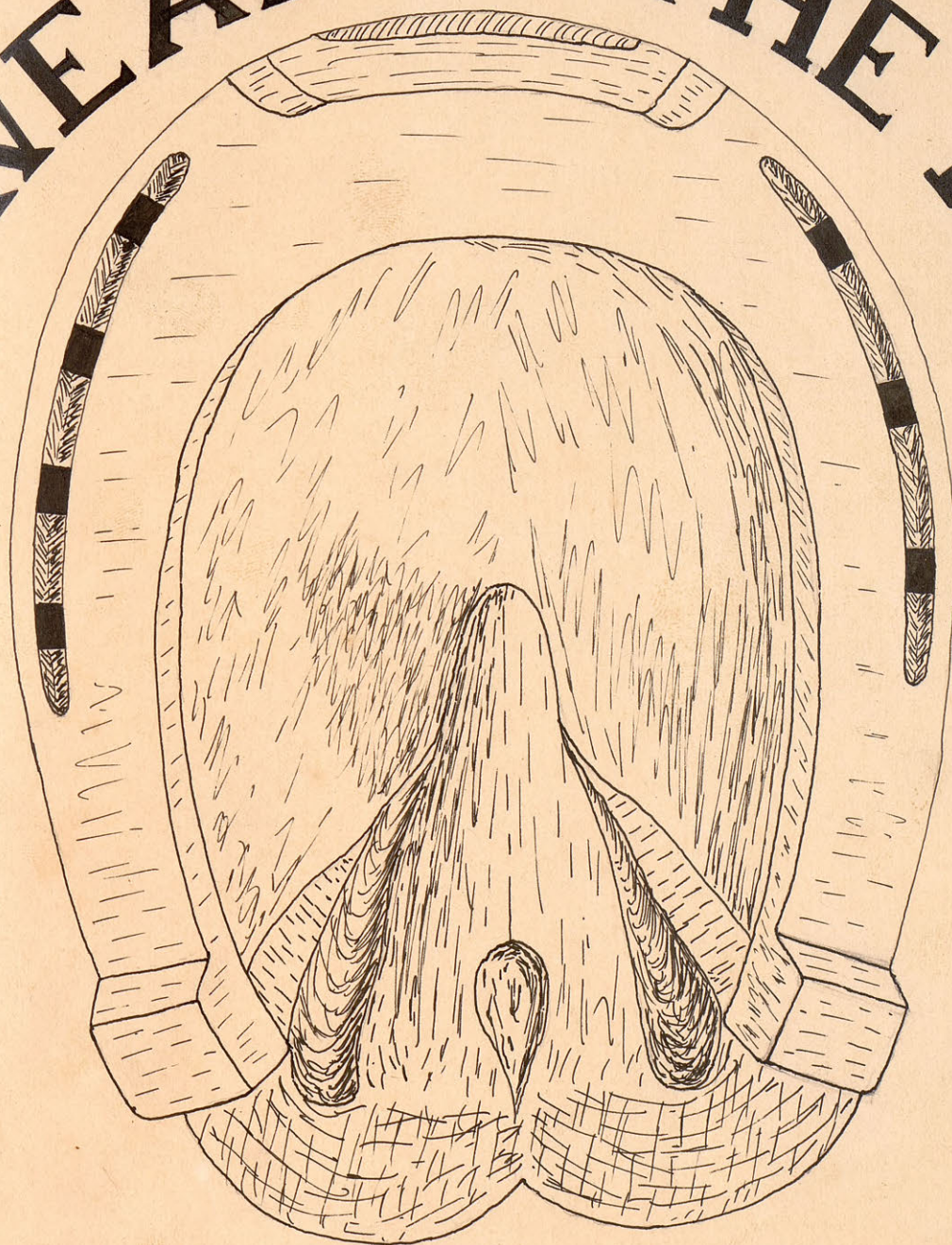


FOOT WEAR OF THE HORSE.



Fred L. Schneider.

Foot-wear of the Scorse.

Altho the evolution of the present horse shoe from the primitive foot wear for draught animals used in ancient times furnishes an interesting subject for investigation very little has been written as a part of history, that might make the subject the more vivid. Neither are there any passages in the Bible that relate to horse shoeing. Xenophon an early historian recommended various means for hardening the hoofs of horses and mules, and from this we are lead to assume that the ancients were ignorant of the art of farriery or horse-shoeing. Ancient columns and marbles having on them representations of horses, have, in but a few instances given evidence of shod hoofs.

No allusion to shoeing is made by early writers on veterinary topics. There is abundant testimony, however, that the ancients did sometimes protect the feet of their beasts of burden. Wrappings of plaited fibre, as hemp, or more commonly a kind of leather sack or sandal which was sometimes provided with an iron sole, were used by the ancients.

In Great Britain of recent years horse shoes of a peculiar form and pierced for nails have been unearthed

while in Scotland ancient horse shoes have been found, consisting of a solid piece of iron, very heavy and made to cover the whole hoof. In 1653 a piece of iron resembling a horse shoe was found in the grave of Childeric I King of the Franks who died A.D. 481. From this some believe that the iron horse-shoe was invented in the fourth century, and because it was first called selenae (moon shaped) that it originated in Greece. (Scribner's Magazine November 1894.)

The iron horse shoe being of comparatively recent date, it has nevertheless passed through its age of mythological superstition being variously regarded as an omen of good or evil according to the prevailing ideas of luck and fortune that the people of the times attributed to it. For instance Sir Walter Scott is quoted as saying,—"Your wife is a witch, man; you should hang a horse shoe on your chamber door!" Again Pliny in his "Natural History" states that "If a horse be shod with shoes where-with a man has been slain he will be most swift and fleet, and nevertho ever so hard rode, tire" Within our own realm we recall to mind that as children we revered the "good luck" horse shoe that hung above our father's doorway, while the little ballad "I found a horse shoe" we

dare say is a mark of even more recent superstition.

Before taking up in detail a discussion of the foot-wear of the horse, it is well to make a few remarks upon the structure, form and action of the foot itself. The foot of the horse consists of an outer insensitive, horny covering called the hoof, and the enclosed structures which for the most part are sensitive.

The hoof tho not a regular geometrical figure, shows some peculiarity in each of the four feet by which the fore and back feet as well as well as a right or left foot are readily distinguishable. The hoof is divided into three parts, namely; - wall, sole and frog. The wall in turn is divided into the toe, quarters and heel. The frog which is the  shaped structure in the sole is softer than the outer tissues, and acts as a cushion, while the bars which are a portion of the sole extend from the heel to the apex of the frog. The crack or crevice in the frog is called the cleft. About the top of the hoof; - a growing point - is found a band or raised portion of horn.

and which is known as the coronet or coronary band.

Taking up the sensitive structures of the foot we find within the sole, the fatty frog, which acts for the foot as a cushion against concussions. The os-naviculare or shuttle bone; the os-pedis or coffin bone and a greater part of the os-coronae or small pastern, comprise the bones of the feet. At either side on the wings of the coffin bone there is attached cartilaginous tissue and known as the "lateral cartilages". Passing down the back of the foot, gliding over the shuttle bone and terminating at the coffin bone is the tendon coming from the flexor pedis muscle.

Surrounding the above named organs and lining the horny hoof of which they are a part are the laminated structures containing nerves and blood vessels and from which hoof and sole are grown, called "sensitive laminae". The foot is plentifully supplied with nerves and blood vessels, the chief nerve being the "plantar nerve" which when severed above the point of branching, destroys all sensation at the foot.

The ultimate function of the foot is to restrain the animal while moving or standing, and to do this to the best advantage, and for

the foot to attain the highest development and remain in the soundest condition, requires the strictest cooperation of all portions of the foot, and especially must integrity of the neighboring parts of the foot within itself, be maintained. Since the foot must sustain weight the, wearing away of the foot will naturally come upon the bearing surface. The frog is a part of the bearing surface, but being externally of a softer horn, when weight is placed upon it, recedes and leaves the heels (wall and bars) to sustain the primary weight. Besides sustaining weight the foot must resist contact with the ground at each step and act as the point of resistance when the body is propelled forward - both of which necessitate foot-wear. It would seem then that the most wear would be at those portions of the foot which touch the ground first and are raised away last. Instantaneous photography shows that a normal foot on a level surface touches at the heels first as well as raising the heel while the toe is yet firmly upon the ground. More wear comes at the toe which in this case acts as a lever of contact with the ground. The heel striking the earth first readily explains the purpose of the elastic cushions such as the frog, frog pad and lateral cartilages.

In shoeing we should retain as nearly as possible the natural bearing surface of the foot, which is, if we may repeat, the lower edge of the wall and the portion of the sole in connection with it, together with a slight sustaining weight on the frog; but in no case, normally, should the arch of the sole be in active wearing contact. Shoeing at the best is not a necessary evil, yet when horses are shod aimlessly, or without due necessity, shoeing may become a source of destruction to the foot and ultimately to the horse himself.

To enumerate briefly the prime objects sought in shoeing, they may be summed up as follows:-

1. To protect the horse at the wearing surface.
2. To insure foot hold or prevent slipping.
3. To prevent foot soreness.
4. To impart action to roadsters and racers.
5. For pathological reasons.

In shoeing a horse foot and shoe must be made to fit each other, and not as ordinarily thought, that the shoe must be made to fit the foot alone or vice versa the foot the shoe. Take for instance a foot

that is overgrown, out of proportion or badly shipped. Such a foot will require alteration to a marked degree before a farrier may fit a shoe. When preparing a foot for the shoe it is essential to remove superfluous horn in order that a good bearing surface may be had, and to bring all parts of the hoof equally into proportion so far as conformation permits. A foot well prepared should show both sides of the hoof of equal height and when looked at from the side the heels and toe should be proportionate in height. (See Figures VIII, IX, X, XI and XVI with explanations.)

Uneven bearing surfaces should be avoided. Injudicious use of the rasp often lowers the wall in part or even to the extent of lowering a whole side (Figures XII, XIII.) If the sole is pared away to produce a deep concave appearance it removes the horn just within the border of the wall taking away the natural support and leaving a narrow surface for the bearing face instead of a strong flat surface. To rasp off an outer layer of horn on the hoof promotes excessive evaporation, callousing the layer underneath forming an undesirable toughness - true toughness being replaced by brittleness. Do not fit a shoe "close" and then finish the "neatness" by rasping off the overlying horn. Another grave fault in shoeing lies in the guilty practice of opening the

heels and which is done to produce an appearance of width at the back of the foot. In this operation the part of the wall at the heel is cut away and usually a slice of the frog is removed at the same time. Upon the whole too much horn should be left rather than too little, as excessive abrasion of the hoof is always a fault and undesirable. A thin horn yields to uneven pressure resulting in damage to the foot, even if perceptible lameness may not be immediate.

It is something that cannot be too seriously considered by farriers, that a judgment of the natural and unnatural inclination of a horse's foot becomes necessary in order to determine the degree of growth in which the hoof ought to be kept, and hence to promote the two important circumstances of normal contraction and expansion. As the diagrams show (Figures VIII, IX and X) a foot may be greatly altered in its angle of obliquity by paring off either the toe or the heels in excess of the other.

Under the supervision of Dr. N. K. Mayo, State Veterinarian, we were enabled to make observations of horses feet, with the purpose of studying particularly the external foot noting characteristics which indicate normal and abnormal conditions in its anatomy. The Russell foot adjuster of figure XVII was employed for determining the angle of obliquity of the foot, as well as for measuring

heights at the heel and toe of a variety of hoofs both in health and disease. If records that were taken and afterward compiled it is found that a hoof which approaches near what a normal foot should be, shows the sole somewhat arched and not flat; the heels broad and distinct; the frog soft and prominent; the outer walls of the hoof tough and glossy, but not dry and hard or showing the presence of cracks. The average well proportioned hoofs vary somewhat in their angles as determined by the foot level or adjuster. A healthy foot however that has been properly leveled and is proportionate in height of heel and toe will come within the range of 45° to 55° . Some hoofs however present an acute angle of 45° , while still others seemingly natural and fairly well proportioned, accommodate the level when adjusted to 58° . A well proportioned hind foot varies from 55° to 60° in the angle at the toe, but the angle in the case of the hind foot is usually if not always greater than the observed angle of a fore foot.

The angle at the heel lies within 77° and 80° of both fore and back feet. A good hoof of angle 49° at the toe and 78° at the heel measured, as the height at the toe five inches (Figure XVII.) and two and one half

inches at the heel. The length of the foot from toe to heel measured five and one half inches, while at the greatest width at the sole; representing the line thru the center of the quarters was spanned by four and one half inches.

The hoofs of unshod horses and especially those horses in which the horn of the hoof is allowed to grow without trimming or leveling, invariably show deranged functions of the wearing surface. By continual concussion with hard roads such hoofs usually crack or split, or the frog may be raised to such an extent that ground pressure will be entirely removed and as a result the downward pressure of the foot above the frog causes that organ to descend, exerting tension on the lateral cartilages thus causing the hoof to contract at the heels, which if persisted in, finally causes chronic "contracted heel." It cannot be disputed but that a foot which is kept well leveled and proportioned - tho not pared to excess; even tho the horse be driven unshod; approaches the ideal which nature intended it should. Horses nowadays are subjected to the extreme in usage, and this applies especially to

roadsters that are being continually driven on hard, dry streets and roads. We must therefore counteract this unnatural adversity by employing unnatural means, that is, we should overcome the difficulty by keeping the foot, by trimming, as near perfect in shape as possible, and to protect it by shoeing.

We have previously seen the foot prepared to receive the shoe. It now only remains to "fit" the shoe and attach it to the foot. But here arises an unforeseen contingency. If we examine a normal unshod hoof that has been well cared for and worn down naturally, we shall find that the bearing surface is not level;— the hoof is worn more at the toe and heels than elsewhere. Examine the wearing surface of an old shoe and an analogous condition is noticed. The question is:— should we fit the shoe as in figure XXXII, as previously prepared, or fit it as illustrated in figure XXXIII? In answer we would say, fit the shoe after the preparation, that was previously explained, has been made, or in the manner of figure XXXII, after which if necessary remove that portion of the ground surface

of the shoe that corresponds to the natural contour of the ground line of the foot.

Two conditions are necessary in applying the shoe; namely, The shoe must fit the surface of contact with the foot at all points and secondly, It must not recede, nor protrude from the outer circumference of the hoof, as to overlook these conditions, may cause lack of bearing surface where shoes are fitted too "close"; or the shoe may be trodden off or may cut the opposite leg in case it be attached too "wide." Saddlers may wear shoes short at the heel, (Figure XXXIII.) but always avoid the "eased heel" of figure XXXIV. as such a shoe when worn on a fore foot may be trodden upon by a rear foot and be torn off.

Having the nail holes in the shoe pitched as in figure XXVIII ("pitched out") and avoiding misplaced and ill shaped holes, such as shown in figures XXVI, XXVII and XXX. insures; together with the present shape of standard, forged nails; insures the proper advance of the nail thru the wall of the hoof. The holes must also

be properly placed as regards to their location with respect to the outer border of the shoe. They must not be too close to the outer edge lest the nail be driven too high into the hoof, and on the other hand they must not be directly near the center of the "wings", which might cause a nail to pierce a portion of the sensitive laminae - or at least pass so close to these structures as to predispose to injury. A nail puncture, however, need not be serious if due attention be given it at once. It seems unjust for a farrier to disguise such unpardonable accidents, and which might otherwise result in an avoidable loss.

Injuries distinct from nail pricks may come from shoeing. Clips may exert lateral pressure to such an extent that the horse's foot is held as if in a vice, or a horse may incur a dangerous wound by stepping upon a high, sharp clip on a loose shoe. A foot may be injured by uneven shoe pressure, as for example where a shoe on a low flat foot may bruise the sole by the pressure of the inner circle of the shoe (usually at the toe). When a shoe is fitted very "close" and especially

when fitted close on the inside, a "corn" may be induced, as a result of pressure upon the sole. A corn is merely a bruise and not a tumor or "corn" as found in the human subject. To eradicate corns of not too severe or malignant ⁱⁿ character it only becomes necessary to remove the pressure by paring the sole at the injured part. Again, avoid excessive charring of the sole by applying a hot shoe, as a charred sole may separate from the quick: and such a foot will convalesce very slowly. The dreaded injury which is known as "treading" and occurring at the coronet is a result of a contusion or puncture incurred by a high sharp calkin. The only preventative of this malady is to fit a shoe narrow at the heels and use the square low calkin of figure XXXVI.

Many horses "cut" their fetlocks, that is bruise the fetlock with the opposite foot; no matter how shod. This habit is generally confined to very old or young horses and deformed individuals, or quite often a horse will cut when he is "out of condition" or tired. Do not attribute this fault, too much to an

oversight on the part of the farrier, nor do not expect, except in rare cases, to prevent this evil by shoeing. Study the horse's wants - apply regular and steady work, combined with "good old oats" and you have reached a logical conclusion. To prevent a horse from over-reaching - striking the heel of a fore foot, usually an inner heel, with the inner edge of a hind shoe, - round off the inside circumference of the offending shoe, at the toe. A slovenly goer will oft-times strike the inside of the toe of the fore shoe with the outer rim of a corresponding portion on the rear shoe. This "clacking" cannot be gotten rid of by altering the shape of the shoe, but a young or inexperienced roadster, will later overcome the difficulty.

Some feet may, thru disease, ill shoeing, injury or thru natural contingencies, become seriously malformed. To shoe bad feet as these conditions are called requires a divergence from the ordinary methods of farriery.

A horse which has a flat foot, naturally, or as a result of disease may

possess a convex sole instead of the normal concave sole, and must be shod in such a manner, that the sole will be raised from contact with the ground, and also with a view of leaving the sole strong and thick. (See figure XL.)

In the treatment of "sand cracks" which include the well known "quarter cracks" and "toe cracks", care must be exercised not to place any direct pressure on the part, nor to fit a shoe that may tend to spread the crack. (Figures XXXVIII, XLII and XLIII.) and in addition to this it is well to insert clips. (Figure XXXIX) which are excellent media to prevent the crack from spreading. A bad sand crack must be cut out or the edges trimmed smoothly, as shown in figures XXXIX and XLII. - but for ordinary sand cracks avoid trimming as this only favors movement at the part and makes the defect of longer duration.

For shoeing a contracted hoof (Figure XLIII) various forms of shoes are recommended, some of which have adjustable heels, allowing expansion by a set screw or by a bar and notches, - while others - tho undesirable - are made to slant out at

the heels and thus force the foot apart, by natural pressure. As contracted hoofs usually result from a lack of use of the feet, or as a result of overgrown hoofs, the best method to follow in shoeing to correct this evil, is to apply merely a tip (Figures XLIV and XLV) and thus allow the heels to grow out and expand naturally.

It often becomes necessary to use soles or pads; one form of which is represented in figure XLVI, and which are nailed on with the shoes; or they may be slipped under the wings of the shoes. In all cases of diseases of the foot or sole, the use of pads allows healing to go on without undue action hindrance of the horse. Expansion of the hoof usually follows the use of pads. The only disadvantage resulting from their use may be a loosening of the shoe; or they may cause thrush by accumulating filth.

In concluding the discussion on the foot wear of the horse we may say that in this era of marvelous ingenuity there may arise new ideas and take the place of the previous knowledge of the art of farriery. Does it not seem feasible that in this age of advanced

learning in the sciences of chemistry and physics, that some means will be devised, when soft, macerated substance can be applied to a horse's hoof? A material which would harden into a substance very similar to horn and in this manner do away with the heavy iron shoes that the horse of to day is forced to wear. It is quite likely that we are as yet only in the infancy, or perhaps even unborn, to a realization of what may be, a vague conception of what the future may see unearthed to further assist our national property - the horse - to more lightly bear his burdens under the most exacting conditions to which he may still be unjustly subjected. But at present we must make the most of the means at hand - shake of traditional ignorance and raise the art to that standard, to which its use to our horse and our nation in all justice belongs.

Explanation of Plates.

Plate I.

- Fig I- Early Arabian Horse shoe.
 Fig II- Later Arabian Horse shoe.
 Fig III- Old English Horse shoe.
 Fig IV- Ancient Moorish Horse shoe.
 Fig V- Ancient Persian Horse shoe.

Plate II

- Fig VI- Diagram showing heels too low and toe too long.
 Fig VII- Side view of Fig VI.
 Fig VIII- A foot proportionate in height at toe and heels.
 Fig IX- Foot too high at the heels.
 Fig X- Foot too low at the heels.

Plate III

- Fig XI- A level foot.
 Fig XII- Foot left too high on one side.
 Fig XIII- Sectional view of Fig XII.
 Fig XIV- Sectional view showing hoof uneven at the coronet.
 Fig XV- View showing different forms of bearing surface.
 Fig XVI- A well leveled hoof.

Plate IV.

- Fig XVII- Figure showing use of foot level or foot adjuster.
 Fig XVIII- Navicular bone inclined downward owing to the foot being left too high at the heels.
 Fig XIX- Ascending position of navicular bone due to the foot having an overgrowth at the toe.
 Fig XX- Figure showing natural growth of hoof.
 Fig XXI- Overgrowth of hoof. Wall below AB should be removed.
 Fig XXII- Hoof too high at both heel and toe. Showing different angles of obliquity by removing horn along lines CB and AD. Hoof should be reduced to line AB.

Plate V.

- Fig XXIII- Machine made shoe.- Fore foot.- "Fullered"
 Fig XXIV- Machine made shoe.- Hind foot "Fullered"
 Fig XXV- Showing nail hole made to properly receive the nail.
 Fig XXVI- In this shoe the nail comes in contact at A and B causing the shoe to become loose after a few days wear.

Plate V (Continued)

- Fig XXVII - Bearing surface of nail and shoe at A and B.
 Fig XXVIII - Fig XIX - Nail holes "pitched" in and out.
 Fig XXXI - Shoe fitted to a curved foot surface.
 Fig XXXII - Shoe fitted to a level foot surface.
 Fig XXXIII - A shoe cut short at the heels.
 Fig XXXIV - "An eased heel."
 Fig XXXV - A high calkin.
 Fig XXXVI - A low calkin.

Plate VI

- Fig XXXVII - Foot well prepared to receive the shoe. Cross lines show methods of obtaining levels.
 Fig XXXVIII - Showing method of preparation of foot for a severe "sand crack."
 Fig XXXIX - "Clip" for use in "sand crack."
 Fig XL - Cross section of shoe used in "convex sole."
 Fig XLI -
 Fig XLII - A method of easing the part in "sand crack"

Plate VII.

- Fig XLIII - A case of "contracted" hoof.
 Fig XLIV - A seated tip.
 Fig XLV - Tip laid on.
 Fig XLVI - A form of frog pad.
 Fig XLVII Bar shoe for corns; flat feet with weak heels sand crack; or in case of pain at the toe and the horse must go on his heels.
 Fig XLVIII A surgical shoe

Fig I.

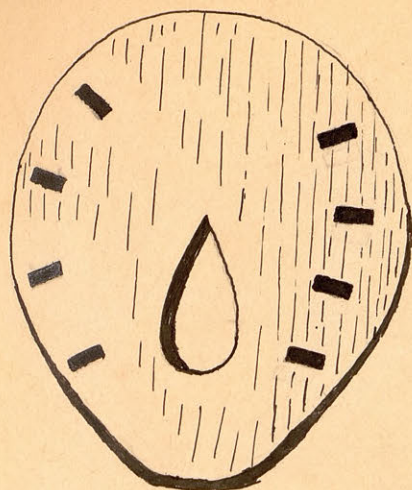


Plate I.

Fig II

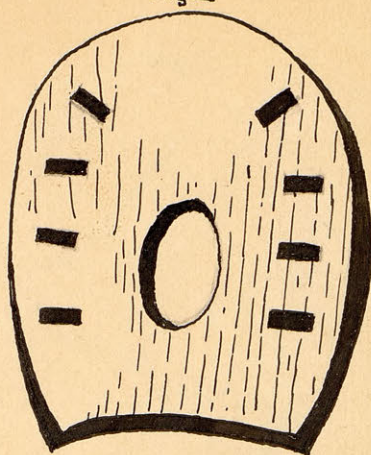


Fig III

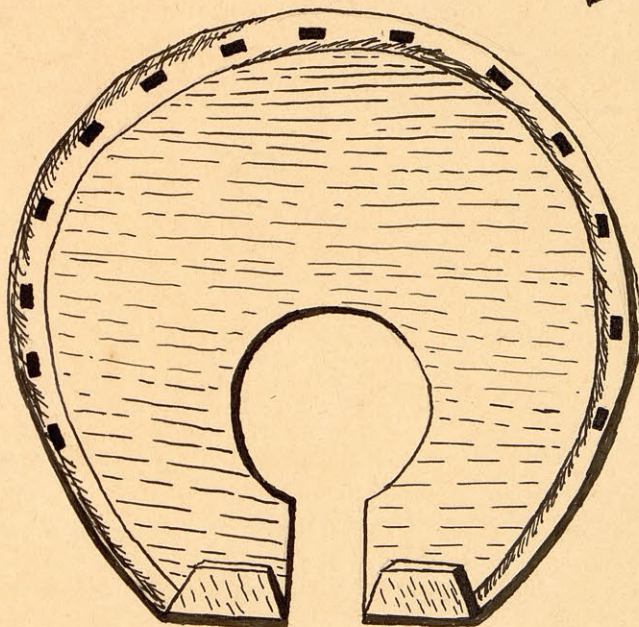


Fig IV

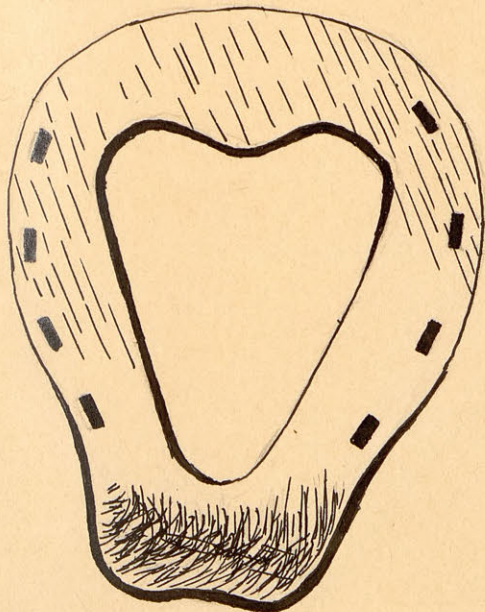


Fig V.

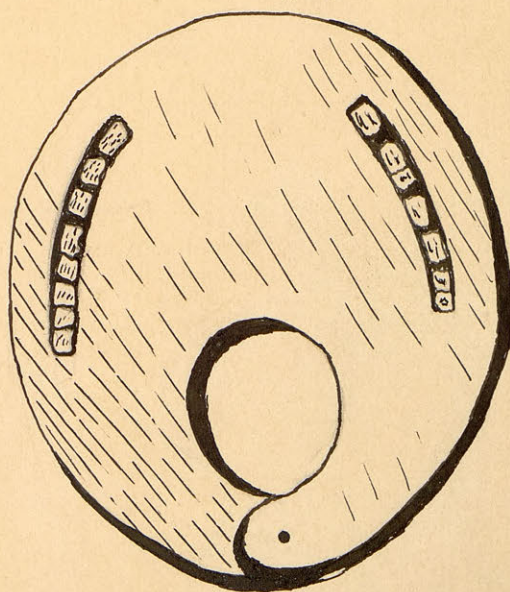


Plate II.

Fig VI.

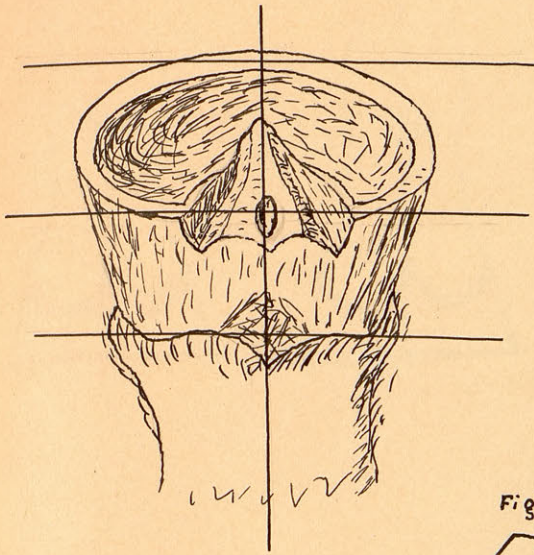


Fig VII.

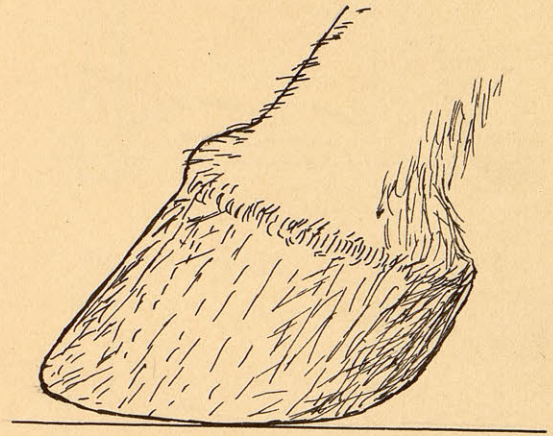


Fig VIII.

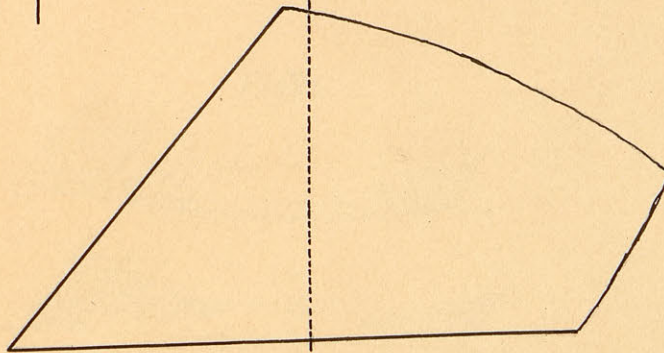


Fig IX.

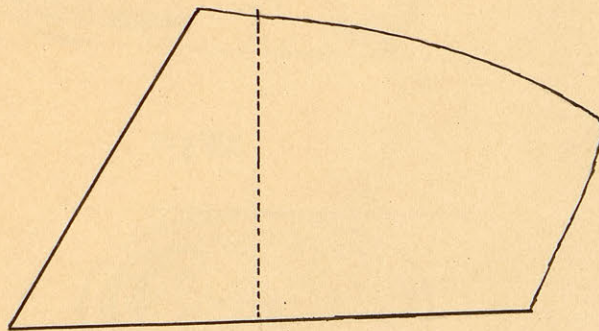


Fig X.

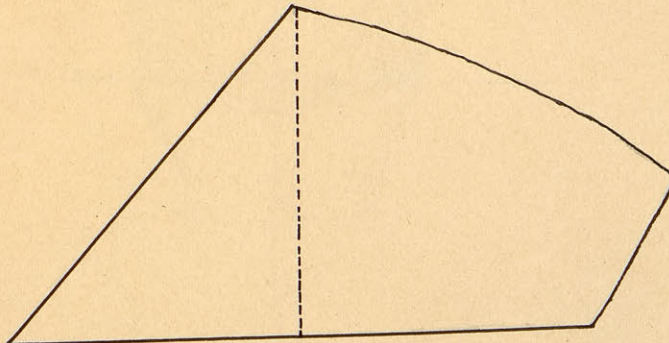


Plate III.

Fig XI.

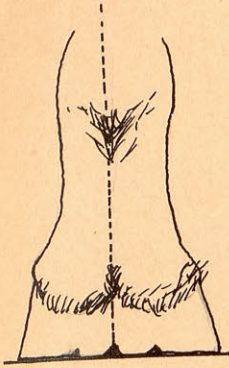


Fig XII.

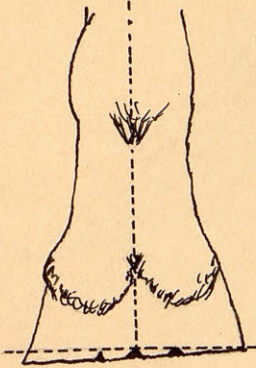


Fig XIII.

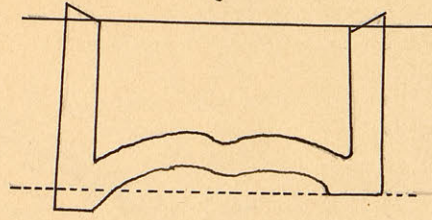


Fig XIV.

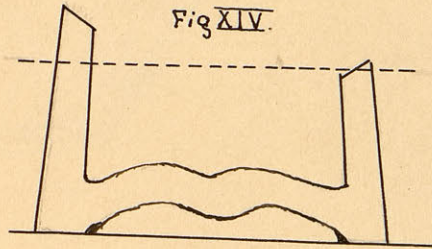


Fig XV.

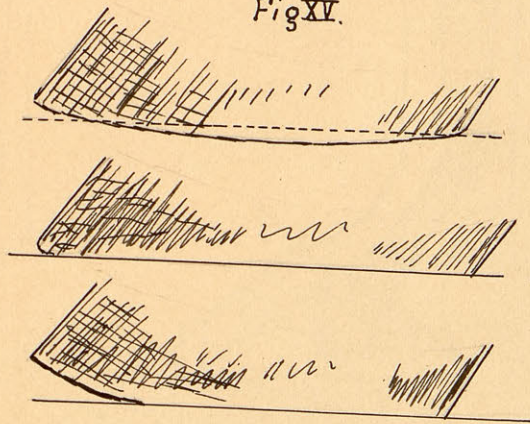


Fig XVI.

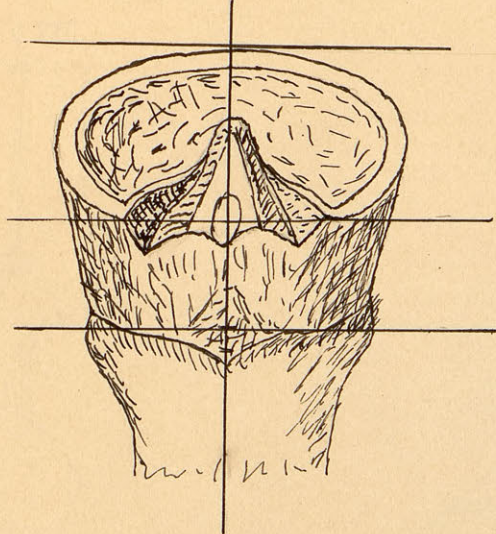


Plate IV.

Fig XVII.

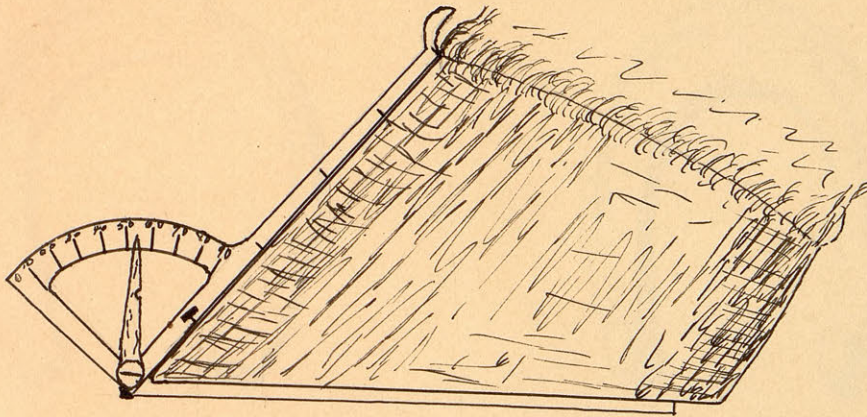


Fig XVIII.

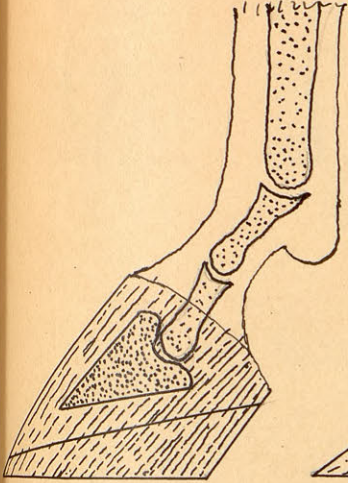


Fig XIX.

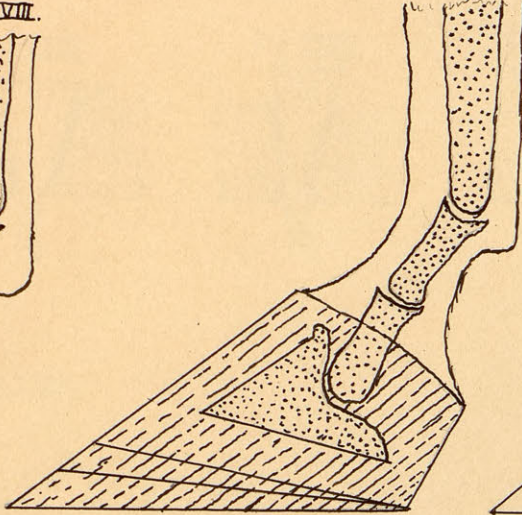


Fig XX.

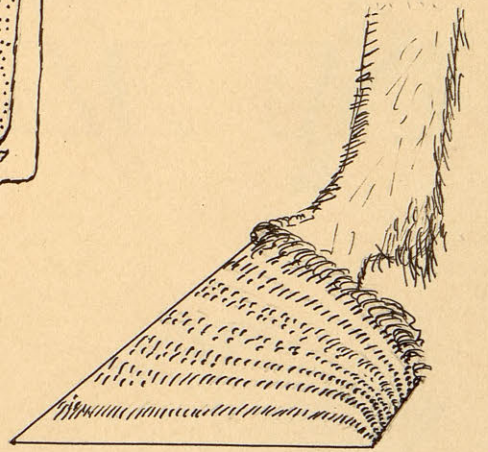


Fig XXI.

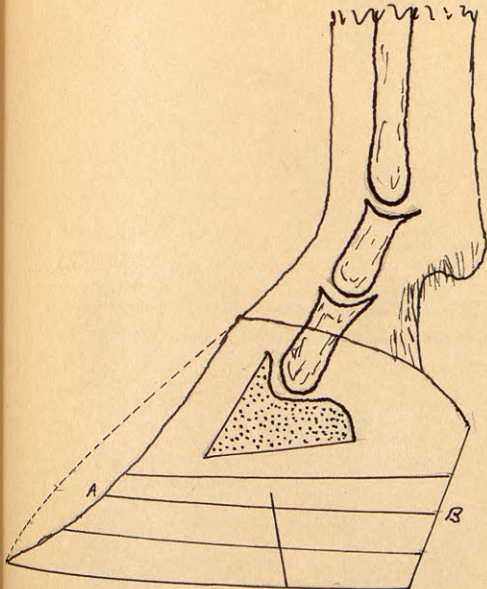


Fig XXII.

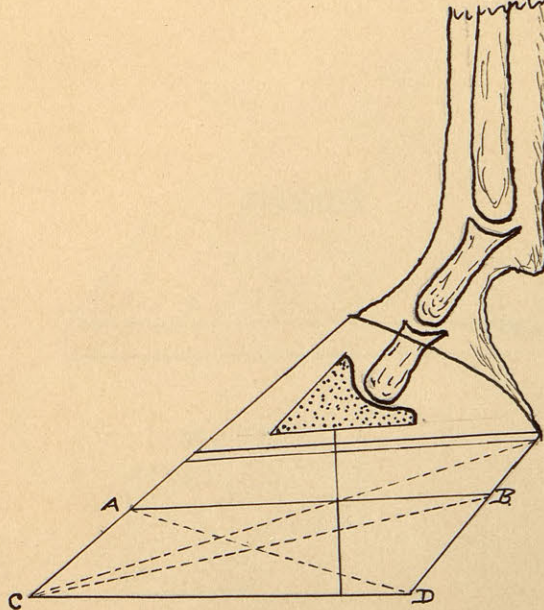


Plate V.

Fig XXIII.

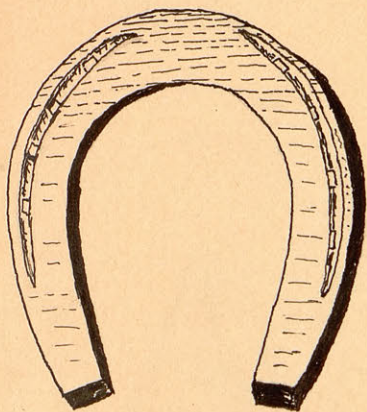


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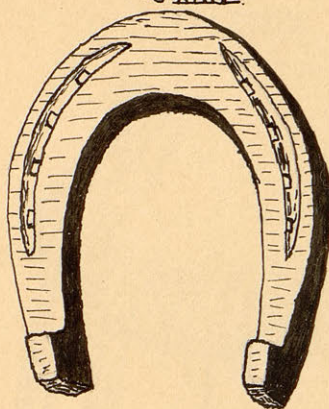


Fig XXV.

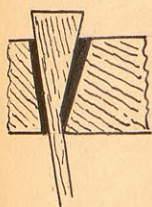


Fig XXVI.

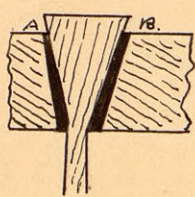


Fig XXVII.

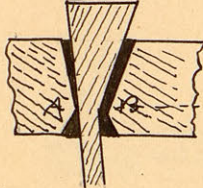


Fig XXVIII.

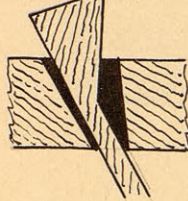


Fig XXIX.

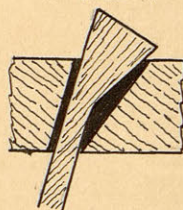


Fig XXXI.

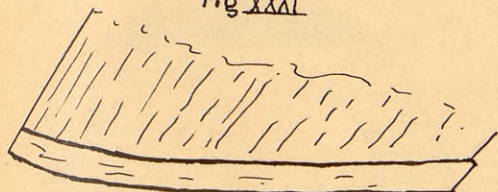


Fig XXXII.

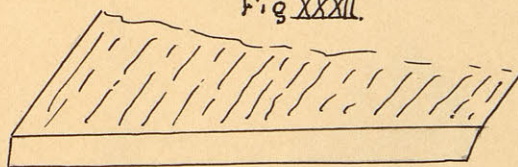


Fig XXXIII.

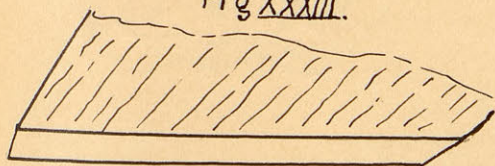


Fig XXXIV.

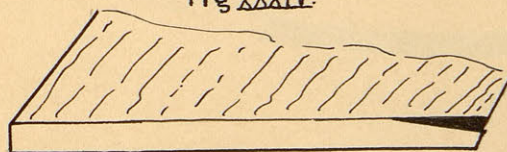


Fig XXXV.

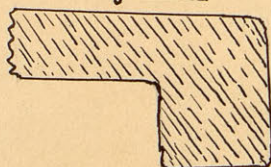


Fig XXXVI.

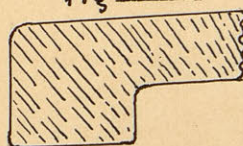


Plate VI.

Fig XXXVII.

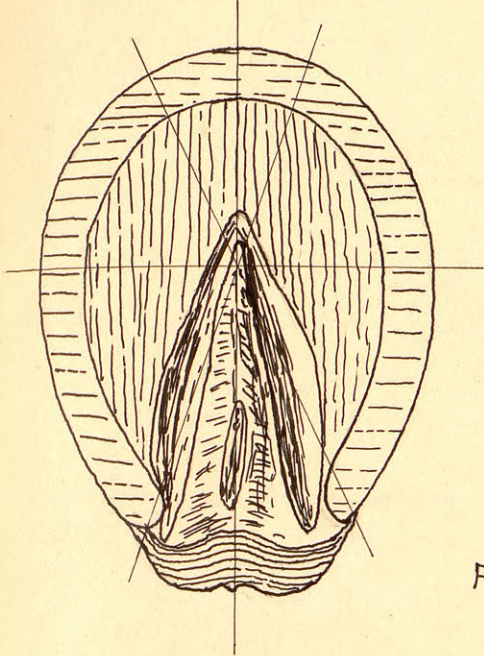


Fig XXXVIII.

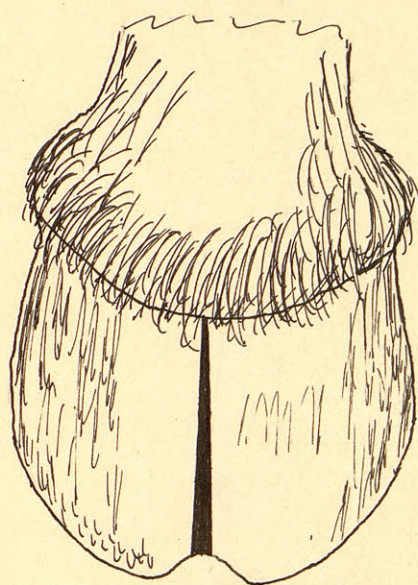


Fig XL.

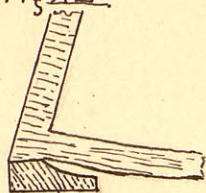


Fig XXXIX.



Fig XLI.

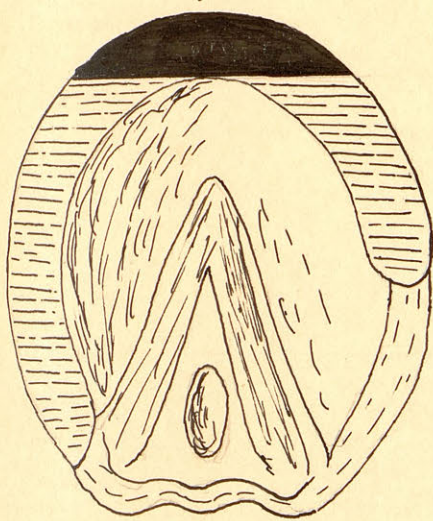


Fig XLII.

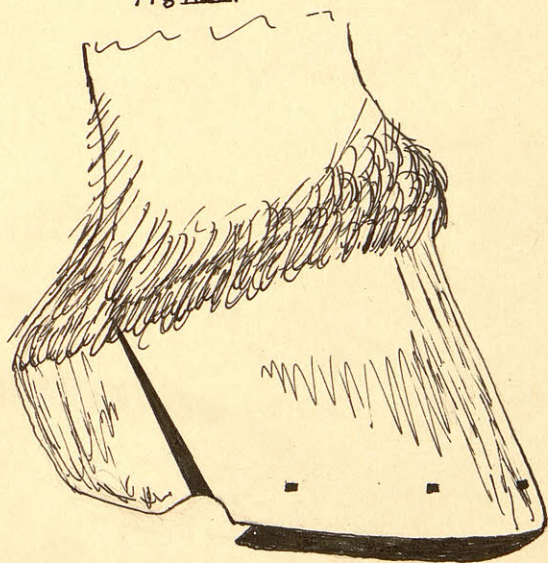


Plate VII.

Fig XLIII.

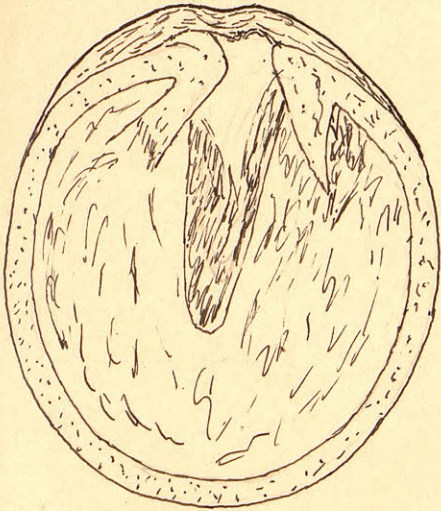


Fig XLIV.

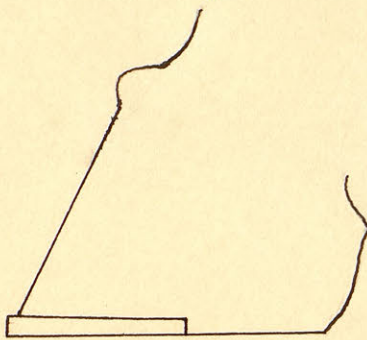


Fig XLV.

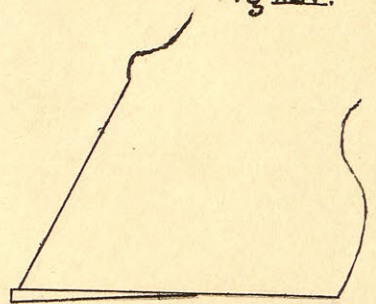


Fig XLVI.

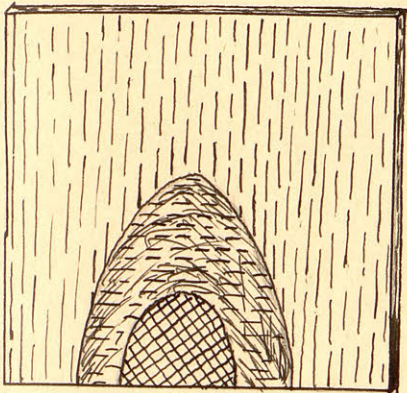


Fig XLVII.

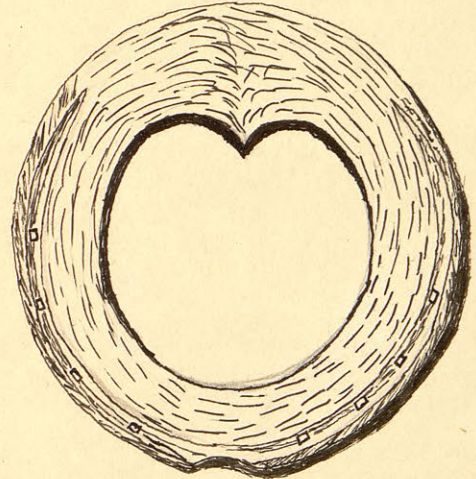


Fig XLVIII.

