is impossible to give too much prominence to the fact that loss of condition and underfeeding are the two chief predisposing causes of sore back. When the vitality is lowered the powers of resistance are considerably lessened, and further, the back waste which follows hard work and underfeeding brings the saddle closer to the bony framework on which it rests (see p. 11).

SECTION V.

How to Fold the Saddle Blanket.

The saddle blanket plays such an important part in the saddlery of the present day, now that pannels have been abolished, that a section devoted to the various methods by which it can be folded is rendered necessary.

Use of saddle blanket.

The object of a blanket is to afford protection to the back and to replace artificially the flesh the horse may have lost. Back waste is an early symptom of hard work, and unless we can keep the saddle at its proper height above the spine, and furnish the horse with something extra to take the strain off his skin, sore backs must result.

There is some variation in the size of blankets owing to shrinking and stretching, the measurements for folding which are given cannot, therefore, be regarded as absolute.

The blanket is not square, the length is 5 feet 6 inches, the width 4 feet 8 inches. To learn the methods of folding, a miniature blanket may be used.

Various methods of folding blankets.

*Regulation method of folding.**—The regulation method of folding a blanket for a sound back well furnished with flesh is as follows:—

"The blanket is to be folded lengthways in three equal folds (Fig. 22, Stage I), one end is then turned over 24 inches, and the other turned into the pocket formed by the folds (Stage II); the blanket thus folded is placed on the horse's back with the thick part near the withers. Size when folded 2 ft. 2 in. by 1 ft. 8 in.

It is the second stage of this method which reads the most complex. In performing it the folds A, B, Fig. 22, at the extremities of the blanket must be shorter than the centre. The end of the last fold

* This method of folding was introduced by Major-General Luck, C.B., Inspector-General of Cavalry, who learned it in Hungary.

is now taken and rolled tightly upwards and towards the folder—Stage III, Fig. 22—until the end of the other fold is reached. The roll is then pushed inside the pocket formed by the first fold under the upper layer of blanket, and then finally unrolled away from the folder. This ensures the blanket being level, and does not displace the other folds; the blanket must lie quite flat and the ends should not overlap.

Fig. 16 shows a method of folding the blanket which until lately was regulation.

There are other methods of folding the blanket which may be practised in certain cases.

The six-fold blanket is obtained by folding the length of the blanket in three equal folds of 20 inches, doubling these in the centre, and putting it on the back with the length across the horse. (*See* Fig. 17.)

Another method of folding the blanket in six throughout is to double the blanket in the centre of its length, then fold in three folds of 20 inches each.

When we are anxious to afford more wither space as in the case of a thick-withered horse, we must arrange the blanket so as to place fewer folds under the arches and more under the side-bar.

The six- and three-fold blanket.—The preliminary steps are the same as the six-fold, viz., it is first folded in three lengthways, of 20 inches each fold, then each end is turned up for 14 inches so as to bring double the thickness under the side-bar to what there is under the arches. (*See* Fig. 18.) The blanket is placed on the numnah folds downwards so as to keep the three thicknesses of the blanket still further off the withers and prevent the folds coming out from under the side bars.

Another method of folding the blanket in six and three, is to turn in both sides of the length of the blanket towards the centre for 13 inches, then fold in three, each fold being 20 inches.

The nine- and three-fold blanket.—The preliminary steps are the same as in the first method of the above, excepting that instead of being folded once towards the centre from each end it is folded twice, the folds of course being shorter than in the preceding, viz., about 10 inches. (*See* Fig. 19.) This method

of folding should only be employed when greater protection is required as in back waste, for it is obvious that the more folds of blanket placed under the bar, the less protection is there to the sides from the girth buckles and D.

The twelve- and three-fold blanket is obtained either by making three folds to the centre of the preceding blanket instead of two, or, better still, by opening the blanket to its full width and length, and, noting the centre, the first fold should be towards the centre in the length of the blanket of about 15 inches in width (*a*, Fig. 20). This is then doubled, which gives four folds on either side of the centre line (*b*, Fig. 20). One end of the blanket is now taken up and folded for about 20 inches, then the opposite end is folded for a similar length ; in this way we have three folds under the arches and twelve under the side bars. (*c*, Fig. 20.) Twelve folds under the side bar is the largest number we can make with the size of blanket at our control, it should afford a thickness sufficient for the majority of cases, though there is no disguising the fact that, excepting for the numnah, there is no protection left on the side of the ribs when the blanket is turned up in this way under the bar.

When a blanket is folded with twelve folds under the bar, it inconveniently narrows the front arch. This can be prevented by another system of folding, viz., the blanket is folded in its length in three folds of 20 inches (*a*, Fig. 21) ; it is now placed on the back having 31 inches or thereabouts of blanket on either side of the spine (*b*, Fig. 21). This is now folded obliquely, so that the front edge of the fold is 12 inches in length and the rear edge 14 inches (*c*, *d*, Fig. 21) ; the front edge projects in front of that portion of the blanket on the back for about 4 inches ; the turned up part is again doubled, the front edge being $6\frac{1}{2}$ inches, the rear edge $7\frac{1}{2}$ inches (*e*, Fig. 21). In this way the folds of the blanket lie obliquely on the back until the blanket is secured well up in the front arch by the numnah strap ,by which the folds are brought parallel with the upper edge of the side bar but do not project above it.

There are certain general rules in the folding of blankets which must be observed :—

1. The width of a blanket when folded, viz., the distance from front to rear, must not exceed 20 inches; this is roughly the distance between the arches taking in the curve of the seat. A 20 inch blanket will lie on the back flat after being strapped up front and rear; any greater length than this wrinkles when the numnah is strapped up to the arches.

2. The length of a blanket may be anything desired, from the middle of the chest on one side to the same region on the opposite side.

3. The disadvantage of folding a blanket the same thickness throughout is that there are just the same number of folds under the front arch (where they are not wanted, and may even prove a serious disadvantage), as under the side bars. The channel of a saddle should be as little occupied with blanket as possible, and thereby prevent the space which should exist from front to rear arch under the seat being seriously diminished.

4. When special methods of folding have to be adopted, as with the nine and twelve folds, we must take care that in benefitting one part we are not damaging another. These special foldings require constant attention and supervision.

It is very difficult to describe the various methods of folding blankets, and even with the diagrams some difficulty will be experienced in understanding them, unless they be worked out either with the blanket itself or with a miniature; for example, a piece of paper having sides $4\frac{3}{4}$ inches by $5\frac{1}{2}$ inches.

SECTION VI.

How to Inspect a Sore Back.

We have now to explain what methods should be pursued in cases of sore back, to determine the cause of the injury and the exact part of the saddle which has produced it.

To inspect a sore back.

We must suppose the injured horse is brought up, the man carrying the saddle; we inspect the injury, a glance at its position tells us the cause, or, if we are not yet sufficiently expert, it tells us at what part of the saddle to look for it. It cannot be too strongly impressed upon all to study the *position* of injuries on the back, the position determines the cause, the cause removed the effect ceases. We should know what every wound on the back means, just as clearly as it is impossible for us on the map to mistake Africa for India, or England for Ceylon.

Age of injury.

After having mentally noted the position of the wound, it is examined to determine whether it is a fresh one, or an old injury recently rubbed, or an injury of a few days' standing concealed in the hope that matters would right themselves. Great care should be taken in giving an opinion on this question without skilled advice, unless the thing is so plain that he who runs may read. A fresh injury is readily determined, blood or something like it on the numnah, or a freshness in appearance is very characteristic. The most difficult injuries to determine the age of, are those where a man reports there was nothing on his horse's back but a piece of thickened skin perfectly covered with hair (always white); this piece of skin has come off and left a large raw patch beneath. The man believes it to be a recent injury, but it is not, it has been there for days, probably weeks, during which time the skin has been slowly dying, the hair changing in colour,

(strange to say the men never observe this), and at last a part of the scab or sitfast comes off, leaving a raw moist surface beneath. Such an injury is caused by pressure which has only been sufficiently severe to kill the skin slowly.

When an injury actually has "matter" on it, we may be certain that it is at least four days old.

Marking the wound.

The saddle is put on in the ordinary way, taking great care that the horse is saddled up *by the man who looks after him*, for it is only by this means that we can insure it being in the position it probably occupied at the time the wound was inflicted. before this is done the injured surface is lightly smeared with a black ointment made of charcoal and vaseline, or soot and lard, or blacking (though this latter is not good as it dries so readily); the object of this is to indelibly mark on the numnah the place producing the injury, and the part of the side bar opposite to this mark on the numnah is the seat of trouble; moreover, the marking conveys to the saddler without any possibility of doubt the exact part of the saddle which needs alteration.

We cannot too strongly recommend this method; its exactitude and simplicity are the great features.

For inspection purposes we may divide sore backs into three zones: a superior, middle, and inferior.

The superior zone is represented by the upper line of the spine and withers.

The middle zone is that surface on which the side bars rest, viz., the back proper.

The inferior zone is the side of the chest.

Injuries to the upper zone.

Injuries to the superior zone must be due to one or other of the following causes:—Arches too low; arch low and narrow and filled up with the folds of the blanket and numnah; the end of loose straps between the numnah and skin; the seat too low and resting on the side of the wither; the webbing between the side bars bearing on the back through being too short; the numnah resting on the withers or spine through not being properly fastened up to the arches; through riding on a numnah the surcingle of which is too tight; the rear pack resting on

the spine through not being drawn up high enough in the centre; blankets being worn without pads, or with pads containing insufficient stuffing to keep them off the spine; or the web surcingle being too tight, as after exposure to rain.

To inspect these injuries the saddle must be put on with the numnah and blanket, the horse girthed up, and if necessary the man mounted; parts which appear well out of harm's way when no weight is in the saddle are brought an inch or two nearer to the spine when a man is mounted. This is a most important point to remember in injuries to the upper zone.

The fact of enumerating the various causes of injury to this region, explains for itself the method by which the investigation is to be carried out.

Injuries to the middle zone.

Injuries to the middle zone are those caused by the side bar, the exact nature of these has been fully described on p. 40. To investigate them the bare tree is placed on the back, and the position of the injury indicates the part of the side bar at fault. The only mistake that can be made is in determining the cause of an injury which is situated at the side of the withers rather low down, due to the distance between the two side bars being too narrow and so pinching this region. It is a most common cause of trouble, and *when the bare tree is placed on the back, the upper edge of the side bar appears to be so far below the wound, that one might be inclined to regard the bar as taking no part in the production of the injury.* This error is due to there being nothing under the saddle, the introduction of a numnah and blanket will be found to raise the saddle in such a way that the upper edge of the side bar exactly corresponds to the injury on the side of the withers. We have emphasised this point, as we know from experience how misleading the bare tree is.

In the first edition of this manual great stress was laid upon the value of the information to be derived from an examination of the upper surface of the pannel (Fig. 12), every depression on this means a projection next the back. The abolition of pannels has removed from us this valuable guide,

still a fair idea of the even fit of side bars can be obtained from the depression left on the upper surface of the blanket after the saddle is removed; one can tell at a glance how far the pressure is evenly distributed by the depth of the impression on the blanket, but the examination must be carried out rapidly, as the imprint of the side bar is quickly obliterated by the natural elasticity of the blanket.

The Injuries to the inferior zone are those produced by whatever is under the saddle flap, viz., the V-shaped girth with its D, sweat flap, and girth buckles. To detect the cause an examination of this region will generally be found to give complete information; we must bear in mind that a short numnah and short blanket afford but little protection to the side from girth buckles, and that the injury in nearly every case is greatly aggravated by a tight surcingle.

Injuries to the inferior zone.

We have mentioned the tight surcingle on several occasions, as we know from experience that it is difficult to get people to believe that it may be such a serious evil, but the examination of the inner surface of a saddle flap will show what a tight surcingle is capable of causing, and if it will allow buckles, &c., to cut into and depress the stout leather of a flap, it will certainly press them into a sensitive skin.

Having determined the cause, it must be dealt with as previously described; the alterations in the saddle must be thoroughly carried out, and the *whole inspected afterwards to see that they are suitable* before the horse is worked.

SECTION VII.

Collars and Sore Shoulders.

It will assist considerably in understanding the horse's requirements in collar fitting, if we study very briefly the shape of the shoulders and the movements they undergo.

Movement of shoulders.

We have seen, page 11, that the shoulder blades are constantly moving backwards and forwards. For the purpose of collar fitting we have to bear in mind that while one shoulder is coming forward the other is going backward, so that at no time is the collar resting on a perfectly parallel surface—such as the two shoulders at rest represent—but always on an oblique one. This backward and forward movement produces considerable oscillation in a collar, which may readily be seen by walking a horse past one with the collar lying on the shoulders. This is a most important point to remember, if we are to understand how collar injuries are produced.

A horse with an upright shoulder is comparatively easy to fit with a collar, especially if the draught place is wide; but an animal possessing oblique shoulders is difficult to fit, for the part is fine, there being no draught place, and the tendency of such a collar is to rise on the shoulders when the horse puts his weight into it.

No matter what shape a shoulder may be, the collar invariably rises when in draught, though with upright shoulders only to a limited extent; this rising appears to be aggravated in a horse with oblique shoulders.

Necks and shoulders vary in shape and size depending on the amount of condition present; this, as will be seen presently, is the key-note to collar fitting and the prevention of injuries.

Necks vary considerably in shape and size according to conformation, whilst some horses are very thick at the crest of the neck (the part in front of the withers), others are thin; some have the neck

so hollow from side to side that it can almost be felt through, whilst others have the muscles large and well developed at this part.

Where the draught is carried.

Physiology tells us that the weight imparted to a horse's shoulders in draught should be evenly distributed over the anterior surface of the blade-bone. Owing to the movements of the shoulders, the collar should fit so closely that but little oscillation is possible between it and the parts beneath; collar injuries are almost always the result of *friction*, which is the great distinction between them and injuries to the back, which are nearly always the result of *pressure;* our object, therefore, is to reduce this friction to a minimum. When a horse throws his weight into the collar, the latter rises on the shoulders especially in draught up hill, hence the necessity of having the throat of the collar away from the neck, so that no undue pressure is caused at this part; but a collar too deep, viz., too long, rises unduly on the shoulders and extra friction is caused.

Fitting a collar.

In fitting a collar the above are the points to attend to. The collar should lie easily on the shoulders, no effort should be required to force it into its place, such would be an indication of it being too narrow, and the sides of the neck would suffer. We should observe that it rests evenly on the shoulders from top to bottom; no see-saw motion should be present, indicating that the centre of the body contains too much stuffing. The top part of the collar just in front of the withers should admit the flat of the hand between it and the neck.

The next important step in fitting is to ascertain that the collar fits close to the side of the neck without pinching; between the inside of the collar and the neck should be a space which will just admit the flat of the fingers, and this space should be found from top to bottom. It will often be observed that the required space exists above, but from the lower third of the neck the space between it and the inside of the collar is so great that it may admit a cricket ball; in other words, there is too much play. Nothing is more certain than this

will produce injury if the animal be called upon to perform heavy and continuous draught work. The secret in collar fitting is to *stop all lateral movement between the collar and the side of the neck* if shoulders are to be kept sound; on the other hand, pinching the side of the neck is to be avoided. To test the amount of lateral movement in a collar, take hold of the points with one hand and steady the collar on the shoulders, with the other hand take hold of the throat, then work the collar from side to side, but still pressing it against the shoulders. The amount of play can now be seen. If above the shoulder joint it amounts to as much as 2 inches, the collar is too wide; in some cases it is as much as 4 or 5 inches.

The next thing to be considered is the depth of the collar. From the foregoing it is clear that a collar too deep is a positive evil, one not deep enough may be a source of very serious trouble. To test the depth of a collar, insert the flat of the hand between the throat of the collar and the horse's neck; if deep enough the hand and wrist should find ready admission; anything more than this is unnecessary.

There is one more point to be examined before our fitting is complete, and that is in connection with the after-wale. When a collar has been in wear for some time the body becomes flatter; this flattening allows the edge of the after-wale in forced draught to overlap the body of the collar and cut the skin of the shoulder. We will again draw attention to this condition, and at present only note that on pressing the collar closely against the shoulders a careful examination of the after-wale should be made just above the point of the shoulder to ascertain that it is nowhere near the skin.

To summarise these points in fitting a collar—

1. See that it does not rest on the neck in front of the withers.
2. That it bears evenly over the shoulder blade.
3. That the space between the inside of the body of the collar and the neck will admit the fingers.

4. That the depth between the throat and the neck will admit hand and wrist.

New collars.

A new collar is worse than a new saddle, because it is only by a certain amount of wear that we can expect this contrivance of leather and straw to adapt itself to the shape of the surface on which it has to rest; for this reason great care should be exercised in the use of new collars until they have adjusted themselves; and the issue of new harness, especially new collars, to troops proceeding on service, cannot to too strongly condemned.

To assist a collar in getting into shape, we believe we have seen advantage arise from the following procedure, viz., to thoroughly wet the collar by leaving it in water for an hour or two and then putting it on and working the horse steadily, taking care that its shape is not altered while drying.

Housing straps.

For very good reasons military collars are made to open at the top, but this is a loophole for trouble, as the "housing strap" which closes it often stretches to such an extent that the collar is not properly closed, and the neck gets pinched. Saddlers often depend on the hames for keeping the collar closed, and to these we must now turn.

Hames.

Hames have to be fitted to the collar, if necessary by heating them: they should fit accurately into the space between the fore and after-wale. Care should be taken in this fitting that the attachment for the trace is neither too high nor too low, and further, that the outline of the collar is strictly followed in the hames or else the fit is imperfect. If the hames are too straight a collar which without them fitted well, will not be found too tight. When hames are fixed the rigidity of the collar is considerably increased and the points are brought much closer together; it is on this fact that, as I have said, saddlers often depend for keeping the collar closed. But it will be found that the hames only close the collar at the points and not behind; this can only be effected by a good-fitting housing strap, which cannot be drawn too tight. Especially is this the case in pole draught when the chains are attached to the collar, and con-

siderable strain comes on the housing strap going down-hill or in pulling-up. For the same reason the most common injury in pole draught is to the neck in front of the withers, and but few horses escape the mane being worn away at this part owing to the continuous friction of the collar. It is for this reason that we strongly impress the necessity of the collar being so stuffed as to cause no pressure on this region of the neck. (See Fig. 14.)

Injuries Produced by the Collar.

Collar injuries are caused by friction.

As previously mentioned collar differ from saddle injuries in one essential, viz., one is caused by friction the other by pressure. *If we have to work a horse with a sore back we must remove the pressure; if we have to work a horse with a sore shoulder we must stop the friction.* There is one well marked exception to the rule given, and that is the injury caused to the neck in front of the withers; this is almost invariably a gall, the result of *pressure.* We have known many horses receive considerable injury to this part of the neck through simply wearing the collar for some hours in the stable.*

Position of collar injuries.

Reference to Fig 13 shows the position of injuries produced by the collar numbered from 1 to 5. No. 1 is the gall to the neck in front of the withers, to which we have just alluded. It is caused by pressure, or by the part being pinched in draught through the housing strap being too loose. It is an injury giving rise to extreme pain, so much so that the animal can only be examined with great difficulty; not uncommonly the skin dies and a piece comes away as in a sore back. It is the only approach to a "sitfast" that is met with in collar injuries, and for the reason previously specified, viz., pressure. This injury is more common in pole than in shaft draught, and is caused by the strain inflicted on the neck in pulling up or going

* We refer here to the horses on Fire Brigade duty at Aldershot; the animals are on the pillar reins for some hours at a time ready to turn out, and injuries from this cause are common.

down hill owing to the action of the pole chains, aggravated by a loose housing strap. The injury may occur on perfectly level roads, and is then often due to carelessness on the part of the driver in shortening the pole chains too much, and so throwing the weight of the pole on the horses' necks. The pole should not rest on the neck, but be perfectly free to move up and down, and the chain though taut should not lift the pole an inch.* A tight wither strap, by drawing back the collar, may also cause an injury to the neck.

If collars are stuffed as in Fig. 14, this injury may be prevented, or a metal pad may be worn between the neck and the collar. These so-called "wither pads" are undoubtedly excellent, though, of course, they cannot prevent injury when the full strain comes on the neck. In the Belgian system of pole draught, recently adopted for the Royal Artillery, the strain of going down hill or pulling up is not imparted to the collar but to the breeching, which by being carried all round the horse and attached to the pole chains, throws the strain on to the very part calculated to take it, viz., the hind quarters.

Injury No. 2 (*see* Fig. 13) is almost invariably due to a tight collar, especially in horses with very fleshy necks; the remedy is simple—remove some of the stuffing or stretch the collar. In stretching a collar it should be borne in mind that there is a risk of damaging it, especially at the throat.

Injury No. 3 is practically always due to a loose collar, viz., one too wide; it is very common and frequently occurs under the point of draught, viz., the attachment of the hames; it is a difficult injury at times to deal with. The remedy is to plug the collar and so make it narrow; all movement in the collar is to be stopped according to the directions previously given. Sometimes injuries occur at this part which appears to be well behind the collar when the latter is fitted; in these cases the collar is generally very much too wide, and if pulled over towards the injury will be found to touch it.

* The pole here referred to is that of the general service waggon.

Injury No. 4 is caused by a loose or a tight collar; the whole neck for about five inches is very tender, and the appearance of the collar is at once indicative of the cause. The remedy is to make it narrower with strips of numnah, or wider by wetting it and stretching it on a block. We should not forget that stretching a collar shortens it.

Injury No. 5 occurs just above the shoulder joint, and is almost invariably due to the raw edge of the after-wale touching the skin. Such collars are generally old, and the stuffing having settled down allows the after-wale to cut into the skin, though this may not be apparent until the horse is tested in draught, when it can at once be seen. At other times the cause of the injury can be determined by simply pressing the collar on to the shoulder, when the after-wale may be seen to touch. The remedy is either to re-stuff the collar, or, if there is no time for this, to cut off the edge of the after-wale close up to the lacing.

Sometimes an injury occurs in the region of No. 5, but above the edge of the after-wale. This is due to the friction of a wide collar, and the remedy is to deal with it as in No. 3.

The nature of collar alterations.

It will be observed that the alterations of a collar resolve themselves into making it narrower or making it wider. We have made no mention of chambering a collar or putting pads beneath it to protect a sore place, because experience shows that the remedy is worse than the disease; a chambered collar will always be unsatisfactory, and a pad beneath a collar is nothing less than cruelty, and the most harmful practice with which we are acquainted.

Pads beneath collar are harmful.

The pad alluded to is a small pillow-shaped body containing hair and covered with leather; it is attached to the collar by straps.

When we consider how necessary it is that the whole weight in draught should be evenly distributed over the shoulder, we can have no difficulty in reasoning out for ourselves what must follow by putting one or more pads under the collar; the draught comes on them entirely, and the damage inflicted has to be seen to be believed.

Horse may be worked

The use of chambers or pads beneath collars is in-

dicative of ignorance of the essential principles of collar fitting. Shoulders which have been injured will heal, many of them during work, if the proper alterations have been effected, and if they continue to rub it is proof positive that the alteration is not satisfactory. With sore shoulders if collar be fitted.

We must not be misunderstood on this point. We do not advise a horse being worked with an altered collar when the shoulders are so inflamed that the animal will not allow itself to be approached; but we do say that after the acute inflammation has subsided, it is unnecessary to wait for the resulting wound to heal before putting that animal to work, if the collar has been properly adjusted.

We have spoken of shoulder injuries as if the collar were always at fault; for all practical purposes it may be considered so, but there are cases where injury has occurred and the collar apparently fitted well. Such will always happen when horses are soft and wanting in condition, and experience teaches us that as the skin hardens the tendency to gall is abolished.

Never allow a collar to be sent to the shop for alteration without the saddler seeing it on and marking the alteration required. It is astonishing how saddlers and collar makers trust to their eye; nothing is more fallacious. Further, they will carry out the most elaborate work without ever thinking of trying the collar on to see how they are progressing, and whether the alterations are on the right lines. No attempt should be made at finally completing the alteration until the collar has been seen on; it should be fitted in the unfinished state. Alteration to be accurately made.

When horses lose flesh as the result of work their collars become too large for them both in width and depth, and injuries are frequent. Effects of loss of flesh in collar fitting

To shorten a collar under these circumstances is a great mistake, for if it is too deep when the animal has very little on its neck, it is certain that it will be much too short for him when he has put up flesh again; besides, a collar once shortened can only be lengthened with difficulty. Yet collars which are too long allow of considerable play, and play means friction. The horse losing flesh must not be allowed to Shortening of collars

wear a long collar, it should be artificially shortened to prevent damage, but it should not be cut. In the same way loss of flesh means a collar too wide; to stuff a collar under these circumstances means that it is too tight when the horse puts up muscle, and yet a wide collar is a source of friction and injury. Here again we must reduce the width not actually by stuffing, but artificially in a manner to be presently described.

But apart from the reasons given against stuffing and shortening the collars of working horses, there is the waste of material, the loss of time entailed by a man having to shorten and re-stuff collars, and in a fortnight's time having to try and make them longer. While the collars are undergoing this course the horses are idle, and yet the most completely satisfactory alteration can be carried out in a few minutes without interfering in the slightest degree with the collar itself, and without stopping the horse's work.

How to reduce the width of a collar.

The method is this:—To make a collar narrower, mark the region with chalk, and observe how much too wide the collar is; a strip of numnah is cut the desired length and the edges shaved off; three or more leather thongs are put through the edge of it, and the whole tied round the body of the collar, the hames passing over the thongs keep the numnah in its place. If the collar is still too wide another strip of numnah is put in at the desired place with the edges shaved off, and this is repeated until the desired amount has been introduced to stop all lateral movement. Some saddlers like to stitch the numnah strips in, or to use straps and buckles instead of leather thongs; it is quite unnecessary, though perhaps neater in appearance.

If a collar is too deep it can be altered in the same way by raising it on the shoulders to the desired height, and strips of numnah inserted—just below where the collar opens—until it is retained at its proper height on the shoulders. These numnah strips are, of course, put in on both sides, and so arranged as not to interfere with the neck.

Such is the simple, expeditious, and absolutely satisfactory way of altering a collar when horses are

performing hard work. We have not known it fail, and by adopting these measures have kept horses at duty which would otherwise have had to be thrown out of work. We may speak of it as the "false collar" process.

The alterations which we have next to speak about are permanent ones, such as arise in the fitting of collars for the first time.

Plugging collars.

The body of a collar is filled with straw—preferably rye. This is introduced into the leather receptacle by means of a piece of iron known as a collar fork or collar-iron; piece by piece the straw is wetted and forced into the body of the collar, until the required amount has been inserted. This process is termed "plugging," and we have nothing more to say about it than that it is to be reserved for collars on first being fitted, and subsequently in course of months, should the body of the collar wear thin. It is a permanent process and should never be adopted when horses are in hard work and losing condition, as it entails too great a call on the saddler's time, is not so satisfactory as the numnah strip, and the whole of the extra stuffing has to be removed when the horse regains flesh. In fitting a new collar the place should always be marked where the extra stuffing is to be placed, and before the collar is finished off it should be again tried on the horse to see that it is perfectly satisfactory. We must bear in mind that a collar can only hold a certain amount of straw, and that where considerable additions have to be made to the stuffing, the collar must be re-lined to admit of it.

In shortening a collar a certain amount on either side of the upper part where it opens is cut off. Collars should never be shortened for horses out of condition; it is not only a waste of labour, but waste of material. Collars can only be re-lengthened after shortening at the cost of much time and trouble.

Where the strain comes on collars.

The greatest wear and tear on a collar is in the throat, which not uncommonly breaks, and the collar when opened and tested will twist in almost any direction. Saddlers look upon this breaking at the throat as a very serious matter, but if the leather work is sound the part can be repaired. A collar

gone in the throat is generally an indication of age and other sources of weakness, but it will also occur from bad usage.

Size of collars.

The following description of the collar is taken from the "Handbook for Military Artificers":—

"There is but one pattern of collar for all services; they vary in size from 19 inches to 24 inches in length. The length is measured from E to F, Fig. 15.

"The collars most commonly used are 21-inch, 21½-inch, 22-inch, 22½-inch, 23-inch, 23½-inch, and 24-inch.

Names of the parts of a collar.

"The technical names for the various parts of a collar are as follows—

A. Fore-wale.
B. After-wale.
C. Caps.
D. Housing straps.
E. Throat.
F. Neck.
G. Body side.

"The fore-wale is made of leather stuffed with straw and capped with light hide. The after-wale is of stout hide, and it covers the body of the collar," which in Fig. 15 lies under B.

The size of a collar is a question of some importance; it cannot well be too large in the body; in this way the load is distributed over a larger surface. In this respect we may take some useful hints from civil life, where the collars are bulky, and utility is not sacrificed to appearance.

Breast Harness Galls.

When shoulders have become so damaged that a collar cannot be worn, breast harness is often adopted. Breast harness should be looked upon as a purely temporary method, enabling us to tide over shoulder trouble. The most elementary observation is capable of demonstrating that harness placed around the breast and shoulders works from side to side at every movement of the limbs, producing a sawing motion which is most destructive. This sawing motion is reduced by attaching the traces to a swingle-tree.

It may be argued that horses have been known to work well in breast harness for years, and that it is not uncommonly employed for trap work. This argument will not bear close inquiry. The difference in draught between a light cart and a loaded general service wagon are two different things; the more the draught is increased the greater the sawing motion.

There can be no doubt that to work horses in breast harness is asking them to exercise their force at a mechanical disadvantage; so much is this the case, that we are informed it was found impossible in the London Fire Brigade to get the pace out of horses wearing breast harness.

As a useful auxiliary breast harness possesses its advantages, but unless our experience is exceptional, it is generally safe to prophesy that a horse wearing it will not work for more than a few days without galling. These few days may be of the greatest value, for by the time the breast has galled the shoulder may have recovered sufficiently to take the collar.

The supporting strap of this harness will sometimes gall the neck. This is generally due to the strap, which connects it to the pad or saddle, being too tight. There should be no strain on the supporting strap; it should hang vertically.

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BY HARRISON AND SONS, ST. MARTIN'S LANE,
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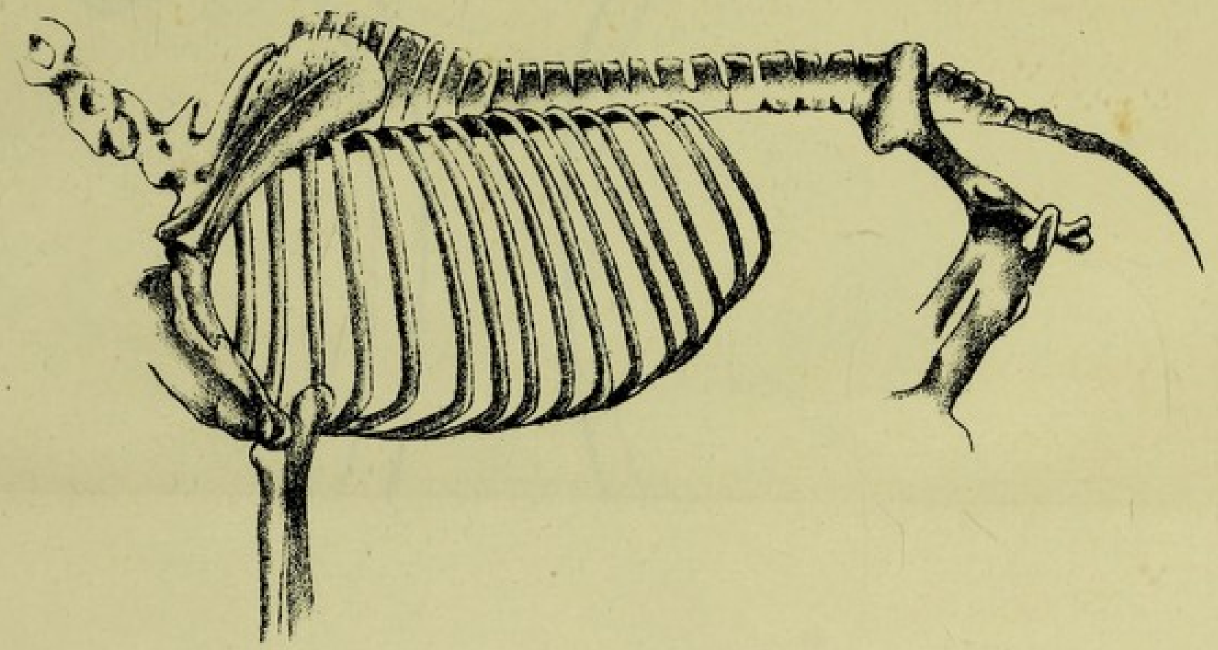
(Wt. 27046 1000 1 | 01—H & S 6442)

FIG. I.

Skeleton of horse showing the arrangement of the back bone and ribs.



The dotted lines through the blade bone indicate the length of the bony processes on the anterior vertebræ.

FIG. I.

Waterlow & Grahams Ltd Litho London.

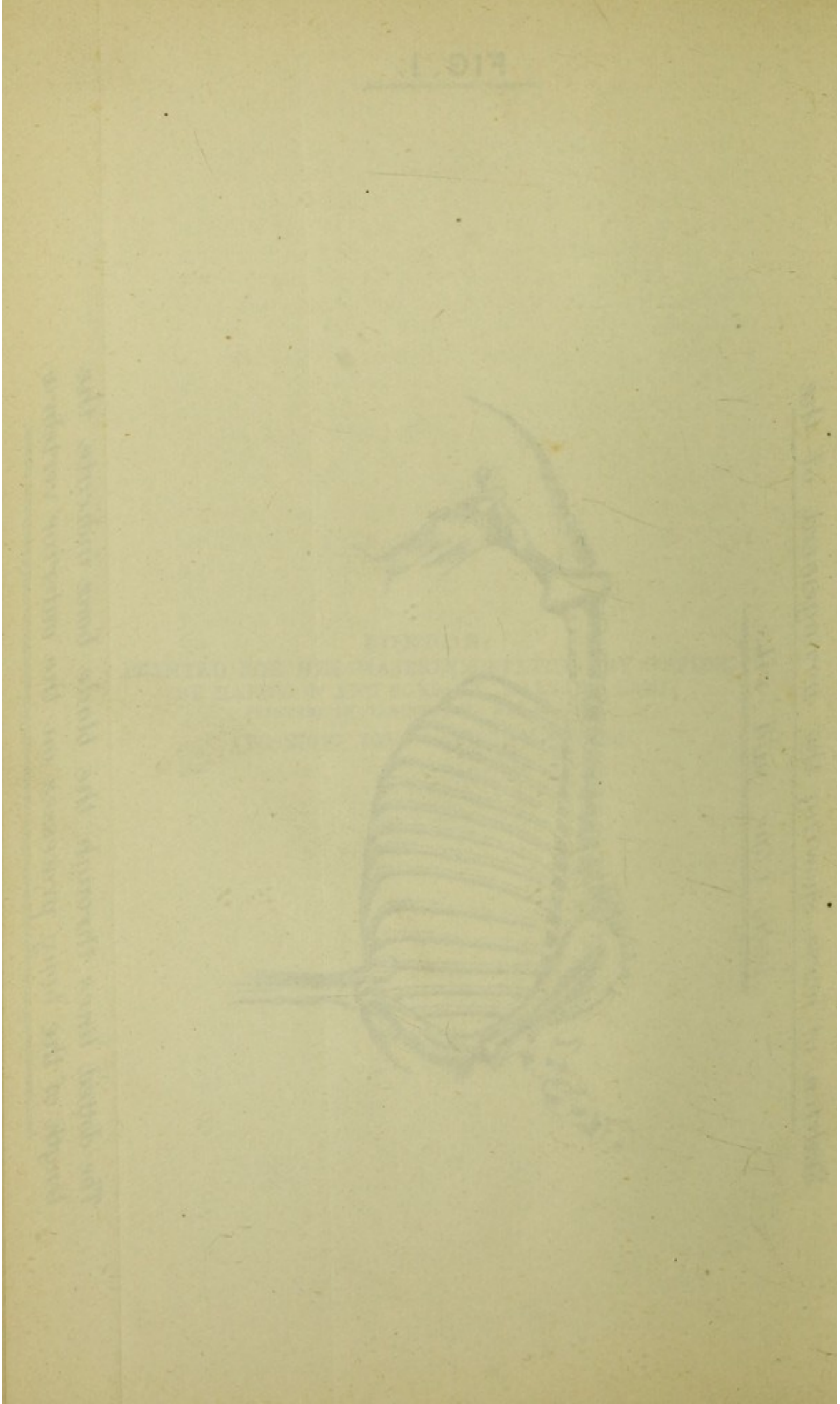
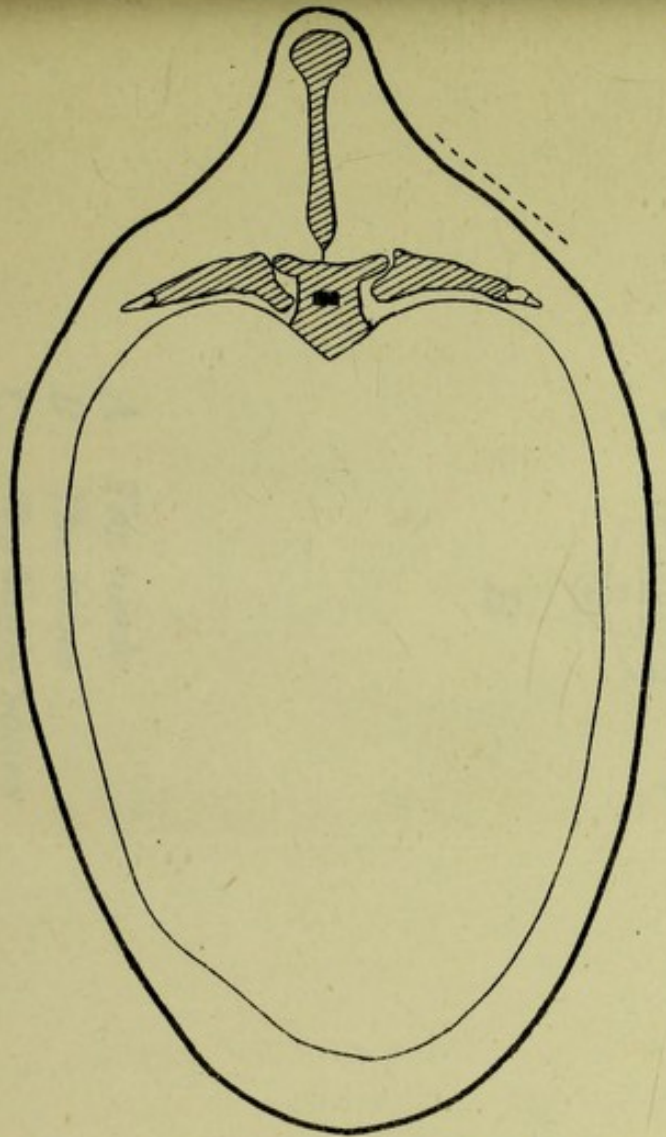
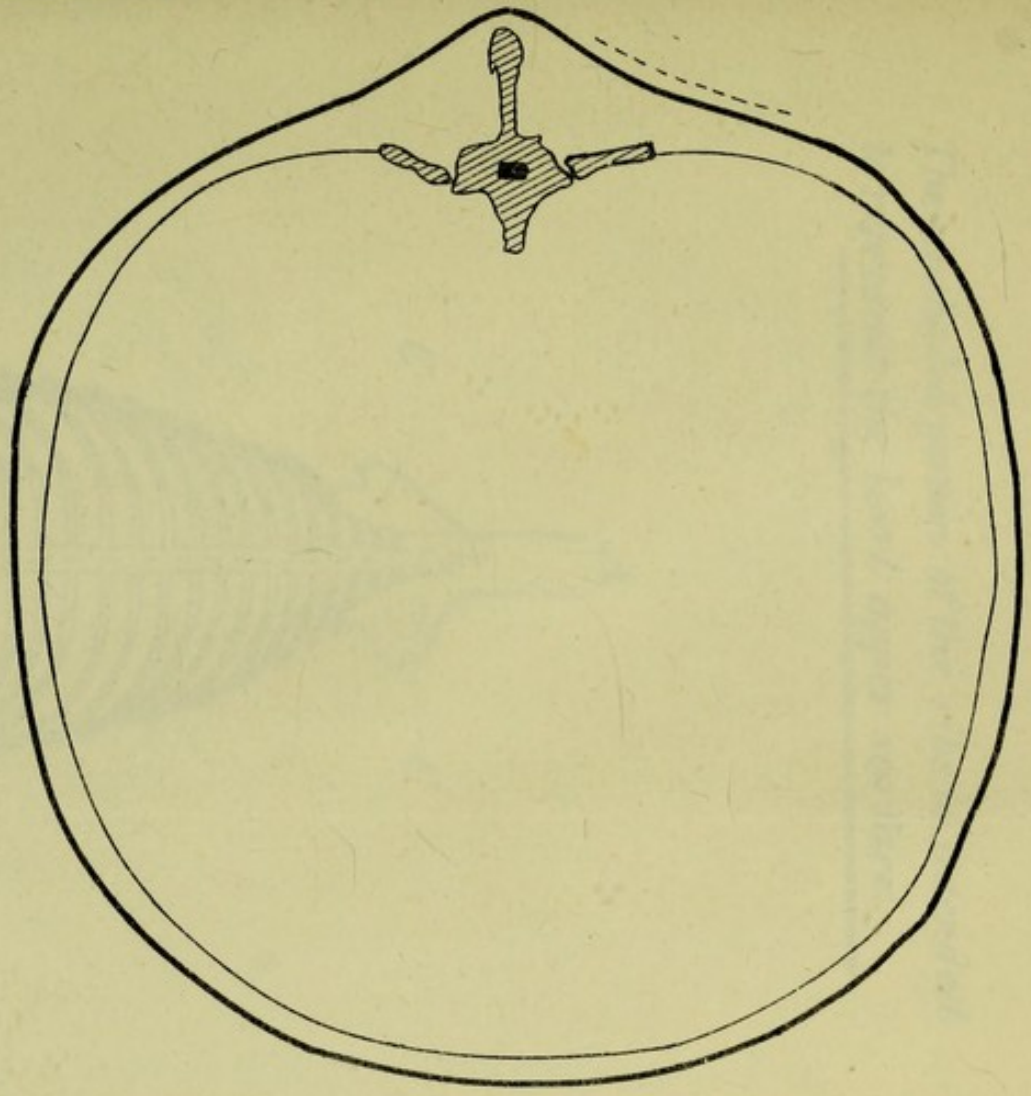


FIG. 2.



Section through the 8th Bone of Back.



Section through the 17th Bone of Back.

Shews sections made through the back behind the Blade Bone & in front of the loins. The dotted lines indicate the direction in which the side Bars bear.

FIG. 2.

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E. Weller & Grahams. Ltd Litho. London.

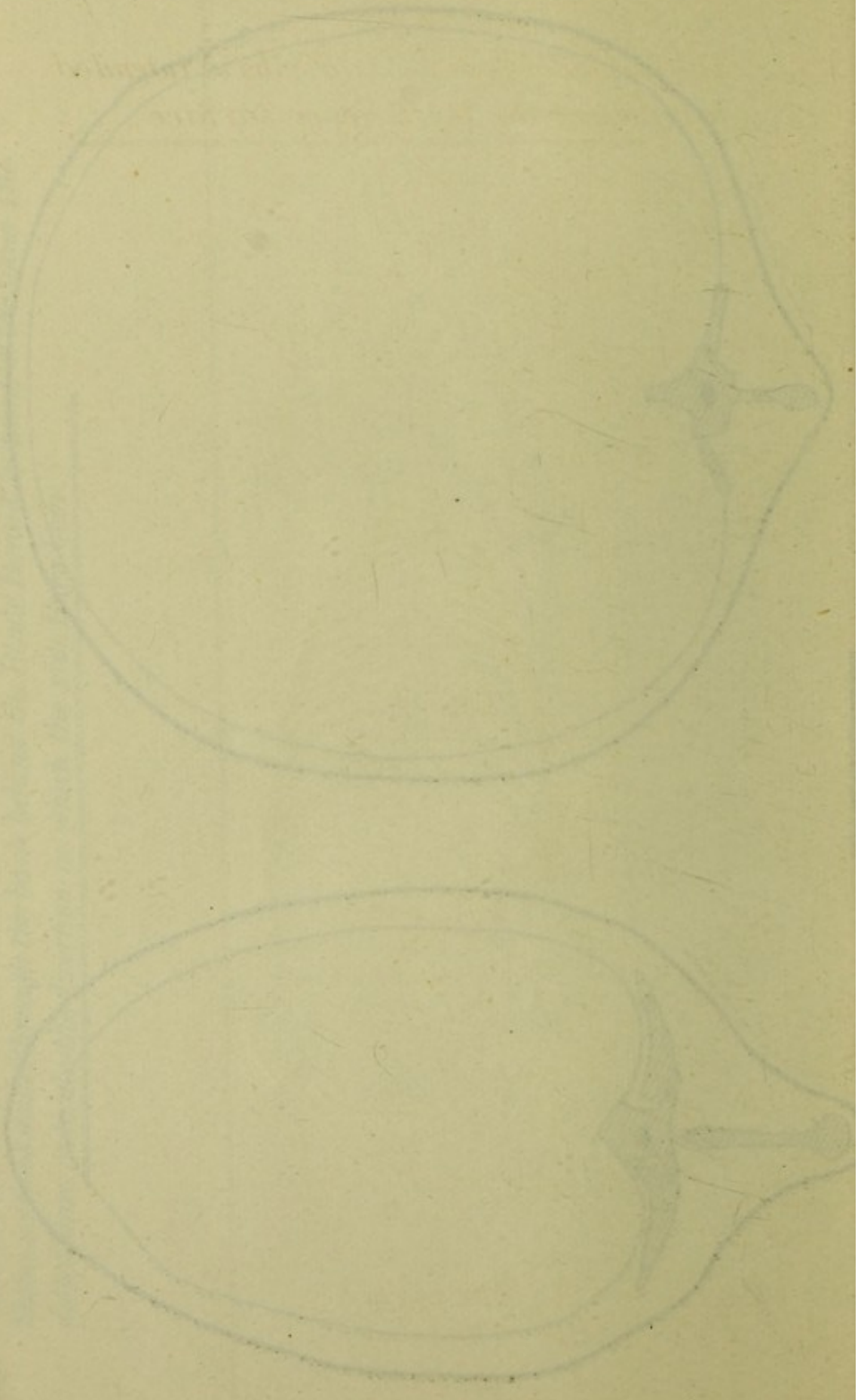
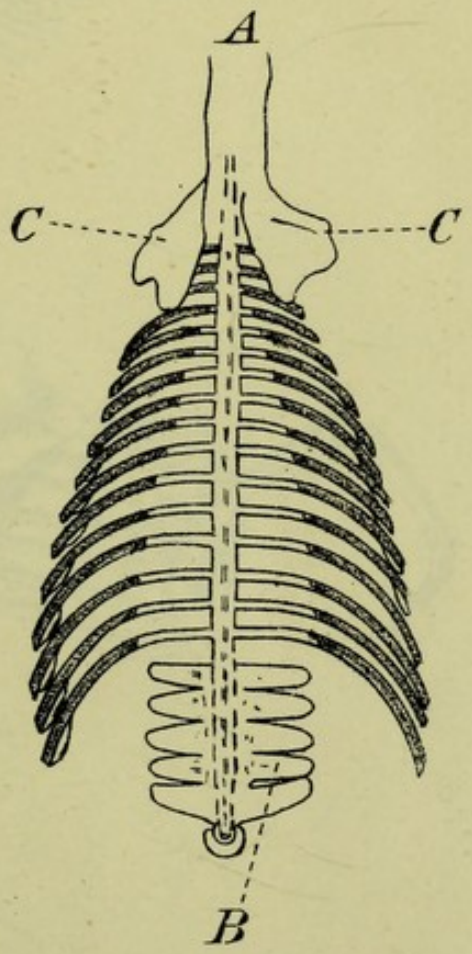


FIG. 3.

The skeleton of the horse viewed from above.

The unshaded portion of the ribs is intended to represent the level upper surface.



A. The neck.
B. The loins.
C. The blade bones.

3:1.1901

E. Weller & Grahams, Ltd Litho. London.

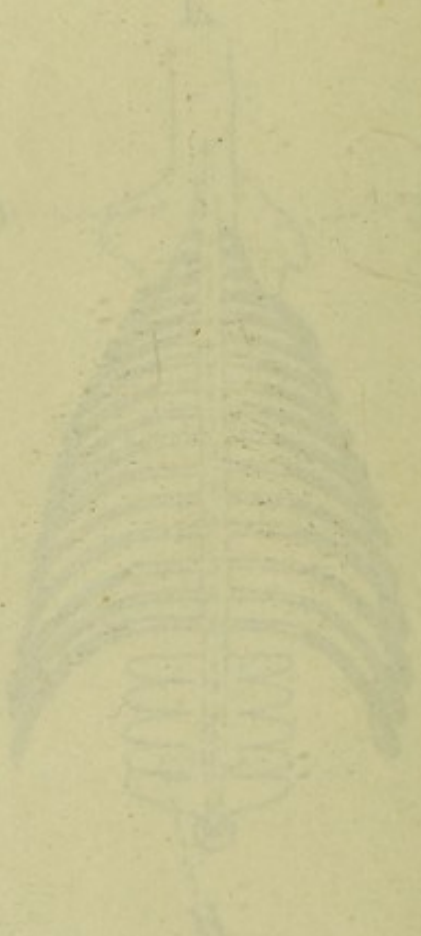


FIG. 4.

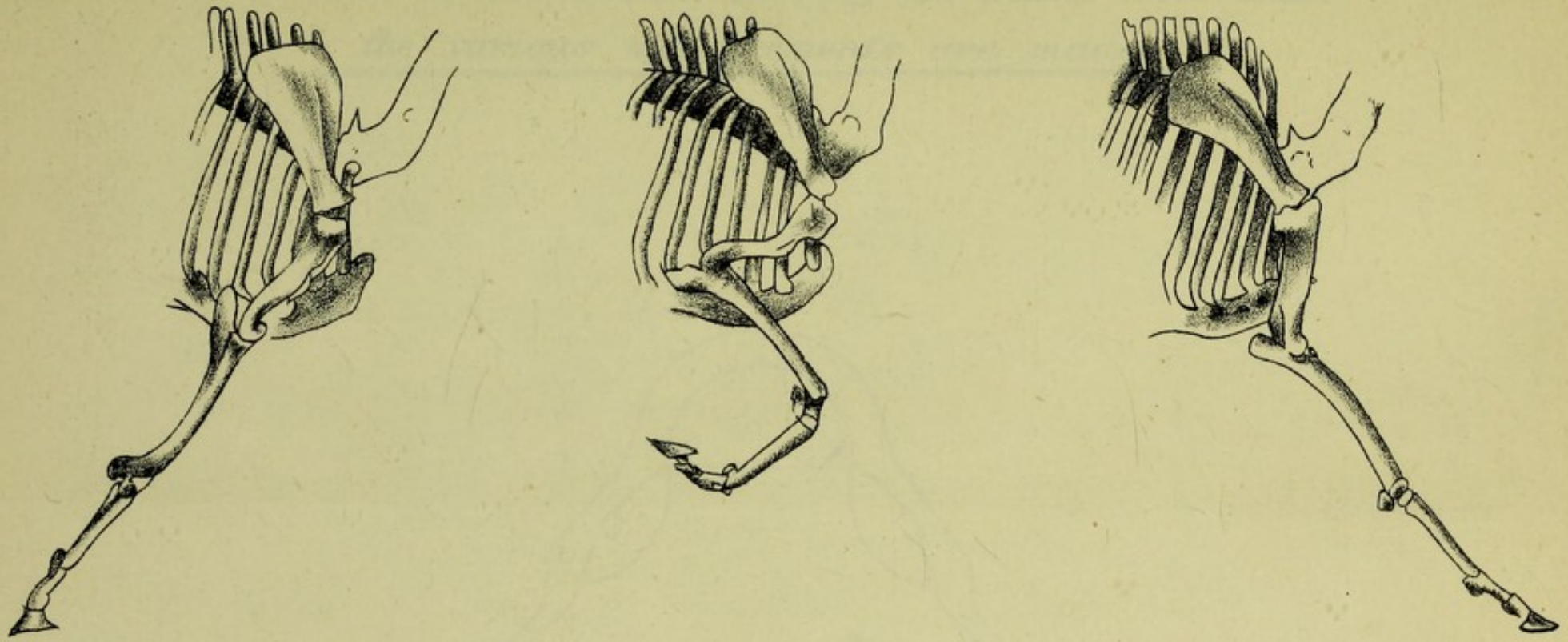


FIG. 4.

Shews the different positions assumed by the Blade Bone during the Flexion and Extension of the Limb.

After Maybridge "The Horse in Motion."

E. Weller & Grahams. Ltd Litho. London.

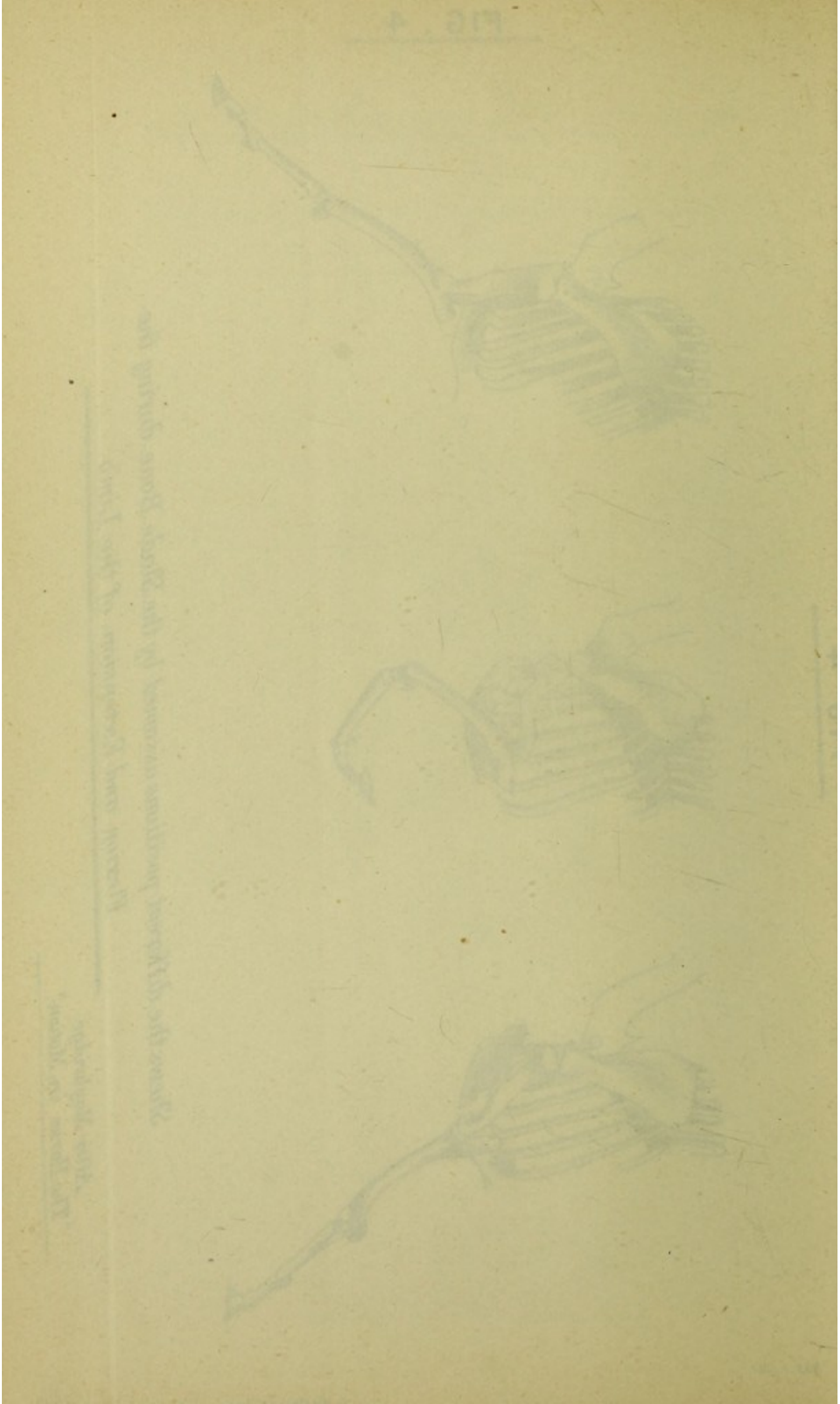


FIG. 5.

Front arch of the saddle shewing the places from which the various measurements are made.

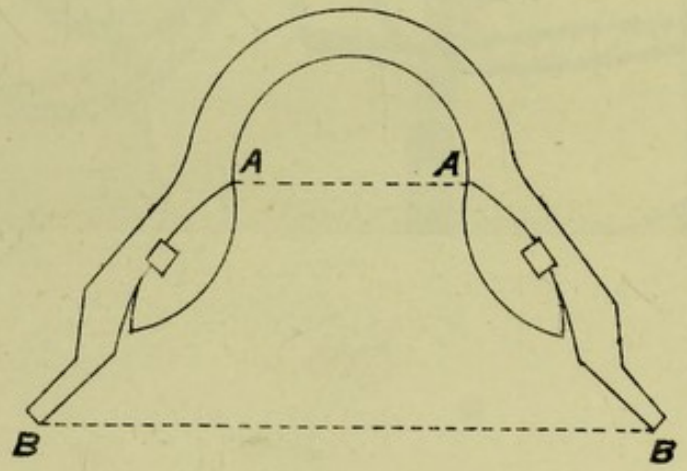


FIG. 5.

1133 / 1901.

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FIG. 6.

German method of keeping the blanket in its place by turning back the front upper fold, passing it over the "Barr" & then under the girth straps.

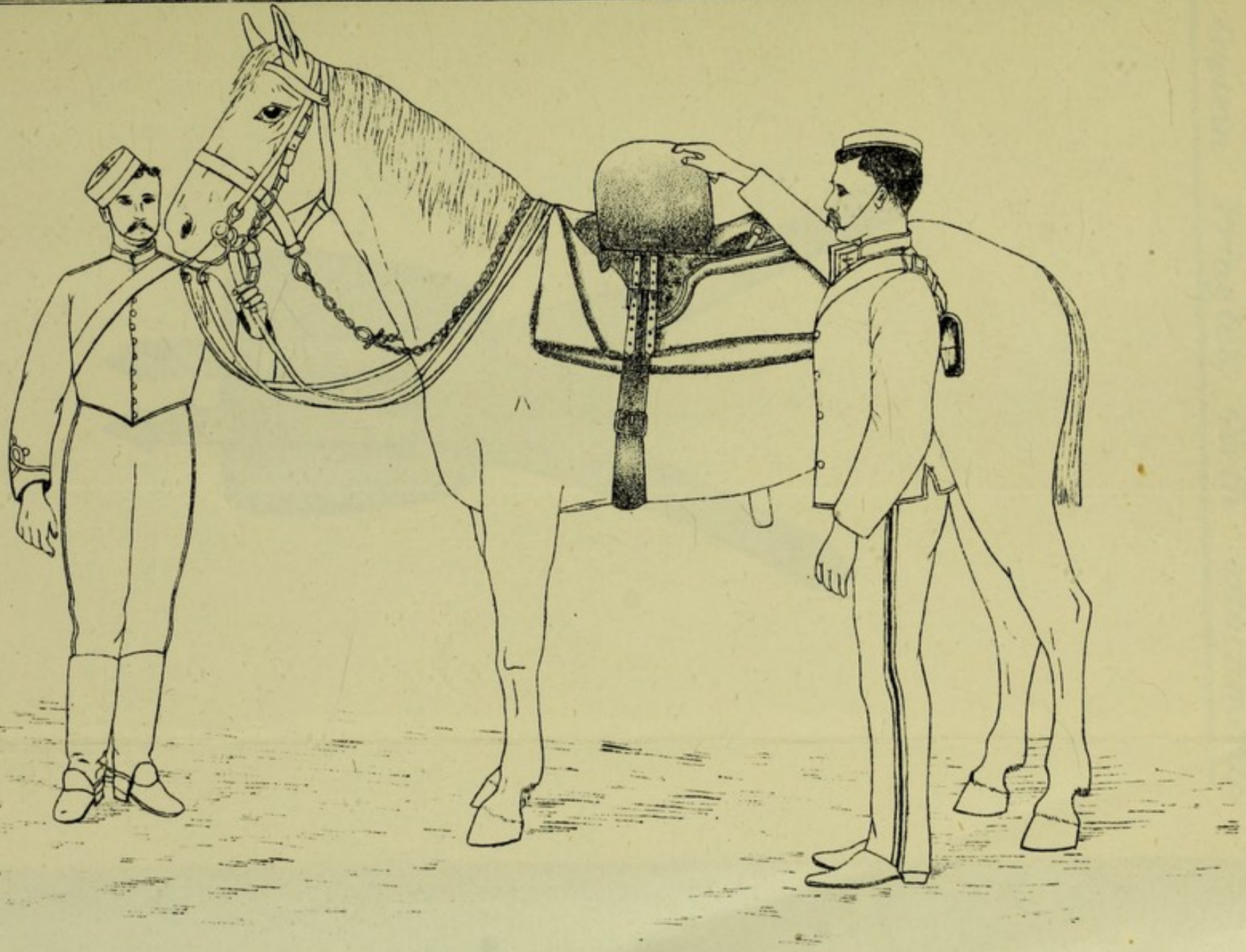
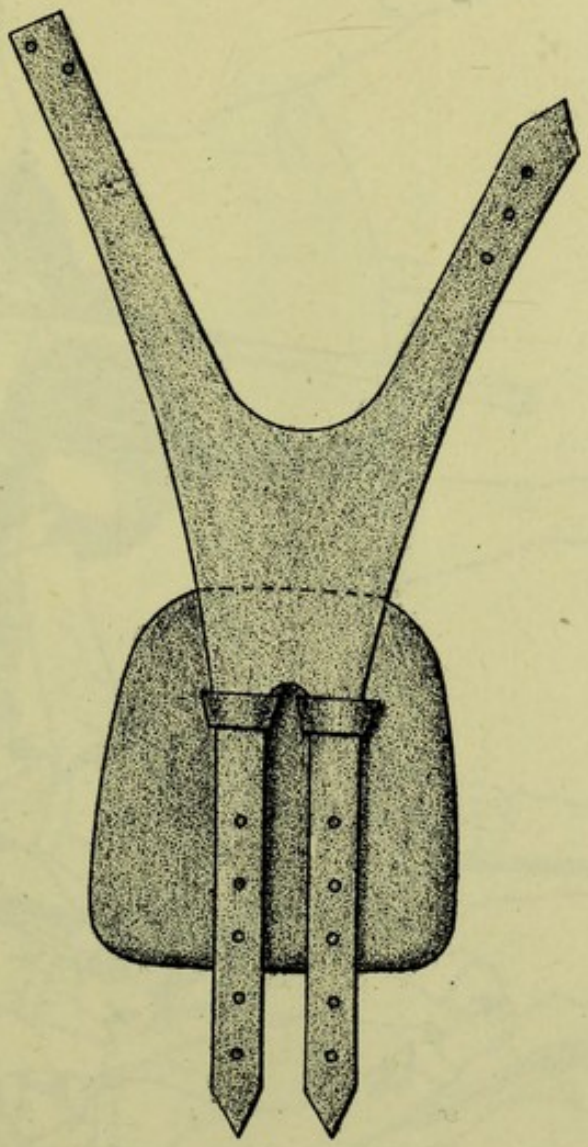


FIG. 6.

E. Weller & Grahams. Ltd Litho. London.

FIG. 7.

Vet^ery Captain Pringle's Girth attachment.



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E. Weller & Grahams. Ltd Litho. London.

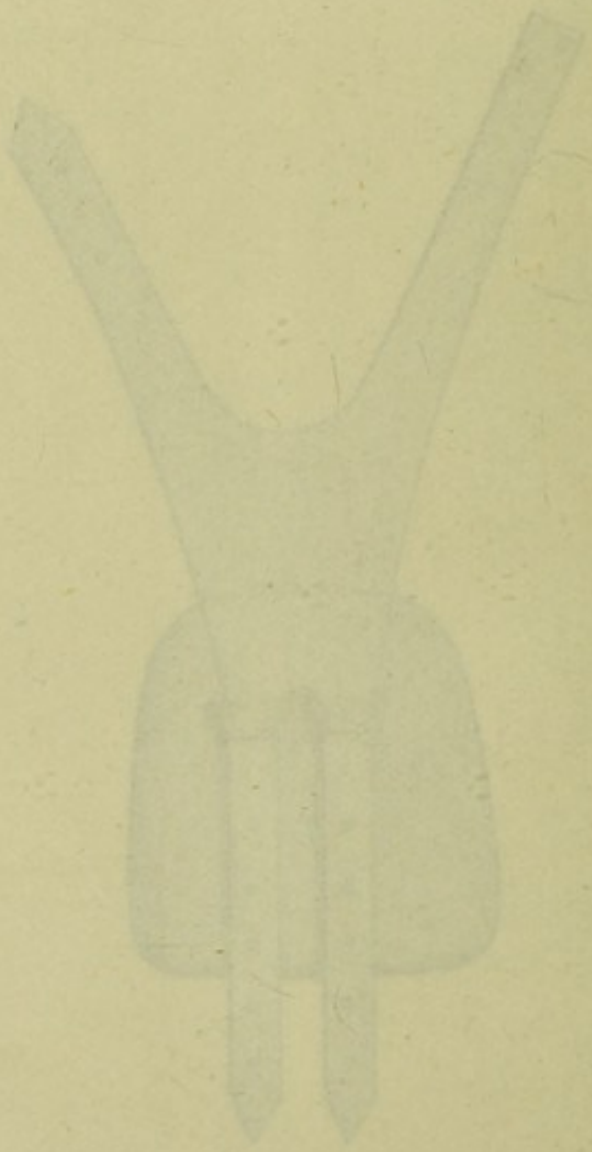

FIG. 8.

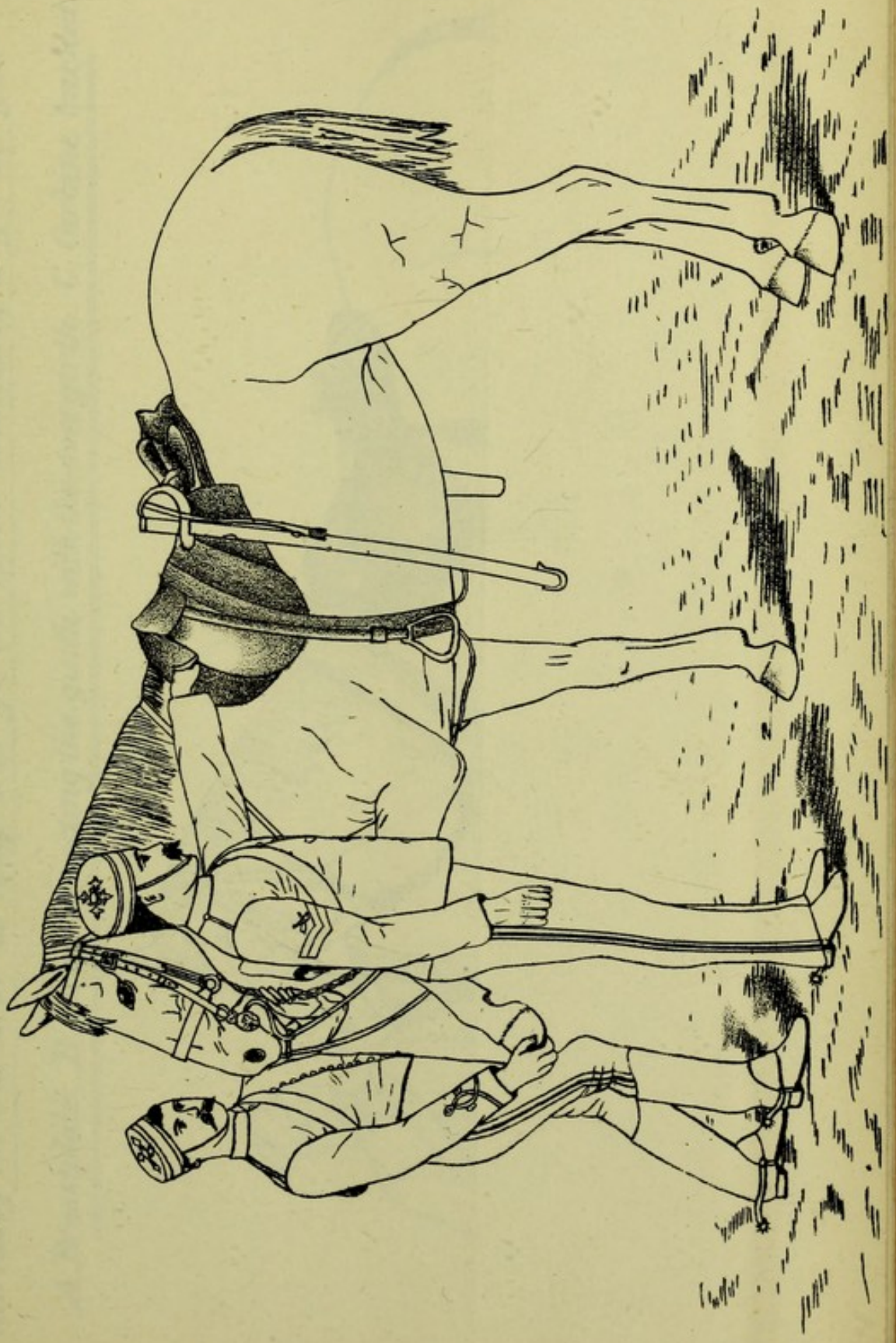

FIG. 8.

Shews the method of testing for blade bone pressure.

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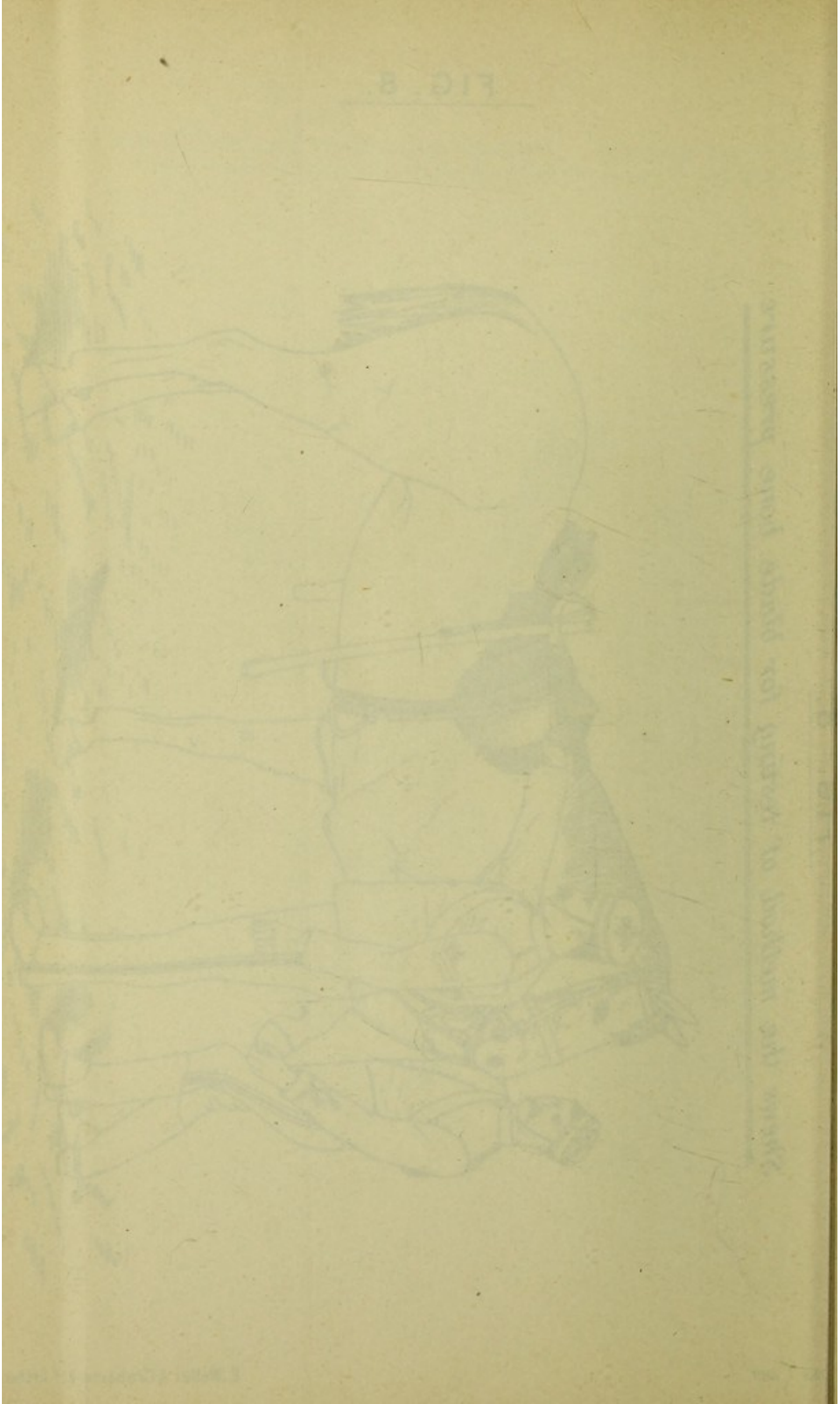

FIG. 9.

The method of strapping the girth back in order to prevent the saddle from working forward, or to keep the girth from touching a girth gall.

A. Breastplate. B. Strap connecting the girth with the overgirth. C. Carbine bucket.

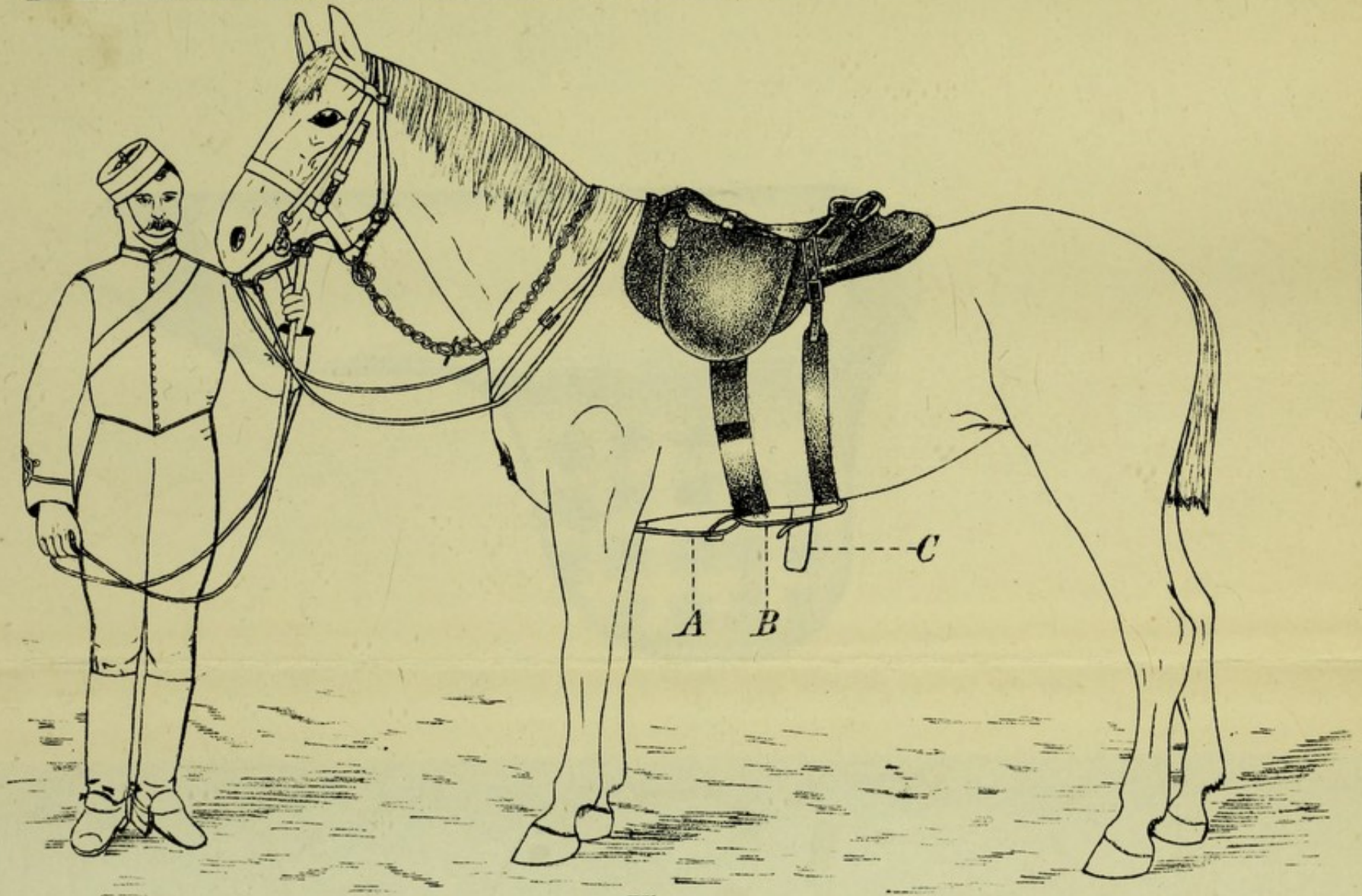

FIG. 9.

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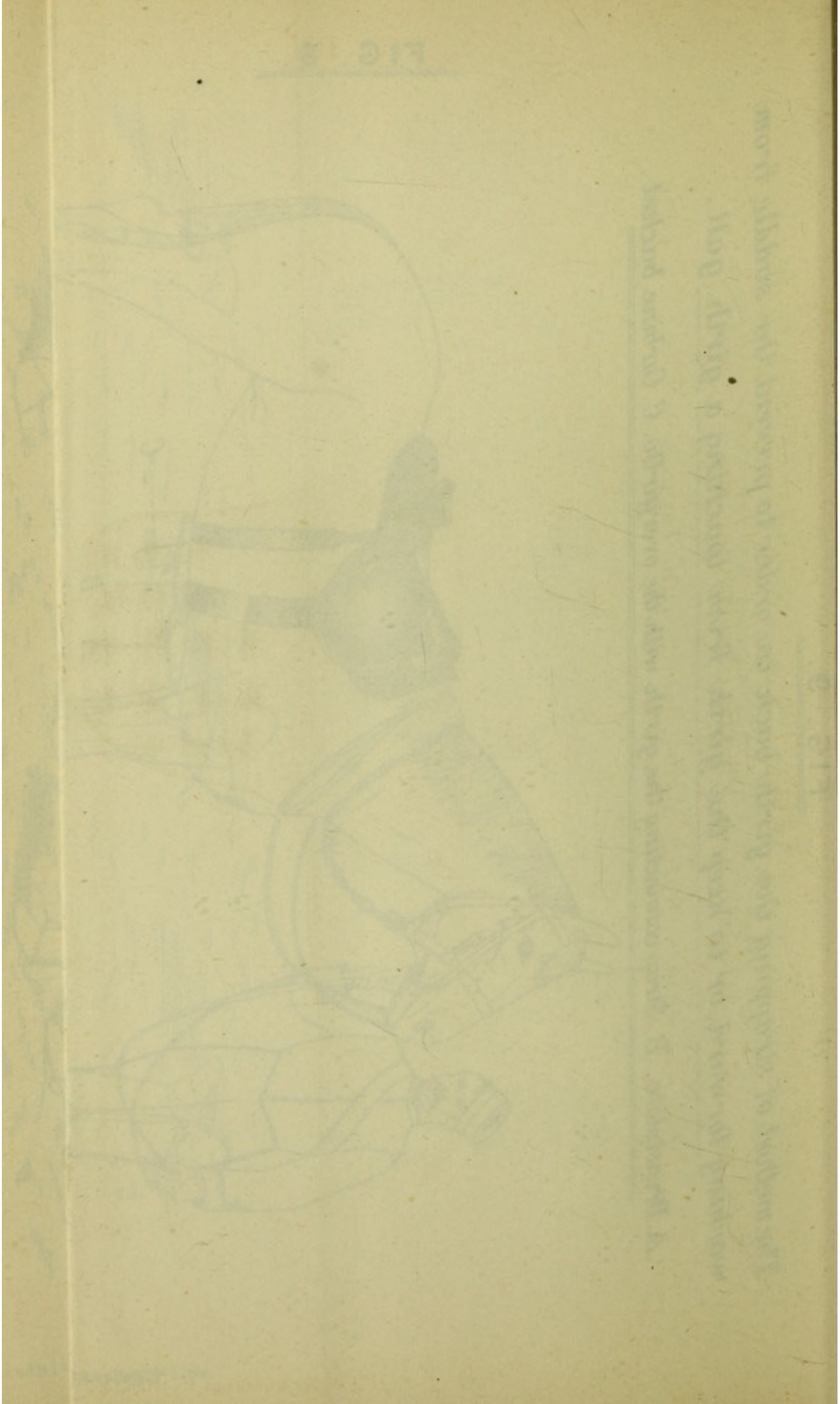

1133 / 1901

FIG. 10.

View of pannel with the stuffing arranged to keep pressure off the blade bones and loins.

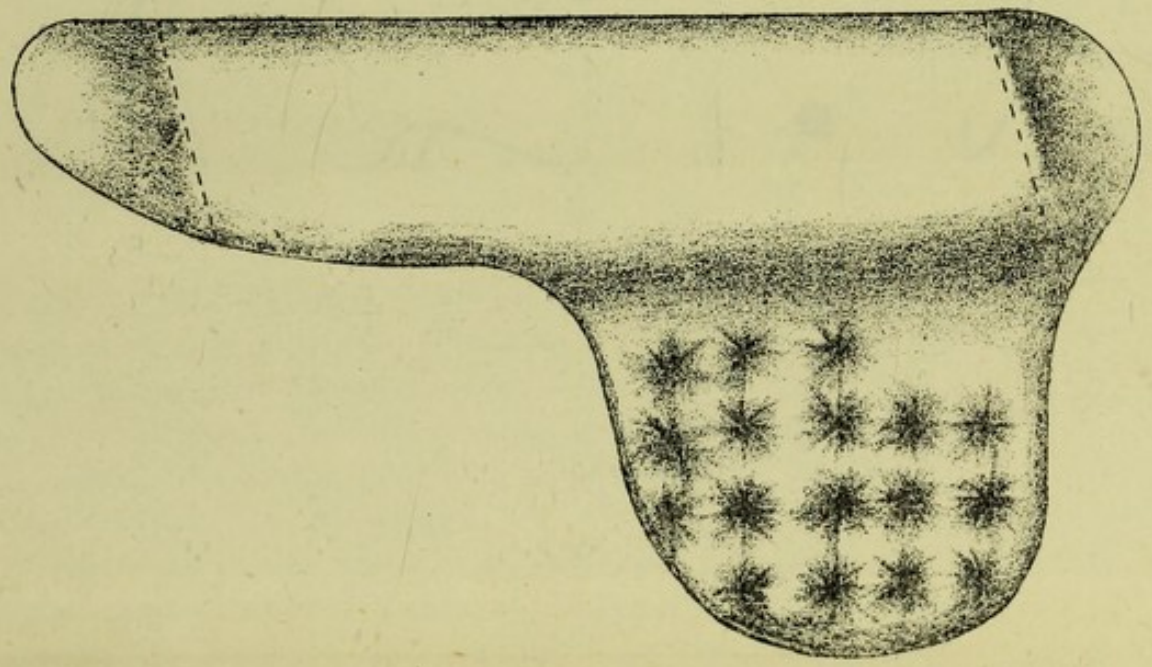

FIG. 10.

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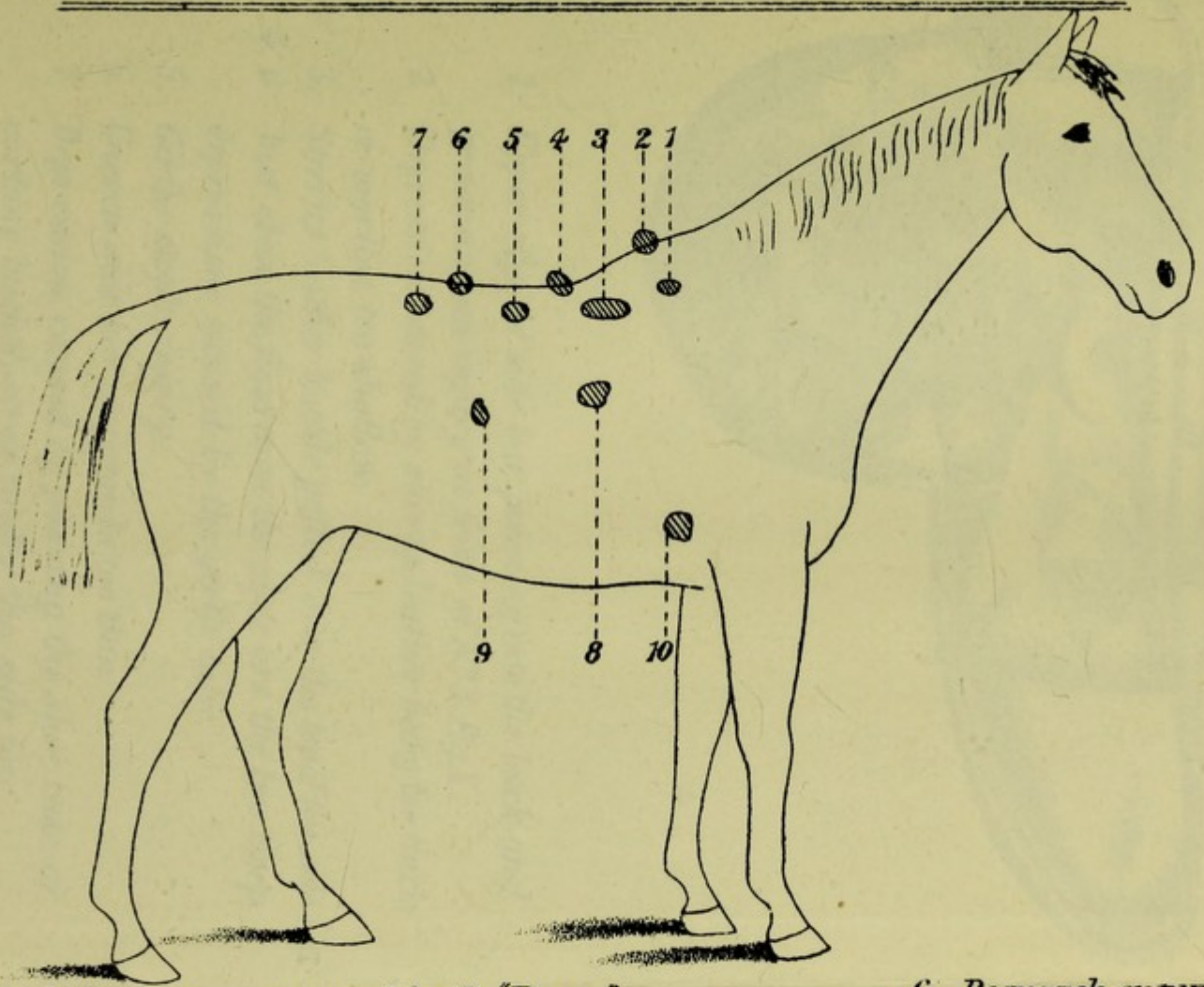
FIG. II.

THE POSITION OF INJURIES IN SADDLE HORSES.



1. *Blade Bone pressure caused by the "Burrs."*
2. *Front arch, blanket, or numnah resting on the withers.*
3. *Saddle too narrow, side bars pinching the withers, or projecting Stirrup leather.*
4. *Cross webbing under the seat of the saddle, or the seat having sank so much as to touch the spine, or a badly padded blanket roller.*
5. *Uneven side bars & thin blanket.*

N.B. The position of these injuries is only relative.

6. *Rear pack or numnah.*
7. *Rear fans.*
8. *Girth straps & D.*
9. *Carbine bucket or sword.*
10. *Girth gall.*

FIG. II.

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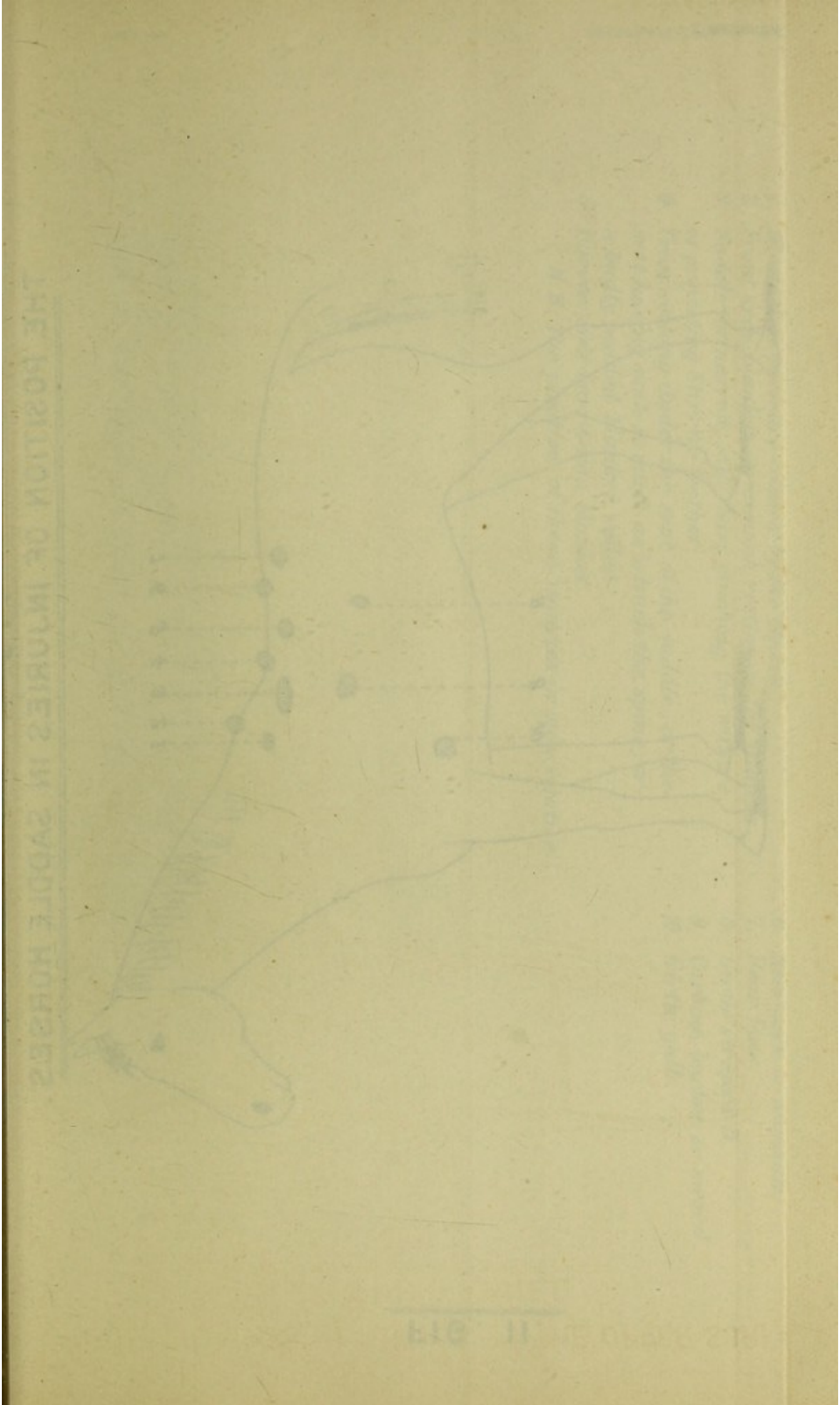
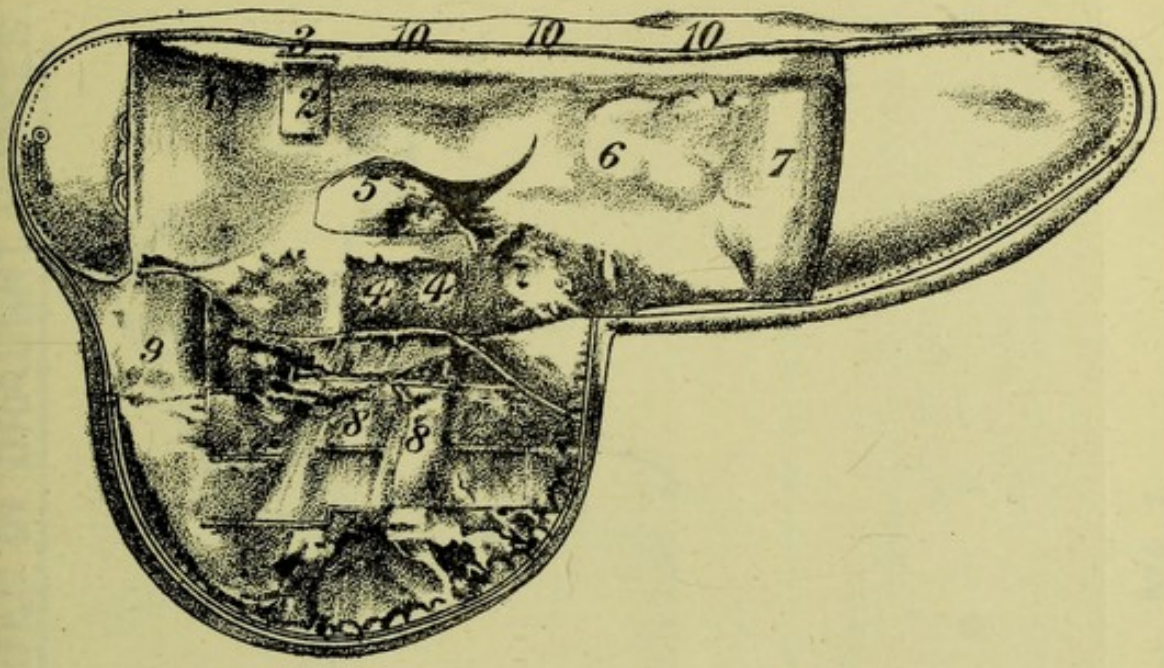


FIG. 12.

POSITION OF INJURIES ON THE UPPER SURFACE OF THE PANNEL.



1. *Upper edge of side bar pressing into the back and producing an injury in front of N.º 3. Fig X.*
2. *Depression caused by stirrup leather being too thick or mortise too shallow.*
3. *Stirrup leather buckle pulled over the top of the side bar.*

4. 4 *Just above the figures on the plate are the two deep depressions caused by the girth tabs.*

5. *Girth staple injury.*
6. *Uneven side bar or pannels too thin.*
7. *Depression caused by passing the shoe case or carbine bucket strap under the side bar.*

8. 8. *Girth buckle injuries.*

9. *Depression caused by the tree being too narrow at the points.*
10. *Flattening of the upper edge of the pannel caused by the seat being too low.*

E. Weller & Grahams, Ltd Litho. L

FIG. 13.

THE POSITION OF INJURIES IN DRAUGHT HORSES.

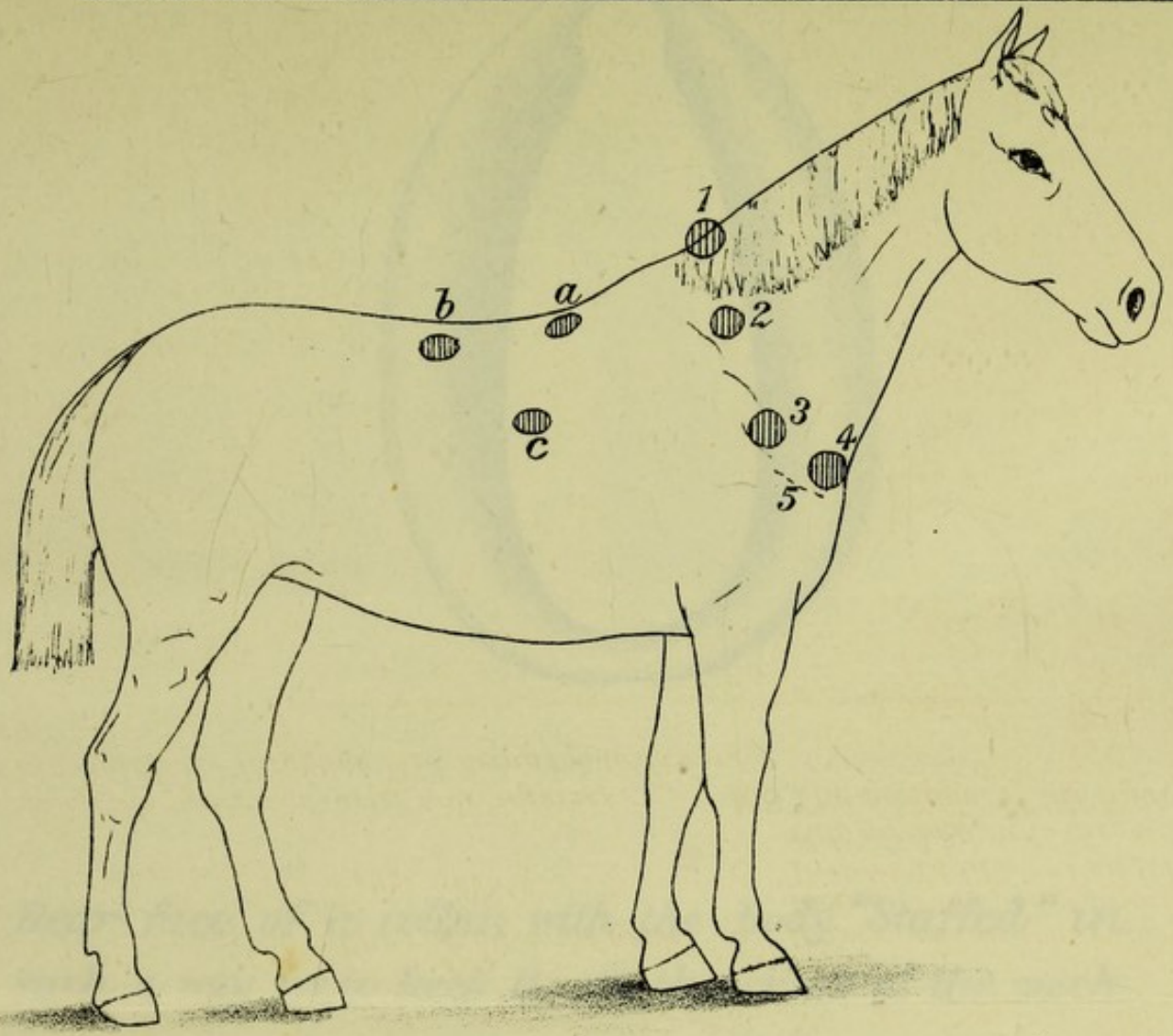


FIG. 13.

1. Collar gall, due to Pole Draught & collar resting on the neck.
2. " " due to a tight fitting Collar.
3. " " " " Collar being too wide.
4. " " " " " " " "
5. The dotted line shows the position of "after wale" injuries.
a. Gall from Drivers Saddle or Luggage Pad being too narrow & pinching the withers.
b. Drivers saddle (old pattern) to low behind & the facing of the panel pressed into the back.
c. Drivers saddle or Pad (old pattern) facing of the flap girthed into the side.

N.B. The position of the injuries is only relative.

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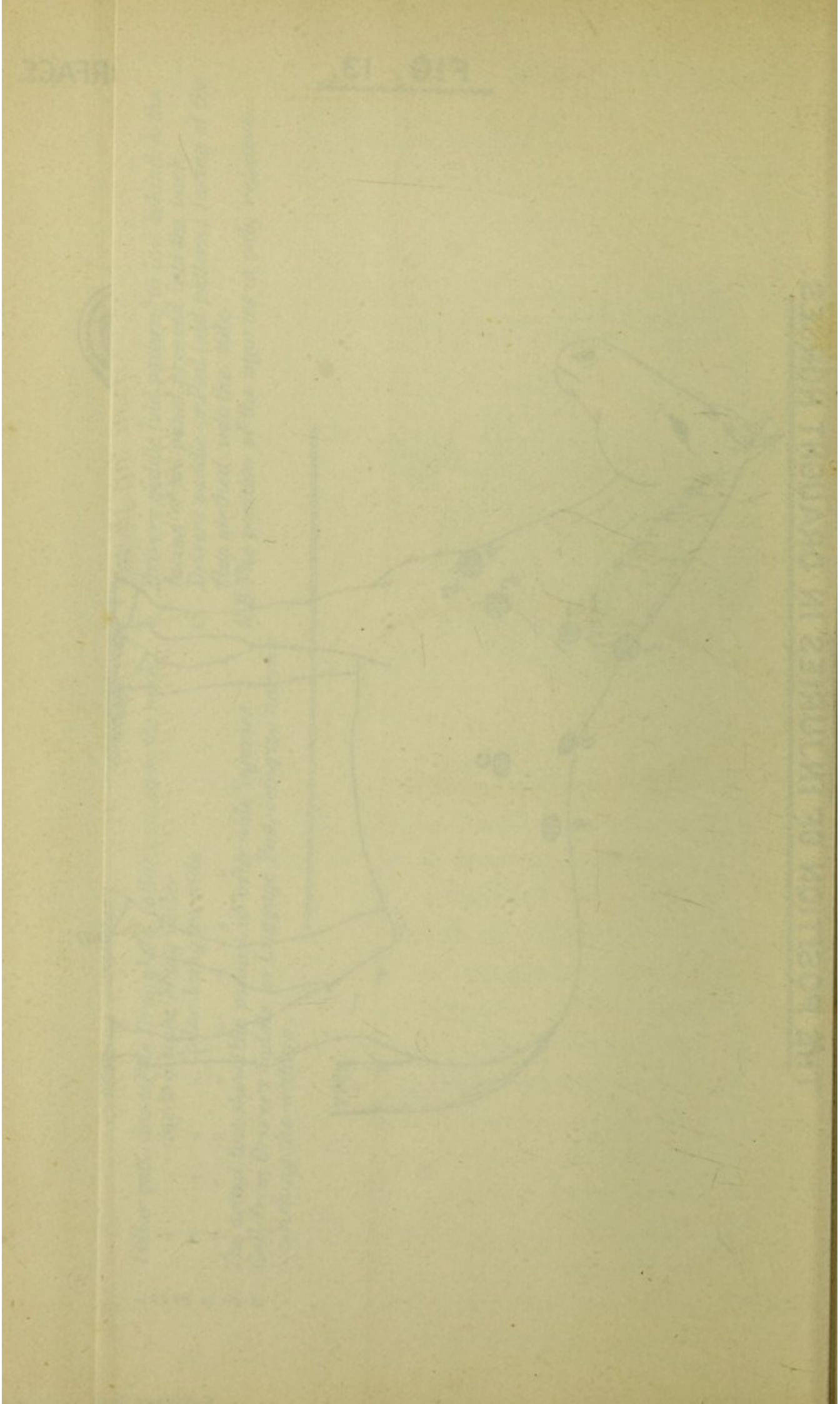

FIG. 14.

Rear face of a collar; with the body "Stuffed" in such a way as to keep it off the crest of the neck and avoid injury No. 1.

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THE NAMES OF THE VARIOUS PARTS OF A COLLAR.

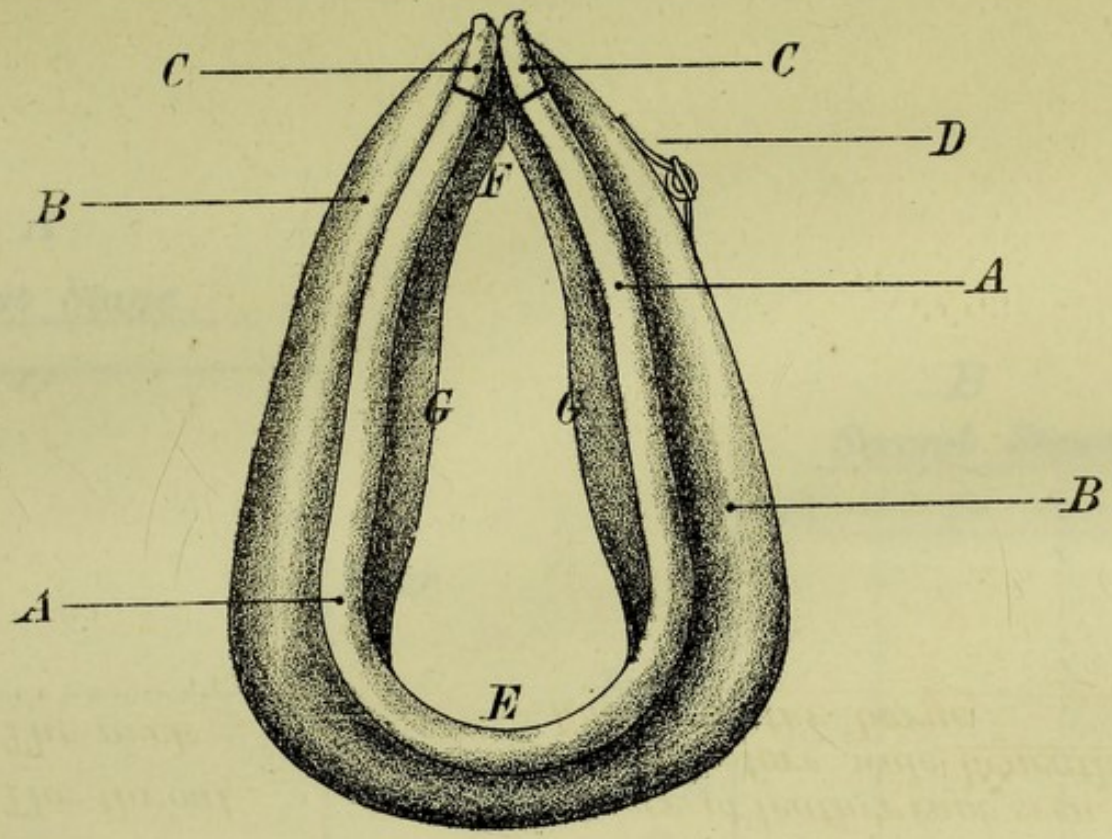


FIG. 15.

A. The fore wale.

B. The after wale beneath which is the stuffed body.

C. The Caps.

D. Housing Strap.

E. The throat.

F. The neck.

G. The body side.

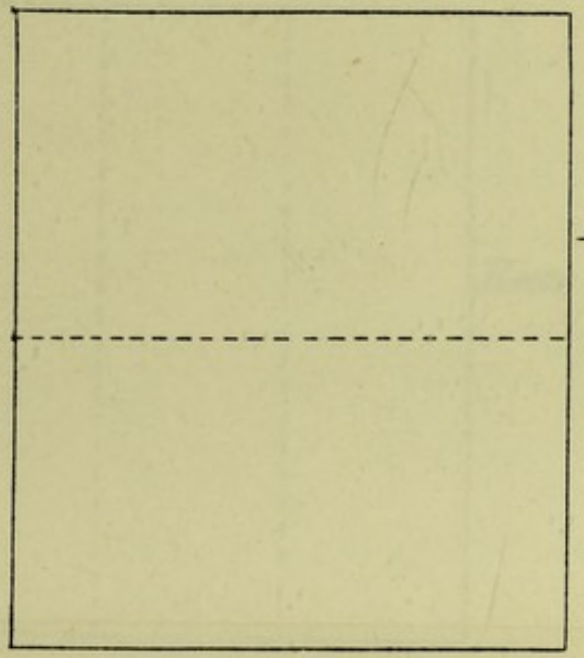
A piece of leather (not seen in the figure) running from the fore-wale <u>beneath</u> the after-wale is known as the "barge".

F. Weller & Grahams Ltd Litho. London.

SIX FOLDS UNDER THE FRONT & FOUR UNDER THE REAR ARCH.

A

First Stage.



B

Second Stage.

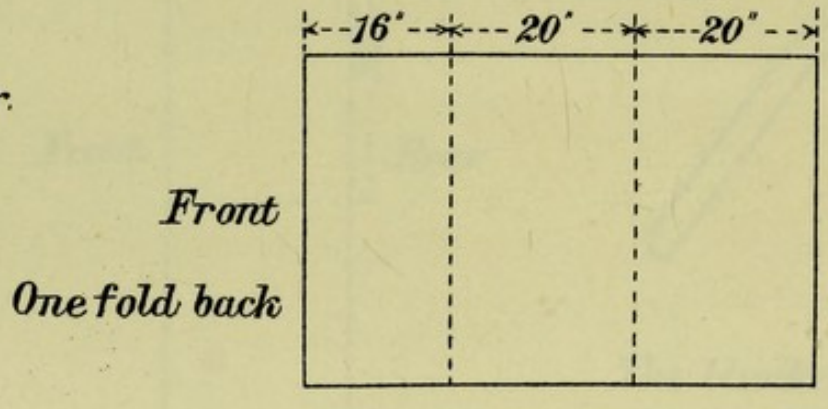
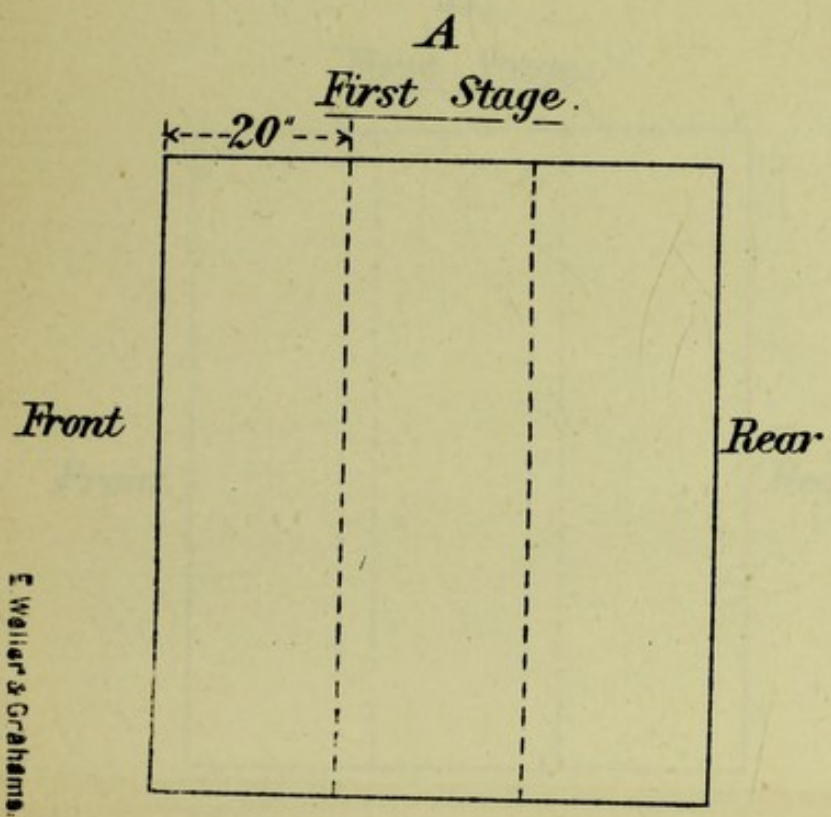
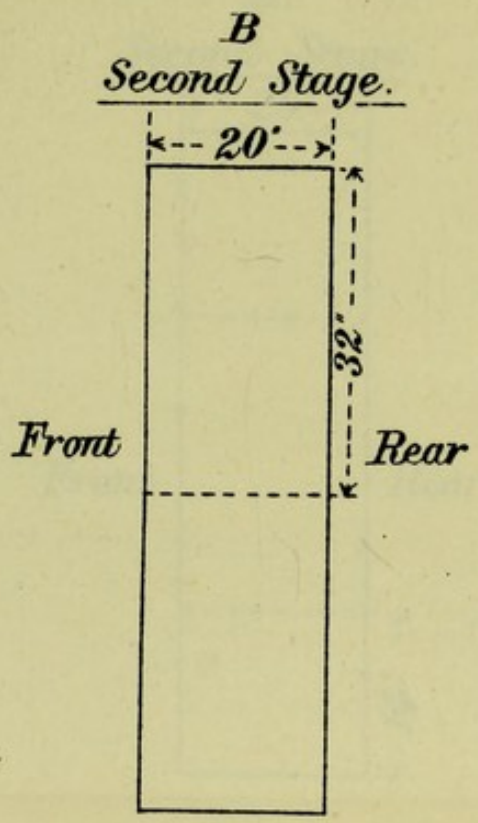


FIG. 16.

SIX FOLDS THROUGHOUT.





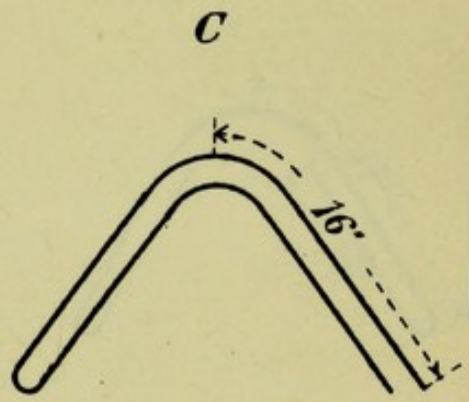


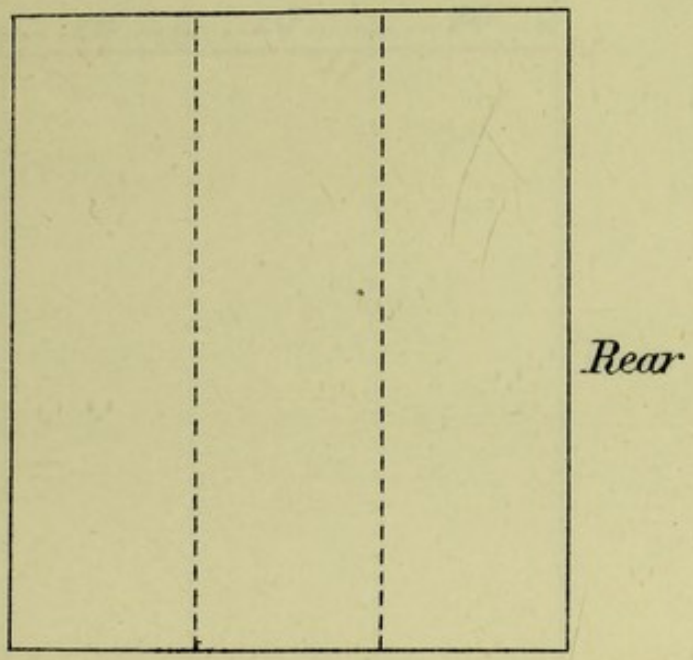
FIG. 17.

The blanket on the back;
The single thick line represents three folds.

THREE FOLDS UNDER THE ARCH & SIX UNDER THE SIDE BAR.

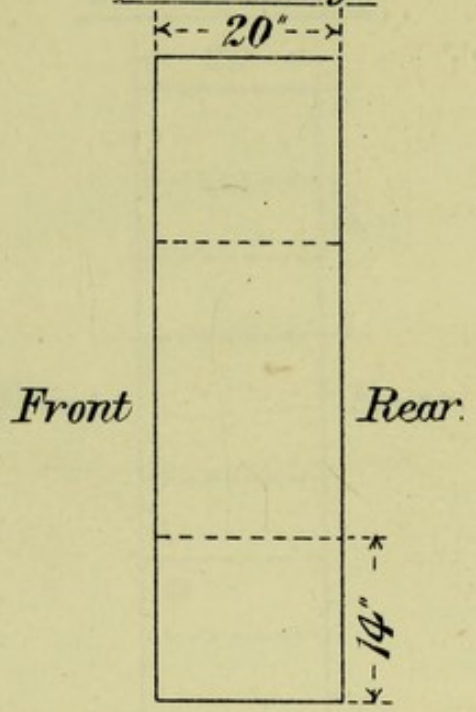
A.

First Stage.

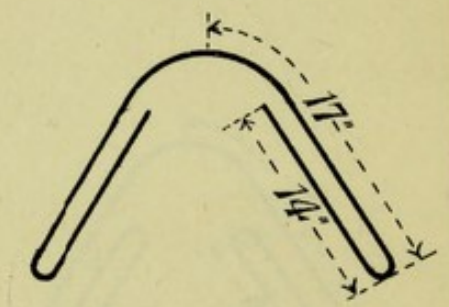


B.

Second Stage.



C.



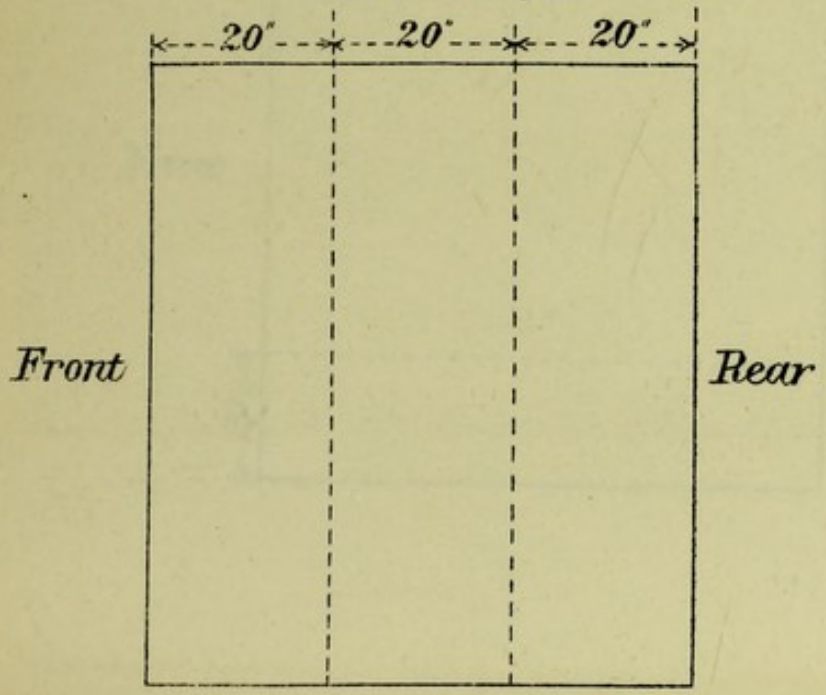
The blanket on the back; The single thick line re-presents three folds.

FIG. 18.

THREE FOLDS UNDER THE ARCH & NINE UNDER SIDE BAR.

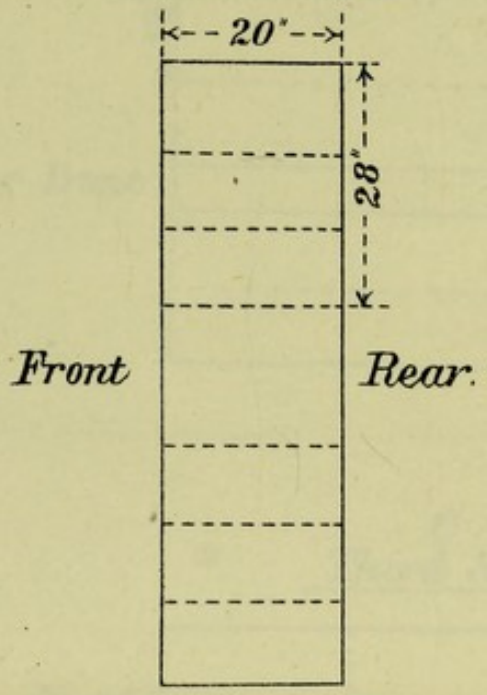
A.

First Stage.

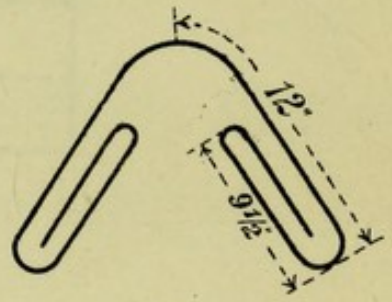


B.

Second Stage.



C.



The blanket on the back;
The single thick line represents.
three folds.

FIG. 19.

THREE FOLDS UNDER ARCH & TWELVE UNDER SIDE BAR.

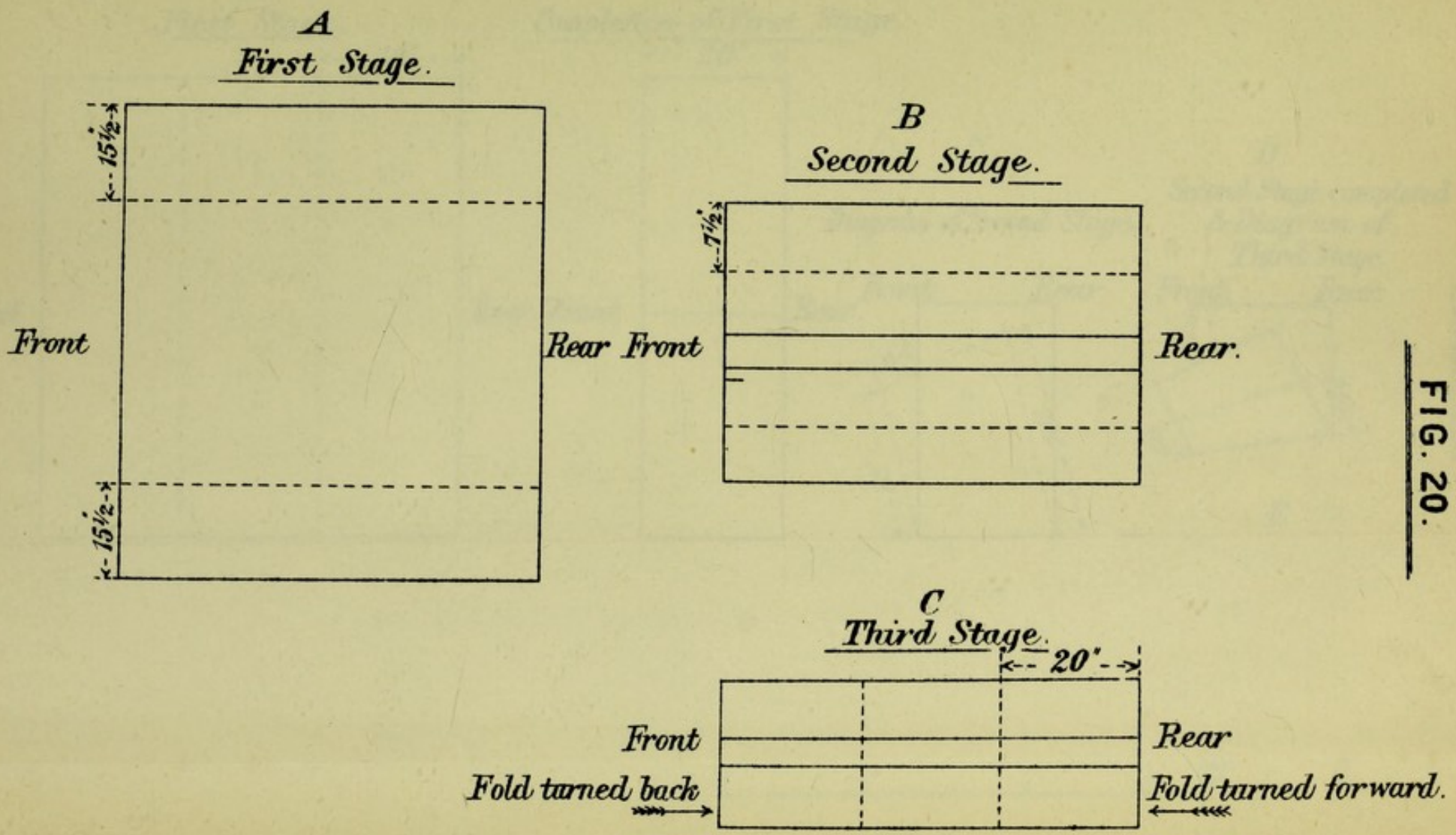


FIG. 20.

FIG. 20.

THREE FOLDS UNDER ARCH & TWELVE UNDER SIDE BAR, BUT SO ARRANGED AS NOT TO FILL UP THE FRONT ARCH.

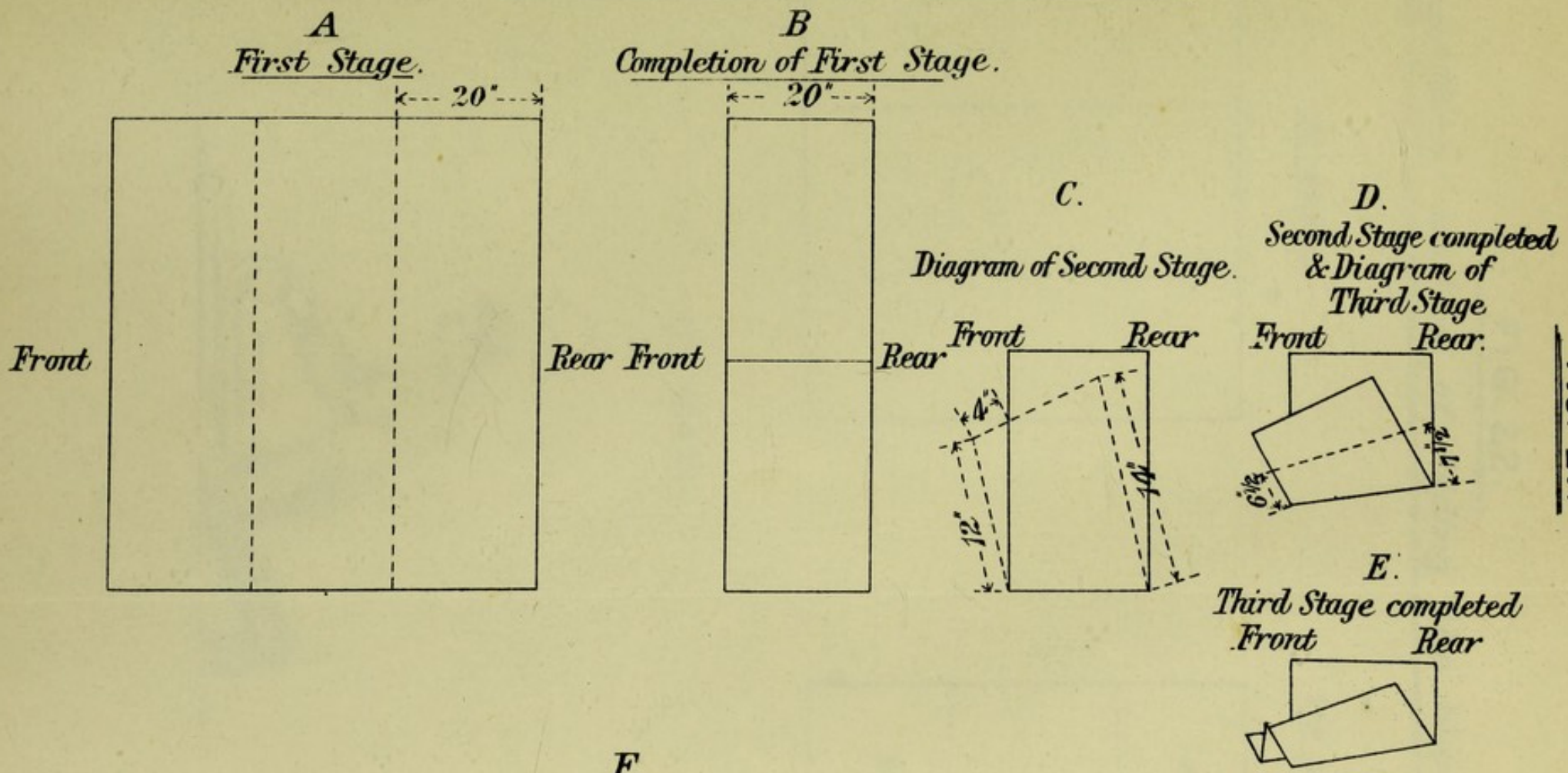


FIG. 21.

F

The blanket on the back.

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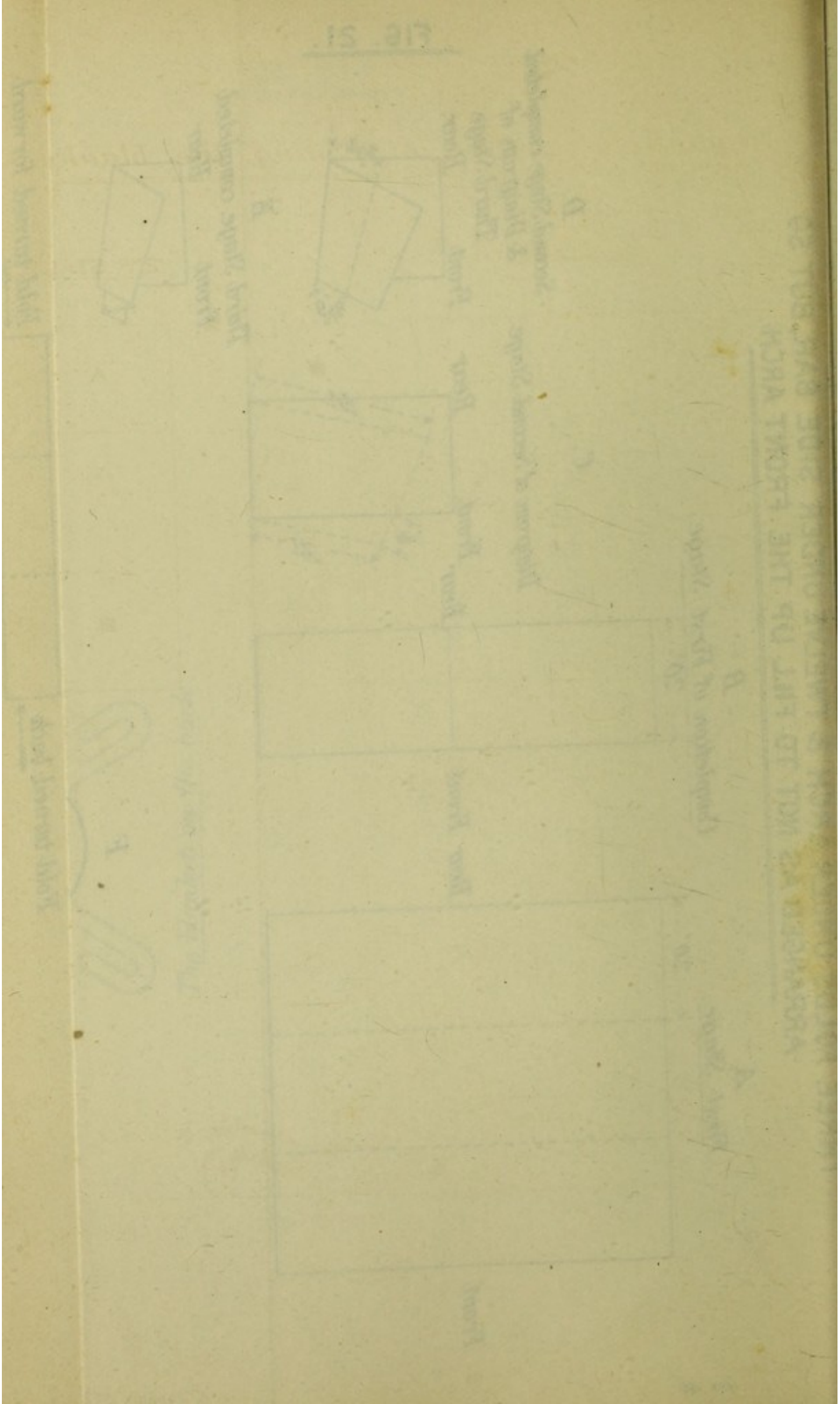
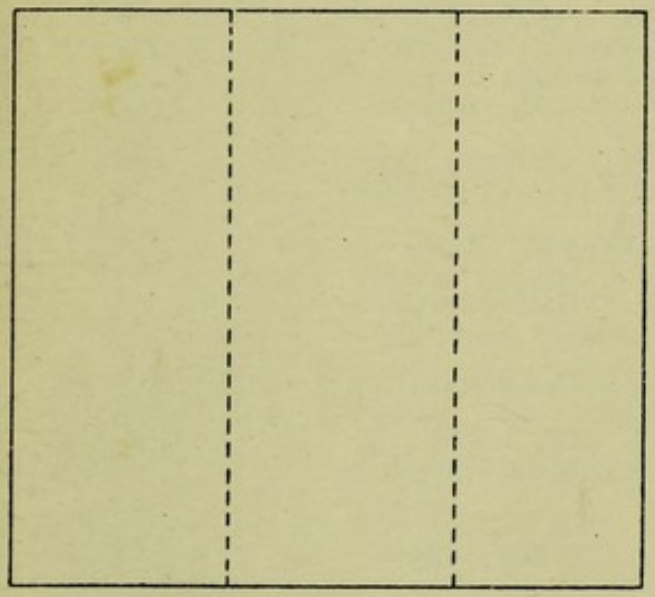


FIG. 22.

Regulation method of folding the blanket.

1ST STAGE.



2ND STAGE.

3RD STAGE.

1133.1.1901.

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11-inch, R.M.L., of 25 tons. 1899. Price 1*s.* 6*d.*
10-inch, B.L. 1900. Price 3*s.*
10-inch, R.M.L., and Mountings. 1899. Price 1*s.*
9-inch, R.M.L., and Mountings. 1899. Price 1*s.* 3*d.*
8-inch, R.M.L., Howitzer of 46 cwt. (Mark I.) For Movable Armament or Armament of Works. 1900. Price 1*s.* 6*d.*
7-inch, R.M.L., of 6½ and 7 tons, on Sliding and Moncrieff Carriage, Land Service. Price 1*s.* 6*d.*
6·6-inch, R.M.L., Howitzer, on Bed and Ground Platform, or on Siege Travelling Carriage. 1899. Price 1*s.* 6*d.*
6-inch, B.L., Howitzer of 30 cwt. (Mark I.) 1899. Price 2*s.* 3*d.*
6-inch, B.L., Howitzer, 25 cwt. (Mark I.) 1899. Price 3*s.*
6-inch, Q.F. (Land Service.) 1898. Price 8*d.*
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