as regards their belting, in giving precise instructions respecting the employment of such machinery or goods. Without holding ourselves responsible for the following notes on belting, we are glad to find space for them, as embodying the result of the experience of a firm who have had much to do in the matter. They say: The formula given below is based on the experience of engineers in Great Britain, America, and France. It serves the purpose of showing what width of belt will do the required work most efficiently, and at the same time last the maximum number of years. Many engineers, more especially in this country, are content to provide belts of greatly reduced width, and of single substance instead of double; hence the frequent complaints of their stretching, breaking, and lasting so short a time. As a matter of convenience and arrangement of machinery, a narrower belt than that which is shown by the generally accepted formula is often imperative; but, in the absence of any such conditions, it is questionable economy to depart materially from it. The following may be regarded as an axiom: To use a belt of ample width and substance for the work required is to secure for it a long existence, with satisfaction to all concerned.

Directions for Calculating the Width of Belts Required for Transmitting Different Numbers of Horse Power.

Multiply 33,000 by the number of horse power to be transmitted; divide the amount by the number of feet the belt is to run per minute; divide the quotient by the number of feet or parts of a foot in length of belt contact with smaller drum or pulley; divide this last quotient by six, and the result is the required width of a single tanned leather belt in inches.

Explanations.—The figures 33,000 represent the number of lb. a horse is reckoned to be able to raise one foot high in a minute. To obtain the number of feet a belt runs per minute, find the number of revolutions per minute of the driving shaft and multiply by the circumference of the drum, which is always 3·1416 its diameter. The final division by six is because half a pound raised one foot high per minute is allowed to each square inch of belting in contact with the pulley; a pound must therefore be allowed to two square inches, or six pounds to a strip one foot long and one inch broad.

Example.—Required the width of a single belt, the velocity of which is to be 1,500 feet per minute; it has to transmit 10 horse-power, the diameter of smaller drum being four feet, with five feet of its circumference in contact with belt:

$33{,}000 \times 10 = 330{,}000 \div 1{,}500 = 220 \div 5 = 44 \div 6 = 7\frac{1}{3}$ inches, the required width of belt.

Directions for Calculating the Number of Horse-power which a Belt will transmit.

Divide the number of square inches of belt in contact with the pulley by two; multiply this quotient by the velocity of the belt in feet per minute; again divide the total by 33,000, and the quotient is the number of horse-power.

Explanations.—The early division by two is to obtain the number of lb. raised one foot high per minute, half a pound being allowed to each square inch of belting in contact with the pulley.

Example.—A six inch single belt is being moved with a velocity of 1,200 feet per minute, with four feet of its length in contact with a three foot drum. Required the horse-power:

$6 \times 48 = 288 \div 2 = 144 \times 1{,}200 = 172{,}800 \div 33{,}000 =$ say $5\frac{1}{4}$ horse-power.

It is safe to reckon that a double belt will do half as much work again as a single one. Belting made from "Helvetia" leather is much stronger and will bear a heavier strain than that made from ordinary tanned leather.

Hints to Users of Belting.

1. Horizontal, inclined, and long belts give a much better effect than vertical and short belts.

2. Short belts require to be tighter than long ones. A long belt working horizontally increases the grip by its own weight.

3. If there is *too* great a distance between the pulleys, the weight of the belt will produce a heavy sag, drawing so hard on the shaft as to cause great friction at the bearings; while at the same time the belt will have an unsteady, flapping motion, injurious to itself and to the machinery.

4. Care should be taken to let belts run free and easy, so as to prevent the tearing out of lace holes at the lap; it also prevents the rapid wear of the metal bearings.

5. It is asserted that the grain side of a belt put next to the pulley will drive 30 per cent. more than the flesh side. Experience can alone verify this; but when belts are required to be worked this way, the fact should be stated in the order, so that the riveting may be arranged accordingly.

6. To obtain a greater amount of power from belts, the pulleys may be covered with leather; this will allow the belts to be run very slack, and give 25 per cent. more durability.

7. Leather belts should be well protected against water and even loose steam or other moisture.

8. Belts working in very wet places should be ordered to be waterproofed.

9. A careful workman will see that his belts are redressed about every four months, by sponging the dirt from them with warm soap and water; then drying with a cloth, and, while still damp, rubbing in castor oil or currier's grease, which will be readily absorbed, the leather being moist from washing. Castor oil has the additional advantage of preventing rats attacking the leather.

10. In putting on a belt, be sure that the joints run with the pulleys, and not against them.

11. In punching a belt for lacing, it is desirable to use an oval punch; the larger diameter of the punch being parallel with the belt, so as to cut out as little of the effective section of the leather as possible.

12. Begin to lace in the center of the belt, and take care to keep the ends exactly in line and to lace both sides with equal tightness. The lacing should not be crossed on the side of the belt that runs next the pulley. Thin but strong laces only should be used.

13. It is desirable to locate the shafting and machinery so that belts shall run off from each other in opposite directions, as this arrangement will relieve the bearings from the friction that would result where the belts all pull one way on the shaft.

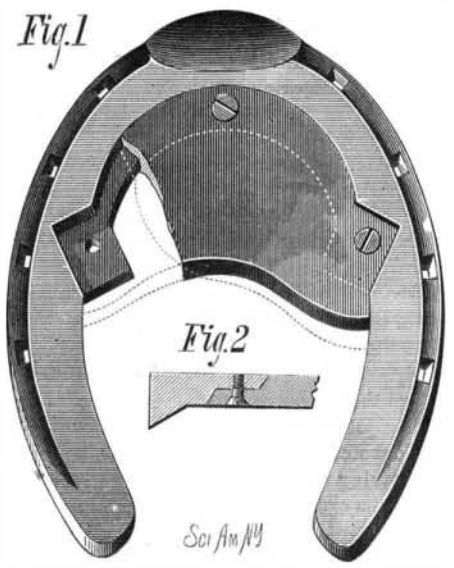
14. If possible, the machinery should be so planned that the direction of the belt motion shall be from the top of the driving to the top of the driven pulley.

15. Never overload a belt.

16. A careful attendant will make a belt last many years, which through neglect might not last one.—*Textile Manufacturer.*

NEW WEIGHTED HORSESHOE.

The annexed engraving represents an improved weighted

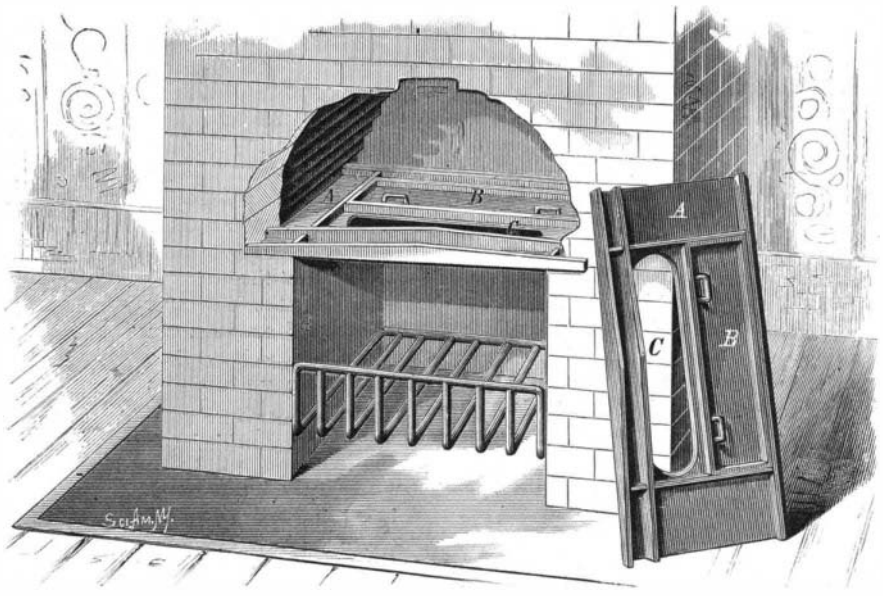


SEIXAS' WEIGHTED HORSESHOE.

horseshoe invented by Mr. Eugene E. Seixas, of Galveston, Texas. The improved horseshoe is designed to be used in training horses to trot rapidly by causing him to extend his strides. It squares his step, and may be used for preventing him from striking his knees with his feet.

In the engraving a part of the weight is broken away to show the form of the shoe under the joint, and Fig. 2 is a section of a portion of the shoe and weight taken through the joint. The weight is fitted to a rabbet or recess formed in the shoe, and is held in place by three screws, so that it may at any time be removed if required.

When it is necessary to use the device for preventing the horse from striking his knees with his feet the weight is made to extend farther back upon one side than the other, as shown in the dotted lines in Fig. 1.



FIREPLACE DAMPER PLATE AND ARCH BAR.

IMPROVEMENT IN FIREPLACES.

The annexed engraving represents an improved fireplace damper plate and arch bar recently patented by Mr. Clark Hanes, of Wheeling, West Va. It serves the purpose of an arch bar for sustaining the brick wall over the fireplace, opening also as a damper for regulating the draught and for preventing the falling of soot when the fireplace is not in use.

The engraving shows the plate and damper in position in the fireplace, and also gives a face view in perspective.

A is a cast iron plate of sufficient length to rest on the walls at the side of the fireplace, and having the oblong aperture, C, which is sufficient for the escape of smoke. A damper, B, fitted between two ribs on the plate, A, is capable of being moved so as to cover the opening, C. The plate is ribbed to give it sufficient strength to sustain the weight of the wall above the fireplace, and thus obviates the necessity of building an arch for that purpose.

This invention facilitates the construction of fireplaces, and renders them free from one of the principal objections brought against them, that is, the escape of soot through the flue opening into the room when the fireplace is not in use.

RECENT INVENTIONS.

Mr. Solomon B. Ellithorp, of Rochester, N. Y., has invented an improvement in waxing mechanisms for sewing machines. It consists of two arms carrying sponges, which are moved reciprocally by the operating mechanism of the machine in such a manner that they pass over melted wax held in a suitable receptacle, taking up a suitable quantity thereof, and at the proper time are rubbed and clasped against the two threads carried by the needle and shuttle.

An improved cord adjuster has been patented by Mr. William W. Batchelder, of New York city. The object of this invention is to furnish cord adjusters and holders so constructed that cords may be moved longitudinally through them as required, and may be held securely in place when adjusted. It consists in a cord adjuster and holder formed of a tube having longitudinal flanges or ribs upon its inner surface, an interior swiveled spiral and a swiveled collar, so constructed and arranged that the cord may be moved longitudinally by turning the collar.

Mr. Alfred E. Feroe, of Tivoli, N. Y., has patented an improved process of obtaining wort, which consists in first dissolving the diastase of the ground malt in warm water at less than a converting temperature, and then bringing the mash to and keeping it at a converting heat by continuously drawing the wort from the bottom of the tub, heating, and passing it through the mash, as specified.

Mr. Edward Earle, of Brooklyn, N. Y., has patented an improved fishing rod which consists in providing the ordinary ferrules or tubes that are fitted to slip together with an annular cap or socket piece that covers the end of the outer tube and prevents water from working in and rotting the rod.

Mr. Charles J. Everickx, of Paris, France, has patented a system of articulation or joints for portable furniture, so that it can readily be folded up to occupy a very small space and can be conveniently carried.

New York City Fire Department.

The statistics of the Fire Department show that there were 1,541 fires in the city in 1879, against 1,655 in 1878. In 1877 there were 1,450. The only printed statistics with which these can be compared are those of the first three years of the existence of the paid department—1866, 1867, and 1868—when there were 798, 873, and 740 fires respectively. The increase in number of fires is accounted for by the increase of the city and the addition of such districts as Westchester to the area covered by the statistics. The higher efficiency of the Fire Department is indicated in the fact that while the percentages of total destruction of buildings by fire were 7, $6\frac{1}{5}$, and 5 per cent for 1866, 1867, and 1868 respectively, the percentages for 1877, 1878, and 1879 were only 3·45, 1·14, and 1·6 per cent of total loss. This difference is said to be due to the perfected system of fire alarms now in use; the convenient arrangement of quarters for men and horses, insuring the promptest response to the signals, and the introduction into the city of a large number of new hydrants, which have always been erected as soon as the Commissioners requested them.

The principal causes of fires have been carelessness on the part of servants or occupants of houses (this is accountable for nearly one-quarter of all the fires), foul chimneys, explosion of kerosene lamps, and window curtains near gas jets. The number of fires from kerosene has been reduced from 136 in 1877 to 92 in 1879, by the methodical inspection of the oil offered for sale, and the regulation of its quality and of the quantity kept in store. Men are constantly employed in collecting samples, which are labeled and tested, and the dealer is attended to if his sample is below the standard fixed by law. The dealers are getting to understand that they cannot keep an inferior oil without detection, and the consequence is that there is seldom any offered for sale that is not of good quality.

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