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Purifying Rancid Butter.

Calvin Peck some ten years ago obtained a patent for restoring and preserving butter; his invention relates to a new process for purifying butter, having especial reference to arresting fermentation and restoring rancid butter. His process consists in melting the butter in a clean vessel under a slow and regular heat, and while it is melting he adds two ounces of pulverized alum to every five pounds of butter, the butter being stirred gently while melting. When thoroughly melted it is strained through a fine strainer into clean cold water. The butter will rise to the surface quite pure and transparent. The alum coagulates the albumen, the caseine, and other foreign matter, all of which are retained in the strainer, leaving the butter perfectly pure and clean, and of uniform consistency.

When the butter is sufficiently cool to be in good working order, it is carefully taken out and thoroughly worked, adding to each five pounds of butter three ounces of good dairy salt, one ounce of clean saltpeter, and one ounce of pulverized white sugar. The butter is then packed in clean vessels, and is fit for use.

By covering it with strong brine and keeping it in a cool place, it is claimed it will remain sweet for any desired length of time.

Apropos to the above a correspondent in *Land and Water* answers an inquirer in its columns who wants to know how to sweeten rancid butter, as follows: If her butter is very bad, premises the writer, I cannot promise that the following plan will entirely restore it; but I can at least describe a process which I once watched at an agricultural show, where a machine for washing butter was at work and where some very horribly odorous butter was in a few minutes rendered edible. It did its work very quickly and by the simple turning of a handle, and the same sort of process might be accomplished by means of a wire sieve or a strainer anywhere. The butter was forced through a finely perforated receptacle into a large tub of fresh cold water. It came rapidly raining down in a fine capilliform shower, lying upon the clear water in a tangle of golden filaments, singularly beautiful, till the water was all covered with them. When the whole lump had been thus transformed into yellow threads, they were stirred and beaten about in the water with a wooden beater; then collected and pressed into a fresh lump of greatly improved appearance, and again forced through the machine in another shower of delicate filaments. This process was repeated several times, till the butter had been washed literally through and through.

Shoeing Horses.

The Rev. W. H. H. Murray, whose advice is worth heeding, says about shoeing: The nails should be quite small and driven in more gently than is the custom. There is no reason why the smith should strike a blow at the little nail head as strong as he would deliver at the head of a spike in an oak beam. The hoof of the horse is not an oak stick, and the delicately pointed and slender headed nail is not a wrought iron spike, and yet you will see the nailer whack away at them as if it was a matter of life and death to get them entirely set in at two blows of his hammer. Insist that the nailer shall drive his nails slowly and steadily, instead of using violence. In this case, if his nail is badly pointed and gets out of proper line of direction, no great injury is done. It can be withdrawn and a new one substituted, without harm having been done the foot. But the swift, blind, and violent way prevents all such care, and exposes the horse to temporary, if not permanent injury. Gentleness should be exercised in clinching the nails. Never allow a smith to touch a rasp to the outer surface of the hoof. Nature has covered it with a thin filament of enamel, the object of which is to protect the inner membrane and fiber from exposure to water and atmosphere. The enamel is exactly what nature puts on the surface of your finger nail, reader. Under no circumstance should it ever be touched. If it is removed nature will be wickedly deprived of her needed covering, and cruelly left exposed to the elements.

AMERICAN INDUSTRIES, NO. 13.

THE MANUFACTURE OF WIRE.

Wire rope has become an important article in almost every branch of industry, and its uses are constantly multiplying. Strength for strength, it is now cheaper than the manila or ordinary hemp cordage used for hoisting or rigging purposes, and when used as a substitute for belting or shafting in conveying power long distances, the cost is trifling when compared with them. The use of galvanized ship rigging is rapidly increasing, and a majority of all vessels which have been built within the last ten years have been fitted throughout with wire standing rigging. Its elasticity is about the same as that of hemp, while its lasting qualities are equal to that of the ship it is used on. In our present issue we give a brief description of the methods followed at

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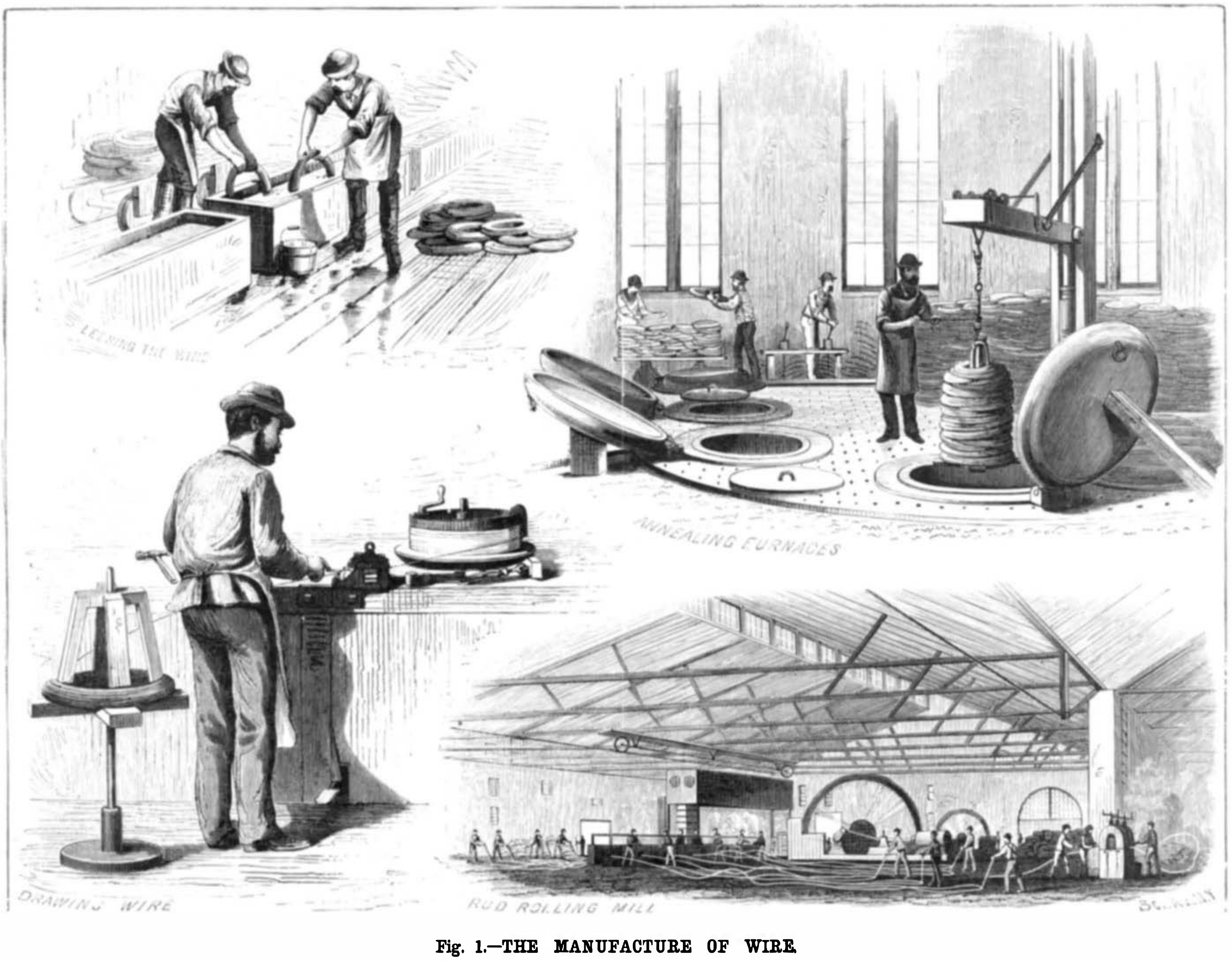

Fig. 1.—THE MANUFACTURE OF WIRE.

THE MANUFACTURE OF WIRE.

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the works of "The John A. Roebling's Sons Company," at Trenton, N. J., for preparing the wire used in the manufacture of wire ropes and bridge cables.

The first operation necessary in making wire of either iron or steel, is that of rolling a wire rod from a solid bar, which usually is either 1¼ or 1¾ inch square. These bars are heated in a furnace to a welding heat if of iron, or to a bright cherry-red heat if of steel. They are then passed through the rolls a number of times—the size each time reducing—until the short thick bar becomes a very long round rod. As the size is reduced and the length is increased, it becomes possible to have the rod in several sets of rolls at the same time, and each of the rolls is reducing the size. This rolling mill, which is shown in our engraving, is arranged on the Belgian system, and is the first one introduced in the United States. It is capable of rolling rods which will make a piece of telegraph wire half a mile in length.

After the rolling the reductions of size are accomplished by cold drawing through a steel die. This operation is shown in the sketch entitled "Wire Drawing." The coiled iron rod is placed on a reel, and is drawn through the die by a wire block, which winds it again into a compact coil. After being drawn cold once or twice the wire becomes very stiff and hard, which makes it necessary to anneal it and get it in such a soft condition that it will admit of further cold drawing if desired. The annealing ovens are represented as being discharged in the upper right hand view. The wire is allowed to remain in the annealers at a dull red heat for twelve hours. All the labor and hoisting in this department are done by hydraulic machinery. After being annealed the wire has a very thin coating of oxide of iron on its surface, which it is necessary to remove before the wire can be further reduced by cold drawing. The oxide is dissolved in a weak solution of sulphuric acid, and a coating of lime water is then put on to keep the surface of the wire bright and prevent it from rusting. This operation is shown in sketch entitled "leesing the wire." The method of drawing steel wire is substantially the same as that for iron, the difference being that it requires more care and greater experience. The size to which wire is drawn is regulated by the size of ropes it is intended to make; this ranges from No. 3 wire gauge, which is ¼ inch in diameter, to No. 36 wire gauge, which is of the thickness of a hair.

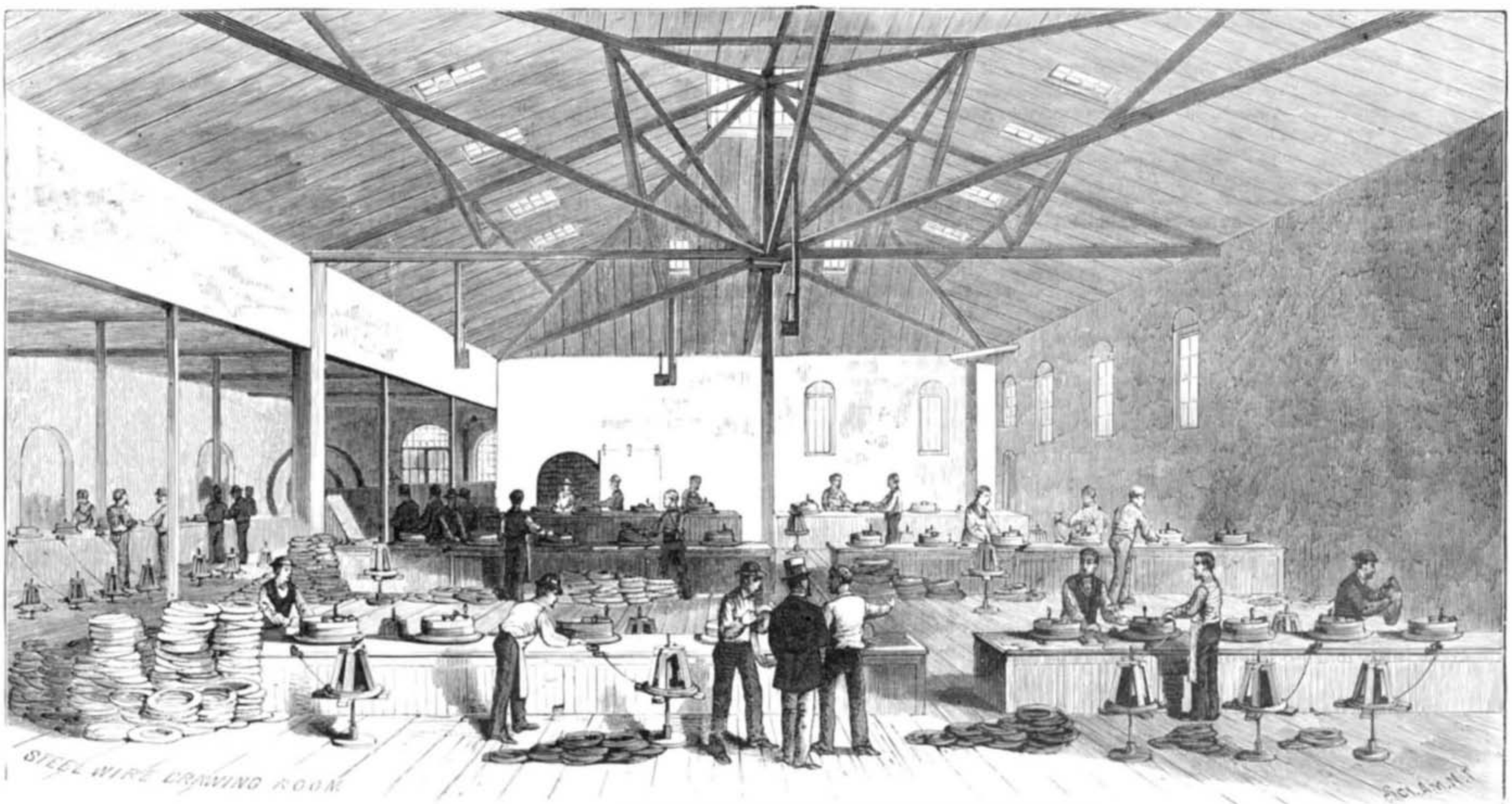

Fig. 2.—DRAWING STEEL WIRE.

The best wire ropes for general use are made of Swedish iron, while in special cases ropes made of fine crucible steel wire are necessary for economical work. For hoisting ropes, which have to stand constant bending and twisting, the lower grades of steel, such as Bessemer, have proved themselves to be almost worthless. Where only a tensile strength is required, as in bridge work, Bessemer steel can be made fully equal to any other quality.

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Rules for Finding the Weights that Timber of a Given Size, Supported at Both Ends, will Sustain.

R. C. Carpenter, of the Michigan State Agricultural College, communicates to the *Post and Tribune*, of Detroit, the following useful table:

1st. If a weight be uniformly distributed from end to end of a horizontal beam it produces the same effect on a beam as though one half the weight were gathered at the center of the beam.

Example.—A horizontal beam, 16 feet in length, sustains a floor 2 feet each side of it—if the weight of floor and load that may be expected to get on it be taken as 75 pounds per square foot, we should find the total load sustained by the beam to be its length, multiplied by the number of square feet sustained, multiplied by the load on each square foot, or 16 x 4 x 75 = 4,800 pounds. This would be equivalent to a center load of 2,400 pounds.

2d. (Converse of first.) If a beam sustain a certain load at the center, it will sustain twice as much load, provided it be uniformly distributed.

3d. The safe load should not exceed one fourth or one fifth the breaking load in bridges, or in floors subject to much vibration from moving bodies. In roofs the safe load should not exceed one fourth or one third the breaking load. (These precautions are necessary for two reasons: timber is injured by a load much below the breaking load, and imperfections in workmanship and materials are constantly occurring.)

4th. (The safe load is assumed to be one fifth the breaking load.)

To find the safe load that a horizontal pine beam, supported at both ends, will sustain:

Rule.—Multiply the breadth of a beam by the square of its depth, and that product by the number 90; divide this result by the length of the beam between the supports, and the quotent will be the number of pounds in the load that the beam will safely carry at the center. If the load is uniformly distributed it will be twice the safe center load, and the foregoing result may be doubled to obtain the total distributed load. (See rule first and second.) If any material besides pine is used instead of the number 90 must be used the numbers in the following table:

Material.	No.
White oak	120
Red or black oak	110
White ash	130
Swamp ash	80
Black ash	60
White beech	90
White cedar or arbor vitæ	50
Walnut	90
Tamarack	80
Spruce	90
Maple	110
Hickory	140
Rock elm	70
Locust	120
White pine	90

Example.—What will be the center safe load of a pine beam, 4 by 6 inches, supported in two places, and 12 feet long between the supports?

(1) If the depth be 6 inches and the breadth 4 inches, the center load will be equal to 4 x 36 x 90 divided by 12 = 1,080 pounds.

(2) If the depth be 4 inches and the breadth be 6 inches, the center load is 6 x 16 x 90 divided by 12 = 720 pounds. From these examples it is seen to be always most economical to set a horizontal beam on its edge, or place it so that the greatest dimensions shall correspond to its depth.

5th. To find the weight that an inclined beam (as a rafter) will safely bear at the center distance between supports:

Rule.—Find the center weight by the fourth rule—that a beam of length equal to the horizontal span or spread of the inclined beam, will safely sustain—divide this result by the horizontal span of the inclined beam, and multiply it by the length of the inclined beam.

Example.—What will a pine rafter, 20 feet long, with 12 feet rise and horizontal span of 16 feet, of 2 by 4 inches, sustain safely at center when there is supposed to be no support at its center? If horizontal and 16 feet long, the safe center weight = 2 x 16 x 90 divided by 16, or 180 pounds: dividing this result by 16 and multiply by 20, the safe center weight is 220 pounds. This would correspond to a uniformly distributed load of 440 pounds. If the rafter be supposed to carry two square feet for each foot in length, the load would be 104 pounds to each square foot.

Note.—A rafter of these dimensions would need a support at the center; in that case its horizontal span would be 8 feet instead of 16. The result would be a safe center load of 440 pounds, or a safe distributed load of 880 pounds; but this is distributed over a rafter 10 feet long instead of 20, so that on the same supposition as before the safe load becomes 41·6 pounds per square foot; a safe load for any roof.

Remark.—This rule, although sufficiently exact for ordinary purposes, and safe for ordinary roofs when the factor of safety, five, is used, must be replaced by more exact and complicated rules when very exact results are required. This is safe for all farm buildings.

6th.—When the dimensions of a horizontal beam that will safely carry a given load are wanted, the following rule must be used:

The product of the breadth into the square of the depth equals the load at the center divided by 90 for pine, or by the numbers given under the fourth rule for any other material. By assuming the depth the breadth can be found.

Example.—What sized pine beam, 16 feet long, will safely support 1,000 pounds at its center? 1,000 divided by 90 equals 77·1, equals the breadth multiplied by the square of the depth. If we assume the depth to be 3 inches, its square is 9 and the breadth 11·1 divided by 9, = 1·3.

Hence the answer is a piece 1·3 by 3.

When the load is distributed over a number of square feet the center load must first be found by multiplying by the number of feet and dividing by 2.

7th. If the beam is inclined divide the center load by the length of the beam. Multiply this quotient by the horizontal space, and proceed as in the sixth.

8th. The amount an upright beam will safely carry when subjected to a pulling strain can be found by multiplying the number of square inches of its cross section by the strength of one square inch.

The following table gives the safe strength of different woods:

Woods.	Safe strength, pounds per square inch.
Ash	3,200
Elm	1,200
Hickory	2,200
Maple	2,000
White oak	2,000
Pine	2,000
Walnut	1,600
Poplar	1,400

9th. The amount an upright post loaded at upper end will sustain can be found approximately in the same way as the tensile load; the amount per square inch should be taken about four fifths that given in rule eight. This is an approximate rule that cannot be relied on in cases where very accurate results are required.

These rules give accurate results with the exception of rules fifth and ninth. The results given by rule fifth are safe and do not differ much from the true results. Those given by rule ninth for the size of posts are very near correct when the posts are of moderate length.