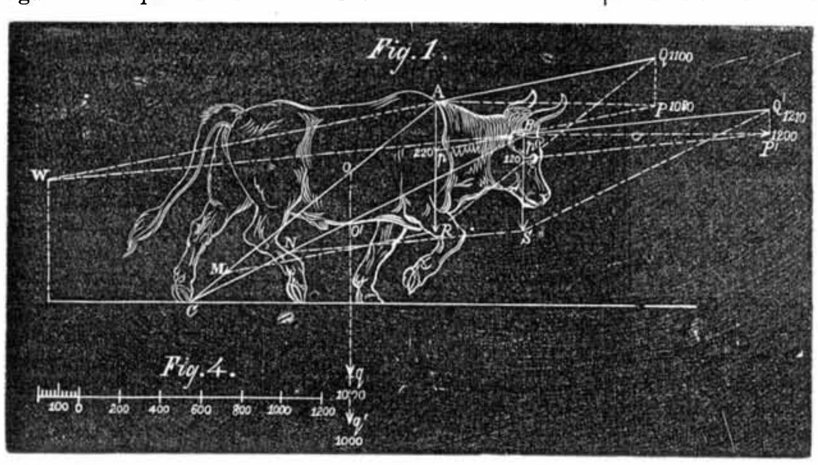
For the Scientific American.

THE BEST WAY OF YOKING OXEN.

Of the three different methods by which the ox is yoked in applying its muscular power as a moving force, the intention of the present article is to determine which is the best adapted to the desired end, or, in other words, how we can employ the ox so as to obtain the greatest amount of work with the least possible degree of inconvenience and fatigue to the animal. The ordinary and almost universal way in this country is to place a collar or bow on the neck so that the ox drags with the shoulder in the same manner as the horse. However well adapted this may be for the horse, it is manifestly unsuited for the ox. That fitting resting place for the collar which the shoulder of the horse presents, is not found in the ox. The ox also carries the head lower, and the bow has then a tendency to rise and come forward at the upper portion and bear entirely against the joint of the leg and shoulder, which has considerable movement and is only lightly covered with flesh. The use of this method, then, involves a considerable amount of unnecessary pain and uneasiness. Second, the most objectionable place of applying the yoke on the ox is on the top of the shoulder bones at the root of the neck. These bones and the top of the backbone being also provided with but little flesh under the skin, present to the yoke sharp ridges, and the animal consequently suffers a hard rubbing pressure on the skin and the sensitive nerves of the back bone. The yoke will likewise rock on these sharp ridges, and has a tendency to slide off. It is also observed that the animal while pulling his load along will constantly move his head up and down, and from side to side, thus expending much of the power to no purpose.

The third and most reasonable and natural method seems to be to put the pressure on the forehead, as we shall endeavor to illustrate. When we apply the draft to the forehead by means of a yoke placed on the neck immediately behind the horns, and a strap running from both ends of the yoke over a cushion placed on the forehead, and secure the side straps or draft ropes to both ends of the yoke, we have a perfectly immovable fixture and the animal will not be disturbed by friction and pressure on sharp edged bones. The backbone near the joint to the head being covered with thick layers of flesh, gives a broad support to the yoke, which is of some importance as there will be some downward pressure on the same. This downward pressure is one component of a power, acting on the yoke in the direction of the foot of the stretched out hind leg, tending to bend the neck down toward that foot and it will not be inconveniently resisted. An ox when attacking an enemy, attempts to take the shock on the horns; and by placing forehead against forehead ability is frequently shown of pushing back an animal of nearly equal weight. Thus nature has clearly shown how we should put an ox to work; the main strength is placed in the neck and use is made of this strength, whenever attacking one another.

By means of the accompanying diagram Fig. 1, we intend to show, according to the rules of mathematics and irrespective of the convenience to the animal, that the yoke is attached by the head with far greater advantage than when against the top of the shoulder bones.



The diagram represents a well proportioned animal in position to work or push a load along. W represents the place of the whiffle-tree to which the draft straps are attached; A, the point at which the yoke is placed in the second case mentioned; B, the forehead; W A and W B, the draft-straps in both cases; C A and C B, lines from the foot of stretched out hind leg to yoke. o q and o' q' represent vertical lines through the centre of gravity of the animal and in length according to the annexed scale equal to the weight of the animal, say 1,000 pounds.

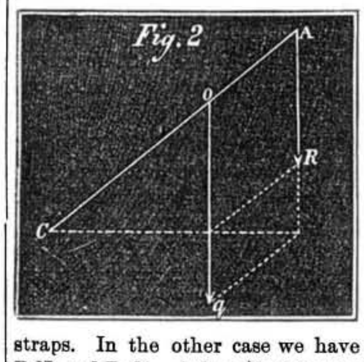
While the animal is pushing on his load, he maintains the represented position by means of the strength of the sinews, and in order to make a mathematical calculation, we shall suppose the animal in this position to be inflexible, so that we have to mark only the points A, B, and C, the lines A C and B C, the points o and o' in which the lines A C and B C are intersected by the lines o q or o' q', the length of the lines o q and o' q', and finally the direction of the side-straps A W and B W.

A C and B C represent levers. At the upper ends, A and B, of these levers the side-straps are attached. These side-straps are represented by the lines in both cases respectively A W and B W, and along these lines on the points A and B of the levers the load will act in the directions from A and B toward W, and tend to turn the levers upward about the point C. The weight of the animal represented by the lines o q or o' q' drawn through the centre of gravity acts vertically on the points o and o' and of levers, A C and B C, and tends to turn the same downward.

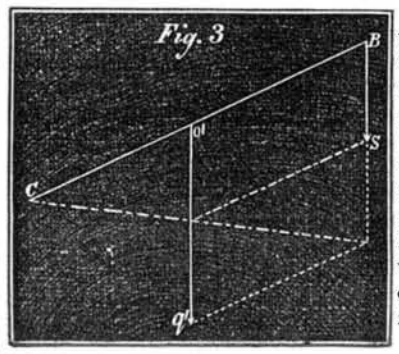
In case the load is such that the strain along the side straps is as much as the animal is able to resist, we have the levers, A C, or B C, in an equilibrium, neither to be turned up or down by the contending powers, o q, or o' q', and those along the lines, A W and B W. In place of the powers, o q, or o' q', acting at the points, o or o' we can, according to the rules of mathematics, place the powers, A R and B S, acting at the points, A and B, of the levers, A C and B C. The length of the lines, A R and B S, we have found by means of diagrams, Figs. 2 and 3, in which the lines, A C, o q', A R, and B C, o' q', and B S, are parallel, and equal to those of diagram, Fig. 1.

We have now in one case a vertical power, represented by line, A R, acting at point, A, of line, A C, and in the other a power, B S, acting at point, B, of line, B C.

According to the teachings of mathematics, one power represented by a diagonal line of a rectangular or acute angular parallelogram is equivalent to two powers represented by the two sides, all emanating from the same corner. This principle we have applied to diagram, Fig. 1, and to the diagrams, Figs. 2 and 3, which we have given separately to obviate overcrowding of lines. We applied the principles of leverage, the powers being in reversed proportion to leverage.



In one case we have now, power, A R, acting at A, equivalent to the two powers, A M, which is to be overcome by the muscular power of the animal and A Q, or the draft along the side straps. In the other case we have the similar powers, B S, B N, and B Q'. A Q we find by our scale, Fig. 4, to be 1,1000 pounds, and B Q' we find to be 1,210 pounds.



By another application of the rule of the parallelogram we find the power, A P, parallel to the load, or the effective power to push the load along, to be 1,080 pounds, or equivalent to A Q, and a vertical power, A p, or pressure on the neck of the animal.

In the same way we find, in the other case, the effective power, B P', to push the load along, to be 1,200 pounds, or equivalent to B Q', and a vertical power, B p', or downward pressure on the head of the animal.

By the scale we find A p to be 220 pounds in the one case, and B p' to be 120 pounds in the other case. Now, to compare our figures, we have:

As 1,080 is to 1,200, so is 100 to 111. By applying the yoke to the head there is a gain of effective power to push the load along of eleven per cent. over the effective power to push the load along when applying the yoke against the top of the shoulder bones.

Further, we have in the latter case a useless pressure to be sustained by the animal of 220 pounds, and by applying the yoke to the head this pressure amounts only to 120 pounds. As we have shown above, this downward pressure on the head will be easier sustained by the animal than the other by applying the yoke at A.

Suppose, now, the animal is able, by yoking as described under the second method, with the effective power of 1,080 pounds, to push along on a smooth road a load, supported on a wagon, of 2,000 pounds, it will be able, by yoking at the head, to push along, with the effective power of 1,200 pounds, eleven per cent., or 220 pounds more, which is a load of 2,220 pounds.

It will be seen that we gain effective power in the last over that in the second case, because the draft straps are nearer to a parallel line with the road, while the downward pressure is diminished from the same reason.

A further advantage of yoking by the head, consequently, is the ability of the animal to regulate the inclination of the draft straps by raising or lowering the head to suit the unevenness of the road.

To use a double yoke seems in any way to be a torture, and the advantages shown under the last case, by using a single yoke with side straps would greatly be reduced by using the double yoke found in some districts of countries.

EDWARD WOLFF.

New York city.

RICHARDSON'S PATENT METHOD OF FORGING HOES.

The inventor of the improvements in the processes of manufacturing hoes, illustrated in the accompanying engravings, says that after twenty-seven years' experience in the manufacture of hardware implements, he believes he is safe in saying there is not so much waste of stock and labor in any department of industrial mechanics as in the manufacture of hoes. He saw, a short time ago, a pile of at least one hundred dozen waste or refuse hoes in one manufactory, the remains of only six months' work.

The method of cutting the steel used in forging a hoe generally practiced, is to cut squarely off from the bar sufficient to make two hoes with their shanks, the stock being drawn down in the middle to make the two shanks, and then cut in two. By this plan it is impossible to shoulder down squarely and do the work properly; none but the most skillful being competent, and thus there is great waste.

Fig. 3

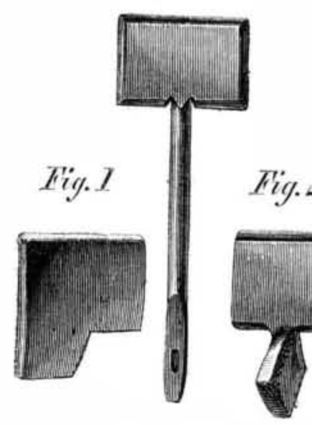


Fig. 1 Fig. 2

The writer, after a succession of experiments, has adopted the following improvements in preparing the stock:

The better method of cutting the steel is that shown in Fig. 1, by which not a particle of the stock is wasted. It will be seen that two of these figures, when joined at the lines of separation, form a parallelogram. Fig. 2 shows the second process, which is to cut in on the whole side, giving a quarter turn or twist to the adhering portion, and then to draw that part out under the trip to form the shank, as seen in Fig. 3.

Fig. 4

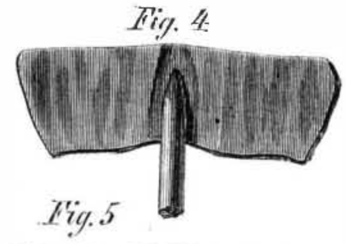


Fig. 5

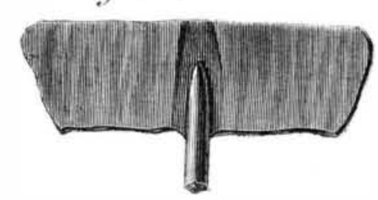
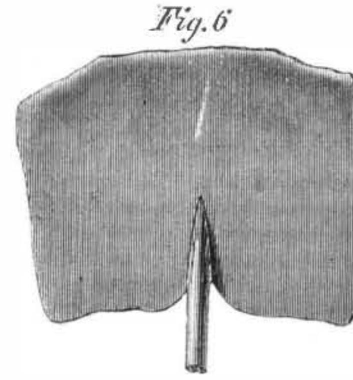


Fig. 6



Next comes the process of spreading, as seen in Fig. 4, known as "plating" among the craft, a work done only by the skillful. In some manufactories it is done by rolling, which facilitates the work, but does not always obviate the difficulty of giving a proper form to the ears. Fig. 5 is an extension of the process seen in Fig. 4. Figs. 3 and 5 obviate the difficulties heretofore experienced, as they do away with the necessity of plating up the ears of the hoe before rolling. Thus prepared, the hoes come out uniform, as seen in Fig. 6, when the hoe is ready to go to the press to be trimmed and prepared for the temperer, as seen in Fig. 7. By these processes every hoe is perfect and alike.

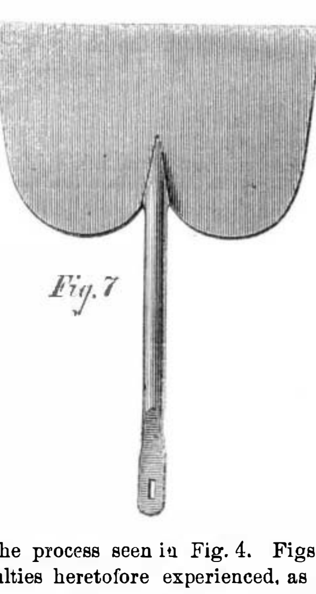


Fig. 7

This principle of cutting out and forming hoes was patent ed through the Scientific American Patent Office, May 26 1868, by L. T. Richardson, who may be addressed at Clay ville, Oneida Co., N. Y.