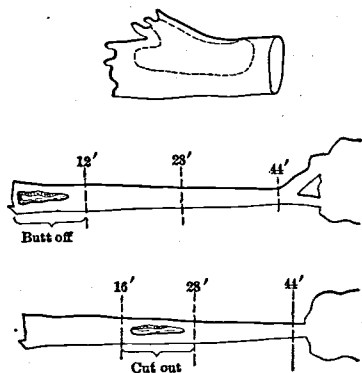
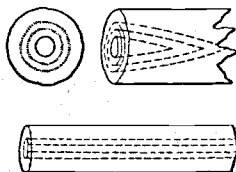


wise the scaler will charge for two extra feet of log and this will be recorded as a "penalty" scale. Measurements of the diameter are taken inside the bark at the small end of the log. If that end is elliptical rather than round an average diameter will be taken by securing a measurement at right angles across the short diameter and averaging the two. In all cases diameters are to be rounded off to the nearest inch.

Proper allowance will be made for all defects that will damage a log, but no definite rule can be followed. The only general



rule that can be followed successfully is to ascertain the amount of board feet included in the defect and deduct this from the full scale. The most common defects are: Hollows, cracks, shake, dote, circular-, uniform- and side-rot, dead, soft, or blue sap, seams, sweeps, and crotches. If a hollow extends the entire length of a log the scaler should deduct from the full scale as many board feet as may be contained in a square timber equal in diameter to the larger end of the hollow and as long as the log. Shorter hollows should be allowed for accordingly. Uniform rot, which extends completely through a log from end to end, should



Rot  
FIG. 181

be allowed for the same as a hollow, shorter rot deducted accordingly.<sup>1</sup>

When cracks and shake are so extensive as to render material "unsound," they must be allowed for accordingly.

Circular and side rot should be treated in a similar manner.

Punk knots invariably indicate a worthless log. If the latter were sound they would not appear. They should not, however, be confused with pitch knots, as the latter seldom damage a log to any great extent and are usually removed in the slab.

Logs having dead, soft, or blue sap should be scaled inside such sap. Blue sap does not necessarily lower the grade of lumber, but always lessens its market value.

Seams should be treated the same as cracks unless they are spiral, in which case they may be so extensive as to render an entire log worthless. Sweep, or curve, as shown in Fig. 182, demands considerable attention, and local conditions must determine the amount to be deducted. As a general rule, no allow-

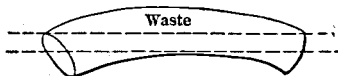


FIG. 182.

ance should be made for the defect when it occurs in logs exceeding 16 feet in length. It is agreed in the contract that log lengths will be varied in such a way as to permit close utilization. Crotches damage a log in proportion to their extent, and result in gnarled, cross-grained, brittle lumber.

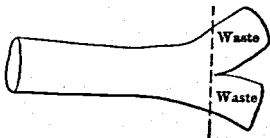


FIG. 183.

Other defects may appear and the scaler must always be on the lookout for them. He should, if possible, devote his spare time to the study of defects as they appear in logs opened at the mill.

<sup>1</sup> As a matter of fact, a hollow log will saw out less lumber than a rotten log having a rot equal in diameter to the hollow of the first. This is accounted for by the fact that the carriage dogs will hold the rotten log until practically all the sound material can be cut from around the rot, while the hollow log can not be held after the hollow is reached. The walls of the hollow either split out or are not strong enough for the dogs to hold securely.

He should also keep a set of grading rules where they may be accessible at all times. A close study of these and of what qualities lumber must possess to be classed in certain grades will enable him to attain a greater degree of proficiency in making allowance for defects. He is supplied with blank records, made up in book form, which permit the contents of one hundred logs to be recorded on each double page. These are numbered from 1 to 00 and carry a column in which to enter lengths. Spaces are provided at the tops of the pages for the name of the purchaser, the date of the sale, the description of the area involved, and for other data pertinent to the sale. Page and grand totals are provided for at the bottom, and there is a separate blank space for the officer's signature and title. These records are open to inspection by the purchaser only in the presence of the Supervisor or a District officer.

## LAND SURVEYS

In practically all of the numerous lines of work he must handle the field man will find the question of land lines involved, and it is essential that he have a thorough knowledge of at least the fundamental principles upon which land surveys are based. A detailed treatise on the subject would require volumes, and for that reason only the most important points will be discussed here. The rectangular system of surveys, in common use in this country, will be considered first.

**Principal Meridians.**—These are north-and-south lines established as a means of control by which the east or west boundary lines of townships may be determined. Owing to the curvature of the earth's surface and to the fact that all such lines, if extended, would converge at one point at the north, east-and-west correction lines are established at certain intervals in order to eliminate as far as possible the otherwise resultant trapezoidal form of townships. These are known as base lines.

**Base Lines.**—These are started at given points and are run due east and west. They serve as a base from which to run base lines and also provide increased facilities for the proper description or location of lands.

**Standard Parallels.**—These lines are run east and west, parallel with base lines, at intervals of 24 miles, and serve as correction lines for range boundaries. Being but 24 miles apart, they pro-

vide for the elimination of practically all convergence of north-and-south lines.

**Guide Meridians.**—These are run north from standard parallels at intervals of 24 miles, close on the next parallel north, and thus lay the country off in theoretical rectangles 24 miles square. These tracts are not, of course, perfect rectangles, but converge slightly to the north. Township boundaries are laid off after the standard parallels and guide meridians have been established.

**Township Lines.**—These are east-and-west lines, 6 miles apart, and mark the north and south boundaries of townships. The tract lying between them and extending from one guide meridian to the next is known as a "township," and is numbered north or south from the base line from which a given survey is made.

**Range Lines.**—Range lines are laid off after the township lines have been established. They mark the east or west boundaries of townships and the 6-mile strip of country between them is known as a "range," and is numbered east or west from the principal meridian from which the survey is made. The establishment of township and range lines divides the country into tracts 6 miles square, and these are also known as "townships."

**Section Lines.**—Townships are next divided into sections, each of which is as nearly 1 mile square as possible. These subdivisions are made by east-and-west and north-and-south lines established at intervals of 1 mile, thus forming thirty-six sections to the township. When convergence of the lines prevents the establishment of thirty-six regular mile-square sections, the extra large or small sections are thrown to the north and west sides of the township. Instances may, but seldom do, occur where irregular sections may be laid off along all four sides of the township.

**Section Numbers.**—Beginning with No. 1, which is at the northeast corner of the township, the series proceeds westward to the northwest corner of the township, where section No. 6 is found. No. 7 is immediately south of this, and the series then proceeds eastward to No. 12, which is south of No. 1. No. 13 is south of 12 and 18 is south of 7. Section 19 is south of 18 and 24 is south of 13. Section 25 is south of 24, 30 is south of 19, and 36 is south of 25 at the southeast corner of the township.

**Section Subdivisions.**—A system of subdivisions has been de-

vised whereby tracts of less than a section may be described. Each boundary line of a section is marked at the center with a "quarter" corner, and a line from one such corner to the one directly opposite divides a section into halves. It is divided into quarters by connecting the corners on the other sides. Quarter sections are divided in a similar manner into "quarter-quarter" sections. These may be divided into "quarter-quarter-quarter" sections and these into "quarter-quarter-quarter-quarter" sections, each of which contains two and one-half acres. It will be seen, therefore, that so long as its boundary lines coincide with those made possible by a regular survey a very small tract of land can be described or located.

**Land Descriptions.**—It is especially important that the field man familiarize himself with methods used in describing lands, and as the subject is such a simple one he should have no trouble in mastering it.

**Sections.**—The first thing given in the general description is the exact description of a section or its subdivisions. Next comes the township number, north or south of a base line, and the range number, east or west of a meridian, follows. Usually the name or number of the principal meridian or base line is also given.

Thus several sections might be described as: Sections 1, 2, 3, 4, 5, and 6 (or Sections 1-6, inclusive), Township Twelve North, Range One East, of a certain meridian and base line. The abbreviated form of this description would be: Secs. 1-6, T. 12 N., R. 1 E., etc.

**Half Sections.**—Three hundred and twenty acres, embracing exactly one-half section, might be described as: The West Half of Section One, Township Twelve North, Range One East of



FIG. 184.

a certain meridian and base line. Abbreviated it would read: W/2 Sec. 1, T. 12 N., R. 1 E., etc. See Fig. 184. If located in both halves of the section it might read: The East Half of the West Half and the West Half of the East Half, or E/2

W/2 and W/2 E/2. It might also be described as: The East Half of the Northwest quarter, the East Half of the Southwest quarter, the West Half of the Northeast quarter, and the West Half of the Southeast quarter. Abbreviated: E/2 NW/4; E/2 SW/4; W/2 NE/4; and W/2 SE/4.

**Quarter Sections.**—One hundred and sixty acres located exactly in one regular quarter-section might be described: The Northwest quarter of a given section. If included in two regular quarter-sections, as shown in Fig. 185, it might read: N/2 SW/4

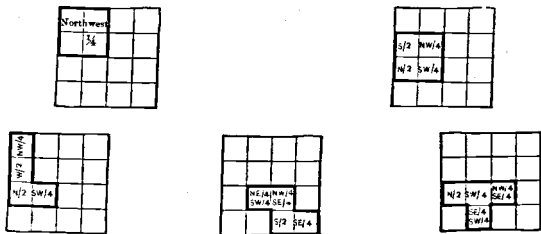


FIG. 185.

and S/2 NW/4. The same acreage, differently located would read: W/2 NW/4 and N/2 SW/4. Lying in this shape it would be known as an "L." If it should embrace N/2 SW/4, NW/4 SE/4, and SE/4 SW/4, it would be known as a "T." If it covered NE/4 SW/4, NW/4 SE/4, and S/2 SE/4, it would be designated as a "Z."

**Quarter-Quarter Sections.**—These embrace an area of forty acres and are described as SW/4 SW/4, or otherwise according to the actual location.

**Quarter-Quarter-Quarter Sections.**—Such subdivisions em-

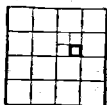


FIG. 186.

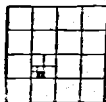


FIG. 187.

brace ten-acre tracts. The one illustrated in Fig. 186 would be described as SE/4 SW/4 NE/4.

**Quarter-Quarter-Quarter-Quarter Sections.**—These tracts in-

clude two and one-half acres, and if laid off as shown in Fig. 187 would be described as SE/4 SW/4 NE/4 SW/4.

**Other Descriptions.**—One hundred and sixty acres lying in two sections of the same township and range as shown in Fig. 188 would be described as: S/2 NW/4, Sec. 3 and E/2 NE/4, Sec. 4, T. 12 N., R. 1 E. Eighty acres, located in two sections, in

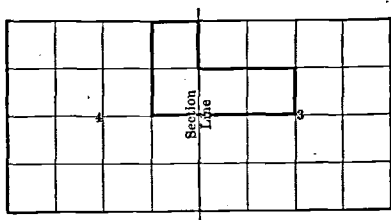


FIG. 188.

the same range but in different townships, as in Fig. 189, would read: SE/4 SE/4, Sec. 34, T. 11 N., and NE/4 NE/4, Sec. 3, T. 10 N., all in R. 1 E. Two hundred acres, located in different

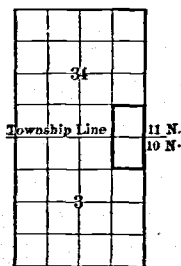


FIG. 189.

sections and in different townships and ranges, as in Fig. 190, would read: W/2 SW/4, Sec. 31, T. 11 N., R. 2 E; SE/4 SE/4, Sec. 36, T. 11 N., R. 1 E; NE/4 NE/4, Sec. 1, T. 10 N., R. 1 E; and NW/4 NW/4, Sec. 6, T. 10 N., R. 2 E. If the township line in Fig. 190 should be a base line and the range line a principal meridian, then the land in sections 31 and 36 would be described as east and west, respectively, of the meridian, and north of the base line, while that in sections 6 and 1 would be described as also east and west, respectively, of the meridian, but south of the base line.

**Corners.**—Only section and quarter-section corners were set in the original surveys made by the United States Land Office. Unfortunately no one system of marking the corners seems to have been followed. In most parts of the middle West and in many parts of the South stones were set, and witness trees, usually four at section corners and two at quarter-corners, were

blazed and scribed with the section, township, and range numbers. In other localities pits were dug and mounds thrown up. In later surveys, particularly in the West and Southwest, stones were set at the corners and chiseled, as shown in Fig. 191. Quar-

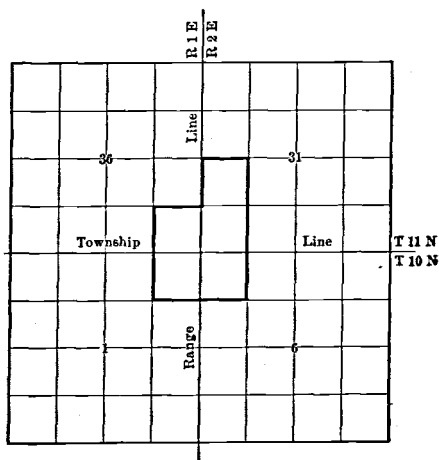


FIG. 190.

ter-corner stones in these surveys were chiseled " $\frac{1}{4}$ " on their west face in north-and-south lines, and in east-and-west lines the north face bore a similar inscription. Where trees were blazed as witnesses a second blaze near the ground was scribed "B T" or "W T," the initial letters of "Bearing Tree" and "Witness Tree," respectively. Such blazes should not be confused with the marks left by porcupines or with the numerous crosses cut through the bark by a religious sect known as the "Penitentes."

Throughout portions of the South, particularly Arkansas and Missouri, which were surveyed between 1840 and 1850, the blazes on witness trees have been covered with a new growth of wood and can be distinguished only after the closest scrutiny. Most of these trees, however, have been blown or burned down, and very few of the original corners can be located except with instruments.

**Metes and Bounds Surveys.**—Land lines in most parts of the Southeast and in certain parts of the East were not established



under the rectangular system of surveys, but were run and described by angles and courses tied to some permanent natural landmark. Such a line might be described as follows: "Beginning at the highest point on (.....) Peak, County of (.....), State of (.....), running thence S 24° E, 11.25 C;

thence, S 42° E, 20.10 C; thence S 14° W, 11.25 C; thence S 20° E, 12.40 C;" and so on, finally closing the survey at the point of beginning.

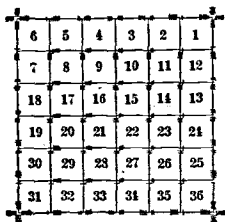


FIG. 191.—A common method of marking section corners. Used chiefly in the West.

### Surveying Crews and Their Work.

—Ordinarily a surveying crew consists of the surveyor, or "transit man" or "compass-man," two chainmen, an axman, and flagman. The first superintends and is responsible for all work done, the chainmen measure distances, the axman removes brush that may interfere with

any of the operations of surveying, and the flagman works in advance of the rest of the party, indicating under instructions from the surveyor where the line is to run. The proper point at which to set his flag is made known to him by the surveyor, who signals with his arms, or by other means previously agreed upon. Assuming that a line is being run north and the flagman has not moved far enough east, this fact is made known to him by the surveyor, who extends his right arm, vertically if the distance is small, horizontally if great, intermediate distances being indicated by proportionate movements of the arm between the vertical and horizontal. If the flagman is to move to the west, the surveyor signals with his left arm. The flagman is to understand that he has reached the desired point when the surveyor raises and lowers, in quick succession, both arms simultaneously. He usually repeats this signal until he is sure the flagman has observed it, such observation on the part of the flagman generally being indicated by his repetition of the signal after the point of the flag has struck the ground.

If he has gone too far along the line the flagman may be brought back by a circular motion of the surveyor's uplifted arm, given at a time when the flagman happens to glance back. He is sent farther along the line when the surveyor raises his

arm and drops it forward. Or, when previously agreed upon, other signals may be used. These two men should, however, have a thorough understanding of all signals to be used.

The flag should be held squarely before the flagman's body, the point directly over the opening of the "V" formed by the flagman's feet as he stands erect, facing the surveyor. It should be gripped loosely between the thumb and forefinger of either hand at a point about on a level with the flagman's chest. This allows the pole to hang vertically and to fall straight down to the ground as soon as the grip is released. Later it is planted firmly and left standing until the surveyor arrives. It often happens that as the result of improper light, or the interference of brush or other obstacles, the surveyor is unable to see the flag unless it is held before the flagman in such a way that his clothing acts as a background; even then the pole may not be visible to the surveyor, but he will be able to ascertain its approximate location by reference to the flagman.

In clearing away brush from the line of sight, the axman needs only to hack it in one side and then bend it sidewise out of line and at right angles to the course, thus leaving a comparatively free opening for the chainmen to pass through.

A general rule in chaining is to use eleven pins, although many surveyors contend that ten are much more convenient, and that by their use mistakes are much less likely to occur. If eleven are used, one is set at the starting point and another is used at the end of every chain thereafter until ten chains (a "tally") have been measured off. When the rear chainman transfers the pins to the front chainman at the end of a tally, the last pin stuck is left sticking in the ground. Each time such transfers are made both men should count the pins to see that none has been overlooked and left behind. The best plan is for each to check the other as chaining proceeds. For instance, when the front man sticks his pin he may call out "Stuck!" and as the rear man recovers a pin he may call "Pin!"

In order to keep accurate count of the tallies chained, it is well for each man to record the number in some tangible method—i.e., he should not attempt to keep the number in mind, but should keep check on it by means of pebbles, one placed in his pocket at the end of each tally, or should record it in a

note-book, or use some other means of record that can not be questioned.

Horizontal, or "level," chaining over rough country may necessitate "breaking" the chain. When this is done only a portion of the chain is used, thereby facilitating leveling. Most chains are equipped with a ring and snap at the middle, and in such work these may be loosened and the chain divided in half; otherwise a certain number of links must be used each time. If a half-chain is used, the eleven pins may be used to tally five chains instead of ten. Errors invariably occur when pins are thrown forward by the rear man to be used by the front man again in the same tally.

If steep slopes are to be level chained the rear man, when ascent is being made, raises his end of the chain until it is directly over the last pin stuck and as nearly as possible on a level with the front end. The front man is notified that the next pin may be stuck, and chaining proceed. In making a descent, the front man raises his end of the chain to a level with the rear end, holds his pin loosely, and then allows it to fall, point downward, when the rear man is ready. He then sets the pin firmly at the point where it first struck.

## THE STANDARD FOREST SERVICE COMPASS

This instrument is so simple in construction that there should be no difficulty experienced in mastering a knowledge of its adaptability to a multitude of uses. The base is of aluminum and is 4 inches square. Its edges are beveled, and one bears a 4-inch rule graduated in  $\frac{1}{10}$ -inches, while another bears a similar rule indicating  $\frac{1}{8}$ -inches; the other two edges are graduated in degrees and half degrees and may be used as a protractor, thus rendering the instrument very useful in field mapping. A small level is attached to each of two corners, and these are used in leveling the instrument when it is set up.

At another corner is a milled nut which tightens or releases the lever that raises the needle from the center-pivot point. This nut should be kept screwed down when the compass is not in use; otherwise the needle will be allowed to swing about and soon the pivot-point will become worn or dulled to an extent that renders the use of the needle very unsatisfactory. However, care must be taken to see that the nut is loosened and the needle allowed to swing clear when the compass is being used.

It may seem that no field man would attempt to run a line with a tightly clamped needle, but as a matter of fact this very thing often occurs, the result, of course, of carelessness.

Suspended from the center pivot is a pendulum-like attachment known as a clinometer and supplied for the purpose of determining grades or elevations. It swings across an arc of 180 degrees, numbered from naught at the center to 90 on either end. To use the clinometer, the compass sights are opened and the base is held as nearly vertical as possible, allowing the clinometer to swing freely. The sights are then trained on the objective point, and the base is tipped carefully until the clinometer rests against it and becomes stationary.

The compass face is then turned carefully toward the observer and the reading is made, not in per cent but in degrees. If a per cent reading is required, a table, showing the relative values of per cent and degrees, must be consulted. For such a table see page, 354, Appendix.

A vernier attachment will be found on the side opposite the clinometer. This works over 44 degrees on one side and 27 degrees on the other side of naught, or no variation. Care must be taken in using it to see that variations are not reversed. If the vernier is not used it is very necessary that the operator be thoroughly conversant with the subject of variations; otherwise improper readings may be made and recorded.

Just above and attached to the base is a circle of 360 degrees numbered from naught, or "N" and "S," to 90 on the east and west points, according to the style of the compass. One style has the initial letter of each cardinal direction stamped on the circle, while another bears a star, or similar design, instead of "N," and "O" at other points instead of "S," "E," and "W." The style bearing initial letters of cardinal directions is so lettered as to lead a novice to believe that the manufacturer made a mistake and reversed the "E" and "W." In order that he may thoroughly understand this method of construction, the field man should turn his compass so the hair sight, which is always the front sight, is immediately over the north end of the needle after the needle has been released and allowed to settle. He will find that a line projected from the rear sight through the front sight will run north, no allowance being made for variation in this particular case. Turning the hair sight 90 degrees to his left, or to the west, he will observe

that the character which indicates West falls directly beneath the north end of the needle; turning it 90 degrees still further to his left, or to the south, he will notice the character which indicates South exactly beneath the north end of the needle; and turning still 90 degrees farther he will see that the character which indicates East is under the north end of the needle. It follows, therefore, that the character beneath the north end of the needle indicates the direction in which the sights are trained. If the north end of the needle is directly above 20 in the arc between "N" and "E" the reading is: "North, 20 degrees East," and is so recorded. If it points to 17 in the arc between "N" and "W," then the reading is: "North, 17 degrees West." If it indicates the figure 89 in the arc between "S" and "E," the reading is: "South, 89 degrees East." Pointing to 2 in the arc between "S" and "W" the reading is: "South, 2 degrees West." It will be observed from this that all readings begin either from north or south, the variation eastward or westward being expressed in degrees after the directions north and south have been read. Readings are recorded in the same manner in which they are made.

The sights are hinged to the base in such a way that they may be folded down across the glass face of the compass when not in use. The hair sight is always folded down first.

Around the glass will be found another circle divided into 360 degrees. Inasmuch as this circle is movable, readings should not be based upon it. Originally this form of compass was intended for underground work where wires were used in the slots when readings were taken.

On the under side of the square base, at one corner, will be found a diagram of a township divided into sections, each of which is numbered.

At the center of the under side will be found a shallow hole into which the upper end of the support is screwed. This support consists of a cylindrical socket into which one end of a ball-and-socket joint fits. The two are held together by means of a screw working in a groove in the pinion. Rotary motion of the socket about the pinion may be prevented by turning this screw up tight, but if necessary it may be left loose enough to allow such motion and still prevent endwise separation of the two pieces. At the lower end of the pinion a ball fits into a hollow circular nut attached to the upper end of another socket made

to fit over the end of a Jacob's staff or on to a tripod. In some instruments this nut has a notch in one side deep enough to allow the pinion at the ball to be tipped sidewise at right angles to the staff, thus permitting the use of the clinometer.

If a compass is to be stored away for any length of time it should be placed with the magnetized end of the needle to the north; otherwise a partially demagnetized needle may be the result. If it is to be carried in an electrically propelled vehicle it should not be placed near a motor or dynamo. While being used in the field metallic objects subject to magnetic action should not be allowed near it; even a heavy pocket knife, in close proximity to a very sensitive needle, may deflect it from a true course, and surveying pins or axes should be kept at a distance.

### VARIATION

A diagrammatical explanation of variation will be found in Fig. 192. This drawing should not be considered as precisely accurate or even drawn to scale; it is purposely distorted in

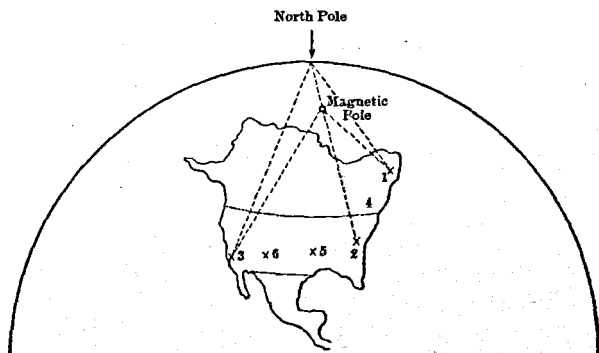


FIG. 192.—Variation.

order to facilitate the explanation and is sufficiently accurate for that purpose.

The location of the magnetic pole is not, as may be supposed, exactly at the north pole, but its situation with reference to the latter is similar to that shown in the illustration. Assuming that a compass is set up at 2, it will be seen that a straight line may be drawn from it through the circle to the north pole, and

timber or other inflammable material, and leaving said fire before the same has been totally extinguished.

Third. All officers and employees of the Department of Agriculture are barred from receiving reward for information leading to the arrest and conviction of any person or persons committing either of the above offenses.

Fourth. The Department of Agriculture reserves the right to refuse payment of any claim for reward when, in its opinion, there has been collusion or improper methods have been used to secure the arrest and conviction thereunder, and to allow only one reward where several persons have been convicted of the same offense or where one person has been convicted of several offenses, unless the circumstances entitle the claimant to a reward on each such conviction.

These rewards will be paid to the person or persons giving the information leading to such arrests and convictions upon presentation to the Department of Agriculture of satisfactory documentary evidence thereof, subject to the necessary appropriation, as aforesaid, or otherwise, as may be provided by law. Applications for reward, made in pursuance of this notice, should be forwarded to the Forester, Washington, D. C.; but a claim will not be entertained unless presented within three months from the date of conviction of an offender.

In order that all claimants for a reward may have an opportunity to present their claims within the prescribed limit, the department will not take action for three months from date of conviction of an offender. The above is applicable to offenses committed since July 1, 1910.

Under the subject of Cooperation in Enforcing State Fire Laws on page 25, U. B., 1915, further official instructions are given as follow:

REG. P-1. All forest officers will cooperate with State officials, so far as practicable, to enforce State laws for the prevention and extinguishment of forest fires. When authorized to do so by the proper State officers, they will, without additional pay, act as fire wardens with full power to enforce the local laws.

Under the subject of Fire Protection Cooperative Agreements on page 25, U. B., 1915, further official instructions follow:

REG. P-2. The Forest Service shall, whenever possible, and is hereby authorized to, enter into such agreements with private owners of timber, with railroads, and with other industrial concerns operating in or near the National Forests as will result in mutual benefit in the prevention and suppression of forest fires; provided, that the service required of each party by such agreements shall be in proportion to the benefits conferred.

**Patrol.**—Thorough and systematic patrol is the first essential in the question of forest fire control. If a carefully planned

system of patrol prevails fires may be attacked in their incipency and extinguished or controlled with little difficulty. Patrolmen should be required to travel along high ridges or other points from where the greatest territories subject to fire danger may be watched. Upon discovering a fire they should report that fact to the proper officers without delay.

**Equipment.**—The equipment generally provided for fire fighting consists of axes, saws, rakes, shovels, wooden or wire brooms, and such other articles as may be used to advantage in quick suppression of fires. Rakes and shovels may prove most effective in one locality, but large loose stones, thick underbrush, or other topographical features or vegetable growths may render them worthless in another. Consequently, before tools are requisitioned, the field man must exercise care and judgment in determining just what articles will prove most effective in his particular district or in the district in which the tools are to be used.

**Tool Caches.**—These should be located at points easily accessible from large territories in which fires may be expected to occur. They should contain such tools as can best be utilized in those particular sections and should be kept under lock and key in order to prevent their removal or destruction by unauthorized or maliciously inclined persons. The patrolman should have an itemized list of the number and kind of tools kept at such caches and should be sufficiently familiar with the location of each cache to enable him to reach them without delay whether a fire is reported in the daytime or at night.

**Immediate Action.**—Unless specifically instructed to the contrary, a field man is expected to proceed immediately to any fire that may be reported in the district assigned to his care. If the fire occurs at a point on the boundary line of his district, or a short distance across on another district, or on lands not within the National Forest, he is governed by whatever orders his superior officer may have issued on that subject.

**Preliminary Inspection.**—Upon his arrival at a fire of great size, possible danger, or difficult control, he should make a careful inspection of all advantages offered by natural barriers to the flames. These include such items as water courses, ridges, cliffs, cañons, and the absence of inflammable material at points where the fire may be attacked. Usually it is possible to utilize such conditions to good advantage, and without their due con-



sideration the suppression of a fire may require hours or even days of extra time, labor, and expense.

**Procedure Following Preliminary Inspection.**—As soon as the preliminary inspection has been completed the officer in charge should proceed to put into effect whatever course of action he may have decided upon. If the fight promises to be of several days' duration and will involve the services of a large number of men he should take immediate steps to secure the necessary labor. He should also see that the proper tools are available, that suitable camp sites are selected, and the camps arranged in most advantageous manner, that cooks, teamsters, and foremen are selected from among the most experienced men, and that every possible precaution is taken to systematize the work and to carry out a definitely fixed plan of operation as quickly and effectively as conditions will permit.

**Classification of Fires.**—In a general way fire may be divided into three principal classes, viz.:

(1) Ground Fires; (2) Surface Fires; (3) Crown Fires.

(1) **Ground Fires.**—These occur in regions where several years' accumulation of leaves, twigs, branches, and old logs forms a sort of peat or spongy mass which may burn or smoulder beneath the surface of the ground for days or even months. They are especially common to the Northeast.

(2) **Surface Fires.**—These consume the litter scattered over the surface of the ground. In thick beds of leaves, in old cuttings where slash is abundant, and in localities where numerous dead dry logs and stumps appear, they may prove very difficult to control. They are common to all timbered portions of this country.

(3) **Crown Fires.**—These are sometimes known as "top" fires and occur usually as the result of severe surface fires from which the flames pass to and ignite the trunks and tops of standing timber. They may be expected to occur when a combination of climatic conditions, such as extremely high winds during very dry weather, is especially favorable. They are common to areas where timber appears in dense stands such as are found in many parts of the Northwest.

**Control.**—(1) **Ground Fires.**—It is usually possible to control these by means of trenches cut through the peat to solid earth. Such trenches should be not less than 2 feet wide and should be absolutely free from all combustible material. Caution must

be exercised not to step accidentally on a place where the surface may give way and allow the workman to be precipitated into the live coals beneath.

(2) **Surface Fires.**—A variety of methods may be resorted to in the control of surface fires. In sandy localities where brush does not occur in dense stands, rakes may be used to clean out a wide path ahead of the fire. This should be at least 4 feet wide, wider if a strong wind is blowing. Where shovels can be used dirt or sand may be thrown on the flames, burning chunks or pieces of logs and branches may be buried, and trenches may be dug or paths shoveled out. Wire or wooden brooms may be used to rake away inflammable material from long strips ahead of and parallel with the fire line. Wire flails may be used in beating out the flames if these are not too hot to be approached and worked over. Bundles of bushes may be used in the same manner, or a small bush with a heavy growth of foliage may be utilized, as may also wet saddle blankets, gunny sacks, and blankets. In rough, rocky regions picks or mattocks may be necessary before the fire can be controlled. They are used in removing stone or rock, so shovels may be used later in cleaning off a bare strip of ground. Certain bags have been devised for use in fighting fires with water, but their use is of course limited to sections in which plenty of water is available. Chemical fire extinguishers have also been used.<sup>1</sup>

(3) **Crown Fires.**—The chief method of control used in fighting these fires is to clear away the standing timber on a strip of

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<sup>1</sup> See Bul. 113. U. S. Department of Agriculture. "Methods and Apparatus for the Prevention and Control of Forest Fires, as Exemplified on the Arkansas National Forest," by Daniel W. Adams.

See also the following: Bul. 117. U. S. Department of Agriculture. "Forest Fires: Their Causes, Extent, and Effects. With a Summary of Recorded Destruction and Loss," by Fred G. Plummer.

Cir. 205. U. S. Department of Agriculture. "Forest Fire Protection Under the Weeks Law in Cooperation with States," by J. Girvin Peters.

Bul. 82, U. S. Department of Agriculture. "Protection of Forests from Fire," by Henry S. Graves.

Bul. 111, U. S. Department of Agriculture, "Lightning in Relation to Forest Fires," by Fred G. Plummer.

"Fire Prevention and Control on National Forests," by S. C. Bartrum.

"Better Methods of Fire Control," by W. B. Greeley.

"National Forest Fire-Protection Plans," by Coert Du Bois.

"Light Burning in California Forests," by F. E. Olmstead

ground from 75 to 100 or more feet in width. It may be found necessary in severe fires to clear two such strips parallel with each other and from 50 to 100 yards apart. The inflammable material on the intervening space is then fired, and this presents a check to the approaching fire. Such lines must of course be well in advance of the main fire line.

**Fighting the Flames.**—This should not be done in an irregular or unsystematic manner. Action should be moderately rapid, but not to an extent that will cause complete physical exhaustion in a few minutes. When rest, food, and sleep become necessary a reliable man should be placed in charge of operations until the field man is again able to resume supervision. Where two or more field men are present they may work in shifts of so many hours each, depending upon their number. This permits an officer to be in charge during the entire fight.

**Patrolling the Backline.**—Patrol of the backline, or the edge of the burned-over area, is the most important part of fire control. Only the most reliable men should be detailed to such work and they should be extremely careful to see that all burning logs, chunks, branches, and similar articles are thrown well back on the burned-over area. If such removal is impossible care must be taken to see that sparks do not blow from them to unburned territory and start another fire. Such work should not be centered at one point along the line, but should be distributed along the entire line, the patrolmen going along the line at regular intervals until all danger is past. This should be continued for several days if dry, windy weather follows suppression of the fire. Burning trees standing near the edge of the burned-over area should be felled backward on it when this can be done. Otherwise they should be felled and then carefully burned around after the upstanding branches have been cut away and compactly piled.

### FIELD COOKING<sup>1</sup>

Since cooking facilities in the field are necessarily limited, only the simplest recipes are given here, and it is suggested that the novice take advantage of his spare moments to experiment with other and more complicated dishes.

<sup>1</sup>For list of provisions and supplies required and for table of cooking utensils necessary for from one to thirty men see "Fire Prevention and Control on National Forests," tables 2 and 3, by S. C. Bartrum.

A few general rules which will be of assistance to the beginner are offered. Chief among these is the mixing together of dry ingredients before liquids are added; the latter are then also mixed together, and finally the two mixtures are added together. This rule holds good in all cases unless specific advice to the contrary is given. Another point to be borne in mind is the fact that actual experience is essential to the best cooking and that satisfactory results can not always be obtained merely by following a given recipe. Ingredients may vary in strength of quality, fuel may not supply the proper heat, altitude has its effect, the water used has more, milk, which should be sour, may be only "turned," or the same condition may exist in milk that should be sweet. It should be borne in mind also that nothing definite on the subject of seasoning can be offered, since individual tastes differ so widely that they must be considered in every case. A recipe therefore can be considered only as a general guide and must be varied to suit local conditions. As a result the field man who is unable to exercise any ingenuity can never hope to become a proficient cook.

**Canned Foods.**—Camp food, or "chuck" or "grub," as it may be known in the camp vernacular, consists largely of canned meats, fruits, and vegetables, and as these undergo a more or less extensive process of cooking at the time they are canned they do not require a great amount of cooking prior to being served. With the exception of milk, which may stand in the open can for several days and not spoil, all canned goods should be removed from the can to glass, porcelain, or enamelware dishes immediately after the can is opened. This is especially true of acidulous fruits and also applies especially to meats. Chemical action may occur and render the foods poisonous if they are left exposed to air in the opened can. Care must be taken not to transfer them to other tin or iron dishes.

**Bread.**—Crackers will not prove satisfactory on extended trips and baker's bread soon becomes tiresome. Consequently camp-made bread is a necessity, but instead of presenting the difficult problem its preparation may appear to be, it is, in fact, a simple process.

Where quick meals are required the bread may be made in the form of biscuits or "flapjacks," but if a camp is in the nature of a semi-permanent establishment, then a more elaborate system of cooking may be followed.

The chief item in baking good bread is to have the oven hot when the dough is placed in it. Otherwise the bread will be heavy and unpalatable.

**Sour Dough Bread.**—Make a batter of flour and water and let this stand in a warm place until fermentation occurs. A half-pint of the fermented mixture is equal to a cupful of old yeast. Sour dough bread is made by adding a cupful of flour and a teaspoonful of salt to a cupful of the fermented mixture. If a tablespoonful of sugar is also added the bread will brown better in baking. Sour dough biscuits are made in a similar manner except that more flour is added and the dough made stiffer. The bread or biscuits should be baked in a hot oven.

Sour dough flapjacks must of course be made from much thinner batter than is used either for bread or biscuits.

A permanent supply of the fermented mixture may be kept on hand by replacing an amount equal to that removed at each baking, the "starter" being kept in a jar provided for that purpose.

**Yeast Bread.**—Add a teacupful of yeast to three teacupfuls of cold water, stir in sufficient flour to make a stiff batter and let it stand overnight. In the morning mix again till the batter is quite stiff. Bake in a well-greased pan in a hot oven.

The variety of yeast most commonly used in camp is known as "potato" yeast and is made as follows: Confine a handful of hops in a small bag and boil with two average size potatoes. Mash the latter when they are well done and add to them two cups of flour. Scald this mixture with the water in which the potatoes were boiled. When this has cooled add to it one yeast cake well soaked in warm water. The yeast cake may be procured at any grocery store.

**Salt Rising Bread.**—This is not as palatable as yeast bread, but is prepared with less trouble and bakes much more quickly. Scald half a teacupful of meal with half a pint of boiling sweet milk, add sugar and salt to suit, then let the mixture stand in a warm place overnight. Next morning scald a teaspoonful of salt, the same amount of sugar and half as much soda, with a pint of boiling water. Add this to the mixture prepared the night before and stiffen the whole with as much flour as may be required. Mix it quite stiff when it has become sufficiently light after having been left in another vessel hung in a kettle

of warm water. Add a tablespoonful of lard before molding into loaves. Bake in a well-greased pan in a hot oven.

**Baking Powder Bread.**—Mix a tablespoonful of baking powder and a teaspoonful of salt into a pint of flour. Stir thoroughly until the three are well mixed, then add water or milk and stir again. These should be added in quantities sufficient to make the dough as thick or thin as desired. The dough should be worked or handled as little as possible and should be baked in a well-greased pan in a hot oven. As soon as the water or milk begins to mix with the baking powder a gas forms that makes the bread light. If the dough is worked much this gas escapes before the dough becomes hard enough on top to keep it confined. Heavy bread is the result.

**Potato Bread.**—Boil four medium-size potatoes for each loaf of bread to be baked. When these are well done mash them thoroughly, then add two teacupfuls of flour and mix. Scald the mixture with the potato water. Knead well and let the dough stand overnight. Knead again the next morning and let it rise before molding into loaves.

**Rye Bread.**—Use the same sponge as for wheat or "light" bread and let it stand overnight. Then add a teaspoonful of salt, one pint each of sweet milk and water, half a teacupful of molasses or sugar, and stiffen the whole with rye flour. The dough should not be made as stiff as in wheat bread.

**Rice Bread.**—Boil a teacupful of rice in a pint of water till tender. Add half a pint of milk, then let the mixture cool. When cold add two teaspoonfuls of baking powder, half as much sugar, one-fourth as much salt, and one and one-half pints of flour. Mix well.

**Corn Bread.**—To a pint each of meal and buttermilk well mixed together add two eggs, two tablespoonfuls of melted lard or butter, one teaspoonful of soda and half as much salt, also well mixed together. If buttermilk can not be secured use water, but instead of using the soda with water a teaspoonful of baking powder should be used. Soda mixed with water or baking powder mixed with buttermilk will not produce satisfactory results.

**Soda Biscuits.**—Dissolve a level teaspoonful of soda in a pint of buttermilk, then add a heaping tablespoonful of lard and a teaspoonful of salt. Mix thoroughly, then stir in a quart of

flour. Let the dough rise for about twenty minutes before it is placed in a hot oven.

**Baking Powder Biscuits.**—Prepare the same as for bread and cut or mold the dough into lumps the size desired.

**Johnny Cake.**—Mix three teaspoonfuls of baking powder, one teaspoonful of salt, half a teacupful of sugar, all mixed well together, with two eggs and two tablespoonfuls of lard. Stir a quart of corn meal into a quart of sweet milk, then add the first mixture and stir again. If sour milk is to be used a heaping teaspoonful of soda should be substituted for the baking powder. Bake in a shallow pan.

**Potato Cakes.**—Add an egg to three peeled and grated potatoes of medium size, and salt to suit. Mix well together and fry in hot grease.

**Rice Cakes.**—Add one and one-half pints of flour to the same amount of boiled rice. To this mixture add three eggs, a heaping teaspoonful of butter or lard, one teaspoonful of soda, one teacupful each of sour and sweet milk, and salt to suit. Bake immediately.

**Flour Cakes.**—Use a quart of flour and sour milk for batter and let it stand overnight. Next morning dissolve a teaspoonful of soda in three times as much water and add it, together with two well-beaten eggs, to the batter. Salt to suit. Water may be used in lieu of sour milk, in which case use a heaping teaspoonful of baking powder instead of soda.

**Buckwheat Cakes.**—Add a teacupful of yeast to a quart of buttermilk and water, equal parts. Put in salt to suit, then stir in enough buckwheat flour to make a batter and let it stand overnight. Next morning dissolve a teaspoonful of soda in warm water and add it to the batter. Bake immediately.

**Corn Meal Mush.**—Add meal to boiling water and stir well to prevent lumps forming. Season with salt to suit and make the mush as thick or thin as desired.

**Cracked Wheat Mush.**—Stir a teacupful of cracked or rolled wheat into a quart of water and add salt to suit. Less boiling will be required if the wheat is soaked overnight.

**Oatmeal Mush.**—Add four or five tablespoonfuls of oatmeal to a quart of cold water, salt to suit, then boil slowly for half an hour, taking care to replenish the water as it boils away. Unless a double boiler is used the mixture should be stirred continually to prevent burning.

**Hominy Mush.**—Soak a teacupful of hominy overnight in a quart of well-salted water, then boil for an hour. With cream and sugar this makes an excellent breakfast food.

**Cereals.**—Nearly all packed cereals may be eaten raw with cream and sugar. However, oatmeal and cream of wheat should be well soaked and then boiled in salt water. This applies also to rice.

**Game Meats.**<sup>1</sup>—Game meats include the meat of the bear, deer, rabbit, squirrel, wild turkeys, ducks and geese, grouse, quails, partridges, and such other birds and animals as may be considered edible. The list may also include opossums, raccoons, ground-hogs (woodchucks), hedgehogs, and snipe, plover, doves, pigeons, and yellow-hammers. Bear meat is at its best when the animal is killed during the autumn months while it is fat and immediately before the animal hibernates. After a season of hibernation the meat is dry and tough, no fat is present, and it is otherwise in such condition as to be far from palatable. Deer meat or venison is best in winter. The choicest parts are those of a fine, reddish-brown grain, such as the saddle, which is that part of the back from the ribs to the hips and which includes the hams. The most common and best method of preparation is by frying. The meat may also be dried and kept for long periods. The meat of an old game animal should be made tender by par-boiling. This is done by boiling it in a strong solution of soda and water for a period of from twenty minutes to an hour. Old animals may be recognized by their lack of plumpness and by their short, yellow, worn-out teeth and scaly claws. Young

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<sup>1</sup> The following six rules for sportsmen in the National Forests are quoted from an official poster placed before the public in Sept., 1915:

1. *Prevent Forest Fires.* They destroy the hunting grounds and the game.

2. *Take the Game Law with You.* It may be obtained from any Forest Officer.

3. *Make Sure It's a Buck.* It may be a Doe, a Cow, or a Man. How would you feel?

4. *Wet the Hand Before Removing Undersized Fish.* It prevents breaking the mucous covering and the entrance of fatal molds.

5. *Don't Shoot Harmless Wild Life.* Only Sharp-shinned Hawks, Great Horned Owls, Prairie Dogs, Porcupines, and "Varmints" do more harm than good.

6. *Leave a Clean Camp and a Clean Record.* You may want to come back.



animals have white, sound, short teeth and smooth, symmetrical claws.

Old birds should also be parboiled. They may be known by their scaly legs and claws, their long spurs, if these are present, and the generally rough and more or less bedraggled appearance of their plumage. Young birds have smooth legs and feet, short spurs, and plumage of a healthy appearance.

**Domestic Meats.**—These include the meat of cattle, hogs, sheep and goats, and domestic fowls. The first is known as “beef” if from animals over about six months old, and as “veal” if from calves. The second comes under the head of “pork,” the dried sides being known in many parts of the West as “salt horse” and in the South as “sow belly.” Meat from the sheep is known as “mutton,” and the same term is usually applied to goat meat as well.

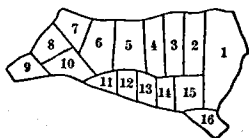


FIG. 193.—Cuts of beef.

1. Neck, or Sticking-Piece.
2. Chuck Ribs.
3. Middle Ribs.
4. Fore Ribs.
5. Sirloin.
6. Aitchbone.
7. Rump.
8. Buttock.
9. Hock.
10. Round.
11. Veiny Piece.
12. Thick Flank.
13. Thin Flank.
14. Brisket.
15. Shoulder.
16. Shin.

Any frozen meat should be thawed in cold salt water before being cooked. Certain portions of most meats, such as ribs and steak, are best when fried. Other parts, usually those including joints or large bones, are best boiled. For the different cuts of beef see Fig. 193.

Fresh beef and mutton are usually secured from private sources in the field, but pork comes in the shape of hams and shoulders or salt sides. Before being cooked, hams, shoulders, and salt sides should be freshened in cold or warm water. This removes a greater part of the salt used in the preservative treatment applied to them at the time they are packed.

**Fried.**—This method of preparing meat requires so much grease that the average person soon tires of such food, and whenever possible to do so the field man should vary the method of preparation by boiling, stewing, or roasting. In frying meats the pan should have a layer of grease over the entire bottom

of at least  $\frac{1}{16}$ -inch in thickness. During the process of frying the meat should also be covered with a pan lid in order to keep in all the heat possible. Proper frying consists chiefly of heating the meat clear through at the earliest possible moment. It should also be turned frequently and not allowed to burn or harden on one side. The grease should be hot when the meat is placed in it.

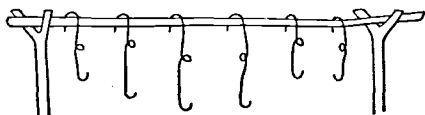
*Boiled.*—This is done by dropping large pieces of meat into boiling water and boiling them till the layers of meat may be separated from each other without difficulty. It is a very satisfactory way of preparing joints and pieces of meat surrounding large bones, but is somewhat more troublesome than frying. The water in which such meats are boiled may be seasoned with salt, pepper, or other articles and is then known as soup. Vegetables may be boiled with the meat and the mixture is then known usually as a "stew" or "mulligan."

*Broiled.*—This method of preparation is usually applied to steaks and large pieces of meat having no bone in them. In such cases the meat is placed on a hot stove or over live coals. The process differs from frying in that no grease is used, and from roasting by reason of the fact that the meat is not allowed to come in contact with the flames. It soon causes the outer portions of the meat to assume a more compact nature, and thus serves to retain the meat juices.

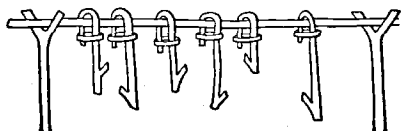
*Roasted.*—This method is used when cooking utensils are not available, and consists merely in placing the meat near enough to the fire to render the former more tender and palatable by heating it through suddenly. The meat may be held in position by a forked stick or other similar contrivance or it may be suspended from a pot-rack. (See Fig. 194.)

*Fish.*—Fish taken from clear, fresh water may be cooked as soon as cleaned and dressed, but those which are taken from muddy or stagnant streams should be soaked in a strong solution of salt and water for from one to two hours. This will remove the unpleasant muddy taste when such fish are cooked. Frozen fish should be thawed in cold water to which a little salt has been added. Small fish, such as trout, perch, and small bass, are better when cooked whole, preferably by frying. The larger varieties should first be cut into pieces and then cooked. To prepare fish for cooking, remove the scales or skin, take out the entrails, wash clean both inside and out, and dry clean with a

soft cloth which absorbs water well. Catfish and others having no scales must be skinned. This is done by dipping them into boiling water and holding them there about ten seconds. This has a tendency to cook the skin and separate it from the flesh. If kept in boiling water much longer than that portions of the flesh will be removed with the skin. Eels should be skinned in



Wire hooks.



Wooden hooks.

FIG. 194.—Pot-racks.

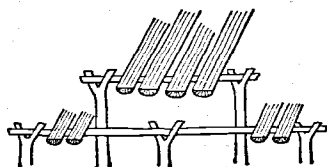


FIG. 195.—Camp table and seats.

a similar manner. After the dipping process has been completed the skin is cut around the neck immediately to the rear of the head and is then stripped backward over the body.

*Fried.*—Roll the fish in flour, meal, or bread or cracker crumbs and fry in plenty of grease over a hot fire. When one side has been browned to the desired degree turn the fish over and treat the other side likewise. Seasoning should be added to suit the individual taste.

*Boiled.*—Cut the fish into pieces of the required size and drop them into boiling water. They may be seasoned while being

boiled or the seasoning may be applied at the time they are served.

*Eggs.—Fried.*—Break the eggs into a separate dish, then slide them into a hot, well-greased pan in such a way that the yolks are not broken. Add salt and pepper to suit. Occasional bad eggs will not be broken in with good eggs if all are broken into some receptacle other than the pan in which they are to be fried.

*Boiled.*—If soft-boiled eggs are desired they should be boiled three minutes, in very high altitudes five minutes. Hard-boiled eggs require six minutes of boiling, in high altitudes ten. They may be considered as hard boiled when the shells dry immediately after they are removed from the water. One very common method of hard boiling is to place the eggs in cold water and heat slowly to a temperature just below boiling. Half an hour of such preparation is sufficient.

*Scrambled.*—These are prepared the same as for frying except that the whites and yolks are all beaten together.

*Poached.*—Slide the broken eggs into boiling water, taking care not to break the yolks. Boil as long as desired and season when served.

*Roasted.*—Cover unbroken eggs with live coals. Care must be taken to see that the eggs are not burned.

*Baked.*—Slide broken eggs into a hot and well-greased stew-pan and bake in a hot oven. If no stove is available use the Dutch oven.

*Omelet.*—Prepare the same as scrambled eggs, and add sweet milk and bread or cracker crumbs till the mixture is as thick as desired. Keep the mixture well stirred to prevent burning and season as desired.

## VEGETABLES

*Potatoes.—Boiled.*—Pare them and cut the large ones in half, wash them thoroughly, then boil them till they offer little or no resistance to a fork thrust into them. When they reach this stage remove them from the fire, drain off the water, then set back over the fire to dry. Season when served.

*Mashed.*—Prepare the same as for boiling, then mash thoroughly and season when served.

*Fried.*—Peel and slice thin and fry in grease in a hot pan;

salt and pepper may be added as they fry. If boiled first and sliced when cold they will fry much more quickly.

*Creamed.*—Cut peeled potatoes in small pieces and boil in salt water, drain, add sweet milk, butter, salt and other desired seasoning, then boil again. Remove them from the fire shortly after the milk boils.

*Baked.*—Wash clean and bake in a hot oven. The skins need not be removed, but, if tough, should be pricked or punctured at a number of places in order to allow the escape of steam and gases.

*Roasted.*—Cover unpeeled potatoes with live coals. Care must be taken to see that they do not burn to a crisp.

*Beans.—Boiled.*—These increase in quantity about one-half when boiled. Remove all dirt, pebbles, and shriveled or decayed beans and wash the sound ones twice in cold water. Add a scant teaspoonful of soda to a half gallon of beans covered with water, boil thirty minutes, then change the water and wash the beans again. After this they should be boiled till all are soft. As the water boils away it should be renewed with boiling water. Cold water will retard the process of boiling. If soda is not available change the water after the beans have boiled about twenty minutes, using fresh cold water.

*Onions.—Boiled.*—Peel and quarter the onions and drop them into boiling water. Boil the same as potatoes, adding salt, pepper, or other seasoning to suit.

*Fried.*—Peel and slice the onions very thin, sprinkle with salt, pepper, or other seasoning, then fry in hot grease. These may be fried with potatoes and found to be very palatable.

*Fresh.*—Cut away the roots and the dead tops, wash carefully and place in cold water to keep them fresh. If the long green tops are not desired they may be cut away at the body of the vegetable.

*Green Vegetables.—Boiled.*—Wash the vegetables thoroughly and drop them into boiling water that has been salted in the proportion of one teaspoonful of salt to a quart of water. If such water is allowed to boil too long before the vegetables are placed in it they will have a less agreeable taste. This is due to the deposits that the boiling water makes on the sides and bottom of the vessel. Young or fresh vegetables boil more quickly than old or stale ones, but under ordinary circumstances the following table may be followed with generally satisfactory results:

Beans.....boiled	1	to 2	hours	
Beets.....	1	" 5	"	
Cabbage.....	"	$\frac{3}{4}$	" 2	"
Carrots.....	1	" 2	"	
Green corn.....	"	$\frac{1}{2}$	" 1	" (depending upon its age)
Green peas.....	"	$\frac{1}{2}$	" 1	"
Parsnips.....	1	" 2	"	
Potatoes.....	"	$\frac{1}{4}$	" $\frac{1}{2}$	"
Potatoes.....baked	$\frac{1}{2}$	" 1	"	
Sweet potatoes..boiled	$\frac{1}{4}$	" $\frac{1}{2}$	"	
Sweet potatoes..baked	$\frac{1}{2}$	" 1	"	
Rutabagas.....boiled	$\frac{1}{4}$	" $\frac{1}{2}$	"	
Squash.....	"	$\frac{1}{3}$	" $\frac{1}{2}$	"
String beans....	1	" 2	"	
Turnips.....	"	$\frac{3}{4}$	" 1	"

**Rice.—Boiled.**—Rice swells to about three times its normal size and doubles in weight when boiled. It should be cleaned the same as beans and then washed thoroughly. Two quarts of water will be sufficient for boiling half a pound of rice. Add a tablespoonful of salt and boil twenty minutes, then drain off the water and place the vessel in another filled with boiling water. Cover the rice and steam it for fifteen minutes, then remove the cover and steam it five minutes longer. If a second vessel is not available boil the rice twenty minutes, then drain off the water, remove the rice from the kettle, sprinkle salt over the sides and bottom of the latter, rub them well with a dry cloth, then replace the rice and set it near the fire to dry and swell. Stirring it breaks the grains. To test it, squeeze a grain between the fingers. If done it will mash easily.

**Sandwiches.—Egg.**—Use coarse-grated, hard-boiled eggs and spread them on buttered bread. Add salt, pepper, mustard, sauce, or other seasoning to suit, then cover with a second slice of bread.

**Ham or Tongue.**—Stir the yolk of an egg into finely chopped ham or tongue, then prepare the same as an egg sandwich.

**Fish.**—Remove all skin or bones and prepare the same as ham or tongue.

## FRUITS

**Apples.—Baked.**—Pare the fruit and remove the cores, fill with butter and sugar, bake in a stew-pan partly filled with water, and after a syrup has formed use it to baste the fruit with.

*Stewed.*—If dried fruit is to be used soak it overnight in cold water, then boil till done and season to suit.

Fresh fruit should be pared, cored, and quartered, then boiled in a syrup made of water and sugar, one quart of the former to a pound of the latter. Lemon juice or peel, preferably the latter, when added to the fruit improves the taste.

*Peaches.*—*Stewed.*—If dried fruit is to be used it should be soaked in cold water overnight and then boiled till it is quite tender and done. Seasoning should be added to suit.

Fresh fruit should be pitted, pared, and quartered and then boiled the same as applies. If the skins are to be left on, the fruit should be thoroughly washed and all the fuzz removed.

*Prunes.*—*Stewed.*—Soak the fruit overnight in cold water, then boil done and season to suit.

*Jams.*—Use a pound of sugar for every pound of fruit and boil to the desired consistency. Season to suit. Apples and pears should be pared, cored, and quartered; small fruit should be washed clean, then mashed or boiled to a pulp and prepared in the same manner.

*Jellies.*—These are prepared from the juice instead of from the pulp of fruits. Use a pint of sugar to each pint of strained juice and boil till the required consistency is reached. Huckleberries require less sweetening than any other fruit, while gooseberries require the most.

*Pickles.*—These are fruits, meats, or vegetables preserved in vinegar. They should never be prepared in tin or iron vessels, since the boiling vinegar may be so affected as to render it poisonous. Only stone jars, glass or porcelain vessels, or enamelware should be used. The last-named should be absolutely free from cracks or bruises where the iron or tin may be exposed to the vinegar. A wooden ladle should be used for stirring and all tin or iron spoons avoided.

*Beets.*—These should be boiled two hours, then allowed to cool. Pare and slice thin and cover with vinegar into which the desired seasoning has been boiled.

*Onions.*—Remove their skins and drop the onions into salt brine made strong enough to float an egg. Let them stand twenty-four hours, then remove them from the brine and cover with seasoned boiling vinegar. If the onions are pared under water, juice from them will not reach the cook's eyes.

*Mixed.*—Add a tablespoonful of salt to a quart each of finely

chopped raw cabbage and boiled beets. Add also a teaspoonful of pepper, a teacupful of finely grated horseradish, and two teacupfuls of sugar. Cover the mixture with vinegar.

*Sweet.*—For apples, pears, peaches, and melon rinds use as many pounds of sugar as of fruit. Boil the seasoning into the vinegar and use half a pint of this to three pounds of fruit. Cover the fruit with boiling vinegar prepared in this manner.

*Ginger Snaps.*—Mix together one teacupful of molasses, one teaspoonful of soda, half a teacupful of lard, and as much ginger as desired. Add flour and mix very stiff. Bake in a hot oven.

*Fruit Pudding.*—Add a teacupful each of sweet milk, minced suet, and molasses to a teacupful of raisins or other fruit. Mix in enough broken bread to make a stiff dough, and then steam the mixture till it is done.

*Pie Crust.*—Add a teaspoonful of salt and twice as much baking powder to a quart of flour. When these have been quite thoroughly mixed together add enough sweet milk to make stiff dough. Fruit juice will not soak through the crust if the latter is well spread over with a beaten egg.

*Pies.*—*Fruit.*—Prepare the crusts as above, place one in the pie pan after the latter has been greased to prevent sticking, put in the stewed fruit, cover with the other crust, close the edges of the two crusts well together, and then bake in a hot oven.

*Rice.*—Use a tablespoonful of rice for each pie required and boil it till quite done. After it has cooled add an egg and fruit and season to suit.

## DRINKS

*Coffee.*—Pour a quart of boiling water over a liberal handful of ground coffee and let it stand ten minutes before serving. To settle the grounds, pour in about half a teacupful of cold water or drop a handful of snow into the coffee-pot. If such a pot is not available put the ground coffee in the Dutch oven and stir it as it heats. After it has been well heated pour boiling water on it and let it stand five minutes. Strain it through a cloth and then replace the liquid in the oven to keep it hot.

*Tea.*—Tea should never be boiled. Use a very scant teaspoonful of tea for each cupful required and pour on boiling water. Let it stand ten minutes before using.

*Cocoa.*—As a general rule it is always more satisfactory to



everybody concerned if each man mixes his own cocoa. This may be done by mixing a teaspoonful of sugar very thoroughly into the same amount of cocoa, then adding as much sweet milk as may be desired for the cup, and mixing it all together until no lumps remain. After this the hot water may be poured into the cup.

**Chocolate.**—Scrape the chocolate from the cake in a fine powder and then prepare the same as cocoa.

**Lemonade.**—One lemon is sufficient for two glasses of this drink, and should be of the thin-skinned variety. The tissues may be broken up and the juice released if the lemon is rolled until it becomes quite soft. When this has been done it may be cut in half and the juice squeezed out, or it may be cut in thin slices and pressed. Sugar and cold water are added to the juice in amounts sufficient to make the lemonade as strong as desired.

**Beer.**—To five gallons of water add half a pint of hops and half a peck (four quarts) of good wheat bran. Boil this mixture till the bran and hops sink. Strain the liquid through a cloth and add two quarts of molasses as soon as it becomes lukewarm. After the molasses has thoroughly dissolved pour the mixture into a keg and add a tablespoonful of yeast. After fermentation ceases cork the keg for a week before using the beer.

## CARE OF COOKING UTENSILS

Vessels in which eggs have been prepared should either be filled with cold water and allowed to stand for a short time or be cleaned immediately after the eggs have been removed. Otherwise the eggs will stick and can be removed only with difficulty.

Milk vessels should be scalded when empty, thoroughly dried, and then set away in such a place and in such a manner that dust can not enter them. Unless carefully scalded and kept perfectly clean they soon become odorous and unsanitary.

Vessels in which dough has been mixed should be filled with cold water and allowed to stand for ten or fifteen minutes. This loosens the dough and permits its removal with greater ease. Hot water will only serve to make it stick worse.

Rust, grease, and burned food may be removed from cooking utensils by using common earth or fine sand for a scouring agent. If pans or kettles are allowed to rust, foodstuffs will stick in them and can be removed only by scouring.

Care must be taken not to crack or otherwise injure the enamel on enamelware dishes. Such openings in the enamel permit exposure of the inner metal, and this soon rusts.

Knives, forks, and spoons may be kept clean and bright by thrusting them into the ground a number of times before they are washed, nearly all soils carrying sufficient grit to provide a suitable scouring agent. After these articles have been washed they should be carefully dried and placed where snow or rain can not reach them.

### BUTCHERING

It happens not infrequently that field men must act as butchers if they are to secure fresh meat, and it is therefore probable that a general knowledge of the operations involved will not come amiss.

Cattle and hogs are usually killed by being shot or by being knocked in the head. Immediately after this has been done they are bled by a thrust of a long-bladed knife which enters the heart. Such a knife should have a very long, thin point and should be started through the skin at a point just above the animal's breast-bone. In order to secure free bleeding at once, the knife-blade should be aimed directly at the root of the animal's tail. This usually leads it directly into the heart. Unless the blood gushes forth in a stream the heart has not been reached, and a second thrust, possibly a third one, will be necessary.

Cattle are skinned. In performing this operation the skin should first be cut entirely around the legs at or near the hoofs. It is then split from this incision along the inner side of each leg to the middle of the lower side of the body. Afterward the skin along the entire under side of the body is split open even to the tip of the tail. Another incision is made around the neck immediately to the rear of the head, and the skin is then ready to be removed. Usually it is removed from the legs and neck first. It may then be stripped off either to the rear or to the front. After this has been done the body is opened along the under side and the internal organs are removed. A block and tackle should be provided and the body hung up head downward. In this position the interior may be dashed with clean cold water and thus washed out. In hanging the body a 30-inch gambrel should be used. Its ends are inserted in slits

cut through between the ham-strings and the bones of the hind legs, and it is then hung from the center to a pole or the branch of a tree. It should be of some tough wood and not less than 3 inches in diameter.

Hogs are scalded.<sup>1</sup> This may be done either by dipping the body into boiling water<sup>2</sup> or by dashing boiling water over it. The object of such scalding is to loosen the bristles so they may be scraped from the skin. After the bristles have been removed the body is hung the same as a beef, and is otherwise treated in a similar manner except that as a general rule the internal organs are not removed until the body has been hung. An 18-inch gambrel 2 inches in diameter is heavy enough to support a 400-pound hog.

Sheep and goats are killed by having the throat cut across back of the jaws and through to the bone in the neck. The animal is placed on its back, the chin is thrust forward with one hand and the butcher then wields the knife in the other. The skin may be removed and the body further dressed the same as that of a cow. Use the same size gambrel as for hogs.

Sheep- and goat-fat may be rendered into tallow, but should not be used for cooking purposes, as it has a very strong and disagreeable odor.

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<sup>1</sup> In some States it is a violation of law to skin a hog, presumably because the identification marks in the ears would thus be removed.

<sup>2</sup> The most convenient method of heating water in the field is by placing large, hot stones in a barrel of water. The barrel should be firmly fixed at an incline to facilitate dipping

# LIVE STOCK

## CARE OF HORSES

Horses are not naturally vicious or otherwise incorrigibly inclined, but such characteristics may develop as the result of improper training or treatment, and continually nagging at or unnecessarily annoying an animal is a practice that can not be too strongly condemned. There is a wide-spread idea prevalent that horses can neither think nor reason, but men who have spent years working with or about them will invariably dispute this theory.

**Water.**—A horse can exist on wonderfully short rations, but it is imperative that he have a certain amount of water. He should not be allowed free access to it, however, while he is extremely warm or fatigued, nor should he be given water immediately after being fed, as in this case the water will carry the grain or forage directly into the intestines before stomachical digestion has been completed. The invariable result of this is colic in more or less severity. The best time to water a tired or warm saddle or work animal is after it has been allowed to rest about twenty minutes and before it is fed. Stagnant or polluted water should never be given.

**Feed.—Grain.**—Various customs of feeding prevail in different localities, and that to which an animal has been accustomed should be followed whenever this is possible. Work animals in the South are usually fed grain and roughage three times a day, but in most parts of the West and Southwest grain only is fed and but twice a day, the animals being allowed to graze at night or at intervals during the day, and thus secure the necessary roughage for themselves.

**Green Corn.**—This must be fed in very small quantities until an animal's digestive organs adjust themselves to the work of assimilating it. Not more than four ears should be given at a feed and only twice daily for the first two weeks. The amount may then be increased two or three ears. An animal fed green corn should have free access to salt at all times.

**Ear Corn.**—This constitutes the principal grain feed of the

South, many portions of the North, and practically all parts of the middle West. It is very nutritious, but creates too much heat for a steady diet or for heavy summer work. Moreover, animals unaccustomed to eating it may have considerable difficulty at first in shelling it from the cob, and if they suffer from bad teeth they will have still more difficulty in masticating it. It is bulky and is not satisfactory grain to pack or transport by wagon from camp to camp.

A very common rule for measuring ear corn is by the number of average ears locally considered as constituting a bushel. Eighty selected ears make a bushel in the lower Missouri valley, one hundred and twenty average ears are accepted as a bushel throughout the middle West, but in most parts of the South and Southeast, where climatic conditions are not so favorable to the production of a good grade of corn, one hundred and twenty-five and sometimes one hundred and thirty average ears are considered a bushel. The weight of a bushel of ear corn is seventy pounds, fourteen of which are assumed to be the weight of the cobs.

For medium heavy work, whether pack, saddle, or wagon, eight ears twice a day will be sufficient for a thousand-pound horse, but an animal raised in the South should have an extra similar feed at noon. All worm dust and worm-eaten kernels should be removed. In addition to this amount of grain such animals should be given as much roughage as they will clean up at a feed. Mules should be fed a third less grain and their roughage allowance should be increased in proportion. Burros, of the type commonly used in the West for pack animals, can seldom be induced to eat ear corn, and the same is also true of Western range horses.

*Shelled Corn.*—This can not be recommended as a satisfactory grain feed. Animals that are tired, warm, or extremely hungry usually eat it too hurriedly and do not crush it fine enough. The result is that a large portion of it enters the stomach whole, where it is not only practically impervious to the digestive juices, but is also subject to such swelling that a severe attack of colic may ensue. Moreover, when it is improperly masticated, it passes through the alimentary canal without supplying the required amount of nourishment, and is therefore a total loss. It is an especially dangerous grain to feed an animal with poor teeth or one that bolts its food as quickly as possible.

However, if no other grain is available shelled corn should be fed very sparingly with a proportionately larger amount of roughage. Two quarts twice a day with roughage will be sufficient. About four average ears will produce a quart when shelled (except where eighty ears are considered a bushel) and will weigh approximately one and three-fourths pounds. Water should never be supplied immediately after an animal has had a feed of shelled corn, but should always be given at least half an hour before feeding.

*Oats.*—Oats can hardly be surpassed for a steady diet that will impart strength and general health to an animal, and their use is strongly recommended when they can be secured. In most States thirty-two pounds constitute a bushel, thus allowing one pound to the quart. The regular feed should be about four quarts twice or three times a day, depending upon the work being done and the manner of feeding to which the animal is accustomed.

*Barley.*—This constitutes the chief grain feed in many of the Western States, where it is crushed or rolled and put up in sacks, usually of seventy pounds, although in some localities a sack may hold as much as one hundred and forty pounds. A seventy-pound sack provides from fourteen to sixteen feeds.

*Wheat.*—In view of the fact that wheat swells when moist, it is not a very satisfactory horse feed, although, after an animal has become well accustomed to eating it, no ill effects follow. However, it is always advisable to have it thoroughly soaked before it is given an animal. The amount given at one feed should not exceed one-half gallon, which weighs approximately four pounds. It is a common grain-feed in the Northwest.

*Bran.*—This acts chiefly as a laxative, possesses a very low nutritive value, and should be fed once a week merely as an aid in keeping an animal's digestive apparatus in good condition. It should be moistened and mixed until it will not be blown about by the animal's breath. If a scant handful of salt is added to the feed it will prove more appetizing and will be eaten with greater relish. One gallon is sufficient for a feed.

*Roughage.*—This may consist of green range grass, tame grasses, or hays and fodders. The first is the most common form of roughage in the West, while the other forms are in common use throughout the middle West and all sections of the South.

*Range Grasses.*—There are so many varieties of these, such as the different grammas, blue grasses, rye grasses, broom grasses, and others, that the subject can not be discussed in detail here. A general treatise on range plants can be secured, and the field man should study it carefully at leisure times.<sup>1</sup>

*Tame Grasses.*—Few of these appear on open range lands, but a large variety will be found in the pastures throughout the East, South, Southeast, and middle West. Chief among them may be mentioned blue grass, Johnson grass, blue stem, crab grass, foxtail, timothy, alfalfa, and clover. An animal should not be allowed free access to any green feed until it has become more or less accustomed to eating it. Wet or dewy clover is especially liable to cause colic.

*Hay.*—Alfalfa is the principal hay used in the West and Southwest. The first cutting may affect an animal's kidneys, and since an inexperienced person can hardly be expected to distinguish between this and subsequent cuttings he should take care not to feed too much alfalfa hay until he is sure it is having no ill effects. Customarily from twenty-eight to thirty-four bales are considered a ton.

Timothy hay is very common to the South, and can hardly be excelled for a steady roughage diet. From twenty-eight to thirty-three bales usually constitute a ton, although bales may weigh as much as one hundred and twenty or twenty-five pounds in some localities. In such a case sixteen bales are considered a ton.

Clover hay, also common to the South and weighing about the same as timothy, is a very satisfactory roughage if properly cured, but it molds so easily if stored away damp that a large per cent of it is usually unfit for horse feed, although it is apparently relished by cattle.

Any good grade of hay carries a large amount of leaves and blossoms or "flowers," is free from coarse stems, weeds, trash, and other such materials, and is of a bright green color.

*Fodders.*—These may be whole stalks, tops, or blades of corn, cane, or Kaffir corn. Whole stalks do not make satisfactory roughage by reason of the large amount of waste in the butts.

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<sup>1</sup> See Notes on National Forest Range Plants, Part 1, Grasses, by the Office of Grazing Studies, Forest Service.

Top fodders and blades are usually eaten up clean and little or no waste remains.

**Salt.**—Herbivorous animals obtain so little salt in their natural foods and require so much salt in the proper digestion of such foods that it is incumbent upon the field man, or any other stock-owner, to see that it is supplied in sufficient amounts and in such a manner that animals may have free access to it at all times. This can best be done by placing the salt in a box where the animals may lick it as they desire. The rock salt, so much in favor among cattle-owners, is not recommended for horses, the construction of their tongues being such that they can not secure salt from a hard mass as readily as cattle may. Regular table salt is somewhat more expensive than rock salt, but on account of its greater strength and purity and the ease with which a horse may secure it, it is recommended in preference to the rock salt. An average handful once a week will prove sufficient.

### SHOEING

**Kit.**—If a man must shoe his own animals he should provide himself with the kit of tools shown in Fig. 196. This includes



Hoof-parers.



Nippers.



Shoeing hammer.



Paring knife.



Rasp.



Toe knife.



Buffer.

F.G. 196.—Horseshoer's kit.



a pair of hoof-parers, a pair of cutting nippers, a hammer, a paring knife, rasp, toe knife, and buffer, and costs from \$3.50 to \$5.00. The 14-inch parers, rasp, and nippers are recommended. Ordinarily he will be able to secure parers, rasp, nippers, and hammer by requisition.

Before he attempts to shoe an animal he should learn something of the structure and functions of the hoof, and thereby avoid mistakes so commonly made by amateur shoers.

**Hoof.**—The hoof is provided as a means of protection to the delicate nerves, membranes, and fibers that compose the foot. It is a tough, horny, fibrous substance, the fibers extending vertically and parallel with each other, and secretes an oil the object of which is to exclude external moisture and to retain internal moisture. The growth is from the upper edge or coronet downward and occurs at the rate of from 3 to 4 inches a year. In thickness it varies from  $\frac{1}{4}$ - to  $\frac{3}{8}$ -inch at the lower edge to about  $\frac{1}{8}$ -inch at the extreme upper edge at the coronet.

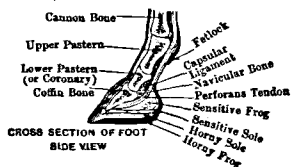


FIG. 197.

From the latter edge downward the increase in thickness is rapid to a point about one inch below the coronet from where it is practically uniform to the lower edge.

It is generally conceded by horsemen and shoers that white or striped hoofs are not as strong and tough as black hoofs.

**Parts of the Hoof.**—These are the sole, frog, heel, toe, walls, bars, and coronet.

Each has its particular function to perform, and lameness or other trouble will occur if normal action is interrupted by careless attention or improper shoeing. It is therefore of the utmost importance that each part be given due consideration when old shoes are to be removed or new ones are to be nailed on.

**Sole.**—This is the portion of the hoof presented to the ground and is thickest at the edges where it meets the hoof walls and thinnest at the center along the edges of the frog. It grows from the sensitive sole above, the dead or worn-out tissues peeling from the under surface in flakes. Lameness will result if the sole is pared away too thin.

**Frog.**—This extends in a V-shape from the rear of the hoof

to or near the center of the sole, the partly cleft wide end being at the rear. A cleft also extends along either side and serves to increase the flexibility of the sole's connection with the frog. The growth is from the sensitive frog above. Its functions are similar to those of a cushion which prevents jars, and it also acts as a wedge which keeps the heel well spread, thereby maintaining a wider sole base. In unshod horses it prevents slipping or sliding forward or sidewise. It should be left free to come in contact with the ground and should not be pared deeply, since the dead tissues will wear away fast enough against the ground.

**Heel.**—This is located at the rear of the hoof and is apparently an upward extension and termination of the frog. It acts as a protection to the attachment of various tendons and ligaments, serves as a brace to prevent the hoof from turning sidewise, and provides a cushion which, in conjunction with the frog, absorbs most of the shock in fast or rough travel. It needs no attention in shoeing unless old injuries have caused the formation of large or hard scales or scabs. In that case it may become necessary to remove these in order that they may not hang in brush or rocks and tear out or otherwise injure the hoof.

**Toe.**—This is the lower forward edge of the hoof. It assists the animal in securing a firm footing and should be especially strong and healthy. The forward or outer upright portion should not be pared away deeply to make it fit the shoe. Such trimming not only causes improper traveling by shortening the toe and causing an animal to "break over" too quickly, but also weakens the hoof seriously. Furthermore, it removes a portion of the hoof wall which secretes the hoof oil and thus allows a certain amount of external moisture to enter and more or less of the internal moisture to escape. It is permissible, however, and even advisable, to rasp away the short, sharp, ragged edge that may project slightly over the shoe.

**Walls.**—These are the upright portions of the hoof. They serve as a protection to a number of joints and tendon and ligament attachments which occur at a point where compactness of arrangement is essential. Like the edge of the toe they should not be rasped away very deeply, if at all.

**Bars.**—These appear in the shape of ridges, one along either side of the frog, beginning at the heel wall and extending to the forward end of the frog. They act as reinforcements to the

parts of the sole immediately adjacent to the frog and also serve as a means of protection to the sides of the frog. They should not be pared away.

**Coronet.**—This is found at the junction of the hair and the hoof. Its function is to produce hoof material, and the health and strength of the hoof depend upon its healthy condition. Bruises or slight punctures made in it remain in the hoof wall until the downward growth removes them at the lower edge of the hoof.<sup>1</sup> The most common injury to the coronet, aside from wire cuts and injuries from nails and similar articles, occurs as the result of a bruise, appears in the form of an abscess, and is known as "quittor." (See page 256.)

**Holding the Feet.**—In holding a forefoot the shoer should place the cannon-bone or pastern joint between his knees as he stands with his back toward the animal's head; a hind foot is held most conveniently if he places the cannon bone over his thigh and allows the pastern joint to rest against his knees. A vicious animal should be thrown or have its forefeet tied up close to the elbows and the hind feet tied to the tail, or fastened as shown in Fig. 198. Blindfolding is also an effective means of control; it may be done by fastening a coat or a feed-sack over the animal's eyes, the coat-arms being tied together beneath its jaws, or the sack-ends thrust under the cheeks of a halter, hackamore, or bridle. The shoer should not touch a blindfolded animal until he has spoken to it and made it aware of his presence. Brutal treatment is never effective and only serves to make a fractious animal less tractable during future operations of shoeing.

**Removal of Shoes.**—Shoes that have been worn so long that

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<sup>1</sup> Strictly speaking, these so-called scars are less in the nature of scars themselves than continuations of scars appearing in the coronet. They bear the same relation to the hoof walls that a crack, ridge, or other unnatural growth resulting from an injury to the matrix bears to the human toe- or finger-nail. Such a growth on the hoof merely indicates that the coronet has at some previous time been more or less severely injured and that its functions have been impaired to a degree which rendered it incapable of producing normal and uniform hoof material at the point of injury. Therefore, originating in an irregular and gnarled condition, that portion of the wall growing from the scarred point of the coronet remains so and thus appears in a form which may lead an inexperienced person to believe that the injury itself extended from the coronet completely through and to the lower edge of the hoof wall.

the hoofs have grown out long and narrow should be removed, and if possible the animal should be allowed to go without shoes for a week or two; this permits the hoofs to wear down evenly and naturally and also allows them to spread and regain whatever shape may have been lost as the result of the shoes' protection. Constant wearing of shoes soon tends to narrow the

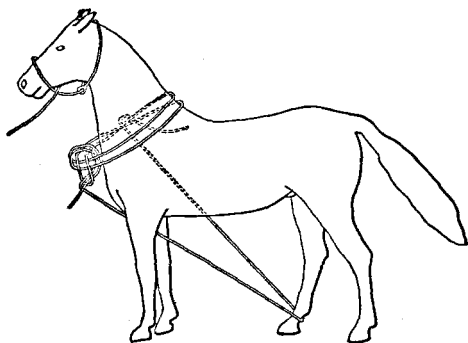


FIG. 198.—Shoeing rig.

hoof and this results in an unnatural strain on the tendons as the animal tries to keep the hoof from tipping.

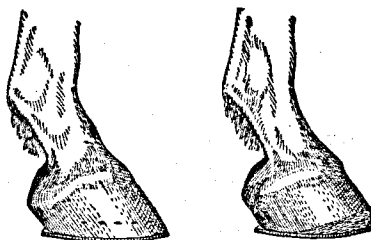
Clinches should be cut away first, and when this has been done the nippers are forced between the shoe and one side of the heel and the handles are then forced downward. As soon as the shoe has been loosened it may be tapped back into place, leaving the nail head protruding far enough to be seized and drawn with the nippers.

The other side of the heel is then treated in a similar manner, and when the rear nails have been drawn the shoe may be tipped downward toward the toe and the remaining nails pulled. If one whole side of the shoe is removed first and the shoe is then tipped sidewise over the edge of the hoof it may cause the wall to be broken or torn as the nails are forced out.

**Leveling the Hoof.**—Long edges are cut away with the parers. If the latter are of the variety having only one cutting edge this edge is placed toward the center of the foot, the blunt jaw being brought to bear against the outer side of the wall. When the rougher edges have been thus cut away smaller irregularities

may be removed with the paring knife. Finally the rasp is used, and last, by means of the paring knife, the central portions of the sole are trimmed down till the shoe will rest directly against the lower edges of the walls. If it is allowed to bear against the sole too far in from the walls corns may result.

**Fitting the Shoe.**—Malleable shoes must be used when no forge and anvil are available. These may be fitted cold and are recommended for use by field men who are not familiar with the use of a forge. The practice of applying a hot shoe to the hoof for the purpose of burning the latter down till it fits the shoe is one to be avoided; the shoe should be shaped to fit the hoof. Preliminary fitting may result in the slight scorching of the hoof, but one or two light applications of the shoe should be sufficient to show what changes must be made in its shape.



Shoe properly fitted. Toe cut away to fit the shoe.

FIG. 199.

It should be wide enough at the heel to prevent it from resting against the frog, and the outer edges should be flush with the edges of the hoof. For proper and improper fitting see Fig. 199.

**Attaching the Shoe.**—Under ordinary circumstances it is most convenient to drive one of the rear nails first. Careful inspection of a horse nail will show the point beveled to one side. In driving the nail this bevel is placed toward the center of the foot and thus leads the nail out of rather than into the hoof wall. After the nail has been driven up close, the protruding point is twisted off with the claws of the hammer, and the oppo-

site nail at the rear is driven in a similar manner. Remaining nails are then driven as convenience dictates.

In very flaring hoofs nails should be set slightly outside of a perpendicular to the face of the shoe, but in very straight hoofs it may be necessary to set them either perpendicularly to the shoe or even inside of a perpendicular.

**Finishing.**—When all the nails have been driven they are “set” securely by holding the buffer against the clinches and tapping the heads sharply with the hammer. Hammering should not, however, be unnecessarily violent. When they have been set, then the clinches are clipped back to not more than  $\frac{1}{8}$ -inch in length and are then flattened against the hoof wall after the ragged edges of the nails and the nail holes have been rasped away. All sharp edges extending over the edge of the shoe are also rasped away.

**Shoeing Mules.**—Mules are shod the same as horses except that differently shaped shoes are used, as shown in Fig. 200.

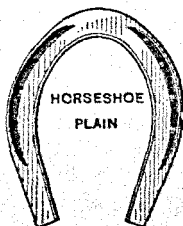
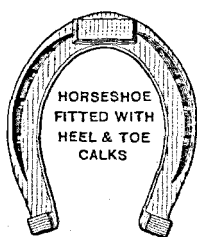


FIG. 200.—Shoes.

This difference is made necessary by the longer and narrower hoof, which requires a broader heel-base for proper support.

**Shoeing Saddle Animals.**—Many horsemen prefer plain shoes for saddle animals, but for travel in a mountainous country heel calks are recommended. They should not exceed  $\frac{3}{8}$ -inch in height and should not be set further than  $\frac{1}{8}$ -inch back of the heels. Toe calks are not recommended for saddle animals but are very satisfactory for use on draft animals.

## HOBBLING

**Double Hobbles.**—These may be attached to either the forelegs or the hind legs, although they are seldom used on the latter. They should be buckled about the legs just above or below the pasterns and should not be drawn so tight as to impede circulation of the blood.

A very satisfactory substitute for leather hobbles may be had by using a rope, preferably of cotton. This is looped about one leg, twisted about itself for a distance of approximately 8 inches, then tied around the other leg.

**Picket Hobble.**—The common practice of buckling a picket hobble to the foreleg is one to be avoided; an animal tied in this manner will invariably throw itself and possibly sustain severe injuries if it becomes frightened and attempts to run. The safest method is to attach the hobble to a hind leg, thus leaving the animal's forelegs free and allowing it greater freedom of motion if it does start to fall. The probability of stifling an animal by attaching the picket hobble to a hind leg is small, a wide-spread belief to the contrary notwithstanding. Furthermore, if a hind leg is hobbled, there is little or no danger of rope "burns" being inflicted on the other legs.

**Side Hobbles.**—These may be used on an animal that has become so adept in the manipulation of regular double hobbles that they no longer serve as an adequate means of confining it to a limited area.

Ordinary double hobbles are used, however, but the short chain that connects them is replaced by a longer one and the two legs on one side are fastened together. When first used on an animal this chain should be long enough to allow the

legs and feet to assume their natural position as the animal stands still; it is shortened as the animal learns to travel better.

Such a method of hobbling is known in the South as "side lining."

It seldom proves effective on a horse that paces.

**Cross Hobbles.**—These are attached to the front and hind legs of opposite sides as shown in Fig. 201, and are especially effective when double hobbles or side hobbles fail to prevent

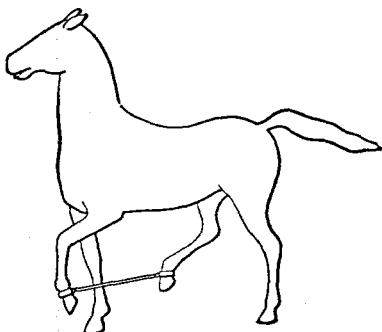


FIG. 201.—Cross hobble.

an animal from straying long distances. The method is known in the South as "cross lining."

**Horseshoe Hobbles.**—These are for use on an animal that stands quiet while being approached but manages to keep just out of reach and thereby avoid being caught. An ordinary horseshoe is slipped about the leg over the cannon-bone and pushed downward till it fits moderately tight. It usually prevents an animal from running.

**Chaining.**—This method of preventing an animal from straying or from running away when approached consists merely of linking a chain into a single, or picket, hobble; when the animal starts to run the chain whips the other legs. Such a chain should be about 2 feet long.

An animal that is hobbled should not be picketed at the same time; it is not only a dangerous practice, but is also quite unnecessary.



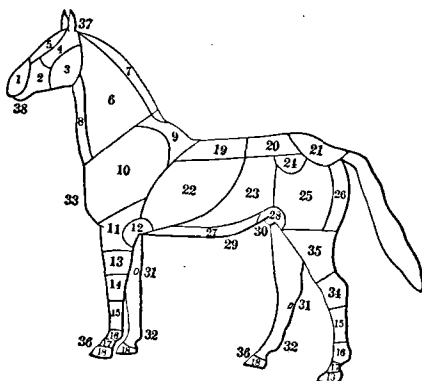


FIG. 202.—Parts of the horse.

1. Nose	14. Knee	27. Belly
2. Cheek	15. Cannon	28. Stifle
3. Jaw	16. Ankle	29. Umbilicus
4. Side of head	17. Pastern	30. Sheath
5. Face	18. Hoof	31. Chestnut
6. Neck	19. Back	32. Fetlock
7. Mane	20. Loins	33. Breast
8. Gullet	21. Rump or croup	34. Hock
9. Withers	22. Ribs	35. Leg or stifle
10. Shoulder	23. Flank	36. Coronet
11. Arm	24. Hip	37. Poll
12. Elbow	25. Thigh	38. Chin
13. Caston	26. Buttock	

## DISEASES

### 1. HORSES

Horses are susceptible to such a multitude of ailments and injuries that a comprehensive treatise on the subject would require a volume too large and too expensive for the field man to carry about in his pack; consequently only the more common diseases, particularly those which may be expected to develop in the field, will be considered here.

**Wind Colic.**—*Causes.*—Overfeeding, watering while hot, use of feed to which the animal has not yet become accustomed, ordinary indigestion resulting from improper mastication, or systemic disorders. The affection is not contagious, infectious, or in the nature of an epidemic.

*Symptoms.*—The animal lies down frequently but soon gets up and walks about with short irregular steps and with the back “humped,” it looks back at the sides and flanks, which may be distended or appear bloated, and the bowels are clogged. This condition of the bowels is directly responsible for all the symptoms displayed; gases generated by fermentation of the contents of the stomach and intestines are not allowed to escape, and the result is that these organs soon become distended to an extent that subjects other internal organs to severe pressure and thereby interferes with their normal action.

*Treatment.*—Apply turpentine to the back immediately in front of the hip “coupling”; such applications may also be made to the umbilicus. (See Fig. 202.) Care must be taken not to rub the turpentine in or to confine it to one spot by means of bandages, or blistering and removal of hair will result. An ounce of chloral hydrate is also good. The animal should be kept rather strenuously exercised, and such other measures as will tend to keep the bowels open should be adopted.

As a general rule wind colic is not fatal.

Many horses are so constituted as to suffer an attack nearly every day, and always on the slightest change of feed.

*Spasmodic Colic.*—*Causes.*—The chief cause of this affection is the accumulation of large masses of indigested material in the intestines, preventing escape of the gases arising from fermentation, and thereby causing great pressure against the internal organs. This pressure is responsible for the internal pains suffered.

*Symptoms.*—Similar to those manifested in common wind colic but more pronounced; rolling is more vigorous and more pain is apparent, excessive perspiration may appear, and in advanced stages the ears and nose become cold; spasms of pain are intermittent with brief periods of comparative relief, and each spasm is more severe than the preceding one.

*Treatment.*—Action must be prompt as soon as the symptoms are recognized. Drench with a quart of warm water into which a teacupful of Epsom salt has been thoroughly boiled. (For Drenching, see page 267.) Repeat the dose if favorable results are not obtained within an hour. Chloral hydrate may also be given, the same as for wind colic.

If neither of these treatments proves effective an attempt should be made to remove the obstruction from the intestines

by hand. A viciously inclined animal may be thrown or it may be tied as shown in Fig. 198. After this has been done, and before the operation proper begins, the attendant should have his hand and arm well oiled or greased in order that none of the delicate membranes encountered may be abraded. Ordinarily the intestines are clogged at a point where the obstruction may be reached and removed by hand.

Another method of removing the obstruction, by relaxation of the intestine walls, is to place a twist or a large handful of leaf tobacco as far up in the intestines as it may be forced by hand.

Large injections of warm water may also bring relief.

If none of these remedies gives relief, the animal may be tapped, but this operation should be performed only by a competent veterinarian, and the adoption of such a method by an inexperienced person is not recommended.

**Founder.**—*Causes.*—This is due, in the majority of cases, to over-feeding or over-watering while an animal is very warm or tired, but it may occur as the result of hard driving over a rough road. It attacks the forefeet, the hoofs of which eventually grow out long and irregular and turn up at the toe; the soles are also affected and may protrude downward to an extent that prevents the edges of the hoof from resting on the ground.

*Symptoms.*—These are frequently, but not always, preceded by symptoms of colic. The feet are extended forward, and as much of the body's weight as possible is borne on the heels, the hind feet are brought well forward under the body to relieve the forefeet of pressure, breathing may be laborious, pulse rapid, nostrils dilated, hoofs painful and feverish, and the animal may lie down for long periods.

*Treatment.*—Make alternate applications of hot and cold water to the hoofs for two or three hours; give half an ounce of nitrate of potash in the drinking water twice a day, and provide clean bedding, a roomy stall, and plenty of rest.

**Distemper.**—This disease (*febris pyrogenica*) is confined chiefly to young horses, seldom attacks mules, and generally leaves an animal immune from further attacks. It ranges from an almost imperceptible form to malignant distemper, and is correspondingly serious in its effects.

*Causes.*—Contact with infected animals or surroundings.

*Symptoms.*—Slight or marked fever, depending upon the gen-

eral physical condition of the animal, appears first. This is followed by a watery discharge of a whitish color coming from the nose and air passages; there is loss of appetite, sluggishness is noticeable, slight chills occur, the coat is rough and dry and the hair stands erect; the animal has a dejected appearance, and stands with low-hung head and with the ears back. Frequent sneezing or coughing produces sounds which indicate surplus moisture in the lungs and air passages. Repeated attempts to drink result in the greater part of the water being spilled from the mouth, this being due to a sore throat. The discharge from the nostrils gradually changes from a whitish to a bluish color, becomes sticky and thicker, finally turns to a yellowish color, and increases in volume. Cessation of fever indicates a fully developed stage of the disease, and, conversely, the fever disappears at this stage. A swelling at the forward part of the throat distends the parts beneath the jaws and is decidedly puffed and very sensitive to the touch, becoming more so as the disease progresses. Relief is at once apparent as soon as this swelling breaks, and in case it does not break of its own accord it should be lanced when it appears to have reached the point of greatest distention, and the pus allowed to escape.

The discharge from it, and from other abscesses that may appear on the sides of the head or at other points on the body, stops in from two to five days. The animal should experience no permanent ill effects from the disease unless perhaps it may be left a "roarer."

*Treatment.*—After the discharges have been stopped, provide fresh, clean quarters, clean feed and water, and plenty of rest for complete recovery. Keep the animal warm. To reduce fever give a handful of Glauber salts three times a day.

If infection of other animals is undesirable the sick animal should be kept in secluded quarters at least 100 yards from other stock. Wholesale infection may eventually prove best, however, by reason of the fact that so far as a particular herd is concerned the trouble is over for all time.

*Glanders—Farcy.*—The average horseman attempts to classify glanders and farcy as two separate and distinct diseases, when as a matter of fact the latter is simply an external indication of the presence of the former. Veterinarians have not yet been able to combat the disease successfully, and the most reliable method of treatment is to kill the animal as soon as it is defin-

itely known to be infected. The disease may be temporarily checked or even forced into a dormant stage, but eventually it reappears and always with fatal results. Such a stage of dormancy may cover a period of months or even years, but no permanent relief other than shooting is possible.

The disease is infectious and contagious, and the animal should be quarantined as soon as the symptoms are recognized. Nearly all State legislatures have enacted laws requiring owners of infected animals to notify certain authorities immediately upon discovery that the disease is present; such officers then make a careful investigation of the case and the infected animal is ordered disposed of at once, the owner being wholly or in part reimbursed for the loss thus sustained.

There seems to be no authentic record of cattle ever having been attacked, but sheep are more or less susceptible, while mules are seldom affected. It may be transmitted to man by contagion or infection, and persons so infected should secure expert medical attention at the earliest possible moment.

The disease is due to a micro-organism called *bacillus mallei*.

*Causes.*—Either by contagion, or by contact with infected animals or articles used in connection with their care, litter and blankets being especially good vehicles for transmission of the germs.

*Symptoms.*—Fever, sluggishness, dulness, and a dry, rough coat. Numerous small abscesses appear in the skin, and are known as farcy "buds" or "buttons." Post-mortem examination reveals the presence in the lungs of numerous small punctures caused by abscesses, and these are no doubt responsible for the fatal termination of the diseases.

*Treatment.*—Keep the infected animal strictly quarantined in sanitary quarters, and supply clean feed, pure water, and complete rest until the proper authorities issue further directions. The quarters, and all articles used in connection with the care of the animal, should be burned immediately after the death of the animal, and the same disposition of the carcass should also be made.

The following remarks on page 119, U. B., 1915, under the subject of disposition of carcasses may prove of interest to persons not familiar with effective means of disposition in such cases:

REG. G-27. The carcasses of all animals which die on the National Forest from contagious or infectious diseases must be burned, and

the carcasses of all animals which die in the close vicinity of water must be removed immediately, and buried or burned.

Comment on this regulation is as follows:

"The carcasses of animals dying from blackleg, anthrax, glanders, and other bacterial diseases scatter germs on the range when they decompose, and a healthy animal may contract the disease. Therefore, to prevent the pollution of water supply and the spread of the disease among human beings, as well as live stock, this rule will be strictly enforced.

*How to Burn a Dead Animal.*—The destruction by fire of the carcass of an animal weighing perhaps a thousand pounds is not an easy matter. One of the best methods known is to dig a hole as close as possible to the carcass, about 2 feet deep and large enough otherwise to contain it. On the sides of this hole dig two or three small ditches or trenches sloping from the surface of the ground into the hole. These will secure a strong draft, which will aid materially in the success of the work. Having filled this hole with dry wood, piled so as to give the maximum draft, the animal can readily be rolled onto the pile, and with an additional supply of wood placed around the carcass the combustion will generally be almost complete. The earth taken from the hole can then be thrown back into it, covering what few bones are left unburned, and the job will be completed in a very satisfactory manner.

*Owners Must Dispose of Dead Animals.*—Where the ownership of a dead animal can be ascertained the work of burning or burying the carcass must be attended to by the owner or his employees. So far as practicable forest officers will notify persons of the presence upon the range of dead animals owned by them. Where this ownership can not be ascertained the duty of carrying out the regulation falls upon the local forest officer."

Since man is not immune to glanders, he should exercise the greatest precautions not to contract it. He should not remain in an infected animal's quarters longer than necessary, and should be especially careful not to allow cracks or open sores on the hands to come in contact with any part of the carcass.

*Bots.*—Horsemen disagree widely as to whether such a disease as bots, as the term is generally understood, really exists, some contending that the symptoms ascribed to the disease are due to other causes and do not indicate that the animal is suffering from "bots."

The disease as recognized by those who insist it does exist usually proves fatal if allowed to progress unattended.

*Causes.*—Said to be caused by the accumulation in an animal's stomach of the eggs of the "nit fly" or "bot fly." Here a certain process of development produces a worm or grub

similar to that found in the backs of cattle and known as a "wolf" or "warble." The eggs are deposited by the fly on the animal's hair, and are found in greatest numbers on the inner sides of the fore legs and below the knees, where they appear as minute yellow specks. Their attachment to the hair produces a tickling sensation which causes an animal to nibble at them and thus take them into the stomach through the throat.

As development progresses here they finally attach themselves to the stomach walls, where they remain and increase in size, sometimes to half an inch in length and almost as much in diameter. Post-mortem examination may show them clustered so closely together as to completely hide the walls.

*Treatment.*—The primary stages are so likely to escape observation that the disease is usually fully developed before it becomes noticeable to the average horseman. The best treatment is of a preventive nature. The animal's stomach should be kept in a healthy condition by frequent doses, administered in the feed, of some article that will assist nature in throwing off the accumulations of eggs. Any good worm medicine will serve the purpose, or a small handful of powdered leaf tobacco in the feed once a month will do as well. Kerosene oil smeared on the animal's legs will repel the flies and at the same time prove so distasteful that the animal will nibble at its legs less.

*Pink Eye.*—This is a contagious fever and is so designated from the red, swollen eyes incident to it. One attack usually renders the animal immune thereafter, although this rule is not invariable.

It may be transmitted through the medium of litter, blankets, or other articles used about the animal, or may even be carried in the attendant's clothes. Horses from three to five years of age are attacked most severely.

*Causes.*—Generally results from contact with infected animals or articles used in their care.

*Symptoms.*—Dulness, violet color of natural openings, partial muscular paralysis, excessive lachrymal secretions that in running down over the sides of the nose may cause blisters, and partial or total blindness or deafness or both. The disease runs from two to three weeks.

*Treatment.*—Quarantine the animal in clean, well-ventilated quarters, and supply clean feed, water, and litter. Tempt the appetite with vegetables, apples, sugar, or anything the animal

exhibits a special fondness for. Copious injections of cold water will reduce the fever.

**Horse Pox.**—Horse pox is infectious, occurs chiefly in young horses and generally leaves an animal immune from further attacks. It should not prove fatal if proper care and attention are given.

*Causes.*—Unsanitary surroundings, such as polluted water, muddy stalls, poor feed and improper care.

*Symptoms.*—Small eruptions appear generally or locally in from three to four days and are most prominent on the mucous membranes, where they are of a bright-red color, and on the pastern joints where they have the appearance of small bird-shot under the skin. At a later stage a small, yellowish spot appears at or near their center and the eruptions become softer. Scabs appear still later and the pocks are completely healed in from seven to ten days. The eyes assume a reddish, feverish appearance, the pulse is accelerated, the appetite is poor and excessive thirst is apparent.

*Treatment.*—Feed clean hay, bran mash, vegetables, apples or other articles the animal exhibits a liking for. Protect from cold drafts with blankets. The legs may be protected by being clothed in an old pair of overalls supported from the blanket by pins.

**Gangrene.**—This exists in two forms known as “dry” and “moist” gangrene. The former will be considered first.

*Causes.*—Usually due to continuous pressure on one spot of an ill-fitting harness or saddle, but may be caused by forcing an animal to lie in wet, dirty litter.

*Symptoms.*—Dulled sensory nerves, resulting from dead tissues, dry leathery appearance of the skin and a general condition of drowsiness.

*Treatment.*—Supply clean litter, adjust the saddle or harness until it fits properly and apply fatty solutions or moist poultices.

Moist gangrene is characterized by swollen, inflamed, and moist skin, and the secretions produced may result in spreading of the affection unless properly controlled. After sloughing stops treat the same as for dry gangrene.

**Rabies.**—The only available treatment for this disease is to kill the animal so affected. So far as known, there is no remedy that will check or cure it.

*Causes.*—Usually transmitted by the bite of an infected animal,



but may be contracted through contact of an open sore or wound with the slavers of such an animal.

*Symptoms.*—If resulting from a bite, the wound may heal over outside and appear to be properly healed inside. Internal healing, however, is not complete and usually produces such a sensation that in its attempts to secure relief the animal finally reopens the wound with its teeth. The most noticeable symptoms generally manifest themselves within about a month after the disease has been contracted, although instances have been known where no symptoms were developed until six or eight months or even a year afterward. Severe spasms occur at irregular intervals between periods of calmness and little apparent suffering and are so intensely painful and so affect the nervous system that the animal loses all control of itself. It rears, plunges, strikes, bites, and kicks at other animals or its stall or manger,<sup>1</sup> suffers from the most rigid contractions of the muscles, is extremely irritable and vicious, the eyes are blood-shot and the vision is affected, assaults on the stall may be made with such insane vigor that broken teeth or even broken jaws may result, and in its crazy rearing and plunging the animal usually brings about its own death by self-inflicted injuries.

*Treatment.*—The animal should be shot and put out of its misery at once. The carcass should be burned (see page, 244, Glanders-Farcy) or buried at a sufficient depth to prevent its disinterment by hogs or other animals.

The attendant should exercise the greatest care in venturing close to the animal during its periods of calmness. There is absolutely no means of knowing how long such a period may last. It may continue for hours or it may pass within a few minutes.

**Blind Staggers.**—*Causes.*—Generally due to the use of feed that is wormy, musty, or sour. Results are usually fatal.

*Symptoms.*—The most prominent symptom, from which the disease derives its name, is partial muscular paralysis which causes the animal to stagger about in an aimless or erratic fashion. It may rear, plunge, kick, or bite, or show other indications of a disordered brain, or have spasmodic fits or spasms, and usually dies within a few hours.

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<sup>1</sup> Many veterinarians claim that inanimate objects are never attacked. In three different cases observed by the writer the manger has been severely damaged by the infected animals.

*Treatment.*—In most cases the primary stages go unobserved, and after the later stages have developed little can be done to secure relief. An experienced veterinary may handle the case successfully if called in time. Otherwise there is little hope of recovery.

**Lampas.**—This disease is generally known as “lampers.”

*Causes.*—In young horses, cutting teeth; in old ones, impaired digestive powers, or inflammation of the hard palate.

*Symptoms.*—The roof of the mouth is swollen downward and in an aggravated case this swelling may continue to such an extent that it projects beyond the ends of the upper teeth. The animal will quite often be noticed rubbing the roof of its tail against trees and buildings or posts.

*Treatment.*—Lacerate the affected parts slightly with the point of a sharp knife and produce moderate bleeding. Bathe the lacerations in a solution of alum water, using a dram of alum dissolved in a pint of warm water. Continue the treatment until the wounds have healed. Give only soft feeds, and keep fresh, cold water before the animal at all times. If lampas results from indigestion, remove the cause.

**Injuries and Other Ailments.**—The most common injuries to which horses are subject in the field are lameness, external or internal poisoning, burns, cuts, bruises, and abscesses in their various forms.

**Lameness.**—*Causes.*—Lameness may result from any one of a number of causes. An animal may step on an irregular stone and twist or sprain one or more joints; hard riding or heavy work may result in strained or displaced tendons; sharp blows or even apparently slight bruises may cause severe lameness, or continued travel through very muddy country may have the same effect.

*Symptoms.*—Lameness in a fore leg will be indicated by quick upward motions of the animal's head when the weight of the body comes on the injured member and the weight will be shifted to the opposite member as quickly as possible. This causes the animal to take short, quick steps with the lame leg, and as soon as the weight of the body has been transferred to the other leg the head and neck will be dropped. If lameness occurs in both forelegs the steps will be unnaturally short and quick on either side, the head will be held high, the shoulders will be kept rigid

and the hind feet will be kept well under the body in order to relieve the fore legs of as much weight as possible.

If lame in a hind leg the animal will object to backing and the hip corresponding to the injured leg will have a greater upward and downward motion when the animal travels. When both hind legs are affected backing will be still more painful and all the weight possible will be thrown on the front feet. This causes the head to be extended and held low.

Lameness in the heel or ankle is indicated when the foot is held forward or kept suspended above the ground. The animal moves with reluctance, and upon being allowed to remain quiet will immediately assume the position mentioned.

Shoulder lameness is indicated when the point of the hoof, or the toe, is rested on the ground. In such cases the foot is seldom extended forward but the knee is usually bent.

The same symptoms indicate lameness in the elbow joint.

If lameness occurs in the knee or hock the joint is held as rigid as possible and bent only when the animal is forced to do so.

Lameness in the hind legs is much more serious than in the fore legs, and if hip lameness is apparent the horse may be considered worthless, since the disease can not be cured. If there is reason to doubt the existence of hip lameness rap the hip-bone sharply. The affection will be indicated by a sudden flinching of the animal.

*Treatment.*—The best general treatment for any lameness is alternate applications of hot and cold water. Bandages should be used. Such treatment should continue for from one to six hours, depending upon the severity of the injury. Afterward the injured parts should be bathed twice a day with equal parts of turpentine and camphor, but this should not be rubbed vigorously or confined by means of bandages, or blistering and removal of hair will follow. This treatment should be continued for from one to six or seven days.

*Internal Poisoning.*—*Causes.*—This may result from mistakes made in filling prescriptions for medicine to be given an animal, may be caused by the animal eating loco weeds or other poisonous plants, or may result from snake bites or from numerous insect stings.

*Symptoms.*—The general symptoms of poisoning are thirst, laborious breathing, convulsions, nervousness, staggering, wide-spread feet, external swellings if due to snake bites or insect

stings, accelerated pulse, and bloating and dysentery accompanied by large quantities of mucus.

*Treatment.*—Drench with half a pint of cinchona in a quart of lukewarm water. Repeat the dose every five minutes until relief is secured.

*Loco Poisoning.*—*Causes.*—This poisoning is caused by animals eating a weed known as the “loco” or “rattle” weed, of which there are two principal varieties. These are the varieties known as *Aragallus lamberti* and *Astragalus mollissimus*. The former poisons sheep and cattle and the latter poisons horses. Cattle and horses do not as a rule relish the weed, but since it appears early in the spring before other green forage can be obtained they soon form the habit of eating it.

*Symptoms.*—These do not appear until a large amount of the weed has been eaten, after which the animal's eyes assume a glassy appearance; it is extremely nervous and often vicious, steps quickly and with unnaturally high movements of the knee and hock joints, and upon being suddenly startled or aroused may have convulsions. In the final stages of poisoning the stomach walls are so affected as to be unable to perform their functions and the animal soon weakens and dies.

*Treatment.*—Loco poisoning can not be treated successfully in its advanced stages. During the primary stages affected animals should be restricted from range areas in which the plant occurs. In addition to this horses should be given one-half ounce of Fowler's solution of arsenic once a day. Cattle should be given from one to three grains of strychnin a day. Sheep should be given one-third that amount of strychnin.

*Poison Wounds.*—*Causes.*—These may be due to the bite of a snake, tarantula, or centiped, or to numerous tick bites or insect stings. In all cases their treatment is the same.

*Symptoms.*—Partial muscular paralysis causes staggering, falling or other similar action; stiffness appears in the limbs, which are held wide apart; the head is hung low, thick, difficult breathing is prominent, and convulsions may occur. In most cases a swelling forms about the wound.

*Treatment.*—Locate the wound as soon as possible. If caused by a snake bite and bleeding is not profuse, make it so by an incision in the wound and allow the blood to flow freely for about five minutes. If the bite is on a limb apply a tourniquet after profuse bleeding has been secured. This may be impro-

vised from a halter- or picket-rope, bridle rein, or a string from the harness or saddle. By thrusting a stick beneath it and twisting the tourniquet up tight poison may be prevented from entering the circulatory system. However, the tourniquet will interfere with bleeding and should not be applied until after bleeding has stopped. Wash the wound thoroughly with water, into which a few drops of carbolic acid have been put, and then apply turpentine, ammonia, or kerosene oil and salt. Permanganate of potassium is also very effective, even for man. Allow the animal two or three days for rest.

If due to numerous insect stings, the symptoms in severe cases are similar to those resulting from snake bites. Bathe the animal in a strong solution of soda and water, rubbing thoroughly and vigorously to insure contact of the solution with the wounds, and then allow a good rest.

In removing ticks from an animal's body care must be taken to see that their heads are not left in the skin or serious complications may ensue. Vaseline, bacon grease, or lard smeared over the ticks will cause them to loosen their hold and drop off.

**Burns.**—Burns of different degrees of severity demand different treatment, yet in all cases the treatment must be such as to keep the air from the wound. This should not be done by means of bandages unless circumstances absolutely demand it, and then the bandages should be light enough and of a sufficiently coarse weave to allow the animal heat to escape from beneath them. Ointments, such as carbolated vaseline, or others of the consistency of syrup, will be found most satisfactory. In severe cases, after the wounds have been washed carefully, an application of alcohol, eggs, and milk will be found effective. The whites of two eggs should be thoroughly mixed into a pint each of alcohol and sweet milk. This mixture should be applied twice each day. Castor oil also makes an excellent dressing for burns and can be secured at any drug store.

Very slight burns need no treatment except careful washing. Applications of castor oil will do them no harm.

**Cuts.**—A general idea of the severity of a cut may be determined from the manner in which blood flows from it. Arterial bleeding is indicated by strong regular spurts of bright-red blood, and such a cut should be given prompt attention. A tourniquet should be used when possible. In arterial bleeding it is applied between the wound and the heart and twisted tight. (See

Poison Wounds, *Treatment*, page 251.) This retards the flow of blood and permits the attendant to dress the wound with less difficulty. If coagulation or clotting does not occur within a reasonable length of time, ligation should be resorted to. This is done by securing the severed artery ends and tying them shut with a thread, preferably of silk. This may appear to the inexperienced as a dangerous procedure, but nature will soon provide means whereby circulation will not long be impeded.

If a vein has been cut that fact will be indicated by a slow, steady flow of dark-colored blood, and coagulation will soon stop, bleeding in an ordinary case. If a tourniquet is necessary it must be applied at a point which brings the wound between it and the heart. This is due to the fact that the veins carry the blood back to the heart.

Blood which slowly oozes from a cut in numerous small drops or a few large ones indicates lacerated capillaries, and the wound needs no attention other than dressing.

Care must be taken in dressing any cut to see that it is washed clean, and its subsequent treatment should be such as to preclude any possibility of infection. Frequent applications of turpentine will serve to destroy germs, and a mixture of turpentine and camphor, equal parts, will remove soreness. When turpentine is used alone grease should be smeared on the hair around the cut. Otherwise removal of the hair will result.

**Proud Flesh.**—*Causes.*—This may occur as the result of improper attention and consequent infection of a cut or it may be due to systemic disorders or constitutional weakness.

*Symptoms.*—Proud flesh may be identified by its pink, frothy appearance. If present under the skin the latter will be swollen and sensitive and will not readily resume its former outline after being pressed into.

*Treatment.*—Apply burnt alum or granulated sugar twice daily. To burn the alum place it in an inverted lard-pail lid or in a tin-cup or can, and heat it. When cool pulverize the ash and sprinkle this over the affected parts. Bandages should not be used to confine it. Sugar is likewise sprinkled on the parts.

**Bruises.**—*Causes.*—Blows, kicks from other animals, falls, and similar accidents.

*Symptoms.*—External swellings may appear or no visible symptoms whatever may be present. For this reason the degree of

severity of a bruise can be determined only by speculation, unless the accident has been witnessed by the attendant or other persons. As a rule, however, lameness and stiffness appear, and unless experienced in such matters the horseman may conclude that certain tendons or ligaments have been strained.

*Treatment.*—Make frequent applications of hot water to the affected parts, follow with applications of cooler water, and finally use cold water. Continue the treatment until the soreness has disappeared.

*Punctures.*—*Causes.*—Stepping on nails, pieces of glass, stubble, or other sharp objects long enough to penetrate the sole of the hoof and injure the inner sole.

*Symptoms.*—These may not appear until weeks after the accident, and then lameness may develop. In many instances the outer portion, or the point of entrance to the puncture, heals over and is not discernible to a casual observer, and the animal's lameness may be ascribed to any one of a dozen different causes, none of which is responsible for the trouble.

*Treatment.*—Give the sole of the hoof a thorough examination for openings and, if necessary, remove the shoe. When the opening has been located trim it out funnel-shape and allow the pus to escape. Turpentine may be injected with a small syringe and infection prevented. Keep the wound open and clean until no more pus forms. The entrance of dirt may be prevented by binding a tow sack about the hoof and under the sole.

*Abscesses.*—*Causes.*—These are caused in most cases by blows inflicted at such a point on the body and in such a way that the deadened tissues can not escape, but decay and form pus under the skin.

*Symptoms.*—A swelling appears at the point of injury, and when pressed is found to be filled with a soft, watery fluid. Extreme sensitiveness is apparent and the skin is feverish.

*Treatment.*—As a general rule abscesses break of their own accord and the pus escapes through the opening. If, however, it appears that the swelling has reached its point of greatest distension and no opening occurs, it should be lanced. This may be done by thrusting the point of a knife-blade through the skin at a point where complete drainage of the abscess may be obtained. Keep the wound open as long as pus flows and inject one or two drops of turpentine twice a day. If an offensive odor is present apply hydrogen peroxid twice daily until "boil-

ing" no longer occurs. Hydrogen peroxid disinfects only in surface wounds where it is exposed to the air. On deep lacerations use a carbolic or coal-tar disinfectant.

**Harness and Saddle Galls.**—*Causes.*—These are the result of the use of improperly fitting harness and saddles and are in the nature of abscesses.

*Symptoms.*—Similar to those of other abscesses except perhaps the hair may be worn off and the skin may appear red and inflamed.

*Treatment.*—Since they are of the same nature as other abscesses they should be treated accordingly. Wash with clean water, into which a few drops of carbolic acid have been put; then treat with applications of turpentine and camphor, equal parts. The animal may be worked during treatment if the wounds are kept clean and the harness or saddle kept in a similar condition and properly fitted. The animal should, however, be given a complete rest if the galls fail to respond to this treatment.

**Sitfasts.**—*Causes.*—These result from continuous pressure of a harness or saddle on one spot, often extend deep into the flesh or muscles, and are similar in nature to corns on the human foot.

*Symptoms.*—A hard, almost horny, growth appears on the flesh, is bare and leathery and very sensitive, and increases in size as the animal is used.

*Treatment.*—Some horsemen claim that sitfasts can be removed only by freezing and, in accordance with that theory, turn affected animals on the range during the winter months. Under certain conditions this treatment might possibly prove effective, but where cures are obtained in such cases they are undoubtedly due more to the rest than to the freezing. The growths may be removed with a sharp knife or razor and with but little discomfort to the animal. Antiseptic precautions should be observed and the animal given a complete rest until recovery.

**Fistula.**—*Causes.*—This trouble, known generally as "fistulo," occurs at a horse's withers as the result of an ill-fitting harness or saddle. It is of the same nature as any abscess and should be treated accordingly. (See Abscesses, *Treatment*, page 254.)

Most horsemen limit the term "fistula" to its meaning as applied to this particular trouble. As a matter of fact any abscess bearing tubes or "pipes" leading to an internal cavity is a fistula, regardless of its location on an animal's body.



**Poll Evil.**—This is another abscess which appears at the back of the head between or behind the ears as the result of a bruise sustained from a blow against low, overhead beams or other similar articles. Treat the same as any abscess.

**Quittor.**—This abscess appears at the coronet of the hoof. (See Fig. 202.) It, too, is caused by a bruise and should be treated as any abscess.

**Sweeney.**—*Causes.*—This is an atrophic condition of the shoulder muscles and is caused by lack of exercise of those muscles, such as when an animal, suffering from lameness or other injuries, stands for long periods on one foot, leaving the muscles of the shoulder corresponding to the opposite leg in a continually relaxed condition.

*Symptoms.*—Gradual withering away of the shoulder until it presents a perceptibly shrunk appearance, tightness of the skin against the flesh of the affected shoulder, extreme pain when the animal is forced to use the affected member.

*Treatment.*—Unless injury of the leg is so severe as to preclude such treatment, force the animal to stand on it. This may be done by tying the other leg up to the body. Seize the skin of the shoulder and pull it outward from the flesh. A sharp, crackling sound will be produced and indicates the tearing away of deadened tissues. The operation will cause the animal considerable pain, but will eventually prove beneficial if repeated twice daily. Apply powdered May-apple root in the form of an ointment, made of as much of the root as will lie on a dime, mixed into half a teacupful of lard. Unless the lard is used blistering will result. Ten cents worth of the root will furnish enough for twenty or thirty applications. One application should be sufficient.

**Scratches.**—*Causes.*—This is caused by forcing an animal to stand in wet, dirty litter or manure, or by overfeeding on grain or unwholesome forage or anything which tends to derange the system.

*Symptoms.*—The skin on the fetlocks appears swollen and inflamed, cracks may appear in the skin and extend through to the flesh and a general tenderness and soreness of both will be apparent.

*Treatment.*—Provide clean quarters for the animal to stand or lie in, clip the hair from the fetlocks and apply carbolated vaseline or castor-oil to the skin three times a day.

## 2. CATTLE

The cattle industry requires a large amount of the average field man's attention on most National Forests and it is therefore imperative that he familiarize himself, to a certain extent at least, with conditions which directly affect the stock in his district. Badly diseased cattle are seldom found on the open range, but certain ailments to which cattle in all sections of the country are subject may be met with, and the field man should be able to take immediate steps looking to the cure or to the prevention of further infection.

Only the most common diseases will be considered here.

**Bloat.**—*Causes.*—This is a form of acute indigestion and may result from any one of a number of causes. Chief among these are overfeeding, feeding too much wet or frosty grass, or allowing access to large quantities of cold water when the paunch is full. Impaired digestive powers may also bring on the trouble.

*Symptoms.*—Great uneasiness is apparent, belching occurs, excessive secretions of saliva cause "slobbering," the animal staggers and the eyeballs protrude unnaturally. The left side is greatly distended and, when tapped or thumped, gives back a hollow, drum-like sound. Difficult breathing occurs as the result of unnatural pressure of the digestive organs against the lungs.

*Treatment.*—Drench with a tablespoonful of aromatic spirits of ammonia in a pint of water, or a teaspoonful of turpentine in a pint of raw linseed-oil, or two tablespoonfuls of common soda in a pint of water. If these remedies fail the animal should be tapped. This is done by thrusting the point of a sharp knife-blade through the skin and the wall of the paunch at a point immediately before the left hip-bone and half-way between it and the last rib. As the gas escapes from the paunch the latter will recede from the skin, and unless a pipe-stem, quill, or similar article is inserted in the two openings they will no longer coincide and the escape of gas will be prevented. The regular instrument used by veterinaries for this purpose is known as a "trocar."

A knife should be used only when no trocar is available. The wound will heal without treatment.

Bloat occurs quite frequently in calves, and as a general rule is the result of overfeeding after they have missed a meal or two. They should be drenched with a pint of raw linseed-oil, or four

tablespoonful's of castor-oil, or half a pound of Epsom salt dissolved in warm water.

**Loss of Cud.**—This is not a disease, but is an indication of a disordered digestive system. Feed bran mash and vegetables or other easily digested foods and keep the digestive organs in proper condition.

**Black Leg.**—*Causes.*—This disease, also known as symptomatic anthrax, is caused by a germ called *Bacillus anthracis emphysematosa*, which means "air bloated." Formerly, it was generally believed to infect most severely such cattle as ranged on low, marshy areas, where stagnant water or periodical floods occurred. In recent years, however, many veterinarians doubt if such lands have any direct influence on the disease's appearance. Thrifty, fat young cattle, from six to twenty-four months old, are most susceptible, although older cattle may be attacked. Infection is not, as generally supposed, transmitted through the alimentary canal, but the germs usually enter through wounds made by thorns, barbs, cacti, and other sharp-pointed agents. The germs multiply only in the absence of oxygen, and large wounds are not, therefore, necessarily sources of infection. Black leg should not be confused with anthrax. The latter is caused by the germ *bacillus anthracis*, and attacks cattle of all ages, all domestic animals, and even man.

*Symptoms.*—If germs have entered through abrasions of the skin of the mouth the latter as well as the tongue will be so swollen as to cause the tongue to protrude. In addition to the protruding tongue a high fever will result if the germs have entered at other points on the body. This will be accompanied by rapid respiration and loss of appetite and the animal will move with difficulty. These symptoms are followed by the appearance of tumors which, when pressed, give back a crackling sound. Thick, dark blood may also ooze from the skin covering the tumors and the latter will be filled with gas.

The tumors in anthrax proper are hard and show no indications of containing gas.

Death usually results in from six to forty-eight hours. Carcasses should be burned, as should also the litter or bedding upon which the animal has lain or been treated. (For burning of carcasses, see Glanders-Farcy, page 243.)

*Treatment.*—Prevent access to range in low marshy areas, where pools or puddles of stagnant water may appear or where

periodical floods may occur. The disease may be successfully combated, or at least checked, by any one who understands the use of virus,<sup>1</sup> but ordinarily the average person can do little except to administer three times daily a dram of carbolic acid well diluted in water. (For measurement of medicine, see page 349.)

**Mange.**—*Causes.*—This disease, sometimes known as “cattle scabies,” is caused by the presence of a parasite known as *Psoroptes communis*, var. *boris*, which appears in greatest numbers in the skin of the neck and shoulders and about the root of the tail. The bite produces an itching sensation which causes the animal to rub or scratch until the hair is often removed and scabs appear.

*Symptoms.*—Continual scratching or rubbing, gray or brownish scabs, thick, hard, dry, wrinkled skin.

*Treatment.*—Dipping is the most effective treatment. (See Mange, page 263.) A second dipping in ten or twelve days is often required to kill the mites which may have hatched after the first dipping.

**Cow Pox (Variola).**—*Causes.*—Cow pox results from improper action of the organs intended to keep the skin in a healthy and normal condition.

*Symptoms.*—Small nodules, about the size of buckshot, appear in the skin of the udder. These either break and form open sores or else they dry up and form scabs.

*Treatment.*—Cow pox is of a self-limited nature and requires no treatment unless it appears advisable to remove soreness and this may be done by frequent applications of carbolated vaseline or of turpentine and camphor, equal parts.

**Lump Jaw (Actinomycosis).**—Under extremely favorable conditions, such as a generally weakened physical state after calving, this may be transmitted to other cattle but should not be considered as invariably contagious.

*Causes.*—Due to the action and development of a vegetable parasite or fungus (*Actinomyces*), frequently found on grain husks and other vegetation. All domestic animals, and even man, may be affected.

*Symptoms.*—The most prominent symptom, and the one from

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<sup>1</sup> Government vaccine may be obtained free of charge from the U. S. Department of Agriculture, Washington, D. C.

which the disease derives its name, is the appearance of a large tumor on the jaw, although other tumors may appear at different parts of the body. Final development of the tumor on the jaw usually results in death, as the animal soon loses the use of its jaws and virtually starves to death.

*Treatment.*—Mix four tablespoonfuls of iodide of potash in a pint of water and administer in about eight equal doses at the rate of one per day. Discontinue the treatment for a week; then repeat and continue alternate weekly treatment as long as necessary. Action of the medicine will be indicated by scales on the skin and discharges from the eyes and nose.

**Tuberculosis.**—*Causes.*—Generally due to unsanitary surroundings.

*Symptoms.*—Cheese-like nodules appear in the tissues of the body. Other prominent symptoms are a dry, rough coat, difficult respiration after moderate exercise, coughing, tight appearance of the skin, and loss of appetite and flesh. Breathing is intensely laborious in the advanced stage and may be accompanied by moaning, severe attacks of coughing occur, the extremities are cold and physical exhaustion is almost complete.

*Treatment.*—Tuberculosis may be checked by injections of tuberculin, but this should not be attempted by an inexperienced person.

**Foul Feet.**—*Causes.*—May be caused by forcing an animal to stand in dirty, muddy quarters, or may result from ranging it on soft ground where necessary wearing away of the hoof is prevented.

*Symptoms.*—The disease appears in various stages, from small cracks in the skin to separation of the hoof and foot, and may even result in loss of the bone.

*Treatment.*—In slight attacks wash the wounds with carbolic acid and water, 1 to 50 parts, then apply turpentine and camphor, equal parts, twice daily. If the attack is severe and formations of pus are apparent beneath the wall or edge of the hoof, bore through the hoof wall with a gimlet or small knife-blade at the point of greatest distention and allow the pus to escape. Use a small syringe to inject the turpentine and camphor, keep out all dirt and filth, and see that the pus is allowed to escape as fast as it forms. Keep the animal on dry ground until recovery is complete.

**Foot and Mouth Disease.**—*Causes.*—Generally due to use of

contaminated range upon which cattle have been grazed too long.

*Symptoms.*—Increase in temperature may occur even though the animal shivers, the hair is rough and dry, and extreme soreness is apparent between the claws. In from four to eight days a practically continuous blister covers the lining of the mouth and excessive secretions of saliva result. At this stage the hoofs may loosen.

*Treatment.*—Drench with a pound of Epsom salt dissolved in boiling water and administered while lukewarm. Wash the mouth with hydrogen peroxid diluted to half-strength; see that the feet are perfectly clean; then apply turpentine and camphor, equal parts, to them till all soreness disappears. (For Drenching, see page 267.)

Another effective treatment is to wash the mouth with a 100 to 1 solution of coal-tar dip and stand the animal in a trough containing a 20 to 1 solution of the same mixture. Disinfect thoroughly.

**Milk Fever.**—*Causes.*—This disease is not really a fever but partakes more of the nature of apoplexy and is peculiar to calving, fat cows being especially susceptible. Costiveness, lack of exercise, or rich feed may also cause it.

*Symptoms.*—Partial paralysis of the hind quarters, staggering, difficult breathing, high pulse, insensibility to pin pricks or other ordinary pain.

*Treatment.*—Give a scant tablespoonful of nux vomica every two hours by placing it on the tongue. Decrease the dose as soon as spasmodic muscular action appears. A physic should not be given, as it is slow in action and may even prove injurious. One treatment is to remove the urine by means of a catheter and empty the intestines by large injections of warm water. Another remedy, having a record of over 96% cures, consists of inflating the udder with sterilized air or oxygen or even water. This is given by means of a specially constructed kit which may be secured through any veterinary.<sup>1</sup>

**Choking.**—*Causes.*—Attempts to swallow rags, blocks of wood, pieces of leather, or similar articles. It may also occur when dry coarse feed is used.

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<sup>1</sup> See Cir. 45, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C.

**Symptoms.**—Attempts are made to disgorge the obstruction from the gullet, the flanks are drawn in at short intervals, the back is "humped," and excessive slobbering occurs.

**Treatment.**—Drench with a pint of raw linseed-oil if the obstruction can not be broken up by kneading or squeezing. As long as the drench is returned through the nose the obstruction remains stuck fast. As a last resort "swabbing" may be necessary. Tie the animal in such a way that the extended head is in line with the neck, wrap one end of a flexible  $\frac{1}{2}$ -inch stick with a well greased cloth, then thrust it down the throat and force the obstruction into the stomach.

**Warbles.**—**Causes.**—These are caused by two kinds of bots, viz.: *Hypoderma bovis* and *H. lineata*, which deposit eggs under an animal's skin. The larvæ increase in size until elliptical swellings, sometimes as large as walnuts, appear in and under the skin. These are known in many localities as "wolves." In others they may be confused with "screw-worms," which are the larval stage of a fly, *Comptosmyia macelleria*.

**Symptoms.**—Swellings appear generally along either side of the backbone or even well down on the sides, the animal moves about as little as possible, and a generally drowsy appearance is noticeable.

**Treatment.**—Force the larvæ out by squeezing the swellings between the thumb and finger. If the opening in the swelling is too small to permit such ejection, it should be enlarged with a sharp knife. In event the larvæ can not be forced out they should be killed by being punctured with a needle. Afterward a drop of turpentine or gasoline may be injected into them. Ordinarily, two or three drops of turpentine should be placed in the wounds after the larvæ have been removed.

**Screw Worms.**—These appear in open wounds and are especially active in rainy weather. Infected animals should have the affected parts bathed in turpentine, gasoline or chloroform.

**Throwing Cattle.**—When operations to be performed on cattle require them to be thrown, gentle

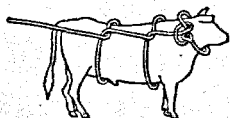


FIG. 203.—Reuff's method of casting.

animals may be tied as shown in Fig. 203, which represents what is known as "Reuff's Method of Casting." A rope is tied about

the animal's neck in such a way that strangling will not occur and two half-hitches are then taken about the body, one immediately to the rear of the fore legs, the other directly in front of the hind legs. The loose end of the rope is then pulled steadily backward until the animal lies down, after which it may be tied as desired.

Wild or vicious animals may be roped from horseback and thrown. Before they have time to regain their feet they should be secured by tying all four feet together.

### 3. SHEEP

On some of the National Forests, particularly in the Southwest, the field man is required to spend a large portion of his time seeing that the grazing regulations with reference to sheep are properly enforced. These include a number of regulations having to do with the physical condition of such animals, and the forest officer must be able to discern disease when it appears and know what action must be taken to combat it. Otherwise serious losses may occur, the range may be contaminated, and unpleasant complications may arise.

**Mange (Scabies).**—*Causes.*—Sheep mange is caused by a parasite, the most common of which is *Psoroptes communis*, var. *ovis*, and which by its action in the skin causes premature or improper shedding of the wool.

*Symptoms.*—Loss of wool before or after the regular shedding season, patchy or ragged wool, and scaly skin.

*Treatment.*—The disease may be prevented by dipping. Two compounds which are widely used in the Southwest are: (1) The arsenic dip; (2) The sulphur dip. The first is composed of a pound each of soda ash and arsenic dissolved in forty gallons of water. The sheep are held in this till it reaches the skin and are then released. They should not be allowed to return to the range until dripping stops or the range may be poisoned.

The sulphur dip consists of eight pounds of sulphur, five pounds of unslaked lime, one pound of tobacco leaves and fifty gallons of water. Sheep should be dipped when the mixture has been heated to a temperature of about 100° F. and should be held in it for a period of two minutes.

The chief ingredient in a third dip is coal-tar. This dip, of which there are any number of reliable makes on the market and which, if desired, can be made by the individual, although



it is generally more economical to purchase already compounded, is rapidly displacing the other dips formerly used for the correction of verminous conditions in sheep and other animals. This is probably due to several reasons, not the least of which are that it is economical, non-poisonous, and does not affect the quality of the wool or hide in other than a highly beneficial way. Such dips are used generally throughout the middle West and Northwest, as well as all over Canada and South America, and now exceed all others in quantity used. The United States Department of Agriculture authorizes them for use and sets the standard of dilution.

**Foot and Mouth Disease.**—This disease is of the same nature as that which occurs in cattle and all cloven-hoofed, herbivorous animals and should receive the same treatment in all cases. (See page 260.)

**Foot Rot.**—*Causes.*—This may result either from the use of contaminated range or from ranging sheep on ground that is too soft to keep the natural growth of the hoof cut away.

*Symptoms.*—Sore, lacerated, ragged and torn hoofs. Soreness and festering are especially prominent between the claws.

*Treatment.*—Cut away all affected parts of the hoof; then dress the hoof with a mixture of two tablespoonfuls of corrosive sublimate in a pint of turpentine. Animals so treated should be kept from the range at least a month after treatment. The disease is contagious.

**Lung Worms.**—These are small, thread-like worms (*Strongylus filaria*), from  $\frac{1}{2}$ -inch to 1 or 2 inches long, and are found in the lungs of young sheep that have been ranged too long on the same areas.

*Symptoms.*—Affected animals lose flesh rapidly and finally become too weak to walk.

*Treatment.*—Drench with a tea made of three parts water to one part flaxseed, to which a tablespoonful of gasoline has been added. Keep the animals from infected range and change range frequently. To drench a sheep set the animal on its haunches and hold it in this position by pressure of the knees against either side. So long as its feet are not allowed to touch the ground it will struggle but little, if any.

**Stomach Worms.**—These infest the fourth stomach and certain portions of the intestines. There are two kinds, viz.: tape-worms (*Tænia plicata*) and hair-worms (*Tricocephalus*).

*Symptoms.*—The symptoms are the same as those caused by lung worms, but are accompanied by diarrhea. The last-named symptom distinguishes the presence of stomach worms from that of lung worms.

*Treatment.*—The same as for lung worms.

*Holding Sheep.*—A peculiar characteristic of sheep is their habit of remaining quiet as long as their feet are not allowed to touch the ground. The easiest method of holding them while medicine is to be administered, therefore, is to set them squarely on their rump and then hold them in this position by pressing the knees against either side.

#### 4. HOGS

Except on the National Forests of the South and Southeast the average field man has little to do with the subject of range hogs, but if he is to be stationed in either of these localities he should know something of the diseases to which hogs are subject.

*Cholera.*—*Causes.*—Cholera may be the result of unsanitary surroundings or it may appear in the nature of an epidemic or contagion. It may also be carried by bird or animal scavengers. The germ is *Bacillus cholerae suis*.

*Symptoms.*—Intermittent fever and shivering, loss of appetite, accelerated respiration, general depression, and watery eyes filled with pus. Blue or bluish-red spots appear on the skin and great weakness is apparent. The disease is fatal in direct proportion to the susceptibility of the animal infected and to the virulence of the attack.

*Treatment.*—So far as known there has not yet been a reliable cure discovered, although inoculation has proven of distinct value. Many so-called cures may prove effective under extremely favorable conditions, but none of them is infallible. The best treatment is of a preventive nature, such as providing sanitary surroundings, frequent disinfection of quarters, strict isolation of infected animals, and careful disposal of carcasses by burning. (See Glanders-Farcy, page 243.)

*Mange.*—*Causes.*—Hog mange is caused by a parasite of the *Sarcoptes* group. The parasite is of sufficient size to be discernible with the naked eye and has the appearance of a minute white speck. The disease flourishes in unsanitary surroundings.

*Symptoms.*—The animal scratches itself frequently and rubs

against the sides of the pen or against trees and posts; scabs and bare white spots appear on the skin, and a generally unhealthy appearance of the skin is noticeable.

*Treatment.*—Use a stiff brush and scrub infected animals thoroughly with a wash made of carbolic acid diluted with water, 1 to 50 parts. A weak solution of water and tobacco leaves is also good, but if made too strong may poison an animal. A good coal-tar dip or disinfectant, such as is used for sheep scab, is just as effective as either of these remedies and is much safer.

*Thumps.*—*Causes.*—Overfeeding and lack of exercise.

*Symptoms.*—The disease occurs chiefly among suckling pigs and is indicated by violent heart action, the heart striking the walls of the chest with sufficient force to cause the body to sway backward and forward. The action is plainly audible, hence the term “thumps.”

*Treatment.*—Regulate the feed by removing the pigs from the sow for three-hour periods twice a day. Allow plenty of exercise.

## ADMINISTERING MEDICINES

*Drenches.*—These are liquid medicines and are administered by being poured into an animal's mouth from a long-necked bottle or similar receptacle. They should never be given through the nose; such procedure not only causes strangulation in many instances, but also results in more or less loss of the drench, while that portion that is utilized decreases in volume and strength as it passes over the extra membranes. Moreover, it may injure these membranes and permanently impair their usefulness.

*Pills or Balls.*—These are administered when powdered medicines are to be used. They should not exceed 1 inch in diameter nor 2 inches in length. They are placed far back on the tongue, after this has been drawn out as far as practicable, and are taken into the throat when the tongue is released. They should not be administered to cattle, as the digestive organs of these animals are so constructed that pills may pass into the paunch and remain there for some time, during which they are without effect; there is also a possibility of their being regurgitated with the cud and chewed over by the animal.

They should not be given dry, but should be soft and moist; otherwise they may stick in the throat until sufficient moisture

is absorbed from this passage to allow their progress into the stomach.

**Drenching Horses.**—Place an open loop of rope about the upper jaw to the rear of the tusks; then raise the head above a level with the neck by pulling downward on the rope after the other end has been passed over a tree limb or a beam; this permits introduction of the bottle-neck into the mouth in such a way that a minimum of medicine is spilled.

The bottle should be tipped upward until the contents run into the animal's mouth in a moderately full stream, but no attempt should be made to administer the entire drench at one operation; after a portion has been given, the animal should be allowed time to swallow before more is released. Horses frequently refuse to swallow, but this action may be overcome by tickling the roof of the mouth with the bottle. The practice of pinching, kneading, or squeezing the throat in order to induce swallowing is to be avoided, although it may be rubbed gently and no ill effects will follow.

The bottle-neck is thrust into the mouth between the bars of the jaws, and care must be taken not to place it so far back that the animal may crush it between the molars.

If the animal is inclined to be vicious and objects to being drenched, it may be tied as shown in Fig. 208.

**Drenching Cattle.**—This can be done if the services of two men are available; one holds the animal by the ears, horns, or nose, or ties it, while the other administers the drench. If one man must work alone he should tie the animal's head up higher than the throat. No trouble need be anticipated in a refusal to swallow; the throat and mouth are so constructed that the drench can not be retained in them as it may by a horse.

**Drenching with a Syringe.**—The tube of the instrument is placed well back in the mouth and the charge is released gradually, allowing the animal plenty of time to swallow. The charge should not be of such a nature that it will absorb a portion of the material of which the syringe is made.

## SUBJUGATING HORSES

**Throwing.**—It not infrequently happens that a field man, purchasing a horse on short notice and without careful inspecting, secures an animal that has not been properly trained, or

one that has been allowed to develop habits not desirable in a saddle animal. Many of these habits may be broken up by persistent treatment, although it is not an uncommon thing to find some animals that are too stupid to learn.<sup>1</sup>

The plan of throwing an animal three or four times daily for a period of from three to six days, tying it down securely, and allowing it to remain in that condition for from fifteen minutes to an hour, usually results in the complete subjugation of a stubborn or viciously inclined animal. While it is thus rendered unable to resent any operations that may be performed on or about it, its feet, ears, head, or other parts of its body may be handled until it learns that it must submit peaceably to such treatment.

A very effective means of throwing is to use a casting rig similar to that illustrated in Fig. 208, except that instead of applying it to one hind foot only both hind feet are secured. Moreover, instead of merely raising one foot from the ground both are drawn up close to the body and thus rendered useless as means of offense or defense. As the pastern joints are forced upward they bend more sharply and there is little danger of the rig slipping as long as it is kept tight; it is advisable, however, to take an extra turn of the rope about them when they are to be tied firmly against the animal's body. One man working alone secures one foot at a time, tying it up securely by fastening the loose end of the rope into the rope collar about the animal's neck. When one foot has been secured in this manner the other is then secured in a similar manner. If two men are to work together, both hind feet may be drawn forward at the same time and then fastened after the animal is down.

If the animal is a kicker and refuses to have the loops placed about the pasterns by hand, they should be laid on the ground and the animal backed into them; or a stick may be used in placing them as desired.

When the hind feet have been brought up and made fast the fore feet are then tied back to them, care being taken in this operation to use a knot that may be released by a pull at the loose end of the rope. It is also necessary to have the rig secured

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<sup>1</sup> Occasionally animals purchased by the United States army prove too stupid to recognize certain bugle calls or other commands; such animals are immediately condemned and disposed of by sale or otherwise.

in such a way that the animal can not effect its release before the operator is ready for it to do so. If an unusually severe lesson is deemed necessary the neck may be forced back along the side and the head securely tied to the feet.

Mules being thrown in this way usually fall to their knees first and retain their footing with the hind feet. This may be overcome by pushing them sidewise at the rear.

**Whirling.**—This is a very effective method of outwitting an animal that refuses to stand still long enough to be saddled or harnessed. The horseman grasps the halter rope in his left hand and the animal's tail in his right, then forces the animal to travel swiftly in a small circle about him until it becomes dizzy. It may then be saddled or harnessed before it regains its complete equilibrium.

**Head-and-Tailing.**—This is similar to whirling, except that the head is drawn back alongside the body and tied to the tail with the halter rope. The animal is then forced to travel in a circle, and as a result of dizziness soon casts itself. Care must be taken to fasten the halter rope in such a way that it may be released from the tail without difficulty.

**Prominent Bad Habits.**—*Biting.*—Little can be done to break a confirmed biter of the habit, but it may be temporarily checked by the use of a stiff bit fitted with a very short curb-strap. When the animal attempts to bite, the reins are drawn in quickly and the animal's mouth suffers so severely that temporary relief may be secured. A specially constructed bit, bearing upright prongs on the bar, is manufactured for this purpose; the prongs prevent the animal from closing its teeth together.

*Kicking.*—This is an especially dangerous habit and requires severe treatment. A very effective method is to pass a rope from a severe curb-bit to a rear pastern, leaving it short enough to allow the animal to inflict its own punishment each time it kicks. Proximity to the animal's heels may be avoided by using a long rope, laying a loop on the ground, backing the animal into it, and then drawing the rope up to the required length.

*Stall Kicking.*—This habit may be broken by the use of a pole hung behind the animal at a point about  $2\frac{1}{2}$  feet above the ground and close enough to permit it to swing against the animal each time it is kicked away. Its action soon discourages the kicker.

*Striking.*—This is a difficult habit to break, and in aggravated

cases such animals should be kept hobbled. Another plan is to rap the cannon-bones sharply with a stiff stick or whip each time the animal strikes.

*Stall Pawing.*—A 2-foot length of light chain buckled to the pastern of the leg most used generally breaks this habit; if it fails the chain may be buckled to the cannon-bone.

*Cribbing.*—This refers to an animal's action in setting the teeth into and sucking at a post, manger, tree, or similar object, and is frequently designated as "stump sucking." There is no means of permanently breaking the habit, but temporary relief may be obtained by sprinkling pepper or other distasteful material over the object at which the animal sucks.

*Setting Back.*—This refers to an animal's action in pulling back on the rope with which it is tied, and is a disagreeable habit that should not be tolerated. It may be broken, after repeated lessons, by tying the animal with a rope it can not break. Such a rope should be noosed about the neck and the animal should be allowed to choke itself down at each attempt to escape, being released just before insensibility ensues.

Another method is to loop a rope under its tail, pass the rope up through the chin ring of the halter or the bozal of the hackamore, tie it firmly to a substantial post, and then leave the animal where it may "set back." To prevent the rope from slipping down from around the root of the tail, it may be doubled, brought upward and along the back, twisted several times, and one end then run through the hackamore from either side of the neck.

A variation of this method is to use, in connection with the strong tail rope, a weaker halter rope that may be broken with moderate effort. Both ropes are then tied to the post, the halter rope being slightly shorter than the other. At the moment the halter rope breaks, or is cut, the animal's whole weight is thrown against the loop under the tail. Four or five lessons should prove sufficient.

*Balking.*—This may be the result of continued overloading, improper training, ill-fitting harness, shoulder sores, or pure stubbornness, although the last is seldom responsible. The habit can not be permanently broken, and an animal addicted to it should be disposed of at the first opportunity. It is peculiar to draft animals, and may, but seldom does, appear in saddle animals.

The common practice of pouring sand, fine gravel, or water into the ears is to be condemned. A better way to gain temporary relief is to loop a rope about one fore foot and pull the foot forward. As the animal attempts to replace it on the ground it will unconsciously step forward, or it may even lunge forward very suddenly. In the latter event care must be taken not to be trampled upon. A second man is needed to hold the reins when this method is being tried.

Another method is to tie the ear tips together. Still another is to back the animal several steps, if this can be done, and then urge it forward suddenly.

The sole object to be attained in the case of a balky animal is to divert its attention from its resolve not to move forward, but whipping or other ill-treatment seldom proves effective. Slight adjustment of the collar or other parts of the harness is always advisable.

*Rearing in Harness.*—This habit may be broken by using the rig shown in Fig. 204. When the animal rears the rope is drawn in, forcing its feet upward toward the body, and thus causing

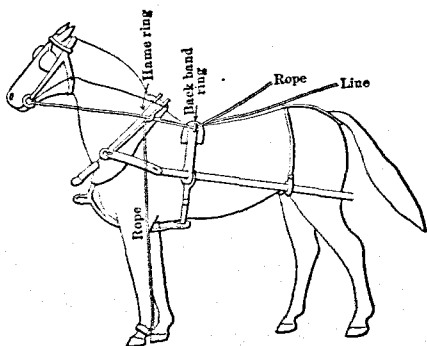


FIG. 204.—Rearing Rig.

it to lower the body in an attempt to replace the feet on the ground. In aggravated cases both fore legs may be treated in a similar manner, the services of a second man, of course, being necessary in handling either the rope or the reins.

*Bolting.*—Another term for this is the common one of “run-



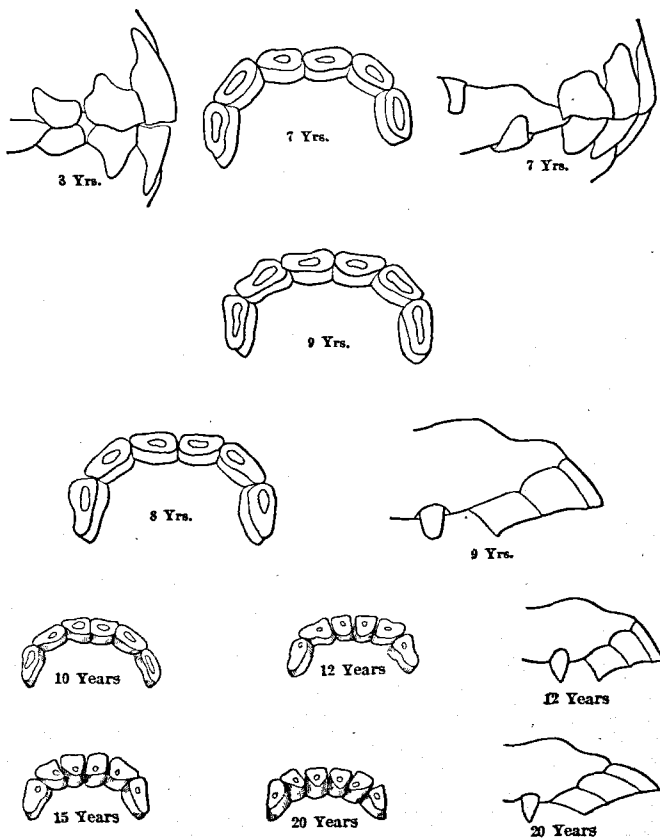
ning away." If a harness animal acquires the habit it should be forced to continue running until exhausted. To break the habit in a saddle animal a 30- or 40-foot rope is noosed about its neck at the time the rider dismounts and the other end is tied securely to some stationary object. No attempt should be made to stop the animal as it bolts, except to call "whoa" just before it reaches the end of the rope. Immediately after it hears this command it will be precipitated headlong. This usually breaks the habit in about three lessons.

### PURCHASING A SADDLE HORSE

In accordance with general administrative procedure, the new field man reporting for duty is immediately assigned to field work. Such a detail involves the purchase of a horse, which a regularly appointed field man must furnish himself, and in view of the fact that practically all of his field trips must be made by horse, the purchaser of a saddle horse should, when possible, exercise the greatest deliberation in inspection of the animal he proposes to buy. It is true of course, that a saddle animal which may suit one man may not suit another, but the suggestions which follow will assist the inexperienced buyer in selecting a fairly satisfactory animal for use until such time as his own experience may tell him that an animal of other qualities will suit his individual likes better.

The prospective purchaser should always make a personal inspection of the animal he is considering, this rule holding good in every case unless he can secure advice from some person whom he knows to be absolutely reliable. Professional horse dealers, and other persons having horses for sale, usually will not or else can not give the buyer complete details concerning the animal negotiated for. As a result of this the buyer may eventually discover characteristics in an animal that were not apparent, or were not made known to him, before or at the time the purchase was made.

**Age.**—Under ordinary circumstances a horse should be in his prime at from seven to ten years of age. As a matter of fact, however, most work or saddle animals are not given proper attention, and as a result may be of little value after they reach the age of seven or eight years. At any rate, if the buyer has reason to believe that he may want to sell the animal within a



The horse's teeth at various ages.

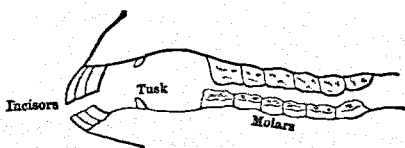


FIG. 205.—Jaws of an adult horse.

year or so, and wants to secure not less than the purchase price, he should not purchase an animal older than eight years unless there is every indication that the animal is perfectly sound; even then, in view of the fact that there is little demand for horses exceeding eight or ten years in age, there is always a question of being able to dispose of them on short notice.

A general rule for determining age by the appearance of the teeth follows, but this should not be considered as infallible. Quite naturally the condition of the teeth is affected by the nature of the feed an animal has been accustomed to; if it has been hard, tough, or gritty, then, of course, the teeth will be shorter or more worn in appearance than if softer feeds have been eaten.

The teeth at various ages are illustrated in Fig. 205.

The colt has six incisors, or front teeth, in both the upper and lower jaw, and three molars, or grinders, on either side in both. The permanent set which replaces these includes twelve more molars, three being added to each side of both jaws. The horse has four tusks at maturity, but these seldom appear in mares, and when they do are poorly developed. Thus the temporary teeth number twenty-four, while the permanent set includes from thirty-six to forty, depending upon whether or not the tusks are present.

The incisors, which are the teeth to be examined in determining age, are known, in the order of their appearance from the sides of the mouth to the center, as "corners," "dividers," and "nippers"; the grinders are examined only in reference to their general condition of evenness and soundness.

*One to Three Years.*—Nippers appear at the age of from one week to ten days, the uppers being cut first and the lowers appearing soon afterward; dividers appear at from four to five weeks, and are followed in eight or ten months by the corners. The temporary teeth are gradually pushed up from beneath by the permanent teeth, the process of shedding them beginning at two and one-half or three years of age. Permanent upper nippers may be visible at three years, but the temporary corners and dividers still remain. Usually the permanent teeth are the shorter.

*Four Years.*—The permanent dividers have appeared and the temporary corners still remain but are worn smooth and are much smaller than the permanent teeth.

*Five Years.*—A full set of permanent teeth is present and the animal is said to have a "full mouth." Nippers and dividers are worn almost level, but retain the narrow cavities known as "cups," which extend lengthwise through the crown. Tusks have appeared in the male.

*Six Years.*—Corners are well worn and dividers retain their cups, but the nippers are either worn level or have very shallow cups.

*Seven Years.*—Corners have shallow cups, dividers and nippers have none, and the tusks are well developed. Usually the upper corners, being wider than the lower ones, are not worn away at the rear but project somewhat below the edge of the crown of the lowers. All the incisors are quite white and have lost their former yellow tint.

*Eight Years.*—Corners are worn level and begin to assume an oval crown and dividers and nippers have grown thicker from front to rear and have decreased in width. All incline forward more and do not fit together so nearly endwise. The "star" appears in the crown approximately half-way between the front enamel and that at or near the center of the crown which is known as the "center" enamel.

*Nine Years.*—The notch found in the corners at seven has nearly disappeared, nippers and dividers have crowns quite oval in shape, and all are thicker from front to rear. The center enamel is nearer that at the rear and the star is quite distinct.

*Ten Years.*—Corners are now of little value in determining age and nippers and dividers have grown almost round. The star is nearer the center of the crown and the center enamel has assumed a triangular shape and receded toward the rear of the tooth.

*Fifteen Years.*—Dividers and nippers are distinctly triangular, the center enamel in the upper ones has disappeared, and the star has reached the center of the lower ones. All incisors protrude forward and are very thick from front to rear.

*Twenty Years.*—Nippers and dividers are thicker from front to rear than from side to side and their crowns have pulled away from each other; corners point inward and the jaw has shrunk until it is very narrow; deep notches appear in the upper corners as the result of wear against the rear edges of the lowers; all protrude forward to a very noticeable extent and set wide apart.

**Size.**—A horse weighing from nine hundred to one thousand pounds is sufficiently heavy for all ordinary field work. Larger ones do not possess the capacity for continued climbing, traveling over rough country, or subsisting on short rations that smaller animals do. They may prove satisfactory for level traveling over good roads, but can not be recommended for mountain travel.

**Build.**—The most efficient type of saddle animal for mountain work has a short back, is high at the withers and deep from there to the chest; the latter is full and very broad, the legs are moderately short and are straight and strong with compact joints and sound hoofs; the head is wide between the eyes and also between the ears and is carried well up, but not high, when traveling, the nose is slightly Roman, and the eyes are large and clear and show very little of the white.

**Color.**—Only three colors, with their variations, actually affect the efficiency of a saddle animal; these are white, what is known as "pinto," and "buckskin." The first usually indicates inbreeding, and when this is present the animal, of course, suffers from constitutional weakness in one or more forms. This color is not to be confused with the cream color of a distinct breed of horses noted for their great intelligence.

Pinto horses, which may also be known as "paint," "speckled," "piebald," or "calico," are descendants of the Indian pony, are very hardy and strong, but seldom attain great size.

Buckskin, or "dun" or "claybank," horses with dark stripes around the legs above and below the knees and hock joints and another extending the entire length of the spinal column, are descended from a distinct breed of Spanish ponies noted for their great powers of endurance. They are the toughest and hardiest horses that can be secured, are intelligent and usually docile unless ill-treated, and are seldom vicious.

Black horses may suffer more from heat than other colors may, bays may be the most vicious, and chestnuts may have the tenderest skins, but actual experience in the field has failed to prove or disprove any of these theories.

**General Disposition.**—Many horses resent having their ears grasped when the halter or bridle is to be adjusted or removed, they object to being slapped on the side or flank, do not like to be rubbed or curried, pull back or kick at the stall or other animals when tied, and acquire many unpleasant habits of a

similar nature. Their examination in this respect should be very thorough, and when such tendencies are shown should constitute a valid reason for rejection of the animal. The common idea that such animals should be purchased merely because they may be secured for less money is a mistake that should never be made; animals having as few faults as possible will prove enough of a problem for the beginner in horsemanship.

**Eyes.**—A blind or partially blind horse is practically worthless for saddle use, and should never be secured for such work. The defect is often difficult to detect by casual observation of the animal's eyes and the examination in this respect can not be too thorough.

A very satisfactory method of doing this is to take the animal from the stable into strong sunlight; if the lids or pupils shrink the sight is defective or at least weak; the change of light should not cause any discomfort.

Another means of determining defective eyesight is to pass the hand quickly across an animal's line of vision and close to the eyes; when this is done and no apparent notice of it is taken by the animal the eyes are wholly or partially sightless.

A good, strong, sound eye is clear, the ball glistens, has a regular contour, and is not spotted or blotched; the white should be clear in color with only the faintest trace of minute thread-like blood-vessels showing beneath the surface. Excessive lachrymal secretions indicate an injured eye and should be carefully investigated. A "glass" eye is not necessarily weak, but its presence always lessens the market value of an animal. In old horses the eyeball is distinctly sunken in the socket.

**Pulse.**—Normal heart action is approximately as follows:

Colt, two to four weeks old	70 to 90 beats per minute
Colt, six to twelve months	45 " 60 " " "
Colt, two to three years	40 " 50 " " "
Mare.....	35 " 40 " " "
Gelding.....	33 " 38 " " "
Stallion.....	28 " 32 " " "

The pulse may be observed by placing the ear against the animal's left side just to the rear of the elbow joint. A dull, regular, thudding sound indicates a healthy heart; wheezing, roaring, rattling, or irregular sounds indicate the opposite.

Another method of observing the pulse is to place the fingers

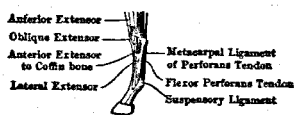
up under and between the lower jaws immediately behind the flat cheek muscles; if the pulse is not located at once the fingers should be moved forward or backward or otherwise until the right spot has been reached.

**Respiration.**—This should be regular and without severe muscular effort, and in a healthy animal occurs at the approximate rate of one breath to every three beats of the heart. Unless the respiratory system is deranged the breaths are inaudible except at very close range.

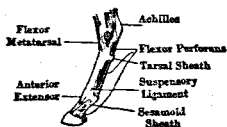
Many animals suffering from improper respiration develop symptoms when strenuously exercised that are not apparent during inactivity; for that reason it is always well to give them ten or fifteen minutes of lively exercise before the purchase is made.

**Hearing.**—If an animal is spoken to sharply at a time when it happens to be looking away from the speaker its observation of the sound will be indicated by a sudden twitch of the ears or head toward the direction of the sound. If no such action results its hearing is probably impaired.

**Legs.**—The distance from the body between the fore legs to the ground should be about the same as that from the withers



Front leg.



Hind leg.

FIG. 206.—Principal tendons and ligaments on the horse's legs.

to the body at the same point, the legs should set well apart at the breast, be straight and well muscled from the knee upward, and the knees should not buckle forward. The hind legs should be fairly straight at the hock joints, and the portions above these joints should be full and well muscled. None of the joints in any of the legs should buckle in any direction, bear any unnatural enlargements, or appear stiff.

**Hoofs.**—Sound hoofs have straight, symmetrical walls, broad heels, a full frog, and a generally oily appearance. Flaring, bell-shaped, cracked, or otherwise disfigured hoofs are to be

avoided. No horse with unsound hoofs will give satisfaction as a saddle animal.

**Gaits.**—The animal should be ridden at various rates of speed for a distance of two or three miles, during which a general test of its traveling capacity may be made. A running walk is a very desirable gait; a "pace," in which the animal moves the legs of one side simultaneously, is to be avoided; a slow trot is a satisfactory gait provided there is sufficient spring in

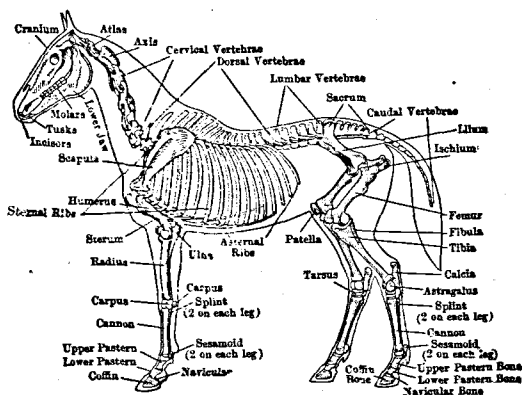


FIG. 207.—Bones of the horse.

the joints to relieve the rider of continual jarring; a "short lope" or a slow gallop is suitable for level traveling but is almost useless in the mountains; and the same is true of the "single foot" gait.

## IDENTIFICATION OF STOCK

Obviously, when cattle or other stock belonging to a number of different owners use a common range, there must be some means possible whereby each owner may identify his own property. Consequently a system of identification, based on visible marks of ownership applied in some manner to an animal's body, has developed automatically until at the present time it has reached a stage where the inexperienced person has good reason to feel completely bewildered as he attempts to decipher some of



the characters used. Unfortunately their selection and application are not controlled by any fixed rule except the one statutory in nature in most States prohibiting different owners in the same locality from adopting the same characters of identification. If their cattle are branded alike then the ear marks must differ, and vice versa. The subject presents rather a difficult problem to elucidate in an intelligent manner, but it is believed that careful attention to the following remarks will provide the inexperienced field man with at least a fairly accurate working knowledge of the different methods used and of the designations and other terms applicable to each:

**Methods Used.**—The methods most widely used are applied, in the order of their prominence, in the forms of: (1) Brands; (2) Ear Marks; (3) Ear Buttons; (4) Ear Loops; (5) Ear Tags; and (6) Dewlaps, which will be discussed in this order.

**1. Brands.**—These may be divided into three general classes, viz.: (1) Fire Brands; (2) Inscribed Brands; and (3) Paint Brands. The first are made by burning characters on an animal's hide, hoofs, or horns; the second are cut or inscribed in the horns or hoofs; and the third are made by smearing tar or paint on an animal, and are sometimes designated as "tar" brands.

**Fire Brands.**—These are applied by means of a heated iron. When only a few animals are to be branded they are either cast or tied as shown in Fig. 208. In the latter case they are tied with what is known as a "branding rig." This consists of a bowline on a bight (see page 327), fastened about the neck, the loose end of the rope being passed about the rear pastern, on the side opposite that to which the brand is to be applied, and the corresponding foot is raised from the ground. This prevents the animal from rearing, kicking, or running, and unless it is very active or vicious will also prevent it from striking.

If a large number of animals are to be branded, they may be driven into a branding "chute," which is fitted with bars to prevent them from passing forward or backing out before the brand is applied.

The irons used in fire branding are known as: (1) Stamp Irons; (2) Bar Irons; and (3) Running Irons.

**(1) Stamp Irons.**—These are usually about 20 inches long by  $\frac{1}{2}$ -inch in diameter. The character, or combination of characters, to be used as a brand, are of iron and are welded to one end of

the handle and at right angles to it. This end of the iron is heated and the character is then pressed against the animal's skin and held there as long as the experience of the operator dictates. If held against the skin too long, a blurred or indistinct brand, known as a "bone" brand, will be the result; if

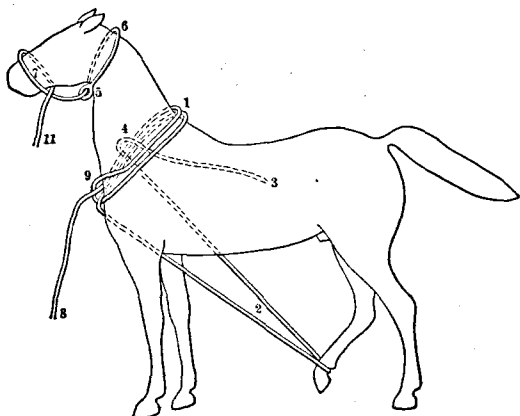


FIG. 208.—Branding Rig.

removed too quickly, no permanent, or at least no visible, scar will be left, and the animal is "hair" branded. The term "hair brand" is also applied to a character clipped in an animal's wool or hair.

A proper knowledge of the length of time required to leave a permanently visible scar can be obtained only through practice. The factors of heat, variety of iron used, and pressure applied to the iron, all have direct influences on the satisfactory application of the iron.

(2) *Bar Irons*.—These differ from stamp irons in that they have only a bar welded to the lower end of the handle and at right angles to it. Ordinarily this bar is about  $\frac{1}{4}$ -inch thick, 2 or 3 inches long, and 1 or 2 inches wide. In using such an iron the operator makes only a portion of the desired character at a time, using either the long or short edge or one corner of the bar. Its use is confined chiefly to open range work, where it

can be carried on the saddle with less inconvenience than a stamp iron. By reason of the longer time required in applying a brand with it, it is not as convenient in this respect as a stamp iron.

3. *Running Irons.*—These are either straight or hooked iron bars which, when heated, are used in tracing characters on an animal's skin. Hooked irons are especially convenient because, turned edgewise, the hook may be used in tracing straight lines and turned sidewise or flat may be used in burning curves.

Another form of running iron is a plain iron ring, usually about  $2\frac{1}{2}$  or 3 inches in diameter, and made of  $\frac{3}{8}$ - or  $\frac{1}{2}$ -inch iron. This is heated and then applied by means of short sticks, secured on the open range, and used tong fashion. The chief advantage of this iron is the convenience with which it may be carried.

Many stockmen prefer copper rings, this preference being due to the fact that such rings heat more quickly and uniformly than common iron rings.

Some State legislatures have passed laws prohibiting the use of running irons, the reason for such action no doubt being the slowness with which brands are applied by their use.

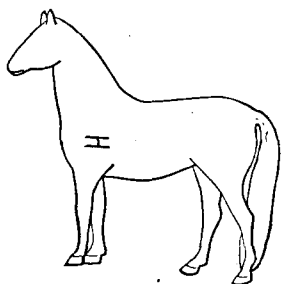
*Location of Fire Brands.*—There is no fixed rule governing the location of fire brands, but there are general customs of applying them to specified parts of different animals. For example: Horses and mules are usually branded on the shoulder or on the lower portion of the hip as shown in Fig. 209; cattle are branded on the shoulder, hip, side, or back, frequently on the neck, and occasionally on the forehead. Burros, in addition to being branded the same as horses and mules, are quite frequently branded on the neck. Fire brands on sheep or goats are applied to the side of the nose, this location for the brand being used because fire brands on other parts of the body would be completely hidden by the wool. Hogs are seldom branded<sup>1</sup> but are invariably ear-marked.

*Cancellation of Fire Brands.*—When ownership of stock is

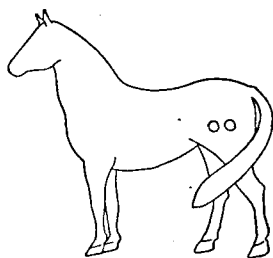
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<sup>1</sup> In response to an inquiry as to whether a brand would discolor the meat of a hog through to the bone, in accordance with a very common idea, the packing firm of Armour & Company replied that possibly, if the iron were too hot, the brand might show to a depth of  $\frac{1}{4}$ -inch below the skin. Swift & Company replied that they had had no experience with branded hogs.

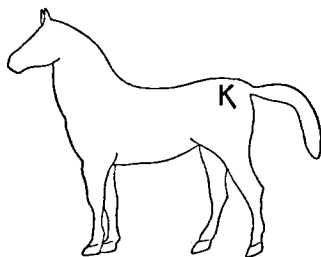
transferred from one person to another it is customary to cancel the former owner's brand and thus remove his visible title to the property.



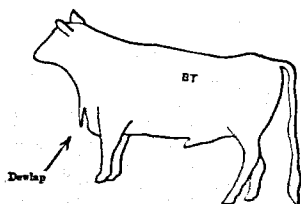
Shoulder brand.



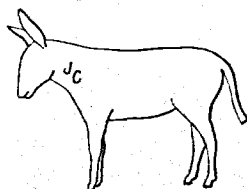
Thigh brand.



Hip brand.



Rib brand.



Neck brand.

FIG. 209.

When this has been done the new owner then applies his own brand to the animal.

Cancellation of a brand may be effected in either of two ways, viz.: (1) Barring out; (2) Venting.

(1) *Barring Out*.—This consists merely in superimposing a bar, slash, or rail across the former owner's brand as shown in Fig. 210, where the brand N has been barred out with a slash and the brand C with a rail. The brand K is canceled with a bar. This method of cancellation is used on both horses and cattle.

(2) *Venting*.—Cancellation by venting is commonly used on cattle and is illustrated in Fig. 211. It consists merely in applying a facsimile of a brand to the shoulder corresponding to

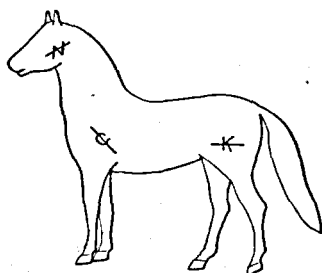


FIG. 210.—Jaw brand. Also cancellation of shoulder brand by rail and of thigh brand by bar.

the side carrying the original brand. Thus a brand on any part of the left side is vented by an application of its facsimile to the left shoulder, while brands on the right side are vented on the right shoulder. Horses are seldom vented.

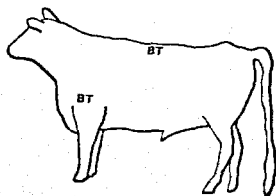


FIG. 211.—Cancellation by vent.

**Inscribed Brands**—These are cut in the hoofs or horns by means of an instrument known as a "scribe" or they may be

burned in with a fine running or stamp iron. Their use is confined chiefly to the horns of sheep and goats, to the horns of exhibition or graded cattle kept in pastures and to the hoofs of army horses and mules.<sup>1</sup>

They are never applied to the hoofs of range horses. Natural growth of the hoofs necessitates reapplication of the brands about every four months.

**Paint Brands.**—These are made by smearing tar or paint on an animal's hair or wool and may be known in some localities as "hair" brands, although this term is usually applied to temporary brands clipped in the hair or wool. They may be smeared on with a straight stick or stamped on by means of a stamp shown in Fig. 213.

**Characters Used as Brands.**—These include: (1) All the conventional letters and figures; (2) Other conventional characters; (3) Arbitrary symbols; and (4) Combinations of the preceding

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<sup>1</sup> A. W. 1083: "Public animals shall, upon the day received, be branded with the letters US on the left fore shoulder. (Sub <sup>1</sup>.) Horses assigned to organizations will also be branded on the hoof of one fore foot 1½ inches below the coronet, with the designation of the company. Branding irons of uniform size and design will be supplied by the Quartermaster's Department. Letters and numbers of hoof brands on the same line to be three-fourths of an inch high, the letter to precede the number, and blocked so as to penetrate the hoof one-sixteenth of an inch. For example, the hoof brands on horses assigned to Band, Ninth Cavalry, would be CB9; to Troop A, Fifth Cavalry, would be A5; to the Band, Second Regiment, Field Artillery, would be BA4; to Company A, Battalion of Engineers, would be BEA."

Excerpt, A. W. 922: "... Condemned animals will be branded IC on the neck under the mane. . ." (Sub <sup>2</sup>.)

A. W. 1084: "Any alteration in the length or shape of the tails, manes, or forelocks of public horses by docking, banging or clipping, is prohibited, and only such reasonable trimming and plucking as may be necessary to prevent shagginess of appearance is permitted."

(Sub. <sup>1</sup>.) In response to an inquiry as to whether the term left "fore" shoulder has any special significance or whether it is merely redundant the War Department through the Quartermaster-General's office replied: "Animals purchased for the army are branded on the left fore shoulder on the flat place over the true arm as shown in enclosed diagram." This diagram is reproduced herewith. However, the term is redundant. A horse has no "rear" shoulder, and its hip is never referred to as its "rear" hip.

(Sub. <sup>2</sup>.) The letters IC are the initials of "Inspected; Condemned," and indicate that after inspection the animal has for some reason been found unfit for army use and has accordingly been condemned.

three. It should be remembered that the characters used as a brand do not necessarily represent an owner's initials, the age of the animal, its number in a herd, or any other specific fact

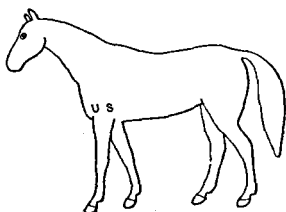
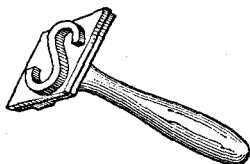
FIG. 212.—Army brand.<sup>1</sup>

FIG. 213.

except an indication of title as this is recorded with the proper authorities.

**Conventional Letters and Figures.**—These are shown in their various positions in Fig. 214, each position being explained in

Conventional Letters and Figures								
Character in regular position.	Reversed	Inverted	Leaning	Lazy	Flying	Walking	Square	Crooked
4	⋈	⋈	⋈	⋈	⋈	⋈	⋈	⋈
K	⋈	⋈	⋈	⋈	⋈	⋈	⋈	⋈

FIG. 214.

accordance with its theoretical reading. But, following a local custom, the flying K may be read as 7K; the walking K may

<sup>1</sup> Supplied by Quartermaster-General's office, War Department, U. S. A.














Other Conventional Characters	
	Figure 1
	Bar
	Slash
	Rail
	Rafter
	Triangle
	Diamond
	Staple
	Square
	Half Circle
	Circle
	Half Moon
	Star

FIG. 215.

be known as LKL connected; and the crooked K may be read as Half-circle C connected or as YC connected. The flying 4 may be known as 74F connected, and the walking 4 as VL or 4L connected. In some localities a "leaning" character is known as "flying"; and "walking," "square," and "crooked" characters may not be designated as such.

**Other Conventional Characters.**—These are illustrated and explained in Fig. 215. No distinction may be made in some





















Arbitrary Symbols	
	Spur
	Winecup
	Hat
	Stirrup
	Beanpot
	Rockingchair
	Clawhammer
	Oil can
	Bud
	Bit
	Bush
	Fan
	Saddle
	Head
	Bowknot
	Clover leaf
	Coffee pot
	Thunderbolt
	Double cross
	Frying pan

FIG. 216.



localities between a "bar" and a "figure 1," or between "rails" and "slashes." A "square" may be known as a "box," and a half-circle as a "swipe"; otherwise the classifications here given are common to most parts of the country.

**Arbitrary Symbols.**—These are shown and classified in Fig. 216. The classifications given are common to all localities and the characters will be found widely used.

**Combinations.**—Combination brands may include any of the letters, figures or other characters heretofore referred to, and a few of the more common ones are shown in Fig. 217. They may appear in a group at one place on an animal's body or they may appear singly or in separate groups at different places. The brand known as a "breaching" consists of a bar across the rear side of both hams above the hocks. A "halter" is a rail applied on the side of the nose. A "hip strap" is a bar run across the back or hips and usually connects a combination brand applied to both sides of the animal.

**Reading Brands.**—Theoretically, brands are read from left to right and downward, but this rule is often disregarded when other methods of reading prove more convenient, such disregard being especially characteristic of stock owners who graze their stock on a common range. In such cases each owner is familiar with all the brands in his locality and his description of a brand, while it may be perfectly intelligible to his fellow stockmen, may mean little or nothing to the person not familiar with the brand.

Local designations of the same character may vary and it is not advisable to contend that a character is any other than that recognized locally. What one stockman may call a slash another may know as a rail, there being no hard and fast rules of designation.

If an animal carries a number of uncanceled brands or a combination brand the reading is from front to rear. Taking, for example, the fourth brand from the top in Fig. 217: If the A appears on the jaw, the bar on the ribs or back and the Y on the hip or thigh, the brand is read theoretically as "A-Bar-Y, jaw to ribs (or back) to hip (or thigh)," but in most instances is shortened simply to "A-Bar-Y."

**Changing Brands.**—This is a form of thievery which, although it was widely practiced on the western ranges in the early days of the cattle industry, is now punishable by such severe penal-

Combination Brands	
-02	Bar O Two Bar Circle Two
7/B	Seven Slash B
J P	J P Combined
A	A Bar Y
4/	Reversed 4 Slash Lazy L
D	Half Circle D
△	Rafter Triangle Bar
V7	V7 Two Bars
⊙	Stirrup Dot Bar
M	Flying M Diamond
56	Fifty-six Connected
G □	G Square G Box
1/2	One-half One Slash Two
3	Lazy 3 Bar H
M A	M A Connected
W	Bit Bar
⊗	Bowknot O Bowknot Circle
⊗	O X Circle X
⊞	Square B F Connected
B	B L Combined

FIG. 217.

ties that few cases occur. The two principal methods of changing brands are known as "running" and "sleeping."

*Running.*—To run a brand the operator merely adds to or changes it or else superimposes another upon it. Thus P may be run into R by adding a rail to the P, or it may be changed to B by adding a quarter circle to the P. The brand US may easily be run into OS, and no difficulty whatever would be experienced in running FI into ET, EL, or EH. A more difficult feat of running a brand is to run X I T into Star Cross but it has been done thus<sup>1</sup>:



Such brands as the Flying Y J Bar and the V Dart can hardly be run without great danger of detection.

*Sleeping.*—This operation consists merely of burning part of a brand so lightly that no permanently visible scar is left, thereby making it possible to retrace and add to the brand later without arousing suspicion. For instance: Assuming that Jones runs the Diamond iron and Smith the W iron, Jones finds one of Smith's calves on the range, brands it with a W, and keeps it separated from its mother until it is weaned. However, he burns the W in very lightly though severely enough not to arouse suspicion except upon the very closest examination, and even if Smith or one of his men happens to discover the calf he naturally assumes that one of the other men employed by Smith branded it, and that the brand is therefore genuine. But as soon as a new growth of hair covers the burn, usually in less than two months, Jones rebrands the calf with his Diamond, running the lower half of the Diamond over one half of the W, and thereby obliterating the last trace of the letter. Consequently, by reason of the apparently fresh brand appearing on a calf unaccompanied by one of Smith's cows, neither Smith nor his men will suspect Jones of sleeping if they happen to observe the calf. This method of thievery is easily detected if the State law requires ear-marks with brands. Obviously, in such a case a calf branded in Jones's iron but ear-marked with Smith's mark would excite suspicion. Suspicion would also attach to a branded but un-

<sup>1</sup>\* It is said that running this brand in such a manner cost a Texas cattle company more than \$20,000.00 in loss by theft.

marked calf or to a calf bearing ear-marks which had evidently been "worked over."

2. **Ear-marks.**—As their name indicates, these are certain marks cut in the ears of animals and, like brands, they are used as a means of identification. Hog-raisers in the South rely almost wholly upon them for this purpose, while cattle in those sections are seldom branded but are invariably ear-marked. In the West, however, brands are usually accompanied by ear-marks, such a combination facilitating identification when one or the other may closely resemble that of some other owner.

Ear-marks may be applied to all classes of stock but are seldom used on horses or mules. They are, however, frequently applied to burros.

**Classifications.**—For greater convenience in explaining them here, ear-marks will be divided into fourteen general classes, viz., (1) Crops; (2) Half-crops; (3) Grubs; (4) Splits; (5) Swallow-forks; (6) Staples; (7) Half-moons; (8) Bits; (9) Scallops; (10) Slopes; (11) Hacks; (12) Slits; (13) Figure 7's; and (14) Holes. These may be further classified as "over" and "under" half-crops, staples, bits, scallops, slopes, hacks, and figure 7's, the term "over" applying to those cut in the upper edge of the ear, "under" referring to those cut in the under edge. Splits, swallow-forks, staples, half-moons, bits, scallops, slopes, hacks, and figure 7's may be cut through the interior

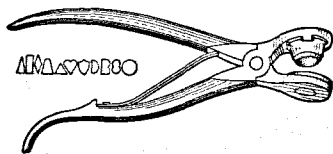


FIG. 218.—Ear punch and dies.

parts of the ear, but not out through the edge, and are then classified with the prefix "inner." Slits and holes are always cut within the ear-edges. They may be made with a common pocket-knife, or with punch and dies like those illustrated in Fig. 218.

**Reading Ear-marks.**—Theoretically these are read by starting at the mark nearest the head on the upper edge of the right ear and following around the ear downward and back to the

head, reading each mark as it is reached. Marks in the left ear are then read in a similar manner.

The marks shown in Fig. 219 are assumed as being observed from the front. Thus the right ear is at the reader's left and the left ear at his right.

Since ear-marks, like brands, are subject to designations fixed by local custom, the foregoing classifications must be modified accordingly. Local methods of applying marks may be responsible for a similarity in the shape of bits, staples, and half-scallops; swallow forks, end staples and half-moons; figure 7's, half-crops and bits; and crops and half-grubs. Little or no distinction is made in the West between bits, staples, and half-scallops, all of which may be known as bits. Hacks, slits, and splits may all be known as splits, while half-moons and end staples may be classified as swallow forks in some sections and bits in others.<sup>1</sup>

The ones shown constitute the varieties of marks most widely used. There are several others possible, but they have not been found satisfactory, principally because stock bearing them are liable to tear their ears on brush or barbed-wire fences or have them torn off by dogs and thus partially or wholly obliterate the marks. Among the more unsatisfactory marks may be mentioned the "swipe," starting near the center of the ear, describing a half-circle and ending near the outer edge of the ear; the "X," a cross cut through the ear; the "paddle," a slit terminating in a hole; the "box," a removal of the greater portion of the interior of the ear leaving only a narrow strip around the edge; and the "jingle bob," which is made by cutting the ear in such a way that a large portion of it droops or hangs down beside the animal's jaw.

It will be seen at once that there is practically no limit to the number of marks possible and that the proper reading of certain combination marks may be attended with more or less difficulty. This is especially true in reading marks in ears that have been cut or remarked in such a manner that they lop down.<sup>2</sup>

<sup>1</sup> The readings given here are in accordance with general usage rather than theoretical rules.

<sup>2</sup> Examination of a cow's ear will show that two large cords run lengthwise through its center. If a split is made beneath the lower cord the portion of the ear under the split will drop till the mark resembles a wide swallow fork rather than a split. Unless the swallow fork effect is desired the split should be cut between the cords.

Right Ear.	Left Ear.
<p><i>Half-grub.</i> It will be observed that the half-grub removes half of the ear.</p>	<p><i>Crop, or smooth crop, and inner over half-scallop.</i> The smooth crop removes approximately one-fourth of the ear.</p>
<p><i>Grub.</i> The grub removes the entire ear and is a mark as unnecessary as it is unsightly and injurious. The passage to the inner ear frequently grows shut as the wound heals.</p>	<p><i>Split.</i> Splits terminate at the end rather than at the edges of the ears.</p>
<p><i>Over slope.</i> If both an over slope and an under slope are cut in the same ear the ear is said to be "pointed" or "sharpened."</p>	<p><i>Under slope.</i></p>
<p><i>Swallow fork.</i> Swallow forks terminate at the edge of the ear tip. They may also be designated as "bits."</p>	<p><i>Over bit.</i> Bits terminate at the ear edge. They are usually smaller than swallow forks.</p>
<p><i>Inner slope and under figure 7.</i> Inner slopes are seldom used, as they are very unsatisfactory in brush.</p>	<p><i>Under bit.</i> Figure 7's may also be known as "bits."</p>
<p><i>Over hack.</i> Hacks terminate at the edge of the ear.</p>	<p><i>Over figure 7 and under hack.</i></p>
<p><i>Over half-scallop and inner under bit.</i> Scallops and half-scallops are cut rounded rather than sharp like bits. Inner bits are seldom used.</p>	<p><i>Under half-scallop.</i></p>
<p><i>Over scallop.</i> Scallops may be known as double bits.</p>	<p><i>Under scallop over half-crop.</i> Half-crops are often known either as bits or swallow forks.</p>
<p><i>Under half-crop and over staple.</i> Staples may often be known as bits.</p>	<p><i>Inner half-moon and end staple.</i> Inner half-moons are seldom used.</p>
<p><i>Under staple.</i> This may also be known as an under bit.</p>	<p><i>Half-moon and inner under staple.</i> Inner staples are seldom used.</p>
<p><i>Inner swallow fork and hole.</i> Inner swallow forks and holes are seldom used.</p>	<p><i>Inner split, inner hack and split.</i> Inner splits and inner hacks are seldom used.</p>

FIG. 219.

**3. Ear Buttons.**—These are used chiefly on registered and graded stock kept within an enclosure and considered too valuable for exhibition purposes to justify their mutilation by marks or brands. The buttons may bear an animal's age, its number in the herd, the owner's name and address, or any other information required. They are made in two pieces as shown in Fig. 220 and are fastened in the animal's ear by means of a pair of pliers especially designed for the purpose. Their chief disadvantage lies in the fact that the information they bear is nec-

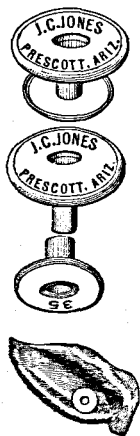


FIG. 220.

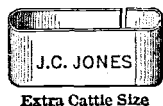


FIG. 221.

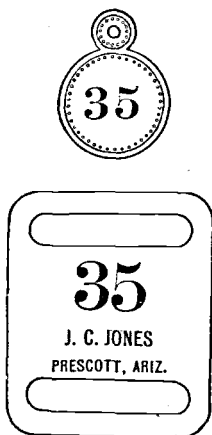


FIG. 222.—Ear tags.

essarily of such small characters that it can not be ascertained except at very close range.

**4. Ear Loops.**—These are shown in Fig. 221 and are fastened through a slit in the ear. Their use is confined chiefly to stock that is kept in pasture or for exhibition purposes. Like ear buttons they may bear any information desired.

**5. Ear Tags.**—Ear tags are suspended from a ring or loop in an animal's ear. They are seldom used on stock except when the animals are to be kept closely confined. Brush, stiff weeds, and barbs along wire fences soon tear them out.

**6. Dewlaps.**—A dewlap is an incision in the loose flap of skin under a cow's neck as shown in Fig. 209. This method of

marking is used on cattle that are pastured or ranged where there is little brush and few snags. If these are encountered the dewlap may be severely torn.

## AGES OF CATTLE

Cattle, unlike horses, have no incisors in the upper jaw, this physical characteristic being common to all cloven-hoofed animals that chew the cud. The teeth to be examined in determining a cow's age are the incisors in the lower jaw. They are eight in number, and are known, from center to the sides, as "pinchers," "middles," "laterals," and "corners."

*To Two Years.*—Temporary pinchers and middles are present at birth, or appear soon after, and are followed by the temporary laterals in from ten to twelve days and by the temporary corners in four or five weeks. All are replaced, in the order of their appearance, by permanent teeth, the pinchers appearing at the age of from sixteen to twenty months and being in place at two years.<sup>1</sup>

*Three Years.*—The middles appear at about thirty months of age and are in place at three years.

*Four Years.*—Laterals appear at the age of three and one-half or four years and are well in place at four.

*Five Years.*—Corners appear at from three and one-half to four and one-half years and are in place at five, when the animal is said to have a "full mouth."

*Over Five Years.*—All incisors gradually grow thicker from front to rear, draw away from each other, and instead of being sharp, as in early age, have low, flat, triangular or circular crowns.

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<sup>1</sup> Where cattle range on brushy areas and depend chiefly on browse for subsistence, as in the Southwest, the temporary teeth are often lost prematurely as the animals bite and pull at the brush. As a result their age can not always be determined with a satisfactory degree of accuracy.



# MISCELLANEOUS

## AILMENTS AND INJURIES

### TREATMENTS

**Antiseptics.**—Antiseptic treatment of wounds is never necessary unless disinfection has been neglected, antiseptics merely counteracting putrefaction which never occurs except in infection.

Hydrogen peroxid, which acts only in wounds exposed to the air, has merely a mechanical action and is not a generally satisfactory antiseptic. Equal parts of turpentine and camphor, well shaken together, will be found about the most effective antiseptic that the field man can carry.

**Disinfectants.**—These are used to prevent the appearance of infectious germs in open sores or wounds, any of which, unless they receive proper preliminary treatment, may become infected. It is therefore always a wise precaution to treat any wound, whatever the degree of its severity, with a disinfectant as soon as possible after the injury is sustained.

A very effective disinfectant may be had by the use of equal parts of turpentine and camphor, well shaken together, and which may be secured at any drug store or at country stores where general merchandise is handled. Ordinarily, ten cents' worth of each will be sufficient for a year's use. In addition to preventing infection, this mixture will also remove soreness and at the same time promote healing. The chief disadvantages of its use are the burning sensations produced by its contact with an open wound and its occasional apparently poisonous effect on persons of subnormal or exceedingly sensitive physique.

**Demulcents.**—These are used on external sores or wounds for purposes similar in nature to those for which bland agents are used in some cases of internal poisoning, viz., as soothing and more or less direct healing agents. Thus, mentholatum, a camphorate preparation, may be used with very satisfactory results on chapped or cracked lips and hands, on sunburns, and even on bruises amounting to lacerations. Many persons prefer camphor ice for the same uses, and still others prefer a mixture of

equal parts of bay rum and glycerin, although the glycerin tends to dry out the skin. Still another demulcent, rather crude indeed, but nevertheless especially effective for use on chapped or cracked lips, is ear wax, removed from the ears and applied to the lips with the finger tips.

Witch-hazel is also a good demulcent.

**Hot Treatments.**—It is often desirable to have some means of supplying a patient with hot treatments when water-bags or bottles are not available. Such treatment may be made possible by the use of stones, flat-irons, horseshoes, or other irons heated and wrapped in cloths. The heated lid of a Dutch oven is especially convenient.

Another simple method is to cut away an old trouser leg, form it into a bag, and fill it with hot sand or earth.

## AILMENTS

### AILMENTS AND THEIR TREATMENT

The origin of practically all ailments to which man is subject may be traced either directly or indirectly to disordered digestive or respiratory action; consequently, as long as these two systems are kept in proper order, the average field man need anticipate no serious physical disorders.

Too much emphasis can not be placed upon the necessity for careful attention to the primary stages of any ailment, and, unless this attention is bestowed when and where it is specifically needed, other and more serious complications will inevitably follow.

**Biliousness.**—This may prove to be a persistent trouble in the field, but it constitutes about the only severe ailment a field man need expect. Carelessness in combating it, however, invariably results in serious complications. As a rule it is due to disordered or overworked digestive organs or to irregular or excessive eating. The primary stages are indicated by a bad taste in the mouth, dizziness, headache, a coated tongue, and sometimes a generally tired or aching feeling over the entire body may be present. Sudden changes of position, such as arising quickly or suddenly changing the line of vision, may result in transient blindness, the eyeballs throb and ache, a sensation of fulness appears in the head, and the circulation is poor. These symptoms indicate that the digestive system must

be given a complete rest and allowed to regain its normal condition.

This may be done by the use of some reliable purgative which will clean the organs and assist them in throwing off the excess load placed upon them. Such a purgative should contain a minimum of calomel, if any at all, or salivation may result. Calomel acts as a very efficient restorative, but care must be taken to see that it passes through the bowels without delay and that it is not allowed to accumulate there. Epsom salt, being more in the nature of a laxative than a purgative, may be used after calomel has been taken, and will in all ordinary cases thoroughly cleanse the bowels of any calomel that may have remained inactive in them.

Except in very severe cases, two or three days' use of a purgative should prove sufficient for the restoration of normal conditions in the alimentary canal.

**Malaria.**—The average field man is stationed high up in the mountains away from low, poorly drained localities where the malaria mosquito (*Anopheles*) breeds, and is therefore less likely to suffer from malaria than other men who may be required to work in mosquito-infected districts.

**Malaria Mosquitoes.**—The common mosquito may be taken as a fairly representative type of the twenty-four principal varieties of mosquito found in the United States. The proboscis of the male is too poorly developed to permit it being thrust into the skin of animals, and the male therefore feeds on plant juices. The female has a strong, needle-shaped proboscis, which, when viewed under a strong magnifying-glass, resembles a coarse, round file. She lays her eggs in boat-shaped masses, of from two hundred to four hundred eggs, in stagnant fresh water, and these hatch in about sixteen hours, producing larvæ known as "wrigglers." The larvæ feed upon minute aquatic organisms, and under favorable conditions, such as very warm weather, develop into pupæ in about seven days.

The pupæ float on the surface of the water for two or three days, and the perfect insect then appears, its entire life covering a period of from ten days to two weeks, unless cold weather has forced it into a dormant stage, in which it may remain during the winter.

The most effective method of preventing incubation and development of the larvæ and pupæ is to pour kerosene oil, gaso-

line, or petroleum into the pond or pool where eggs have been laid. The oil forms in a thin film over the surface of the water and prevents the immature insects from breathing. If no oils are available common salt may be used, making the water in the pool from 2% to 3% salt.

The malaria mosquito may be distinguished from the common mosquito by her spotted wings, while the yellow-fever mosquito (*Stegomyia*) has silvery stripes on the thorax and abdomen. The last-named mosquito is found only in very warm localities.

*Transmission of Malaria.*—The parasite which causes malaria is an animalcule called *Hæmanæba*, which infests and remains in a red corpuscle until this is completely filled. It then divides into innumerable spores, which escape into the plasma of the blood and finally infest other corpuscles. Paroxysms of chills and fever are produced by the simultaneous release of great numbers of these spores. One variety of parasite causes daily paroxysms; another produces the spores every other day, the paroxysmal periods corresponding to the periods when the spores are liberated; and another variety, liberating the spores every third day, produces the paroxysms on these days.<sup>1</sup>

*Symptoms.*—These may be and frequently are preceded by biliousness, persons in this condition being much more susceptible to malaria than those who do not suffer from disordered digestive organs. There is a general feeling of soreness throughout the body, and this is especially noticeable in the muscles at the small of the back. The patient is dull and listless, stretches and yawns frequently, and is unable to rest long in one position. Fever may be preceded by a distinct chill that causes the body to shake and the teeth to chatter. The chill lasts from thirty minutes to an hour, and during the interval the finger-nails assume a bluish or purplish tint. Fever may last from one to four hours and is succeeded by a sweating stage, and comparative comfort is then enjoyed until the next paroxysm. In some cases there may be no chill or cold stage, the patient merely having a high fever for several hours followed by defervescent sweating. In a mild case no paroxysm occurs the second day, but may be expected to appear on the third day, and if proper precautions have been observed should not be as severe as the

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<sup>1</sup> In malarial districts of the South, malaria may be known as "every-other-day shakes," "every-day shakes," and "third-day shakes."

first. If malignant malaria results in daily paroxysms, a change of climate is advisable.

*Treatment.*—If constipation is present a good purgative is required. After the purgative acts, three-grain doses of quinine should be taken at intervals of two hours until the ears ring or nervousness begins to appear. Such treatment should be continued daily until paroxysms no longer occur. Two-grain doses of quinine three times daily for two or three days will prevent an immediate return of malarial symptoms, the bowels during this period being kept regular.

Quinine can best be taken in capsules, which may be filled at any drug-store.

*Diarrhea.*—This may result from a change of diet or water, and has a very weakening effect on the patient. It indicates the presence in the alimentary canal of some substance that nature is trying to eject.

The most effective treatment is a tablespoonful of castor oil, which will act as a mild purgative and thereby assist nature in removing an objectionable load from the digestive organs. Little or no food should be taken for a day or more, and the organs should be given a complete rest.

*Dysentery.*—This follows diarrhea. Castor oil should be taken the same as for diarrhea, and a complete rest is essential to quick recovery. After the purgative has acted, five drops of laudanum and ten grains of bismuth should be taken every three or four hours. A liquid diet is necessary.

*Cholera Morbus.*—This is another disorder of the digestive organs arising from the use of foods that have a more or less poisonous effect on them. Cramps or convulsions may occur, and intense pain is felt in the bowels. A very gentle emetic often proves effective, after which warm or hot-water bags should be applied over the seat of the pain. Drinks of hot pepper or ginger tea are also effective. If these fail to give relief ten drops of laudanum may be used.

*Cramps.*—This is merely another name for a very slight attack of cholera morbus, the symptoms being similar and requiring the same treatment.

*Headache.*—This is generally due to indigestion, and the cause must be removed before permanent relief can be obtained. Temporary relief may be secured by drinking half a pint of water in which two teaspoonfuls of powdered charcoal

have been mixed. Headache is usually one of the first noticeable symptoms of biliousness, and immediate precautions should be taken to combat this ailment.

**Toothache.**—Apply equal parts of pulverized alum and table salt to the affected tooth. Fill hollow teeth with absorbent cotton soaked in chloroform. If the nerve is exposed have the tooth attended to by a competent dentist.

**Sore Lips.**—Extremely dry, windy weather often causes the lips to crack or otherwise suffer as the result of their unnaturally dry condition. Soreness may be removed, healing promoted, and the skin softened by the use of mentholatum, camphor ice, or vaseline. After a few weeks of constant exposure to wind and dry weather the skin will become so toughened that little or no more trouble from soreness need be anticipated.

**Sore Throat.**—Gargle with a strong solution of salt water or saturate a woolen cloth or sock with hot turpentine and grease or lard, equal parts, and bind it about the throat upon retiring for the night.

**Sore Lungs.**—Bathe the chest, neck, and the sides of the body with hot turpentine and grease, equal parts, and rub vigorously. Upon retiring for the night pin a cloth, saturated with hot turpentine and grease, to the night clothes in such a manner that it will rest directly upon the breast.

**Bleeding at the Nose.**—Bathe the sides of the nose and the back of the neck in cold water or rub them with ice or snow. Snuffing cold water into the nostrils is also effective. Medical attention should be secured if bleeding is persistent and so profuse that the patient becomes weak through loss of blood.

**Felon.**—Apply a mixture of equal parts of hot turpentine and pulverized salt to the felon in the form of a poultice. Hot flax-seed poultices are also good. Any poultice should be removed as soon as it becomes cold and another hot one should be applied.

**Chilblains.**—This affection is the result of exposure to cold and generally proves most severe in the heels. Applications of ice or cold water usually remove the soreness. The feet should not be bathed in warm water to remove soreness.

**Corns.**—These result from the wearing of improperly fitting shoes. Apply tincture of iodine several times daily. Cover corns between the toes with a cloth soaked in the tincture and glycerin. Another effective treatment is frequent applications of

acetic acid, which may be used on either hard or soft corns. Finally, wear shoes that fit.

**Ingrowing Toenails.**—Like corns, these are caused by ill-fitting shoes. They should be scraped thin at the top in order to weaken them at that point and allow a buckling-up process to take place, during which the edges will be drawn upward out of the sides of the toe.

**Chapped Hands.**—This trouble usually appears as the result of prolonged exposure to extreme frost or cold weather when there is not sufficient moisture or elasticity in the skin to prevent it from cracking, as it contracts through cold. Bay rum and glycerin, equal parts, will prove temporarily effective, but can not be recommended as preferable to mentholatum.

Laborers engaged in work that causes the skin on the palms and the lower surfaces of the fingers to thicken and harden often suffer from deep cracks in the skin surrounding the joints. This trouble is frequently remedied by means of a cord tied about the joint in such a way that it fits into the crack and against its raw surfaces, thus protecting these parts from injury and allowing the crack to heal from the bottom outward.

## INJURIES

In the regular course of their work field men are subjected to a number of possible injuries, and unless they possess some knowledge of the treatment required in a specific case they may suffer from severe complications later on. Often they are remote from medical supplies or attention, and in such cases must of course treat themselves.

The most important factor in any treatment is presence of mind, and in case of an injury the field man who becomes excited only makes a bad matter worse.

Open wounds should be washed clean and kept so; if dirt or other foreign substances are allowed to enter, the wounds can not heal properly. Too much attention can not be given to antiseptic precautions or to sanitary measures, and a liberal use of disinfectants is always advisable. The most serious effects of injuries are not always due to the injuries themselves, but in many instances develop as the result of improper or careless preliminary treatment.

**Cuts.**—These probably constitute the chief injuries received

in the field, and unless they are unusually deep or ragged no complications should ensue. The first thing to determine is whether or not an artery has been severed, and this will be indicated by strong regular spurts of bright-red blood. When such a course is possible a tourniquet should be applied between the wound and the heart, and the injured part should be elevated above the latter. Soot, cobwebs, or mud should never be bound on a cut; it should be washed with from three to five drops of carbolic acid in a pint of water.

Darker blood, flowing in a slow, steady stream, indicates a severed vein, and such a wound seldom proves serious. Bleeding may be stopped by binding fresh flour to the wound. In severe cases a tourniquet may be used, being applied at a point which brings the wound between it and the heart.

Blood which merely oozes out in a few large drops or a number of very small ones indicates injured capillaries, and such a wound requires no attention other than possibly that of the use of a disinfectant.

Hydrogen peroxid applied to a wound will "boil" if the wound is festering or if other unnatural conditions exist. Soreness may be removed by frequent application of turpentine and camphor in equal parts. This will produce a severe burning sensation if applied to an open cut, and in some instances may even have a slightly poisonous effect on the patient, but as a general rule it is as effective a remedy as can be used.

**Gunshot Wounds.**—Ordinarily, by reason of the fact that the edges of the wounds are ragged or torn, these are more difficult to treat than other lacerations. Care must be taken to wash them thoroughly and to prevent infection as they heal. If very serious, they should be treated by a competent physician.

**Burns.**—Wash the wounds, then apply castor oil, taking care to see that no blisters are broken. Bandages should not be used, but if they are found to be absolutely necessary they should be light and open enough to allow the escape of natural heat from beneath them. Air may be kept from the wounds by applications of castor oil or vaseline. Cotton saturated with vinegar and laid on the wounds is said to prevent scars.

**Bruises.**—These should be bathed for an hour or two, according to their severity, in warm water. Allow the temperature of the water to decrease gradually, and finally bathe with cold water. Raw beef bound to the wound will remove discolora-



tion, or a cloth soaked in very hot water, wrung dry, and applied to the wound will serve the purpose as well.

**Fractures.**—Provide complete rest and see that the injured part is protected from unnecessary movement. Bathe the affected part in cold water to keep down fever, and secure expert medical attention at once. If a splintered bone is forced through the skin, no attempt should be made by an inexperienced person to replace it unless expert attention is absolutely out of the question. In such a case force the splintered end backward and if possible fit it into its natural position, fit the shattered ends together as well as circumstances will permit, and work the limb into a natural position and hold it there by means of splints. These may be made from barrel staves or pieces of wooden boxes, or may be hewn from green timber. See that they are perfectly smooth and that they fit the limb closely. Do not apply directly to the flesh, but bandage the latter lightly, then apply the splints and later make them secure with other bandages. The main object is to hold the fractured ends of the bone together in one position till they knit.

**Dislocations.**—Pull or otherwise force the joint into its natural position and then bathe the parts surrounding it with warm water and treat as a bruise. In some instances cold water may give more relief than warm water. Give the joint a complete rest and do not use it till all soreness has disappeared.

**Sprains.**—These are caused by excessive strain on the tendons. Allow a good rest of the injured parts and bathe in turpentine and camphor, equal parts. Do not use the member till soreness has disappeared.

**Faint.**—This may result from biliousness, fright, or sudden surprise, extreme mental or physical pain, or from a disordered circulatory system due to improper nerve control. The direct cause is lack of blood in the brain.

Lay the patient flat on his back with the limbs extended and the head lower than the body, loosen the clothing about the throat and waist, and dash cold water in the face. Stimulate with a tablespoonful of whiskey or with strong smelling salts held close to the nose. External stimulation may be secured by rubbing the body with alcohol or by chafing the hands and arms. Upon revival remove the patient to quiet quarters and allow a complete rest.

If due to biliousness remove the cause.

**Shock.**—This is similar to faint and should be given the same treatment.

**Freezing.**—There is little danger of serious freezing as long as a sensation of extreme cold is felt; freezing occurs at the time these sensations cease and is responsible for their disappearance. Frozen parts may be distinguished by their dead-white appearance and insensibility.

The first symptom is a feeling of extreme cold, which soon disappears and leads the patient to believe that warmth is returning; drowsiness soon appears and the patient has an uncontrollable desire for sleep. It is very necessary, however, to see that he is not allowed to sleep, as this invariably results fatally. He should be forced to exercise, and to adopt such other methods as will serve to stimulate circulation of the blood. If he has become so numb that physical action is impossible he should be taken into a snowbank or other shelter where the wind can not strike him and should then be rubbed vigorously with ice or snow or bathed in the coldest water obtainable. He should never be taken into a warm room until all frost has been removed and he no longer feels numb.

If amputation becomes necessary it should be done by a surgeon who is thoroughly familiar with the prevention of blood-poisoning.

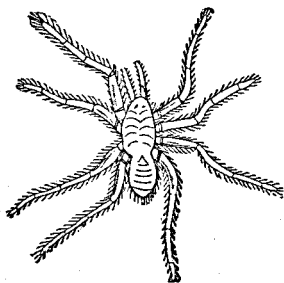
**Sunstroke.**—Remove the patient to the shade and lay him flat on his back, dash cold water in his face, and see that the clothing is loosened. If recovery does not occur in from forty-five minutes to an hour, salt should be added to the water until a strong solution is secured. Recovery is seldom so complete that the patient will be able to withstand exposure to extreme heat again without a recurrence of the stroke.

**Drowning.**—Lay the patient face downward over a log or a roll of clothing in such a way that the pressure of the support is against his stomach. Place one or both fore-arms beneath his forehead to keep this from the ground, then press down vigorously on his back, afterward turning him over and pressing on his chest. Alternate pressing of the back and chest should be continued until all the water has been removed from the lungs.

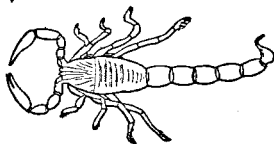
If this treatment fails to remove the water, stand astride the patient's body as he lies face downward, seize him at either side just below the ribs, and give the body a sudden jerk upward,

taking care to see that the operation does not result in bruising the face against the ground. In event this also fails to remove the water from the lungs, the attendant, if he is strong enough, should hoist the patient to his back, the patient's head down and the crook of his knees resting over the attendant's shoulders, while the attendant holds the patient there by a firm grasp of the ankles. In this position the patient may be carried about at a rough, jolting walk or run for several minutes, during which time most of the water will be shaken from his lungs.

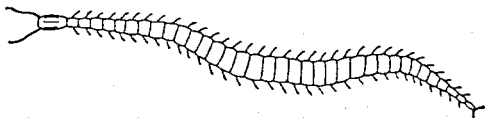
If natural respiration does not reappear soon after the water has been removed from the lungs, the patient should be laid flat on his back, and the attendant should then hold shut the nos-



Tarantula.



Scorpion.



Centiped.

FIG. 223.

trils while he forces his own breath into the lungs of the patient, removing it by pressure on the chest. This should be continued until respiration begins again in a normal manner, care being taken, of course, not to interrupt the first faint breaths that occur.

The patient should be removed to quiet quarters and given a complete rest as soon as natural respiration has been secured.

**Lightning Stroke.**—This should be treated the same as sun-stroke.

**Tarantula, Centiped and Scorpion Wounds.**—These should be bathed in turpentine for about twenty minutes and care should be taken to see that all parts of the wounds are reached.

Contrary to a general belief that such wounds are invariably fatal they will seldom prove more than temporarily serious unless the patient is in a generally run-down physical condition.

**Catfish Wounds.**—These are inflicted by means of the spines appearing at the gills and at the front of the dorsal fin of the catfish. They frequently result in severe soreness, but no permanent ill effects should follow if the wounds are thoroughly bathed in turpentine immediately after they are inflicted.

**Dog Bites.**—Expert medical attention should be secured immediately if there is reason to believe that the bite has been inflicted by an animal suffering from hydrophobia.<sup>1</sup> The animal's brain should be secured in such cases if this is possible and should be examined by competent authority to ascertain whether or not indications of hydrophobia are present. In any case the wound should be well opened and filled with turpentine.

**Snake Bites.**—The average field man, in the course of his regular duties, encounters so few poisonous snakes that he gives little or no attention to the study of means to counteract the poison. It is well, however, for him to be prepared for emergencies and to know what should be done in case he is bitten by a poisonous snake.

The poison is primarily a violent blood poison rather than a stomach poison, although its presence in the circulatory system will cause severe illness and nausea. Thick, laborious breathing and physical exhaustion are prominent symptoms, nausea is present but vomiting is difficult, dizziness occurs and partial muscular paralysis attends the advanced stages. Severe internal pains produce spasms and a violent swelling appears about the wound.

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<sup>1</sup> The following treatment is said to counteract hydrophobia poisoning, but since there has been no opportunity to verify its actual workings it is not offered as strictly infallible: Bruise up one and one-half ounces of green Elecampane root, a composite plant allied to the aster, and put it in a pint of sweet milk. If the green root is not available use the dried root, which can be secured at most drug stores. Boil the milk down to one-half pint, let it cool then drink it. Repeat the dose in ten or twelve hours but use two ounces of the root. Take a third two-ounce dose twelve hours later. Eat nothing for a period of from six to eight hours after each dose.

Action should be immediate. Locate the wound and make an incision in it to allow free bleeding. If the teeth are sound and the lips free from cracks or other lacerations and the wound can be so reached it should be sucked vigorously. A strong emetic, such as mustard water or warm salt water, should be taken immediately afterward in order to throw off any poison that may have entered the stomach through the mouth and throat.

Instances have been known where chewing and swallowing tobacco and its juice have counteracted the effects of the poison injected through the wound. Another method is to soak the wound in turpentine or in a strong solution of kerosene oil and salt. Moderate drafts of whiskey may prove effective, but in the majority of cases which prove fatal, death is doubtless due more to the excessive amounts of whiskey taken than to the effects of the poison itself.

The most effective remedy is an injection of permanganate of potash, one part of it being used with one hundred parts of water. It comes in the shape of small grains, similar in appearance to gunpowder, and can be secured at any drug store.<sup>1</sup>

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<sup>1</sup> The following official memorandum, issued to Forest officers in District 3, on September 13, 1915, may prove of interest: "Snake bites are most often received on the legs, below the knees, and less frequently on the hands or arms. Wherever the bite may be located, first-aid treatment must be given quickly to be effective. In the case of a bite on the foot or leg below the knee, the first thing to do is to expose the limb instantly and bandage or ligature it just above the knee so tightly as to at once stop the flow of blood and prevent as far as possible the distribution of the poison to other parts of the body. In the case of a bite on the hand or forearm, place the bandage just above the elbow. Anything that can be tied, such as a rope, strap, handkerchief, will answer. A pad of cloth placed under the knee will help to make the bandaging more effective. The second step is to sink the point of a clean, sharp knife to the bottom of each wound made by the snake's fangs, which usually penetrate about one-fourth of an inch, and to slit the flesh parallel with the limb, for one-third to half an inch; avoid cutting across or around the limb, which is more likely to sever a blood vessel. Pinch and rub the flesh about the wound and suck the blood from it for several minutes, or as long as a free flow of blood continues. This will remove much of the venom. The blood and poison should be spit out quickly from time to time. (No one having abrasions, open sores, or cuts on the lips or in the mouth should suck a wound, as these may take up the poison.) The third step is to thoroughly sterilize the wound by an application of permanganate of potash. Spread the wound open and pour the crystals into the cut

It is true that so many bites may be inflicted that death may be almost instantaneous, but this is a very rare occurrence.

**Poisoning.**—This may occur as a result of impure foodstuffs being taken into the stomach, may result from mistakes made in compounding or administering drugs or medicines, or it may result from a deliberate attempt at self-destruction. Action in any case should be prompt and unattended by excitement or confusion, and should be persistent until the poison has been ejected or neutralized and the patient made as comfortable as conditions will permit.

In nearly every case it is advisable to administer an emetic as soon as the first indication of poisoning appears. While the stomach is being emptied, an antidote may be prepared, and action will thus be hastened and little or no time lost.

**Emetics.**—The most effective emetic that can be used consists of  $\frac{1}{10}$ -grain of apomorphin hydrochlorid dissolved in a syringeful of water, the patient being given liberal quantities of water afterward for purposes of dilution. Another emetic consists of strong, warm, salt water, while another may be made of strong mustard water. If none of these is available vomiting may be induced by thrusting the finger far down in the patient's throat.

**Antidotes.**—These are given as means of neutralizing poisons to an extent that renders them ineffective. A general rule is to give an acid antidote for alkaline poisoning and an alkaline antidote for acid poisoning.

**Blands.**—Blands are of a demulcent or soothing nature, and should be given in all cases where the nature of a poison has

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freely. An application of iodine in the form of a strong tincture or crystals will answer, if the permanganate is not available. Keep the limb bandaged for at least an hour after the blood has been thoroughly sucked from the wound. Then the bandage can be slackened a little provided the patient shows but little effect (depression), from the poison. If the patient is greatly affected, do not loosen the bandage. When snake bites are received in a part of the body where a bandage can not be applied effectively, opening the wound, sucking out the blood and poison, and sterilizing the wound is all that can be done before taking the patient to a doctor, which in all cases should, if possible, be done promptly. A large dose of whiskey, brandy, diluted alcohol, or aromatic spirits of ammonia should be given at once and repeated as often as is necessary to keep up the patient's strength. Of course, the services of a physician should be secured as soon as possible."

been such as to corrode or burn the membranes attacked. Sweet milk, raw eggs, and olive oil are about the most effective.

**Stimulants.**—In event a poison leaves the patient physically exhausted or mentally depressed these conditions may be overcome by administering liberal drinks of strong tea or coffee, and if these are not available then whiskey or brandy may be used instead. The first two, however, are preferable in most cases. If the effect of the poison causes nervousness, extreme sensitiveness, or excitability, then, of course, a stimulant should not be used.

## POISONS

These occur in such a multitude of forms that no attempt whatever will be made here to classify them in their various orders. Only such poisons as the field man may possibly encounter during his field work can be considered and these are arranged alphabetically for quicker reference.

Poisons	Symptoms	Treatment
Aconite.....	Numbness in lips and tongue: tingling sensation in limbs.	Emetic: complete rest; stimulant if necessary: warmth.
Alcohol.....	Unconsciousness: deep respiration: snoring: paleness: weak heart-action.	Emetic: large quantity of sweet milk or strong coffee.
Ammonium hydroxid....	Severe pains in stomach and bowels: stained lips and mouth; vomiting.	No emetic necessary: vinegar or lemon juice: bland: stimulant if necessary: rest and quiet.
Ammonia.....	(See above.)	
Arsenic.....	Vomiting: unconsciousness: pain in mouth. stomach and bowels: exhaustion.	Emetic: raw eggs well beaten; stimulant: rest.
Atropia.....	Drowsiness: unconsciousness: deep breathing; flushed face and dilated pupils.	Emetic: stimulants; keep the patient aroused. and, if necessary, produce artificial respiration.
Belladonna....	Staggering: delirium: face flushed: dry mouth and throat: bright, dilated pupils.	Emetic: strong coffee or tea: keep limbs warm; allow plenty of rest for complete recovery.
Bromin.....	Abdominal pains; vomiting: diarrhea: impaired heart-action and respiration; local muscular spasms.	Emetic: stimulant; warmth.

Poisons	Symptoms	Treatment
Camphor.....	Burning sensation in all parts attacked: dizziness; headache: impaired vision: convulsions: irregular pulse: nausea.	Emetic: castor oil or alcohol: rest.
Cantharides....	Externally. blisters: internally. same: nausea; vomiting.	Emetic: no oils should be given: give drinks of gruel, water and meal or flour or other mucilaginous drinks.
Carbolic acid...	Pains in mouth, stomach, and bowels; lips and mouth burned white: tongue swollen: spasms and unconsciousness.	Sweet milk, melted butter or lard, or alcohol: bland: stimulant if necessary: rest.
Charcoal fumes	Flushed face; short and rapid respiration: surface of body cold: in slight attack similar to intoxication.	Provide plenty of fresh air: artificial respiration if necessary.
Chloral.....	Similar to intoxication: nausea; vomiting: irregular pulse and respiration: face flushed: extremities cold: convulsions may occur.	Emetic (strong): alkaline antidote: stimulant: keep the patient aroused and do not allow sleep: produce artificial respiration.
Chlorin.....	Inhaled: suffocation, coughing, pains in chest.	Plenty of fresh air: to relieve pain inhale ether.
Chloroform....	First stage, warm feeling and tingling sensations, followed by unconsciousness, relaxation and vomiting.	Artificial respiration: raise feet above head to force blood to brain: if taken into stomach give an emetic, then olive oil and stimulant: keep warm.
Chromic acid...	Muscular cramps: vomiting: diarrhea: slow respiration: collapse.	Emetic: large quantities of sweet milk.
Cicuta.....	Weakness: partial paralysis: dilated pupils: weakened respiration, which, in a fatal case, causes the death.	Emetic: stimulant; prevent cessation of respiration: force patient to breathe.
Cocaine.....	Dry, burning throat and nose; burning in stomach: quick pulse at first, but becomes slow: cold extremities: dilated pupils.	Emetic; liberal doses of powdered charcoal.



Poisons	Symptoms	Treatment
Copper.....	Bitter taste in mouth: nausea: vomiting: colic: thirst.	Emetic: flour paste. raw eggs. or sweet milk.
Corrosive sublimate....	Pain in mouth: vomiting: purging: abdominal pains: convulsions.	Emetic: raw eggs. sweet milk: stimulant.
Cyanid of potassium...	Drowsiness: insensibility: flushed face: dilated pupils; deep breathing.	Emetic: keep patient awake: produce artificial respiration.
Digitalis.....	Impaired vision: headache: thirst: irritation in stomach: pulse slow but strong: impaired heart-action.	Emetic: stimulant: rest: warmth.
Ether.....	See Chloroform.	
Fly poisons....	These are generally arsenic; symptoms are similar to those in arsenic poisoning.	Emetic: raw eggs well beaten; stimulant; rest.
Formaldehyd...	See Chloral.	
Fowler's solution.....	See Arsenic.	
Hartshorn.....	See Ammonia.	
Hellebore.....	Burning sensation in stomach and bowels; slow, feeble pulse: drowsiness: dizziness; dilated pupils: nausea.	Emetic: place patient flat on his back with the feet higher than the head: give a stimulant.
Hydrates or Hydroxids of Ammonium (Ammonia or Hartshorn) Potassium Sodium.	Soapy taste; burning sensation in mouth, throat, and stomach: light, accelerated breathing: slow pulse: clammy skin.	Emetic: vinegar. lemon or lime juice: if antidote is not available. give a stimulant.
Iodin.....	Abdominal pains: diarrhea: vomiting: local muscular spasms: impaired heart-action and respiration.	Emetic: boiled rice. flour or meal: remove yellow stains from skin with ammonia.
Laudanum.....	Drowsiness: unconsciousness: flushed face: dilated pupils: deep breathing: snoring.	Emetic: prevent sleep and compel patient to move about: stimulant; no rest until effects wear off.
Lead salts.....	Pains in alimentary canal; spasms.	Emetic: raw tomatoes, lemons, oranges: stimulant.
Lye.....	Shriveled lips and tongue: vomiting: severe pains in alimentary canal.	No emetic necessary; raw tomatoes. lemons, or oranges: stimulants: rest.

Poisons	Symptoms	Treatment
Mercury salts..	Vomiting: pains in the alimentary canal; insensibility.	Emetic: bland: stimulants.
Morphin.....	Similar to laudanum, except pupils are contracted.	Treat as for laudanum.
Muriatic acid...	Stained and shriveled lips and mouth; pains in alimentary canal: vomiting.	Emetic: sweet milk, raw eggs, lime, plaster, magnesia, chalk: stimulant.
Mushrooms....	Spasms of stomach and bowels: interrupted heart action: excessive lachrymal secretions: contracted pupils.	Emetic: purgative.
Nicotin.....	Extreme nausea; vomiting: dizziness: rapid pulse and respiration: cold extremities.	Emetic: stimulant: warmth.
Nitric acid.....	See Carbolic acid.	
Nitroglycerin...	Inhaled: a severe "powder headache": taken internally: colic, vomiting, dizziness, and great weakness.	Emetic: strong coffee.
Nux vomica....	Stiffness: spasmodic action of muscles: convulsions.	Emetic: strong purgative: complete rest.
Opium.....	See Morphin.	
Oxalic acid.....	Intense pain in alimentary canal: vomiting: stained or burned lips and mouth.	Emetic: chalk, lime, magnesia, or plaster: bland: stimulant.
Paragoric.....	See Morphin.	
Paris green....	Pain in alimentary canal: convulsions: vomiting: purging.	Emetic: raw eggs, sweet milk, castor-oil: bland: stimulant.
Phosphorus....	Pain in alimentary canal: convulsions: vomiting: purging.	Emetic: chalk, lime, plaster, magnesia: bland: stimulant.
Picric acid.....	Fulness in head: roaring in ears; dullness; impaired vision: difficulty in swallowing: pulse weak.	Sweet milk, melted butter or lard, or alcohol: bland: stimulant: purgative will only further irritate bowels.
Poison Hemlock	See Cicuta.	
Potash.....	Pain in alimentary canal: vomiting: convulsions: burned lips and mouth.	No emetic necessary: give raw tomatoes, vinegar, or lemons: bland: stimulant.

Poisons	Symptoms	Treatment
Potassium chlorate.....	Pain in alimentary canal; vomiting; possibly diarrhea may occur.	Emetic; stimulant; rest.
Potassium nitrate.....	Pain in alimentary canal; vomiting; purging; local muscular spasms; impaired heart-action and respiration.	Emetic; stimulant; rest; warmth.
Prussic acid (Potassium cyanid).....	Palpitation of the heart; cold perspiration; dilated pupils; irregular respiration; convulsions.	If large amount has been taken no antidote will be effective; in very small amount give emetic, and produce artificial respiration.
Ptomaine.....	Severe pain in the alimentary canal; vomiting; purging; convulsions; cramps; extreme nausea.	Emetic; purgative; powdered charcoal or wood ashes in teaspoon doses; stimulant if necessary.
Rat poisons....	See Fly Poisons.	
Salicylic acid...	See Picric Acid.	
Silver nitrate...	Pains in throat and stomach; vomiting; vertigo; spasms.	Emetic; raw eggs, sweet milk; rest.
Strychnin.....	See Nux Vomica.	
Sulphuric acid..	Pain in alimentary canal; stained or burned mouth and lips; vomiting.	Emetic; soda, chalk, plaster, lime, magnesia; bland; stimulant.
Tartar emetic..	Pain in alimentary canal; vomiting; purging.	Milk or raw eggs; bland; stimulant.
Wood alcohol...	Nausea; headache; delirium; profuse perspiration; dilated pupils.	Emetic; stimulant; rest.
Zinc chlorid....	Excessive secretions of saliva; difficulty in swallowing; vomiting; collapse.	Emetic; raw eggs, milk, or strong green tea; rest.

**Poisonous Plants.**—It is impossible to classify these plants definitely because some of them may poison some persons and have no perceptible poisonous effect on others, some that are harmless to animals are very poisonous to humans and some that are poisonous in the raw state are harmless when cooked.

Among the poisonous plants of the United States the most prominent are water hemlock, poison hemlock, henbane, black nightshade, belladonna, lobelia, digitalis, aconit, hellebore, poke-weed and ivy.

The last is often confused with the Virginia creeper or five-

leafed ivy, which may also prove poisonous to some people, but may be distinguished from it by having only three leaves instead of five. It proves poisonous to most persons who come in contact with it and to many who get only in close proximity to it. The affection known as "ivy poisoning" appears in the form of numerous blisters, and extreme irritation of the infected parts ensues. On the hands it usually appears first between and at the base of the fingers, while on the feet it first appears between the toes.

An effective remedy is an application once or twice daily of buttermilk, lemon-juice, vinegar, or raw tomato. Sulphuric ether is also good, but must be used during the primary stages to be effective, and if not used till secondary inflammation appears will be of little use. Its action is to take into solution the volatile oil and to so spread it as to permit rapid oxidation and consequent weakening of the poisonous properties of the plant.

## REPTILES

**The Horned Toad.**—This is not really a toad, but is a large lizard with a wide, flat body. It is common to the South and Southwest and is usually found in hot, dry, sandy localities. It has a flat, circular body, somewhat greater in diameter than a silver dollar, and on its back and head small horn-like protuberances appear which give it its name. These "horns" also appear around the edges of the body. The tail is blunt, the legs are rather long but slender, and the head is short and thick. The entire body is marked with dull red, orange, yellow, gray, and black spots and stripes which, together with the "horns," give the reptile an especially unnatural and repulsive appearance. It is perfectly harmless and makes frantic efforts to escape when approached.

**The Mountain Boomer.**—This is another large lizard found in the South and Southwest. It seldom exceeds 8 inches in length, has a long, cylindrical body, and a large, triangular head, and bears markings on the body similar in color to those of the horned toad, the chief difference being the brighter hues. It is extremely timid and, upon being approached, runs away with lightning-like rapidity. No reason can be given for the origin of the name.

**The Gila Monster.**—This reptile is found only in the Southwest, and is the largest and the only poisonous lizard found in

this country. It grows to a length of 18 or 20 inches, and has a long, cylindrical body from 2 to 3 inches in diameter and marked with red and brown stripes, the legs are short and thick, the head and tail are blunt and striped with red and brown rings, and the movements are sluggish. It inhabits low, hot, sandy localities, and the bite, though poisonous, is not necessarily fatal.

**Poisonous Snakes.**—In this country these include the rattlesnakes, copperhead, and water moccasin or "cotton-mouth," the common and scientific names of which follow:<sup>1</sup>

Common Name	Scientific Name	Habitat
<b>Rattlesnakes</b>		
Banded or timber	<i>Crotalus horridus</i>	Eastern and Central U. S.
Diamond back	<i>Crotalus adamanteus</i>	Southeastern U. S.
Dog-faced	<i>Crotalus molossus</i>	Ariz., N. Mex., North Mexico
Green	<i>Crotalus lepidus</i>	Southwestern U. S.
Horned	<i>Crotalus cerastes</i>	Deserts, Southwest U. S.
Massasauga	<i>Sistrurus catenatus</i>	Central U. S.
Pacific	<i>Crotalus oregonus</i>	West U. S.: Pacific region
Pigmy	<i>Sistrurus miliarius</i>	Southeastern U. S.
Prairie	<i>Crotalus confluentus</i>	East of Rocky Mountains
Price's	<i>Crotalus pricei</i>	Arizona
Red	<i>Crotalus atrox ruber</i>	South Cal.; Lower Cal.
Texas	<i>Crotalus atrox</i>	Texas, Ariz., N. Mexico
Tiger	<i>Crotalus tigris</i>	Southwestern U. S.
West. Massasauga	<i>Sistrurus catenatus con-</i>	
	<i>sors</i>	Southwestern U. S.
White	<i>Crotalus mitchelli</i>	Deserts: Southwest U. S.
Copperhead	<i>Ancistrodon contortrix</i>	Eastern and Central U. S. to Texas
Water Moccasin	<i>Ancistrodon piscivorus</i>	Southwestern U. S.; Florida to Texas

**Common Characteristics.**—The most prominent physical characteristics common to all three snakes listed are the flat, triangular head, sharp nose, broad jaws, short, heavy body rather disproportionate to its length, the more or less regular and well-defined diamond-shaped markings of the skin, the hollow, needle-like fangs of the upper jaw and the muscular action involved in advancing or lowering them, the process of emitting poison from the poison glands, the inability to strike unless coiled, and the serious effects of the bite.

**Fangs.**—These are located in the upper jaw, one on either side, are from  $\frac{1}{8}$  to  $\frac{3}{8}$ -inch long, hollow, and very sharp, and

<sup>1</sup> Supplied by Bureau of Biological Survey, U. S. Department of Agriculture.

slightly curved toward the rear. Except when used for offensive or defensive purposes they repose backward along the jaw, but the roots are so attached to muscles that the fangs may be advanced instantly. Their backward curve causes them to hang to whatever they may be thrust into.

*Poison Glands.*—The poison glands are situated at the root of the fangs and consist merely of a small sac containing a violent blood poison which is provided in such quantities by the snake's system that the glands are always supplied, except immediately after a continued attack on the part of the snake. They refill within the space of an hour or so.

*Emission of Poison.*—When the fang is thrust into the victim, the root presses against the poison gland and forces the contents through the minute tube in the center of the fang. The process is similar to the action involved in using a hypodermic syringe.

*The Poison.*—This is a very thin, light green fluid having the nature of a blood poison, although its presence in the stomach will produce severe attacks of vomiting and even its odor may cause nausea. It is fatal to the snake when self administered through accident or otherwise.

*General Comparison of Rattlesnakes, Copperheads and Moccasins.*—*Size.*—The rattlesnake varies in length from 18 inches to 5 feet and instances have been known where this length was exceeded. The girth varies from 3 to 8 inches. The body is fairly well proportioned, although rather heavy for its length, and at the rear extremity bears a series of horn-like rings, commonly called "rattles,"<sup>1</sup> and from which the snake derives its name.

Copperheads are so called from the bright coppery appearance of the head. They attain a length of from 12 to 24 inches and in girth vary from 3 to 6 inches. The body is short and heavy and the head rather disproportionately large.

Moccasins, or "cotton-mouths" as they are frequently known, vary in length from 18 inches to 3 feet. The average girth is

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<sup>1</sup> Contrary to a general belief, the number of rattles does not indicate the snake's age. The young snake at birth possesses the "button" seen at the end of a perfect series of rattles, and acquires a new "rattle" each time the skin is shed. Shedding may occur one, two, three or even four times in a year. The "rattles" are the only portion of the snake's skin that is not shed.

about 4 or 5 inches. The body is rather flat and somewhat too heavy for its length.

*Color.*—Rattlesnakes vary in color from rusty brown to light yellow. The diamonds or bands are darker and are well defined. The under side of the body may be splotted with yellow or brown markings. Copperheads are of a rusty brown or copper color. If shady places have been frequented the skin is bright and smooth with a light copper color; when sunburnt it appears rough and rusty. Like the rattlesnakes, copperheads are marked with "diamonds" along the upper side of the body. These diamonds may be lighter or they may be darker than other parts of the skin. They diminish in size toward the rear and finally disappear altogether, leaving the extreme tail tip a solid color and usually lighter than the rest of the skin. They also diminish in size toward the head but do not disappear entirely. The head is smooth and light brown and has a pronounced triangular shape.

Moccasins are also marked with the "diamonds." The general color is light or dark brown, depending upon whether or not the skin is sunburnt. The scales are large and widely separated so that when they are slightly displaced the white skin shows through between them.

*Habits.*—The general opinion that a rattlesnake always warns his victim by "rattling" is erroneous.<sup>1</sup> The rule is general but by no means invariable and can not be depended upon to indicate the snake's presence in all instances.

These snakes frequent clumps of bushes or grass and sage, may be found coiled under cacti or in rough cliffs or stone heaps, and frequently appear coiled or stretched at full length on the warm sand in full sunlight. They are by no means timid but are seldom the aggressor.

Copperheads are distinctively Southern, although they appear in some of the Northern States, and will be found about barns, granaries and other outbuildings infested by rats, mice,

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<sup>1</sup> A diamond-back rattlesnake in southern Arkansas was pushed with a pole from the shadows of a bush into sunlight for its photograph and could not be induced to "rattle"; a prairie rattlesnake in South Dakota was carried for a distance of more than a mile entwined in a plum bush and never "rattled"; and in Arizona a dog-faced rattlesnake, coiled under a cactus, could not be induced to "rattle" even though it was dragged out and stoned to death.

and lizards. They may also be found under dwellings or about wells and springs where toads and frogs appear. At other places they may appear under clumps of brush or grass where they lie in wait for prey, or they may be found stretched out full length on a flat, warm rock in the sunshine. Frequently they are found in groups of from two to a dozen individuals. By nature they are pugnacious and vicious fighters and seldom attempt to escape when attacked. They are stealthy, move silently, and never appear in a hurry unless in an offensive or defensive attitude when they strike quickly, accurately, and repeatedly.

Moccasins, which on account of the soft white, cottonlike appearance of the lining of their mouths are frequently known as "cotton-mouths," inhabit lagoons, bayous, pools, and streams of running water. They also appear in swamps and drainage ditches or along water-filled ditches beside roads and trails. They are of a timid nature and will escape from danger when this is possible but fight with vigor when forced to defend themselves. Their strength and great size render them formidable opponents.

### LOCATION OF CAMP SITES

**Water.**—The one thing of most importance in locating a camp site is a supply of water. This is absolutely essential except at temporary camps where a supply of water is provided in barrels or canteens.

When camps are to be more or less permanent in nature they should be located at a point far enough away from and above the source of water supply to prevent its contamination by contact with camp refuse if this is allowed to accumulate. It should, however, either be burned or buried.

**Fuel.**—This is the next important item to consider. Ordinarily, where camps are established in wooded regions, there will be found sufficient dead and down material to provide for all fuel needed either for heating or cooking purposes. But if no wood is available and a camp is to be made in open country, dry stock manure will prove an excellent substitute.

**Accessibility.**—This also demands close attention. If transportation of equipment and supplies is to be by means of wagons it is especially desirable to have the camp located at a point where the wagons may reach it without difficulty and where they may even have plenty of room in which to be backed or



turned about. The camp may be located in a much rougher place, however, if pack animals are to be used. In either event it should be so located as to provide easy access to whatever work is to be done.

**Protection.**—After the questions of water, fuel, and accessibility have been satisfactorily settled, the one of protection should next be considered. For example: Winter camps located on north slopes where little sunlight can penetrate through possibly heavy timber prove very dreary and uncomfortable. On the other hand, summer camps located on bare, exposed south slopes are equally uncomfortable.

When camps must be established in country where stock grazes at large it is always advisable to construct some sort of fence about the tents or other equipment.

**Camp Fires.**—*Location.*—The average novice, when he builds his first camp fire, does so with absolute disregard of the wind's direction and velocity, the nature of the fuel he must use, and the amount of fuel he may have at his disposal. The fire should be located at a point far enough and in a direction from the camp to prevent embers or smoke from blowing into the tents or bedding. If the fire is to be cooked over, however, it should not be so far away from the dining tent that valuable time may be lost in going to and from it.

*Building the Fire.*—Small, dry fuel should be placed directly on the ground and covered with the coarser fuel, the latter being prevented from smothering the blaze by the support of stones or logs placed beside the spot selected for the fire. Green logs are preferable for this use and should be laid parallel with each other, one on either side of the fire; placed in this position they not only serve as a means of support for the fuel but they also act as walls for the confinement of the live coals.

Camp fires should never, in any instance, be built against the trunks of large trees or against large logs that will not be completely consumed by the time camp is to be moved. Neither should they be built in the midst of inflammable material until a wide area has been swept off quite clean.

*Fuel Woods.*—Dry wood will be found preferable to green wood if a quick, hot fire is desired either for heating or cooking. Dry heartwood of any of the pines makes good kindling but is not satisfactory when used exclusively in camp fires or camp stoves; the deposits made by the smoke soon clog a stovepipe,

and this demands frequent attention in the matter of opening the pipe.

Dead aspen (*Populus tremuloides*), or any of the oaks, hickories, or junipers, will be found very good for stove wood, as will also mesquit, chaparral, dry manzanita and greasewood. Dry juniper is not a satisfactory fuel for open camp fires; the constant snapping and cracking frequently throw live coals to a considerable distance and these may fall on the tents, bedding, or other inflammable equipment.

After a deep bed of live coals has been secured, any of the oaks will prove very satisfactory for extended heating purposes. The coals of such a fire may be well covered with ashes at night and enough of them kept alive to supply considerable heat the next morning.

*Care of the Fire.*—Regulations concerning camp fires in the National Forests are particularly stringent and good care must be taken to see that a general conflagration does not result from a camp fire. When camp is moved, the fire should be completely covered with dirt in order to prevent the escape of any flames or live coals. If water is available, it should be used freely and the coals thoroughly drenched, but in any case covering with dirt is advisable.

**Six Rules for Prevention of Fires in the Mountains.**—The following six rules for prevention of fires are quoted from page 22, U. B., 1915:

1. *Matches.*—Be sure your match is out. Break it in two before you throw it away.
2. *Tobacco.*—Throw pipe ashes and cigar or cigarette stumps in the dust of the road and stamp or pinch out the fire before leaving them. Don't throw them into brush, leaves, or needles.
3. *Making Camp.*—Build a small camp fire. Build it in the open, not against a tree or log, or near brush. Scrape away the trash from all around it.
4. *Leaving Camp.*—Never leave a camp fire, even for a short time, without quenching it with water or earth.
5. *Bonfires.*—Never build bonfires in windy weather or where there is the slightest danger of their escaping from control. Don't make them larger than you need.
6. *Fighting Fires.*—If you find a fire, try to put it out. If you can't, get word of it to the nearest United States forest

ranger or State fire warden at once. Keep in touch with the rangers.

**Protection of the Public Health.**—Unfortunately there appears to be a tendency on the part of a certain class of thoughtless campers to pay little or no attention to sanitary precautions in their own camps or to the welfare of the local residents among whom they may be temporarily located. Forest officers, however, have definite instructions to see that sanitary measures are adopted by the camping public, as will be seen in the following regulation appearing on page 29, U. B., 1915:

REG. P-4. The following acts are prohibited: Having or leaving in an exposed or insanitary condition on National Forest lands camp refuse or débris of any description, or depositing on National Forest lands or being or going thereon and depositing in the streams, lakes, or other waters within or bordering upon the National Forests any substance or substances which pollute or are liable to cause pollution of the said streams, lakes, or waters.

In explanation of this regulation "The Use Book" goes on to say:

"Every precaution will be taken by forest officers to protect the public health. All persons on National Forest lands are liable to trespass proceedings if insanitary conditions result from their presence. The main danger to be guarded against is that of typhoid fever, resulting from toilet accommodations which drain to waters used for domestic purposes, and from the exposure of refuse of all kinds to flies. In large or permanent camps latrines must be dug in suitable locations remote from the water, and disinfectants should be used freely. All camp refuse must be disposed of, either by burying or burning. In small temporary camps suitable precautions should be observed, and refuse of all kinds must be kept well away from the water. The carcasses of all dead animals when they are a menace to public health should be buried or burned. . . ."

"Forest officers will enforce compliance with Regulation P-4 on the part of all campers, stockmen, permittees, and other persons traveling through or occupying National Forest lands."

## CONFUSION OF DIRECTIONS

This presents about as unpleasant a problem for the field man as any he encounters, and since its occurrence is so frequent and so common to the beginner in the field service a few general suggestions may prove of value.

When they are obtainable the field man should secure reliable maps of the country in which he is to work. He should make a special study of the location of streams, mountain ranges,

roads, trails, settlements, mines, sawmills, and other features which may serve as guides by which he may travel. He may observe, for example, that the drainage of a particular locality is westward, that main lines of travel are along valleys or on the tops of ridges, that a prominent mountain top has a certain easily remembered location with reference to other and less prominent peaks, that north slopes may be steeper than south slopes, or vice versa, that certain villages or ranches are located at peculiar or unusual points, and he may, by close observation, notice numerous other pertinent facts that may be of great value to him at a time when they are especially necessary.

It seldom happens that maps of this sort are not available, but in event they can not be secured, then the field man must rely either upon the advice of local settlers or else upon his own ability to reach his destination. It should be remembered that the inability to travel directly through strange territory is not confined strictly to inexperienced travelers; veteran woodsmen occasionally "get lost" and sometimes have considerable trouble in ascertaining even their approximate location. In such cases, however, their confusion is due to carelessness and to only casual instead of close observation of their surroundings.

It is always well to take frequent "back sights" at the country gone over. This presents to the traveler views of certain landmarks as they will appear on his return trip, and as a result he will be able to retrace his former route with less difficulty.

Upon proper requisition the field man may secure a regulation Forest Service compass, and if he has one of these along he should consult it immediately upon discovering that he has been traveling in the wrong direction. On such occasions he will invariably have a feeling that the compass may possibly be out of order and that it is not working properly, complete faith in his own sense of direction may make him unwilling to be guided by a mechanical contrivance, and he will follow the compass directions with reluctance. At such times there should be no doubt as to the reliability of the compass. It is true, of course, that the instrument may have been damaged by careless handling, and that as a consequence it will fail to work properly, but this or a similar contingency is the only one in which the compass should be disregarded.

On days when the sun may be seen a common watch may be used as a means of determining the approximate direction in

which a person is traveling. The end of the hour-hand is pointed toward the sun; a line projected from the pivot on which the hands are hung over a point mid-way between the end of the hour-hand and the figure "12" will run approximately south.<sup>1</sup>

When "lost" at night the traveler may observe the stars, if these are visible, and ascertain his general direction of travel from them. A very prominent constellation is Ursa Major, or the Big Dipper, consisting of seven stars, each having an individual name and known from the end star in the handle successively as Benetnasch (a white sun), Mizar (white and emerald), Alioth (very bright), Megrez (yellow), Precda (yellow), Merak (greenish white), and Dubhe (yellow). Two of these, Merak and Dubhe, on the side of the dipper opposite the handle, are in line with the pole-star and are known as "pointers." The curved line marked by Alioth, Mizar, and Benetnasch points directly toward Arcturus. The pole-star forms the extremity of another constellation called Ursa Minor, or the Little Dipper, which also consists of seven stars. Another constellation in the immediate vicinity of these two consists of five stars of the third magnitude arranged somewhat in the shape of the letter M and called Cassiopeia. Further east are the Pleiades, six stars in number and all visible to the naked eye. Orion is the most prominent southern constellation, can best be studied during the winter months, and sets at the same time the constellation called the Scorpion rises. Another constellation, the Twins, appears in the region of the Pleiades. To the east of the Twins appears the Lion, consisting of three stars of the second magnitude and one of the first, others in the constellation not being easily discerned with the naked eye.

If neither the sun nor stars can be used in determining direction then the traveler must rely upon his general knowledge of the section in which he is located. It should be borne in mind that in sparsely settled localities the few settlements which do occur are found mostly along the watercourses which, consequently, should be followed rather than crossed. Ordinarily the first settler met with will be able to direct the traveler further.

Ascertaining directions by means of the moss on trees in localities where the timber-stand is dense is quite reliable, but

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<sup>1</sup> Applicable only in the Northern Hemisphere.

is never a safe guide in sections where a thin stand of timber allows air and sunlight to penetrate thoroughly.

Confusion of directions on a prairie, where it is much more likely to occur than in timber, may be removed by careful attention to the manner in which the grass stems lean; prevalent southwest winds will eventually cause them to lean to the northeast.

In Colorado, New Mexico, and Arizona, the Occident ant (*Pogonomyrmex occidentalis*) throws up a mound of coarse sand and fine gravel and in nearly every instance leaves an opening at the southeast side, presumably in order that the early morning sun may warm the runway sooner. Careful observation of a group of these mounds will assist the traveler in getting his bearings. In the same localities the Thatching ant (*Formica rubiginosa*) covers its mounds with pine needles, straws, grass stems, and small twigs, and also generally leaves an opening at the southeast side. This rule is not followed as closely, however, as in the case of the Occident ant.

Quite naturally, the realization that he is lost in strange territory confuses the average traveler, and this confusion may extend to and so affect his judgment that he may run wildly about in a frantic attempt to locate some known landmark and thus extricate himself from his dilemma. Under such conditions he may strike a road or trail that he has been over, but in his confusion is unable to recognize it, and he continues to wander about until physical exhaustion overcomes him.

Such excitement is, of course, wholly uncalled for. If night overtakes him he should make no attempt to proceed further, but should make the best of matters and wait for daylight; this may seem like a waste of time, but, on the contrary, it is the best means of saving time.

If he is accompanied by another person who is familiar with the country being traveled over he should not question that person's judgment even though it may seem that a contrary direction is being followed.

## FASTENINGS

**Knots.**—The field man who must be continually packing, saddling, tethering animals, raising and lowering articles by means of ropes, or using ropes in a number of other ways should be

more or less familiar with those knots for which he may have the greatest use. Ordinarily, he need not have a general knowledge of all knots but he should possess a working knowledge of most of the simpler ones, and for that reason these are illustrated and discussed here.

In order to simplify the subject as much as possible, it will be considered as including knots, nooses, hitches, latigo ties, and splices. Technical terms will be avoided in so far as this may be practicable.

It is suggested that if the beginner wishes to practice the construction of the various knots by endeavoring to tie them as he refers to the illustrations, he provide himself with a 6-foot length of  $\frac{1}{4}$ -inch braided cotton line. This will not twist or tangle as badly as twisted line. However, the latter must be used while splices are being studied. If knots or ties are to be made in leather he should secure a very pliant piece with which to experiment.

*Overhand.*—This is the simplest knot tied and its construction needs no explanation. It is used at the ends of ropes to prevent the strands from untwisting, may be used as a means of marking spaces along a line, or may serve as a check-knot for loops of lines working on others.

*Surgical.*—This is used chiefly by surgeons in securing severed artery ends and for other purposes where small knots that will not slip are required. It is constructed the same as the overhand except that one end is given an extra turn about the other. It may be released by pulling either end in a direction at right angles to the series of turns.

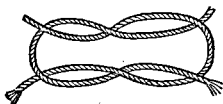
*Staffordshire or Tail.*—The term "Tait's" knot is taken from the name of the surgeon who first employed it. In construction it is the same as the surgical knot except that a round turn is taken before the latter is tied. It is also loosened the same as the surgical knot.

*Square or Reef.*—This is another common knot used chiefly in fastening loose ends together. Its construction is so simple as to require no explanation.

*Combined Surgical and Reef.*—The chief advantage of this knot over the plain surgical knot is the method by which the ends are made fast and which prevents them from slipping. It is opened by pulling the loose ends in a direction at right angles to the reef.



Overhand.



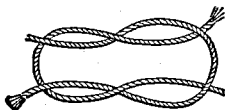
Granny.



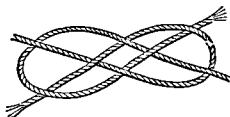
Sheep-shank.



Surgical.



Thief.



Carrick bend.



Staffordshire  
or "Tait's."



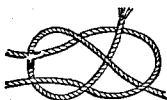
Figure 8.



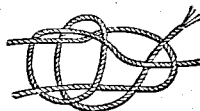
Double overhand.



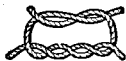
Square or reef.



Single sheet bend.



Double sheet bend.



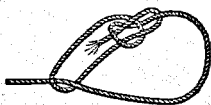
Combined  
surgical and reef.



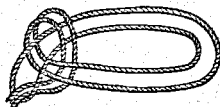
Bowline.



Overhand  
and half hitch.



Running bowline.



Bowline on a bight.



*Granny.*—At first glance this appears to be identical in construction with the square or reef, but close observation will reveal the fact that in the latter the ends leave the other loop from the same side on which they entered it, while in the granny they leave from the opposite side.

*Thief.*—This also appears to be the same as the square and granny knots. However, it will be observed to differ from the first in having one loose end at the top and the other at the bottom. It differs from the second in that the ends enter and leave the knot at the same side.

*Figure 8.*—This knot is used chiefly for ornamental purposes, being frequently tied in the braid of official caps and uniforms. For practical purposes it is no better than the overhand.

*Single Sheet Bend.*—In making this the loop is the first part to be formed. The loose end is then passed through it, around the neck, and back between the loop and itself. The knot will not slip if properly constructed and is a very reliable method of tying animals by the neck. When used for this purpose the loop is constructed far enough back from the end of the rope to allow the latter to reach around the animal's neck and fasten into the loop. Its chief disadvantage for such use is that it may be drawn so tight that it can be opened only by cutting the rope. However, this trouble may be avoided if the loose end is tied in a draw loop.

*Double Sheet Bend.*—The construction of this knot is the same as that of the single sheet bend except that the loose end encircles the loop twice instead of once, passing beneath itself both times.

*Bowline.*—This is usually pronounced "bolan." Like the single sheet bend it can not slip if properly constructed. The loose end is passed through a half hitch in the long end from the under side, crosses under the long end, and doubles back over itself and through the half hitch from the upper side.

*Running Bowline.*—This is constructed the same as a bowline except that a larger noose is provided for. The bowline may be tied about the long end of the line or, if the latter is loose, it may be passed through the bowline. The running bowline is used where nooses must be opened and closed quickly and easily.

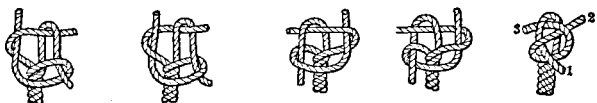
*Bowline on a Bight.*—The construction of this is slightly different from the other bowlines shown. Owing to the use of a

double line throughout the knot it is much more easily tied. If properly constructed the loop will not close up.

*Sheep-shank.*—The chief use of this knot is in taking up slack in a line. Its regular construction is rather too complicated to explain here, but a simpler and just as effective method is merely to turn the half hitches about the loops.

*Carrick Bend.*—Like the figure 8 this is used chiefly for ornamental purposes though it may be used in tying lines together. It will not slip if tightened evenly.

*Turk's Head.*—This knot is frequently used at the ends of lines to prevent the strands from untwisting. Four incorrect



Incorrect starts.

Correct start.

FIG. 225.—Turk's head.

methods of starting it are shown. The fifth illustration shows the correct method. After the strands have been made fast under each other as shown here, the ends are disposed of as follows: No. 1 passes around outside of 3, upward between itself and 3, and out through the triangle formed by 1, 2, and 3; 2 passes around outside of 1, upward between itself and 1, and out through the triangle; 3 passes around outside of 2, upward between itself and 2, and out through the triangle. After the knot has been drawn tight the loose ends should be cut away close to it. Turk's heads are tied in lines of more than three strands by following the same method of procedure.

*Overhand and Half Hitch.*—The chief advantage of this knot lies in the ease with which it may be finished after the first part has been tied and while there is great draft on the lines. After the overhand has been tied a half hitch in one end is taken about a loop in the other. It may be completely released by pulling the loop backward through the half hitch. It is especially adapted to fastening down a grain pack.

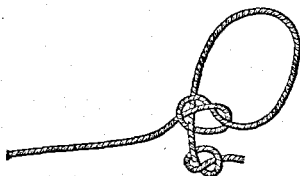
*Double Overhand.*—This may be tied in rope but is especially suitable for tying leather and is frequently used at the end of a pair of reins. The two loops are first formed, the short end of the one to the left being toward the operator, and that of the the one to the right in the opposite direction. The end of the

first is then passed to the right around the second and forward through the loop formed by itself. The end of the second is passed to the left around the first and out rearward through its own loop.

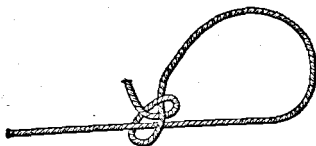
**Nooses.**—*Hangman's Noose.*—This noose derives its name from the fact that it is frequently used in the execution of criminals. When used for this purpose the knot, usually consisting of nine turns, is placed at the left side of the neck against the ear. Being quite stiff it suddenly forces the head to the right at the moment the weight of the body comes against the noose



Hangman's.



Halter.



Slip.

FIG. 226.—Nooses.

and two or more of the neck joints are separated. When properly constructed it also closes quickly and becomes tighter as the weight remains suspended from it. It is also a favorite method used by horseman in disposing of long dangling ends of saddle-strings or in fastening up halter-ropes that will not be used for some time.

The turns begin at the noose after the long inner loop has been laid along the other side of the noose. The end is secured by being passed through the end of the inner loop. If it is to be constructed in such a manner as to remain open an overhand knot must be tied at either side immediately before the first turn.

*Halter Noose.*—This noose is made by passing the loose end of a rope through an overhand knot tied at a point far enough from the end to allow the noose to encircle an animal's neck. The end is also tied in an overhand knot which prevents it from pulling through the first one. The noose can not be closed by

draft on the long end of the rope, but the knots may be drawn so tight that it will be necessary to cut the rope before the noose can be opened.

*Slip Noose.*—For use where it must close by draft this noose is quite reliable. However, a very stiff rope can hardly be tied so the overhand will not open when the draft is applied. This trouble may be remedied by giving the loose end a half-hitch about itself just to the rear of the overhand.

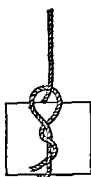
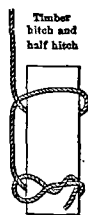
*Hitches.*—*Half Hitch.*—Practically all of the more complicated knots include some use of the half-hitch or its more elab-



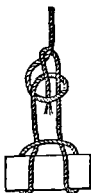
Clove hitch.



Clove and a half.



Timber hitch



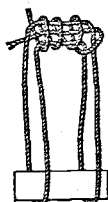
Sling



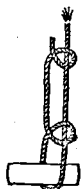
Rolling hitch



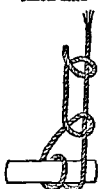
Blackwall hitch



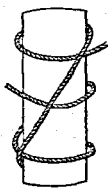
Cats paw



2 half hitches

Round turn  
and 2 half  
hitches

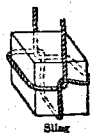
Anchor hitch



Mooring hitch



Telephone hitch



Sling

FIG. 227.—Hitches.

orate formation as a clove hitch. In constructing it, the line is grasped in both hands held with the palms downward, the thumbs toward each other. The left palm is then turned upward and the tips of the thumbs are brought together. The left thumb may be raised from the line and lowered on the

length which crosses just before it. In this way the hitch may be held with the left hand while the right is used otherwise, as may be required.

*Clove Hitch.*—Like the preceding hitch this one plays an important part in the construction of a number of the more complicated hitches. It will not slip when properly constructed and is therefore especially convenient in fastening tent ropes and in making ropes fast otherwise. It is constructed of two half hitches, one in either hand, the inner edge of the one to the right being passed under the corresponding edge of the one at the left and across to the opposite side. This permits the hitches to coincide, and the clove may then be dropped down over the tent-peg or other object to which the rope is to be tied.

*Clove and a Half.*—This is used for the same purposes as the clove and is constructed in a similar manner except that one more half hitch is included.

*Timber Hitch.*—This is made simply by taking a half hitch about the long end of a line and fastening the loose end by passing it over, around, and under the rope to the rear of the half hitch so it rests against the article about which the timber hitch is taken. It is used as a means of raising logs, timbers, or similar articles, or may be used in securing them to others. It is prevented from slipping by the pressure of the rope against the loose end passed under it, and can be easily loosened by releasing the draft on the long end. This allows the half hitch to be slipped backward and relieves it of its own pressure.

*Timber and Half Hitch.*—The most common use of this tie is in raising vertical timbers. The timber hitch not only provides greater binding capacity but also fastens the end of the half hitch. To release it, slack the long end of the line. This allows the timber hitch to be removed and the half hitch can then be taken off.

*Overhand Sling.*—This is for use in raising boxes, barrels, and similar articles. It consists of an overhand knot passed about the article to be raised, one length of the knot passing under it and the other two about the sides. Removal of the draft releases it.

*Bowline Sling.*—This may be used for the same purposes as the overhand sling and is especially adapted to raising articles that are not to be turned or rolled. Two half hitches are taken about the article and the loose ends are tied together in a bow-

line. Where great weight is likely to pull the bowline tight it should be tied with a draw loop. To release the sling, loosen the bowline.

*Rolling Hitch.*—This consists of a clove hitch with the ends passed under a turn taken between the two sides of the clove. To release it loosen one end. This opens the turn and permits the other end to be removed.

*Mooring Hitch.*—As its name indicates this hitch is used in mooring vessels to wharves. At first glance it may appear to be the same as the rolling hitch. However, its construction differs in having one side of the clove bound by the turn twice instead of once as in the rolling hitch. To release it loosen the side of the clove that is bound only once. This opens the clove and removes the pressure from both places on the other side.

*Two Half Hitches.*—This consists merely of a clove hitch taken about the long end of a line. If there is reason to believe it may be drawn so tightly as to be released only with difficulty the second half hitch should be made with a draw loop. If the article to which it is tied is very smooth or if it tapers considerably the loop may slip along.

*Round Turn and Two Half Hitches.*—The construction of this is similar to that of two half hitches except that the line is given a turn about the object to be tied. Its advantage over the two half hitches lies in the fact that the turn prevents the hitch from slipping unless an article has a very great amount of taper. It is released by removal of the second half hitch.

*Anchor Hitch.*—This is constructed the same as the preceding hitch, except that after the loose end has been passed about the line it is then passed through the turn before the second half hitch is taken about the line. To release it remove the second half hitch and pull the line downward as if starting a second turn. This loosens the turn already taken and permits the loose end to be drawn backward through it.

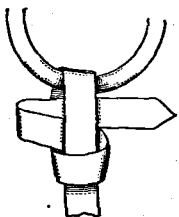
*Telephone Hitch.*—This is for use in dragging poles or timbers lengthwise. It is constructed by passing the ends of a doubled line about the timber from opposite directions and tying the ends together in an overhand knot. To release it pull the overhand backward and open it.

*Cat's Paw.*—Two lines may be used in this hitch. One is given a round turn about an object and the ends are then tied

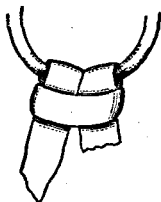
together. The other is passed through the turn a number of times and made fast by passing the loose end through the turn about itself. To release it remove the draft and withdraw the loose end.

*Blackwall Hitch.*—This hitch is used in fastening a line into a hook and consists merely of a half hitch taken about the hook shank, the line crossing itself in the bend of the hook. Removal of the draft will release it.

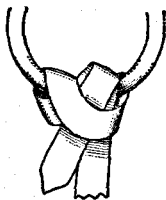
*Latigo Ties.*—*Overhand.*—This tie is shown in Fig. 228. It is very simple in construction, is easily applied, and is a widely used



Overhand.



Double half hitch.



Clove.

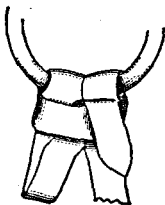
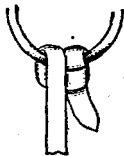
Double half hitch  
with draw loop.Modification of  
double half hitch.

FIG. 228.—Latigo ties.

method of securing a latigo to the saddle ring. Its release is facilitated if a draw loop is used.

*Double Half Hitch.*—This is probably the most widely used of all latigo ties. It consists of two half hitches being taken through the saddle ring and, unless the latigo leather is unusually hard and stiff, will seldom or never slip. Like the overhand it may be removed with less difficulty if the draw loop is used.

*Clove Hitch.*—This tie is used about as often as the overhand

but, unless the latigo leather is very soft and pliant, will sometimes slip and allow the cinch to work loose. It should also be tied with a draw loop.

**Splices.**—Splices in rope may be either permanent or temporary. They may be supplied for the purpose of fastening two ropes together or they may be used to form eyes through which other ropes or eyes are passed.

1. *Permanent Splices.*—A general method of making permanent splices is shown in Fig. 229. To do this the strands of each rope end are untwisted and if the splice is to work through tackle blocks a portion of each strand may have to be cut away

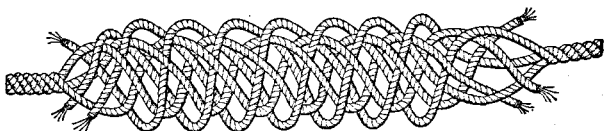


FIG. 229.—Permanent eye splice.

in order to reduce the diameter of the splice. A splice 8 inches long is sufficient for  $\frac{1}{2}$ -inch rope. Larger rope should have proportionately longer splices.

The actual work of splicing begins after each strand of one rope has been passed through between two strands of the other and the tightly twisted portions of each have been brought close together.

One strand of the solid rope is raised each time and a strand of the untwisted rope is passed beneath it, the rear strand always being brought up first and drawn tight. The splice should terminate with a loose end projecting from each of the rope's three sides. These are cut off close to the rope and the splice is then rolled smooth and even.

The entire process will require considerable practice before it can be successfully followed, but a careful study of Fig. 229 should prove of material assistance to the beginner.

2. *Temporary Splices.*—These are used where spliced ropes must be taken apart frequently and may be made in a number of different ways. The chief temporary splices used are as follows:

*Hawser Bend.*—This consists of a loop in the end of one rope passed through a second loop in the other. The loose ends are



given a half hitch about and lashed to the respective ropes as shown in Fig. 230.

*Clove and Overhand Splice.*—This is also illustrated in the same figure with the hawser bend.

It consists of a clove hitch slipped over the end of another rope bearing an overhand knot at its end.

*Toggle Splice.*—Fig. 230 also shows how this splice is constructed. A toggle pin or stick is fastened into the end of one



Hawser bend.



Clove and overhand.



Toggle.



Double eye  
splice.



Leather splice.

FIG. 230.—Splices.

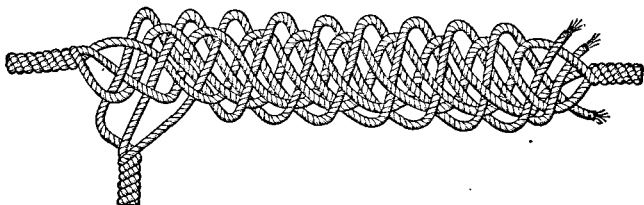
rope and is passed through an eye splice in the other. The eye splice should be only long enough to permit the toggle pin to pass through beside the rope which carries it.

*Double Eye Splice.*—Ropes fastened together by means of this splice are each equipped with an eye as shown in Fig. 230. Such a splice is released by bending the rounded ends of the eyes toward each other.

*Leather Splice.*—Leather straps to be spliced together are both slit at one end. Each strap is then passed through the slit in the other, as shown in Fig. 230, and drawn tight.

*Eye Splices.*—A very common but improper method of starting an eye splice is shown in Fig. 231. By following such a method the strands of the loose end all start into the splice along one side of the rope. This leaves a very unsatisfactory connection that does not fit closely into the splice. The proper method of starting the splice is also shown in Fig. 231, where the three strands each enter the splice at different sides. This may leave one strand rather higher than the others at the end of the splice but the eye is substantially made and is generally satisfactory. After the strands have been started they are passed through between the others the same as in splicing two

ropes together. The same method is also followed when one rope is to be spliced into the side of another. Except in the matter of keeping up the extra strands ropes having more than



Incorrect method of starting an eye splice.



Correct method.

FIG. 231.

three strands are spliced the same as those having only three. Temporary eye splices may be made the same as the hawser bend. This same splice is frequently used in wire cables.

**Flat Ends in Leather.**—This method of fastening the ends of leather strands is employed chiefly in reatas and similar leather articles and presents a flat, compact end that does not carry a large, inconvenient knot. As the illustration shows, the lower strand of the series is split each time, remaining strands, regard-



FIG. 232.—Flat end for leather strands.

less of their number, are passed through it, after which each in its turn is split in a similar manner as it reaches the bottom of the series. Finally, at the extreme end in a series of four strands,

only the second and third strands from the top are passed through the bottom strand, thus permitting two strands to emerge from each side of the flat end. If six or eight strands are used then three or four strands, respectively, are passed through the slit.

Or, as is often done, all the remaining strands may be passed through the slit and the flat end will still be left flat and compact.

## FIELD WORK IN THE PHILIPPINE ISLANDS <sup>1</sup>

Field work in the Philippine Islands demands different equipment than that required in the United States. This is due to a number of facts, chief among which are: (1) The climate is warmer and damper; (2) traveling through the forests is done on foot rather than by horse; (3) men instead of animals are employed in packing; (4) there is no lack of laborers; (5) the days are about twelve hours long the year round.

Rains occur almost daily between June and December, but as a rule continue only a short time and generally occur after noon. During this season, however, typhoons, or hard rains with severe winds lasting from three to seven days may be expected. Extreme heat generally prevails throughout May. The chief trouble experienced during the rainy season is keeping equipment and supplies in good condition and preventing them from becoming moldy.

A light tarpaulin may be carried, but is not absolutely necessary, as the native woodsmen possess a skill in erecting shelters of rattan or *bejuco* leaves which renders them almost rain-proof. These shelters may be constructed in a very few minutes.

Clothing should consist of strong but light trousers, light underwear, and a medium weight woolen shirt such as is used in the army. Even on short trips the equipment should include one or two extra suits of underwear, as the climate induces considerable perspiration and the traveler may become chilly late in the evening unless dry underwear is available. Several pairs of medium weight woolen socks should also be included in the outfit and it is always well to carry an extra pair of shoes, preferably of canvas with substantial leather soles. Rubber boots or shoes are to be avoided on account of the warm climate. Hats should be of the wide-brimmed felt variety and as light as possible.

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<sup>1</sup> Contributed by Forest Ranger Wayne Russell.

A woolen blanket on an ordinary army cot is sufficient for bedding, but the entire bed should be covered with a good mosquito bar. Very few poisonous snakes are encountered. Leeches are found in most localities and in general appearance resemble those of the States, but they inhabit wet grass instead of stagnant pools. They seldom appear in the lower altitudes during the dry seasons, but may be found as low as 500 feet above sea-level during the rainy season. The natives of the Province of Tayabas, which is the worst infected district, carry soap or grease with them on extended trips and rub this on the leeches if any attach themselves to the travelers' legs or feet. This causes them to drop off. Persons wearing shoes and leggings are seldom troubled with this pest.

Deer and wild hogs are numerous and several varieties of wild doves provide excellent fresh meat. Chickens and eggs may be procured at most villages. The former are transported alive by the native packers, are "staked out" at night by being tied to a stake or bush, and are killed and dressed as required.

A fern called *paco* and a rattan blossom known as *palasan* may be found in most sections, and both are edible. Very little of the wild fruit is fit to eat. Tame fruit, such as pineapples and bananas, should not be eaten at a time when great hunger is experienced, or cramps or other internal disorders will invariably result. Wild honey occurs in abundance, but is found suspended from a large branch or tree-trunk rather than in hollow limbs and trunks.

Rice and dried fish constitute the principal foods, and after the traveler once becomes accustomed to the native method of preparation these prove quite palatable to him. All foods should be eaten while warm and the use of canned foods should be avoided whenever this is possible.

Few cooking utensils are necessary, since the native packers can soon produce cups, saucers, plates, dippers, and other similar articles from a bamboo called *cana bojo*. Rice and such foods are prepared in earthen jars. The traveler may, if he prefers, carry a limited number of dishes for his own use, but the packers prefer to eat from leaves. Coffee may be prepared by pouring boiling water into a flannel sack partly filled with ground coffee. Bad water will be found quite frequently, and for that reason a canteen of good drinking water should always be carried.

Cigarettes should be carried for the packers and they are always willing to have their pay reduced accordingly.

Quinine and disinfectants should always be carried in the pack, as should also a good cramp remedy. A few bandages might also be included, but beyond this little else is required in the way of medicinal equipment.

The packers work singly or in pairs and the pack is suspended from a pole known as a *pingon*, which rests on the packers' shoulders as the pack is carried between them. Packs for one man may weigh from twenty-five to forty pounds; for two men from one hundred to one hundred and twenty-five pounds. Guides, or *guias*, expect to carry their own camp outfit.

The native packers have more respect for and are more deferential to travelers who require them to do all the work. They should be reprimanded only when this is absolutely imperative, and there should be no reference made to the matter later. Their attention and respect may be obtained only by firmness and dignity and no familiarity from them or the interpreter should be tolerated. Neither should implicit confidence be placed in the latter unless previous experience and acquaintance with him justify it.

# APPENDIX

## ADMINISTRATIVE DISTRICTS<sup>1</sup>

### U. S. Forest Service

District Number 1.—	Headquarters	Missoula, Montana
" 2.—	"	Denver, Colorado
" 3.—	"	Albuquerque, New Mexico
" 4.—	"	Ogden, Utah
" 5.—	"	San Francisco, California
" 6.—	"	Portland, Oregon
" 7.—	"	Washington, D. C.

## FOREST SUPERVISORS' HEADQUARTERS<sup>1</sup>

State	Dist. No.	Name of Forest	Supervisors' Headquarters
Alaska.....	6	Chugach.....	Ketchikan
	6	Tongass.....	Ketchikan
Arizona.....	3	Apache.....	Springerville
	3	Chiricahua....	Portal
	3	Coconino.....	Flagstaff
	3	Coronado.....	Tucson
	3	Crook.....	Safford
	4	Dixie.....	St. George, Utah
	3	Manzano.....	Albuquerque, New Mexico
	4	Kaibab.....	Kanab, Utah
	3	Prescott.....	Prescott
	3	Sitgreaves....	Snowflake
	3	Tonto.....	Roosevelt
	3	Tusayan.....	Williams
Arkansas.....	7	Arkansas.....	Hot Springs
	7	Ozark.....	Harrison
California....	5	Angeles.....	Los Angeles
	5	California.....	Willows
	5	Cleveland.....	Escondido
	6	Crater.....	Medford, Oregon
	5	Eldorado.....	Placerville

<sup>1</sup> Compiled from The Use Book, 1915.

FOREST SUPERVISORS' HEADQUARTERS (*Continued*)

State	Dist. No.	Name of Forest	Supervisors' Headquarters
California .....	5	Inyo .....	Bishop
	5	Klamath .....	Yreka
	5	Lassen .....	Red Bluff
	5	Modoc .....	Alturas
	5	Mono .....	Gardnerville, Nevada
	5	Monterey .....	Big Sur
	5	Plumas .....	Quincy
	5	Santa Barbara .....	Santa Barbara
	5	Sequoia .....	Hot Springs
	5	Shasta .....	Sisson
	5	Sierra .....	Northfork
	6	Siskiyou .....	Grant's Pass, Oregon
	5	Stanislaus .....	Sonora
	5	Tahoe .....	Nevada City
	5	Trinity .....	Weaverville
Colorado .....	2	Arapaho .....	Hot Sulphur Springs
	2	Battlement .....	Collbran
	2	Cochetopa .....	Saguache
	2	Colorado .....	Fort Collins
	2	Durango .....	Durango
	2	Gunnison .....	Gunnison
	2	Hayden .....	Encampment, Wyoming
	2	Holy Cross .....	Glenwood Springs
	4	La Sal .....	Moab, Utah
	2	Leadville .....	Leadville
	2	Montezuma .....	Mancos
	2	Pike .....	Denver
	2	Rio Grande .....	Monte Vista
	2	Routt .....	Steamboat Springs
	2	San Isabel .....	Westcliffe
	2	San Juan .....	Pagosa Springs
	2	Sopris .....	Aspen
	2	Uncompahgre .....	Delta
	2	White River .....	Meeker
Florida .....	7	Florida .....	Pensacola
Idaho .....	4	Boise .....	Boise
	4	Cache .....	Logan, Utah
	4	Caribou .....	Montpelier
	4	Challis .....	Challis
	1	Clearwater .....	Orofino
	1	Cœur d'Alene .....	Cœur d'Alene

## FOREST SUPERVISORS' HEADQUARTERS (Continued)

State	Dist. No.	Name of Forest	Supervisors' Headquarters
Idaho.....	4	Idaho.....	McCall
	1	Kaniksu.....	Newport, Washington
	4	Lemhi.....	Mackay
	4	Minidoka.....	Oakley
	1	Nezperce.....	Grangeville
	4	Palisade.....	St. Anthony
	4	Payette.....	Emmett
	1	Pend Oreille...	Sandpoint
	1	St. Joe.....	St. Maries
	4	Salmon.....	Salmon
	4	Sawtooth.....	Hailey
	1	Selway.....	Kooskia
	4	Targhee.....	St. Anthony
	4	Weiser.....	Weiser
Kansas.....	2	Kansas.....	Garden City
Michigan.....	2	Michigan.....	East Tawas
Minnesota....	2	Minnesota....	Cass Lake
	2	Superior.....	Ely
Montana.....	1	Absaroka.....	Livingston
	1	Beartooth.....	Billings
	1	Beaverhead...	Dillon
	1	Bitterroot.....	Missoula
	1	Blackfeet.....	Kalispell
	1	Cabinet.....	Thompson Falls
	1	Custer.....	Miles City
	1	Deerlodge.....	Anaconda
	1	Flathead.....	Kalispell
	1	Gallatin.....	Bozeman
	1	Helena.....	Helena
	1	Jefferson.....	Great Falls
	1	Kootenai.....	Libby
	1	Lewis & Clark	Chouteau
	1	Lolo.....	Missoula
	1	Madison.....	Sheridan
Nebraska.....	2	Nebraska.....	Halsey
	2	Nebraska.....	Halsey
Nevada.....	5	Eldorado.....	Placerville, California



## FOREST SUPERVISORS' HEADQUARTERS (Continued)

State	Dist. No.	Name of Forest	Supervisors' Headquarters
Nevada.....	4	Humboldt....	Gold Creek
	5	Inyo.....	Bishop, California
	5	Mono.....	Gardnerville
	4	Nevada.....	Ely
	4	Ruby.....	Deeth
	4	Santa Rosa...	Paradise
	5	Tahoe.....	Nevada City, California
	4	Toiyabe.....	Austin
New Mexico..	3	Alamo.....	Alamogordo
	3	Carson.....	Taos
	3	Chiricahua....	Portal, Arizona
	3	Datil.....	Magdalena
	3	Gila.....	Silver City
	3	Lincoln.....	Capitan
	3	Manzano.....	Albuquerque
North Dakota.	3	Santa Fe.....	Santa Fe
	1	Dakota.....	Camp Crook, South Dakota
Oklahoma....	7	Wichita.....	Cache
Oregon.....	6	Cascade.....	Eugene
	6	Crater.....	Medford
	6	Deschutes.....	Bend
	6	Fremont.....	Lakeview
	5	Klamath.....	Yreka, California
	6	Malheur.....	John Day
	6	Minam.....	Wallowa
	6	Ochoco.....	Prineville
	6	Oregon.....	Portland
	6	Santiam.....	Albany
	6	Siskiyou.....	Grant's Pass
	6	Siuslaw.....	Eugene
	6	Umatilla.....	Pendleton
	6	Umpqua.....	Roseburg
	6	Wallowa.....	Wallowa
	6	Wenaha.....	Walla Walla, Washington
	6	Whitman.....	Sumpter
Porto Rico....	7	Luquillo.....	
South Dakota	2	Black Hills....	Deadwood
	2	Harney.....	Custer
	1	Sioux.....	Camp Crook

## FOREST SUPERVISORS' HEADQUARTERS (Continued)

State	Dist. No.	Name of Forest	Supervisors' Headquarters
Utah.....	4	Ashley.....	Vernal
	4	Cache.....	Logan
	4	Dixie.....	St. George
	4	Fillmore.....	Richfield
	4	Fisklake.....	Salina
	4	La Sal.....	Moab
	4	Manti.....	Ephraim
	4	Minidoka.....	Oakley, Idaho
	4	Powell.....	Escalante
	4	Sevier.....	Panguitch
	4	Uinta.....	Provo
	4	Wasatch.....	Salt Lake City
Washington...	6	Chelan.....	Chelan
	6	Columbia.....	Portland, Oregon
	6	Colville.....	Republic
	1	Kaniksu.....	Newport
	6	Okanogan.....	Okanogan
	6	Olympic.....	Olympia
	6	Rainier.....	Tacoma
	6	Snoqualmie...	Seattle
	6	Washington...	Bellingham
	6	Wenaha.....	Walla Walla
Wyoming.....	6	Wenatchee....	Leavenworth
	4	Ashley.....	Vernal, Utah
	2	Bighorn.....	Sheridan
	2	Bonneville....	Lander
	2	Bridger.....	Pinedale
	4	Caribou.....	Montpelier, Idaho
	2	Hayden.....	Encampment
	2	Medicine Bow	Laramie
	4	Palisade.....	St. Anthony, Idaho
	2	Shoshone.....	Cody
	4	Targhee.....	St. Anthony, Idaho
	4	Teton.....	Jackson
	2	Washakie.....	Lander
	4	Wyoming.....	Afton

LANDS ACQUIRED UNDER THE WEEKS LAW<sup>1</sup>

State and Area	Headquarters
Georgia:	
Georgia area	Blue Ridge
Savannah (South)	Clayton
New Hampshire:	
White Mountain	Gorham
North Carolina:	
Mount Mitchell	Marion
Nantahala	Andrews
Pisgah	Asheville
Savannah (North)	Highlands
South Carolina:	
Savannah (South)	Clayton, Georgia
Tennessee:	
Cherokee	Etowah
Smoky Mountain	Townsend
Unaka	Johnson City
White Top (part)	Abingdon, Virginia
Virginia:	
Massanutten	Woodstock
Natural Bridge	Buena Vista
Potomac (part)	Woodstock
Shenandoah (part)	Harrisonburg
White Top (part)	Abingdon
West Virginia:	
Monongahela	Elkins
Potomac (part)	Woodstock, Virginia
Shenandoah (part)	Harrisonburg, Virginia

<sup>1</sup> Compiled from The Use Book, 1915.WEIGHTS  
AVOIRDUPOIS

Used in weighing practically all heavy articles.

27.34375	Grains	= 1 Dram	
16	Drams	= 1 Ounce	
16	Ounces	= 1 Pound	
14	Pounds	= 1 Stone	(An English measure of weight and used chiefly in reference to the weight of a person.)
100	Pounds	= 1 Hundredweight (Cwt.)	
20	Cwts.	= 1 Ton	
2240	Pounds	= 1 Long Ton	

NOTE.—1 pound Avoirdupois = 1.21528 pounds Apothecaries' or Troy weight.

## TROY

Used in weighing precious metals and stones.

3.2 Grains	= 1 Carat (K)
24 Grains	= 1 Pennyweight (Dwt)
20 Dwts	= 1 Ounce
12 Ounces	= 1 Pound

## APOTHECARIES'

Used in weighing medicines and drugs.

20 Grains	= 1 Scruple
3 Scruples	= 1 Dram
8 Drams	= 1 Ounce
12 Ounces	= 1 Pound

## MEASURES

## SURVEYORS'

Used in measuring lands.

## LINEAR

7.92 Inches	= 1 Link
100 Links	= 1 Chain (Gunter's)
80 Chains	= 1 Mile (Land)

## SQUARE

10 Sq. Chains	= 1 Acre (A)
640 Acres	= 1 Section

## LONG MEASURE

Used in measuring distances or lengths.

6 Points	= 1 Line
12 Lines	= 1 Inch
3 Inches	= 1 Palm
3 Palms	= 1 Span, or 9 Inches
4 Inches	= 1 Hand
3 Hands	= 1 Foot, or 12 Inches
3 Feet	= 1 Yard
2 Yards	= 1 Fathom
5½ Yards	= 1 Rod (Also known as "Perch" and "Pole.")
40 Rods	= 1 Furlong, or ¼-Mile, Land
320 Rods	= 1 Mile, Land, or 5,280 Feet
3 Miles	= 1 League

NOTE.—A Knot, or Nautical or Sea Mile, or a Geographical Mile = 6,080.27 Feet.

## SQUARE MEASURE

Used in measuring surfaces.

144 Sq. Inches	= 1 Sq. Foot
9 Sq. Feet	= 1 Sq. Yard
30.25 Sq. Yards	= 1 Sq. Rod
160 Sq. Rods	= 1 Acre (10 Sq. Chains)
640 Acres	= 1 Section

## CUBIC MEASURE

Used in measuring bodies having length, breadth and thickness.

1728 Cu. Inches	= 1 Cu. Foot
24.75 Cu. Feet	= 1 Perch, a measure of stone 16½ feet long, 1½ feet wide and 1 foot thick.
27 Cu. Feet	= 1 Cu. Yard, generally considered a reasonable load of sand or gravel for a two-horse team.
128 Cu. Feet	= 1 Cord, a measure of wood 8 feet long, 4 feet high and 4 feet wide.

## DRY MEASURE

Used in measuring vegetables, grain, etc.

2 Pints	= 1 Quart
8 Quarts	= 1 Peck, or 2 Gallons
4 Pecks	= 1 Bushel, or 2150.42 Cu. Inches per "struck" or "stricken" or leveled bushel. The "cone" of a "heaped" bushel is not less than 6 inches high and this measure = 1¼ struck bushels.

## LIQUID MEASURE

Used in measuring liquids.

4 Gills	= 1 Pint (Pt.)
2 Pints	= 1 Quart (Qt.)
4 Quarts	= 1 Gallon (Gal.)
32 Gallons	= 1 Barrel (Bbl.) (In most localities)
2 Barrels	= 1 Hogshead
2 Hogsheads	= 1 Butt or Pipe
2 Butts	= 1 Tun

## APOTHECARIES' OR WINE MEASURE

Used in measuring liquid medicines, wines, etc.

60 Minims (M)	= 1 Fluid Dram (f ʒ )
8 Drams	= 1 Fluid Ounce (f ʒ )
16 Ounces	= 1 Pint (O)
8 Pints	= 1 Gallon (Cong: Abbreviation for Congius)

## SPOON AND CUP MEASUREMENTS

This table gives only approximate amounts of medicines contained in teaspoons, tablespoons, and cups. It should be borne in mind that these articles may vary in size and that this table has reference only to those of average size. Liquids are measured in drops, minims, drams, and fluid ounces; powders are measured in grains, drams, and ounces.

1	Drop	= 1 Minim
60	Minims or Drops	= 1 Dram
1	Dram	= 1 Teaspoonful
4	Drams	= 1 Tablespoonful
1	Drop	= 1 Grain
60	Grains, Minims or Drops	= 1 Dram
8	Drams	= 1 Fluid Ounce
$\frac{1}{2}$	Fluid Ounce	= 1 Tablespoonful
16	Fluid Ounces	= 1 Pint
1	Pint	= 2 Cups

## WEIGHTS AND MEASURES OF GRAIN, HAY, SEED, AND VEGETABLES

Local conditions are often responsible for local acceptance of weights and measures of hay and grain that are not standard elsewhere. Thus, in Kansas and other portions of the middle West, where climatic conditions are more favorable to its production, corn is often measured "by the ear," 120 average size ears constituting a bushel. But in most parts of the South, where corn is generally of smaller ears or inferior quality, 125 and in some instances 130 ears are accepted as a bushel.

Eighty ears of selected corn constitute a bushel in the lower Missouri valley.

Two cubic feet of ear corn will make about one bushel when shelled.

Wheat is often "tested" and sold by "test." The standard bushel of wheat weighs 60 pounds, although a test may show that it weighs considerably more or less per 2150.42 cubic inches. The testing machine consists of a specially constructed scale which shows the weight of a given quantity, and the weight of a bushel of such grain is then determined from the figures thus secured.

Hay is sold by measure or weight. Loose hay varies in bulk, but when moderately well packed averages about 500 cubic

feet per ton. From 28 to 34 bales of alfalfa constitute a ton among buyers and sellers in the West, and from 30 to 33 bales of timothy or clover are considered a ton in nearly all parts of the South and Southeast, although in some sections of the South 16 bales of timothy or clover weigh a ton.

A bushel, as the term is used in the following table, contains 2150.42 cubic inches or approximately 1.24 cubic feet, and fills a cube approximately 12.91 inches in each dimension or a cylinder 8 inches deep and 18½ inches in diameter. It is unfortunate that the various States have not adopted a standard measure for different commodities, but this lack of uniformity is doubtless justified by difference in local conditions. The following table however will be found applicable to most sections:

Commodity	Pounds per Bushel
Alfalfa seed . . . . .	60
Barley, whole . . . . .	48
Beans, lima . . . . .	56
Beans, navy . . . . .	60
Beets . . . . .	55
Blue grass seed, Kentucky . . . . .	14
Brome grass seed . . . . .	14
Broom corn seed . . . . .	46
Buckwheat . . . . .	50-52
Canada field peas . . . . .	60
Cane seed . . . . .	50
Clover seed, all varieties . . . . .	60
Corn, field or Indian, ears . . . . .	70
Corn, field or Indian, shelled . . . . .	56
Corn, sweet . . . . .	46
Cow peas . . . . .	60
Emmer seed . . . . .	40
Flax seed . . . . .	56
Hemp seed . . . . .	44
Johnson grass seed . . . . .	25
Kaffir corn . . . . .	56
Meadow fescue seed . . . . .	24
Millet seed, common and German . . . . .	50
Millet seed, Hungarian . . . . .	48
Millet seed, Japanese . . . . .	35
Millet seed, Siberian . . . . .	50
Oat grass seed, tall . . . . .	14
Oats . . . . .	32
Onion sets, bottom . . . . .	32
Onion sets, top . . . . .	28
Orchard grass seed . . . . .	14
Peanuts . . . . .	22

Commodity	Pounds per Bushel
Peas, garden, wrinkled.....	56
Potatoes, Irish.....	60
Potatoes, sweet.....	50
Rape.....	60
Red top grass seed.....	14
Rye.....	56
Rye grass seed, Italian.....	24
Rye grass seed, perennial.....	24
Sheep fescue.....	14
Sorghum seed.....	45
Soy beans.....	60
Speltz.....	40
Sunflower seed, Russian.....	24
Timothy seed.....	45
Turnips.....	55
Vetch, hairy.....	60
Vetch, spring.....	60
Wheat.....	60

## PER CENT MEASUREMENT OF GRADES

The grade, or inclination, of roads, trails, and railroads is usually expressed in per cent and is determined by the relation of the perpendicular distance to the horizontal distance as shown in the accompanying illustration. It will be observed that although there is a definite relation between the degrees and the per cent of a grade, these are two separate quantities. A 20 per cent grade equals a vertical angle of approximately 11 degrees, but a vertical angle of 45 degrees, or a rise of 100 feet in a horizontal distance of 100 feet, which equals a 100 per cent grade, is not a perpendicular, as might at first be supposed. See page 354, Appendix.

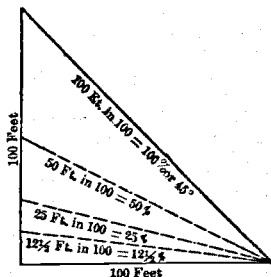


FIG. 233.—Per cent grade.

A very common and wholly inexcusable error often made by amateur road- or trail-builders is to assume that a 3 per cent grade, for instance, is a rise of 3 inches in a horizontal distance of 12 inches. Such a grade is of course a 25 per cent grade.



## MISCELLANEOUS WEIGHTS

Commodity	WEIGHT IN POUNDS	
	Average per M. Ft.	Average per Cu. Ft.
Ash (lumber) <sup>1</sup> .....	3,915	47
Brick, <sup>2</sup> soft .....	.....	100
Brick, hard .....	.....	125
Brick, pressed .....	.....	150
Cast iron .....	.....	450
Cast steel .....	.....	450
Cement, <sup>3</sup> natural .....	.....	85
Cement, Portland .....	.....	105
Charcoal, oak .....	.....	30
Charcoal, pine .....	.....	20
Coal, anthracite, loose .....	.....	52
Coal, bituminous, loose .....	.....	49
Coke, loose .....	.....	27
Dirt, loose, dry loam .....	.....	76
Dirt, packed, dry loam .....	.....	95
Dirt, loose, wet loam .....	.....	95
Dirt, packed, wet loam .....	.....	115
Feldspar .....	.....	165
Flint .....	.....	160
Gneiss, solid .....	.....	168
Gneiss, crushed .....	.....	95
Granite, solid .....	.....	170
Granite, crushed .....	.....	96
Gravel .....	.....	98
Hemlock (lumber) .....	2,100	25
Hickory (lumber) .....	4,425	54
Ice .....	.....	57
Lead .....	.....	710
Limestone, solid .....	.....	170
Limestone, crushed .....	.....	96
Maple (lumber) .....	3,350	50
Marble, solid .....	.....	170
Marble, crushed .....	.....	96
Oak (lumber) black .....	2,600	37
Oak (lumber) live .....	4,500	59
Oak (lumber) red .....	2,600	37
Oak (lumber) white .....	3,500	48
Peat .....	.....	25
Pine (lumber) white yellow .....	2,500	36
Pine (lumber) white .....	2,000	25

MISCELLANEOUS WEIGHTS (*Continued*)

Commodity	WEIGHT IN POUNDS	
	Average per M. Ft.	Average per Cu. Ft.
Quartz, solid.....	....	165
Quartz, crushed.....	....	94
Quicklime <sup>4</sup> .....	....	53
Salt.....	....	60
Sand, dry quartz.....	....	98
Sandstone, solid.....	....	151
Sandstone, crushed.....	....	86
Slate.....	....	75
Snow, fresh dry.....	....	8
Snow, wet.....	....	22
Soapstone.....	....	170
Spruce (lumber).....	2,100	25
Steel.....	....	490
Sycamore (lumber).....	3,000	37
Tar.....	....	62
Tin.....	....	459
Trap, solid.....	....	187
Trap, crushed.....	....	105
Turf.....	....	25
Walnut, black (lumber).....	3,175	38
Water, fresh.....	....	62 $\frac{1}{2}$
Water, salt.....	....	64 $\frac{1}{4}$

<sup>1</sup> Figures referring to weights of lumber apply only to well-seasoned material which is perfectly dry. To secure approximate weights of green lumber add from  $\frac{1}{5}$  to  $\frac{1}{2}$  the weight of dry lumber, according to the degree of seasoning. The prevalent idea that 1,000 board feet must weigh the same as a solid body of 83  $\frac{1}{2}$  cubic feet of lumber is erroneous by reason of the loss in sawing, nearly all lumber being cut from  $\frac{1}{8}$ - to  $\frac{1}{4}$ -inch scant, but measured full. Crushed stone weighs less per cubic foot than solid stone, the decrease in weight being due to the numerous voids between the fragments. Sand consisting of coarse and fine grains weighs more per cubic foot than when the grains are more nearly uniform in size; the finer grains fill the voids between the larger grains, and thus tend to form a more compact mass. The weight of salt and ice depends upon the porosity and the amount of foreign material present. Salt water outweighs fresh water in proportion to the amount of salt held in solution.

<sup>2</sup> 22 bricks, with mortar, in a cubic foot of masonry. Standard brick, 2 x 4 x 8 inches, scant.

<sup>3</sup> Natural cement, 300, and Portland, 380 pounds per barrel.

<sup>4</sup> 66 Pounds per bushel.

## RELATION OF DEGREES AND PER CENT

All road, trail, or railroad surveys of grades are expressed in per cent, while curves are expressed in degrees. For example: A 10 per cent grade rises 10 feet in a horizontal distance of 100 feet, while a 3-degree curve has a horizontal deflection of 3 degrees.

These points should be remembered and care taken not to confuse the two terms. The following table shows the relation they bear to each other:

Degrees	Per Cent	Degrees	Per Cent	Degrees	Per Cent
1.....	1.74	16.....	28.67	31.....	60.10
2.....	3.49	17.....	30.57	32.....	62.49
3.....	5.24	18.....	32.49	33.....	64.94
4.....	6.99	19.....	34.43	34.....	67.45
5.....	8.75	20.....	36.40	35.....	70.02
6.....	10.51	21.....	38.39	36.....	72.65
7.....	12.28	22.....	40.40	37.....	75.35
8.....	14.05	23.....	42.45	38.....	78.14
9.....	15.84	24.....	44.52	39.....	80.98
10.....	17.63	25.....	46.63	40.....	83.90
11.....	19.44	26.....	48.77	41.....	86.93
12.....	21.26	27.....	50.95	42.....	90.04
13.....	23.09	28.....	53.17	43.....	93.25
14.....	24.93	29.....	55.43	44.....	96.57
15.....	26.80	30.....	57.73	45.....	100.00

## TO ASCERTAIN GRADES WITHOUT A GRADOMETER

The accompanying illustration shows one method of determining a grade when no gradometer is available. A 10-foot pole is used. One end is allowed to rest on the ground and the other end is held at a point which leaves the pole horizontal. The vertical distance from the high end to the ground is then secured and when multiplied by ten gives the per cent of the grade. An average of several such measurements taken at different points on a grade will give the approximate per cent of grade over the entire route.

In case no spirit-level is available for leveling the pole, a very satisfactory substitute may be had by the use of a bottle filled with water, tightly corked, and attached to the pole about

midway between the ends. The pole may be assumed to be approximately horizontal when the air-bubble in the bottle remains stationary at or near the middle of the bottle.

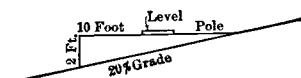


FIG. 234.

## SAG TABLES

**Pole Lines.**—The following table shows the amount of sag to be allowed for in hanging No. 9 or No. 12 galvanized wire for telephone lines. An extra allowance of 2 inches should be made if No. 12 hard-drawn copper wire is used.

Temp., F.	-30°	-10°	10°	30°	60°	80°	100°
Length of Span. in Feet	Sag. in Inches						
75.....	1.0	1.5	1.5	2.0	2.5	3.0	4.5
100.....	2.0	2.5	3.0	3.5	4.5	5.5	7.0
115.....	2.5	3.0	3.5	4.0	5.5	7.0	9.0
130.....	3.5	4.0	4.5	5.5	7.0	8.5	11.0
150.....	4.5	5.0	6.0	7.0	9.0	11.5	14.0
176 <sup>1</sup> .....	6.0	7.0	8.0	9.5	12.0	15.0	18.0
300.....	22.0	25.5	29.5	33.0	42.5	49.0	55.0
400.....	43.0	48.5	54.5	60.0	78.0	84.0	96.0
500.....	72.0	84.0	90.0	96.0	114.0	132.0	150.0

<sup>1</sup> Length of standard span used by the Forest Service. See top page 358.

**Tree Lines.**—Greater sag must be allowed in lines hung on trees and should be not less than shown below for wires mentioned in the foregoing table.

Temp., F.	-30°	-10°	10°	30°	60°	80°	100°
Length of Span, in Feet	Sag, in Inches						
75.....	25.0	25.5	25.5	26.0	26.5	27.0	28.5
100.....	26.0	26.5	27.5	27.5	28.5	29.5	31.0
115.....	26.5	27.0	27.5	28.0	29.5	31.0	33.0
130.....	27.5	28.0	28.5	29.5	31.0	32.5	35.0
150.....	28.5	29.0	30.0	31.0	33.0	35.5	38.0
176 <sup>1</sup> .....	30.0	31.0	32.0	33.5	36.0	39.0	42.0
300.....	46.0	49.5	53.5	57.0	66.5	73.0	79.0
400.....	66.0	72.0	84.0	90.0	102.0	108.0	120.0
500.....	96.0	108.0	114.0	120.0	138.0	156.0	174.0

<sup>1</sup> Length of standard span used by the Forest Service.

### TO ASCERTAIN DISTANT ELEVATIONS

The following table indicates the difference in altitude between distant points and the point from which observations are taken. It makes allowance for refraction, curvature of the earth's surface, and 4½ feet as the height of the instrument used in taking observations. The difference in altitude indicated should, of course, be added to the altitude of the point from which observations are taken if the reading is to include elevation above sea-level; otherwise the reading will cover only the difference in elevation between the point observed and the one from which observations are made.

DISTANCE, IN MILES	1	2	3	4	5	6	7	8	9	10
Vertical Angles, in Degrees	Feet									
1.....	97	191	286	383	480	768	678	778	880	984
2.....	189	376	563	752	941	1,131	1,324	1,516	1,710	1,906
3.....	282	560	840	1,121	1,403	1,685	1,970	2,255	2,541	2,829
4.....	374	745	1,118	1,491	1,865	2,240	2,617	2,995	3,374	3,754
5.....	467	931	1,396	1,862	2,329	2,797	3,267	3,737	4,208	4,681
6.....	560	1,117	1,675	2,234	2,794	3,355	3,918	4,481	5,046	5,612
7.....	653	1,304	1,955	2,607	3,261	3,915	4,571	5,227	5,886	6,545
8.....	747	1,491	2,236	2,982	3,729	4,477	5,227	5,977	6,729	7,483
9.....	841	1,680	2,519	3,359	4,200	5,043	5,887	6,731	7,577	8,425
10.....	936	1,869	2,803	3,738	4,674	5,611	6,550	7,489	8,430	9,372

**TRAVERSE TABLE<sup>1</sup>**  
**SHOWING WHOLE DEGREES ONLY**

Degrees	Latitude	Departure	
0	1.000	0.000	90
1	1.000	.017	89
2	.999	.035	88
3	.999	.052	87
4	.998	.070	86
5	.996	.087	85
6	.995	.104	84
7	.992	.122	83
8	.990	.139	82
9	.988	.156	81
10	.985	.174	80
11	.982	.191	79
12	.978	.208	78
13	.974	.225	77
14	.970	.242	76
15	.966	.259	75
16	.961	.276	74
17	.956	.292	73
18	.951	.309	72
19	.946	.326	71
20	.940	.342	70
21	.934	.358	69
22	.927	.375	68
23	.920	.391	67
24	.913	.407	66
25	.906	.423	65
26	.899	.438	64
27	.891	.454	63
28	.883	.470	62
29	.875	.485	61
30	.866	.500	60
31	.857	.515	59
32	.848	.530	58
33	.839	.545	57
34	.829	.559	56
35	.819	.574	55
36	.809	.588	54
	Departure	Latitude	Degrees

<sup>1</sup> For table showing traverse distances of fractional degrees consult "Instructions for Making Forest Surveys and Maps," 1912, U. S. Dept. of Agriculture. By Henry S. Graves, Forester.

Any other reliable work on general surveying should include similar information concerning traverse tables.

## TRAVERSE TABLE (Continued)

SHOWING WHOLE DEGREES ONLY

Degrees	Latitude	Departure	
37	.799	.602	53
38	.788	.616	52
39	.777	.629	51
40	.766	.643	50
41	.755	.656	49
42	.743	.669	48
43	.731	.682	47
44	.719	.695	46
45	.707	.707	45
	Departure	Latitude	Degrees

PRESERVATIVE TREATMENT OF TELEPHONE  
POLES.<sup>1</sup>

**Application of Creosote.**—The equipment required for this work consists of one 10-gallon iron pot, a half-gallon dipper, a 2- or 3-gallon bucket, a 4-inch wire-bound brush, and a thermometer. Creosote is heated in the iron pot, dipped out into the bucket and carried about as desired, and applied to the poles with the brush. It should be heated to a temperature between 120° F. and 150° F. in hot, dry weather and to about 180° F. in cold weather. It should be applied to the poles while hot, the points of application being the end surfaces of the poles, and their entire outer surfaces from the lower end up to a point at least 18 inches above ground when the poles are set. A second application should be made twenty-four hours later. Braces, stubs, and re-enforcements should receive similar treatment.

If the creosote is allowed to boil over it may take fire and be consumed.

<sup>1</sup> See the following Forest Service publications:

Cir. 188, Volatilization of Various Fractions of Creosote after Their Injection into Wood.

Bul. 84, Preservative Treatment of Poles.

Bul. 78, Wood Preservation in the United States.

Cir. 191, Modification of the Sulphonation Test for Creosote.

Cir. 190, A Visual Method for Determining the Penetration of Inorganic Salts in Treated Wood.

## SIZE AND NUMBER OF NAILS PER POUND

Size	Lgth in Ins.	Wire Gauge	App'ox. No. per Lb.	
<i>Common Wire</i>				
2.....	1	15	876	Used in all ordinary rough work such as building, fencing, out- side repairs, etc.
3.....	1¼	14	568	
4.....	1½	12½	316	
5.....	1¾	12½	271	
6.....	2	11½	181	
7.....	2¼	11½	161	
8.....	2½	10¼	106	
9.....	2¾	10¼	96	
10.....	3	9	69	
12.....	3¼	9	63	
16.....	3½	8	49	
20.....	4	6	31	
30.....	4½	5	24	
40.....	5	4	18	
50.....	5½	3	14	
60.....	6	2	11	
<i>Common Wire, Galv'z'd.</i>				
6.....	2	11½	380	Used for the same pur- poses as common wire nails.
8.....	2½	10¼	92	
10.....	3	9	60	
<i>Blued Wire</i>				
2 Common.....	1	15	876	Used in lathing. The bluing permits them to be held in the mouth without danger of infection.
3 Fine.....	1½	15	778	
<i>Lath. Blue, Sterilized</i>				
2 Light.....	1	17	1,158	
<i>Fine Wire</i>				
2.....	1	16½	1,351	Used when thin light nails are required.
3.....	1½	15	778	
<i>Wire Casing</i>				
4.....	1½	14	473	Used in ceiling, orna- mental work, and other fine work or repairing.
6.....	2	12½	236	
8.....	2½	11½	145	
10.....	3	10½	94	

Cement-coated nails are used as substitutes for common wire nails.

Ordinarily wire nails are shipped in lots of 100 pounds per keg, but the shipping weight of cement-coated nails varies from 88 pounds for 2ds to 90 pounds for 60ds. However, there are as



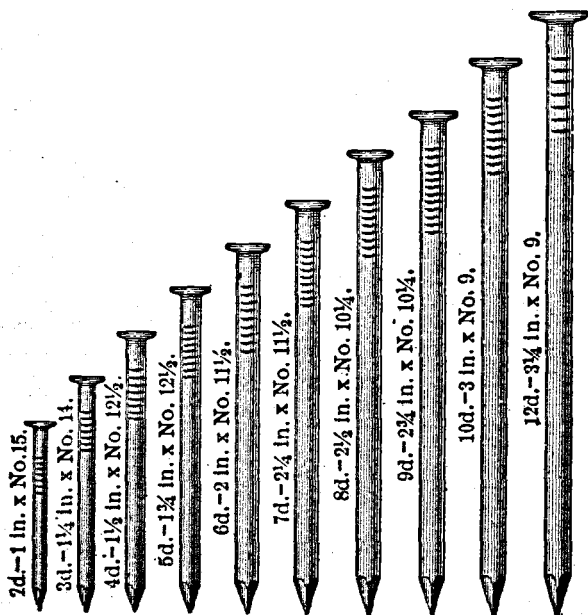


FIG. 235.—Wire nails.

many per keg as there are common wire nails of a corresponding size, the difference in weight being due to the lighter gauge.

They are also used where more adhesive resistance is required than is furnished by a common wire nail. It is claimed that the cement coating renders them from 20% to 30% more durable when exposed to extreme moisture. In a comparative test of adhesive resistance, a common wire 8d nail, driven 2 inches, showed a resistance of 146 pounds; a cement-coated nail of the same size, driven a like distance, showed a resistance of 322 pounds.

#### SIZE AND NUMBER OF FENCE STAPLES PER POUND<sup>1</sup>

Size, in Inches.....	1	1 1/4	1 1/2
Number per Pound.....	120	100	80

<sup>1</sup> Supplied by Simmons Hardware Company, St. Louis, Mo.

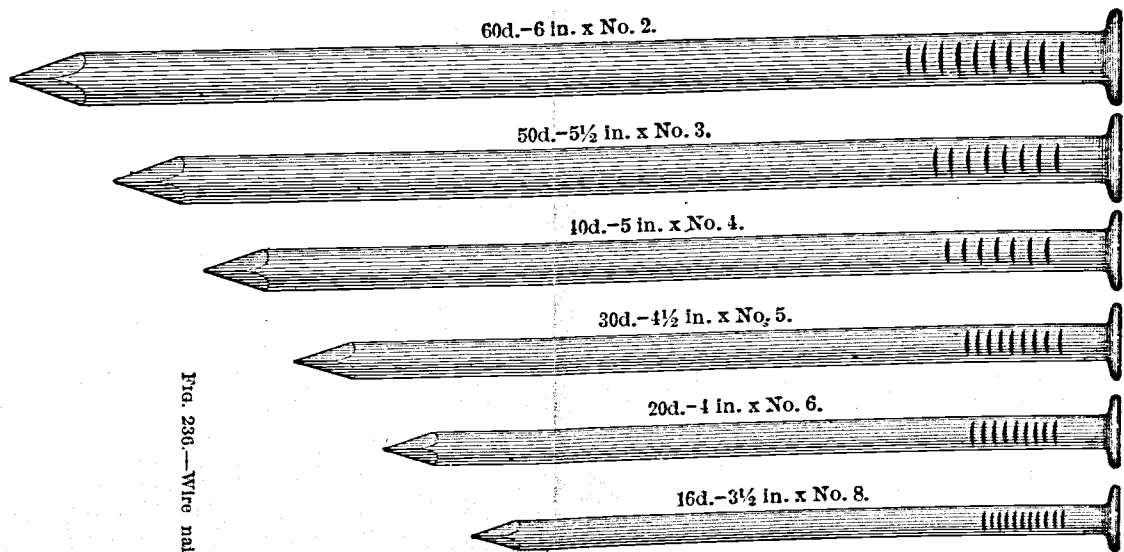


FIG. 230.—Wire nails.

ESTIMATES OF MATERIAL REQUIRED FOR A TWO-BAG BATCH OF CONCRETE<sup>1</sup>

Kind of Concrete Mixture	Proportions by Parts			TWO-BAG BATCH						
	Cement	Sand	Stone or Gravel	Materials			Concrete	Size of Measuring Boxes Inside Measurements		Water in Gallons for Medium Wet Mixture
				Cement	Sand	Stone or Gravel		Sand	Stone or Gravel	
				Bags	Cu. ft.	Cu. ft.	Cu. ft.			Gals.
1: 2: 4 Concrete.....	1	2	4	2	3¾	7½	8½	2' x 2' 11 ½"	2' x 4' 11 ½"	10
1: 2 ½: 5 Concrete...	1	2 ½	5	2	4¾	9½	10	2' x 2 ½' 11 ½"	2' x 5' 11 ½"	12 ½

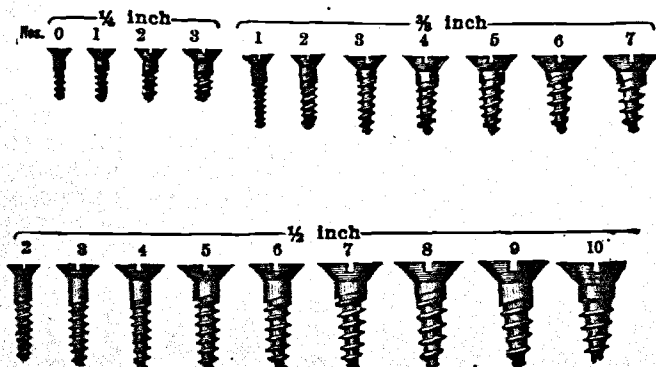
<sup>1</sup> Supplied by the Southwestern Portland Cement Co., El Paso, Texas.

FIG. 237.—Screws.

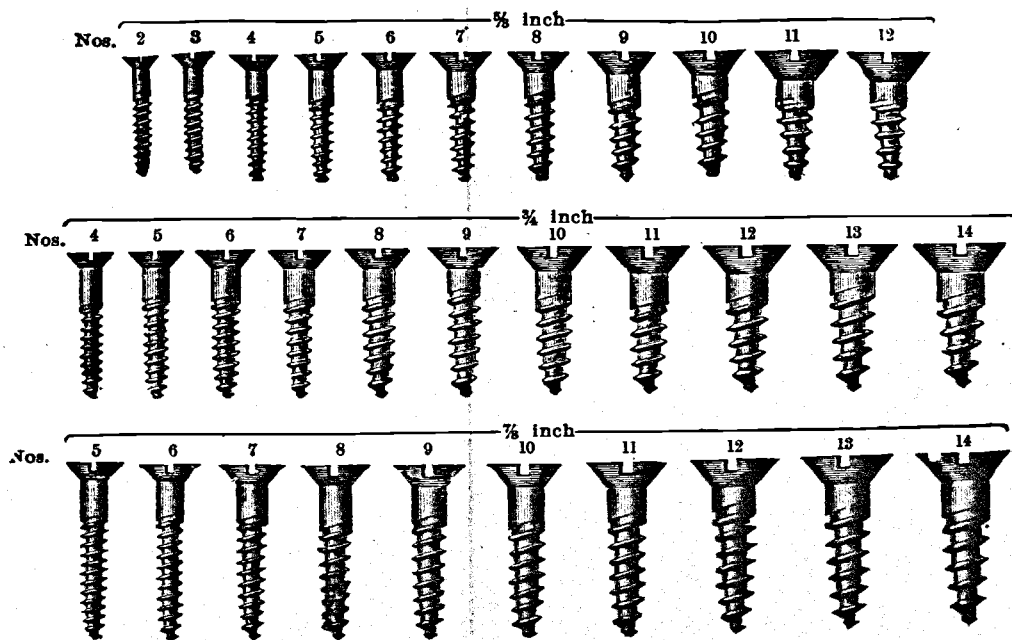


FIG. 233.—Screws.

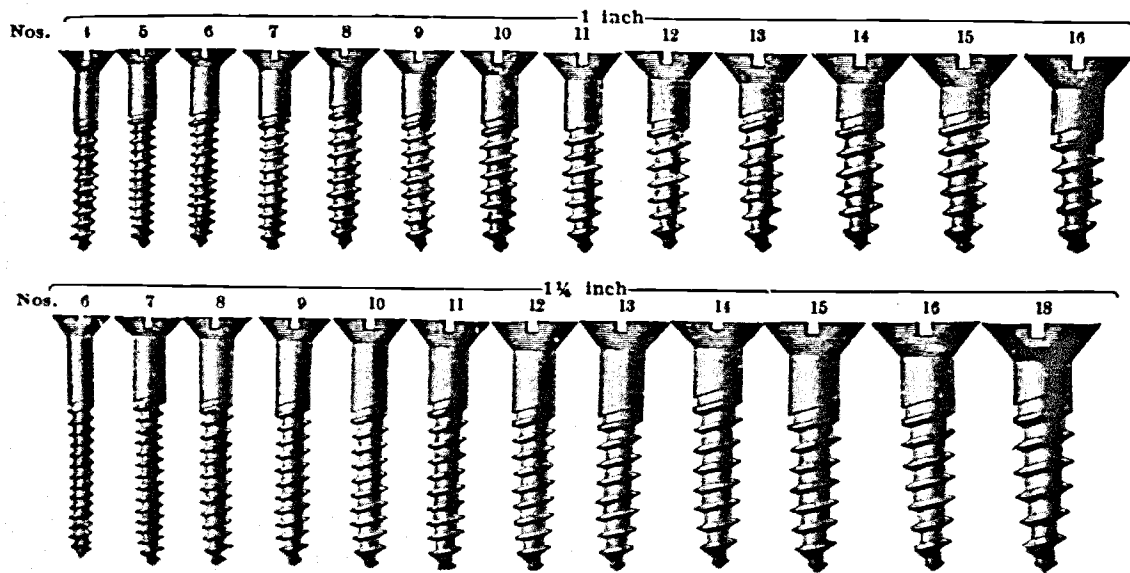


FIG. 239.—Screws.

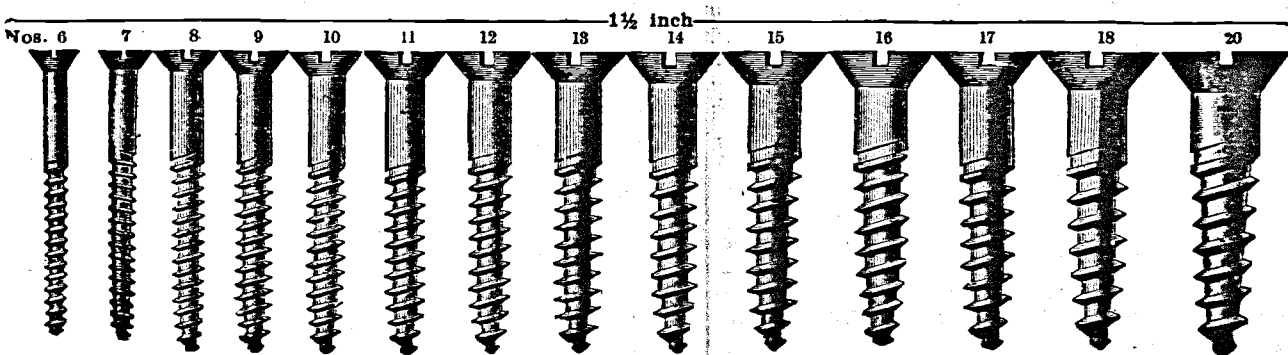


FIG. 240.—Screws.

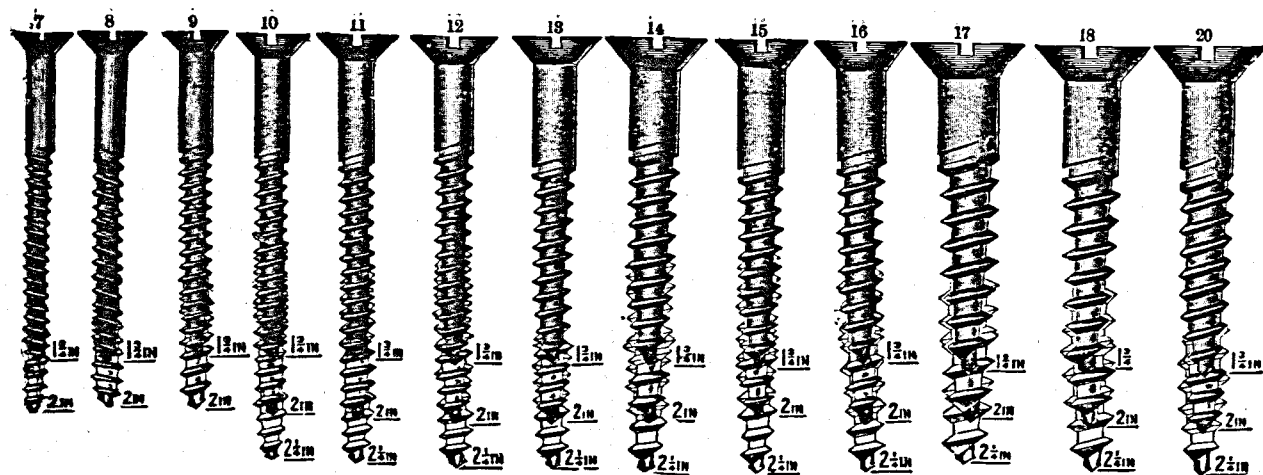


FIG. 241.—Screws.

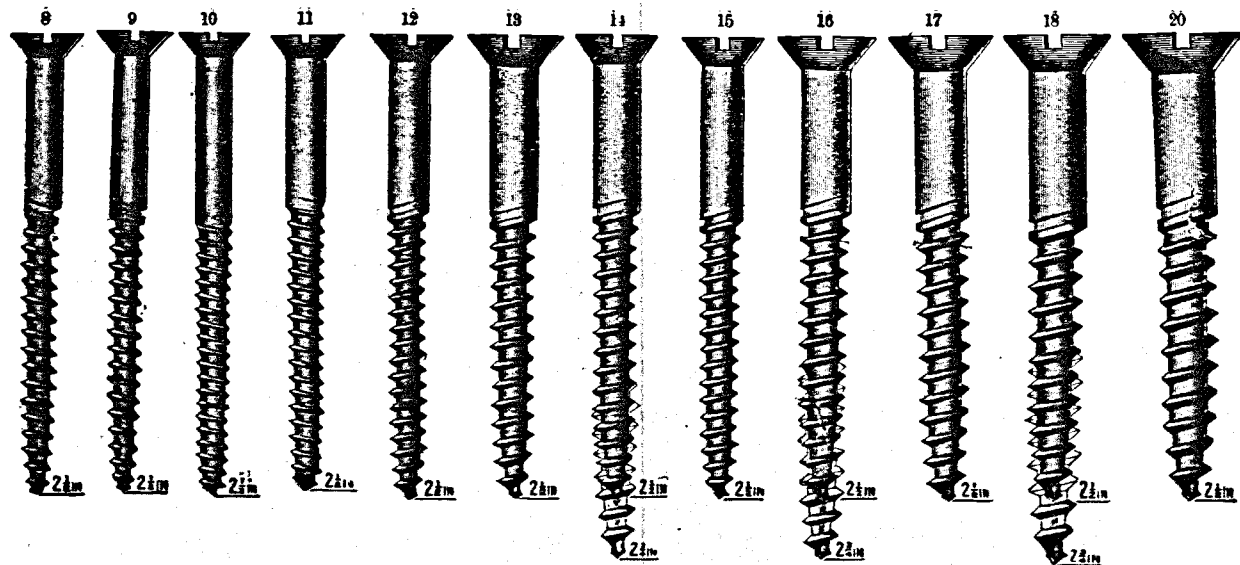


FIG. 242.—Screws.



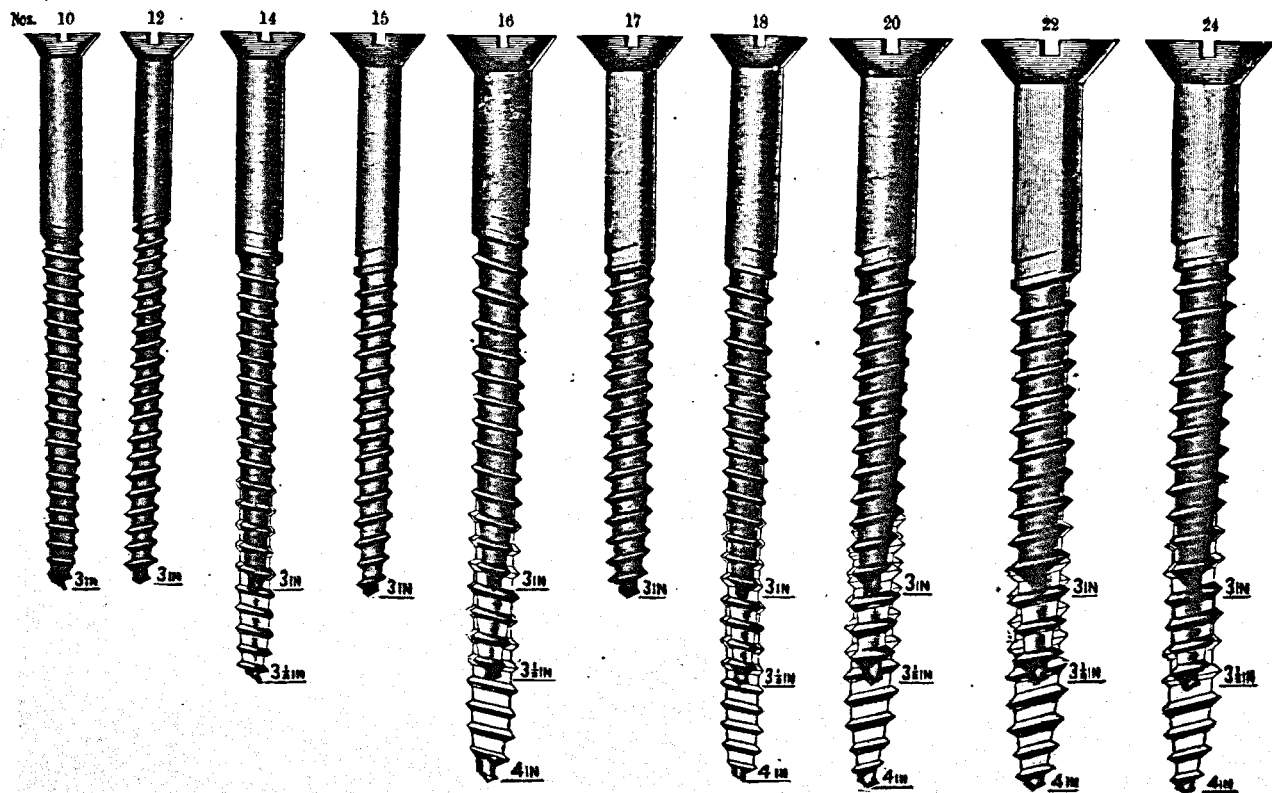


FIG. 243.—Screws.

BLASTING CHARGES<sup>1</sup>

Weight of Boulder, Pounds	APPROXIMATE NUMBER OF 1¼" x 8" CART- RIDGES REQUIRED FOR		
	Block- holing	Snake- holing	Mud- capping
100 to 500.....	¼	½ to 1	½ to 1½
1,000.....	½	1½	2
2,000.....	¾	2½	3
3,000.....	1	3	3½
4,000.....	1¼	3½	4
5,000.....	1¾	4	4½
7,500.....	2½	5	6
10,000.....	3½	6	8

GOVERNMENT FORMULA FOR WHITEWASH<sup>2</sup>

Take half a bushel of unslacked lime; slack it with boiling water and cover during the process to keep in the steam; strain the liquid through a fine sieve or strainer; add a peck of salt previously well dissolved in warm water, 3 pounds of ground rice boiled to a thin paste; stir in boiling hot one-half pound of powdered Spanish whiting and one pound of glue which has been previously dissolved over a slow fire, and add five gallons hot water to the mixture; stir well and let it stand for a few days, covered up from the dirt. It should be put on hot. One pint of mixture will cover a square yard properly applied. Small brushes are best. There is nothing that can compare with it for outside or inside work, and it retains its brilliancy for years. Coloring matter may be put in and made of any shade, as Spanish brown, yellow ochre, or common clay.

## LOG RULES

The log rules most widely used in the United States are the Two-Thirds rule, used in many parts of the North and South, and the Southeast and Northwest; the Doyle, also used in the same sections; the Scribner, in common use throughout the

<sup>1</sup> Supplied by E. I. du Pont de Nemours Powder Company, Wilmington, Delaware.

<sup>2</sup> Contributed by International Harvester Co., Chicago, Ill.

country; the Doyle-Scribner, which is perhaps the most widely used of any; and the Scribner Decimal "C," which is the official log rule of the Forest Service.

**Two-Thirds Rule.**—This rule is based on a formula in which the square of two-thirds of the small diameter of a log is multiplied by the number of the log's length in feet, this result then being divided by 12. Thus, letting  $D$  represent the diameter,  $L$  the length, and  $C$  the number of board feet in a log, the formula

is  $\left(\frac{2D}{3}\right)^2 \times \frac{L}{12} = C$ . For a 12-foot log the formula would, of

course, be  $\frac{2D}{3} = C$ . This scale crosses the Doyle at 18 and

the Scribner at 15 inches, overrunning both to these respective diameters and underrunning them thereafter.

**Doyle Rule.**—This scale is also based on a formula, wherein 4 is subtracted from the small diameter and one-fourth of the remainder is squared and then multiplied by the number of the log's length in feet, thus:  $\left(\frac{D-4}{4}\right)^2 \times L = C$ . A shorter formula,

applicable only to 16-foot logs, follows:  $(D-4)^2 = C$ . A third formula, applicable to logs of any length, is:  $(D-4)^2 \times \frac{L}{16} = C$ .

The subtraction of 4 from the diameter is supposed to account for the loss in kerf and slabs, and, since it applies with equal force to large and small logs, is obviously unfair. The only means by which the mill tally may be made to agree with it are by scaling each log full with no allowance whatever for defect and by the very poorest and most wasteful sawing. Even then the mill overrun may be astonishing. The rule up to and including a 24-foot log 48 inches in diameter is shown on page 372.

Numbers shown on the scale stick fail in several instances to agree with results obtained from the formula:  $\left(\frac{D-4}{4}\right)^2 \times L = C$ .

There appears to be no systematic disposition of fractions in computations involving the contents of logs having diameters other than multiples of 4, but the wide discrepancies noted in reference to contents of logs 10, 19, 22, 38 and 39 by 20, 23 by 14 and 16, 27 by 16, 31 by 22, and 39 by 12 elude explanation.

Some of these discrepancies are shown in table opposite.

Diameter in Inches	Lgth. in Feet	BOARD FEET AS SHOWN		DIFFERENCE	
		By Stick	By Formula	Loss	Gain
9.....	24	37	37.50	.50	.....
10.....	20	46	45.00	.....	1.00
14.....	18	112	112.50	.50	.....
14.....	22	137	137.50	.50	.....
15.....	24	181	181.50	.50	.....
17.....	24	253	253.50	.50	.....
18.....	18	220	220.50	.50	.....
18.....	22	269	269.50	.50	.....
19.....	20	280	281.25	1.25	.....
21.....	24	433	433.50	.50	.....
22.....	18	364	364.50	.50	.....
22.....	20	404	405.00	1.00	.....
22.....	22	445	445.50	.50	.....
23.....	14	313	315.875	2.875	.....
23.....	16	359	361.00	2.00	.....
23.....	20	452	451.25	.....	.75
23.....	24	541	541.50	.50	.....
26.....	18	544	544.50	.50	.....
26.....	22	665	655.50	.50	.....
27.....	14	463	462.875	.....	1.25
27.....	16	530	529.00	.....	1.00
27.....	18	596	595.125	.....	.875
29.....	20	782	781.25	.....	.875
29.....	22	860	859.375	.....	.625
31.....	20	912	911.25	.....	.875
31.....	22	1,004	1002.375	.....	1.625
34.....	14	787	787.50	.50	.....
34.....	18	1,012	1012.50	.50	.....
34.....	22	1,237	1237.50	.50	.....
35.....	20	1,202	1201.25	.....	.75
35.....	22	1,322	1321.375	.....	.625
38.....	14	1,011	1011.50	.50	.....
38.....	18	1,300	1300.50	.50	.....
38.....	20	1,446	1445.00	.....	1.00
39.....	12	910	918.75	8.75	.....
39.....	20	1,530	1531.25	1.25	.....
41.....	24	2,053	2053.50	.50	.....
43.....	20	1,902	1901.25	.....	.75
45.....	20	2,102	2101.25	.....	.75
45.....	22	2,312	2311.375	.....	.625
46.....	20	2,206	2205.00	.....	1.00
47.....	20	2,312	2311.25	.....	.75

DOYLE LOG RULE<sup>1</sup>

Diam. in Inches	LENGTH IN FEET								
	8	10	12	14	16	18	20	22	24
8.....	8	10	12	14	16	18	20	22	24
9.....	12	16	19	22	25	28	31	34	37
10.....	18	23	27	32	36	41	46	50	54
11.....	24	31	37	43	49	55	61	67	74
12.....	32	40	48	56	64	72	80	88	96
13.....	40	50	61	71	81	91	101	111	122
14.....	50	62	75	88	100	112	125	137	150
15.....	60	75	91	106	121	136	151	166	181
16.....	72	90	108	126	144	162	180	198	216
17.....	84	106	127	148	169	190	211	232	253
18.....	98	122	147	171	196	220	245	269	294
19.....	112	141	169	197	225	253	280	309	338
20.....	128	160	192	224	256	288	320	352	384
21.....	144	181	217	253	289	325	361	397	433
22.....	162	202	243	283	324	364	404	445	486
23.....	180	226	271	313	359	406	452	496	541
24.....	200	250	300	350	400	450	500	550	600
25.....	220	276	331	386	441	496	551	606	661
26.....	242	302	363	423	484	544	605	665	726
27.....	264	330	397	463	530	596	661	726	794
28.....	288	360	432	504	576	648	720	792	864
29.....	312	391	469	547	625	703	782	860	938
30.....	338	422	507	591	676	761	845	930	1,014
31.....	364	456	547	638	729	820	912	1,004	1,094
32.....	392	490	588	686	784	882	980	1,078	1,176
33.....	420	526	631	736	841	946	1,051	1,156	1,262
34.....	450	562	675	787	900	1,012	1,125	1,237	1,350
35.....	480	601	721	841	961	1,081	1,202	1,322	1,442
36.....	512	640	768	896	1,024	1,152	1,280	1,408	1,536
37.....	544	681	817	953	1,089	1,225	1,361	1,497	1,634
38.....	578	723	867	1,011	1,156	1,300	1,446	1,590	1,734
39.....	612	765	910	1,070	1,225	1,379	1,530	1,684	1,838
40.....	648	810	972	1,134	1,296	1,458	1,620	1,782	1,944
41.....	684	856	1,027	1,198	1,369	1,540	1,711	1,882	2,053
42.....	722	902	1,083	1,264	1,444	1,625	1,805	1,986	2,166
43.....	761	951	1,141	1,331	1,521	1,711	1,902	2,091	2,282
44.....	800	1,000	1,200	1,400	1,600	1,800	2,000	2,200	2,400
45.....	840	1,051	1,261	1,471	1,681	1,891	2,102	2,312	2,522
46.....	882	1,103	1,323	1,544	1,764	1,985	2,206	2,426	2,646
47.....	925	1,155	1,387	1,618	1,849	2,080	2,312	2,542	2,774
48.....	968	1,218	1,452	1,694	1,936	2,178	2,420	2,662	2,904

<sup>1</sup> Supplied by Lufkin Rule Co., Saginaw, Mich.

**Scribner Rule.**—This rule is based on diagrams showing what logs of different lengths and diameters should saw out. It is fairly accurate on logs over 28 inches in diameter, but overruns on smaller logs unless these are very carefully culled and sawed. The rule up to and including a 20-foot log 36 inches in diameter follows:

## SCRIBNER LOG RULE

Diam. in Ins.	LENGTH IN FEET						
	8	10	12	14	16	18	20
6....	4	5	6	7	9	10	11
7....	8	10	12	14	16	18	20
8....	12	15	19	22	25	28	31
9....	18	23	27	32	36	40	45
10....	24	30	37	43	49	55	61
11....	32	40	48	56	64	72	80
12....	40	49	59	69	79	88	98
13....	48	61	73	85	97	109	122
14....	57	72	86	100	114	129	143
15....	71	89	107	125	142	160	178
16....	79	99	119	139	159	178	198
17....	93	116	139	162	185	208	232
18....	106	133	160	187	213	240	267
19....	120	150	180	210	240	270	300
20....	140	175	210	245	280	315	350
21....	152	190	228	266	304	342	380
22....	167	209	251	292	334	376	418
23....	188	235	283	330	377	424	470
24....	202	252	303	353	404	454	505
25....	229	287	344	401	459	516	573
26....	250	313	375	439	500	562	625
27....	274	342	411	479	548	616	684
28....	291	363	436	509	582	654	728
29....	305	381	457	533	609	685	761
30....	328	411	493	575	657	739	821
31....	355	444	532	622	710	799	888
32....	368	460	552	644	736	828	920
33....	392	490	588	686	784	882	980
34....	400	500	600	700	800	900	1,000
35....	438	547	657	766	876	985	1,095
36....	462	577	692	807	923	1,038	1,152

**Doyle-Scribner Rule.**—By combining Doyle measurements for logs under 28 inches in diameter with Scribner measurements

for larger logs this rule eliminates the greatest faults of both and provides a fairly accurate rule for all logs.

**Scribner Decimal "C" Rule.**—This is merely a revision of the Scribner rule and is formulated by dropping units and rounding off tens to the next above or below. Therefore the figures representing board feet on the scale stick are not complete, but require the addition of a cipher except in 6- and 7-inch logs 6 feet long and 6-inch logs 8 feet long, the contents of all of which are indicated on the stick as 0.5, which, being theoretically multiplied by 10, as are all the other volume numbers, equal 5 board feet.

The system of revision seems to lack uniformity throughout the rule up to the 12-inch diameter.

Instructions concerning official use of the rule state that in Alaska and west of the summit of the Cascade Mountains, in Washington and Oregon, all logs up to 32 feet long, inclusive, will be scaled as one log. Logs from 34 to 64 feet, inclusive, will be scaled as two logs as nearly the same length in even feet as possible. Logs exceeding 64 feet in length will be scaled as three logs as nearly equal in lengths of even feet as possible. When such divisions of a log are necessary the scaler must make allowance for taper, but tables of taper may be secured upon requisition.

The rule up to and including a 32-foot log 120 inches in diameter follows:

SCRIBNER DECIMAL "C" LOG RULE<sup>1</sup>

Diam. in Inches	LENGTH IN FEET													
	6	8	10	12	14	16	18	20	22	24	26	28	30	32
6.....	0.50	0.5	1	1	1	2	2	2	3	3	3	4	4	5
7.....	0.5	1	1	2	2	3	3	3	4	4	4	5	5	6
8.....	1	1	2	2	2	3	3	3	4	4	5	6	6	7
9.....	1	2	3	3	3	4	4	4	5	6	6	7	8	9
10.....	2	3	3	3	4	6	6	7	8	9	9	10	11	12
11.....	2	3	4	4	5	7	8	8	9	10	11	12	13	14
12.....	3	4	5	6	7	8	9	10	11	12	13	14	15	16
13.....	4	5	6	7	8	10	11	12	13	15	16	17	18	19
14.....	4	6	7	9	10	11	13	14	16	17	19	20	21	23
15.....	5	7	9	11	12	14	16	18	20	21	23	25	27	28
16.....	6	8	10	12	14	16	18	20	22	24	26	28	30	32
17.....	7	9	12	14	16	18	21	23	25	28	30	32	35	37
18.....	8	11	13	16	19	21	24	27	29	32	35	37	40	43
19.....	9	12	15	18	21	24	27	30	33	36	39	42	45	48
20.....	11	14	17	21	24	28	31	35	38	42	45	49	52	56
21.....	12	15	19	23	27	30	34	38	42	46	49	53	57	61
22.....	13	17	21	25	29	33	38	42	46	50	54	58	63	67
23.....	14	19	23	28	33	38	42	47	52	57	61	66	71	75
24.....	15	21	25	30	35	40	45	50	55	61	66	71	76	81
25.....	17	23	29	34	40	46	52	57	63	69	75	80	86	92
26.....	19	25	31	37	44	50	56	62	69	75	82	88	94	100
27.....	21	27	34	41	48	55	62	68	75	82	89	96	103	110
28.....	22	29	36	44	51	58	65	73	80	87	95	102	109	116
29.....	23	31	38	46	53	61	68	76	84	91	99	107	114	122
30.....	25	33	41	49	57	66	74	82	90	99	107	115	123	131
31.....	27	36	44	53	62	71	80	89	98	106	115	124	133	142
32.....	28	37	46	55	64	74	83	92	101	110	120	129	138	147
33.....	29	39	49	59	69	78	88	98	108	118	127	137	147	157
34.....	30	40	50	60	70	80	90	100	110	120	130	140	150	160
35.....	33	44	55	66	77	88	98	109	120	131	142	153	164	175
36.....	35	46	58	69	81	92	104	115	127	138	150	161	173	185
37.....	39	51	64	77	90	103	116	129	142	154	167	180	193	206
38.....	40	54	67	80	93	107	120	133	147	160	174	187	200	214
39.....	42	56	70	84	98	112	126	140	154	168	182	196	210	224
40.....	45	60	75	90	105	120	135	150	166	181	196	211	226	241
41.....	48	64	79	95	111	127	143	159	175	191	207	223	238	254
42.....	50	67	84	101	117	134	151	168	185	201	218	235	252	269
43.....	52	70	87	105	122	140	157	174	192	209	227	244	262	279
44.....	56	74	93	111	129	148	166	185	204	222	241	259	278	296
45.....	57	76	95	114	133	152	171	190	209	226	247	266	286	304

<sup>1</sup> Official rule of the Forest Service and used in all Government scaling.



## SCRIBNER DECIMAL "C" LOG RULE (Continued)

Diam. in Inches	LENGTH IN FEET													
	6	8	10	12	14	16	18	20	22	24	26	28	30	32
46.....	59	79	99	119	139	159	178	198	218	238	258	278	297	317
47.....	62	83	104	124	145	166	186	207	228	248	269	290	310	331
48.....	65	86	108	130	151	173	194	216	238	260	281	302	324	346
49.....	67	90	112	135	157	180	202	225	247	270	292	314	337	359
50.....	70	94	117	140	164	187	211	234	257	281	304	328	351	374
51.....	73	97	122	146	170	195	219	243	268	292	315	341	365	389
52.....	76	101	127	152	177	202	228	253	278	304	329	354	380	405
53.....	79	105	132	158	184	210	237	263	289	316	341	368	395	421
54.....	82	109	137	164	191	218	246	273	300	328	355	382	410	437
55.....	85	113	142	170	198	227	255	283	312	340	368	397	425	453
56.....	88	118	147	176	206	235	264	294	323	353	382	411	441	470
57.....	91	122	152	183	213	244	274	304	335	365	396	426	457	487
58.....	95	126	158	189	221	252	284	315	347	379	410	442	473	505
59.....	98	131	163	196	229	261	294	327	359	392	425	457	490	523
60.....	101	135	169	203	237	270	304	338	372	406	439	473	507	541
61.....	105	140	175	210	245	280	315	350	385	420	455	490	525	560
62.....	108	145	181	217	253	289	325	362	398	434	470	506	542	579
63.....	112	149	187	224	261	299	336	373	411	448	485	523	560	597
64.....	116	154	193	232	270	309	348	387	425	464	503	541	580	619
65.....	119	159	199	239	279	319	358	398	438	478	518	558	597	637
66.....	123	164	206	247	288	329	370	412	453	494	535	576	617	659
67.....	127	170	212	254	297	339	381	423	466	508	550	593	635	677
68.....	131	175	219	262	306	350	393	437	480	524	568	611	655	699
69.....	135	180	226	271	316	361	406	452	497	542	587	632	677	723
70.....	139	186	232	279	325	372	419	465	512	558	605	651	698	744
71.....	144	192	240	287	335	383	430	478	526	574	622	670	717	765
72.....	148	197	247	296	345	395	444	493	543	592	641	691	740	789
73.....	152	203	254	305	356	406	457	508	559	610	661	712	762	813
74.....	157	209	261	314	366	418	471	523	576	628	680	733	785	837
75.....	161	215	269	323	377	430	484	538	592	646	700	754	807	861
76.....	166	221	277	332	387	443	498	553	609	664	719	775	830	885
77.....	171	228	285	341	398	455	511	568	625	682	739	796	852	909
78.....	176	234	293	351	410	468	527	585	644	702	761	819	878	936
79.....	180	240	301	361	421	481	541	602	662	722	782	842	902	963
80.....	185	247	309	371	432	494	556	618	680	742	804	866	927	986
81.....	190	254	317	381	444	508	572	635	699	762	826	889	953	1,016
82.....	196	261	326	391	456	521	586	652	717	782	847	912	977	1,043
83.....	201	268	335	401	468	535	601	668	735	802	869	936	1,002	1,069
84.....	206	275	343	412	481	549	618	687	755	824	893	961	1,030	1,099
85.....	210	281	351	421	491	561	631	702	772	842	912	982	1,052	1,123
86.....	215	287	359	431	503	575	646	718	790	862	934	1,006	1,077	1,149

## SCRIBNER DECIMAL "C" LOG RULE (Continued)

Diam. in Inches	LENGTH IN FEET													
	6	8	10	12	14	16	18	20	22	24	26	28	30	32
87.....	221	295	368	442	516	589	663	737	810	884	958	1,031	1,105	1,179
83.....	226	301	377	452	527	603	678	753	829	904	979	1,055	1,130	1,205
83.....	231	308	385	462	539	616	693	770	847	924	1,001	1,078	1,155	1,232
90.....	236	315	393	472	551	629	708	787	865	944	1,023	1,101	1,180	1,259
91.....	241	322	402	483	563	644	725	805	886	966	1,047	1,127	1,208	1,288
92.....	246	329	411	493	575	657	739	822	904	986	1,068	1,150	1,232	1,315
93.....	251	335	419	503	587	671	754	838	922	1,006	1,090	1,174	1,257	1,341
94.....	257	343	428	514	600	685	771	857	942	1,028	1,114	1,199	1,285	1,371
95.....	262	350	437	525	612	700	788	875	963	1,050	1,138	1,225	1,313	1,400
96.....	268	357	446	536	625	715	804	893	983	1,072	1,161	1,251	1,340	1,429
97.....	273	364	455	546	637	728	819	910	1,001	1,092	1,183	1,274	1,365	1,456
98.....	278	371	464	557	650	743	835	928	1,021	1,114	1,207	1,300	1,392	1,485
99.....	284	379	473	568	663	757	852	947	1,041	1,136	1,231	1,325	1,420	1,515
100.....	289	386	482	579	675	772	869	965	1,062	1,158	1,255	1,351	1,448	1,544
101.....	295	393	492	590	688	787	885	983	1,082	1,180	1,278	1,377	1,475	1,573
102.....	301	401	502	602	702	803	903	1,003	1,104	1,204	1,304	1,405	1,505	1,605
103.....	307	409	512	614	716	819	921	1,023	1,126	1,228	1,330	1,433	1,535	1,637
104.....	313	417	522	626	730	835	939	1,043	1,148	1,252	1,356	1,461	1,565	1,669
105.....	319	425	532	638	744	851	957	1,063	1,170	1,276	1,382	1,489	1,595	1,701
106.....	325	433	542	650	758	867	975	1,083	1,192	1,300	1,408	1,517	1,625	1,733
107.....	331	442	553	663	773	884	995	1,105	1,216	1,326	1,437	1,547	1,658	1,768
108.....	337	450	563	675	788	900	1,013	1,125	1,238	1,350	1,463	1,575	1,688	1,800
109.....	334	459	573	688	803	917	1,032	1,147	1,261	1,376	1,491	1,605	1,720	1,835
110.....	350	467	583	700	817	933	1,050	1,167	1,283	1,400	1,517	1,633	1,750	1,867
111.....	356	475	594	713	832	951	1,069	1,188	1,307	1,426	1,545	1,664	1,782	1,901
112.....	362	483	604	725	846	967	1,087	1,208	1,329	1,450	1,571	1,692	1,812	1,933
113.....	369	492	615	738	861	984	1,107	1,230	1,353	1,476	1,599	1,722	1,845	1,968
114.....	375	501	626	751	876	1,001	1,126	1,252	1,377	1,502	1,627	1,752	1,877	2,003
115.....	382	509	637	764	891	1,019	1,146	1,273	1,401	1,528	1,655	1,783	1,910	2,037
116.....	389	519	648	778	908	1,037	1,167	1,297	1,426	1,556	1,686	1,815	1,945	2,075
117.....	396	528	660	792	924	1,056	1,188	1,320	1,452	1,584	1,716	1,848	1,980	2,112
118.....	403	537	672	806	940	1,075	1,209	1,343	1,478	1,612	1,746	1,881	2,015	2,149
119.....	410	547	683	820	957	1,093	1,230	1,367	1,503	1,640	1,777	1,913	2,050	2,187
120.....	417	556	695	834	973	1,112	1,251	1,390	1,529	1,668	1,807	1,946	2,085	2,224

COMPARISON OF LOG RULES<sup>1</sup>

The following table shows the comparison of measurements of 16-foot logs from 8 to 48 inches in diameter as these are given by the more widely used rules. Less prominent rules, such as

<sup>1</sup> Supplied by Lufkin Rule Company, Saginaw, Mich.

Doyle-Baxter, Herring, Drew, Minor, Beaumont, and numerous others are not listed in the table:

Diameter in Inches	Doyle Scale	Scribner Scale	Favorite Scale	Baxter Scale	Two-third Scale	Dusenberry Scale	Cumberland River Scale	St. Louis Hard- wood Scale	Northwestern Scale	Decimal Scale	Spaulding's Pacific Coast Scale	Combined Doyle and Scribner Scale
8.....	16	25	22	34	36	....	....	33	33	3	....	16
9.....	25	36	29	44	48	....	....	46	45	4	....	25
10.....	36	49	37	56	58	40	47	59	61	6	50	36
11.....	49	64	48	69	70	54	57	72	70	7	63	49
12.....	64	79	64	84	85	68	68	85	77	8	77	64
13.....	81	97	82	100	100	80	80	100	97	10	94	81
14.....	100	114	98	117	116	100	93	116	117	11	114	100
15.....	121	142	120	136	133	117	107	133	144	14	137	121
16.....	144	159	142	156	151	136	121	150	170	16	161	144
17.....	169	185	166	177	171	157	137	172	188	18	188	169
18.....	196	213	197	200	192	180	153	192	206	21	216	196
19.....	225	240	226	224	213	204	171	213	226	24	245	225
20.....	256	280	248	250	237	229	190	237	248	28	276	256
21.....	289	304	285	277	261	256	209	261	285	30	308	289
22.....	324	334	324	305	286	285	229	284	324	33	341	324
23.....	359	377	357	335	313	315	250	312	357	38	376	359
24.....	400	404	392	366	341	346	281	341	392	40	412	400
25.....	441	459	434	399	370	379	296	369	421	46	449	441
26.....	484	500	476	432	400	414	320	400	450	50	488	484
27.....	530	548	520	468	432	450	345	432	520	55	528	530
28.....	576	582	562	504	464	487	372	464	536	58	569	576
29.....	625	609	596	543	498	526	399	498	584	61	612	609
30.....	676	657	632	582	533	567	427	533	632	66	656	657
31.....	729	710	678	623	569	609	456	568	678	71	701	710
32.....	784	736	725	665	606	652	485	608	725	74	748	736
33.....	841	784	785	709	648	697	516	645	785	78	796	784
34.....	900	800	845	754	685	744	548	685	845	80	845	800
35.....	961	876	882	800	725	792	581	725	882	88	897	876
36.....	1,024	923	920	848	768	841	614	768	920	92	950	923
37.....	1,089	1,029	978	897	811	892	649	810	978	103	1,006	1,029
38.....	1,156	1,068	1,037	946	855	945	685	856	1,037	107	1,064	1,068
39.....	1,225	1,120	1,098	999	901	999	721	901	1,090	112	1,124	1,120
40.....	1,296	1,204	1,160	1,052	944	1,054	759	947	1,160	120	1,185	1,204
41.....	1,369	1,272	1,213	1,107	995	1,111	798	996	1,213	127	1,248	1,272
42.....	1,444	1,343	1,266	1,163	1,045	1,170	835	1,045	1,266	134	1,312	1,343
43.....	1,521	1,396	1,334	1,221	1,095	1,227	877	....	1,334	140	1,377	1,396
44.....	1,600	1,480	1,402	1,280	1,147	1,300	918	....	1,402	148	1,448	1,480
45.....	1,681	1,518	1,474	1,340	1,200	1,350	960	....	1,474	152	1,512	1,518
46.....	1,764	1,587	1,546	1,401	1,253	1,410	1,003	....	1,546	159	1,581	1,587
47.....	1,849	1,656	1,621	1,464	1,309	1,470	1,048	....	1,621	166	1,652	1,656
48.....	1,936	1,728	1,696	1,529	1,365	1,580	1,092	....	1,696	173	1,724	1,728

Doyle Scale

Scribner Scale

# GLOSSARY

In any locality to which he may be assigned the new field man will experience more or less confusion in his dealings with local residents who may use terms which are vague or even meaningless to him.

A word or phrase that may be typical of one region may not be used in another, or, being used, may be so corrupted or modified as to take on an entirely different meaning, and it is therefore impossible to compile a glossary covering each and every strange term in all its phases. It is believed, however, that the following list of words and their definitions covers most of the terms the new man will not at first understand. The definitions given are not in every case precisely in accordance with those preferred by many philologists, but they will be found applicable to their respective terms as these are used and generally understood in the field.

Technical terms, applicable to special lines of work, are usually defined in an official glossary that may be secured upon requisition, and for that reason only the more common ones are included here.

A key to the abbreviations used follows:

n. = Noun.	N. = North.
v. = Verb.	S. = South.
a. = Adjective.	E. = East.
adv. = Adverb.	W. = West.
pro. = Pronounced locally.	NE. = Northeast.
col. = Colloquialism in.	NW. = Northwest.
cf. = Compare with.	SE. = Southeast.
Sp. = Spanish origin.	SW. = Southwest.
com. = Common to.	AS. = All sections.

Where reference has been had to a dictionary, Webster's Intercollegiate has been used.

## A

- adobe, *n.* (1) A brownish-colored variety of stiff clay found in SW. and portions of W. (Sp.: *adobar*, to plaster.) Pro. ah-doe'-bay, but generally abbreviated to "dobe."  
 (2) A sun-dried brick made of adobe.  
 (3) A building made of adobe brick. Generally known as a "dobe."

**alfalfa, n.** A homestead entered in a National Forest under the Act of June 11, 1906. Col. W. and SW. See JUNE 11.

**arrastra, n.** A crude form of ore-crusher, the ore being ground rather than crushed. An upright shaft sets in a circular rock-bottomed enclosure and usually bears two or four horizontal arms, to the outer ends of which heavy stones are hung in such a manner that the ore is ground between them and the rock bottom of the pit. The shaft is rotated by means of water-, horse- or man-power. (Sp.: *arrastrar*, to crawl, to creep.) Pro. "raster." Especially com. SW., and frequently used in other gold-producing regions.

*v.* To crush ore in an arrastra.

**arroyo, n.** A deep, narrow ditch or gully. (Sp.: *arroyo*, a rivulet.) Pro. ah-roy'-yoh. Com. W.

## B

**backfire, n.** A fire started in front of another in such a manner as to burn toward it and consume inflammable material upon which it would otherwise feed.

*v.* To fight one fire by means of another.

**balky, a.** A term applied to an animal that refuses to work in harness.

**band, n.** A group of sheep or goats, usually from 2,000 to 2,200 in number.

**bang, v.** To cut away an animal's foretop. Cf. ROACH.

**bar, n.** (1) The ridge at the side of an animal's frog.

(2) That part or a bit which passes through an animal's mouth.

(3) That part of an animal's jaw between the molars and incisors.

(4) One of the crosswise ridges at the roof of an animal's mouth.

(5) One form of branding-iron.

(6) A horizontal mark used as part of or to cancel a brand.

(7) The wooden side of a saddle-tree.

(8) One of a set of poles used in lieu of a gate.

(9) A shallow ridge formed in the bed of a river by action of the current. Also col. S. and SE. for a long, low, flat stretch of clean gravel or sand appearing between the river's edge and the bank proper.

(10) See CROW BAR and PINCH BAR.

**iron, n.** A straight iron rod with a shorter piece or bar welded at right angles to it at one end and used as a branding-iron.

**barrow, n.** A castrated hog.

**bay, n.** A bay animal.

*a.* Reddish-brown in color.

**bay, v.** The action of a "cow" dog in barking at and otherwise engaging a cow's attention until she can be caught by the stockman.

**bed, n.** (1) A wagon box.

(2) The foundation of a trail or road tread.

(3) The bottom of a ditch or cañon.

**v.** (1) To prepare ground upon which cotton is to be raised.  
Com. AS. where cotton is raised.

(2) To "bed down" cattle or sheep; to stop and keep them quiet over night.

**beetle, n.** A heavy wooden mallet used in driving iron wedges or wooden gluts into timbers that are to be split open. The head sets at right angles to the handle and is bound at either end with an iron band. Cf. MAUL.

**bevel-square, n.** A small adjustable square used in laying off angles.

**bit, n.** (1) That part of a bridle which works in an animal's mouth.

(2) The blade or cutting portion of a tool.

(3) Col. S., SE., W. and SW. for twelve and one-half cents

(4) A variety of earmark.

**blab, n.** A flat piece of wood or heavy tin or leather suspended from a calf's nose in such a way as to fall before the calf's mouth and thereby prevent sucking. The calf soon learns to throw it forward and out of the way in feeding from the ground.

**v.** To attach a blab to a calf's nose.

**boar, n.** An uncastrated hog.

**board, n.** Col. S., SE., and W. for clapboard or shake (*q.v.*).

foot: The unit of lumber measure; equal to a plank 12 inches square and 1 inch thick.

**bob, v.** To cut away the hair at the end of an animal's tail. Cf. ROACH.

**bog, n.** A small area of stiff mud deep enough to entrap animals that enter it in their attempts to secure grass or water. Also known as "boghole."

**v.** (1) To bog down; to be entrapped in a boghole.

(2) Bog pulling, the operation of pulling or assisting an animal out of a boghole.

**bole, n.** The trunk or stem of a tree.

**bolster, n.** That portion of a wagon gear upon which the bed rests.

**bone-brand, n.** A blurred brand due to excessive heat or protracted pressure of the iron at the time the brand is applied.

**v.** To burn an animal severely in branding.

**bozal, n.** That part of a halter, hackamore or bridle which passes about the animal's jaws above the mouth. (Sp.: *bozal*, a muzzle, a novice.) Pro. *bo-zahl'*. Com. W. and SW.

**brand, n.** A character burned into or otherwise applied to an animal's skin, hoofs, or horns to facilitate identification. Also applied to tools and other property for the same purpose.

*v.* To apply identification marks to property.

**branding-hatchet, n.** See MARKING-HATCHET.

**breast-collar, n.** (1) A leather strap passed from one side of the saddle rig beneath the animal's neck and across to the other side of the rig and supplied in order to facilitate leading or dragging stock from the saddle-horn.

(2) That part of a buggy or carriage harness which passes before an animal's breast and which is supported from a strap across the neck immediately before the withers.

**strap, n.** That part of a harness which supports the end of the neck yoke.

**yoke, n.** That part of a wagon gear which is suspended from the team's collars and which supports the forward end of the pole. More commonly known as "neck" yoke. The term "breast yoke" doubtless originates from the fact that the yoke works before the animals' breasts.

**brindle, a.** Marked with streaks of (usually) black and brown, although often used in reference to a similar arrangement of other colors.

**brisket, n.** That portion of an animal's breast next to the ribs. The term applies only to cattle.

**broncho, n.** A half-tamed animal, applicable alike to horses, mules, burros and cattle. (Sp.: *broncho*, rough, sturdy, wild.) Pro. *brong'-ko*. Com. all parts W. Cf. MUSTANG.

*a.* Wild, rough, uncouth. Col. all parts W.

**broom tail, n.** An undersized or poorly developed pony. Col. SW.

**broomy, n.** See above.

**brow band, n.** That part of a bridle or halter which passes before and at the base of an animal's ears.

**browse, n.** The leaves and twigs of brush. Pro. *browce*.

*v.* To eat browse. Pro. *browze*.

**buck, n.** (1) An uncastrated goat. Also frequently used in reference to an uncastrated sheep. Col. AS.

(2) An Indian (male). Col. W.

*v.* (1) To cut a tree stem into log lengths.

(2) The action of an animal in attempting to unseat the rider by means of a series of sudden, irregular jumps.

**buckaroo, n.** Vaquero (*q.v.*). Pro. *buck-a-roo'*, or *buck-kay'-roe*. Col. SW.

**bucks, n.** (1) One who cuts tree stems into log lengths.

(2) An animal that bucks.

**buck-rim, n.** An obsolescent style of cantle. It differs from a bound cantle in having the rear side of its edge fitted with a

rim sometimes 2 inches wide and set at right angles to it. The term probably originates from the rim's frequent utilization as a handhold when an animal pitches or bucks.

**bug, n.** An improvised lantern made by fastening a candle in a tin can and fitting the latter with a wire bail or handle. Com. all parts W. Also col. same section for "lantern."

**bugs, n.** Col. all parts W. for "screw worms."

"To have the bugs": to be tubercular. Col. all parts W. Com. SW.

**bulge, n.** The outward swell at either side of a saddle fork.

**bull, n.** An uncastrated male of the ox kind.

*v.* A common term used among stockmen in reference to a cow's desire to copulate.

**bulldog, v.** A very rough and more or less dangerous form of amusement practiced by cattlemen and expert horsemen of the West. The bulldogger leaves the saddle at the moment his mount carries him alongside a steer, alights with his body on the steer's neck or on its head between the horns, seizes a horn in either hand, and then throws the steer either by sheer brute strength or else by twisting its head to one side and holding it there till the steer becomes exhausted and falls.

**bunk, n.** (1) A bedstead usually built against and attached to a wall.

(2) The bolster of a log wagon.

**block:** The block attached to either end of a bolster to prevent logs from rolling off.

**house:** A house used as sleeping-quarters.

*v.* To sleep in a bunk.

**butte, n.** A prominent peak. (French: *butte*, a target, a landmark.) Pro. *beaut*, as in beauty. Com. W.

## C

**cabin, n.** A small building. Col. S. Cf. SHACK.

**cabresto, n.** A hair rope. (Sp.: *cabresto*, a hair rope.) Pro. *cah-vrase'-toe*. Col. SW.

**cache, n.** (1) A secreted place in which articles may be temporarily stored or hidden. Pro. *cash*.

(2) The articles stored or hidden in a cache. Com. SW. and parts W.

*v.* To hide or temporarily store articles.

**calico, n. or a.** See PINTO.

**calve, v.** To give birth to a calf.

**camino, n.** A road. (Sp.: *camino*, a road.) Pro. *cah-me'-no*. Col. and com. SW.



**cannon, n.** That part of an animal's leg between the knee and pastern.

**cañon, n.** Col. W. for a deep hollow or ravine. (Sp.: *cañon*, a hollow.) Pro. can'-yon.

**canthook, n.** A tool used in logging. Cf. PEAVY.

**cantinas, n.** The leather bags supplied field men for use in carrying papers, blank forms, stationery, etc. (Sp.: *cantinas*, cellar, canteen.) Pro. can-teen'-as.

**canter, n.** A slow gallop.

*v.* To travel at a slow gallop.

**cantle, n.** The upright rear portion of a saddle-seat.

**cap, n.** (1) A small tube closed at one end and loaded with a combustible explosive substance, used in detonating dynamite.

(2) The surface of a road or trail bed. In this case the word "cap" refers to the material used rather than to the surface presented to travel. Cf. TREAD (4).

**cast, v.** To throw an animal to the ground and hold it there by means of ropes.

**cavallo, n.** Col. SW. for horse. (Sp.: *cavallo* or *caballo*, a horse.) Pro. cah-wah'-yo.

**cayuse, n.** Col. W. and SW. for horse. The cayuse proper is a species of small inbred pony originated by the Cayuse Indians. Pro. ki'-use or ki-use'-y.

**center fire, n.** Col. all parts W. for a single cinch rigged saddle.

**chafe, n.** A leather guard attached to a cinch ring to prevent injuries to an animal's side.

*v.* To make sore by rubbing.

**chap, v.** To whip with a pair of chaparejos or a heavy belt. A rough form of amusement or punishment indulged in in most parts W. when a "tenderfoot" is to be initiated or an offender punished. Pro. shap.

**chaparejos, n.** Seatless leather or canvas trousers or leggings worn as a protection against brush. (Sp.: *chaparejos*, leather trousers.) Pro. chop-ah-ray'-hos. Com. all parts W.

**chaps, n.** Chaparejos. Col. all parts W. Pro. shaps.

**chestnut, n.** (1) The tough, horny protuberance appearing above the knees and below the hocks at the inner sides of the legs of horses, mules, and burros. A smaller chestnut is found at the rear of the pastern and is surrounded by the fetlock.

(2) A chestnut-colored animal.

*a.* Of a dark bay color.

**chink, n.** A Chinaman. Col. all parts W.

*v.* To fill the crevices of a wall with mud or other material.

**chinking, n.** The material used in filling the crevices of a wall.

**chock, n.** A log, stone, or similar article placed beneath a wheel to prevent it from revolving.

*v.* To place an obstruction beneath a wheel.

**block, n.** The obstruction used to prevent a wheel from revolving.

**choker, n.** A link made larger at one end than at the other. It is usually the end link of a chain and is used in lieu of a hook. Other links pass freely through the wide end, but are held securely when dropped edgewise into the narrow end. Sometimes known as a "choke hook."

**cholla, n.** A genus of herbaceous plants indigenous to SW. and some parts of W. It bears a tall, woody central stalk springing from a low clump of tough, pointed leaves, and is variously known as yucca, mescal, century plant, agave and American aloe. (Sp.: *cholla*, skull, judgment.) Pro. choy'-yah.

**chops, n.** Coarsely ground corn.

**chuck, n.** (1) An instrument used for holding a tool so it may be rotated.

(2) Food, provisions. Col. all parts W.

*v.* To throw the rider. Col. W.

**ribs, n.** The first ribs back of the shoulders. Applies to cattle.

**steak, n.** The steak immediately over the chuck ribs.

**wagon, n.** The wagon used in transporting food, bedding, and other supplies on a "cow works."

**churn drill, n.** A long drill for use by two men in drilling stone.

*v.* To operate a churn drill

**cinch, n.** A saddle girth. (Sp.: *cincha*, a band, a fastening).

*v.* To make a saddle girth fast.

**clip, n.** (1) The hook at the end of a single-tree into which the tug or trace is fastened.

(2) The amount of wool or mohair taken from a band of sheep or goats in one season. Com. among sheep and goat raisers.

*v.* (1) To shear an animal's hair or wool close to the body.

(2) To shear sheep or goats.

(3) To remove the tuft of hair, or fetlock, at an animal's pastern.

**cockeye, n.** The eye at the end of a tug or trace through which the single-tree clip passes.

**comb, n.** The peak of a roof.

**concha, n.** A metal or leather button. (Sp.: *concha*, a silver shell.) Pro. cont'-shah.

**cord, n.** A measure of wood 8 feet long, 4 feet high, and 4 feet wide.

*v.* To arrange wood symmetrically for measurement.

**cork, v.** To injure one hoof by a blow from the shoe on the opposite hoof. Cf. INTERFERE, FORGE, and OVERREACH. Col. among horsemen for "calk."

**coronet, n.** That part of an animal's leg at the junction of the hair and hoof and from which the hoof grows.

**corral, n.** A small enclosure in which to confine stock. (Sp.: *corral*, enclosure, yard, playhouse.) Pro. ko-rel'. Com. all parts W. Cf. Lot.

v. To enclose stock in a corral.

See TRAP CORRAL.

**coupling-pole, n.** See REACH.

**cow outfit, n.** A cattle ranch.

**works, n.** The operations involved in rounding up and branding cattle.

**cows, n.** A general term used by stockmen, particularly in all parts W., in reference to cattle regardless of age or sex.

**coyote, n.** A small species of wolf. (Mexican: *coyotl*, a sneak.) Pro. ki'-yote or ki-yo'-te.

**crab, n.** A geared machine used in raising or erecting heavy weights. It is operated by means of one or two cranks, the loose end of the intake cable running from the drum to a snub-post.

**cramp, v.** To turn the front wheels of a vehicle out of line with the rear wheels to facilitate turning the vehicle by backing it.

**crib, n.** A pen used for the confinement of stone which is to serve as piers.

v. To gnaw, bite, or suck posts, poles, trees, mangers, etc. The term applies usually to horses only.

**cribber, n.** An animal addicted to cribbing.

**crimp, n.** The crease which binds a cap to the fuse.

v. To compress the open end of a cap about the fuse.

**crosscut, n.** An opening running at about right angles to a mine tunnel.

v. To run a cut out at one side of a tunnel.

**saw, n.** A saw having teeth so constructed as to cut across the grain of a timber.

**saw (two-man), n.** A crosscut saw fitted with a handle at either end and designed for use by two men.

**crow bar, n.** A heavy iron bar beveled on two sides of the point and used in moving heavy weights. Cf. PINCH BAR.

**crown, n.** (1) The top of a tree.

(2) That part of a bridle, hackamore or halter which passes upward over an animal's head back of the ears.

(3) The upper surface of an animal's tooth.

**fire, n.** A fire occurring in the tops or crowns of timber. Com. NW.

**crutch, n.** (1) A pole or other timber inserted in a wheel in such a way that the wheel's strength is maintained after the dish has been lost.

**crutch, (n)** (2) A pole placed under the end of an axle and supported from the bed in such a way that the wagon may be moved by sliding: used when a wheel has been broken down.

**curb strap, n.** The strap which passes from one bit ring to the other beneath an animal's jaws. Used as a means of better control.

**cut, n.** (1) A trench made through high ground in order to maintain a uniform grade.

(2) A piece of meat or a steak.

*v.* (1) To separate certain stock from a herd.

(2) To castrate.

## D

**dally, n.** The turn of a rope about a saddle-horn.

*v.* To take several turns of a rope about a saddle-horn in such a way that slack may be taken up or paid out quickly if necessary.

**dewlap, n.** (1) The pendulous skin along the under side of a cow's neck.

(2) An identification mark.

*v.* To make an incision in the dewlap for purposes of identification.

**diangling, a. or adv.** Diagonally. Col. S. and SE.

**dike, n.** A line of rock projecting above the surface of the ground.

**dish, n.** In an upright wheel, the difference in distance horizontally between the outer spoke surfaces at the hub and the outer edge of the rim.

*facd, a.* With a noticeably sunken profile.

**dobe, n.** Adobe. Col. SW. See ADOBE.

**dock, v.** To cut away a portion of an animal's tail. The operation is frequently performed on lambs at the time they are castrated and marked. In some sections the meaning of the term is restricted to removal of the hair only, and may also be known as "bobbing."

**doe, n.** A ewe (*q.v.*). Col. SW.

**dogey, n.** A motherless young calf. Usually applied to one that has lost its mother through death. Cf. MAVERICK. Pro. doe'-gay. Col. W.

**double-jack, n.** A sledge requiring the use of both hands in drilling stone.

*v.* To drill stone, one man holding the drill, the other striking.

**tree, n.** That part of a wagon gear to which the single-trees are attached. Cf. EVENER.

**drench, n.** A quantity of liquid medicine to be given an animal.

*v.* To administer liquid medicine to an animal.

**drift, n.** (1) See CROSSCUT.

(2) A herd's gradual movement to a new range or location.

**v.** (1) To move gradually to a new range or location.

(2) To depart hurriedly and continue a journey. Col. W.

**fence, n.** A length of fence provided for directing the movements of stock.

**drill, n.** (1) An instrument used in driving holes in stone.

(2) An augur used in boring holes in either wood or metal.

**v.** Col. most parts W., meaning to depart.

**drop, v.** To give birth to a calf. Thus a calf is said to be "dropped" or "calved" rather than born. Cf. CALVE.

**dugout, n.** (1) An excavation made in the side of a hill and used as a room.

(2) A water-trough made by hewing out the inside of a log.

**dump, n.** The accumulation of refuse material at the mouth of a tunnel or shaft.

**v.** To throw the rider. Col. AS.

**dutchman, n.** A plank nailed to a tree for the purpose of serving as a support for barbed or other wires, but designed primarily as a means of preventing the wire from being imbedded in subsequent growth of the tree.

## E

**earmark, n.** An incision made in an animal's ear for purposes of identification.

**v.** To make an incision in an animal's ear.

**end gate, n.** The upright board forming the end of a wagon bed or box. Usually known as "head" gate, front, and "tail" gate or "tail board," rear.

**epidemic, n.** A disease attacking great numbers simultaneously.

**evener, n.** See DOUBLE-TREE.

**ewe, n.** A female sheep. See DOE.

**eye splice, n.** A loop made in a rope by splicing one end of the rope back into itself.

## F

**fell, v.** To cut down a tree. Also spelled "fall," this term being col. N. and S. woods.

**feller, n.** One who fells trees. Generally called "faller."

**felloe, n.** A section of the rim of a wagon wheel. Frequently called "felly" and "feller."

**fender, n.** The broad leather between the rider's leg and the animal body, attached to the stirrup strap.

**fetlock, n.** The tuft of hair at an animal's pastern joint.

- filly, n.** A young mare. Usually applied to a mare up to the birth of her first colt.
- fire brand, n.** (1) A brand made by burning.  
(2) A piece of burning material.
- fistula, n.** An abscess having tubes or pipes leading to an internal cavity. Frequently, though improperly, called "fistulo."
- flag, n.** The pole used by a surveyor to indicate where a line is to be run.  
*v.* (1) To set a flag pole.  
(2) To stop a runaway horse or team. Col. W.
- flake, n.** One of the loose sections of a bale of hay. These may vary in number in a bale from two to a dozen or more, depending upon the length and tangle of the grass stems. It is, therefore, misleading to say that one flake or two flakes or any other number of flakes should be sufficient hay for one feed.
- foal, n.** A very young colt.  
*v.* To give birth to a colt. Thus a colt is said to be "foaled" (improperly called "foalded") rather than born.
- fool killer, n.** A broken branch left hanging in the top of a tree. Com. AS. where logging is carried on.
- foretop, n.** That part of an animal's mane which hangs down over the face.
- forge, n.** A specially constructed furnace used by blacksmiths.  
*v.* (1) To make an article of iron.  
(2) An animal's action in striking the heel of the forefoot with the toe of the hind foot in traveling. Cf. OVERREACH.
- frog, n.** The V-shaped ridge on the sole of a horse's hoof.  
*v.* To putter about in an aimless manner. Col. W. The term doubtless originates from the one used in playing the game of Solo or Sluff, wherein a "frog" is the lowest bid that can be made.
- fuse, n.** A slender, flexible tube filled with combustible material, which when ignited conveys a flame to the cap inserted in a dynamite cartridge.

## G

- gag runner, n.** The iron loop through which the check rein passes at or near the upper end of the bridle cheek.
- gall, n.** (1) An abrasion caused by friction of a saddle or harness.  
(2) A knot-like growth on leaves, twigs, and branches of trees.  
*v.* To abrade an animal's skin with an improperly fitting saddle or harness.
- gallows frame, n.** A structure erected over the mouth of a shaft to facilitate hoisting.

- gambrel, n.** A stick used by butchers to keep the legs of a carcass spread well apart during the operation of cleaning or washing. The ends are sharpened and are thrust into the legs between the bone and the ham string, and in addition to spreading the legs the gambrel may also be used as a means of support for the carcass.
- gather, n.** The difference in distance between the front rim edges of the same pair of wheels as compared with the distance between the rear rim edges.
- v.** (1) To assemble stock in a herd.  
(2) To harvest. Col. S. and SE.
- gear, n.** (1) The framework of a wagon exclusive of the bed or box.  
(2) Harness. Col. S. and SE.
- gee, n.** A word of command used by teamsters to turn a team to the right.
- gelding, n.** A castrated horse.
- gilt, n.** A young sow. Commonly applied to one up to the birth of her first litter of pigs.
- gin poles, n.** Poles used in erecting heavy timbers or beams.
- glut, n.** A large wooden wedge used in opening timbers after they have been partly split open with smaller iron wedges.
- goose neck, n.** An iron hook fitted to the forward end of a wagon pole and provided as a means of attaching other teams to the pole. The term is also applied to the hook which connects the pole with an ox yoke.
- grain rope, n.** The rope used in tying sacks of grain or other bulky articles to a pack saddle.
- Greaser, n.** A Mexican. Col. all parts W.
- Greener, n.** A tenderfoot (*q.v.*). Col. all parts W.
- ground fire, n.** A fire occurring in peaty ground. Com. NE.
- grout, n.** Concrete made very thin in order to facilitate pouring and settling in narrow forms.

## H

- hackamore, n.** A halter-like article used in breaking or controlling horses. See JAQUIMA.
- hair brand, n.** An indistinct brand resulting from insufficient heat or pressure of the iron at the time the brand is applied. Occasionally used in reference to a tar or paint brand, and frequently in referring to characters burned or clipped in an animal's hair or wool.
- ham string, n.** The large tendon which connects with the point of the hock in an animal's leg.
- v.** To make lame by cutting or otherwise injuring the ham string.

**haw, n.** A word of command used by teamsters to turn a team to the left.

**headstall, n.** Halter; the leather part of a bridle.

**heifer, n.** A young cow. Commonly applied to one up to the birth of her first calf.

**herd, n.** A number of animals grouped together or owned by one person.

*v.* (1) To confine stock to one place when no fences are available.

(2) The action of other persons in preventing a pitching animal from colliding with posts, trees, etc., where a sudden stop might injure either it or the rider or both. Col. W.

**hill billy, n.** A mountaineer. Col. S. and SE. Cf. RIDGE RUNNER.

**hip, v.** To injure an animal's hip.

**hipped, a.** Having one or both hips injured.

**hobble, n.** Any article used in tying an animal's legs together to prevent straying. Frequently spelled "hopple."

*v.* (1) To tie an animal's legs together.

(2) To tie the stirrups together beneath an animal's body. A common practice among horsemen when a saddle animal is expected to pitch vigorously. Having the stirrups fastened in this manner provides increased facilities for retaining the seat.

**honda, n.** The eye in the end of a rope. (Sp.: *honda*, a sling.) Pro. hon'-doo.

**horse camp, n.** Winter quarters for horses used in handling cattle. In charge of a "wrangler" (*q.v.*).

**hounds, n.** The parts of a wagon gear which brace the axles on the pole and reach. Sometimes spelled "hauns" and "hawns."

**housewife, n.** A cloth or leather receptacle for sundries used in repairing clothes.

## I

**interfere, v.** To strike the ankle or pastern joint of one leg with the hoof or shoe of the opposite leg. Cf. CORK and FORGE.

**iron, n.** The abbreviated form of "branding-iron." Com. all parts W.

## J

**Jacob's staff, n.** The iron-shod wooden pole used as a support for a compass. Also known as Jake staff, Jake rod, Jake stick, Jake pole, Jim rod, Jim pole and joy stick.

**jaquima, n.** An Indian word from which the word "hackamore" is derived. Pro. yak'-i-mah.



**jerk, v.** To dry thin strips of meat in the sun.

**jerk line, n.** A single line used in guiding a team. Customarily one steady pull turns the team to the right and three short jerks turn it to the left. It is commonly used in teams of four or more animals and is attached to the near bit ring of the near lead horse. Other animals in the team are trained to follow the lead pair.

**jerky, n.** Sun-dried meat. Com. SW.

**jockey, n.** The leather which forms the side of a saddle seat immediately over the fender.

**box, n.** A tool box built against an end gate.

**stick, n.** A stick used in lieu of a halter rope and designed to keep a vicious animal at a distance from the attendant.

**jump weld, n.** The attachment of the end of one iron at right angles to and against the side of another.

**June 11, n.** A homestead entered in a National Forest under the Act of June 11, 1906. Col. among Forest officers.

## K

**kak, n.** A saddle. Sometimes used in reference to a very old horse. Col. SW.

**kayak, n.** A box frame covered with rawhide and used in packing loose articles. Also spelled "kaiak" and "kyack." Pro. ki'-ack. Plural, kyax.

**keel, n.** Lumbermen's designation of marking crayon.

**kerf, n.** The opening resulting from a saw's passage through a timber. Commonly expressed in fractions of an inch.

**kid, n.** A young goat.

**v.** To give birth to a kid. The young is "kidded" or "dropped" rather than born.

**king bolt, n.** The bolt which connects the forward end of the reach with the front axle.

## L

**lamb, n.** A young sheep.

**v.** To give birth to a lamb. The young is "lambled" or "dropped" rather than born, and the ewe is said to "lamb" rather than to give birth to young.

**lariat, n.** A noosed rope used in catching stock. (Sp.: *la reata*, a rawhide rope used in tying animals together.) Pro. lary-et'. Cf. REATA.

**v.** To catch stock with a noosed rope.

**lash rope, n.** The rope used in tying the top pack to the grain pack or pack saddle.

- lasso, n.** A noosed rope used in catching stock. (Sp.: *lazo*, a noose.)  
*v.* To catch stock with a noosed rope. Col. W., "lass."
- latigo, n.** The leather strap which connects the cinch with the rig of a saddle. (Sp.: *latigar*, to lash or make fast.)
- lead, n.** The left, or near, side of a horse, wagon, etc. Pro. leed.  
**horse, n.** The near horse in a team. Also a horse that is to be led.  
*side, n.* The left, or near, side of an animal or team.  
*team, n.* The foremost animals in a team of four or more.
- lean, a.** Applied to mortar carrying a minimum amount of lime or cement.
- lean-to, n.** A shed or side room. Col. S. and some parts W.
- lepe, n.** A motherless calf. (Sp.: *lepe*, a motherless calf.) Pro. lep'-py. Col. SW. Cf. DOGEY.
- light, v.** To dismount. Col. S. and SE.
- lightered, n.** Dry pitch pine. Also known as "lightwood," the term probably originating from the quick, bright blaze coming from the burning wood. Col. S. and SE.
- lobo, n.** A species of wolf that runs or hunts alone. (Sp.: *lobo*, a wolf.) Pro. loe'-boe. Also known as "loafer" wolf.
- loco, n.** A poisonous range plant. (Sp.: *loco*, mad, crazy.)  
*a.* Crazy. Col. W.  
*v.* To drive frantic. Col. W.
- lode, n.** A vein containing metallic ore. Pro. load.
- logey, a.** Dull, tired, listless. Applied to a wornout horse. Col. W. Pro. loe'-gay.
- log scale, n.** (1) A rule or scale which shows the contents of a log in board feet.  
 (2) The number of board feet contained in all the logs taken from a certain area or sawed at a certain time. Cf. MILL RUN.
- lot, n.** An enclosure for stock. Col. S. and SE. Cf. CORRAL. Verb. PEN.
- lunger, n.** Col. W., especially SW., for a person suffering from pulmonary tuberculosis.

## M

- manana, n.** Col. W., especially SW., for a person who continually and habitually procrastinates. (Sp.: *mañana*, tomorrow.) Pro. man-yan'-ah.
- marking-hatchet, n.** A light ax bearing the raised letters US on the poll and used by Forest officers in marking timber. Also known as "branding-hatchet," and "marking-ax."
- marlin-spike, n.** A sharp-pointed instrument used in separating the strands of a rope.

**mash, n.** A thick mixture of bran and water.

**mattock, n.** A double bitted tool used in loosening and moving earth. One bit is in line with the handle, the other at right angles to it.

**maul, n.** A heavy wooden mallet or hammer. It differs from a beetle in having the head and handle in one piece and in line lengthwise with each other. Cf. BEETLE.

**maverick, n.** An unbranded calf. Usually applied to one that has left its mother after being weaned. The term is said to have originated in Texas, where one Maverick, observing that other stock raisers branded their animals, concluded the most distinctive evidence of ownership that he could use would be the absence of any brand whatever on his stock. He accordingly claimed all unbranded stock.

**mecate, n.** A hemp rope. (Sp.: *mecate*, a hemp rope.) Col. SW. Pro. may-cot'-ay.

**mesa, n.** A high plateau or flat-topped peak. (Sp.: *mesa*, a table.) Com. W. Pro. may'-sah.

**mill, n.** (1) An establishment where ore is crushed or refined or lumber is sawed or dressed.

(2) The result of a herd of frightened horses or cattle swimming frantically about in a circle, each trying to escape from the water by climbing upon another's back. Com. all parts W.

**v.** (1) To crush and refine ore.

(2) To swim frantically about in a circle. Sometimes used in reference to the restless and uneasy movements of a herd on land. Also applied to a throng of people who continually move about. Col. W.

**run, n.** The number of board feet of lumber actually sawed out regardless of the amount indicated by a log scale.

**monument, n.** A pile of stone set up to mark a line or corner of land.

**morral, n.** A feed bag designed to be suspended from an animal's head. (Sp.: *morral*, a feed bag.) Pro. mo-rel'. Com. all parts W.

**muck, n.** Mud and refuse material from a mine.

**v.** To loosen and remove muck.

**mucker, n.** One who removes muck.

**mud, n.** An injection used by drillers to indicate that for some reason striking must be temporarily suspended.

Also Col. AS. for "mortar."

**muley, n.** A naturally hornless individual of any horn-bearing species. Also applied to a McClellan saddle or any other saddle not fitted with a horn.

**muley, a.** Without horns. The term can not be applied to an animal that has been dehorned.

**mustang, n.** See BRONCHO. (Sp.: *mesteno*, wild.)

## N

**nanny, n.** A ewe. Col. among sheep and goat raisers. Usually applied to a female goat.

**near side, n.** An animal's left side. See LEAD SIDE.

**neat, a.** Applied to mortar having only lime or cement for the body.

**neck yoke, n.** See BREAST YOKE. In reference to the term as applied to work with oxen, the word "neck" is usually omitted and "ox" is frequently, though not always, substituted.

**nester, n.** A settler, usually a homesteader. Col. W.

**nigh side, n.** See NEAR SIDE. Col. S. and SE.

## O

**off color, a.** A term applied to stock not colored like others of the herd. Thus, a black cow in a herd of Herefords would be called "off color," and in most instances would not sell for as high a price as the Herefords, although the latter might not be as large or in as good condition.

**off side, n.** An animal's right side.

**orejano, -a, n.** A maverick, male or female, respectively. (Sp.: *orejano*, -a, unclaimed.) Col. SW. Pro. ory-han'ay.

**outlaw, n.** A term applied to a horse too wild or vicious to be ridden or worked. Also applied to other animals that have never been branded, or having been branded have never received any further attention from their owners, and have been allowed to run wild.

**overreach, v.** To place the hind foot at a point on the ground in advance of where the fore foot was set. Improperly called "forging." Cf. INTERFERE.

## P

**pacer, n.** An animal that moves both legs of the same side simultaneously.

**paint brand, n.** See TAR BRAND.

**paling, n.** See PICKET. Col. S.

**pannier, n.** A leather or canvas bag used in packing. Cf. KAYAK.

**peavy, n.** A tool used in moving logs. It differs from a canthook in having the lower end armed with a pike instead of a lip.

**picket, n.** One of the upright pieces in a fence made of sharpened stakes or scantlings.

**v.** To tie an animal to a picket pin.

**pin, n.** An iron stake to be used in lieu of a post and to which a grazing animal may be tied.

**rope, n.** The rope by which an animal is tied to a picket pin.

**piebald, n. or a.** See PINTO.

**pinch bar, n.** A heavy iron bar beveled on one side of the point and used in moving or raising heavy weights. Cf. **CROW BAR**.

**pinto, n.** A spotted pony. Also known W. and SW. as piebald, calico, paint, and speckled. (Sp.: *pinto*, spotted.)

**pitch, n.** (1) The degree of slope of a roof.

(2) The difference in distance between the lower rim edges of the same pair of wheels as compared with the distance between the upper rim edges. Frequently known as "tread" or "set."

(3) A name applied to the sap of a pine tree.

**v.** A horse's action in trying to unseat its rider. Pitching differs from bucking in being more vigorous and irregular, and action is prolonged to a greater degree.

**placer, n.** The short term for "placer claim" or "placer mine." Nearly all such claims or mines are located on gold-bearing streams, where gold-dust may be separated from the earth by "panning," an operation in which a flat, shallow pan is filled with earth and water and then shaken vigorously. The water is allowed to spill gradually and takes the refuse material with it, the gold settling to the bottom of the pan. Another method is to perform a similar operation by means of an apparatus known as a "rocker." Still another method of securing the gold is to throw the gold-bearing earth into a "flume," through which water flows swiftly. Bars or "rifles" across the bottom of the flume catch the gold as it settles. Pro. "plaser," as in plaster.

**point, n.** A prominent peak or landmark. Col. S. Cf. **BUTTE**.

**v.** (1) To mark an animal's ear with both an over- and an under-slope, thus leaving it pointed.

(2) To ride ahead of a herd of cattle being moved and thus supply them with an object to follow.

**pole, n.** A wagon tongue.

**strap, n.** The strap of a harness which connects the breast yoke of the wagon gear with the belly band or breeching of the harness.

**poll, n.** The head of an animal or tool.

**pommel, n.** The highest part of a saddle immediately before the seat.

**slicker, n.** A water-proof coat having very long, wide skirts designed to protect both the rider and the saddle from rain.

**poncho, n.** A sleeveless, water-proof garment with a hole at the center, through which the wearer's head is thrust. (Sp.: *poncho*, lazy.) (Col. Sp.: *poncho*, a sleeveless garment.) Com. W. Pro. *pont'-cho*.

**port, n.** The arch in the bar of a bridle bit.

**pull, n.** The distance, on the ground, between a telephone pole and the point where it should be set to be in direct line with the first pole at either side of it.

**v.** To pull leather: to seize some part of the saddle with one or both hands when an animal pitches.

**puncher, n.** One who works with cattle. Col. all parts W. The term originates from the practice of prodding cattle that persist in lying down while being shipped by rail or boat.

**puncture, n.** A small hole resulting from the entrance of a nail, wire or similar article in a horse's hoof.

## Q

**quarter corner, n.** A corner set approximately half-way between section corners on the same line.

**crack, n.** A perpendicular crack in an animal's hoof.

**quartering, a.** Diagonally.

**quirt, n.** A short riding-whip of sewn or plaited leather. (Sp.: *cuerda*, a rope.)

**quitter, n.** A balky animal.

**quittor, n.** An abscess at the coronet.

## R

**racker, n.** An animal that travels in a manner between that of a trot and a gallop.

**rake, n.** The distance from the vertical to which a telephone pole inclines outward when set in a curve. Designed to offset the extra strain imposed by pull (*q.v.*).

**ram, n.** An uncastrated sheep.

**v.** To tamp concrete.

**ranch, n.** Either a stock- or grain-farm of any size. Contrary to a general belief of persons from the East, a ranch may consist of no more than two or three acres, or may even include no more than a fraction of one acre. (Sp.: *ranch*o, a stock farm.)

**v.** To operate a ranch.

**ranchero, n.** A stock raiser or a farmer. (Sp.: *ranchero*, one who conducts the business of a ranch.) Pro. ranch-er-roo' or ran-chay'-roe.

**range, n.** (1) The strip of land lying between north-and-south lines located approximately 6 miles apart. Such a strip of land is described as being east or west of a given meridian.

(2) The area upon which stock grazes.

(3) The forage secured from a range by stock.

**v.** To graze stock on a certain area

raster, *n.* See ARRASTRA.

*v.* To crush ore in an arrastra.

rattler, *n.* See ROARER. Also the abbreviated form for "rattlesnake."

reach, *n.* (1) The pole which connects the front and rear axle of a wagon.

(2) The distance an animal steps in traveling.

plate, *n.* An iron plate connecting the forward ends of the rear hounds in a wagon gear and securing them to the reach.

reata, *n.* A rope, usually though not always of rawhide, used in catching stock. (Sp.: *la reata*, a rawhide rope used for tying animals together.) Pro. ray-ah'-tah. Com. W. and SW.

remuda, *n.* A reserve herd of mounts. (Sp.: *remuda*, exchange; a change of shift when stock is being held in herd.) Pro. ray-moo'tha. Com. SW.

renegade, *n.* See OUTLAW.

rich, *a.* Applied to mortar carrying a large amount of lime or cement.

rick, *n.* (1) A measure of wood 8 feet long, 4 feet wide, and of the same width as the length of the sticks. Cf. CORD.

(2) A windrow of freshly cut hay. Com. S.

*v.* (1) To pile wood symmetrically for measurement.

(2) To rake hay into long piles preparatory to removal from the field. Col. S.

ride, *n.* A journey by horseback. Com. AS.

*v.* To work with cattle or other stock.

ridge runner, *n.* A mountaineer. Col. SW.

rig, *n.* That part of a saddle to which the cinches are attached.

rim, *n.* (1) The edge of a mesa. Com. W.

(2) That part of a carriage wheel which corresponds to the felloes of a wagon wheel. It differs from the latter in carrying half the number of the spokes in a wheel while a felloe carries only two spokes.

fire, *n.* Applied to a single cinch rigged saddle.

rise, *n.* (1) The perpendicular distance between the plates and the comb of a roof.

(2) A gentle slope. Col. S.

rive, *v.* To split out boards, shakes or palings.

roach, *v.* To trim an animal's mane or tail. Usually applied to mules.

roan, *n.* A roan-colored animal.

*a.* Of a mixed color, consisting usually of white or gray spots in bay.

roarer, *n.* An animal that breathes in an audible manner as the result of a throat affection.

- rodeo, n.** See **ROUNDUP**. (Sp.: *rodear*, to go a roundabout way.)  
 Pro. ro-day'-o or ro-day'-er. Com. NW., W. and SW.
- roll, n.** A stuffed leather pad used by riders to prevent injury against the saddle fork or horn.
- rope, n. and v.** See **LASSO**.
- burn, n.** An injury inflicted on an animal's leg by the sliding motion of a rope drawn swiftly and violently against it.
- rosette, n.** An ornamental button used on saddles and harness.  
 It differs from a concha usually in having a loop at the back instead of eyes through the center for the passage of thongs or straps.
- roughage, n.** Grass, hay, fodder, etc. Com. W.
- roughness, n.** See above. Com. S. and SE.
- roundup, n.** The assembling of all or a part of the stock on one range.
- v.** To assemble stock.
- rowel, n.** The spiked wheel of a spur, or the roller in a bit.
- v.** To spur an animal vigorously.
- rub iron, n.** An iron plate attached to the lower corner of a wagon bed for protection of the bed when the fore wheel is cramped under it.
- run, n.** (1) The horizontal distance between the plate and the comb of a roof.  
 (2) The amount of ore milled or lumber sawed at one time.  
 (3) The country covered in a day's cruise. Col. among reconnaissance men.
- v.** (1) To gallop at a high rate of speed.  
 (2) To run an iron: To own, lease or otherwise handle the stock bearing that brand.  
 (3) To run a brand: To change it by superimposing another upon it.
- running iron, n.** A straight iron rod used in tracing brands.

## S

- safety belt, n.** A heavy leather belt used by telephone linemen.
- strap, n.** A heavy leather strap used by telephone linemen in securing themselves to a pole when the desired height has been reached.
- sag, n.** The distance below the horizontal to which a telephone wire is allowed to hang at or near the center of the span.
- scantling, n.** A thin, narrow strip of lumber. The term usually applies to pieces of odd lengths, uneven edges and other irregular surfaces.
- scissor bill, n.** A mountaineer. Com. S. and SE. Cf. **HILL BILLY**.



**scratch, v.** To draw the spurs along an animal's sides from its neck or shoulders to its flanks or thighs, thus inducing it to pitch more vigorously.

**screw bug, n.** See SCREW WORM. Col. all parts W.

**worm, n.** The larval stage of a fly (*Comptosmyia macelleria*) which attacks open sores and wounds.

**set, n.** (1) The cutting thickness of a saw.

(2) See Pitch (2).

(3) A corruption of "site." Thus, a good "set," instead of a good "site," is frequently used in reference to the location of a sawmill, and may include such features as the contour of the ground, the amount of timber available, and all other factors which help to make the site desirable.

**shack, n.** A small building. Com. W. Cf. CABIN.

**shake, n.** (1) A flat piece of split timber used as a shingle.

(2) The chill caused by ague. Col. S.

**v.** To shiver with ague. Col. S.

**shank, n.** (1) That part of an animal's leg between the knee and the foot; usually applies to cattle. Cf. CANNON.

(2) That part of a tool which connects the handle with the acting part.

**shear, n.** One of a pair of gin poles.

**v.** To cut or clip away wool or mohair of sheep or goats.

**sheave, n.** The wheel of a pulley. Also known as "shive" and "shiv."

**shim, n.** A thin wedge used to align a plank.

**v.** To align a plank by means of a thin wedge.

**sill, n.** The lowest timber in the frame of a building.

**silla, n.** Col. SW. for saddle. (Sp.: *silla*, chair or seat.) Pro. see'-yah.

**single-footer, n.** An animal that raises only one foot at a time in traveling.

**jack, n.** A sledge hammer for use in one hand in drilling.

**tree, n.** That part of a wagon gear to which the traces are hooked. Frequently known as "whiffle" tree, and improperly called "swingle" tree.

**sitfast, n.** A corn-like growth caused in an animal's back by constant pressure.

**skein, n.** The iron covering at the end of an axle and upon which the wheel revolves.

**skew back, a.** Having a slight downward curvature along the back. Applies to hand saws. Cf. SWAY BACK.

**slavers, n.** Excessive secretions of saliva. Also spelled "slabbers" and "slobbers."

**sleeper, n.** A horizontal supporting timber of a floor or ceiling; usually applied to the first. Cf. STRINGER.

**v.** To change a lightly burned brand by burning a heavier one over some portion of it.

**sleeve, n.** (1) That part of a carpenter's brace which covers the chucks.

(2) Part of a wagon skein.

(3) A double tube used in splicing copper telephone wire.

**slicker, n.** A water-proof garment with narrow skirts. Cf. POMMEL SLICKER.

**slough, v.** To peel away, as dead skin. Pro. sluff.

**snub, n.** The turn of a rope about a snub-post.

**v.** To take a number of turns about a post in such a way that the rope may be released quickly.

**post, n.** The post to which a rope is snubbed.

**sombrero, n.** A hat, usually of the wide-brimmed felt variety. (Sp.: *sombra*, shade.) Pro. som-bray'-ro. Col. W., "sombo."

**sorrel, n.** A sorrel-colored animal.

**a.** Of a light bay color.

**spade, n.** An inverted V-shaped attachment placed on the bar of a bit designed for the control of vicious animals.

**span, n.** (1) A team of two animals; usually applied to mares or mules.

(2) The length of a telephone wire between two poles.

(3) The distance between two supports of a bridge.

**spay, v.** To remove the ovaries.

**spike, n.** The foremost animal in a team having an odd horse in the lead.

**team, n.** A team with an extra animal in the lead.

**spile, n.** A length of sumac, elder, or similar wood with the pith removed. It is inserted in a hole bored in a tree and serves as a spout by which sap may be carried to a bucket. Com. all parts E.

**spill, n.** A rolled or twisted paper used in lieu of a match after being ignited at an open fire. Com. S. and SE.

**v.** To throw the rider. Col. all parts W.

**splint, n.** (1) An unnatural growth on the bone of a horse's leg and due to a bruise or blow. It seldom appears except on the foreleg and below the knee.

(2) A strip of padded wood or other material used to hold the ends of fractured bones together till they knit.

**spreader, n.** A strap bearing an iron ring through which the check of a line passes. The other end is buckled into a hame staple. The object of a spreader is to provide greater freedom of motion in the use of the check.

**stag, n.** Any male animal castrated after the age of about four years.

**stall, n.** A compartment in a stable for an animal.

*v.* To overload a team or drive them into a place from which they can not extricate the load.

**stampede, n.** A wild rush of excited cattle or horses.

*v.* To frighten cattle or horses till they run wildly, all in the same or different directions.

**stamp iron, n.** A branding iron bearing a certain character at one end.

**stave, n.** One form of the word "stay." Col. S. and SE. See below.

**stay, n.** A short post or paling set loosely in a panel of fence to strengthen it.

*v.* To brace a fence with stays.

**steer, n.** A castrated young male of the ox kind.

**stem, n.** The bole or trunk of a tree.

**straightedge, n.** A plank, usually about 10 feet long, dressed exactly straight along one edge and used by carpenters in leveling and plumbing.

**stretcher, n.** A substitute for a single- or double-tree. A chain provides a means of central attachment and is fitted with hooks or clevises into which cockeyes or other stretchers may be fastened. The ends of the chain are held apart by a stick or rod having each end sharpened with a shoulder and thrust into a link at the desired distance from the end of the chain. Also known in some localities as a "spreader."

**string, n.** (1) A flight of stairs.

(2) A number of extra saddle animals held in reserve for alternate use.

(3) Col. all parts W. for lasso (*q.v.*).

**stringer, n.** A supporting timber of a floor or ceiling; usually applied to the latter. Also applies to the floor timbers of a bridge. Cf. SLEEPER.

**stub, n.** A short post set beside a telephone pole and provided as a means of re-enforcement.

*v.* To brace a telephone pole with a stub.

**stump sucker, n.** See CRIBBER.

**surface fire, n.** A fire occurring in the litter on the surface of the ground. Com. AS.

**measure, n.** The method of computing lumber in units of square feet regardless of the thickness of the planks.

**swab, n.** A slender, flexible stick wrapped with cloth at one end and used in forcing obstructions down a cow's throat.

*v.* To force an obstruction from the throat to the stomach by means of a stick.

**swamp, v.** To clear away brush and other obstructions or debris as in clearing out for a road or trail or telephone line or in logging.

**swamper, n.** One who swamps or "swamps out."

**sway back, a.** Abnormally low in the back. Applied to horses.  
Cf. **SKEW BACK.**

**sweller, n.** An animal that inflates the lungs as the saddle cinch is tightened.

## T

**tail board, n.** See **END GATE.**

**down, v.** To throw an animal by pulling it to one side by the tail.

**gate, n.** See **END GATE.**

**tailings, n.** Refuse material from a mine.

**tally, n.** (1) The number of calves born in a herd in one year. Thus a stock raiser may assume that the number of his entire herd is equal to two, three, or four times the number of calves branded, depending upon whether or not there has been a good "calf crop," and in this way keep a fairly accurate check on the number of cattle he owns. Sales, slaughters, and losses are, of course, deducted from the number thus obtained.

(2) A unit of measure used by surveyors; usually 10 chains.

**tamp, v.** To pack earth or other material about posts, or poles, or over shots by repeated slight strokes of a crow bar or similar tool.

**tamping, n.** The material packed about posts, poles, etc.

**tap, n.** (1) The burr or nut which holds a wagon wheel to the skein.

(2) The abbreviated form of "tapadera" (*q.v.*). Col. all parts W.

**v.** To pierce an animal's side at such a point and in such a manner that internal gases may escape from the paunch. The operation as performed by veterinaries involves the use of a trocar and canula. It is frequently resorted to as a means of relief for cattle suffering from bloat, but is adopted only as a last recourse in cases of horses suffering from colic.

**tapadera, n.** The leather covering of a stirrup. (Sp.: *tapar*, to cover.)

**tar brand, n.** A brand made by smearing tar or paint on an animal's hair or wool. Usually applied to sheep and goats. Also known as "paint" brand.

**tenderfoot, n.** A person unacquainted with Western customs. Col. all parts W.

**thimble, n.** See **SKEIN.**

**thumb, v.** To draw the ends of the thumbs suddenly and simultaneously along both sides of an animal's neck in a forward or diagonally upward direction. This usually induces a half-broken animal to pitch.

**top fire, n.** A fire occurring in the crowns or tops of timber. Also known as "crown" fire. Com. NW.

**pack, n.** Bedding, tents, etc., placed over the grain pack.

**touley, n.** A tourist. Col. SW. A helper about an oil well is known as a "tooley."

**track, n.** The distance, on the ground, from center to center of tires of the same pair of wheels.

**v.** The action of the rear wheels in following the path of the fore wheels.

**trailer, n.** A wagon attached and pulled behind another.

**trap, n.** A name loosely applied to several varieties of rock of volcanic origin.

**corral, n.** A corral fitted with a gate so arranged that it may be opened from the outside by an animal attempting to reach the bait, usually salt, placed just inside the gate. The gate closes automatically after the animal has passed through and can not be opened from the inside. Such corrals are used chiefly in rough or mountainous country inaccessible to horsemen and in corralling stock too wild to be caught otherwise.

**tread, n.** (1) The width, from front to back, of a stair step.

(2) Used in some localities with reference to track, and in others meaning width of tire. Cf. GATHER.

**trocar, n.** A large, hollow needle, or a needle encased in a tube, used in tapping cattle.

## U

**undercut, n.** A notch cut into a tree to facilitate felling it in a desired direction. Sometimes designated as "kerf."

**v.** To notch a tree for felling.

**underrunner, n.** The strap which connects the breeching with the pole strap in a harness.

## V

**vaquero, n.** Col. SW. for one whose profession is breaking horses or handling cattle. (Sp.: *vaquero*, a "cowboy.") Pro. buck-a-roo' or buck-kay'-roe.

**vault, n.** To mount an animal by springing into the saddle without the aid of the stirrup.

**vent, n.** Cancellation of a brand by reproducing it in fac-simile on the shoulder of the same side. The term is probably either a corruption or a derivative of the verb "vend."

*v.* To cancel a brand by reproducing it in fac-simile.

**voids, n.** The interstices between fragments of stone or grains of sand used in concrete.

**volt, n.** The unit of electro-motive force in use among electricians, and defined legally in terms of the ampere and ohm.

**voltage, n.** Electro-motive force reckoned in volts.

## W

**warble, n.** A grub hatched from an egg deposited in the backs of cattle by the gadfly.

**wether, n.** A castrated sheep; also used in reference to a castrated goat.

**wheel horse n.** One of the animals in the team next to the load; usually applied to the near animal.

**whifle-tree, n.** See SINGLE-TREE.

**whim, n.** A machine fitted with a drum about which a cable works in hoisting material from a shallow shaft.

**horse, n.** The animal used to furnish power in revolving a whim.

**wind-broken, n.** Chronic suffering from impaired respiration, due usually to over-exertion; applies to horses.

**sucker, n.** See CRIBBER.

**withers, n.** The high, bony part of a horse's anatomy immediately over the shoulders.

**wolf, n.** See WARBLE.

**wrangler, n.** One who "wrangles" or takes care of saddle animals used in handling cattle.

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