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WAR DEPARTMENT

U. S. Dept of Army

TECHNICAL MANUAL

THE HORSESHOER

March 11, 1941

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TECHNICAL MANUAL
No. 2-220

WAR DEPARTMENT,
WASHINGTON, *March 11, 1941.*

THE HORSESHOER

Prepared under direction of the
Chief of Cavalry

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*This manual supersedes TM 2140-15, November 1, 1926.

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CHAPTER 1

BASIC INFORMATION

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II. Anatomy and physiology of horse's foot, pastern, and legs	2–12
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SECTION I

GENERAL

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General	1

1. General.—*a.* The power of the horse's foot to resist wear and injury depends upon the elasticity of the horn structures, proper functioning of the sensitive and nonsensitive structures, and distribution of the weight of the animal in accordance with the ability of the various parts of the foot to carry the load. The strength of the horn structures depends largely upon the percentage of moisture contained therein. This moisture is supplied from the blood circulating through the feet and from external sources, such as moist footing. The strength of the hoof and the rapidity of growth are sufficient under natural conditions to offset the wear and protect the inner structure of the foot against injury. When the horse is removed from his natural environment and is used for carrying or drawing heavy loads over hard and dry footings, or when stabled in stalls where the floors are hard and dry, the blood may not furnish sufficient moisture to keep the horn structures of the foot in normal condition. Additional moisture should be supplied and the hoof must be protected against wearing away at a rate greater than the growth of horn. Therefore, the necessity of applying shoes is apparent.

b. That shoeing is a necessary evil cannot be denied. Shoes fitted and applied in the best-known method are detrimental to the free functioning of the foot structures. Every nail driven into the wall of the hoof destroys a number of horn fibers and tends to weaken the

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main weight-bearing part of the foot. The shoe raises the frog from the ground and interferes with the functioning of the horny frog and elastic structures.

c. The horseshoer must have a working knowledge of the anatomy and physiology of the horse's foot and must be familiar with the horseshoer's tools and know how to use them to make horseshoes which will interfere as little as possible with the functioning of the foot. Also, he should have a general knowledge of the location, shape, and direction of the bones of the legs, so that by skillful work and knowledge of shoeing he can retain true gaits, improve or correct faulty gaits, alleviate or eradicate many of the disorders of the feet, and furnish relief to injured parts.

SECTION II

ANATOMY AND PHYSIOLOGY OF HORSE'S FOOT, PASTERN, AND LEGS

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Definition	2
Bones of legs	3
Parts of foot	4
Bones of pastern and foot	5
Elastic structures of foot	6
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Blood supply	10
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Conformation of pastern and feet	12

2. Definition.—Anatomy is the science of the structure of the body; as used herein it is the study of the various parts in the formation of the horse's foot, pastern, and legs. Physiology is the study of the functions or uses of these parts.

3. Bones of legs.—The names and locations of the bones of the fore and hind leg are shown in figure 1.

4. Parts of foot.—The horse's foot is composed of four parts:

a. The bones.

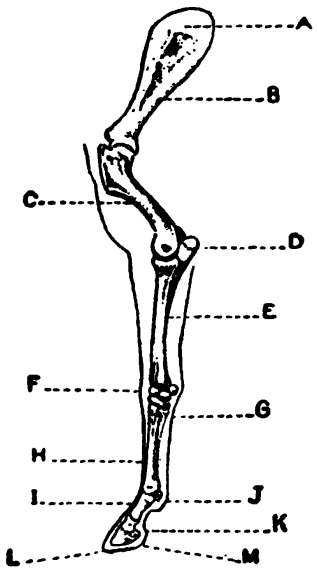
b. Certain elastic structures of cartilage or gristle.

c. A layer of highly sensitive flesh or quick, the corium, which covers the bony and elastic framework.

d. The box or case of horn called "the hoof" which incloses and protects the sensitive parts.

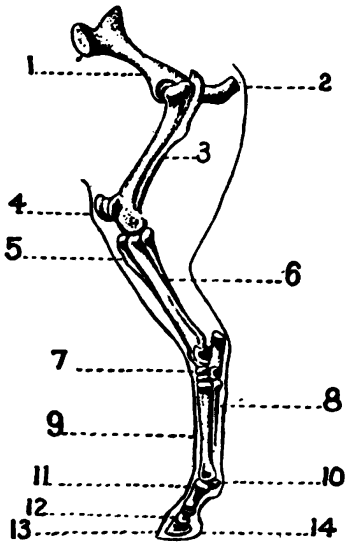
5. Bones of pastern and foot.—The bones of the pastern and foot form a column extending downward from the fetlock joint

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A. Cartilage of prolongation.
B. Scapula.
C. Humerus.
D. Ulna.
E. Radius.
F. Carpus.
G. Small metacarpal.
H. Large metacarpal.
I. Long pastern bone.
J. Sesamoid.
K. Short pastern bone.
L. Coffin bone.
M. Navicular or shuttle bone.

① Fore leg.



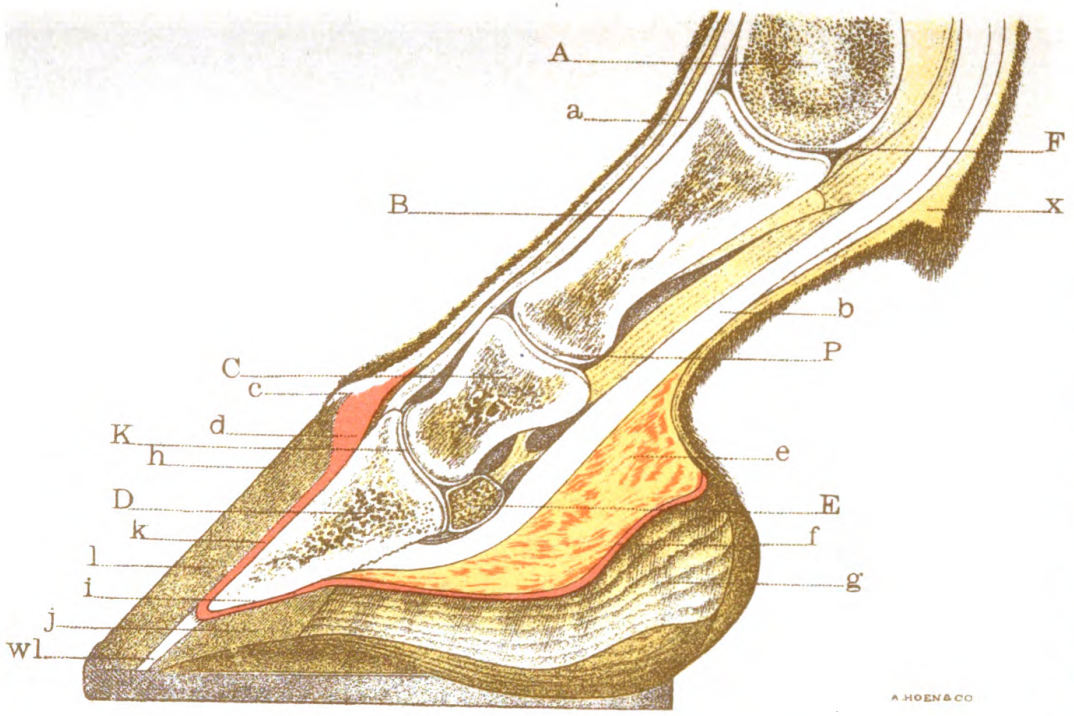
1. Pelvis.
2. Ischium.
3. Femur.
4. Patella.
5. Tibia.
6. Fibula.
7. Tarsus,
8. Small metatarsal.
9. Large metatarsal.
10. Sesamoid.
11. Long pastern bone.
12. Short pastern bone.
13. Coffin bone.
14. Navicular or shuttle bone.

② Hind leg.

FIGURE 1.—Bones of the legs.

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A. Cannon bone
B. Long pastern
C. Short pastern
D. Coffin bone
E. Navicular bone
F. Fetlock joint
K. Coffin joint
P. Pastern joint

a. Extensor tendon
b. Deep flexor tendon
c. Perioplic ring
d. Coronary band
e. Plantar cushion
f. Sensitive frog
g. Horny frog
h. Periople
i. Sensitive sole
j. Horny sole
k. Sensitive laminae
l. Horny wall
wl. White-line
x. Ergot

FIGURE 2.—Parts of the pastern and foot.

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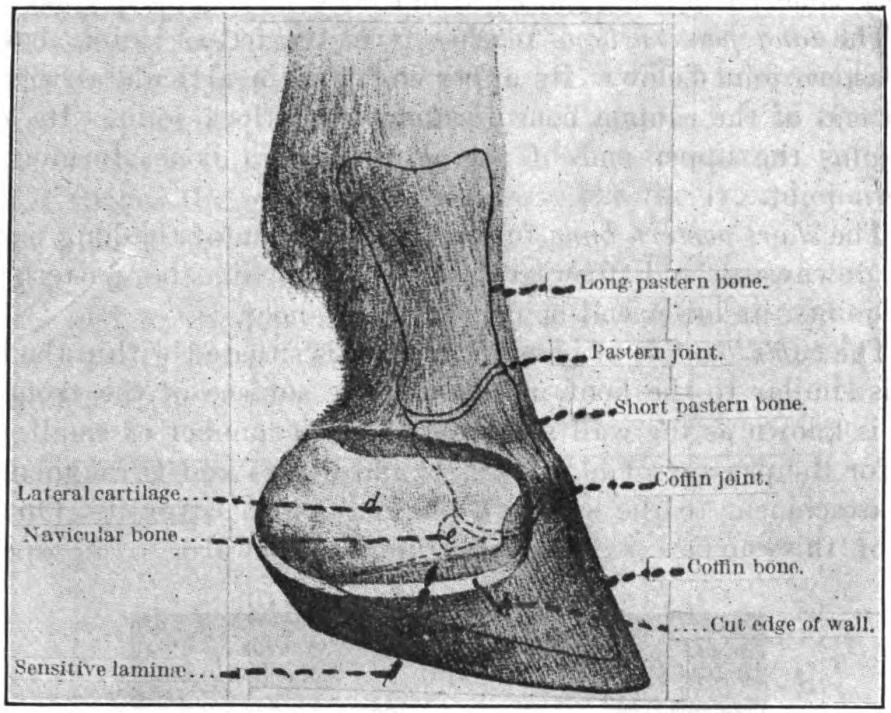


FIGURE 3.—Relation of bones to outside of foot, cartilage largely exposed.

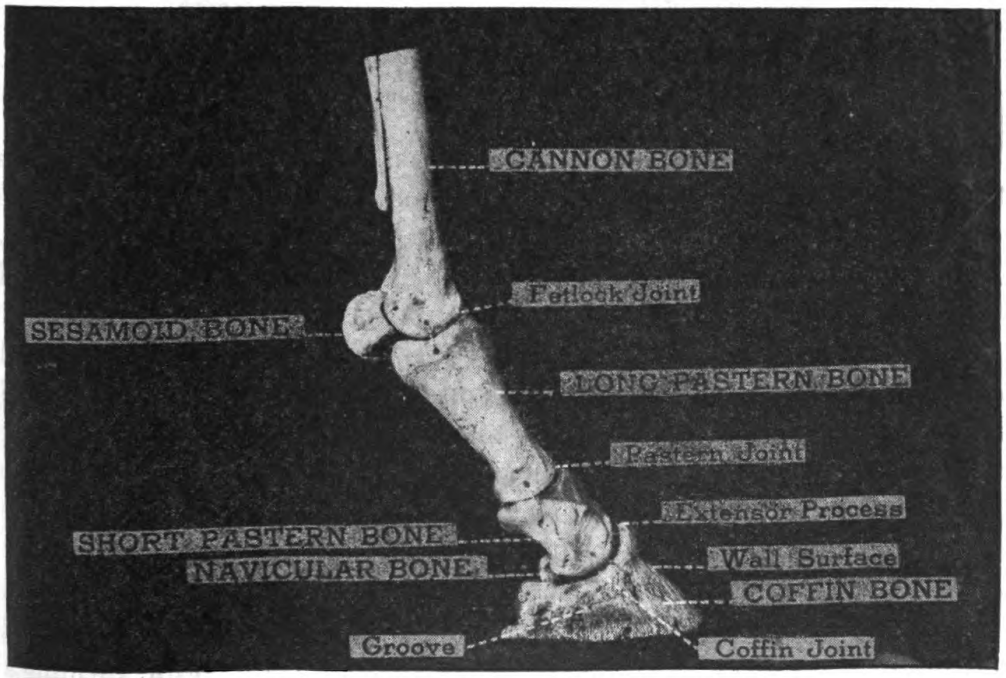


FIGURE 4.—Bones of foot and pastern region.

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into the hoof and are as follows: the long pastern bone, short pastern bone, coffin bone, and navicular bone.

a. The *long pastern bone* reaches from the fetlock joint above to the pastern joint below. Its upper end joins or articulates with the lower end of the cannon bone forming the fetlock joint. Its lower end joins the upper end of the short pastern bone, forming the pastern joint.

b. The *short pastern bone* follows the direction of the long pastern bone downward and forward and lies between the pastern and coffin joints, its lower end being within the hoof.

c. The *coffin bone* is of irregular shape, is situated within the hoof, and is similar to the hoof in shape. The surface of the front and sides is known as the wall surface. It has a number of small openings for the passage of blood vessels and nerves and is roughened to give attachment to the sensitive laminae which cover it. On each side of this surface is a groove running forward to an opening

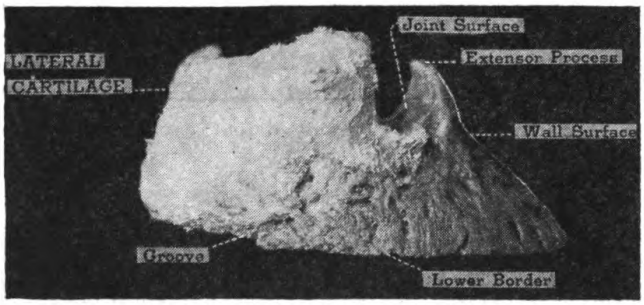


FIGURE 5.—Coffin bone.

through which an artery and a nerve enter the bone and a vein leaves it. At the top of the wall surface, in front, is a projection called the extensor process to which is attached the extensor tendon of the foot. On each side of the coffin bone is an extension to the rear called the wing. The lateral cartilages are attached to the outer and upper borders of the wings, and the ends of the navicular bone are attached to the inner surface. The lower surface of the coffin bone, called the sole surface, is concave, half-moon shaped, and smooth, except at the back part, which is roughened for the attachment of the deep flexor tendon of the foot. It is called the tendinous surface. The upper surface, called the articular surface, articulates with the short pastern bone and navicular bone and with them forms the coffin joint.

d. The *navicular bone* is of irregular shape. It is situated behind and below the short pastern bone and behind the coffin bone forming a joint with both. The extremities of the bone are attached to the wings of the coffin bone. The lower surface is covered with car-

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tilage, forming a smooth surface for the movement of the deep flexor tendon which bends the joint.

6. Elastic structures of foot.—All the structures of the foot, except the bones, are more or less elastic or springy and yield when pressure is applied. Certain parts have a high degree of elasticity. Their purpose is to overcome the effects of concussion or jar when the foot strikes the ground. These parts are the lateral cartilages and the plantar cushion.

a. The *lateral cartilages* are two large elastic plates of cartilage, one attached to the top of each wing of the coffin bone, extending backward and upward. Their borders may be felt at the heels under the skin above the coronet.

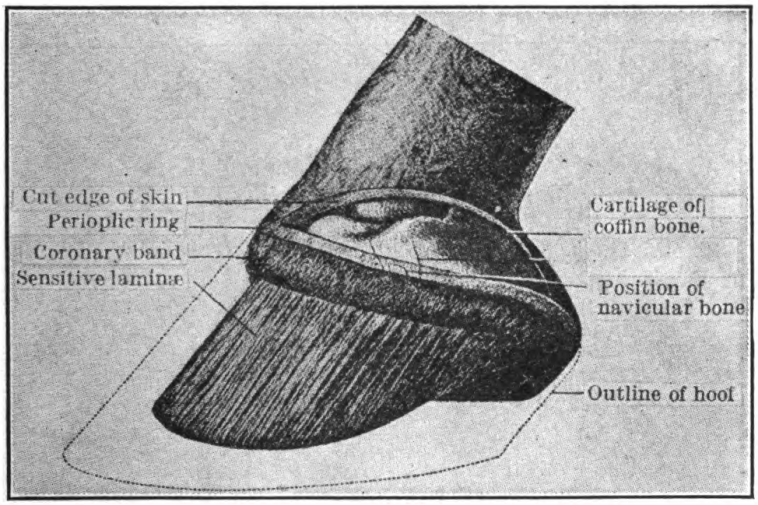


FIGURE 6.—Side view of foot after removal of hoof and part of skin.

b. The *plantar cushion* is an elastic wedge-shaped pad which fills up the space between the lateral cartilages on the sides, the frog below, and the deep flexor tendon of the foot above. The point or front part of the plantar cushion extends forward to the ridge, which separates the sole surface from the tendinous surface of the coffin bone. The base or back part is covered by the skin above the heels. When the frog comes in contact with the ground as the foot is planted, the plantar cushion acts as a buffer and prevents jar.

7. Sensitive structures of foot.—Over the bones and elastic parts of the foot is found a complete covering of sensitive flesh called the corium. From each part of this layer of flesh some portion of the hoof is secreted or grown. The sensitive parts are the coronary band, the perioplic ring, the sensitive laminae, the sensitive sole, and the sensitive frog.

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a. The *coronary band* is a thick band of tough tissue nearly an inch wide. It extends entirely around the top of the hoof from one bulb to the other, and lies in a groove on the inner surface of the wall at its upper border. The surface of the coronary band is covered with small pointed projections called "villi" from which is grown the horny wall of the hoof.

b. The *perioplic ring* is a narrow band of flesh running around the hoof just above the coronary band and separated from it by a faint groove in the wall. From the fine villi on the surface of this ring the delicate fibers grow which form the periople or hoof varnish.

c. The *sensitive laminae*, or sensitive tissue, cover and are firmly attached to the wall surface of the coffin bone and to the lower part of the outer surface of the lateral cartilages. From these delicate tis-

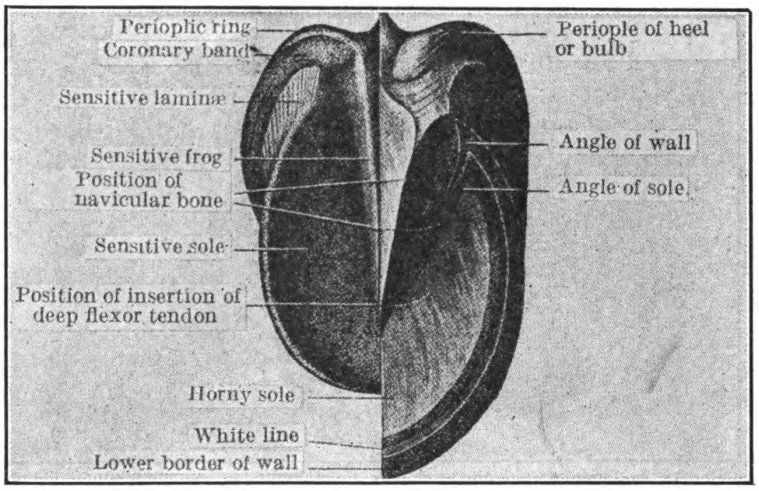


FIGURE 7.—Ground surface of foot after removal of half of hoof.

sues of flesh grow the horny laminae or inside lining of the horny wall.

d. The *sensitive sole* covers the sole surface of the coffin bone, is covered with villi, and grows the horny sole.

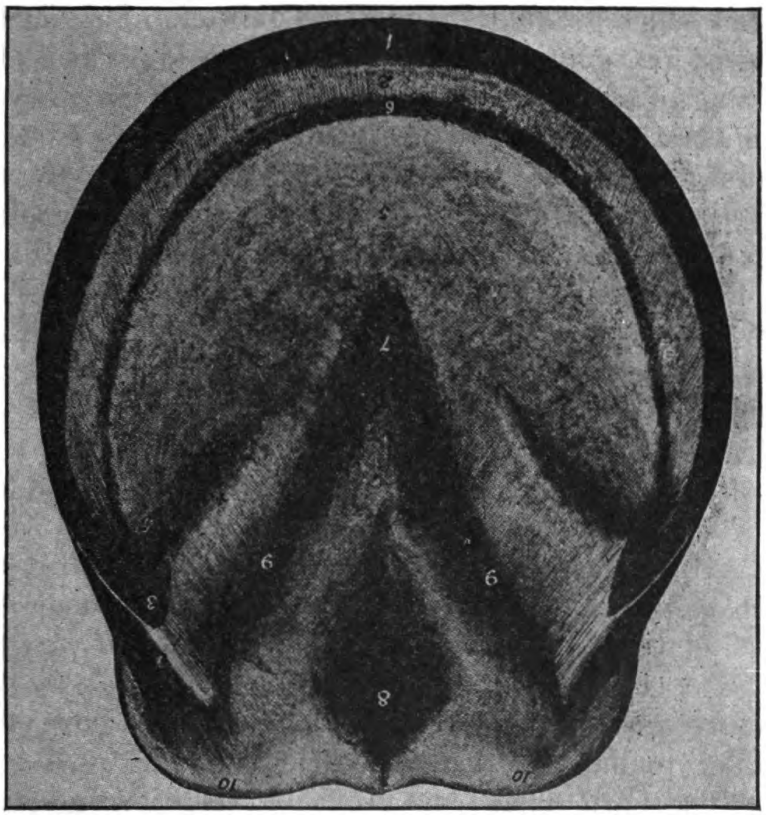
e. The *sensitive frog* covers the lower surface of the plantar cushion and from its villi the horny frog grows.

8. Hoof.—*a. Parts.*—The hoof is the outer horny covering of the foot. It is divided into three parts: the wall, sole, and frog. In the healthy foot these parts are firmly united.

(1) The *wall* proper extends from the edge of the hair to the ground. The outer surface of the wall is covered by a thin varnish-like coat of fine horn called periople. The inner surface of the wall consists of from 500 to 600 laminae. These are thin plates of horn running downward and forward. Between them are fissures

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into which dovetail the sensitive laminae. The horny laminae and the sensitive laminae are firmly united in the healthy foot. This union between the laminae binds the wall of the hoof to the coffin bone and its cartilages, suspends the weight of the horse from the wall as in a sling, and thus prevents the bones from descending on the sole. On the upper border of the wall lies the coronary band. The lower border of the wall is known as the bearing surface. The regions of the wall are the toe, the quarter, the buttress, and the bar.



1. Bearing surface of wall.
2. Horny laminae.
3. Angle of wall or buttress.
4. Bar.
5. Horny sole.
5¹ Angle of sole.
6. White line or junction of wall and sole.
7. Point of frog.
8. Cleft of frog.
9. Commissures.
10. Bulbs of frog.

FIGURE 8.—Ground surface of foot.

(*a*) The *toe* is the front part of the wall. It extends on either side to the point where the first nail is driven into the foot of the shod horse.

(*b*) The *quarter* extends backward on each side from the toe to the buttress.

(*c*) The *buttress* is that part of the wall which turns abruptly inward and forward.

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(*d*) The *bar* is that part of the wall which extends inward and forward from the buttress to within about an inch of the point of the frog. The hoof is thus made stronger by the ends of the wall extending inward to form the bars. The bars are weight carriers and act directly on the wall to produce expansion when weight is placed on the frog.

(2) The *horny sole* is a thick plate of horn. The sole is arched upward and joins the sensitive sole from which the horny sole grows. Its lower surface is hollowed and is covered with scales or crusts of dead horn which gradually loosen and fall off. The outer border of the sole is joined to the inner part of the lower border of the wall by a ring of soft horn called the white line. The inner border of the sole is V-shaped and is in union with the bars, except where the sole joins the point of the frog. The sole protects the sensitive parts above, and in the healthy foot should not be in contact with the shoe except along a very narrow border at the white line. This border should not exceed one-eighth of an inch.

(3) The *frog* is a wedge-shaped mass of softer horn filling the V-shaped space between the bars and sole. The lower surface has two prominent ridges, separated behind by a cavity called the cleft. These ridges terminate behind in the bulbs of the frog. Between the sides of the frog and the bars are two cavities called the commissures. The upper surface of the frog is the exact reverse of the lower. It has in the middle a ridge of horn called the frog stay, which assists the plantar cushion in breaking concussion. Its expansion and contraction aid in the circulation of the blood in the foot.

b. Structure of horn.—(1) The horn of the hoof consists of fine fibers, similar to hair in structure, held together by a cementing substance. The horn fibers run in a parallel direction downward and forward and are straight in the wall and sole and wavy in the frog. The fibers of the frog are finer, softer, and more elastic than those of the wall and sole. The wall wears away at the lower border or, if the animal is shod, the growth is removed in preparation for shoeing. The sole and frog scale off always in unshod feet and sometimes in shod feet when the fibers have reached their proper length. They should not be cut except when necessary in the treatment of a diseased condition or to remove a surplus accumulation of horn.

(2) The average rate of growth of horny structures under normal conditions is about three-eighths of an inch per month. The rate of growth is governed by—

(*a*) Climatic conditions.

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(*b*) Amount of work or exercise.

(*c*) General physical condition of the horse.

(*d*) Ability of the horny frog to function naturally.

(*e*) Care given the horn structures, such as providing moisture when needed. Moisture may be added to the horn structures by the application of white rock or clay packs over the area of the horny sole and frog, by applying cold water packs to the wall of the hoof, or by standing the horse in the soak stall for several hours with the feet immersed in water.

(*f*) Use of stimulating agents, for example, application of a mild irritant or an ointment, such as lanolin, around the coronet.

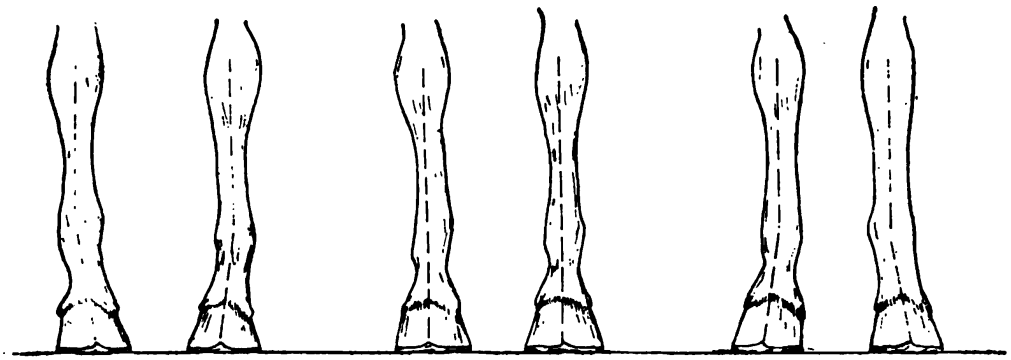
9. Dissipation of concussion.—The concussion borne by the foot is lessened by the functioning of its parts. The weight of the horse is transmitted down the bony column of the leg. The end of the bony column is suspended within the hoof by the dovetailing of the sensitive laminae and the horny laminae. As the weight is transferred from the bony column to the wall and bars of the foot, these laminae give way slightly, allowing the bony column to descend. This in turn causes the sole to be somewhat lowered. Contact of the bearing surface of the foot with the ground compresses the horny frog and the plantar cushion. The plantar cushion in turn expands outward against the lateral cartilages which force the quarters outward. This outward movement at the quarters is called expansion. When the foot is lifted from the ground these elastic structures return to their normal shape and position. This is called contraction.

10. Blood supply.—The sensitive structures, especially the corium, are well supplied with arteries and veins. The arterial circulation is sufficient unto itself, but the venous circulation receives a mechanical aid from the movements of the foot. When expansion takes place the blood in the veins is forced out of the foot toward the heart. When the foot is lifted from the ground the veins refill with blood. These movements of the foot aid materially in the circulation, and the expansion and contraction diminish the jar to the foot and leg. The horse should have daily exercise to give the tissues of the foot their proper nourishment and, when taken out to work, the animal should be walked at first to allow the circulation to adjust itself to the change from rest to work.

11. Moisture.—The wall of the healthy foot is by weight about one-fourth water, the sole more than one-third, and the frog almost one-half. This water is derived internally from the blood supply and externally from moist standings and the soil, and preserves the horn in a tough and elastic condition. The periople which covers the

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wall serves to prevent undue evaporation and therefore should never be rasped, except when absolutely necessary for corrective shoeing, particularly on flat feet. As there is no similar covering for the sole and frog, the layers of horn on their exposed surfaces dry out and die. The dead layers are hard and brittle and gradually flake off, but as they help to preserve the moisture in the live layers beneath, as little as possible should be removed in preparing the hoof for



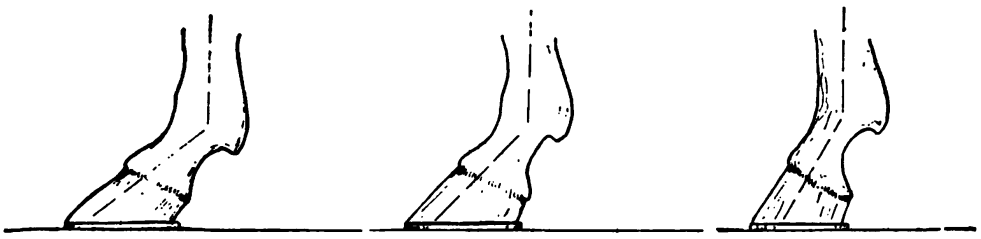
① Toe-in. ② Straight. ③ Toe-out.

NOTE.—Dotted lines show pastern and foot axis as viewed from the front.

FIGURE 10.—Pastern conformation (front view).

shoeing. Moisture may be introduced artificially by first bringing into the foot an abnormal supply of moisture and then applying to the hoof a dressing of some vegetable oil to prevent undue evaporation.

12. Conformation of pastern and feet.—*a. Definitions.*—(1) Pastern conformation as viewed from the front is classified as toe-in, straight, and toe-out. (See fig. 10.)



① Sloping. ② Regular. ③ Stumpy.

NOTE.—Dotted lines show pastern and foot axis as viewed from the side.

FIGURE 11.—Pastern conformation (side view).

(2) Pastern conformation as viewed from the side is classified as sloping, regular, and stumpy or upright. (See fig. 11.)

(3) The pastern axis, as viewed from the front and side, is an imaginary line passing through the long axis of the pastern, dividing the pastern into equal parts.

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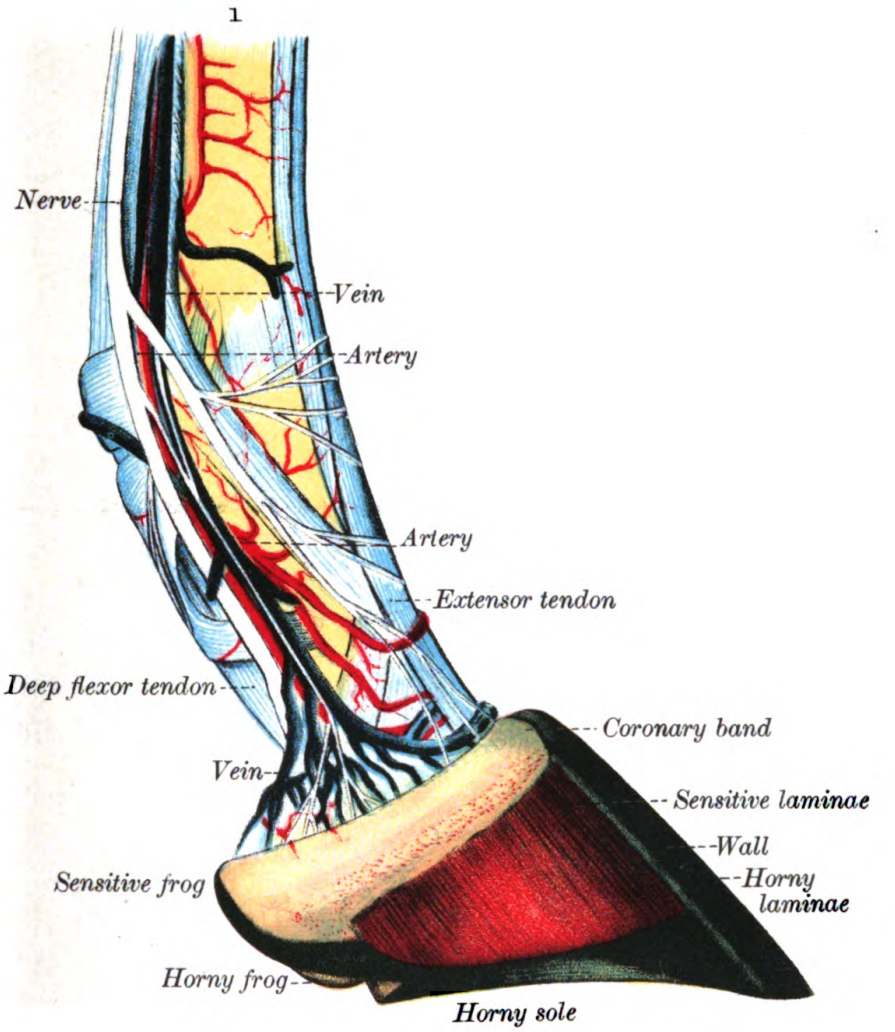


FIGURE 9.—One-half of hoof removed showing corium.

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(4) The foot axis, as viewed from the front, is an imaginary line passing through the front part of the hoof at the center of the toe from the coronet to the lower border and dividing the foot into equal parts.

(5) The foot axis, as viewed from the side, is an imaginary line passing through the side of the hoof parallel to the front line of the wall from the coronet to the lower border at the toe.

b. Conformation of the pastern.—For the riding horse, pastern conformation classified as straight and regular is desired. The gait is true and there is not as much strain upon the foot and leg structures as with the other pastern conformations. The horse with a toe-in pastern conformation extends the feet during flight with an outward swing. The horse with very sloping pasterns is susceptible to strained flexor tendons. The horse with stumpy pasterns is susceptible to foot disorders, due to greater concussion on the foot structures. The gait is likely to be rough and lacking in flexibility.

c. Conformation of the feet.—The feet are classified as cup-shaped, flat, round and broad, long and narrow.

(1) (*a*) A cup-shaped foot is one in which the horny sole is arched. Looking at the bottom of the foot, the horny sole is concave.

(*b*) A round and broad foot is one that is often too large in proportion to the size and weight of the horse and may have a horny sole that is flat.

(*c*) A long and narrow foot is one in which the width of the foot at the quarters is not in conformity with the length of the hoof.

(2) The cup-shaped foot is desired, as it is stronger and less liable to injury than the flat foot. Dark-colored horn is preferable to light-colored horn.

SECTION III

HORSESHOER'S TOOLS, MACHINE-MADE SHOES, AND NAILS

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Pritchel	27
Shoeing box	28
Fire shovel	29
Fire rake	30
Box-leg vise, 5-inch jaw	31
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13. General.—The horseshoer's tools are designed for a specific class of work. The terms "horseshoer" and "blacksmith" are often erroneously considered as being synonymous. Tools that are suitable for blacksmith work are not suitable for shoeing horses. To enable the horseshoer to perform skilled work, he is issued good tools. Tools should be kept in good condition. The skill of the workman is reflected in the condition in which he keeps his tools.

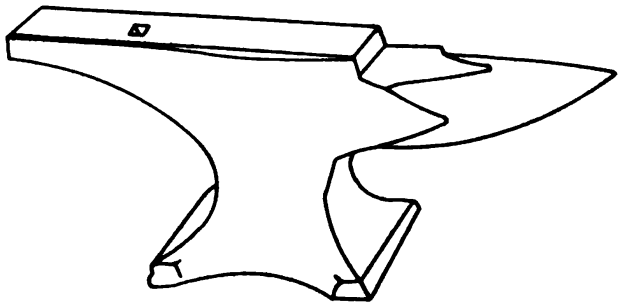


FIGURE 12.—Anvil.

14. Anvil.—The anvil is used for shaping shoes, opening nail holes, turning heel calks, leveling the shoe, and for welding. The farrier's anvil has the following features not found on the blacksmith anvil: The heel of the farrier's anvil is cut under (thinner) to permit working the shoe over the heel, for example, straightening the shoe or turning heel calks; the horn is larger than the one on the blacksmith's anvil and is tapered from base to point to facilitate forming the toe and quarter in the shoe.

15. Leather apron.—The leather apron is used to protect the shoer's clothing from being burned when working at the forge, and from being torn when working upon the feet.

16. Clinch cutter.—The clinch cutter is used to straighten or cut the clinches prior to removing a shoe from the foot. The blade is

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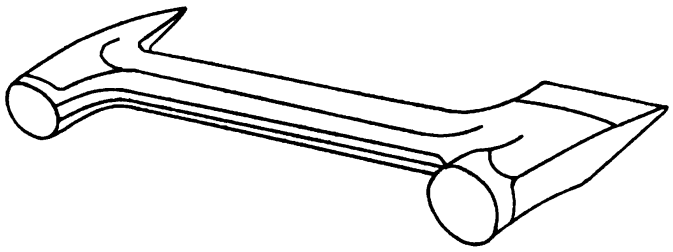
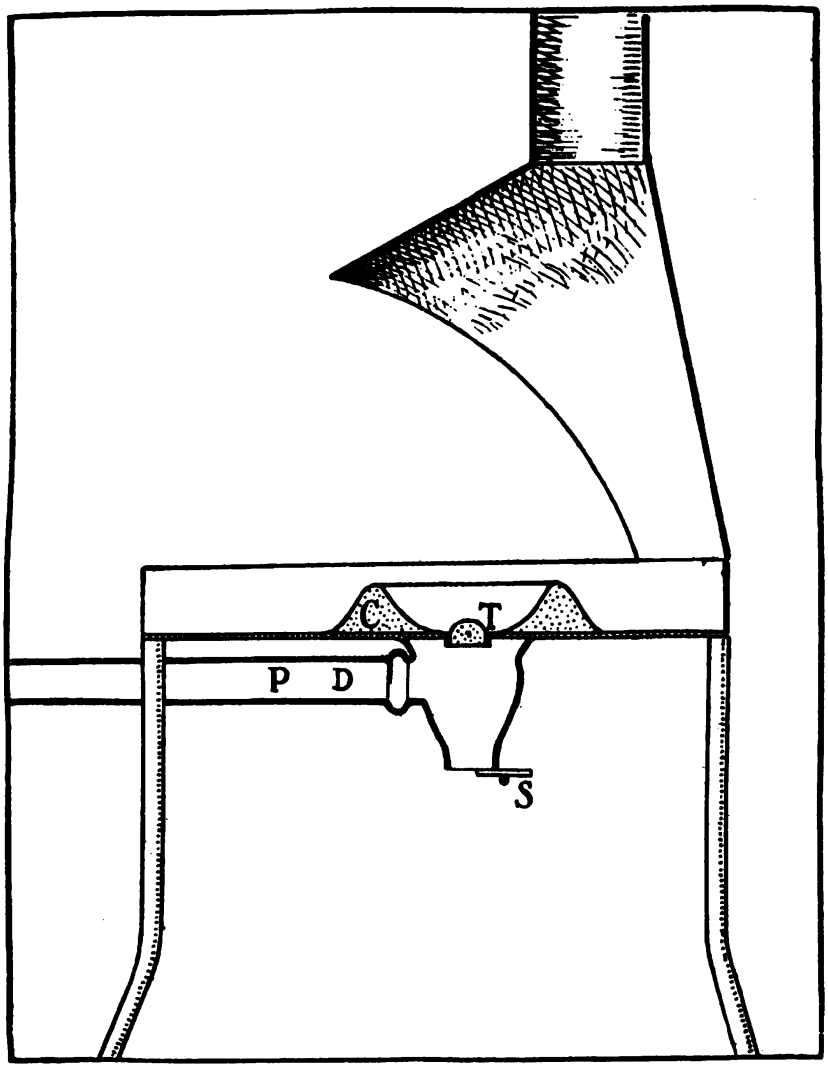


FIGURE 13.—Clinch cutter.



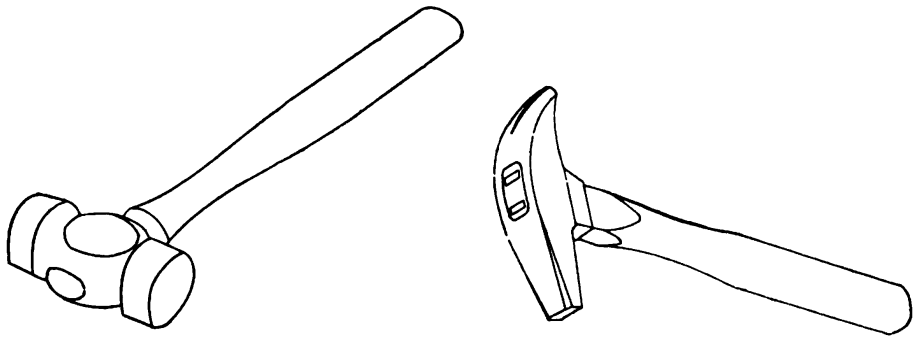
C. Crater.
T. Twyer ball.
S. Slide.
P. Pipe leading from fan.
D. Draft.

FIGURE 14.—Portable forge.

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used for this purpose and the pritchel-shaped end is used to extract a seated nail from the shoe.

17. Portable forge.—In the portable forge, air is forced through the fire by a fan which operates by a driving gear. The twyer ball corresponds to the grate of a stove. Firmly attached to it and extending toward the operator is an iron rod by which the ball may



① Rounding. ② Driving.

FIGURE 15.—Hammers.

be rocked. A crater of clay or, better, of cement should be made around the twyer ball to confine the fire.

18. Hammers.—*a.* The rounding hammer is used for shaping shoes, concaving and leveling shoes, making shoes from bar steel, turning heel calks, and welding.

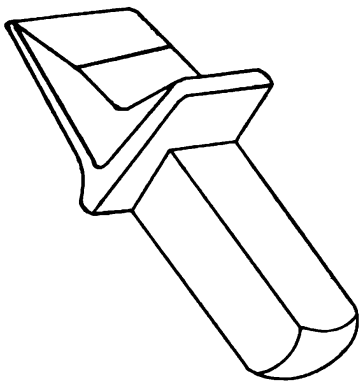


FIGURE 16.—Hardy.

b. The driving hammer is used for driving nails to secure the shoe to the foot and forming and finishing the clinches.

19. Hardy.—The hardy is used for cutting hot metals, such as cutting off the heels when the shoe is being fitted.

20. Farrier's knife.—The farrier's knife is used for removing scales of dead horn on the sole of the hoof, cutting out corns, and for

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other work of a corrective, pathological nature requiring a blade not greater than ½ inch in width.

21. Fullering iron.—The fullering iron or creaser is used to make a crease for the reception of the nail heads in the hand-forged shoe, or to repair damaged creases.



FIGURE 17.—Farrier's knife.

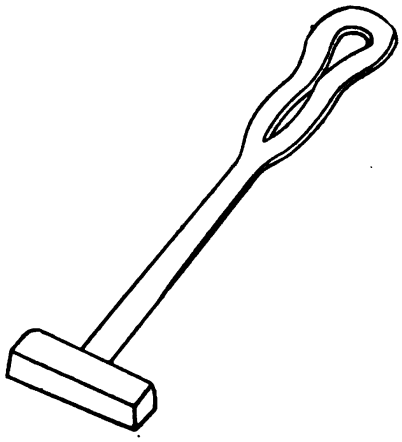


FIGURE 18.—Creaser.

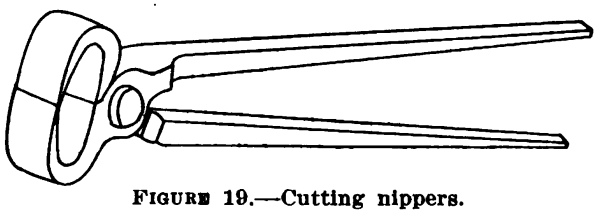


FIGURE 19.—Cutting nippers.

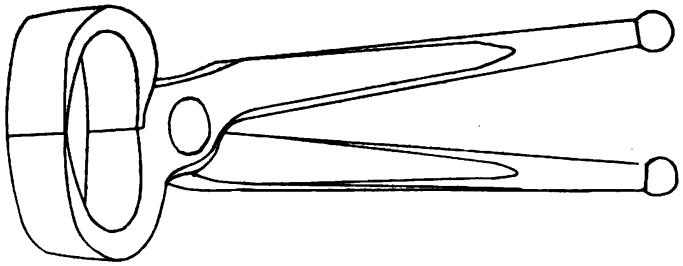


FIGURE 20.—Pincers.

22. Cutting nippers.—The cutting nippers is used for removing surplus length of wall from the hoof when preparing the foot for shoeing.

23. Farrier's pincers.—The pincers is used to remove—

a. The shoe from the foot.

b. Improperly driven nails.

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24. Hoof parer.—The hoof parer is used for the same purpose as the cutting nippers—to remove the surplus length of wall of the hoof when preparing the foot for shoeing.

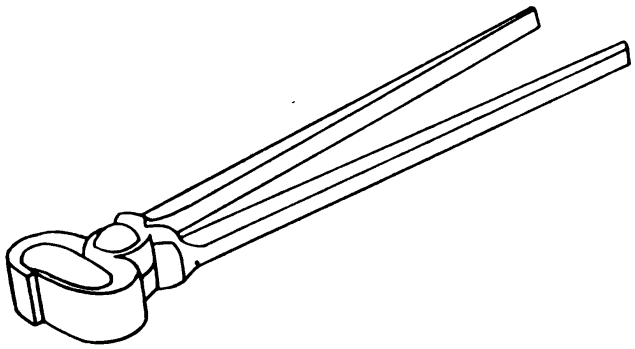


FIGURE 21.—Hoof parer.

25. Tongs.—Farrier's tongs are used to remove shoes or other hot metal from the fire, and to secure the metal while working it on

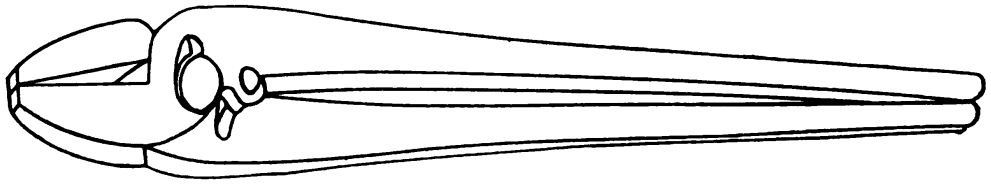


FIGURE 22.—Farrier's tongs.

the anvil. These tongs automatically adjust themselves to any size and thickness of shoe insuring a firm hold.

26. Horseshoeing rasp, plain, 16-inch.—The horseshoeing rasp is used in leveling the bearing surface of the foot, finishing the



FIGURE 23.—Horseshoeing rasp, plain, 16-inch.

clinches, and hot-rasping the heels of the shoe after the surplus length has been removed.

27. Pritchel.—The pritchel is used for opening the nail holes in the shoe.

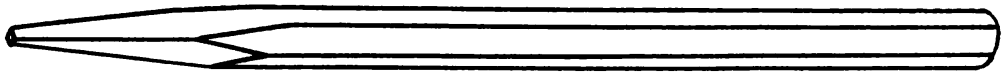


FIGURE 24.—Pritchel.

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28. Shoeing box.—The shoeing box is used for assembling and transporting the tools used by the shoer when working on the feet.

29. Fire shovel.—The fire shovel is used for adding fuel to the fire.

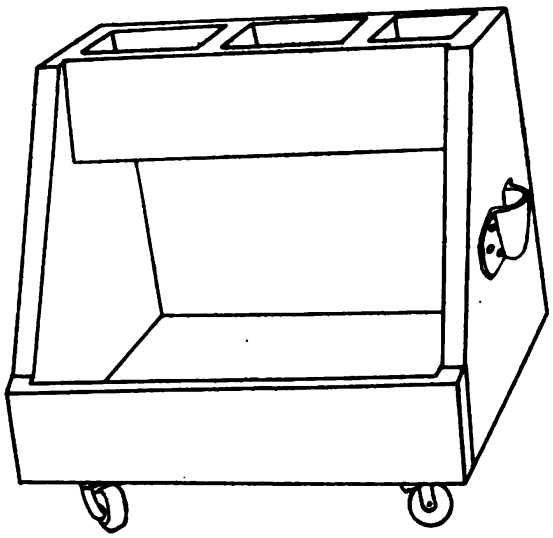


FIGURE 25.—Shoeing box.

30. Fire rake.—The fire rake is used for removing clinkers from the fire.

31. Box-leg vise, 5-inch jaw.—The vise is used for holding shoes in place for hot-rasping the heels and for miscellaneous work

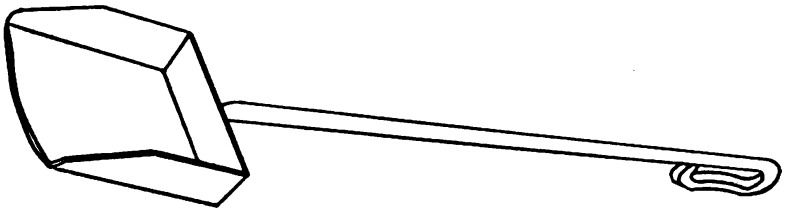


FIGURE 26.—Fire shovel.

32. The fire.—*a. Building and care.*—(1) Coal, charcoal, coke, or even wood may be used as fuel to create the necessary heat in the forge.

(2) Before building the fire, the crater of the forge must be thoroughly cleaned and all dirt, ashes, and unconsumed fuel removed.



FIGURE 27.—Fire rake.

The twyer ball should be rocked vigorously and the slide opened. A few blasts will aid in removing the accumulated dust. The ball is often so heated as to fuse. Melted metal and clinkers may close the

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openings around the ball, preventing the passage of the blast. The obstructions must be removed with the fire rake.

(3) Coal is banked around the twyer ball in the form of a crater, in the center of which dry particles of any inflammable material are placed and ignited. When these particles are burning, coke or wet coal, if no coke is available, is gradually placed on the fire and the fan is revolved slowly, care being taken not to cover the fire so thoroughly that the flames are smothered.

(4) When the fire is burning brightly, it should be built up around the edges with wet coal, which will in time become coke. This coke is next burned and replaced by wet coal, thus keeping up the supply of coke. Green coal is of little use in heating iron or steel for the reason that it does not give a high degree of heat; it sticks to metal and

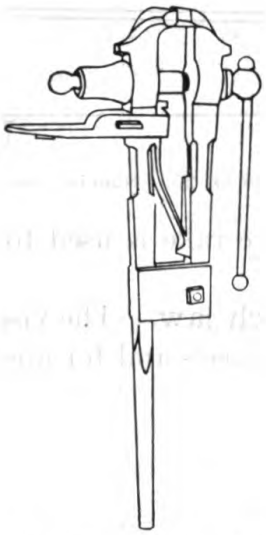


FIGURE 28.—Box-leg vise, 5-inch jaw.

gives off a smoke that interferes with the work. A clear fire without smoke is essential for good work, as the higher degrees of heat can only be obtained from such a fire. The depth of the fire should be about 9 inches. The metal is then supported at the place of the greatest heat, that is, about 6 inches above the twyer ball. If the metal is too near the twyer ball the heat is affected by the cold blast.

b. To bank a fire.—Cover thoroughly with the fuel and open the slide. This will keep the fire alive for several hours. Whenever the fire is left for more than a few minutes the slide should be opened.

c. Clinkers.—Heated steel or iron gives off particles or scales which remain in the fire. These melting particles bind together particles of burned coal, gradually become larger, and finally form what is called a clinker. Clinkers give off but little heat, obstruct and spoil

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the fire, and must therefore be removed as fast as they form. Their presence is shown by a tendency of the fire to spread and an unusual throwing out of sparks. If indications of clinkers appear, the fire should be opened up with the fire rake. As soon as the air touches the clinker it will turn black and become a solid mass which can be lifted out as a whole. Trying to drag out the clinker without opening up the fire only results in breaking up the clinker and making the fire worse than it was before.

33. Heats.—*a.* There are four degrees of heat to be considered by the horseshoer: black, cherry-red, white, and welding heat.

(1) Black heat occurs when the metal is hot but shows no color. It is used in making minor changes in shaping and leveling and in the final opening of the nail holes.

(2) Cherry-red heat occurs when the metal shows a bright cherry-colored glow. It is used in the general shaping of the shoe, in pointing the pritchel, in opening nail holes, and in sharpening tools.

(3) White heat occurs when the metal shows almost white. This heat is used when it is necessary that the metal should be very pliable and easily worked, as in drawing toe clips, in cutting off the heels, in drawing the heels, in hot rasping, and in turning heel calks.

(4) Welding heat is sometimes called sparking heat for the reason that the metal gives off small particles which explode or spark above the fire. As soon as the sparks appear, the shoer should watch the metal closely and, when the part to be welded has a bubbling or fluxing appearance, it must be withdrawn from the fire and worked immediately. The success of the weld depends almost entirely upon the proper heat of the parts at the exact moment the weld is attempted.

b. A newly made coal fire can be used for ordinary heating, but for a welding heat, coke is required. Coke is ordinary coal from which the gases have been driven off by gradual heating. It will be found, ready at hand, around the edge of the fire. As coke does not smoke, there is no trouble in observing when the metal has reached the exact welding heat.

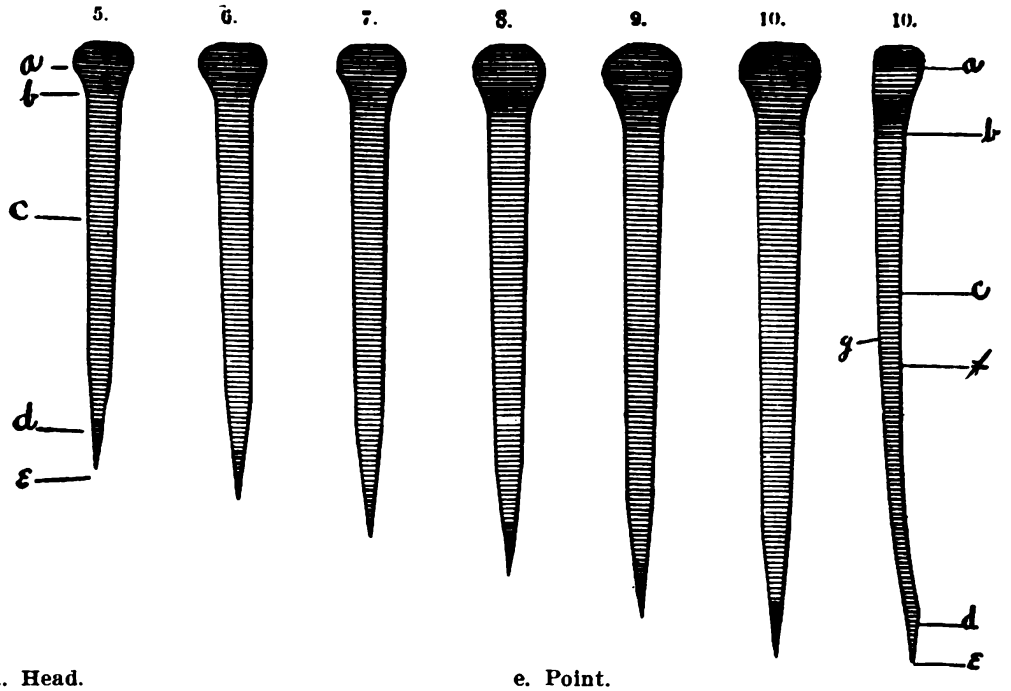
34. Machine-made shoes.—Machine-made shoes are manufactured in sizes and weights as shown in the following table. These shoes are manufactured with long heels so that the extra length can be used in turning heel calks or in making a bar shoe. (See par. 45.)

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MACHINE-MADE SHOES

Sizes, weights and approximate number per 100-pound keg

Weight	Size							
	1	2	3	4	5	6	7	8
Horse shoes:								
Front:								
Extra extra light	133	114	94	80				
Extra light	119	94	80	70	58	49	42	36
Light	107	82	71	62	50	42	36	30
Medium	94	75	62	52	43	37	33	30
Heavy	84	68	58	48	41	34		
Hind:								
Extra extra light	177	160	133	106				
Extra light	146	110	92	76	63	53	45	
Light	123	97	80	65	55	47	41	33
Medium	110	92	71	60	51	45	41	36
Heavy	92	75	62	53	45	40	36	
Mule shoes:								
Light	145	128	103	80	68	51		
Heavy	123	97	78	60	56	51	45	



a. Head.
b. Neck.
c. Shank.
d. Bevel.
e. Point.
f. Inner face.
g. Outer face.

FIGURE 29.—Machine-made horseshoe-nails (natural size) with low, wide head for fullered shoe. Last nail shown from one border; others from inner face.

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35. Nails.—Nails issued for use in the Army are machine-made. One side of the shank is flat, the other concave with a bevel near the point. This bevel as it enters the horn forces the point of the nail in the direction of the flat side toward the outside edge of the shoe. The head of the nail is tapered on the same side as contains the bevel of the point. This tapered side of the head is roughened so that the horseshoer can determine the correct side of the nail by the sense of touch.

SECTION IV

MAKING HORSESHOES FROM BAR IRON OR STEEL

	Paragraph
General	36
Parts of shoe	37
Procedure	38

36. General.—Since working a piece of bar iron or steel into a horseshoe requires skill, it is well for beginners to become familiar with the making of shoes from bar iron or steel. Briefly the reasons for this work are as follows:

a. Experience is gained in the working of iron at various heats and in the use of the forge and tools.

b. It provides training in visualizing the shape of the horse's foot in detail and then translating this picture into a horseshoe which will fit the foot.

c. Making the horseshoe by hand permits spacing the nail holes in the shoe to suit the individual foot.

d. Skill in this work is essential for special shoeing.

37. Parts of shoe.—The parts of the horseshoe are as follows:

a. The toe is that portion between the first nail hole on one side and the first nail hole on the other side.

b. From the toe to the heel on either side is termed the branch.

c. The quarter is that part of the branch between the last nail hole and the heel.

d. The ends of the branches are called the heels.

e. The web is the breadth and thickness of the metal in the horseshoe.

f. The lower surface of the shoe is the ground surface, and the upper surface is the foot surface.

g. The foot surface of the shoe is divided into the bearing and the concave surface.

(1) The bearing surface is that part of the shoe surface which is actually in contact with the foot.

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(2) The concave surface is that part of the shoe which extends over the horny sole.

38. Procedure.—A section of bar steel ¾ by 5/16 inch and 12 inches in length is suitable for this work.

a. Heat the center section of the bar to a cherry-red heat. With the tongs remove the bar from the fire and place one end on the outer edge of the face of the anvil; the other is held so that the bar makes a 45° angle with the horizontal. With the rounding hammer,

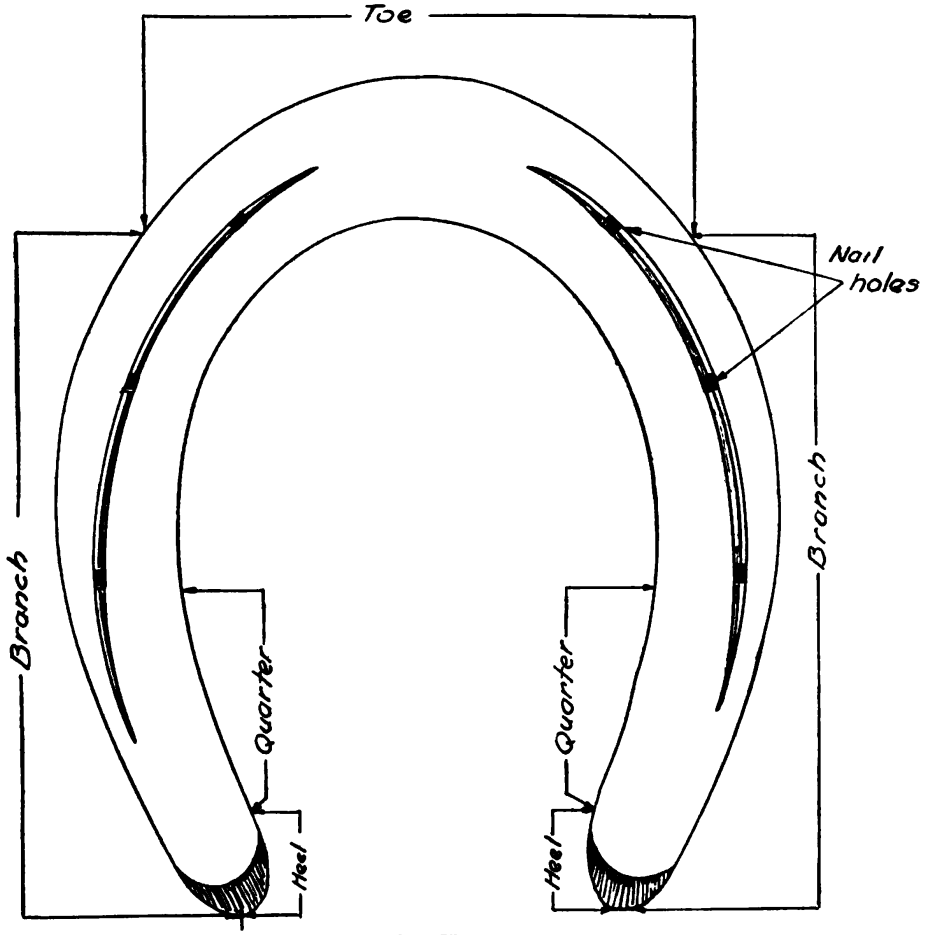


FIGURE 30.—Hand-forged shoe.

strike light blows at the center of the edge of the bar until an oval turn is made, and the branches form a right angle at the center of the bar. Reheat each branch separately and shape them over the horn of the anvil to conform with the shape of the outline of the outer border of the hoof at the quarters and heels.

b. The position, shape, size, and angle of the nail holes are very important features of shoeing. The security of the shoe and strength of the wall depend largely on this particular part of the work. The

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nails are spaced as far apart as will conform consistently to the size of the foot and insure firm nailing. To secure the shoe firmly and maintain the strength of the wall, the position of the nail holes in the shoe is as follows:

(1) The first nail hole is punched about 1 inch in rear of a line parallel to the toe of the shoe and $\frac{3}{8}$ inch from the outer border of the web.

(2) The quarter nail hole is punched at the bend of the quarter and $\frac{3}{16}$ inch from the outer border of the web. A third hole is punched at an equal distance between the toe and quarter holes and $\frac{1}{4}$ inch from the outer border of the web.

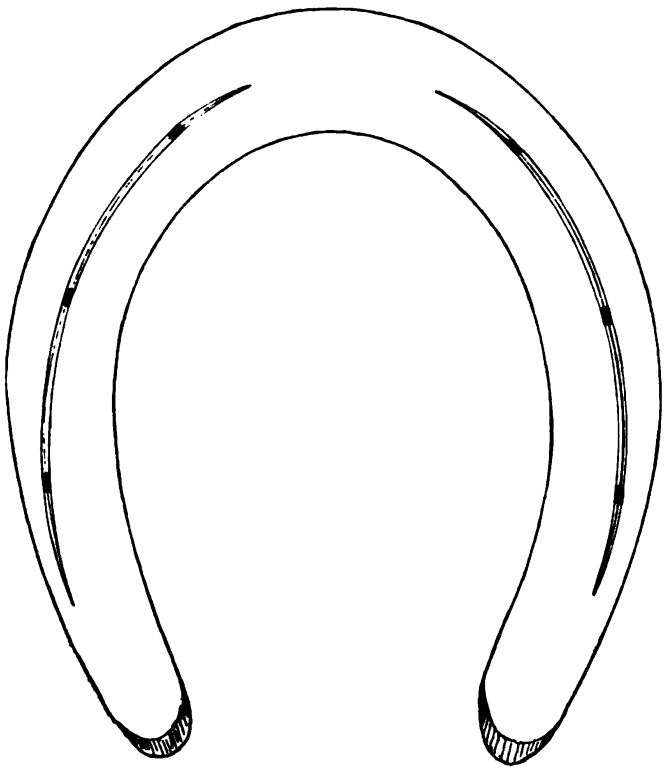


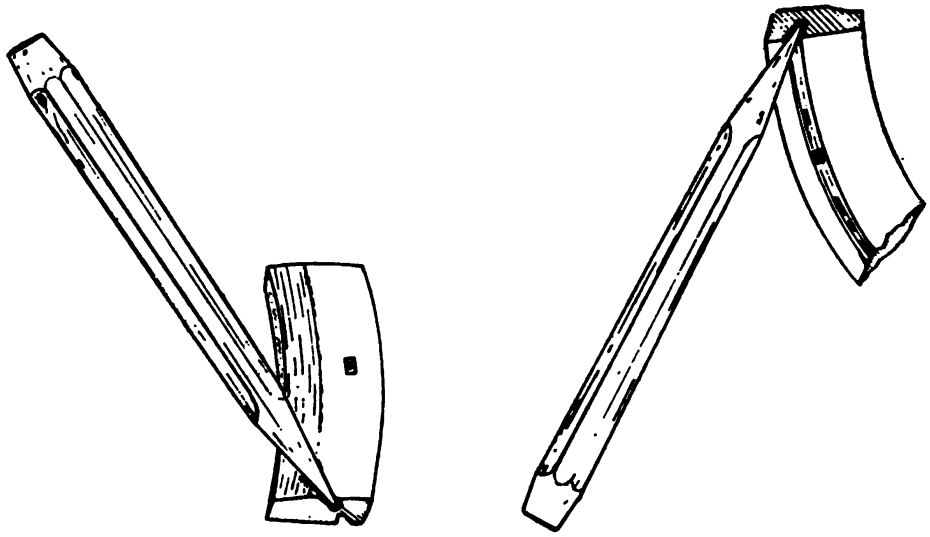
FIGURE 31.—Hand-forged shoe, showing position of nail holes.

(3) The nail holes in the other branch of the shoe are punched in the same manner. The position of the holes in the shoe now conforms to the position of the white line.

c. The nail holes in the shoe must be opened to conform in size and shape to those of the nail used. They must be at an angle to correspond with the slope of the wall at the point where the nail enters the wall in order to insure easy, safe, and strong nailing.

d. The foot surface of the shoe is concaved around the toe and along the branches to about 1 inch beyond the quarter nail holes.

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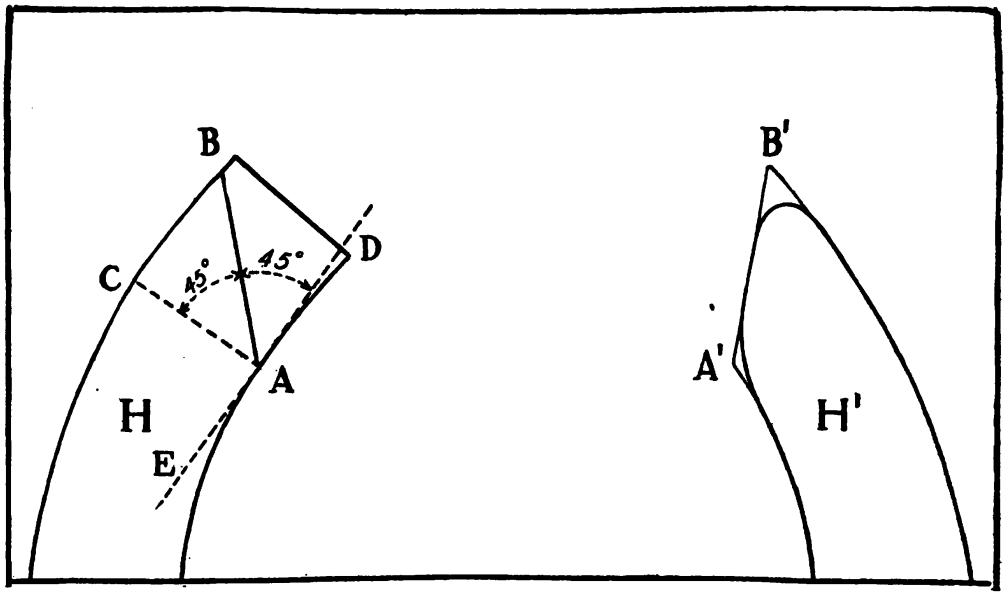
① Cross section of shoe showing position of pritchel when opening nail holes of foot surface.

② Cross section of shoe showing position of pritchel when opening nail holes on ground surface.

FIGURE 32.—Angle of opening nail holes.

The concaving varies from zero at the nail holes to about one-third of the thickness of the shoe at the inner edge of the web. This work requires only a low degree of heat in the shoe, and the convex face of the rounding hammer is used.

e. For cutting off the heels the shoe is heated to a white heat. It is then placed on the hardy with the bearing surface up and is held



H. Unfinished heel.
CA. Square cut.
ED. Direction of web at A.
AB. Diagonal cut.
H'. Finished heel.
A'B'. Angles removed by hot-rasping.

FIGURE 33.—How to cut off and finish heels.

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in a position to allow the heel to be cut off at an angle of 45° with the horizontal. The outer edge of the shoe should be longer than the inner edge when the cut is completed.

f. The heels are now finished by hot-rasping. The shoe is placed in the bench vise with the ground surface toward the shoer, and the heels are rounded. Care is taken to preserve the bevel which makes the foot surface longer and wider than the ground surface. Do not leave sharp edges on the heels that might cut the horse.

g. The shoe is now leveled. Place the ground surface of the shoe upon the face of the anvil, and with the flat face of the rounding hammer strike light overlapping blows on the bearing surface.

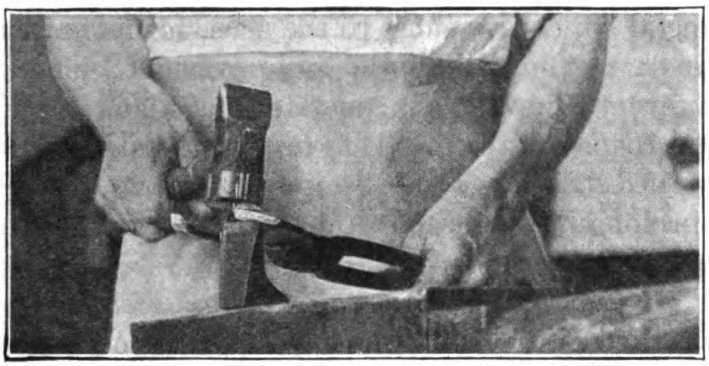


FIGURE 34.—Ready to cut off heels.

Start at the heel on one branch of the shoe and continue the blows around the toe to the heel of the opposite branch.

h. Final steps: Examine the nail holes. Insert the size nail that is to be used, and note whether the head will seat properly and the nails fill the holes snugly and at the correct angle.

SECTION V

BORIUM-TREATED HORSESHOES

Paragraph
Borium-treated horseshoes 39

39. Borium-treated horseshoes.—*a. Treatment of issue horseshoes.*—Research is being made by various agencies at the disposal of the War Department to develop a method of treating horseshoes with some form of very hard material which will prevent slipping and at the same time increase the wearing qualities on hard-surfaced roads. Borium, which is a trade name for a form of tungsten carbide, has been found satisfactory. It is a very hard material composed of loose, sharp-edged crystals inclosed in a soft metal tube which acts as a bond. Borium is supplied in two forms: acetylene tube borium,

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screen size 8–10; and electric tube borium, screen size 10–30. Limited experience indicates that crystals found in the electric tube borium are much finer and therefore offer much less security from slipping than is the case with the acetylene tube borium in which the crystals are coarse, rough, take hold much better on any hard-surfaced road, and wear much longer. Also, the equipment necessary for the electric arc welding process is considerably more expensive than that for the acetylene welding process and requires a highly skilled mechanic to perfect the proper electric welding, whereas the ordinary mechanic with a little experience can apply the borium successfully with the acetylene welding equipment. When applied to the bottom surface of a horseshoe, the borium itself does not fuse, but when bonded in the soft metal which is welded to the shoe, forms hard projections which remain sharp and will hold in any pavement. Shoes so treated effectively prevent slipping on concrete, macadam, brick, or other hard-surfaced roads or streets. Due to their hardness, borium crystals when applied to a horseshoe also improve its wearing qualities, in some cases prolonging its usable life by two to three times that of an untreated shoe.

b. Method of applying borium with an oxyacetylene torch.—(1) A mechanic skilled in the use of the oxyacetylene torch, and equipped with a torch and the necessary cylinders of oxygen and acetylene, can treat a horseshoe with borium in about 5 minutes. The procedure is as follows: The area to be hard-faced should be ground to remove all scale or oxides. The torch flame should then be applied to the shoe and the area to be surfaced heated until it begins to sweat. The torch flame should then be adjusted until it contains a definite excess of acetylene. The tube borium is applied by heating and puddling the borium on the ground surface of the shoe until the desired areas are covered. Continue the heating of the covered areas until the bonding metal has flattened and the tungsten carbide crystals extend above the bond. The shoe should be allowed to cool in the air as this will prevent the borium from chipping and flaking when it may be necessary to alter the shoe by cold fitting. If the shoe is dipped in water as an aid to cooling, the borium metal becomes too highly tempered and chips off when shoes are cold fitted as well as from ordinary wear.

(2) The number of deposits of borium and their spacing is one phase of the treatment which must be carefully handled to insure proper balance and uniform wear of the treated shoe. The deposits should be placed on the outer edge of the ground surface of the shoe at the toe, and cover the entire ground surface of the shoe at

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the heels for a distance of 1 inch in front of the point of the heels. At the toe they should extend from the forward edge of the crease on one side across to the forward edge of the crease on the other. A single deposit is then placed on each heel. If 50 percent of the material used for each shoe is placed on the toe and the remainder divided between the heels, the rate of wear on the shoe will usually be uniform. The depth of the deposits should be approximately the same to preserve balance. One pound of borium is sufficient to treat twelve to fifteen shoes.

c. Precautions to observe in using oxyacetylene welding outfit.—(1) *General.*—(*a*) Do not use oil or grease on the cylinder valves, regulators, or torches.

(*b*) Do not light the torch with both valves open.

(*c*) Do not use leaking or damaged apparatus. If a cylinder valve leaks, take the cylinder out of the shop and notify the shipper at once. If torches or regulators leak, have them repaired and tested by the manufacturer. If the hose leaks, immediately exchange it for a good hose.

(*d*) Keep the hose from kinking, free of obstructions, and do not use excessive hose lengths.

(*e*) Keep the torch flame and sparks away from the hose, regulators, and cylinders. Keep the hose away from heated metal.

(*f*) Close the cylinder valves when not in actual use.

(*g*) Do not tighten the regulator adjusting screw to the limit in order to "bleed" the cylinders.

(*h*) The regulator adjusting screws should be released when not in use.

(2) *Starting.*—(*a*) Open the cylinder valves slowly, to blow out any dirt before connecting the regulators to the valves, then close the valves.

(*b*) Connect the regulators to the cylinder valves, with the regulator adjusting screw released; make sure that the connecting seats are clean, free from grease or bruises, before connecting. Set the connecting nuts up tightly with the proper wrench and carefully avoid crossing threads.

(*c*) Open the acetylene cylinder valve one full turn; open the oxygen cylinder valve slowly, full open.

(*d*) Connect the hose to the regulator and blow out the hose with gas to free it from dust or dirt before connecting to the torch by turning in the regulator adjusting screw, then releasing the screw to close the regulator.

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(*e*) Connect the torch to the hose. Standard oxygen connections have right-hand threads, acetylene connections, left-hand threads. Set the nuts up tightly with the proper wrench, making sure that the connecting seats are clean and free from bruises to avoid leaks.

(*f*) Use only tips that have clean seats, free from bruises. A bruised or dented tip makes a leaky seat and scores the torch head, making repairs necessary. Using a larger size tip than necessary wastes gas and is likely to result in poor work.

(*g*) Open the torch acetylene needle valve, with the oxygen valve closed; turn in the acetylene regulator adjusting screw until the low-pressure gage registers the desired working pressure; close the acetylene needle valve. Then adjust the oxygen regulator for the required working pressure; close the oxygen needle valve.

(*h*) Open the acetylene needle valve and light the torch with the spark-lighter; open the oxygen needle valve and adjust for neutral welding flame.

(*i*) Set the working pressures at the regulators slightly higher than required tip pressures, and adjust the flame with the torch needle valves; this is done to avoid frequent readjustment of the regulators to compensate for falling pressures.

(3) *Stopping.*—(*a*) Close the acetylene valve on the torch first.

(*b*) Close the oxygen valve on the torch.

(*c*) Close the acetylene cylinder valve.

(*d*) Close the oxygen cylinder valve.

(*e*) Open the torch acetylene valve, with the oxygen valve closed, to drain the line; release the adjusting screw on the acetylene regulator, then promptly close the torch acetylene valve.

(*f*) Open the torch oxygen valve, with the acetylene valve closed, to drain the line; release the adjusting screw of the oxygen regulator, then promptly close the torch oxygen valve.

(*g*) Flashbacks result from mixed gases in either the oxygen or the acetylene hose. By following these rules acetylene will not get over into the oxygen line nor oxygen into the acetylene line when starting or shutting down. If the torch flame is properly adjusted and maintained, with correct pressures, and the tip outlets kept free from obstruction in operating, flashbacks will be eliminated.

(*h*) Remove the regulators when moving the cylinders unless on a hand truck. Replace the caps over the cylinder valves when the cylinders are empty and mark the cylinders "MT."

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SECTION VI

FUNDAMENTALS OF HORSESHOEING

Paragraph
Fundamentals of horseshoeing 40

40. Fundamentals of horseshoeing.—*a. General.*—The fundamentals of horseshoeing are to protect the foot from breaking and wearing away at a rate greater than the growth of horn supplied by nature, and at the same time to interfere as little as possible with the physiological functions of the different structures of the foot and with the gaits of the horse. The horseshoer interferes least with the natural gaits of a horse when he shoes him in such a manner that his gaits are balanced. Balanced gaits are dependent almost entirely upon the balance of the individual feet.

b. Balance of foot.—A foot may be said to be balanced when its position in relation to the leg is such that the weight of the animal is equally distributed over the foot. Balance of the feet is one of the important fundamentals of horseshoeing.

c. Balance of gait.—A balanced gait means that the movements of the feet and legs are without lost motion or interference. The feet and legs should move backward and forward in alinement with the body, without lateral swing, with clearance between the front and hind feet in action, and with sufficient elevation to clear the ground properly in the forward extension of the feet. To acquire and maintain balance of the gait it is essential that the feet be balanced. The feet and pasterns should move in alinement with the body. To do this the feet must be in alinement at the moment of breaking over and leaving the ground. The design and fitting of the shoes control the position of the foot at the moment of breaking over and leaving the ground, as well as the rapidity with which the foot breaks over. Hence the balance of the gait depends upon the skill and knowledge of the horseshoer.

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CHAPTER 2

NORMAL, SPECIAL, AND CORRECTIVE SHOEING

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SECTION I

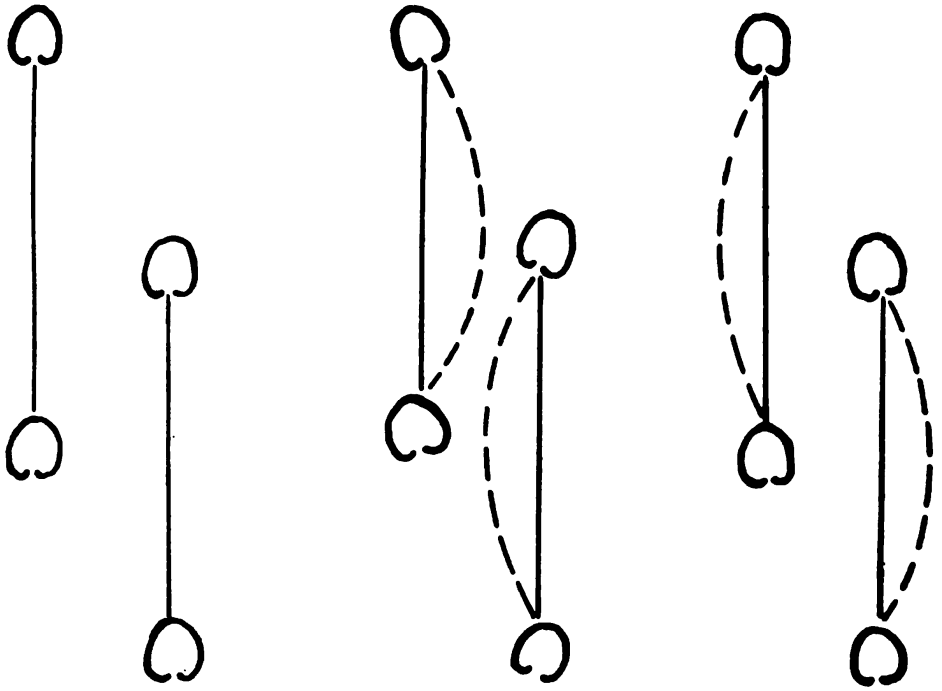
NORMAL SHOEING—THE RIDING HORSE

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Common errors in shoeing and their effects on foot and leg structures 50

41. Preliminary examination.—Before shoeing or reshoeing a horse, a careful preliminary examination should be made of the gait, the conformation of the legs, and the size, shape, and general condition of the feet in order to determine the correct method of shoeing. Normal shoeing is suitable for the riding horse when he has sound feet, good gaits, and is used for general purpose work.

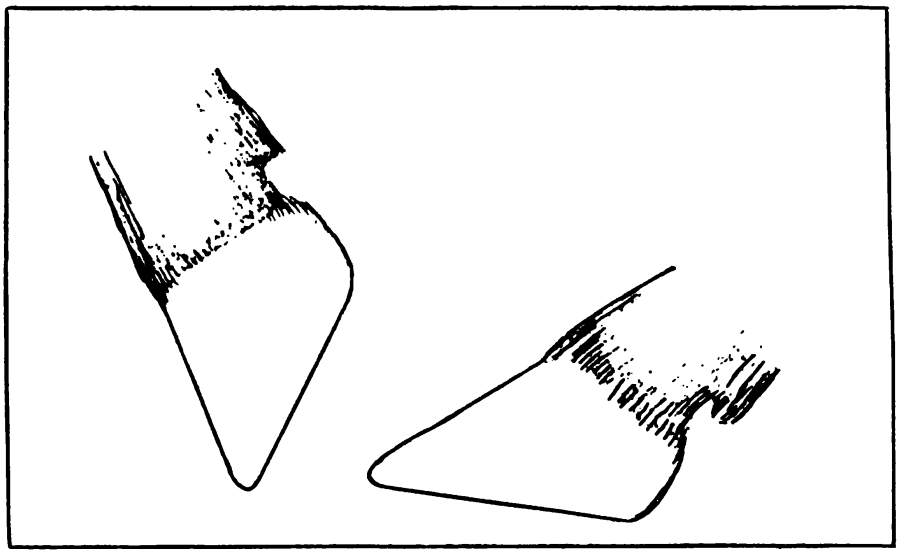
a. Examining gait of riding horse prior to shoeing.—The horse should be shown under the saddle and ridden by one accustomed to riding the horse. The horse should be ridden for at least 20 minutes before showing so he will perform in a normal manner, for when first mounted after a rest period he may be high and not show satisfactorily. To observe the extensions of the feet and legs in relation to the alinement of the body, the observer watches the horse moving in a direct line toward and away from him. The horse should have free use of his head and be shown over level ground. The movement of the front and hind feet and legs are studied at the walk, slow trot, and extended trot. Irregularities,

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① Proper alinement with body. ② Faulty gaits.

FIGURE 35.—Path of feet.



Proper coordination of the front and hind foot during flight.

FIGURE 36.—Elevation of feet.

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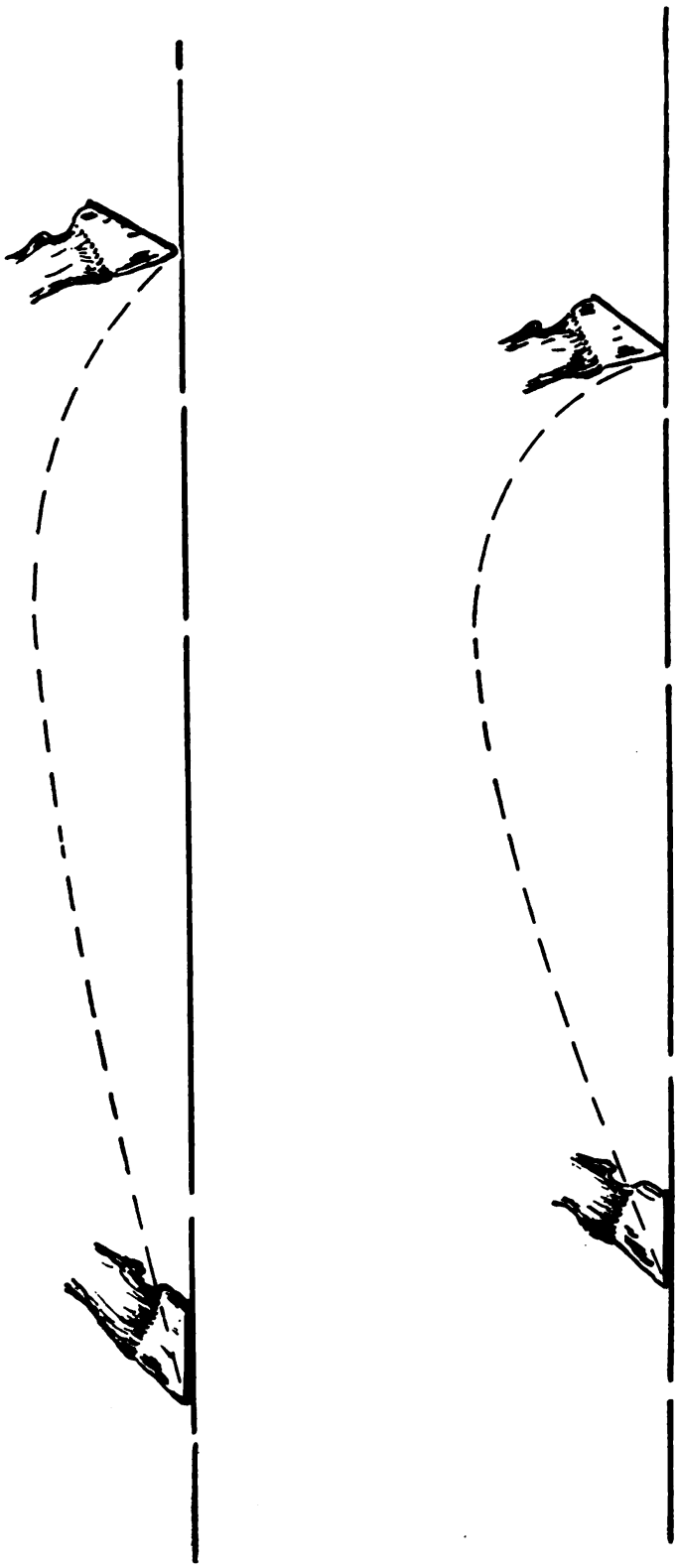


FIGURE 36.—Elevation of feet—Continued.

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if present, are more pronounced at one gait than at another. The following specific points are observed and considered:

(1) Are the feet and legs during flight moved in alinement with the body or moved with a lateral swing?

(2) From a position at right angles to the line of travel, note the relative position of the front and hind feet on the same side at the moment the front foot is starting in flight and the hind foot is being planted. Is the front foot raised in time to clear the approaching hind foot as it is extended and planted?

(3) Are the feet raised sufficiently during flight to clear the ground properly?

b. Conformation of legs.—Note the conformation of the legs. Irregularities in the conformation of the front and hind legs may cause faulty gaits.

(1) From a position directly in front of the horse, does the leg column form a continuous straight line from the upper part to and including the hoof? Or is there a break at the fetlock causing toe-out or toe-in pastern conformation? Is there a break at the knee causing knock-knee or bowleg conformation?

(2) From a position directly in rear of the horse, does the leg column form a continuous straight line from the upper part to and including the hoof? Or is there a break at the hock, such as cow-hock or bowleg conformation of the hind leg?

c. Examination of feet for symmetry, injury, and disease.—Examine the feet for evidence of contraction of the quarters and heels, balance of the feet, size of the feet, amount of surplus horn to remove, and wear of the old shoes. This is necessary to determine the proper preparation of the foot and the best type of shoes to be used.

42. Raising and holding feet of horse for shoeing.—This may be done without much trouble if the horse has been handled from early colthood. Certain rules governing the manner of taking hold of the feet and of manipulating them afterward are of value.

a. Never grasp a foot suddenly. The horse should be prepared for this act. First see that the horse stands in such a position that he can bear his weight comfortably upon three legs. This is well worth noticing. If the horse does not assume such an easy position voluntarily, move him gently until his feet are well under his body.

b. To raise the left forefoot, stand on the left side facing the animal, speak quietly to him, place the palm of the right hand flat upon the animal's shoulder and, at the same time, with the left hand stroke the leg downward to the cannon and grasp the cannon from in front. With the right hand now gently press the horse toward the opposite

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side. The foot becomes relaxed as the weight is shifted upon the other leg and is easily lifted from the floor. The right hand now grasps the pastern from the inside followed by the left hand on the inside and the right hand on the outside, then, turning partly to the right, support the horse's leg upon your left leg. Now, in order to free both hands to work on the hoof, grasp the toe with the left hand so that it rests firmly in the palm while the fingers are applied to the wall of the toe; take a half step toward the rear; pass the hoof behind your left knee into the right hand (which has been passed backward between the knees to receive it), draw the hoof forward, outward, and upward, and support it firmly on your knees—apply your legs just above the knees tightly against the pastern. Do not raise the forefoot higher than the knee nor hold it in a strained position.

c. To lift the left hind foot, gently stroke the animal as far back as the angle of the hip, against which the left hand is placed for support, while the right hand strokes the leg down to the middle of the cannon, which it grasps from behind. While the left hand presses the animal's weight over toward the right side, the right hand loosens the foot and carries it forward and outward from the body so that the leg is bent at the hock. Then turn your body toward the right, bring your left leg against the inside surface of the fetlock joint, and carry the foot backward. At this time, pass your left arm over the horse's croup and above and to the inner side of the hock. Finally, both hands grasp the pastern and foot.

d. If the right feet are to be raised, the process is reversed. In raising the feet no unnecessary pain should be inflicted by pinching, striking, or lifting a leg too high. In dealing with young horses the feet should not be kept lifted too long—let them down from time to time.

43. Removing old shoes.—If the feet are healthy, all the shoes may be removed at one time. However, there are certain diseases of the hoof in which this should not be done. In removing shoes draw them cautiously, do not wrench them away with violence. The shoer takes his position for removing the old shoe and with the clinch cutter and driving hammer cuts or straightens the clinches to avoid breaking the wall as the nails are withdrawn. Having cut the clinches, the pincers are used to remove the shoe. Insert the jaw of the pincers under the branch of the shoe in rear of the nails and exert a quick thrust toward the toe until the branch of the shoe is raised ½ inch from the wall. Repeat the operation on the opposite side of the foot. Then insert the pincers under the shoe just in front

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of the quarter and gently pull toward the center of the foot to draw the nails from the hoof on the one side. Follow the same operation on the opposite side of the foot and remove any stubs of nails.

44. Preparation of foot.—The foot should be prepared so there will be no interference with the functioning of the various parts. Trimming should be sufficient only to cause the size of the foot to correspond with the other feet and to the size of the animal. Live horn is exposed only over the white line and the outer border of the sole.

a. Procedure.—The following are the different operations performed in the preparation of the foot:

(1) Remove all dirt over the area of the horny sole and commissures and with the farrier's knife carefully cut away any ragged particles of horn on the frog. Examine the frog for evidence of thrush. With the point of the knife cut away the dead horn over the white line. Start at a point just in rear of the bend of the quarter on the one side and continue the cut around the toe to the opposite side of the hoof. This cut should be confined to the white line except for a narrow margin along the extreme outer edge of the horny sole. When the dead horn is removed and the live horn exposed, use this base as the greatest depth to which the wall should be removed. This will insure ample hoof to protect properly the sensitive structures of the foot. To retain the elasticity of the live horn of the sole and frog and to protect the sensitive sole and frog against bruising, a covering of dead horn is essential. Cutting away the bars weakens the foot and may result in contraction of the quarters and heels.

(2) Examine the horny sole at the angle formed by the wall and bar for evidence of a corn. This area of the horny sole is known as the "seat of corns."

(3) The horny sole in the angle formed by the wall and bar should be cut away sufficiently to avoid contact with the shoe at the heel.

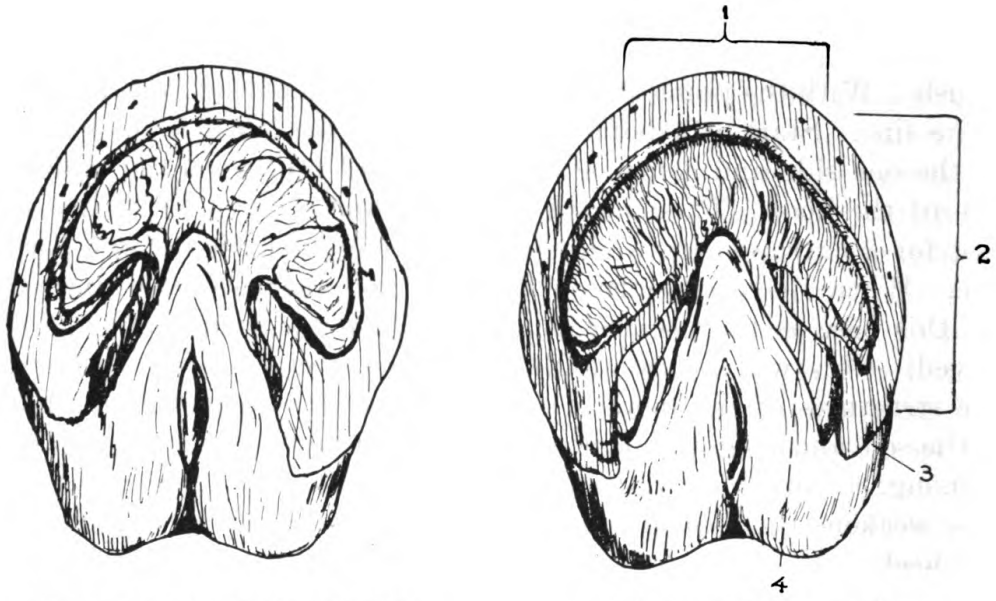
(4) Using the point of the farrier's knife, carefully remove such flakes of dead horn covering the sole as will break loose easily.

(5) Remove the surplus growth of horn from the wall.

(*a*) *Sloping or regular pasterns.*—When preparing feet on horses with pasterns classified as sloping and regular, the greater amount of surplus horn is found at the front part of the hoof. Lower the toe first, for if the heels are lowered first, and later it is found that a corresponding amount of horn cannot be cut from the toe, it will be impossible to balance the foot without the use of heel calks or a thickened web at the heels. Take the hoof parer in both hands so

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that the handle is perpendicular to the plane of the bearing surface. Begin at the bend of the quarter with a thin cut and work toward the toe, gradually increasing the depth of the cut until the white line shows plainly and live horn has almost been reached at the center of the toe. Continue the cut from the toe around the opposite side to the bend of the quarter, gradually diminishing the cut as the quarter is approached. To prepare a foot in which the heels are too high, the heels must be lowered before removing any horn of the toe. As shown in the figure, the amount of horn removed at the heels will determine the amount to be removed at the toe to keep the foot in balance.



Appearance of foot after old shoe has been removed.

② Foot ready for new shoe.

1. Toe.
2. Quarters.
3. Buttress.
4. Bar.

FIGURE 37.—Diagrammatic sketch showing preparation of foot.

(*b*) *Stumpy pasterns.*—When preparing feet on horses with pasterns classified as stumpy, the greater amount of surplus horn is found at the heels. When preparing feet of this nature lower the heels first. If the toe is lowered first and later it is found that a corresponding amount of horn cannot be cut from the heels, it will be impossible to balance the foot from toe to heel, and a broken forward condition of the foot results.

(6) Level the foot, using the rasp. Grasp one end of the rasp with the right hand. The left hand is over the other end with the

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left palm resting on the upper surface to act as a guide. Place the coarse side of the rasp against the ground surface of the wall after it has been cut with the hoof parer. Level the ground surface of the wall, then work on the rear part of the quarter and buttress. Remove such horn as may be necessary to effect balance of the foot from toe to heel and procure a level surface for the shoe. Then use the rasp to balance the ground surface laterally. For the left half of the foot it is necessary to reverse the hands on the rasp. For a

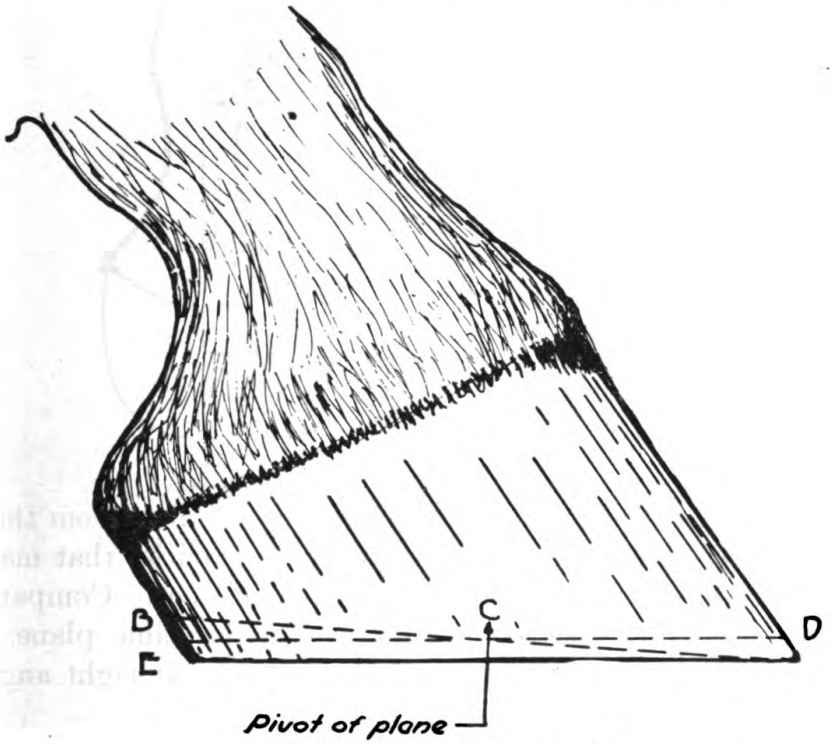


FIGURE 38.—Preparation of foot.

NOTE.—To balance the foot when the heel is too high: *C* is the greatest depth to which the wall can be lowered at the quarter without making the horse lame. Should the wall be lowered at the toe to the depth *D* then the heel can only be lowered to the point *E*. To balance the foot, all horn below the line *A–B* should be removed. Similarly when the toe is too long, the toe is reduced first; when the outside of the foot is too high, the horn is removed from this area first; when the inside of the foot is high, this area of the foot is lowered first.

right-handed man this half will be found more difficult at first because of the awkward position necessary. As a result, the work will often be slighted. Experience shows that an inexperienced right-handed man usually leaves the left half of the foot too high.

(7) Check the balance of the foot. To determine this balance, stand the horse on a level surface and in position to distribute the weight of the body equally on the four legs.

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(*a*) *Viewed from front.*—The feet must be in such position in relation to the leg that the weight borne by the leg is distributed equally over the foot (the foot directly under the leg column).

(*b*) *Viewed from side.*—The slope of the wall from the coronet to the toe should correspond to the slope of the pastern. Then raise

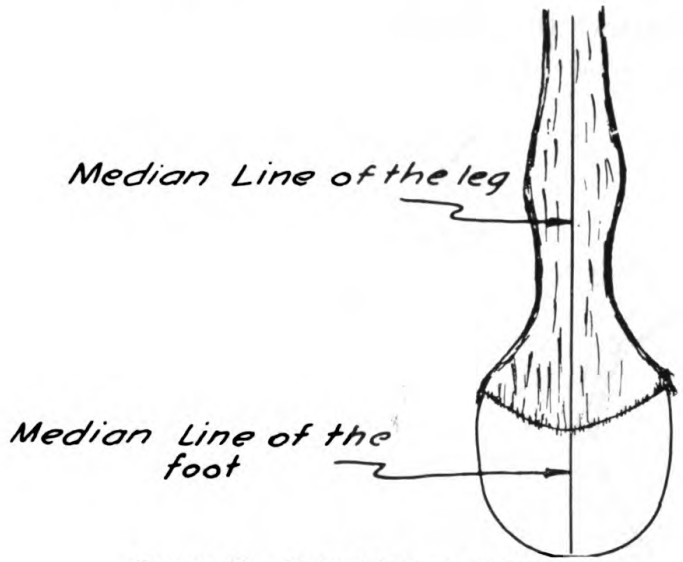
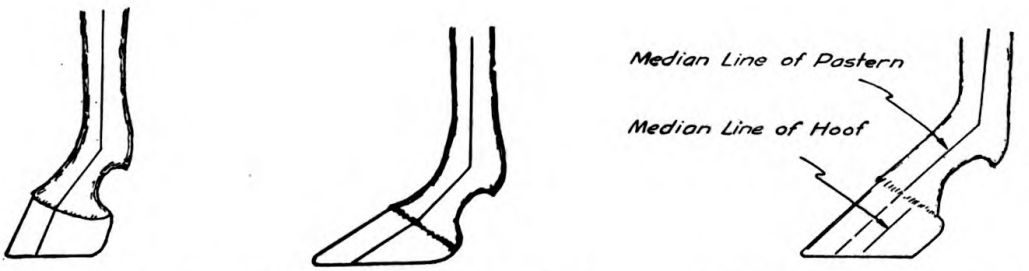


FIGURE 39.—Lateral balance of foot.

the foot and sight over the bearing surface of the foot from the buttress to the toe on one side, and note any irregularities that may appear, then examine the other side in a like manner. Compare the two sides collectively and see if they are in the same plane. The plane of the bearing surface of the foot should be at right angles to the column of leg bones.



① Foot broken forward. ② Foot broken back. ③ Balance from toe to heel.

FIGURE 40.—Balance of foot.

b. Feet not same size.—In case one foot is larger in circumference than its mate, the larger foot should be prepared for the new shoe before attempting the preparation of the smaller foot. Remove the surplus horn on the larger foot. Balance the foot laterally and likewise balance it from toe to heel. With the dividers or foot gage

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measure the front line of the hoof from the hair line (coronet) to the lower border. Apply the foot gage and find the angle of the wall at the toe in degrees. Since the length and angle of the wall on the larger foot are established, the work of preparing the smaller foot can be started. Before removing any horn on the smaller foot, make a measurement of the wall at the toe with the dividers. Also apply the foot gage to determine the angle of the wall. First, reduce the length of the toe to correspond with the large foot. Having reduced the length of the wall at the toe to the correct measurement, again apply the foot gage to determine the amount of horn

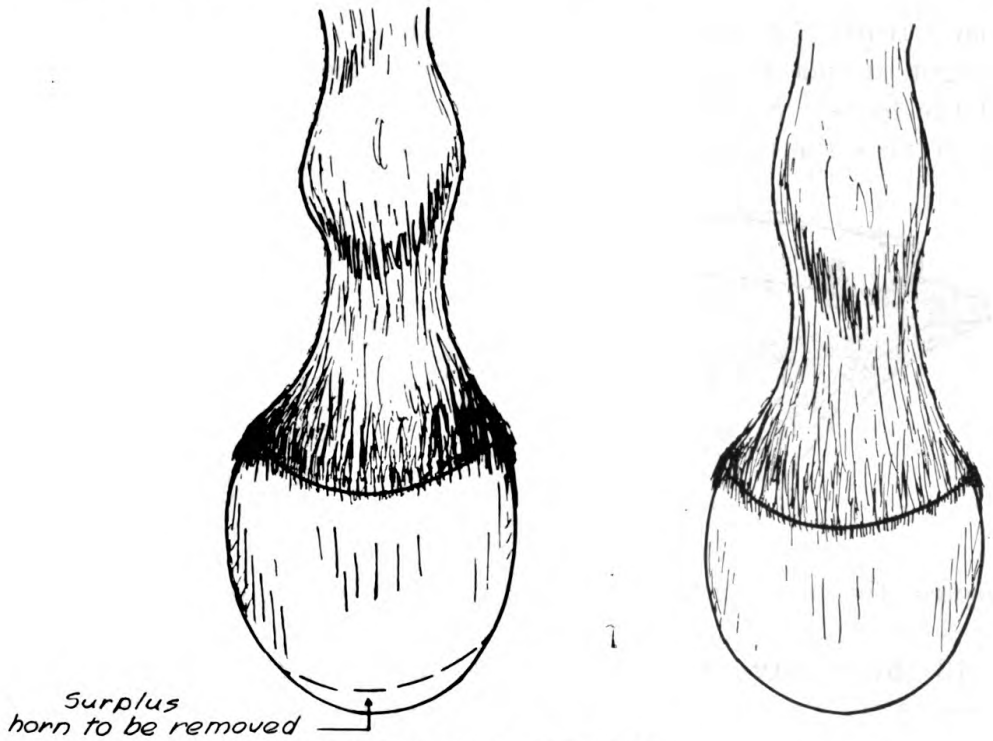
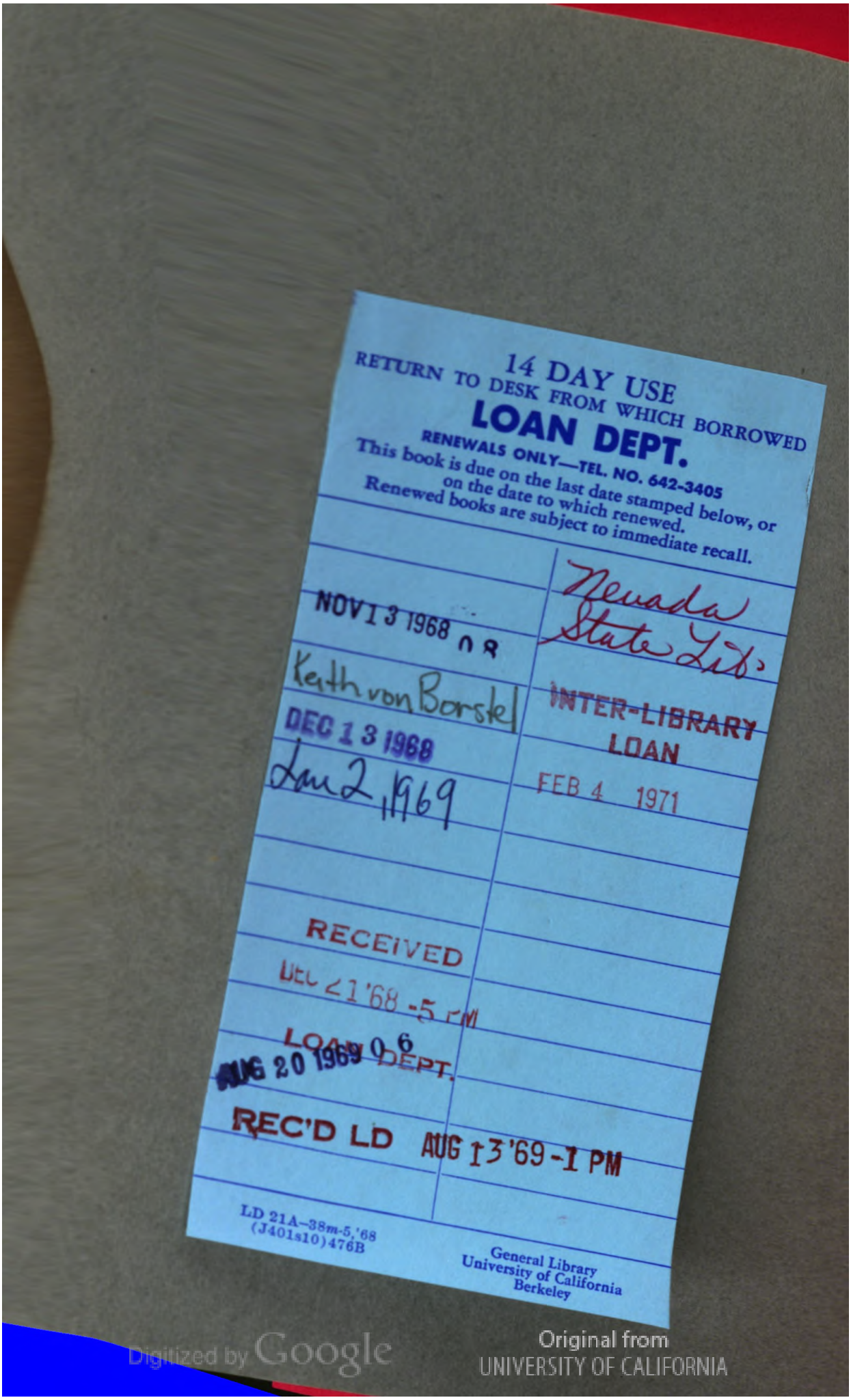


FIGURE 41.—Feet not same size.

to be removed from the buttresses and quarters to conform with the large foot. This cutting away of the horn at the buttresses and quarters should be done with the rasp. Make frequent measurements with the gage as the work proceeds to insure the same length of toe and height of heels on the corresponding feet when the work is completed. The importance of equal measurements is to obtain and maintain regularity of gaits.

c. Feet flat or flaring.—In preparing feet that are flat or flaring, it is necessary to remove a part of the outer surface of the wall at its lower border in order to insure secure nailing. As will be explained later under nail driving, the nails should enter the bearing

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surface of the foot at the outer edge of the white line. Horseshoes issued for shoeing Government mounts do not have the nail holes punched in a position to conform with the thickness of the wall, which varies from the heel and quarter to the toe of the hoof. The nail holes in the issue shoe are too close to the outer border of the shoe, particularly the holes near the toe. Unless a portion of the outer wall is removed to permit the nails to enter the hoof at the inner surface of the wall bordering the white line, the wall will split to the height the nails are driven. Consequently rasping the outer surface of the wall is necessary to insure proper nailing.

45. Selecting shoe.—The foot having been prepared, leveled, and made ready for the shoe, the shoer should estimate the size and weight of shoe required; the heavier the shoe, the greater the labor of the horse. So the lightest shoe in which the last nail hole falls at or near the bend of the quarter, of a weight that will properly

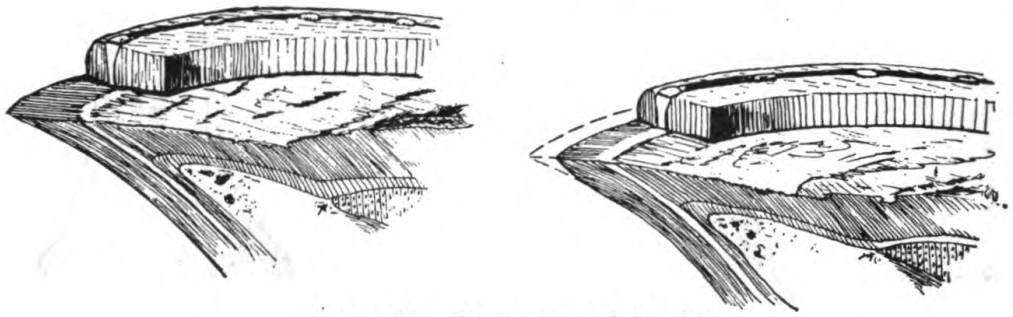


FIGURE 42.—Preparation of flat foot.

protect the hoof and furnish a reasonable length of service, should be selected.

46. Successive steps in fitting shoe.—*a. Procedure.*—Select a shoe of the desired size and weight, note the general changes to be made in its shape, then place the toe of the shoe in the fire and heat to a white heat if a toe clip is to be drawn, or to a cherry-red heat if the toe clip is to be omitted.

b. Making toe clip.—The toe clip is a semicircular ear protruding upward on the bearing surface of the shoe at the center of the toe. To draw the clip place the toe of the shoe on the outer edge of the face of the anvil, bearing surface of the shoe resting upon the edge of the anvil, held downward and at an angle of 45° with the face of the anvil, the toe of the shoe projecting ¼ inch above the face. With the rounding hammer, strike light blows on the part of the shoe projecting above the face, drawing the hammer toward the shoer as the blow is struck. The height of the clip should be about 1½ times the thickness of the shoe. The clip should be thickest at the base

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and taper gradually to the point. The toe clip, if needed, is drawn before the shoe is shaped.

c. Shaping shoe.—(1) The toe of the shoe is fitted first as this part of the shoe will not be affected by shaping the quarters and heels. Fitting the quarters and heels before shaping the toe causes the quarters and heels to be thrown out of shape while fitting the toe.

(2) Ordinarily the toe of the service shoe requires opening and rounding to fit the average foot. The toe of the shoe is placed over the horn of the anvil so that there will be a small space between the

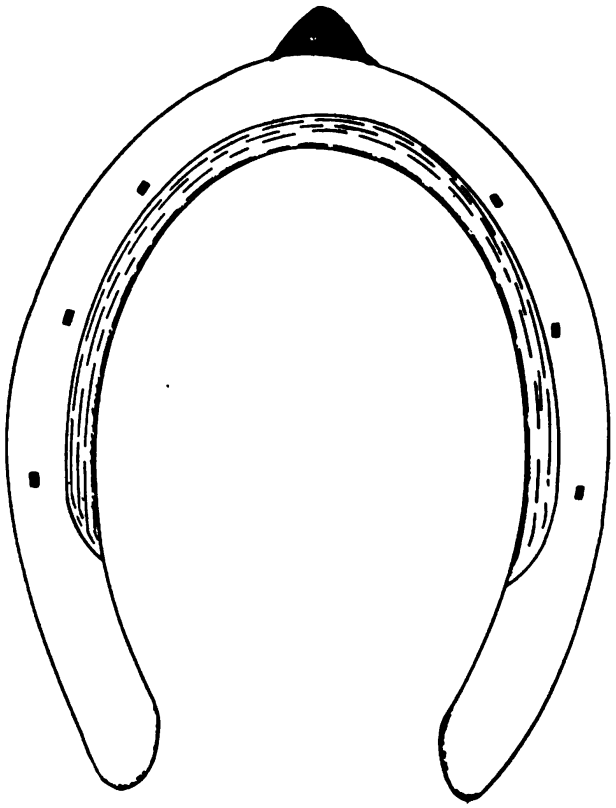


FIGURE 43.—Shoe showing toe clip.

shoe and the horn, the center of the toe directly above the center of the horn. Strike lightly along the toe, not confining the blows to any one spot. The object is to increase uniformly the arc of the circle formed by the toe of the shoe.

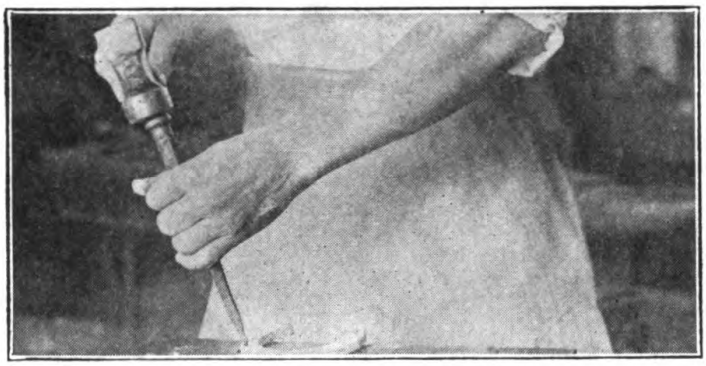
d. Opening nail holes in shoe.—The next operation should be carried out with great care, as the security of the shoe depends in a large measure on the manner of opening the nail holes.

(1) Before attempting to open the holes, the point of the pritchel should be examined and the point shaped to conform with the size and shape of the nail, halfway between the head and point.

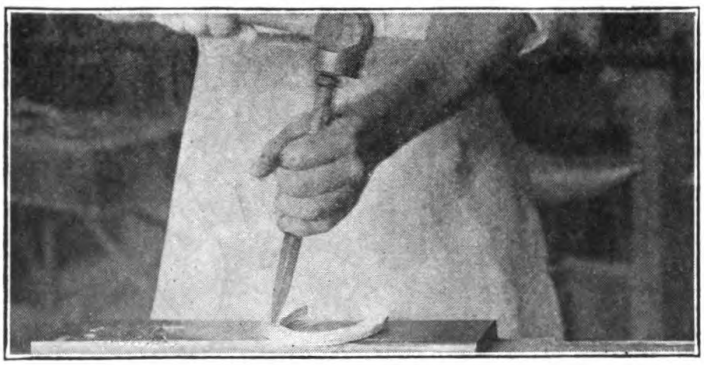
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(2) Place the shoe upon the face of the anvil, bearing surface upward. Holding the pritchel sloping inward to conform with the angle of the wall of the foot, open the hole nearest the toe on one side and continue toward the quarter. Graduate the position of the pritchel to near the perpendicular at the quarter nail hole. Repeat the same operation on the opposite side of the shoe. Do not drive the point of the pritchel too deep in this first operation.

(3) Having opened the holes on the bearing surface, turn the shoe over with the ground surface up and open the holes from this side. The pritchel is held at an outward angle to maintain the angle



① Ground surface.



② Foot surface.

FIGURE 44.—Position of pritchel when opening nail holes.

of the wall. The pritchel is driven with greater force, as the hole when completed must be larger on the ground surface of the shoe than upon the bearing surface.

(4) As the work proceeds, make frequent trials with a nail of the size to be used. The size of the hole should allow the head of the nail, when seated, to project slightly below the ground surface of the shoe.

e. Shaping quarters and heels.—Place both branches of the shoe in the fire and reheat to a cherry-red heat. Remove the shoe from

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the fire with the tongs and place one branch diagonally over the horn of the anvil. The heel of the shoe should be nearest the small end of and project slightly beyond the horn. With the rounding hammer, strike light blows upon that part of the shoe projecting beyond the horn to curve in the branch. Continue to extend the shoe over the horn and at the same time strike light blows on the shoe just beyond the point where the shoe rests upon the horn of the anvil. Both branches of the shoe may be shaped in the same manner and held in the same position, or the shoer may use the reverse diagonal for shaping one side. The branches are shaped to conform to the shape of the foot for which the shoe is being prepared.

f. Trial fitting.—The shoe is now cooled and taken to the foot for a trial fitting. Place the shoe on the foot, the front part of the shoe even with the outer edge of the bearing surface of the foot, and

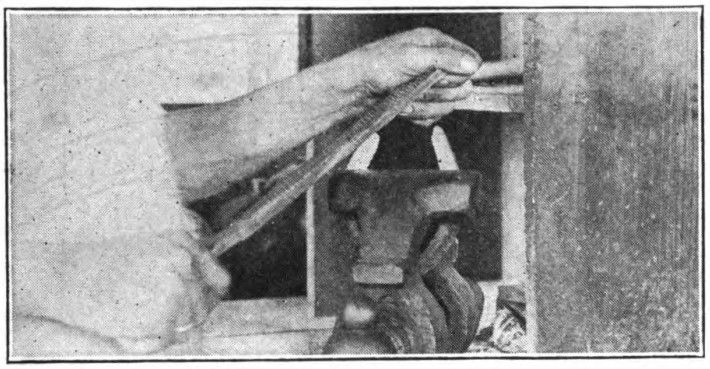


FIGURE 45.—Finishing heels.

centered with the center of the wall at the toe of the shoe. Note the outline of the shoe at the toe, quarters, and heels. Minor changes in fitting may be accomplished without reheating the shoe. If there are major changes to make, the shoe should be reheated. In making major changes on a cold shoe, the force of the blow required to make the change will seriously mar the shoe and may cause it to crack.

g. To cut off heels of shoe.—Having properly shaped the shoe, place the shoe on the foot and estimate the amount to cut from the branches. After heating the branch of the shoe to a white heat, remove the shoe from the fire. Place the ground surface on the hardy at an angle of about 45° below the horizontal so as to cut the heel off to conform more nearly with the shape of the finished heel. The beginner will find it necessary to heat one branch of the shoe at a time and then to finish this heel. The other branch of the shoe is then heated and the heel is similarly cut and finished. The expert shoer usually cuts and finishes both heels after heating both branches simultaneously.

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(*h*) *To finish heels* (*hot-rasping*).—The heels are now finished by hot-rasping. The shoe is placed in the vise with the ground surface toward the shoer and the heels are rounded, holding the rasp in a position to effect a slight bevel. This leaves the foot surface longer and wider than the ground surface when completed. Care must be used to leave no sharp edges on the heels that might cut the horse. Further work in finishing the heels is now done by placing one branch of the shoe in a diagonal position, with the heel and quarter contacting the surface of the horn of the anvil. Strike light overlapping blows on the edge of the shoe near the ground surface, forming a slight bevel from the heel to a point near the quarter nail hole. Reverse the position of the shoe and bevel the opposite branch. This beveling is called hemming. For this operation very little heat is required as the upper surface of the web of the shoe is not narrowed or elongated. The service shoe as issued is hemmed around the toe

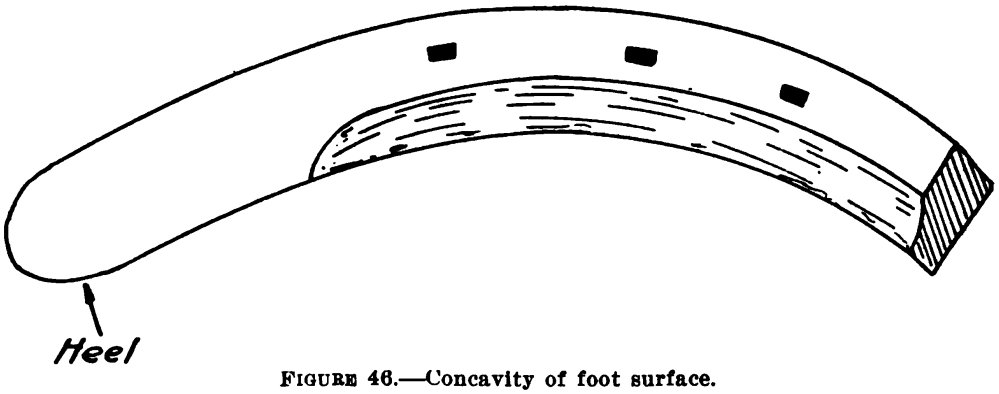


FIGURE 46.—Concavity of foot surface.

and extends on the branches to a point slightly beyond the nail holes. Hemming the shoe lessens the danger of injuries to the horse by cutting himself and also adds to the appearance of the work.

i. Concaving shoe.—Heat the toe and branches of the shoe uniformly to a cherry-red heat. Remove the shoe from the fire and place upon the face of the anvil, with the bearing surface upward. With the convex face of the rounding hammer, strike light overlapping blows on the inner portion of the bearing surface of the web. Start about 1 inch in rear of the nail hole at the quarter, and continue the concaving around the toe to a similar point on the quarter opposite the starting point. The concavity of the shoe should start at or near the inner border of the nail holes, with a minimum amount of concaving, and increasing to about one-third of the thickness of the shoe at the inner edge of the web.

j. To level shoe.—Having completed the concaving, there still remains sufficient heat in the shoe for leveling. With the flat face

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of the rounding hammer, strike light blows on the bearing surface of the shoe, starting on one branch at the heel, and continuing with light overlapping blows entirely around the shoe. Make a final trial of fitting; check the size and shape of nail holes and the level of the foot and shoe.

47. Outline of fitted shoe.—The shoe should be shaped to follow the outline of the foot from the bend of the quarter on the one side around the toe to the bend of the quarter on the other side of

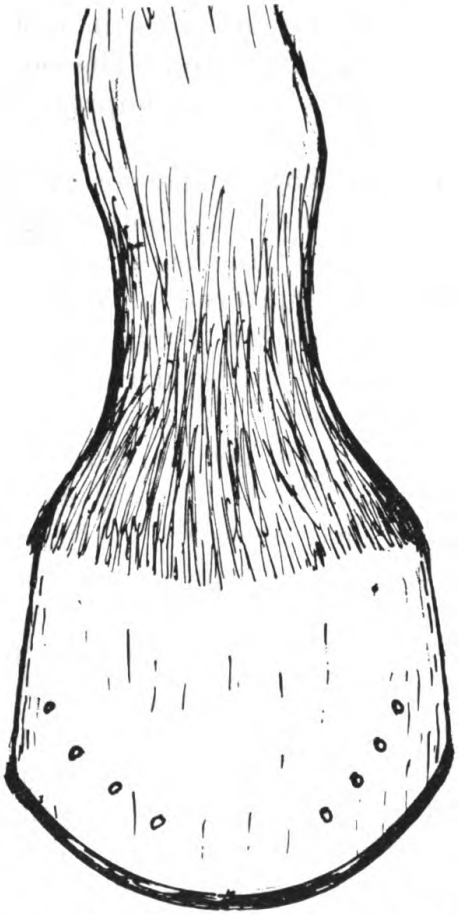


FIGURE 47.—Fitted shoe secured to the foot.

the foot. The branch of the shoe in rear of the bend of the quarter extends beyond the outline of the wall, starting with zero at the bend of the quarter, and increasing to about ⅛ inch at the point of the heel. If the wall is broken, the shoe should be fitted so that it follows the outline of the foot as it would be if the lost section were still in place. The length of the shoe is regulated by the bulb of the frog. The shoe should be fitted with roundness (width) at the toe to give lateral support to the foot at the moment of breaking

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over and leaving the ground. A shoe fitted so as to be pointed at the toe may cause the horse to interfere, stumble, or forge. The fullness of the shoe at the quarter and heel provides for the expansion of the rear part of the hoof when weight is thrown upon the foot. The shoe is concaved to prevent pressure on the horny sole. The bearing surface of the foot and the bearing surface of the shoe must fit snugly (no air space) in order to hold the shoe securely in position on the foot. The front feet of a horse require a shoe that has a wide web and not too great a thickness, for they carry more weight of the body when the animal is in motion, causing greater strain on the foot and leg structures. The outer edge of the shoe should be filed bright and smooth to improve its appearance when secured to the foot.

48. Securing shoe to wall.—The normal hoof is considerably larger in circumference at the lower border (ground surface) than at the top (the coronet), and the hoof is cone-shaped. The horn structure of the wall is not uniform in thickness. The wall at the toe is twice the thickness of that at the rear part of the quarter. This difference in thickness may be attributed to the general functions of the foot structures as a whole.

a. The size of the nail should not be greater than required to hold the shoe securely in place. Nails classified as No. 5 are sufficiently large to hold a No. 1 shoe securely. A No. 6 nail is sufficiently large to hold a No. 2 or 3 shoe which ranges in weight from 10 to 16 ounces.

b. Driving nails into the wall of the hoof to secure the newly fitted shoe, and at the same time to minimize the damage to the horn fibers, requires knowledge and skill on the part of the horseshoer. Security of the shoe and soundness of the animal depend upon the nailing. When securing the shoe to the wall, the point of entry and direction the nail is driven are important. The nail when properly driven enters the horn at the extreme outer edge of the white line and at an angle to conform with the angle of the wall where the nail is driven. The height on the wall where the nail emerges is governed by the condition of the wall, number and position of the old nail holes, size of the foot, and size and weight of the shoe. Emergence of the nail ¾ inch above the ground surface of the foot is sufficient to hold the shoe securely, providing there are no old nail holes in the wall. If there are old nail holes in the wall, the new perforations should be at least ⅜ inch above or away from the old holes in order to obtain strong nailing and to avoid undue damage to the horn fibers. The direction of the nail when entering the

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horn structure of the wall is parallel to the horn fibers so that the course of the nail does not cut or sever them. The point of the nail will follow a course parallel to the horn fibers when light blows of the driving hammer are applied. To force the point of the nail through the outer surface of the wall at the desired place, the shoer applies light blows until the nail is driven to two-thirds the required height. Then apply a sharp heavy blow upon the head of the nail to force the point through the surface of the wall at the desired

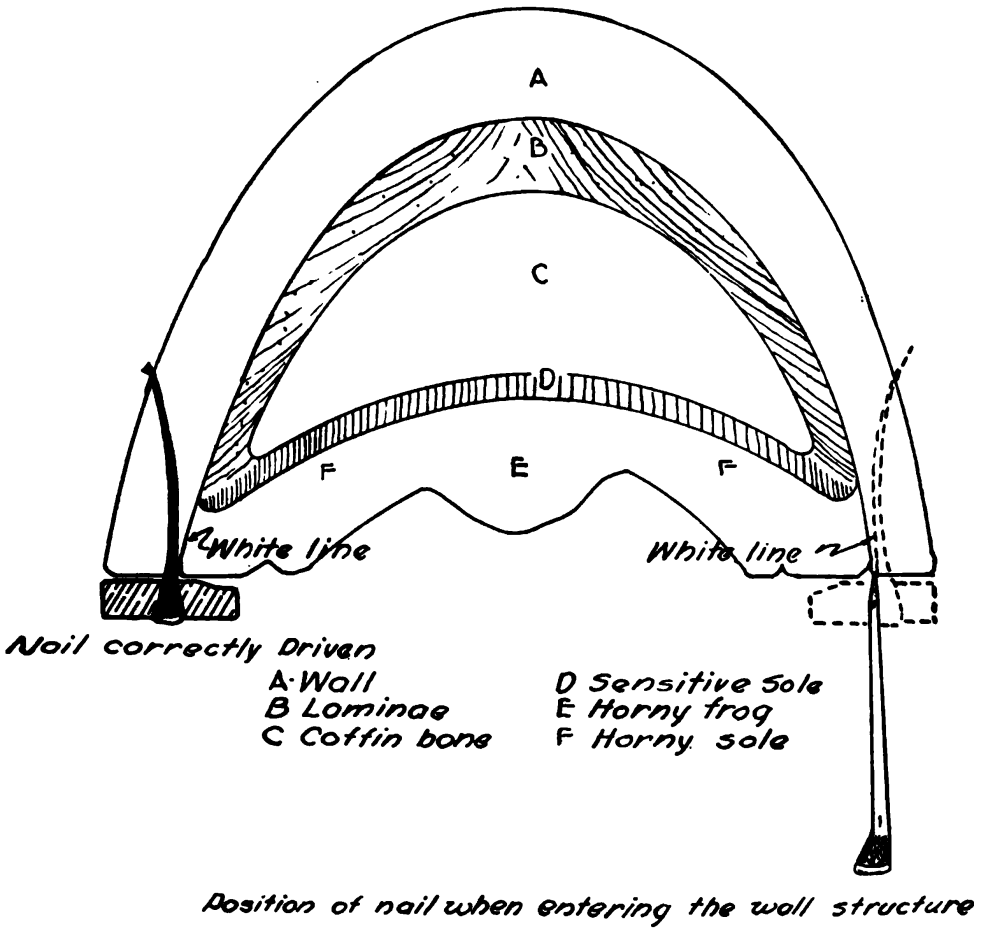


FIGURE 48.—Driving nails to secure shoe.

height. The bevel on the point of the nail is for this purpose. The bevel is effective only when being driven rapidly through the horn. Nails driven to a uniform height add to the appearance of the work. The shoer should endeavor to obtain this uniformity as nearly as possible without sacrificing the strength of the wall. If the nail comes out of the wall at a point near the desired position, it is advisable to allow it to remain, providing it is in sound horn, rather than to remove it and make a second perforation. Unless started

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parallel to the slope of the wall, the point of the nail when driven will make its appearance on the surface of the wall too close to the lower border, or it may penetrate the sensitive structures of the foot.

c. Remove the nail points as each nail is driven, cutting or twisting the nail off close to the wall. When the required number of nails to secure the shoe are driven, the next procedure is to seat the nail heads in the crease of the shoe and form the clinches. This should be done methodically with the pincers and driving hammer. In seating the nail heads into the crease of the shoe and in forming the clinches, the shoer may begin on either side of the foot. He forms the clinch by holding the jaw of the pincers against the protruding end of the nail on the side next to the wall, and striking sharp blows upon the head of the nail with the driving hammer. Forming the clinches is done in the following order: the two nails nearest the toe on one side, followed by the three nails nearest the toe on the opposite side, and then

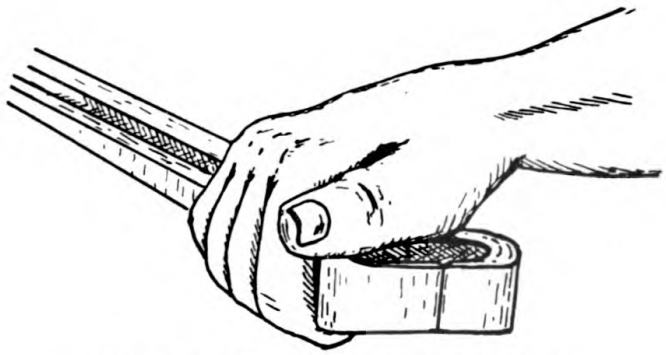


FIGURE 49.—Holding pincers for clinching.

the quarter and heel nail on the side first worked upon, followed by the remaining heel nail. This manner of seating the heads of the nails and forming the clinches is essential to secure a uniform strain on the clinches and the wall of the hoof. A horse with a thin and weak wall will invariably go lame if the shoes are not secured with equal pressure on both sides of the foot.

d. Having completed the seating of the nail heads and forming the clinches, finishing and smoothing is next. The purpose of the clinch is to counteract the vertical pull on the nail. The shank of the nail will resist the lateral strain when the shoe is secured to the foot, therefore, the clinch to be effective must have great strength at the point where the nail is turned abruptly and folded back toward the part that lies within the hoof. The clinch should be the full thickness of the nail, and no longer than the width of the nail where it emerges from the wall.

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(1) The horn fibers on the outer surface of the wall are broken when the nail emerges. When the clinch is formed, a portion of broken horn fibers remains under the newly formed clinch. This loose horn must be removed in order to seat the clinch. A mill file is preferable to the rasp for cutting away this broken horn. The shoer should confine the cut to the width of the clinch.

(2) To seat the clinch, hold the pincers firmly against the head of the nail and, using the driving hammer, strike a few light blows in a downward direction on the uppermost part of the clinch. Follow this by light blows on the face of the clinch to seat it even with the surface of the wall.

(3) The clinches are now finished smooth, leaving no rough edges projecting on the surface of the wall. The mill file or flat bastard, having a much finer grain-cut than the rasp, makes it much easier to control the extent of cutting. The common practice of using the rasp for this work results in making too deep and too long a groove under the clinch and destroys too many of the fibers of the wall.

e. Careless nailing will result in great damage to the feet. Frequently horses are observed with hoofs in such a weakened condition it is impossible to keep a shoe in place for any great length of time. There are several contributing causes to this condition of the wall. The horn fibers of the wall may be dry and brittle and lacking in elasticity. The nail may have entered the wall other than at the outer border of the white line. The nails may not have been driven at an angle parallel to the horn fibers. Reshoeing may have been too frequent. The horse may have continued work with a loose shoe.

49. Inspecting newly shod horse.—*a.* Having completed the shoeing of a horse, the shoer should make an inspection of the work in minute detail. Irregularities in one part of the work may be such as to disqualify the entire job. There must be attention to detail in shoeing. The health and condition of the feet and legs depend largely on the care given at the shoeing shop.

b. Starting the inspection from a position in front of the horse answer the following:

(1) Are the corresponding feet the same size (toes same length, heels same height)?

(2) Is the foot in balance in relation to the leg?

(3) Is the foot directly under the leg, the axis of the foot in prolongation to the axis of the upper leg bones, the weight of the body equally distributed over the foot structures?

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c. Now move to a position at the side of the horse:

(1) Does the axis of the foot coincide with the axis of the pastern? (The slope of the wall from the coronet to the lower border should be parallel to the slope of the pastern.)

(2) Has the lower outer border of the wall been rasped?

(3) Do the conformation of the foot and type of shoe used warrant the amount of rasping done?

d. Note the height and strength of nailing:

(1) Do the nails come out of the wall at the proper height and in sound horn?

(2) Are the nails driven to a greater height in the wall than necessary?

(3) Is the size of nail used best suited for the size and condition of the foot and weight of shoe?

(4) Are the clinches of sufficient thickness where the nail comes out of the wall to insure strength?

(5) Are the clinches smooth and not projecting above the surface of the wall?

e. Note the outline and the size of the shoe:

(1) Is the toe of the shoe fitted with sufficient fullness (rounded) to give lateral support to the foot at the moment of breaking over and leaving the ground?

(2) Are the branches of the shoe from the bend of the quarter to the heel fitted fuller than the outline of the wall to provide for expansion of the foot and normal growth of horn between shoeing periods?

(3) Are the heels of the shoe of sufficient length and width to cover the buttresses?

(4) Are the heels finished without sharp edges?

(5) Does the shoe rest evenly on the bearing surface of the hoof covering the lower border of the wall, white line, and buttresses?

(6) Is the shoe concaved so it does not rest upon the horny sole?

(7) Are the nail heads properly seated?

(8) Is the shoe the correct size for the foot?

(9) Will the weight of the shoe provide reasonable wear and protection to the foot?

(10) Have ragged particles of the horny frog been removed?

(11) Are the toe clips in the center of the toe of sufficient strength and height, and are they properly seated?

50. Common errors in shoeing and their effects on foot and leg structures.—*a.* Feet broken in may result in contracted heels, interfering, or strained ligaments and tendons (fig. 50).

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b. Feet broken out may result in contracted heels, faulty gaits, or strained ligaments and tendons (fig. 51).



FIGURE 50.—Feet broken in.

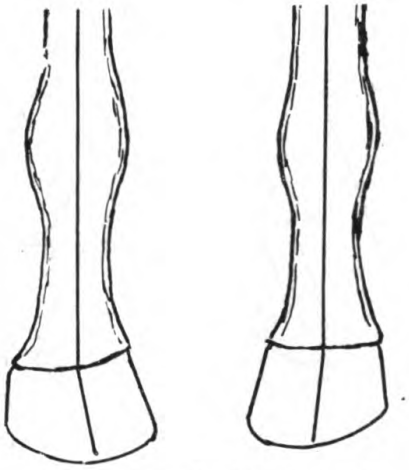


FIGURE 51.—Feet broken out.

c. Feet broken forward may result in stumbling or strained ligaments and tendons (fig. 52).

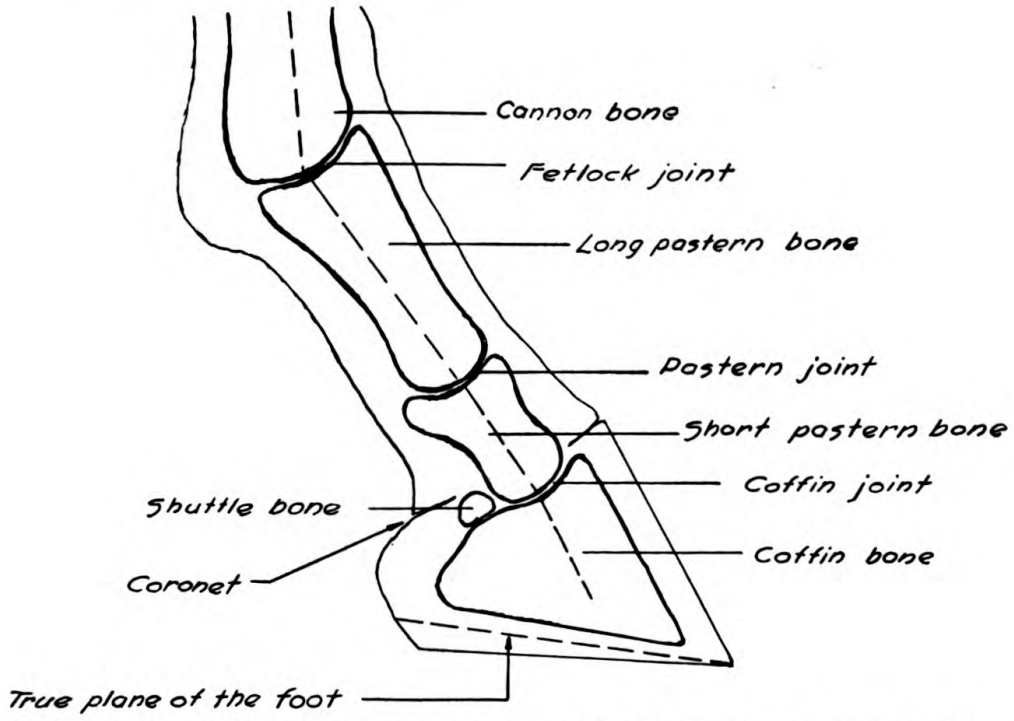


FIGURE 52.—Foot broken forward (showing position of bones in pastern and foot).

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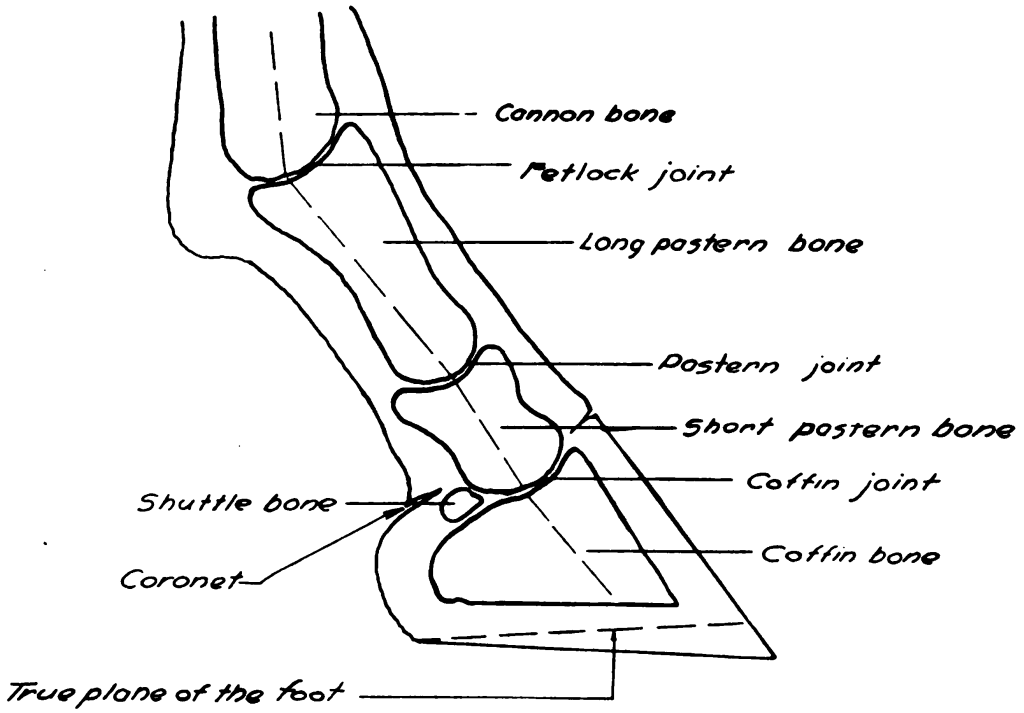


FIGURE 53.—Foot broken back (showing position of bones in pastern and foot).

d. Feet broken back may result in forging, stumbling, and strained flexor tendons (fig. 53).

e. Corresponding feet not the same size will result in stumbling and forging (fig. 54).

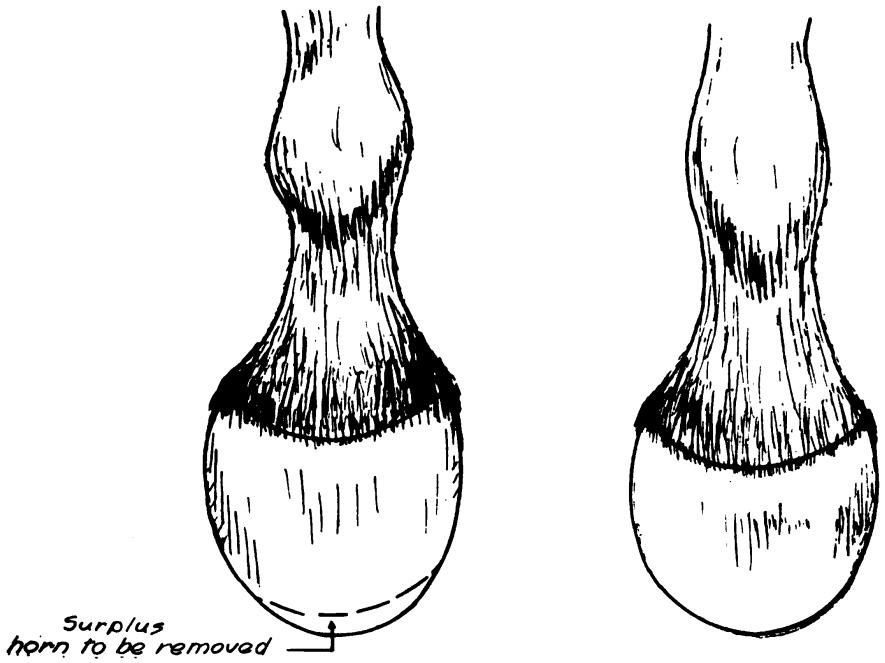
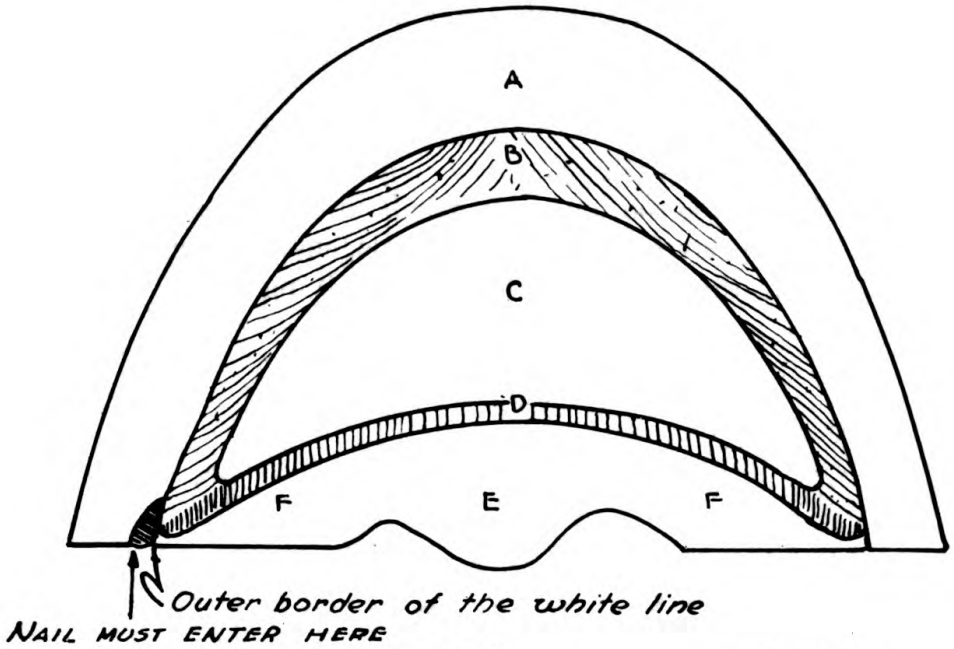


FIGURE 54.—Front feet not same size.

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A. Wall.
B. Laminae.
C. Coffin bone.
D. Sensitive sole.
E. Horny frog.
F. Horny sole.

FIGURE 55.—Vertical cross section of foot (showing too much horn removed from lower border of wall).

f. Too much horn removed from the lower border of the wall will result in lameness (fig. 55). There is danger of pricking the horse when securing the shoe to the wall.

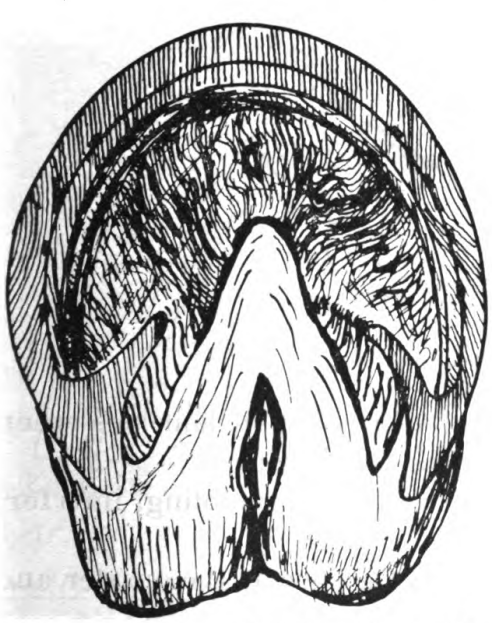


FIGURE 56.—Shoe too large (showing position of nail holes).

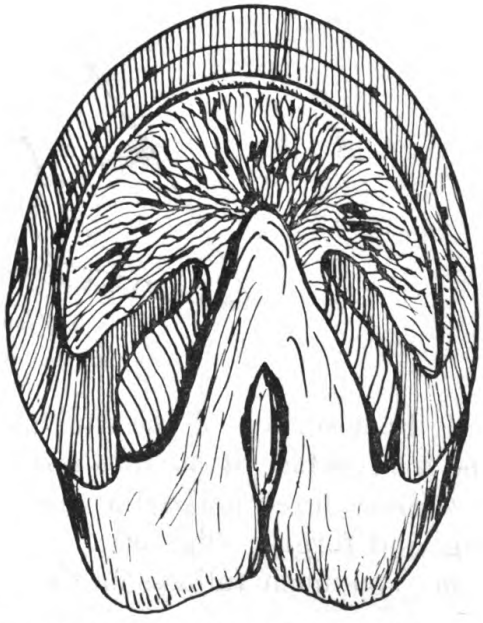


FIGURE 57.—Shoe too small (showing position of nail holes).

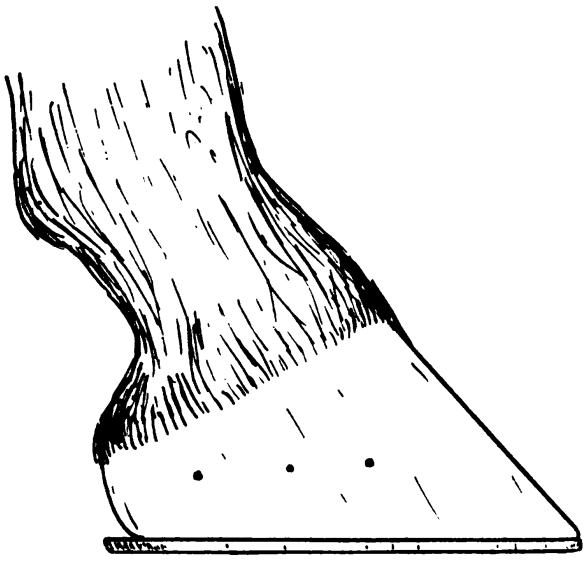
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g. Shoe too large will impede the expansion of the quarters and heels (fig. 56). There is danger of pricking the horse when securing the shoe.

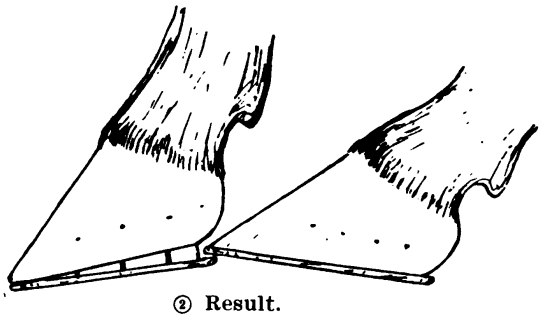
h. Shoe too small, that is, nail holes too far forward, will result in sprung or cast shoes (fig. 57).

i. Heels of the shoe too long may result in cast shoes (fig. 58).

j. Heels improperly finished, for example, sharp pointed heels, will result in cutting the legs of the horse when lying down.



① Heel of shoe too long.



② Result.

FIGURE 58.—Shoe heel too long.

k. Foot surface of the shoe not level will result in lameness when the foot surface of the shoe rests upon the horny sole.

l. Shoes fitted pointed at the toe will result in stumbling, interfering, and forging (fig. 59).

m. Too much fullness on the branch of the shoe at the quarter and heel may result in interfering and cast shoes.

n. (1) Nail holes too large will result in loose or cast shoes (fig. 60).

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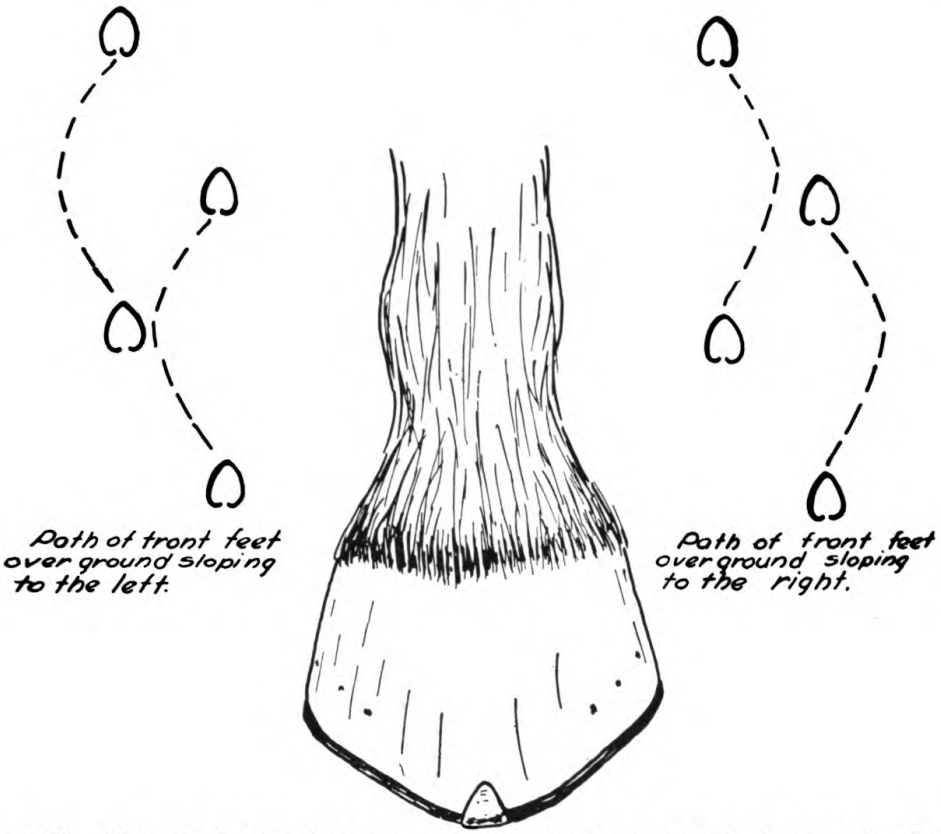
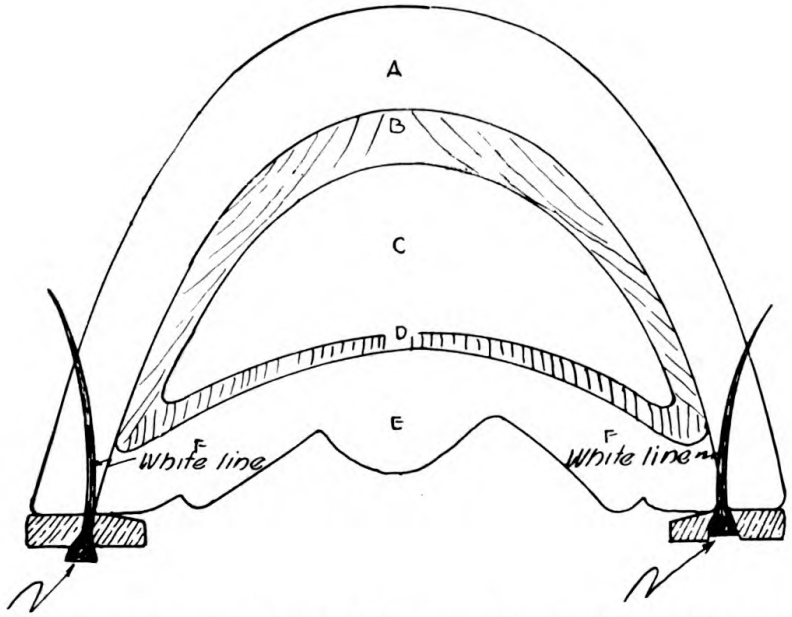


FIGURE 59.—Shoe fitted pointed at the toe (on rough or rutted roads, feet may break over either to right or left).



A. Wall.
B. Laminae.
C. Coffin bone.
D. Sensitive sole.
E. Horny frog.
F. Horny sole.

FIGURE 60.—Faulty nailing.

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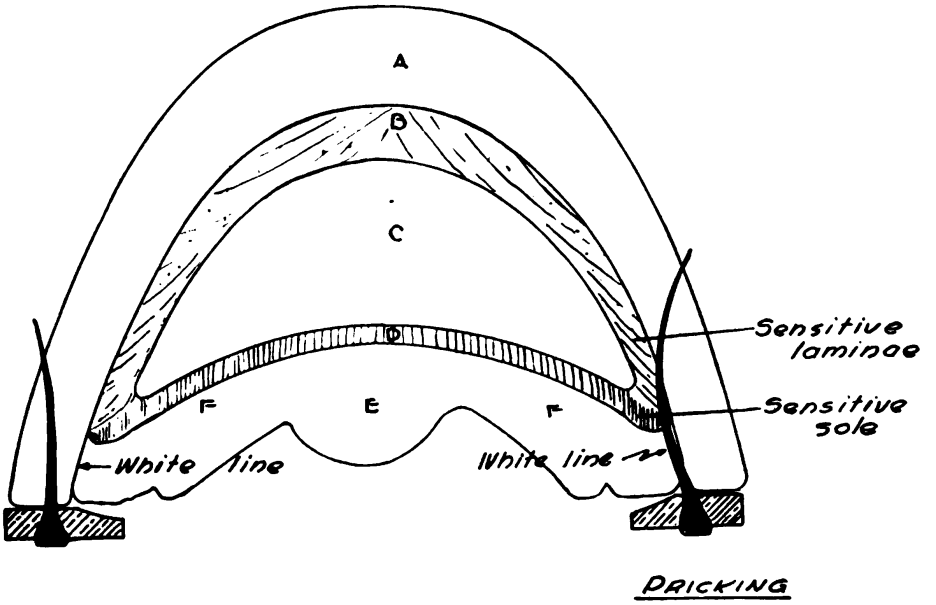


FIGURE 61.—Insecure nailing.

(2) Nail holes too small will wear away the nail heads, resulting in loose or cast shoes (fig. 60).

o. (1) Insecure nailing, for example, nails that do not enter the outer border of the white line, will result in cast shoes and breaking away of the wall (fig. 61).

(2) Nails driven into the sensitive structures (pricking) will result in lameness (fig. 61).

p. Nails driven too close to the sensitive structures will cause pressure and irritation and result in lameness (fig. 62).

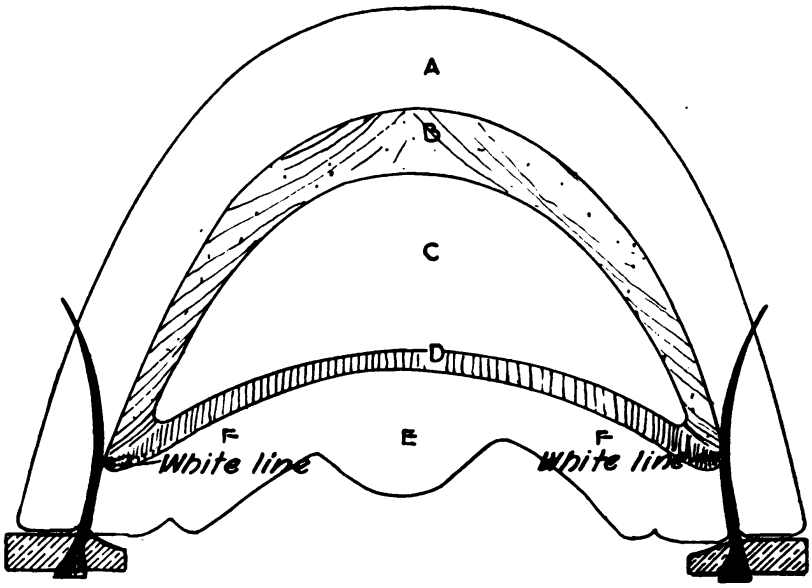


FIGURE 62. -Nails driven too close to sensitive structures.

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SECTION II

SPECIAL SHOEING—POLO HORSES, HUNTERS AND JUMPERS, DRAFT ANIMALS

Paragraph
Polo horses 51
Hunters and jumpers 52
Draft animals 53

51. Polo horses.—*a. General.*—(1) The polo horse's shoeing should permit him to move at speed—to start, turn, and stop quickly. Unfortunately, more consideration is usually given to performance during a polo game than to preserving the health of the foot. The shoe best suited for performance is not of sufficient weight and strength to protect the hoofs during a 6-months' playing season. Therefore, during and at the close of the playing season, irregularities which develop must be corrected. During the playing season, foot ailments can be held to a minimum by proper care of the feet in the stable and by careful shoeing.

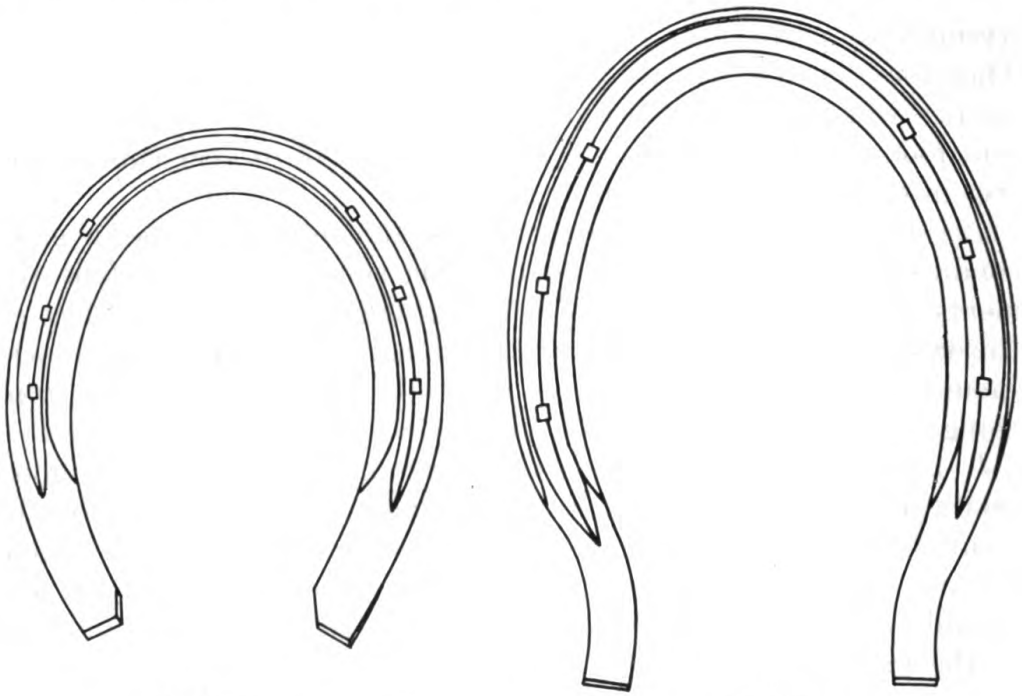
(2) Before the playing season opens, the feet should be in good condition, free from thrush, contraction, corns, and other foot ailments. The wall should be of sufficient length to resist the effect of concussion and be free from numerous nail holes. The horny sole should be of sufficient thickness to protect the sensitive sole from being injured.

b. During training period.—(1) Assuming the feet are in good condition, they should be carefully prepared for the new shoes to insure balance of the gait. "Snowshoes" (hind pattern) are suitable for use during the training period. The shoes for the front feet should not be calked. They must be fitted with sufficient roundness at the toe to afford lateral support to the foot at the moment of starting in flight. The branches are fitted and finished to cover the buttresses and allow for expansion of the quarters and heels. The shoe is concaved to avoid sole pressure; the nail holes are opened to conform in size and shape to the nail used in securing the shoe, and at an angle to conform with the angle of the wall where the nail is driven.

(2) The shoes for the hind feet are generally fitted with heel calks ½ inch in height. The outside heel calk is made as described in paragraph 51*d;* the inside heel calk should be diamond-shaped. A toe clip is placed at the point of the toe to hold the shoe in position. Calks of this pattern on the hind shoes give firm footing and allow the horse to turn on the haunches with the minimum strain on the ligaments and tendons of the lower part of the leg.

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c. During playing season.—(1) Some changes in shoeing will be necessary as the horse enters the playing season. Lighter shoes are used and fitted with less fullness at the quarters and heels. The shoer should not remove as much surplus horn (shorten the wall) when preparing the feet as is customary when preparing the feet for ordinary shoeing. The lighter weight shoe will permit of fast work without undue fatigue; the shoe fitted close at the quarters and heels will reduce casting shoes; plenty of horn will counteract the effects of increased concussion due to fast gaits, as well as compensate for more frequent reshoeing. The horseshoer should use a foot gage when preparing the feet for the shoe to insure the same length of



① Front. ② Hind.

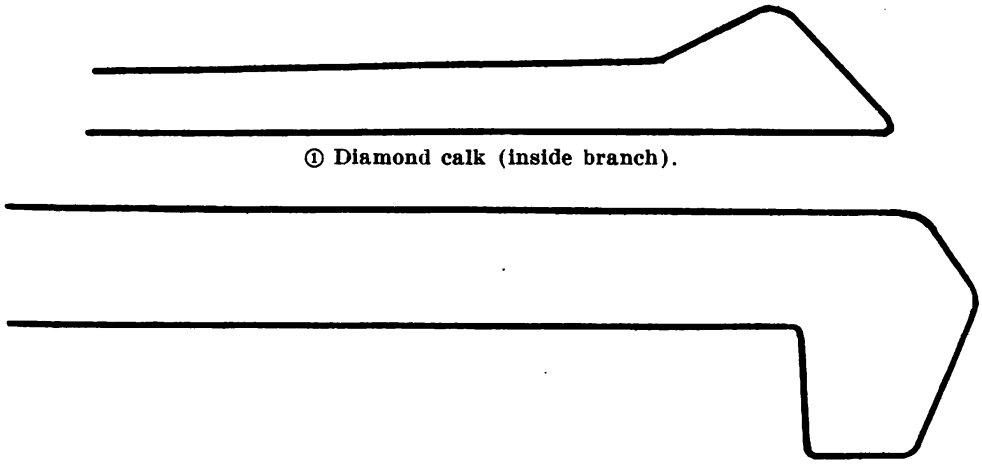
FIGURE 63.—Full swedge shoe.

toe and height of heels on corresponding feet. Shoeing a polo pony is similar to shoeing a race horse and requires exactness in every detail. Measurements of the feet should be recorded as a guide for preparing the feet of successive shoeings. The full swedge shoe is well adapted for use on the polo horse during the playing season. This shoe is light in weight. Its construction is such that it will afford firm footing and protect the hoofs from ordinary injury. This type of shoe may be procured in the various sizes and weights. A commercial shoe, steel trotting plates, with heel calks on hind shoes as explained above also makes a satisfactory, light, serviceable shoe for use during the playing season.

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(2) Prepare and balance the feet for the new shoe, leaving about ⅛ inch greater length of wall for normal shoeing. The branches of the shoe should terminate with the buttresses. There should be very little fullness of the shoe beyond the outline of the wall from the bend of the quarter to the buttress. The heels of the shoe are finished so that the ground surface of the shoe is shorter than the foot surface to prevent casting the shoe. Otherwise, the shoe is fitted as for normal shoeing. The preparation of the hind feet should be the same as for the front feet. More wall is left than for normal shoeing. A record should always be made of the measurements. In general, the measurements of the hind feet will coincide with those of the front feet.

(3) The full swedge shoe fitted with heel calks (par. 51*d*) is suitable for the hind feet. This shoe in action works as follows: As the



① Diamond calk (inside branch).

② Heel calk (outside branch).

FIGURE 64.—Calks for polo.

horse turns to the right, the major portion of the weight is upon the right hind leg; the outside heel calk acts as a pivot, and the inside diamond calk slides easily over or through the turf. The opposite foot and leg being free from weight make the turn without the calks penetrating the turf to a great extent. The same is true when the turn is made to the left and the weight is thrown upon the left hind leg.

d. Making shoes for polo horses.—For instructional purposes polo shoes are made from the issue service shoe. The shoes for the hind feet are made in pairs, namely, right and left. Select two hind shoes and place them on the face of the anvil side by side, with the ground surface uppermost. The branches that lie close together are used for turning the outside heel calks of the shoe. Place the

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branches designated as the outside heels in the fire and heat to a white heat. Remove the shoes from the fire, one shoe at a time, and proceed to form the calk. The calk when finished should not be more than ½ inch in height, the rear portion of the calk as viewed from the side should be triangular in shape, and the vertex of the angle should be on a line with the ground surface of the web. The calk should be turned out slightly with the front part of the calk at right angles to the plane of the shoe. The inside heel calk is triangular or diamond-shaped. The heel calks are finished by hot-rasping after the general shaping is completed.

52. Hunters and jumpers.—*a. Problem.*—Shoeing hunters and jumpers presents similar problems inasmuch as both perform work of a like nature. Both hunters and jumpers must jump and gallop at speed. This work causes more than ordinary shock and strain on the structures of the foot and leg. In order to prevent soreness in the foot, great care must be exercised to keep the foot in a normal, healthy condition. Because of the increased shock and possibility of soreness in the foot, more horn is left when reshoeing; the wall should be left ⅛ inch longer than in ordinary shoeing. The balance of the foot must be maintained in order that the gaits will remain free and straight with no undue strain on the foot or leg structures. Slipping or sliding when galloping or jumping may result in strained ligaments and tendons and even in the fall of the horse and rider. Shoes which secure the horse from slipping should, therefore, be used. This is best accomplished by using heel calks on the hind shoes at all times and on the front shoes if the footing is poor.

b. Fitting and securing shoe.—When a horse is jumping or galloping over heavy ground there is likelihood of his casting a shoe. To lessen this possibility, the outline of the shoe at the quarters and the heel must not be too full and the shoe must be fitted closely at the heels. The end of the branches should extend backward to cover the buttresses only, and the toe of the shoe must be rounded sufficiently to support the foot at the moment of starting in flight. The shoe must be concaved to avoid sole pressure, and the bearing surface of the shoe should rest firmly upon the bearing surface of the hoof. All calks should be ½ inch in height and finished smoothly.

c. Shoeing jumpers.—During the training period of a jumper, it is advisable to shoe in front with a plate shoe and to replace it with a calk shoe prior to exhibiting the horse. The use of calks in front for an extended period will cause soreness and, unless the shoe is slightly beveled from the bend of the quarter to the point of the heel, may result in contracted heels. Snowshoes, both front and hind

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pattern, are suited for use on jumpers. Screw calks may be used on front shoes to advantage. The use of screw calks permits changing from plate to calk shoes without removing the shoes from the feet. Whenever calk shoes are used to replace plates, the change should be made at least 3 days before the horse is exhibited so that the horse may become accustomed to the change.

53. Draft animals.—*a. General.*—The efficiency of the draft animal can be greatly increased by proper shoeing. In draft, the horse or mule does most of his work with his hind feet and legs. For ordinary work over average roads, plate shoes are used on the front feet. On the hind feet, shoes with blunt toe and heel calks are used to improve the animal's footing on dirt and gravel; sharp calks are used on icy footing. Shoes for draft purposes are manufactured

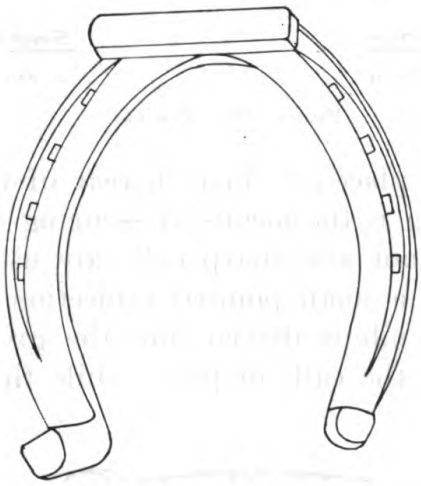


FIGURE 65.—Draft calk shoe (blunt calks).

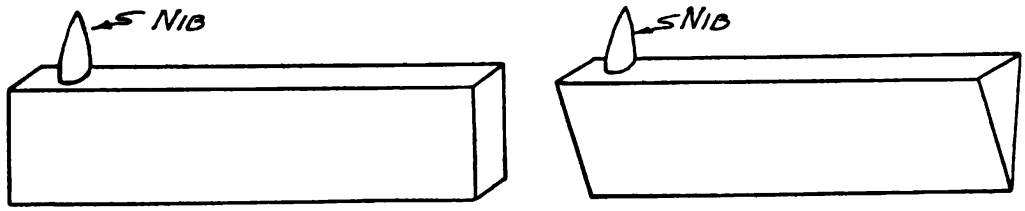
with toe and heel calks attached. Toe calks are also manufactured separately for use when converting the issue shoe into calked shoes. The manufactured calks are made in two patterns, blunt and sharp, and of various lengths and sizes. Toe calks may be made from bar steel at the forge.

b. Making a draft calk shoe.—(1) Select a front or hind issue shoe of the desired size. Heat the end of one branch of the shoe to a white heat, then remove the shoe from the fire with the tongs. Place the shoe on the face of the anvil with the foot surface uppermost, the toe toward the shoer and the heels extending 1 inch beyond the edge of the anvil's face. With the rounding hammer strike sharp blows upon the heated end of the branch. This turns the last inch of the branch at right angles to the plane of the shoe. Now turn the shoe over and place on the anvil with the calk directly above

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the face of the anvil and strike medium blows on the face and sides of the calk until it is shaped and finished. Heat the opposite branch and shape a similar calk. The calks when finished must be of equal height and should be turned outward slightly from the curve of the shoe adjacent to the calk.

(2) The toe calk is a steel bar welded on the ground surface of the shoe at the toe. It extends from one rim of the shoe to the



① Blunt. ② Sharp.

FIGURE 66.—Toe calks.

opposite side and is placed ¼ inch in rear of the front line of the shoe. When welding is the means of securing the calk to the shoe, two patterns, the blunt and sharp calk, are used. (See par. 55*d*.) These patterns have a small pointed projection on the shoe surface called a nib. This nib is driven into the ground surface of the heated shoe to hold the calk in place while the shoe and calk are

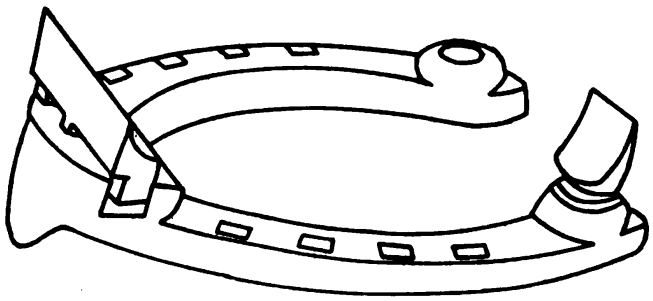


FIGURE 67.—Ice shoe (drive calks).

heated to make the weld. Toe calks should be as high as heel calks and thick enough to equal the wear of those at the heels.

c. Preparing feet, nailing and securing shoe.—The feet are prepared as for normal shoeing. They must be properly balanced. The shoes are outlined as described for normal shoeing, except the heels of the shoe are fitted ½ inch longer when calks are used, and the calks are turned outward slightly to give more lateral support to the foot.

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d. Drive-calk shoe.—A very satisfactory commercial draft shoe, called the drive-calk shoe, is manufactured with adjustable calks that are inserted into openings in the shoe. There are two cone-shaped holes at the toe and one on each branch of the shoe near the end. The base of the calk is tapered to fill the holes in the shoe snugly. This shoe is particularly adapted to localities where there is much snow and ice. Care must be exercised in fitting this shoe to avoid marring the holes in the shoe that are made for the reception of the calks. These holes in the shoe are cone-shaped, and, if not true, the calks will not remain in place. The drive-calk shoe is fitted and secured to the foot before the calks are placed in the shoe. Worn calks may be removed and replaced without removing the shoe. When worn calks are carefully replaced, the shoe will last indefinitely.

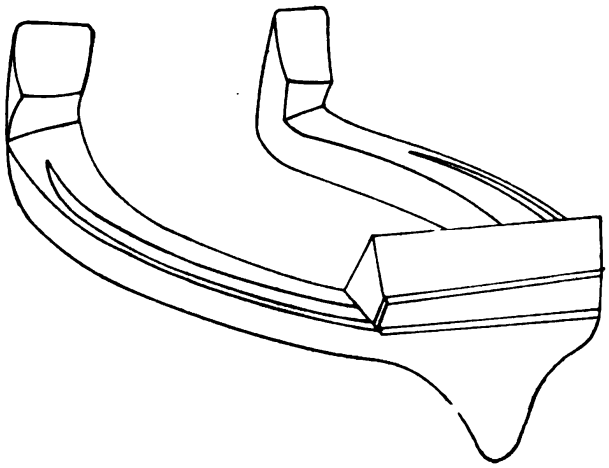


FIGURE 68.—Ice shoe, hand forged.

e. Rubber shoes.—Commercial type rubber shoes are particularly suited for light draft horses and riding animals on city streets throughout all seasons of the year. Rubber shoes are fitted cold. The general shape may be slightly changed by closing or opening the shoe bodily.

f. Ice shoe.—This type of shoe, made at the forge, is satisfactory when the draft horse does most of his work on dirt or gravel. The calks should be ¾ to 1 inch in height. The heel calks are turned and then drawn to a sharp chisel edge. The toe calk is welded in position and drawn to a sharp edge and finished with the bench rasp. Leather pads covering the sole and frog may be used to prevent snow from packing between the branches of the shoe. (See ch. 1, sec. V.)

g. Shoeing mules.—The draft mule requires shoes that provide firm footing, particularly on the hind feet. The feet of the mule differ from the feet of the horse. The buttresses on the mule's feet do not

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extend backward even with the bulbs of the frog. The foot is long and narrow; from the bulb of the heel to the buttress the hoof is very sloping. The fitting of mule shoes differs from the fitting of shoes for horses in that the heels of mule shoes extend beyond the buttress at least to a point even with the bulb of the frog. The heels should be turned outward (muled) from a point just in rear of the buttress

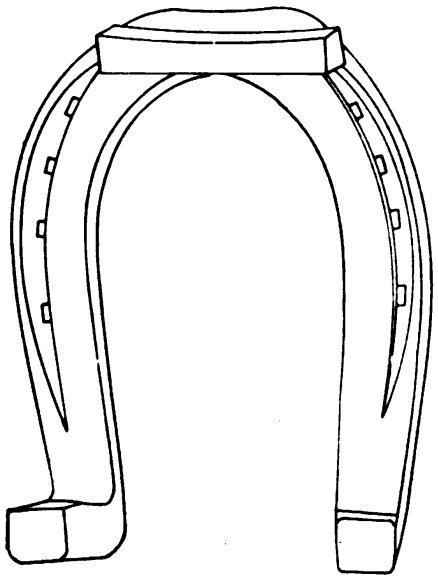


FIGURE 69.—Mule shoe (blunt calks).

to give lateral support to the foot. The width between branches of the shoe after being turned outward should not exceed the width of the hoof at the quarters. Mule shoes are the same for front and hind feet, there being no difference in width or thickness of the web of the shoe.

SECTION III
CORRECTIVE SHOEING

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54. Definition.—Shoeing to relieve or correct faulty conditions or gaits is called corrective shoeing.

55. Bar shoe.—*a. General.*—This shoe is made from the service shoe. Its general shape and fit when finished are the same as those of the open service shoe, except that the end of the branches are joined (welded), forming a bar that extends across the horny frog over the area of the bulbs. Thus the horny frog becomes a part of the bearing surface of the foot.

b. Scarfing heels.—The branches of the shoe are heated to a white heat for scarfing. The scarfing is accomplished by placing the shoe

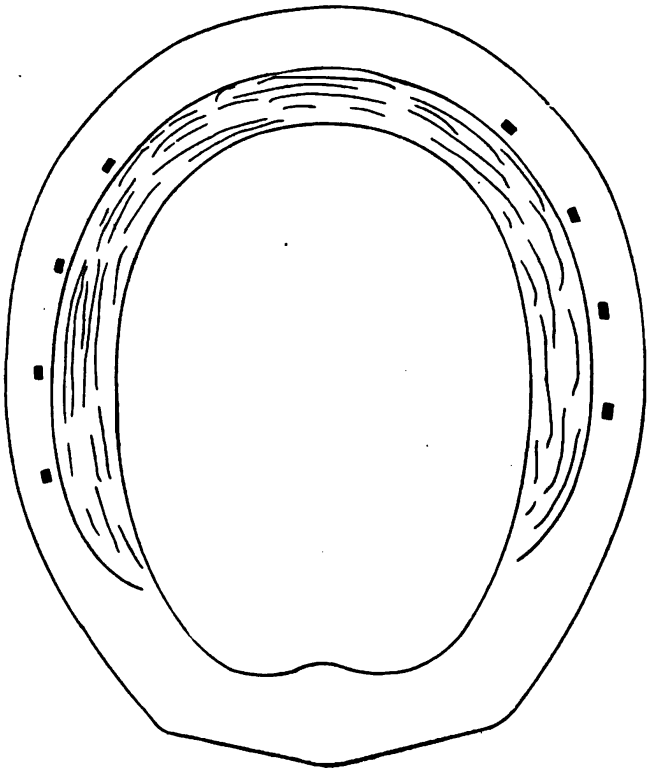


FIGURE 70.—Bar shoe, foot surface, hand forged.

on the face of the anvil with the ground surface upward and the toe of the shoe toward the shoer. With the rounding hammer strike blows on the upper edge of the left-hand branch at the extremity of the heel. The blows fall at an angle of about 45° with the plane of the upper surface. This produces a bevel between the upper and lower surfaces of the heel about three-fourths of an inch in length. Scarf the other heel in the same way, except that the shoe is turned over and the scarf is made on the opposite surface. To insure a smooth welt, the point of the scarf should be narrowed slightly. The method described for scarfing the heels of the shoe is correct for

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the right-handed shoer. Positions shoul be reversed for a left-handed shoer.

c. Turning branches to form bar.—One branch of the shoe is placed over the horn near the point. It is held in a horizontal position and at right angles to the horn with the branch extending about 1½ inches beyond the horn. With the hammer turn the branch inward at right angles to the shoe. Repeat on the opposite branch. The branches are then overlapped by closing the shoe bodily. When the bar is prepared for welding, the two flat surfaces are in contact and the scarf surface is exposed on both branches. The branches overlap to the extent of placing the upper edge of the bevel on one branch directly above the upper edge of the bevel on the other branch.

d. Welding bar.—(1) After the branches of the shoe have been closed preparatory to welding, the shoe is placed in a clean fire and slowly preheated, that is, slowly brought up to a white heat. By a clean fire is meant a fire without clinkers or smoke. This preheating is done slowly to insure a uniform heating of the metal. When the metal reaches a white heat, small particles of metal are given off

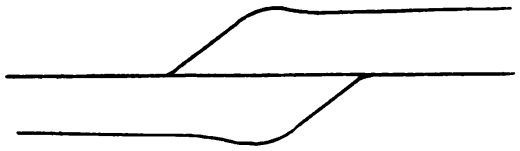


FIGURE 71.—Bar prepared for welding.

and generally spark above the fire. It is now necessary to bring the surface of the bar rapidly to a molten state preparatory to welding. This is done by increasing the blast from the blower while the shoe is rocked forward and backward in the fire, bringing the surface of the bar to a liquid state. When this liquid state is reached, the surface of the metal takes on a bubbling or sweating appearance and is at a welding heat.

(2) Now the shoe is removed from the fire, the bar is placed on the face of the anvil and a few light blows are struck with the hammer over the surface of the bar. This will bind the branches together. This operation must be executed with speed. The melted metal cools quickly and it is necessary to form a union between the molten surfaces of the two branches before the molten surface begins to harden. Heavy blows when starting the weld will force the molten or liquid metal from between the inner surfaces of the branches, resulting in a failure to make a weld.

(3) Place the shoe in the fire again and reheat to a welding heat and complete the weld by heavier blows, reversing the shoe so that

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both sides will be flattened. An experienced shoer can generally complete his weld with one heat, but in case the metal is cooling quickly it is better to reheat to insure a good union between the branches.

e. Shaping bar.—After the weld is completed, the shoe is reheated to a cherry heat. With the horn of the anvil projecting through the

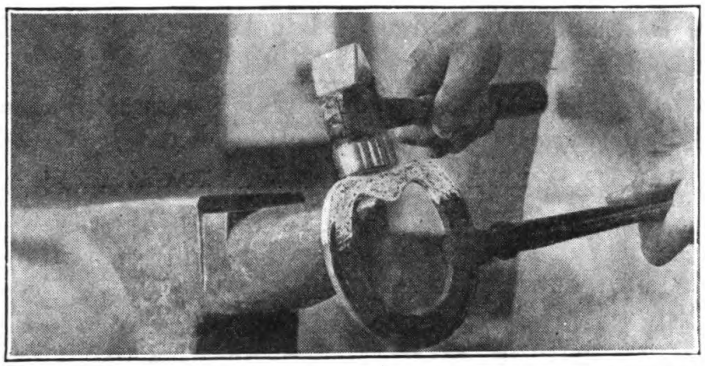


FIGURE 72.—Shaping bar when quarters are correct length.

opening in the shoe, and the bar resting upon the upper surface of the horn near the point, finish and shape the bar. The blows are directed on that part near the heel to narrow the bar and leave the center diamond-shaped.

56. Beveled-edge shoe.—*a.* The beveled-edge shoe is a miniature wedge on which the horse is constantly standing. The buttresses of the hoof are resting upon a beveled surface on the shoe that is sloped toward the outside edge. This wedge encourages a constant spreading of the heels.

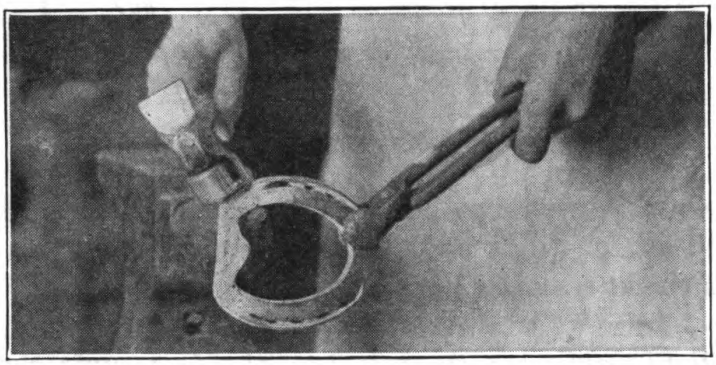


FIGURE 73.—Shaping bar when quarters are too long.

b. The service shoe can be converted into a beveled-edge shoe by using a file to make the bevel. The beveled surface of the shoe is made as follows: Determine the amount of bevel required. This varies between $\frac{1}{32}$ and $\frac{1}{16}$ inch. The shoe is then placed in a bench

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vise so that the foot surface of the shoe is uppermost. Scratch a line on this surface of the shoe from a point on the outer edge of the shoe ½ inch in rear of the last nail hole to a point on the end of the branch 3/16 inch from the inner edge of the shoe. With the file cut a sharp groove on the outer edge of the foot surface to a depth corresponding with the amount of bevel desired (for example, 1/16 inch). The lowest point of this groove will serve as a guide as to where to start in making the bevel on the heels. With a flat



A-A Cross section of the shoe near heel

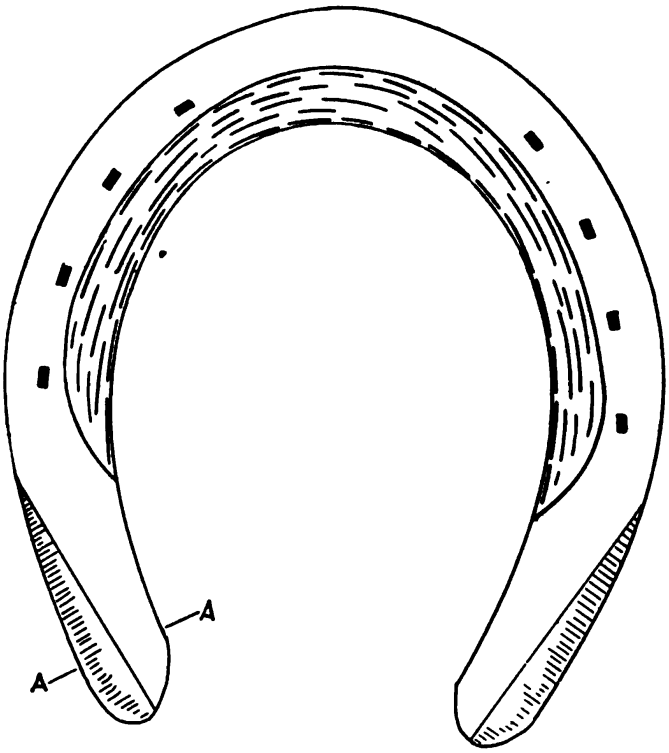


FIGURE 74.—Beveled-edge shoe.

bastard mill file cut away the metal on the foot surface of the shoe to complete the bevel. This beveled surface should be carefully finished so that it will be flat, for if the surface is irregular the heels will not be spread properly. If the horseshoer is an expert mechanic, the bevel on the heels of the shoe may be made with the rounding hammer in place of the file after the heels have been heated to a cherry heat.

57. Shoeing to correct contraction of quarters and heels.—*a. Causes.*—Contraction of the quarters and heels is an unnatural

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shrinking or narrowing of the feet at the quarters and heels. Causes: lack of exercise, dry and hard horn structures, thrush, cutting out the bars, continued use of heel calks on open shoes, and allowing the wall of the hoof to grow to an excessive length. Contraction of the heels is a condition that develops gradually, and one accustomed to seeing the feet daily may not notice that a hoof malformation is developing until it is quite pronounced.

b. Detection.—In order to determine the presence of contraction, measure the width of the hoof (on the bearing surface) from a point on the outside edge and ¼ inch from the rear of the buttress on one side to the corresponding outside edge of the buttress on the opposite

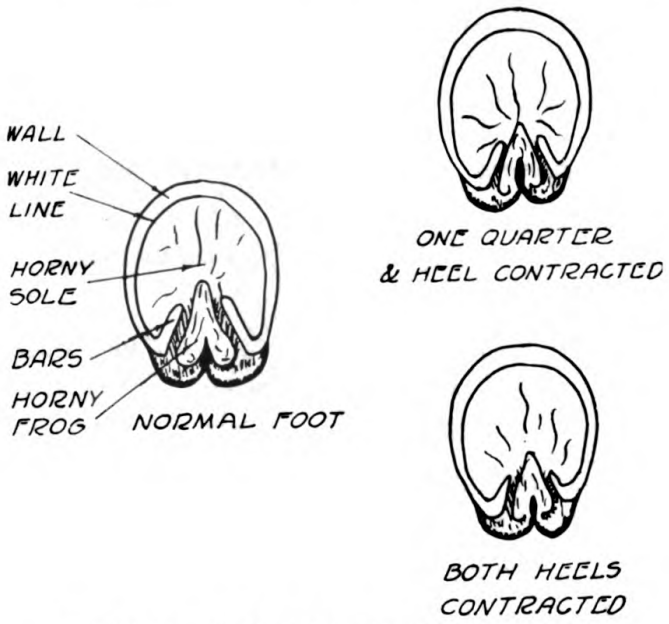


FIGURE 75.—Contraction of quarters and heels.

side. If the foot is normal this should equal the width of the hoof across the nail holes nearest the toe. The width of the heels will be less than this width at the toe when contraction is present.

c. Preliminary preparation of feet prior to shoeing.—Invariably the horn structures are hard and dry when contraction of the heels develops. Before attempting to reshoe the horse, return the hoofs to a flexible condition. There are several ways of doing this. Apply a linseed meal poultice to the feet, repeating the application until the feet reach the desired flexibility, or use moist clay packs on the soles of the feet for several days. The softening of the feet is vitally important in order to avoid injury to the foot structures when shoeing with the beveled-edge shoe. Forced spreading of the heels while hard and inflexible often results in cracks in the wall or injury to the

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inner parts of the foot. The horn structures when in a flexible condition will resist jar more effectively and will allow the inner parts of the foot to function in a more natural manner than when the hoof is hard and unyielding. With the aid of a properly fitted shoe, the hoof will immediately start returning to its natural shape.

d. Preparation of foot for applying shoe.—Prepare the foot as described for normal shoeing. Then, when the foot is prepared and ready for fitting the shoe, place the foot on a piece of cardboard and carefully mark the outline of the hoof on the cardboard. Measurements made at the commencement of the treatment, followed by measurements at each successive shoeing, will show conclusively the progress made.

e. Type of shoe used.—(1) The beveled-edge shoe is very effective in forcing the heels to widen. For this reason, plus the ease with which it can be made, it is the best shoe for general use in spread-

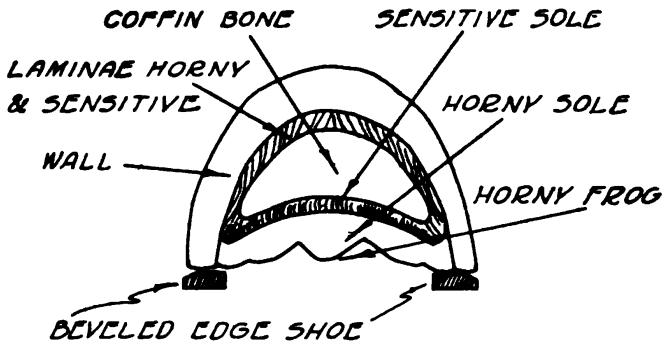


FIGURE 76.—Vertical section of hoof showing effect of beveled-edge shoe.

ing contracted heels. The shoe is fitted with greater expansion at the heels than for a foot in normal condition, otherwise the shoe is fitted as for a normal foot. The shoe must cover the buttress or the bevel will retard the spreading of the heels. When the quarters and buttresses of the hoof are resting upon the beveled surface of the shoe, they are constantly being forced outward by the weight of the animal. As the heels spread, the horny frog will regain its normal size. In its first stages, contraction can be corrected very easily by this method of shoeing and by proper care of the feet. Maintain a normal elastic condition of the horn structures and shoe with a beveled-edge shoe. While using this shoe the feet must be kept pliable, that is, in a normal state of elasticity. Observe closely any increased widening of the hoof at the heels. Normally the feet will spread rapidly, resulting in the need of changing the shoes at frequent intervals. Usually one shoeing period will accomplish the desired result (3 to 6 weeks).

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(2) A bar shoe properly made and fitted will also correct a condition of this kind.

f. Aid.—Removing the shoes and allowing the horse to go unshod for a time will prove beneficial.

58. Corns and corrective shoeing.—*a. Causes and symptoms.*—(1) Corns are the result of bruising the sensitive laminae covered by the wall of the hoof at the quarters. They are also caused by bruising the sensitive sole in the angle formed by the wall and bars. One or both of these structures may be involved at the same time. Corns appear as a reddish spot or as discolored horn in the sole over the area known as the "seat of corns" which is in the angle formed by the wall and bar.

(2) Corns may develop from excessive concussion, contraction of the heels, cutting the hoof away excessively over the buttresses, a



FIGURE 77.—Position of corn.

blow on the surface of the wall at the quarters and heels, and from laterally unbalanced feet.

(3) Corns are classified as dry corns and suppurating corns. A dry corn is one in which there is no pus formation. A suppurating corn is one in which there is a formation of pus. Lameness may accompany either condition. If lameness is present there will be an increased temperature in the structures surrounding the injury.

(4) Horses ridden or driven over hard-surfaced roads are susceptible to corns, as the constant pounding will induce inflammation in the sensitive structures of the feet and may develop corns. Dry, hard, horn structures will usually result in a change in shape of the hoof and cause contraction of the heels followed by corns. The coffin bone occupies the greater part of space within the hoof, and the structures surrounding the coffin bone are susceptible to injury in the malformed foot. A contraction of the heels develops; the

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buttresses and quarters are drawn together, closing the space formerly filled with a healthy frog. The narrowing of the hoof at the quarters and heels compresses the structures covering the coffin bone in the rear part of the foot, and injury to the sensitive laminae and lateral cartilage may result.

(5) Horn rasped away excessively over the buttresses (heels too low) will weaken the hoof at a point where great strength is required to counteract the effect of the blow when the weight of the animal is placed upon the foot structures. By cutting away too much horn from this part of the hoof, the sensitive sole is easily injured. This is believed to be one of the most common causes of corns.

(6) A blow on the outer surface of the wall at any point on the quarter or heel may also injure the inner sensitive structures and result in a corn. This injury may occur in the field when a horse steps between two protruding edges of stone. An accidental blow on the side of the hoof from a polo mallet, or a misdirected blow of the driving hammer high upon the wall of the hoof when forming and finishing the clinches, may result in bruising the sensitive laminae.

(7) Laterally unbalanced feet cause an uneven distribution of weight on the foot structures. The foot is so constructed that under normal conditions all parts coordinate in counteracting the effects of concussion. If the load is not equally distributed on the hoof, the inner structures of the foot do not have proper protection and are susceptible to injury and corns.

b. Preliminary preparation of feet prior to reshoeing.—Have the horn structures in a normal state of elasticity before shoeing is attempted. If the hoof is dry and hard, soften it. If there is inflammation or infection, the horse requires the attention of a veterinarian, and shoeing should be postponed until these conditions are corrected.

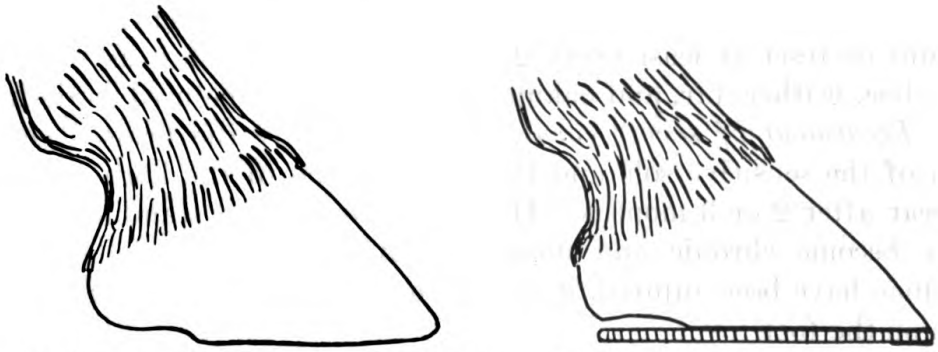
c. Preparation of feet for applying shoe.—(1) When the feet are in condition for shoeing, prepare the feet as for normal shoeing by removing the surplus horn and by balancing the feet. Then cut away the horn at the seat of the corn, noting carefully the discoloration in order to detect injury to the sensitive structures. If only the sensitive sole is affected, the discoloration of horn will be pronounced over the area of the sole and not pronounced bordering the white line. If the sensitive laminae are affected, the discoloration will be pronounced at the white line. The results of this examination will govern the preparation of the foot for the shoe and also the type of shoe to use.

(2) When the injury is confined to the sensitive sole, cut away the bearing surface of the wall over the area of the corn, starting at a

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point near the bend of the quarter or immediately forward of the discolored horn and continuing the cut to and including the buttress. This cut should be of sufficient depth to prevent the branch of the fitted shoe from touching the wall and buttress over the affected area when the animal puts his weight on the foot.

d. Type of shoes to relieve and correct corns.—(1) The bar shoe is preferable to the open shoe if the horny frog is free from thrush, for the bar affords more bearing surface than the open shoe. With the bar shoe the horny frog becomes a part of the bearing surface for the shoe, compensating for the loss of bearing surface on the quarter and giving more stability to the shoe and foot. The shoe should be made and fitted so that the bar rests upon the bulbs of the horny frog directly below the plantar cushion at its greatest thickness. The horny frog and plantar cushion, with the aid of the



① Removing pressure over area of corn. ② Plate shoe adjusted to foot.

FIGURE 78.—Method of shoeing to relieve corns.

bar shoe, will carry the weight formerly carried by the wall and buttress at the quarter. The sole of the foot can be packed with tar and oakum and covered with a leather pad as a part of the shoeing, or this can be omitted if considered best. But when the horn over the seat of the corn has been cut away severely, it is advisable to pack the sole of the foot with tar and oakum and cover it with a leather pad before nailing on the shoe; this will protect the sole from further bruising, especially where the horn is cut away. The application of tar and oakum packs is as follows: Put a thin covering of pine tar over the surface of the horny sole and frog with a short-bristled brush (a worn paint brush about 2 inches wide is satisfactory), then apply a layer of veterinary oakum about ½ inch in thickness to hold the tar in place, and cover with a leather pad. Leather pads in shape and size to conform with the size of shoes are issued for this purpose. Place the fitted shoe upon the leather pad, mark

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the outline of the shoe, and trim away the surplus edge. Attach the pad to the shoe by driving a nail through the shoe and pad on both branches. Cut these nail points even with the surface of the leather, and remove them when the shoe has been partially secured to the foot. This type of shoe should not be used if there is any doubt regarding the ability of the horseshoer to do this work. When the horny frog is infected with thrush the bar shoe should not be used, as the bar would seriously interfere with treating the infection. Leather pads, tar, and oakum should be omitted for the same reason.

(2) A plate shoe (open shoe) can be used with a fair degree of success in treating corns. The preparation of the foot should be the same as heretofore described. The shoe should be fitted normally; the branch of the shoe over the affected area will not have the support (contact) of the wall and buttress and is likely to bend and contact the quarter after the shoe has been on the foot for a period of 2 weeks, resulting in a recurrence of lameness. Consequently, the shoe should be reset at least every 2 weeks. With this shoe as with the bar shoe, leather, tar, and oakum may or may not be used as desired.

e. Treatment of severe corns.—(1) Ordinarily the bruised condition of the sensitive sole and the discoloration of the horn will disappear after 2 or 3 months. If the corn is of long standing it may have become chronic and incurable. Assuming that the sensitive laminae have been injured, it will be necessary to perform an operation on the foot.

(2) The wall of the hoof over the affected area must be removed in order to relieve the pressure on the injured structures. This operation should be performed under the supervision and direction of a veterinarian, and will require shoeing with a "pressure pack" if the horny frog is free from thrush but has deteriorated. The procedure in applying a pressure pack is the same as in applying a tar and oakum pack except that large quantities of oakum are rolled into solid layers and placed over the area of the horny frog to replace the normal frog. This gives contact with the fitted shoe and aids the elastic structures in their normal functions.

59. Fundamentals of correcting faults in gaits.—*a.* To acquire and maintain a balanced gait, the feet must be balanced and in alinement with the body at the moment they leave the ground. There will be faults in the gaits of a horse if the rider is unskilled or the horse equipment is improperly adjusted. Over these matters the horseshoer obviously has no control.

b. The skillful horseshoer can control the position of the foot at rest and in flight. He must, of course, understand the structures of

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the foot and leg of the horse and their action in flight before he can apply successfully corrective measures to change a gait. Each horse that requires corrective shoeing must be considered individually for the type of shoe best suited to correct the faulty gaits. Although two or more horses may have the same fault in a gait, each may require a different method of shoeing. Shoeing alone will not always completely correct the fault in a gait, but it will reduce the harmful results of the fault.

60. Shoes for correcting faults in gaits.—Shoes for correcting faults in gaits are of two kinds:

a. An issue shoe converted into a pattern that will effect lateral balance and will correct faults in the breaking over and in the flight of the foot.

b. A hand-forged shoe made from bar steel into the pattern required to correct faults in the breaking over and in the flight of the foot. Such a shoe is more effective than a converted issue shoe, but it requires more than average skill to make it properly.

61. Square-toe shoe.—This shoe is made from the issue shoe by changing the outline at the toe from an oval to a straight line. Front and hind shoes of the square-toe pattern are frequently used when correcting faulty breaking over of the feet prior to flight and when correcting faulty gaits. Select a shoe, place the toe in the fire, and heat to a cherry-red heat. Remove the shoe from the fire with the tongs and place the toe at right angles to and over the horn of the anvil near the point. Now move the shoe toward the shoer until the point of contact is near the end of the crease on the branch of the shoe. Strike moderate blows with the flat face of the rounding hammer on the toe at or near the center; reverse the position of the shoe on the horn of the anvil and repeat the operation. This changes the shape of the toe from oval to a straight line and retains all of the metal in the toe of the shoe. The toe of the shoe when completed is straight from the end of the crease on one branch to the end of the crease on the opposite branch. The straight outline must be at a right angle to the length of the shoe. Should the toe of the shoe be squared (straightened) by hot-rasping or from the use of the file, the wearing qualities of the shoe are reduced.

This shoe gives better support to the foot when approaching the breaking over point and increases slightly the rapidity of breaking over.

62. Lateral-extension-toe shoe.—*a. General.*—The lateral-extension-toe shoe resembles the square-toe shoe; it differs only in that the straight section extends a greater distance from the median line

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of the shoe on one side, that is, on the inside or on the outside portion of the toe.

b. Procedure in making.—(1) *From bar steel.*—If the shoe is to be for the right front foot, select a bar of steel 1 inch by $\frac{5}{16}$ inch and 12 inches in length. Heat and work the bar into shoe shape, then proceed as explained for making the square-toe shoe. Now hem (narrow) the web of the shoe about $\frac{3}{8}$ inch, except for a section from the straight line at the toe, to a point between the second and third nail holes on the right hand side of the shoe.

(2) *From an issue shoe.*—The issue shoe should only be converted into a lateral-extension-toe shoe for temporary use. Select an issue

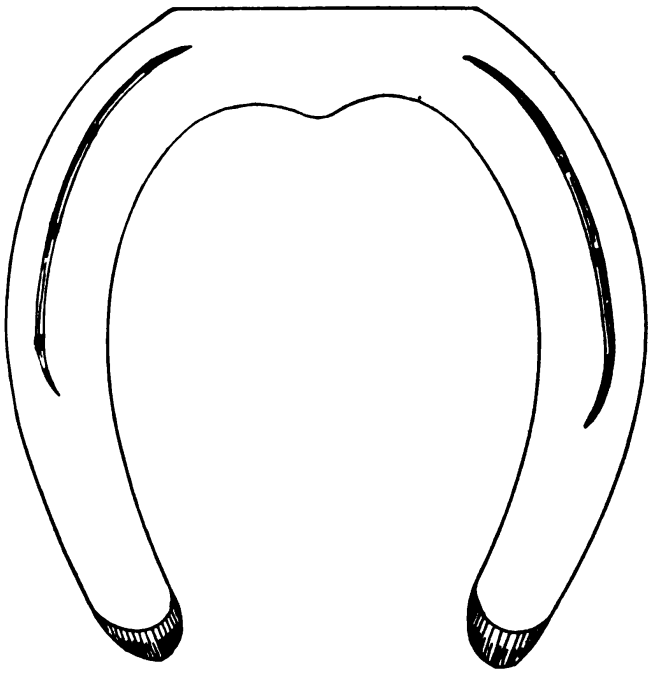


FIGURE 79.—Square-toe shoe.

shoe, heat and shape the toe as described for a square-toe shoe. To procure the lateral extension, the shoe is heated and placed on the face of the anvil with the foot surface uppermost. With the rounding hammer strike moderate blows upon the bearing surface of the shoe at the junction of the oval and straight section. This will increase the width of the web at this point, particularly the ground surface. The foot surface of the shoe is destroyed at this point and the thickness of the web is lessened, resulting in the shoe wearing away rapidly at this point. The extension at the toe will be effective for a short time only. This shoe causes the foot to break over at the center of the toe and to extend forward in a straight line.

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63. Trailer for hind shoe.—*a.* The term "trailer" is applied when the outside branch of the shoe is longer than the opposite branch. The trailer furnishes more lateral support to the foot than is obtainable with a normally fitted shoe. When using square-toe shoes on the hind feet, it is a common practice to use a trailer on the outside branch of the shoe. The trailer may also be used with the lateral-extension-toe shoe when used on the hind feet. When a trailer is to be used, the outside branch of the shoe is not cut off until after the trailer is formed.

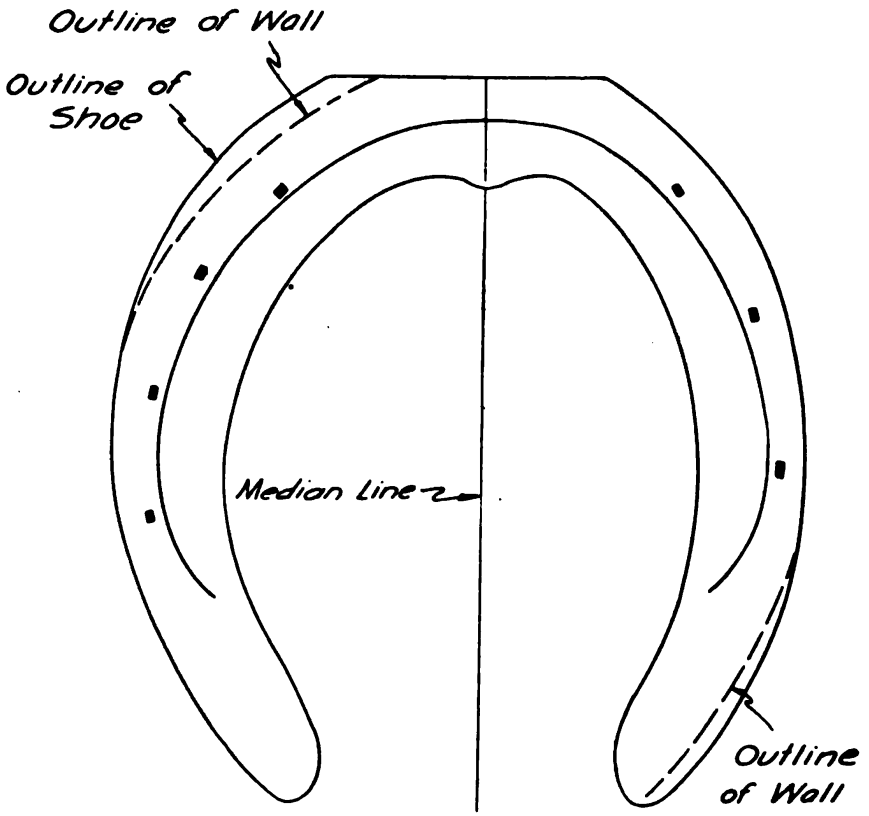


FIGURE 80.—Lateral-extension-toe shoe (left front shoe hand-forged).

b. The fitting of the outside branch differs from the normal shoe in this respect: From a point at the buttress of the foot the heel of the shoe is turned outward at an angle of 45°. The turned-out portion of the heel (trailer) will vary from ½ to ¾ inch in length.

64. Rocker-toe shoe.—A rocker-toe shoe is one in which the toe-portion of the shoe is curved upward at an angle of about 10°. The rocker-toe shoe is made from the issue shoe and its use is confined principally to the front feet. The toe of the shoe should be fitted accurately to the foot before converting to the rocker-toe. Select a front issue shoe, heat and shape, then reheat to a cherry-red heat;

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place the foot surface of the shoe on the face of the anvil with the heels of the shoe toward the shoer and the toe extending beyond the front edge of the face to a distance equal to three-fourths the width of the web. With the rounding hammer strike moderate blows on that part of the ground surface of the shoe projecting beyond the face. The blows should fall at or near the edge of the face of the anvil. The web of the shoe which extends beyond the face of the anvil is turned to an angle of about 10°. This operation reduces the length of the ground surface of the shoe and when applied to the foot produces a forward rocker effect when the horse is in motion.

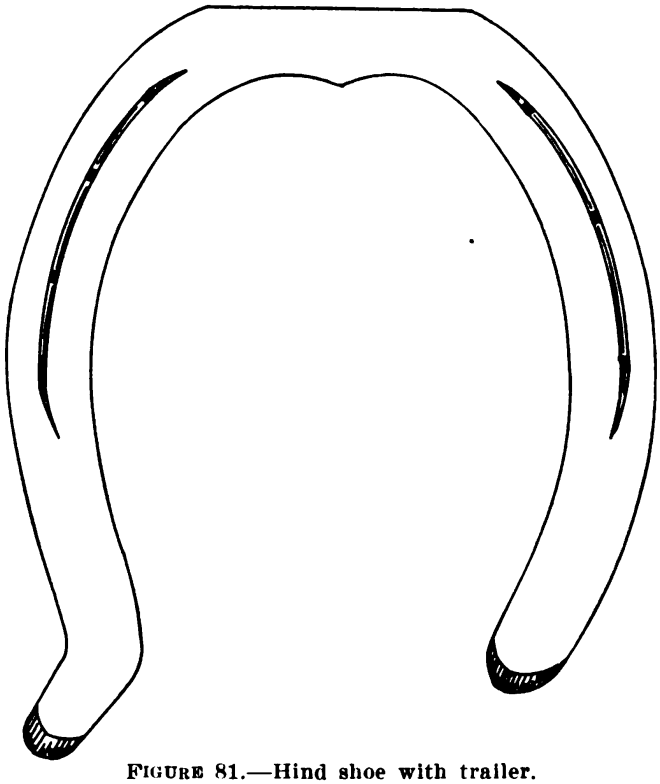


FIGURE 81.—Hind shoe with trailer.

The rocker-toe shoe increases the rapidity of breaking over of the foot by shortening the ground surface of the shoe at the toe and lessening the labor of the flexor tendons. It increases the height of the action and decreases the forward extension of the foot.

65. Shoeing to correct stumbling.—*a. Causes.*—The causes of stumbling are either permanent or temporary. When the cause is permanent, due to faulty conformation of the legs, the horse will have a natural tendency to stumble. In this case, the most that may be accomplished by corrective shoeing will be a temporary reduction in the extent of the faulty flight of the feet. Some temporary causes are unbalanced feet, shoes of unsuited weight, and improperly fitted

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shoes. In these cases the correction is obvious—remove the cause. Young horses during the early period of training are predisposed to stumbling even though the conformation of the legs may be good. The muscles are undeveloped, the horse is not accustomed to carrying the weight of the rider and the equipment, and has no confirmed gaits. He is easily thrown off balance in his movements, becomes fatigued quickly, and stumbling results.

b. Corrective measures.—(1) (*a*) If stumbling is the result of undeveloped muscles or debility due to sickness, the horseshoer

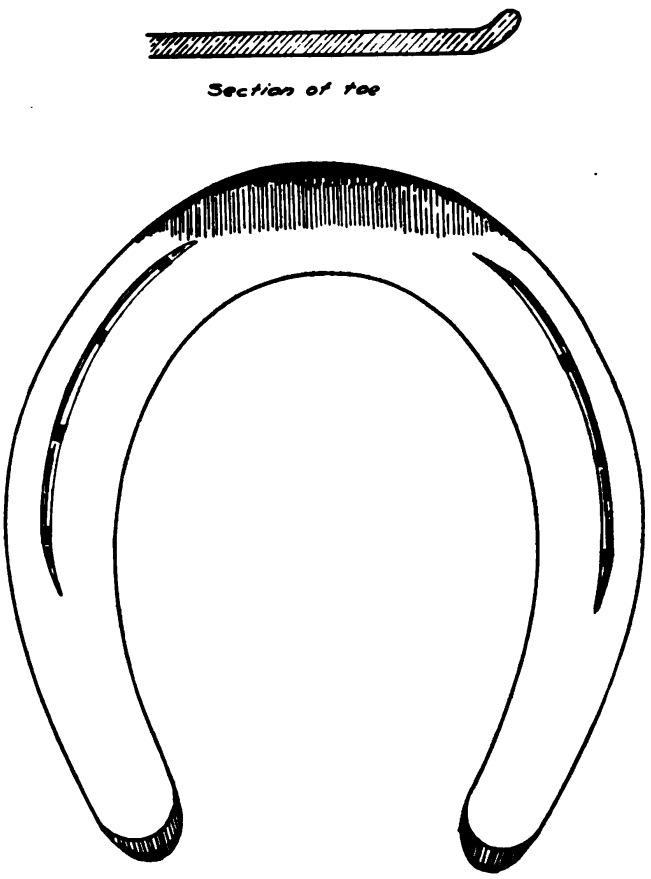


FIGURE 82.—Rocker-toe shoe, ground surface.

must use as light a shoe as will reasonably protect the hoof and must exercise great care in constructing the shoes. This permits easy breaking over of the feet when starting in flight and relieves the strain on the leg muscles.

(*b*) Before shoeing the horse, carefully observe the movements of the horse at the walk, slow trot, and extended trot. Observe the general conformation of the horse, then examine closely the condition of the hoofs and shoes. Observe the feet from the front and side

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for balance. Note the amount of surplus horn and the weight and fitting of the old shoes. Make inquiry as to the amount and nature of work the horse performs. This knowledge will assist greatly in determining the method of shoeing.

(2) Shoeing to correct stumbling in which the fault is due to weakness and fatigue, there being insufficient elevation of the front feet during flight, is as follows: Prepare and balance the feet as for normal shoeing. Select extra extra light issue shoes; heat and shape the shoes to the feet with the exception of cutting off the heels. Reheat and convert the toe as previously described for making the rocker-toe shoe. Now make a seat for the upturned portion of the shoe at the toe with the file surface of the rasp by cutting away the lower edge of the wall at the point of the toe. The shoe should contain sufficient heat to sear (mark) the contact of the shoe on the wall in order to procure a snug fitting. Further fitting of the shoe follows the procedure of normal shoeing. The rocker-toe will aid in easy breaking over of the foot, induce greater elevation of the stride, and will cause less fatigue, since strain on the leg structures is reduced.

66. Shoeing to correct forging.—*a. General.*—Forging is a fault of the gait in which the toe of the hind foot overtakes and strikes the bottom of the front foot on the same side at the moment the front foot is starting in flight. The front foot is slow in breaking over and leaving the ground to avoid the forward extension and planting of the hind foot.

b. Causes.—Forging may be due to faulty conformation, leg weariness, improper adjustment of the saddle, improper riding, or improper shoeing. Faults in conformation which tend to cause forging include a short body with relatively long legs; front or hind feet set too far under the body; or short front legs and long hind legs. Forging may be caused by leg weariness, a condition resulting from debility or overexertion. Improper preparation of the feet or improper shoeing may slow down the breaking over of the front feet, decreasing the height of their action and causing forging. Young horses with good conformation and properly balanced feet are subject to forging while being trained and developed. In this case the forging is caused by fatigue of underdeveloped muscles.

c. Corrective measures.—The method of correction should be governed by the cause of the irregularity and the nature of work the horse habitually performs. Have the horse ridden at the walk, slow trot, and at the extended trot to determine at what rate of speed the irregularity is most pronounced. Watch for lack of coordination

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between the front and hind feet during flight; look for such conditions as would aggravate an unbalanced gait. Is the conformation of the horse good or faulty? Are the feet balanced laterally and from toe to heel? Are the shoes correctly fitted and of suitable weight? In answering the questions, the horseshoer can determine the specific cause. If forging is caused by unbalanced feet, shoes too heavy, or shoes not properly fitted, the correction is obvious—remove the cause. Three examples of corrective shoeing are submitted in which the cause is due to faulty conformation of the horse.

(1) *Example No. 1.*—Properly prepare and balance the front feet and shoe with rocker-toe shoes equal in weight to the front issue shoe classified as light. Prepare and balance the hind feet; leave the hoof a little longer than normal; and shoe with lightweight shoes equal in weight to the hind issue shoe classified as extra extra light. Fit the shoes full to the point of the toe and extend the heels back about ½ or ¾ inch beyond the buttresses. Turn the heels outward slightly. This method increases the rapidity of breaking over of the front feet and decreases the rapidity of breaking over of the hind feet.

(2) *Example No. 2.*—Prepare and balance the front feet and shoe with rocker-toe shoes equal in weight to the front issue shoe classified as extra light. Prepare and balance the hind feet (normal length of hoof), and shoe with hind issue shoes classified as extra extra light with heel calks and rocker-toe. This method of shoeing induces greater hock action and elevation of the hind feet in flight with decreased forward extension, and effects more clearance between front and hind feet in action.

(3) *Example No. 3.*—Prepare and balance the front feet and shoe with rocker-toe shoes equal in weight to the front issue shoe classified as extra extra light. Prepare and balance the hind feet, leave the hoof a little longer than normal, and shoe with hind issue shoes classified as extra extra light, convert the shoe into a square-toe and extend the heels back about ½ or ¾ inch beyond the buttresses. Turn the heels outward slightly. The straight section of the shoe at the toe is set back from the outline of the wall at the toe about ¼ inch. The wall that projects beyond the shoe at the toe should not be removed. This method of shoeing increases the rapidity of breaking over of the front feet and higher action. The preparation of the hind feet, plus the greater length of shoes, delays the breaking over of the hind feet, thus allowing more time for the front feet to be carried into sufficient elevation to effect clearance of the hind foot when extended and planted. The shoe being set back from the

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point of the toe will avoid the clicking noise of shoe striking shoe, namely the toe of the hind shoe striking the ground surface of the front shoe near the toe.

67. Interfering and corrective shoeing.—*a. General.*—Interfering is a fault in gait in which the horse strikes any part of the inside of one leg with the inside branch of the shoe on the opposite foot. The injury from interfering may be located at any spot from the coronet to the knee on the front legs; on the hind legs the injury is usually found on the fetlock joint. In most cases injuries are more common on the hind legs than on the front, and most interfering is on the inside portion of the fetlock joint.

b. Causes.—The causes of interfering are temporary or permanent.

(1) *Temporary.*—These causes are fatigue, faulty preparation of the feet, and improper shoeing. Interfering from improper shoeing results from pointed toes, trimming the inner half of the wall too low, failing to remove large flares on the inner quarters, fitting the shoes too full on the inner quarters, leaving rough clinches, and using shoes that are too heavy.

(2) *Permanent.*—These causes, due to faulty conformation, are toeing-out, being so narrow-chested that there is not sufficient clearance between the front legs in flight, or having hind legs that are cow-hocked.

c. Corrective measures.—(1) *For temporary causes.*—The cause may be corrected by proper preparation and balancing of the feet. The horseshoer should use shoes of the proper weight, remove flares, smooth clinches, fit the shoes close at the inner quarter, and hot-rasp (round) the edge on the ground surface. Fit the shoe to insure lateral support at the time the foot is breaking over and starting in flight. Where the feet have little lateral support when breaking over, the horse is easily thrown out of balance as the foot starts in flight. This loss of balance may cause interfering. Shoes with pointed toes give little lateral support and are a common source of interfering.

(2) *For permanent causes.*—Permanent causes may be overcome temporarily by corrective shoeing, but when the corrective shoe is discarded the fault will almost invariably return.

d. Examples of corrective shoeing.—Before shoeing a horse to correct interfering, observe his movements at the walk, slow trot, and extended trot. Determine at what gait the interfering occurs. Observe the conformation of the horse, particularly the leg structures. Examine the balance of the feet, laterally and from the toe to heel, the amount of surplus horn to remove, the weight and fitting of the

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old shoes. This examination is made to determine the cause of the irregularity in the gait and to obtain knowledge of methods necessary to correct the fault. The horseshoer must have in mind the essential points of a balanced gait; the feet breaking over at the center of the toe prior to starting in flight; the feet and legs moving in alinement with the body without lateral swing during flight, and having sufficient elevation to clear the ground properly in the forward extension of the feet.

(1) *Example No. 1.*—The horse is striking the inside portion of the fetlock joints on the front legs. Cause is due to lack of lateral support at the toe of the shoe (toes pointed). Prepare and balance the feet; shoe with a square-toe shoe, light in weight, fitted with the straight section of the shoe at the point of the toe even with the outline of the wall, and extending laterally slightly beyond the wall on both sides of the toe of the hoof. The inside branches of the shoe should be hot-rasped and smooth on the edge of the ground surface the entire length of the branch.

(2) *Example No. 2.*—The horse is striking the inside portion of the fetlock joints on the front legs. The cause is due to faulty leg conformation. The alinement of the column of leg bones, as viewed from the front, diverges at the fetlock joint, resulting in a toe-out pastern conformation.

(*a*) Prepare and level the feet. Select front shoes of issue pattern classified as extra extra light and convert them into lateral-extension-toe shoes, with the extension on the inside portion of the toe. Fit the shoes even with the wall at the point of the toe and extend the outline of the shoe to ¼ inch beyond the outline of the wall at the junction of the oval and straight section. Graduate the fullness to zero at a point just in rear of the second nail hole in the shoe, and from this point to and including the heel the shoe should follow the outline of the wall. The outside branch of the shoe should be fitted close at the outside portion of the toe and full from the bend of the quarter to the heel (slightly fuller than for normal shoeing). The edge of the ground surface on the inside branch of the shoe should be hot-rasped and finished smooth. The purpose of the lateral-extension-toe shoe is to place the foot in a straight forward position when breaking over and starting in flight and to reduce the extent of the inward swing during flight. The fullness of the shoe at the natural breaking-over point of the foot acts as a lever to turn the foot into a straight forward position while the heels are being raised prior to the foot starting in flight. Handmade shoes are preferable to issue shoes when material is available for forging the shoes.

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(*b*) Prepare and level the feet; make and fit the shoes as described in (*a*) above with one exception—the inside branches of the shoes are fitted about ¾ inch longer than normal (the heel of the shoe extending in rear of the buttress). The purpose of the long heel on the inside branch is to induce the planting of the foot in a straight-forward position. When the foot is planted, the heels of the shoe contact the ground before the toe. The long inside branch of the shoe, being the first to make contact, acts as a lever to turn the toe of the foot inward or in alinement with the body. This, plus the lateral support furnished by the square toe, will start the foot in the proper direction when leaving the ground prior to the flight.

(3) *Example No. 3.*—The horse is striking the inside portion of the hoof at the coronet. The cause is due to a narrow chest resulting in the front legs being too close together. This conformation causes leg weariness, and when the horse is worked over uneven ground he is most likely to interfere. Prepare and balance the feet; shoe with rocker-toe shoes made from extra extra light issue shoes. The inside branch of the shoes should be fitted close, hot-rasped, and finished smooth. It is advisable to use interfering boots when the horse is used for long rides or over rough ground.

(4) *Example No. 4.*—The horse is striking the inside portion of the fetlock joints on the hind legs. The cause is due to faulty leg conformation. The hind legs as viewed from the rear show considerable space between the hocks, and when the horse is standing naturally on the hind legs the feet are very close together. The prolongation of the median line of the upper part of the leg passes through the foot near the outside quarter. This condition is described as "base narrow." Prepare and level the feet. Select extra light shoes and convert them into a square-toe with a trailer on the outside branch. The trailer should be about ¾ inch in length with a turned heel calk, or a section of bar steel about ⅜ inch in height welded on the ground surface, the length of the trailer. The inside branch of the shoe should be fitted close (following the outline of the wall from the quarter to the buttress), hot-rasped, and finished smooth; no heel calk on the inside branch of the shoe. This type of shoe, when properly adjusted, will balance the foot and reduce the inward swing of the foot in flight.

(5) *Example No. 5.*—The horse is striking the inside portion of the fetlock joints on the hind legs. The cause is due to faulty leg conformation. The hind legs as viewed from the rear show the hocks very close together and the feet in a toe-out position. The horse is said to be cow-hocked. Prepare and level the feet. Select

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extra light shoes and convert them into lateral-extension-toe shoes with trailers on the outside branches (no calks). The shoes are made and fitted with the lateral extension at the inner portion of the toe. The inside branches of the shoe are fitted close from the bend of the quarters to the buttresses, and are hot-rasped and finished smooth. The trailer should be ½ or ¾ inch in length. This type of shoe, when properly adjusted, will balance the foot and reduce the inward swing of the foot in flight.

68. Paddling and corrective shoeing.—*a. General.*—Paddling is an irregularity in gait in which the front feet and legs are carried with an outward swing in the backward and forward extensions. The swing is most pronounced in the backward extension. The feet break over the outside portion of the toe in leaving the ground, and the outside half of the foot is carried with the greater elevation. The horseshoer may correct this irregularity in the young undeveloped horse, but little can be done to correct the fault if the horse has reached maturity with developed muscles and confirmed gaits.

b. Causes.—Paddling is common in the riding horse during the period of development and training, regardless of leg conformation. At this period, paddling is caused by undeveloped muscles, fatigue, not being accustomed to carrying weight, and not being confirmed in his gaits. A horse with a toe-in standing of the feet will naturally travel with a lateral swing of the feet and legs. A young horse that is worked on the longe at the trot, and particularly on a tight longeing rein that keeps the head to the inside of the circle, invariably acquires the habit of paddling, and will continue the fault even when traveling on a straight course.

c. Correction.—(1) For correcting paddling in the gait of the young horse with good leg conformation, use a lightweight square-toe shoe. The toe of the shoe is set even with the border of the wall at the point of the toe. This type of shoe will afford lateral support and induce a proper pointing of the foot at the moment of breaking over and starting in flight.

(2) To reduce the extent of the lateral swing of the front feet of a horse that has a toe-in pastern conformation, the horseshoer must endeavor to reduce the elevation of the stride and induce the feet to break over at the center of the toe. Increased elevation of the feet in flight increases the extent of the lateral swing. A long toe or hoof of considerable size reduces the rapidity with which the foot breaks over. Prepare and level the feet, leaving more hoof than for normal shoeing, and shoe with lateral-extension-toe shoes as described for toe-out in front, but fitted on the reverse diagonal of the feet; that is,

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fitted full on the outside branch from the toe to the second nail hole and close from that point back to the heel. The inside branch of the shoe is fitted close at the toe and full from the bend of the quarter back to the heel. The extension of the shoe at the outside portion of the toe causes a straight-forward breaking over of the feet. The greater length of wall increases the ground surface of the foot, retarding the breaking over of the foot and diminishing the elevation of the stride, with a consequent lessening of the lateral swing.

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CHAPTER 3

CARE OF FEET, FIELD EXPEDIENTS, AND PRACTICAL SUGGESTIONS

Paragraphs
SECTION I. Care of feet between shoeing periods 69–72
II. Care of feet of unshod horses 73–76
III. Field expedients and practical suggestions 77–83

SECTION I

CARE OF FEET BETWEEN SHOEING PERIODS

Paragraphs
General 69
Keeping feet healthy 70
Shoeing records and inspections 71
Inspection of feet during grooming 72

69. General.—The old adage "An ounce of prevention is worth a pound of cure" is peculiarly fitting to the care of horses' feet. In the interval between shoeing periods, strict attention from stable attendants and close supervision by the organization commander to the care of the feet will prevent many of the most common foot disorders.

70. Keeping feet healthy.—To maintain the health of the feet and counteract the effects of shoeing, the horn structures must be kept in a natural state of elasticity and the horny frog kept free from thrush.

a. Moisture in hoof.—When horses are kept stabled, or where the ground over which they work is hard and dry, the horny structures of the hoof are deprived of the moisture they would receive in a natural state. Under these conditions the moisture supplied by the blood is insufficient to keep the foot in a normal condition. If nothing is done to remedy this situation, the hoof rapidly hardens and becomes inelastic; the quarters and heels contract, resulting in corns; and the horny frog wastes away.

b. Methods of keeping foot moist.—(1) Before putting the horses in their stalls for the night, clean and pack the front feet (of such horses as require it) with moist white rock or clay. The white rock or clay is packed in to fill the space over the horny frog and sole. Because of its porous nature, the horny frog and sole absorb

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the moisture in the white rock or clay. Satisfactory results can be obtained by having a clay stand adjacent to the stables. Leading horses through this clay stand, prior to tying-in, will fill the hoofs with moist clay that will generally remain in the feet until all the moisture has been absorbed from the clay. The clay stand can also be used advantageously for reducing heat or fever in the feet.

(2) Under normal, dry conditions moisture will evaporate from the hoofs. Oil of tar applied to the horny sole, frog, and walls will largely eliminate this evaporation. Oil of tar can best be applied with a short, stiff-bristled brush. In freezing temperatures, the use of oil of tar is preferable to packing the feet. The condition of the feet dictates the frequency of the use of oil of tar or packing. The objective to keep in mind is to obtain and maintain a healthy, resilient foot by the most practical method.

71. Shoeing records and inspections.—A shoeing record should be kept at each stable and should show the date on which each horse was last shod. This record is an aid to the organization commander in inspecting shoeing but must not be followed blindly. The length of time between shoeings is governed by the rapidity of the growth of horn, by the wear of the shoe, and by the general condition of the foot. The feet of some horses grow more rapidly than the feet of others. Consequently, these horses will need shoeing more often than the horses with slow-growing feet. The time intervals between shoeings for a given horse are not constant. Climatic conditions, the care the feet receive, and the nature and amount of work given the horse influence the time intervals between shoeings. The organization commander should inspect the feet regularly. His inspection should include the following conditions: balance of the feet, length of the hoofs, outline of the shoes, security of nailing and clinching, evidence of interfering, and general condition. A written memorandum should be made of the horses to be shod before the next inspection. This memorandum should include any changes in the type of shoeing of each animal. This is necessary because structural changes in the feet that will require a different type of shoe may have taken place since the last shoeing.

72. Inspection of feet during grooming.—During grooming, the feet should be carefully cleaned to remove any filth that may have accumulated around the horny frog and over the horny sole. Care must be exercised during this cleaning not to inflict bruises or injuries with the pick. At this same time, the foot should be examined for evidences of injury, such as nails lodged in the horny frog or sole or a stone lodged between the branch of the shoe and

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the frog. Note the softness of the horny frog—in health it has about the consistency of rubber; observe the condition of the shoe, its wear, position on the foot, the security of nailing, and the smoothness of the clinches; and examine the inner part of the legs for evidence of interfering.

SECTION II

CARE OF FEET OF UNSHOD HORSES

	Paragraph
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Preparing feet	75
Care of feet in pasture	76

73. General.—The importance of preparing the feet of horses that are to run unshod is generally underestimated. After the shoes are removed, it is imperative that the feet are balanced and the border of the wall well rounded. This preparation requires skill but insures even wear on the horn structures and prevents excessive breaking away of the wall.

74. When shoes are removed.—If horses remain shod for long periods, the horn fibers in the hoof become less elastic and break down easily. This condition is indicated most noticeably on the surface of the foot, where the wall breaks away to the height of the nail holes, and on the horny frog, which diminishes in size. If conditions permit, it is advisable to allow a horse to run without shoes for a period of 2 or 3 months out of the year.

a. When the shoes are removed from the feet of horses that have been constantly shod for a period of a year or longer, the hoof breaks away badly during the first few weeks. This breaking away may cause lameness. The lameness caused by breaking and wearing away of the hoof is not serious and will gradually disappear as the new horn accumulates. The sensitive sole may become bruised and discolored, but this also will soon disappear leaving no ill effects.

b. While the hoof is bruised or tender the horse is less inclined to race and run about the pasture. On the contrary the horse will probably move about slowly, taking care to select soft footing.

c. During their first few days in pasture, horses are inclined to roll and run. Most satisfactory results may be obtained by leaving the front feet shod during this initial period. When pastures are rough and rocky, the front feet should remain shod for a few days. Leaving the front shoes on during these days protects the feet from excessive wear and breakage. After the horses are accustomed to being in pasture, the shoes should be pulled and the feet trimmed.

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75. Preparing feet.—To prepare the feet of horses that are to go unshod, it is necessary to leave a greater amount of horn on the hoof than in the case of reshoeing. The dead horn on the sole must not be cut away but allowed to remain to counteract the greater wearing away of the hoof. The wall must be trimmed to effect balance, and the outer border of the bearing surface must be well rounded.

76. Care of feet in pasture.—Horses running without shoes require careful and frequent attention. The feet must be carefully examined each week for broken edges and loss of balance. Such irregularities as appear should be corrected. Healthy feet in normal condition can stand much wear, and if properly trimmed can remain unshod for extended periods, provided the horse is not worked continuously over hard-surfaced roads.

SECTION III

FIELD EXPEDIENTS AND PRACTICAL SUGGESTIONS

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To sharpen rasp	79
To obtain speed in shoeing	80
Shoeing young horses	81
Shoeing refractory horses	82
Shoeing vicious horses	83

77. General.—Many situations arise, both in the field and in garrison, that require forethought and resourcefulness on the part of the horseshoer. This section concerns itself with suggestions to the horseshoer that will enable him to perform his duties more efficiently.

78. In the field.—When the horseshoer takes the field his shoeing equipment is usually limited and may at times be reduced to practically nothing. Since he must keep his horses shod under such circumstances, the shoer must exercise his initiative and ingenuity and utilize any and all implements at hand. It may be stated briefly that he can accomplish it by one means or another. If a forge is lacking, the fire can be built on the ground. Wood, corncobs, or practically any kind of inflammable material can be used instead of coal to produce a cherry-red heat which is sufficient for shaping the shoe. In place of an anvil, a piece of iron pipe or steel rail, or even a block of wood, can be used. Wire cutters can be substituted for the pincers, the shoeing knife for the rasp, and a horseshoe for a clinching block. Any hammer can be substituted for the driving hammer.

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A complete job of shoeing can be done cold if the heels have been precut.

a. Preparing for field.—When the horseshoer first anticipates field service, he can do much to make his job easier in the field. He should prefit the shoes that are to be carried into the field—prefitting means rounding the toes somewhat, opening the nail holes to the correct size for the nails that are to be used, and cutting off and partially finishing the heels.

(1) Cutting off the heels is especially important before taking the field. The issue shoe when fitted as a plate shoe has an average excess length of about 1 inch in each branch. This excess length of metal weighs about 2 ounces per pair of shoes. This method eliminates the need for some of the shoeing tools of bulk and weight and greatly expedites the actual shoeing in the field.

(2) If there are facilities for treating the shoes with borium, the ratio of service wear to number of pounds is increased about three to one.

b. Nails.—Horseshoe nails, if exposed to a damp atmosphere, are most susceptible to rust and corrosion. To prevent the nails from becoming unserviceable in the field, they should be wrapped in a cloth saturated with oil and packed in a watertight container.

79. To sharpen rasp.—Resharpening the rasp is an economical measure and one that greatly prolongs its usefulness. The ability to resharpen the rasp is particularly desirable in field service where supply is difficult. The following method may be used: Remove the temper from the teeth on the coarse side by holding this side of the rasp down and placing it over the fire above the coals. When the teeth commence to show color, remove the rasp from the fire and allow it to cool slowly. When it cools, place the rasp in the vise with the coarse side up. With an 8-inch three-cornered saw file, point the teeth by running the file right-angled across the rasp, first on the front side of the teeth and then on the back of the teeth. When the filing has been completed, reheat the teeth to a cherry-red heat, holding the rasp above the fire with the coarse side down, and cool quickly by immersing the rasp in water.

80. To obtain speed in shoeing.—When the horseshoer has mastered the fundamentals of shoeing and has become reasonably skilled in his work, the following method will effect an economy of his time and labor: The work is divided into four distinct operations—preparation of the feet, fitting the shoes, nailing, and clinching. Each operation is taken up in order and is completed for all four feet before the next is begun. When fitting the shoes, it is best to heat two at

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a time—fronts first and then hinds. When each shoe is fitted, it should be marked with the hammer so that it may be promptly recognized later. If the horseshoer fits one shoe at a time and then nails it on the hoof, he will find the fire is down and the time necessary to rebuild the fire has been lost.

81. Shoeing young horses.—*a.* (1) The first step should be to teach the young horse that raising his foot will do him no harm. This lesson should be given at the first grooming. The prescribed methods of raising the forefoot and the hind foot should be thoroughly understood by all enlisted men and should be part of the instruction of every recruit. When the young horse surrenders his foot, lower it again quietly and pat him. Later use the horse brush on the soles of his feet. Next tap the soles lightly with the currycomb. Finally, take the shoer's position and go through the same steps. This complete instruction may be a matter of a day or of many days, depending upon the animal's disposition, but it should not be slighted or hurried.

(2) The following method is recommended for young horses that are disposed to kick when their hind legs are first handled: The horse is equipped with a cavesson which is held by the animal's trainer. A surcingle is placed around the girth. The man that grooms the horse takes hold of the surcingle with the inside hand in order to move with the horse and avoid injury. With the outside hand he strokes the haunches and legs, gradually working downward. In the meantime the trainer pats the horse on the neck, but corrects him sharply with the cavesson whenever he displays temper. This method is almost invariably successful.

b. The second step is to let the young horse grow accustomed to the shop. While the horseshoer is at work on a quiet horse, the young horse should be led into the shop and held by the man who has been grooming him and raising his feet. The animal should not be tied nor should he be held by any other man than the one he knows and trusts. When the animal shows neither timidity nor excitement the shoer begins work on the feet. Frequently the removal of the surplus growth of horn is all that can be accomplished without excitement or resistance. At the first sign of either, work for that day should be abandoned and the horse removed from the shop. The shock of the hammer is conveyed to the joints of the pastern bones, and the green horse, startled thereby, will struggle to free his foot. The shoer can usually handle the forefoot unassisted. If a good helper holds the hind leg in a comfortable position on his thigh and holds the hoof firmly with both hands, the shoer can work with more certainty,

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the shocks of nail driving will be taken up to a great extent in the helper's wrists and arms, and the horse will stand quietly. Patient quiet work will eventually succeed, and thereafter each shoeing is more easily completed.

82. Shoeing refractory horses.—Most horses that may be classed as refractory in shoeing have been brought to this condition by improper handling when green and unaccustomed to the sights and sounds of a shoeing shop. To shoe the horse that has been spoiled by poor handling, or one that has a naturally mean disposition, some form of restraint is required. A simple method which is very effective in restraining refractory horses is as follows:

a. Means.—(1) *Cuff.*—A strap of double thickness of leather 18 inches long and 1½ inches wide is sewed to a D-ring 3 inches long

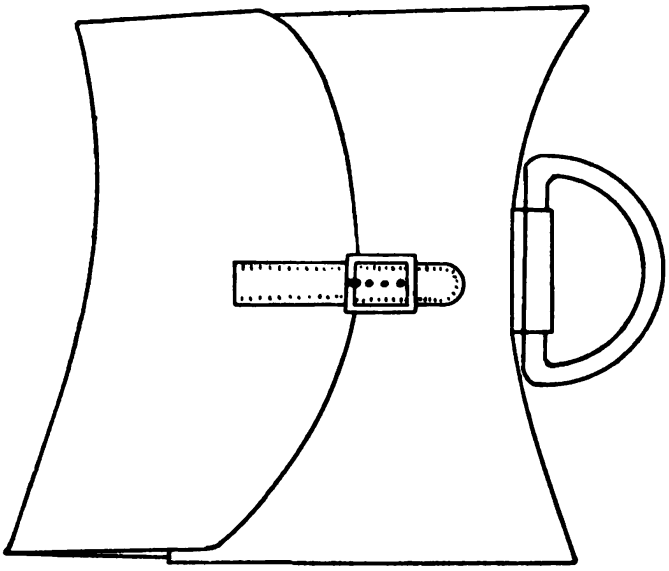


FIGURE 83.—Cuff.

made of ⅜-inch round iron. A piece of thin leather 9 inches long and 3 inches wide is sewed on the inside of the strap next to the D-ring; a buckle and keeper are sewed on the outside of the strap.

(2) *Surcingle.*—Two 3-inch rings are sewed on the outside of the surcingle, and are so placed that when the surcingle is adjusted the rings will hang down about midway on each side of the horse. A rope ¾ inch in diameter and about 20 feet long is also used.

b. Procedure.—(1) *To raise a forefoot.*—Strap the cuff around the pastern, the ring above the heels. Pass one end of the rope through the ring and tie a half-hitch. The other end of the rope is passed through the ring in the surcingle on the side on which the foot is to be raised; gently flex the knee, raising the foot, and at the

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same time taking in the slack of the rope. When the foot is in position for shoeing, make the rope fast in the ring; or if a helper is available let him hold the rope without making it fast. In case the rope is tied to the ring, the knot should be one that can be easily untied in case the horse should throw himself.

(2) *To raise a hind foot.*—Strap the cuff around the pastern, the ring above the heels. Draw the horse's tail to one side and make a loop in it; fasten one end of the rope in the loop by a "single sheet bend." Pass the other end of the rope through the D-ring on the

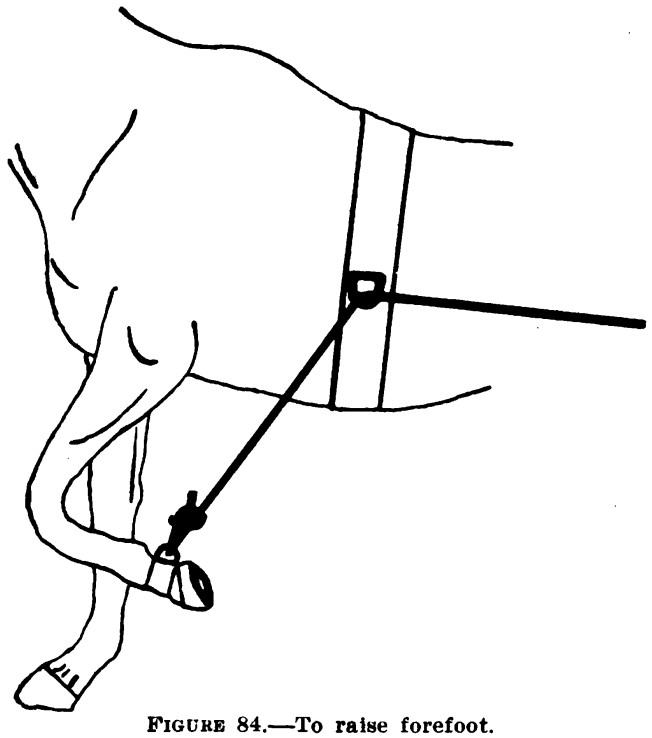


FIGURE 84.—To raise forefoot.

cuff and draw it to the rear. The rope is held by an attendant or is made fast to some convenient place and tied in such a manner that it can be untied quickly and easily.

83. Shoeing vicious horses.—When a horse is so vicious that it is dangerous to shoe unless he is rendered helpless, either of two methods can be used. One is to put him in the shoeing stocks; the other is to throw him and tie him down. The latter method is a last resort and should be used only when gentler methods have been tried and proven unsatisfactory, and then only under the direction and supervision of the veterinarian.

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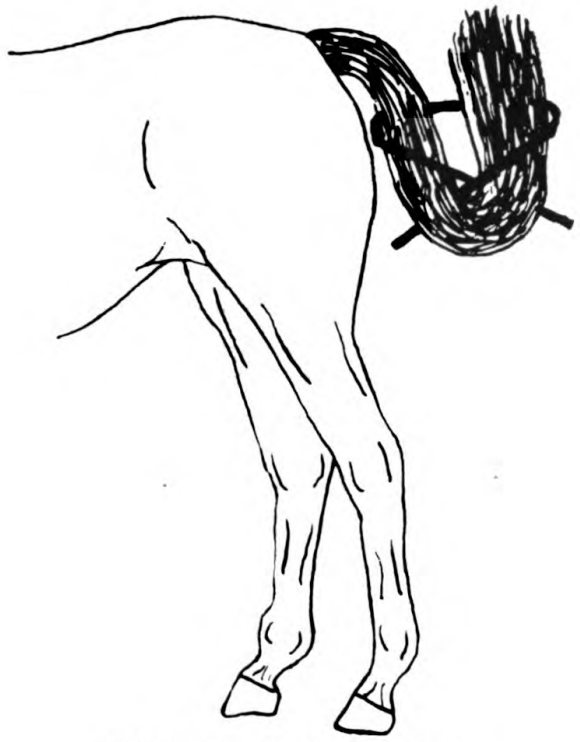


FIGURE 85.—Single sheet bend.

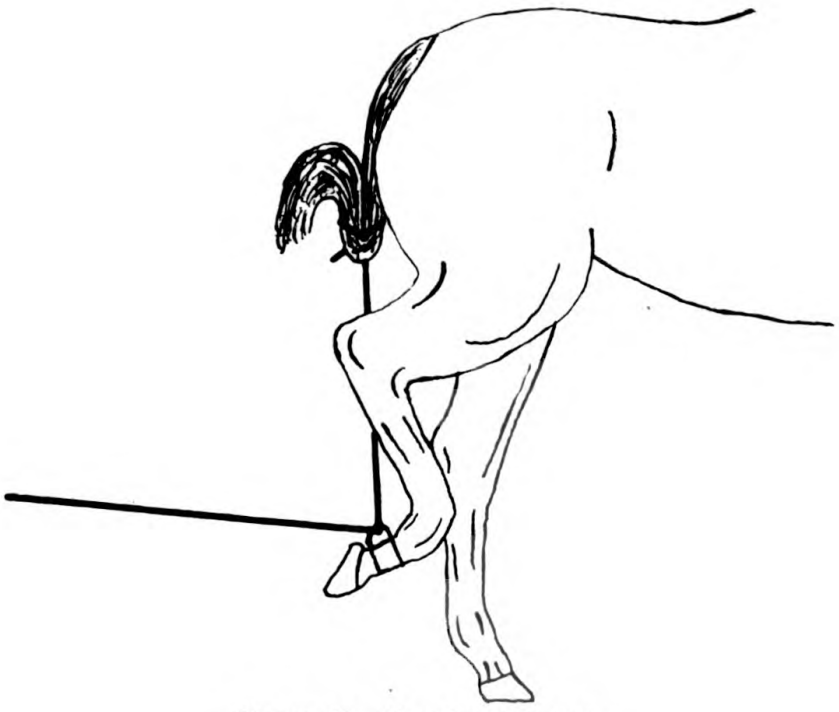


FIGURE 86.—To raise hind foot.

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APPENDIX

HORSESHOER'S CATECHISM

		Questions
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II.	Normal shoeing	38–65
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SECTION I

ANATOMY OF FOOT

1. *Q.* Why must the horseshoer know the anatomy of the feet and legs of the horse? *A.* Knowledge of anatomy of the horse, and particularly that of the feet and legs, is the key that reveals the fundamentals of correct shoeing.

2. *Q.* What is the nature of the foot structures? *A.* The structures consist of bone, cartilage, ligaments, tendons, fatty tissue, highly sensitive flesh, horn, blood vessels, and nerves.

3. *Q.* Name the bones of the pastern and foot. *A.* Long pastern bone, short pastern bone, coffin bone, and navicular bone.

4. *Q.* What are the general functions of the bones? *A.* The bones form the framework upon which the other structures are built and are so contructed as to permit articulation (movement).

5. *Q.* What elastic cartilages are found in the foot structures? *A.* The lateral cartilages attached to either side of the coffin bone.

6. *Q.* What is the function of the lateral cartilages? *A.* The lateral cartilages assist in the expansion and contraction of the foot.

7. *Q.* What are the principal tendons of the pastern and foot? *A.* The extensor tendon and flexor tendons.

8. *Q.* What are the general functions of the tendons? *A.* To assist and control the movement of the bones where they meet in the joints.

9. *Q.* What is the function of the extensor tendon? *A.* To straighten and extend the leg.

10. *Q.* What is the function of the flexor tendons? *A.* To flex or bend the leg.

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11. *Q.* What is the structure called the plantar cushion? *A.* The plantar cushion is composed of elastic fibrous tissue, corresponding to the horny frog in shape.

12. *Q.* Where is the plantar cushion located? *A.* In the rear part of the foot between the wings of the coffin bone and lateral cartilages on the side, the flexor tendon above, and the sensitive frog below.

13. *Q.* What are the functions of the plantar cushion? *A.* The plantar cushion assists largely in reducing the shock on the foot structures when the horse is in motion, and assists in stimulating the circulation of blood throughout the foot.

14. *Q.* What are the lateral cartilages? *A.* The lateral cartilages are irregular plates of gristle.

15. *Q.* Where are the lateral cartilages located? *A.* The lateral cartilages are attached to the wings of the coffin bone and extend backward and upward so that the upper borders extend above the coronet.

16. *Q.* Name the highly sensitive structures. *A.* The perioplic ring, coronary band, sensitive laminae, sensitive sole, and sensitive frog.

17. *Q.* What is the general function of the sensitive structures? *A.* The sensitive structures secrete (grow) the horn structures.

18. *Q.* What horn structure is grown from the perioplic ring? *A.* The periople (outer covering of the wall).

19. *Q.* What horn structure is grown from the coronary band? *A.* The wall proper, or middle layer of the horn of the wall.

20. *Q.* What horn structure is grown from the sensitive laminae? *A.* The horny laminae (inner layer of horn of the wall).

21. *Q.* What horn structure is grown from the sensitive sole? *A.* The horny sole.

22. *Q.* What horn structure is grown from the sensitive frog? *A.* The horny sole.

23. *Q.* Name the different parts of the hoof. *A.* Wall, sole, and frog.

24. *Q.* Are the horn structures of the healthy hoof elastic? *A.* Yes. They are not, however, classed as elastic structures.

25. *Q.* What gives the elasticity to the horn structures? *A.* The elasticity of the horn structures is furnished by moisture from the blood and moisture absorbed by the horn structures when in contact with damp clay or while standing in water.

26. *Q.* What is the importance of maintaining elasticity in the horn structures? *A.* To maintain the strength of those structures, to resist better the effects of concussion, and to avoid contraction of the quarters and heels.

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27. *Q.* What is the function of the horny frog? *A.* The horny frog assists the plantar cushion and lateral cartilages in performing their functions.

28. *Q.* Are the various horn structures in the healthy hoof firmly united? *A.* Yes.

29. *Q.* How is the outer border of the horny sole united to the inner lower border of the wall? *A.* The horny sole is united to the wall by a narrow ring of soft, light-colored horn called the white line.

30. *Q.* What is the buttress of the foot? *A.* The buttress is that part of the wall at the heel where it bends abruptly inward and forward.

31. *Q.* What are the bars of the hoof? *A.* The bars are a continuation of the wall, extending from the buttress to a place near the point of the frog.

32. *Q.* What is the function of the bars? *A.* The bars strengthen the wall at the heels and act as a governor to regulate the expansion and contraction of the foot.

33. *Q.* What harm may result in cutting away the bars, when preparing the foot for the shoe? *A.* Cutting away the bars weakens the wall and makes the hoof susceptible to abnormal contraction.

34. *Q.* What is meant by expansion of the foot? *A.* The foot spreads (widens) at the quarters and heels when the weight of the body is thrown forcibly upon the foot structures.

35. *Q.* What structures, in addition to the elastic structures, assist in reducing the concussion on the foot when the horse is in motion? *A.* The suspensory ligament, the attachment of the coffin bone to the inner surface of the wall (the coffin bone being suspended from the wall as in a sling), the elasticity of the horn structures, and the vast amount of blood in the foot and the arrangement of the blood vessels. All parts of the foot work together for a common cause, namely, to counteract the effects of concussion.

36. *Q.* How is the blood supplied to the foot? *A.* Blood is supplied to the foot by the heart. It is carried by blood vessels called arteries.

37. *Q.* How is the blood carried from the foot back to the heart? *A.* The blood is carried from the foot back to the heart by blood vessels called veins.

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SECTION II

NORMAL SHOEING

38. *Q.* What are the fundamentals of correct shoeing? *A.* (1) Balance the feet laterally from toe to heel.

(2) Leave sufficient wall and sole properly to protect the inner structures of the hoof.

(3) Fit the shoes so as to maintain the balance of the feet and permit the hoof to function freely.

(4) Secure the shoes firmly to the feet with minimum damage to the wall.

39. *Q.* What is meant by normal shoeing? *A.* The shoeing of a horse with sound feet, good leg conformation, and correct gaits.

40. *Q.* What care should the feet receive between shoeings? *A.* The feet should be cleaned each day in order to remove manure and other filth that may have accumulated over the sole and around the frog. They should be carefully inspected for nails or evidence of puncture or other injuries, to see that the horny frog is soft and free from thrush, that the shoes are secure and the clinches smooth, and that the legs show no evidence of interfering. Modern methods of stabling, together with the practice of working animals on hard-surfaced roads, require that, in order to maintain the normal elasticity of the structures, moisture be furnished to the horny structures of the foot. This is particularly essential during dry weather. Evidence of need of moisture is characterized by dryness of the horny frog. When the horny frog becomes hard and inelastic, the remaining horn structures are likewise in need of moisture.

41. *Q.* What methods are used for supplying moisture to the horn structures? *A.* Pack the feet with moist clay or white rock; apply cold water packs to the feet, or stand the animal in moist clay, or in water.

42. *Q.* How often should the horse be reshod? *A.* The shoeing periods are governed by the rapidity of the growth of the wall, the wear of the shoe, and the character of work done by the animal. Normally shoes remain on the feet from 3 to 6 weeks.

43. *Q.* What conditions of the feet and shoes would warrant reshoeing? *A.* The horse should be reshod if one or more of the following irregularities are present: excessive growth of horn which materially affects the balance of the feet or the natural functions of the various parts of the feet; loose or worn shoes; stumbling or interfering.

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44. *Q.* What is the effect of too great a length of wall at the toe? *A.* Too great a length of wall at the toe increases the strain on the flexor tendons, causes a retarded breaking over of the foot, and consequently a decreased elevation of the stride. These things may result in strained tendons, stumbling, and forging.

45. *Q.* What is the effect of too great a length of wall at the heels (heels too high)? *A.* Heels which are too high raise the frog so far from the ground that it does not perform its work. This results in greater concussion on the foot, a decreased blood supply to the structures of the foot, a wasting away of the horny frog, and contraction of the quarters and heels. This unbalanced condition of the foot from toe to heel may result in stumbling.

46. *Q.* What is the effect of lateral unbalance of the feet, such as front feet broken in? *A.* This condition causes an uneven distribution of the weight of the animal on the foot structures, faulty breaking over of the feet, and susceptibility to interfering, enlargement of the fetlock joints, contraction of the inside quarters and heels, corns, and strained ligaments and tendons.

47. *Q.* What preliminary examination should be made before shoeing a horse? *A. First*, examine the horse to determine whether he has any faults in his gait. *Second*, examine the condition of the feet to determine the type of shoe best suited to this particular horse. *Third*, ask yourself the following questions: Are the feet normal or abnormal? Are the feet balanced? Are the corresponding feet the same size? *Fourth*, note the general conformation of the horse, the conformation of the legs, the position of the feet in relation to the legs, the amount of surplus horn to be removed, and the position and wear of the old shoe.

48. *Q.* Why should the clinches be cut or straightened before removing a shoe? *A.* The clinches should be cut in order to avoid breaking away the wall while removing the shoe.

49 *Q.* How may the horseshoer determine the amount of surplus wall that may be removed with safety when preparing the foot for the shoe? *A.* The amount of surplus wall that may be removed with safety when preparing the foot for the shoe is governed by uncovering the live horn over the white line and by not cutting away the wall beyond this point.

50. *Q.* What is the difference between dead and live horn? *A.* Live horn is tough and pliable, whereas the dead horn is flaky and brittle and crumbles away easily at the touch of the knife.

51. *Q.* What is the best method to follow in removing surplus growth of wall? *A.* First, remove that part of the wall where the

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greatest amount is to be cut away, in order to effect balance of the foot, and then cut away a like amount of horn over the entire surface. This effects and maintains balance of the foot.

52. *Q.* Of what particular advantage is the use of the foot gage? *A.* The foot gage is used to insure the same length of feet and the same angle of wall on corresponding feet. This enables the shoer to prepare the feet with a greater degree of accuracy than is possible when only the eye is used to estimate these measurements.

53. *Q.* How are the level and balance of the foot determined? *A.* The level of the foot is determined by raising the foot and sighting over the bearing surface from the buttress to the toe on one side to see if any irregularities appear, then examining the other side in a like manner, comparing the two sides collectively, to see if they are in the same plane. To determine the balance of the feet, stand the horse on a level surface in such a position as to distribute the weight of the body equally on the four legs. The foot should be in such position in relation to the leg, and, viewed from the front, in such prolongation to the column of leg bones, that the weight borne by the leg is equally distributed over the entire foot. When viewed from the side, the slope of the wall from the coronet to the toe should correspond to the slope of the pastern (parallel).

54. *Q.* What is the importance of having the corresponding feet the same size? *A.* The corresponding feet must be the same size in order to maintain equal rapidity in breaking over and leaving the ground, and to induce the same elevation and length of stride during flight.

55. *Q.* If one foot is naturally larger than its mate, which foot should be prepared first when reshoeing? *A.* The larger foot should be prepared first, in order to insure equal length of toes and height of heels when both feet are prepared. After the larger foot has been prepared, the preparation of the smaller is governed by the length of toe and height of heel of the larger foot.

56. *Q.* What particular care must be exercised in preparing a flat or flaring foot for the shoe? *A.* Care must be exercised in the use of the knife. Very little if any cutting is done. Care must be exercised in the amount of wall removed from the bearing surface and in the concaving of the upper inner surface of the shoe. The flat foot has little, if any, dead scales of horn covering its lower surface; consequently the thickness of horn is barely sufficient to protect the sensitive sole from being bruised. Care must be taken, therefore, in the amount of wall removed in order to maintain a proper bearing

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surface for the shoe, and the shoe must be well concaved on the upper inner surface to avoid resting on the horny sole.

57. *Q.* Why is it advisable to remove a portion of the outer lower border of the wall around the toe, when preparing the flat or flare foot for the issue shoe? *A.* This is done in order to permit the nail to enter the hoof at the outer border of the white line when securing the shoe to the foot. The position of the nail holes in the issue shoe does not conform to the position of the white line. The width of the bearing surface of the wall around the toe is greater (width from the white line to the outer edge of the wall) than the width of the bearing surface of the shoe (width from the nail holes to the outer border of the shoe).

58. *Q.* What damage to the wall may result when fitting and securing the issue shoe to the natural outline of the flat or flare foot? *A.* The nail entering the wall at any position outside the soft horn fibers bordering the white line will result in the destruction of the wall to the height the nails are driven. There will be greater difficulty in driving the nails, insecure nailing, and loose or cast shoes.

59. *Q.* Why should the nails enter the outer border of the white line in securing the shoe to the foot? *A.* The nails should enter the hoof at the extreme outer border of the white line in order to insure maximum security of nailing and minimum damage to the horn fibers of the wall, to eliminate pricking (driving the nail into, or too close to, the sensitive structures), and to avoid loose or cast shoes. The horn fibers of the inner surface of the wall are soft and flexible, yielding to the passage of the nail without seriously separating the union of the horn fibers, which may cause cracks in the outer surface of the wall.

60. *Q.* What guide should be used in the selection of the shoe for the foot? *A.* The correct size shoe for the foot is determined by the position of the nail holes in the shoe in relation to the wall where it bends inward from the quarters to the buttresses. Select the lightest shoe in which the nail holes nearest the heel are approximately at the bend of the quarters (widest part of the foot) when the shoe is placed on the foot, and which will give a reasonable length of service as estimated from the conformation of the horse and the work he is to perform, and will furnish proper protection to the hoof.

61. *Q.* Why is it advisable to use the plate shoe whenever the condition of the footing will permit? *A.* The plate shoe affords greater freedom of action and interferes to a minimum degree with the functions of the foot structures, as compared with calked shoes. Shoes when attached to the feet interfere somewhat with the free functioning

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of the foot structures. The plate shoe is the nearest approach to nature, as it gives protection to the horn structures against breaking and wearing away.

62. *Q.* What importance is attached to the opening of the nail holes in the shoe? *A.* The serviceability of the shoeing depends largely on having the nail holes opened at the correct angle and of proper size and shape. In order to secure the shoe firmly to the wall with a minimum of damage, the nail holes must be opened at an angle to conform to the angle of the wall at the point where the nail enters the wall. The holes must conform in size and shape to the shank of the nail used. The nail must fit the hole in the shoe snugly, or the shoe becomes loose or cast in a short time.

63. *Q.* How should the shoe be outlined at the toe? *A.* The shoe should be outlined to conform with the outer edge of the wall from the bend of the quarter on the one side around the toe to the bend of the quarter on the other side. The shoe should be further outlined with sufficient fullness (rounding) at the sides of the toe near the point to afford lateral support to the foot at the moment of breaking over, irrespective of the outline of the wall at this point.

64. *Q.* How should the shoe be outlined from the bend of the quarter to the heel? *A.* From the bend of the the quarter to the heel the shoe should extend beyond the outline of the wall a sufficient distance to allow for the natural expansion of the heels and for the growth of horn between shoeings.

65. *Q.* What governs the width and length of the shoe at heels? *A.* The heels of the shoe should be of sufficient width to cover the buttresses and extend to a point even with the bulbs of the frog for the plate shoe and a trifle further when calks are used. The heels should be well finished and smooth to prevent cutting the horse, and shaped in such a manner as to permit cleaning out the foot around the horny frog.

SECTION III

SHOEING TO RELIEVE OR CORRECT DISORDERS OF FOOT

66. *Q.* What are the essentials of locating foot lameness? *A.* A knowledge of the construction of the foot, the functions of the various parts, and the characteristic symptoms that accompany each disorder.

67. *Q.* What are the symptoms of disorders of the feet? *A.* A hard and dry condition of the horn structures; the horny frog emit-

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ting a foul odor; contraction of the quarters and heels; discoloration of the horny sole at the junction of the wall and bars; nonflexible condition of the upper section of the lateral cartilages; temperature of the foot above normal; short, "peggy" gait; the horse when standing, "pointing" (advancing for resting) first one foot and then the other; lameness at the walk or trot.

68. *Q.* What are the causes of hard and dry hoofs? *A.* Modern methods of stabling; dry weather; hard and dry footing over which the horse is worked; concussion; failure to supply moisture to the horn structures in an artificial way.

69. *Q.* How is it determined that the horn structures are in need of moisture? *A.* By the condition of the horny frog. When the horny frog has lost its natural elasticity, it is in need of moisture, and the wall and sole are likewise in need of moisture. The flexibility of the horny frog indicates the elasticity of the remaining horn structures.

70. *Q.* What are the results of failing to furnish moisture to the horn structures when needed? *A.* Malformation of the hoofs, such as contraction followed by deterioration of the horny frog; increased concussion on the foot structures; retarded growth of horn; cracks in the wall of the hoof; insecure nailing of the shoe; corns and other internal disorders of the feet.

71. *Q.* What is meant by contraction of the quarters and heels? *A.* Contraction of the quarters and heels is a condition in which the hoof becomes narrower at the heels, and the space is reduced between the buttresses which is normally filled by a healthy frog.

72. *Q.* What corrective method of shoeing to overcome contraction of the heels may be accomplished by a shoer of average skill? *A.* By the use of the beveled-edge shoe. The beveled-edge shoe is simple in construction and very effective in expanding the heels, and may be applied successfully by a shoer of no great skill.

73. *Q.* What are corns? *A.* Corns are the result of bruises to the sensitive laminae and sensitive sole.

74. *Q.* Give the classification of corns. *A.* Dry corns and suppurating corns.

75. *Q.* What are the causes of corns? *A.* Contraction of the heels; excessive concussion; removing too much wall at the heels; continued use of open calked shoes; lack of frog pressure; accidental blows upon the wall at the quarters of the hoof.

76. *Q.* What are the symptoms of corns? *A.* Lameness or a shortened gait; fever in the foot; "pointing" of the affected foot;

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discoloration of horn at the angle formed by the wall and bar; pus formation (which may or may not be present).

77. *Q.* If a corn is in a suppurating condition, what treatment is necessary before the horse is ready for shoeing? *A.* All pus formation must be stopped, and inflammation must be reduced before the foot is ready for shoeing.

78. *Q.* What is the best method of shoeing in case only the sensitive sole is bruised? *A.* Prepare the foot as for normal shoeing, followed by cutting away the bearing surface over the affected area, and shoe with a bar shoe. Leather pads, tar and oakum, may be used in conjunction with the shoe if desired.

79. *Q.* What are the principal functions of the bar shoe? *A.* Frog pressure, which increases the circulation of blood in the foot, additional bearing surface (that of the horny frog), and greater strength of the shoe by welding the open ends together.

80. *Q.* What is meant by relieving pressure? *A.* Cutting away the weight bearing surface of the wall in such a way as to avoid contact with the shoe at a specified point.

81. *Q.* Give method of shoeing for temporary relief of a corn. *A.* A plate shoe may be used with a fair degree of success in relieving corns. Normal preparation of the foot, followed by cutting away the bearing surface of the wall over the area of the corn. The shoe should be fitted normally. The branch of the shoe which is not supported is likely to bend and contact the wall over the affected area within 2 weeks' time, resulting in a recurrence of lameness.

82. *Q.* Why are corns confined principally to the front feet and rarely found in the hind feet? *A.* The concussion is greater on the front feet than on the hind, as the front feet carry more of the body's weight when the horse is in motion. Also, the horn structures of the front feet are more susceptible to becoming hard and dry than the hind, as the horn structures of the hind feet receive considerable moisture from the droppings when the horse is standing in the stall.

83. *Q.* Give two forms of nail pricking. *A. First*, the nail enters the sensitive structures of the foot while the shoer is securing the shoe to the foot. *Second*, the nail in its course through the wall is driven so near the sensitive structures as to cause pressure on them by a bulging of the inner layer of horn.

84. *Q.* What precaution should be taken to avoid infection in case of a nail prick? *A.* Remove the nail, apply tincture of iodine to the nail hole, and report the animal to the veterinarian at once for further treatment.

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SECTION IV

SHOEING TO CORRECT FAULTS IN GAITS

85. *Q.* Define a balanced gait. *A.* A balanced gait means that the feet and legs move in alinement with the body without lateral swing; that there is clearance between front and hind feet in action, and that there is sufficient elevation to clear the ground properly in the forward extension of the feet.

86. *Q.* What features in the conformation of the riding horse are essential to give him a balanced gait? *A.* Conformation as viewed from the front: chest of good width; legs straight; feet in alinement with the body (pointing straight to the front). Conformation as viewed from the side: chest of good depth; body of fair length and well ribbed; neck fair length, set properly on the shoulder, and head carried erect; legs strong and set perpendicular to the body. Conformation as viewed from the rear: buttocks well muscled; legs straight and in alinement with the body.

87. *Q.* Name the most common faults in the gait of the riding horse. *A.* Interfering, stumbling, and forging.

88. *Q.* What are the general causes of faulty gaits? *A.* Poor conformation; unbalanced feet; improperly fitted shoes; undeveloped muscles: debility due to sickness; shoes of unsuitable weight.

89. *Q.* How should the causes of faulty gaits be classified? *A.* Causes should be classified as temporary and permanent.

90. *Q.* How should irregularities of gaits be corrected which are due to temporary causes? *A.* By removing the causes.

91. *Q.* What is meant by stumbling? *A.* The elevation of the feet when taking the stride being insufficient properly to clear the ground.

92. *Q.* What faults in conformation would make a horse susceptible to stumbling? *A.* Narrow chest; front legs weak, caused, for example, by small bone, or tendons "tied in" immediately below the knee; front legs set too far under and not perpendicular to the body; neck and head not properly set on shoulders; head carried low.

93. *Q.* What is the general method of shoeing to correct stumbling caused by faulty conformation? *A.* The feet should be prepared for the reception of a rocker-toe shoe. A rocker-toe shoe will induce an easier and more rapid breaking over of the feet, thereby increasing the elevation of the stride.

94. *Q.* What faults in shoeing make a horse susceptible to stumbling? *A.* The wall of hoof too long at the toe (foot broken back); shoes fitted too full at the toe; shoes too heavy.

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95. *Q.* What is meant by interfering? *A.* The foot in flight strikes the opposite leg anywhere from the hoof to and including the knee in front and anywhere from the hoof to and including the fetlock behind.

96. *Q.* What are the causes of interfering? *A.* Faulty conformation; improper preparation of the feet; improper shoeing; debility and overexertion; undeveloped muscles; unconfirmed in gaits.

97. *Q.* What faults in conformation would make a horse susceptible to interfering? *A.* Toe-out pastern conformation; narrow chest, front legs close together; narrow hind end and legs close together; cow-hocked; long narrow feet, and pointed toes.

98. *Q.* Name some of the temporary causes of interfering? *A.* Faulty preparation of the feet, such as lateral unbalance; shoes too heavy; debility and overexertion; undeveloped muscles, not being confirmed in gaits; improperly fitted shoes, such as shoes pointed at the toe and too full at the inside quarter.

99. *Q.* What general method governs the correction of interfering due to faulty conformation? *A.* Level the feet and outline the shoes to effect balance as nearly as possible, in order to induce a proper breaking over and reduce the lateral swing of the feet during flight.

100. *Q.* What types of shoes are most commonly used to correct interfering? *A.* The square-toe shoe and the lateral-extension-toe shoe.

101. *Q.* Define forging. *A.* Forging is a fault of the gait in which the toe of the hind foot overtakes and strikes the bottom of the front foot on the same side at the moment the front foot is starting in flight. The front foot is too slow in breaking over and leaving the ground to clear the forward extension and planting of the hind foot.

102. *Q.* What are the causes of forging? *A.* Faulty conformation; improper preparation of the feet; shoes not correctly fitted; debility; overexertion.

103. *Q.* What faults in conformation make a horse susceptible to forging? *A.* Faults in conformation, such as a short body with relatively long legs, legs set too far under the body, and long hind legs with short front legs.

104. *Q.* What faults in the preparation of the feet and shoeing would make a horse susceptible to forging? *A.* The wall of the front feet at the toe too long and the heels too low; shoes of unsuitable weight; shoes fitted too pointed at the toe.

105. *Q.* Why do many young horses forge when first placed in training, even though the conformation be good? *A.* This condition is due to undeveloped muscles and the horse not being confirmed in his gaits.

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106. *Q.* What is the procedure involved in correcting forging? *A.* The general procedure is to quicken the breaking over of the front feet and to get them in elevation before being overtaken by the hind feet when planted.

107. *Q.* What type of shoe is most generally used on the front feet of the riding horse to correct forging? *A.* The rocker-toe shoe.

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[A. G. 062.11 (1–9–41).]

BY ORDER OF THE SECRETARY OF WAR:

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Chief of Staff.

OFFICIAL:

E. S. ADAMS,
Major General,
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D2 (3); IR 2, 6 (10); IC 2, 6, 8 (5).

U. S. GOVERNMENT PRINTING OFFICE: 1941

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