STRAIGHTENING METAL PLATES.

No. III.

We now come to straightening as effected by pening, a process usually applied to straighten or, if necessary, to bend bars, rods, beams, frames, and other thin pieces of wrought iron which, from being too heavy or from their positions, cannot be straightened upon an anvil.

The principle involved in the process of pening is that of stretching the skin of the metal, and thus producing a surface strain that holds, by tension, the rest of the surrounding metal out of its natural shape. Suppose, for example, that Fig. 15 represents a rod of iron which it is required to straighten. It is obvious that if we stretch the skin on the hollow side by hammering it all over (as shown at A, in Fig. 15, by the hammer marks denoted by the small circles), the face on that side will be stretched; and becoming in consequence longer, it straightens out. The hammer used for pening is shown in Fig. 16. It usually weighs about ½ lb. The ball end, A, is employed to deliver the stretching blows, that shape being preferred because, by delivering the force of the blow upon a small area, the effect of the blow is greater; then again the indentations made by the hammer, being dish-shaped, do not disfigure the plate so much, especially as the blows are light and the hammer marks so close together as to contact or partially cover one another. The flat face is used in cases where much pening has been done, to efface as much as possible the marks left by the ball pene end of the hammer. In many cases, however, this is unnecessary. While pening a piece of metal, it will greatly assist the operation if a pressure is placed upon the work in the direction in which the work is required to go or set; and for this purpose clamps are often used. Suppose, for example, that a strap such as is shown in Fig. 17 requires to be made narrower at A. We may rest it upon the bench, E, in the position shown, press down the end of the jaw, B, and deliver the blows denoted by the marks shown on the round corner, C. In this case, the effect of the hammer blows will be sufficient, if the flat face of the hammer is used. If, however, the strap

Fig. 15.

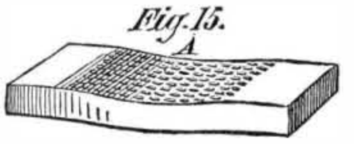
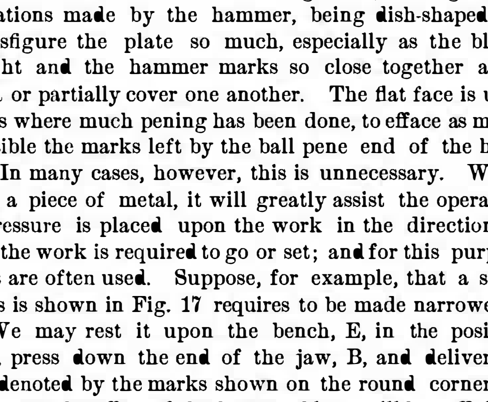
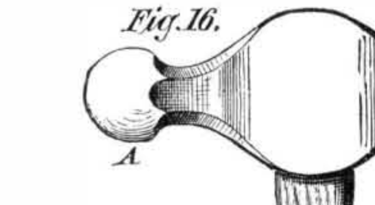


Fig. 16.



had a sharp corner, it would be necessary to rest the two ends of the strap jaws on the bench, and, using the ball pene, deliver the blows shown by the marks at D. In either case, the effect will be to close the distance between the jaws at A. The reason in the latter case for pening the strap in the middle is that, since the pening will tend to round the face lengthways, the filing out the pening marks will tend to straighten that face, and may be more quickly performed; for, if we were to pene the face in two places, the filing out of the marks would aid the pening to round the face. It is obvious that, were the jaws too narrow at A, pening the inside crown face of the strap would widen them. The blows should fall dead—that is, the hammer should fall, to a great extent, by its own weight, the number rather than the force of the blows being depended upon; hence the hammer marks will not be deep. This is of especial importance when pening has to be performed upon finished work, because, if the marks sink deeply, proportionately more grinding or filing is required to efface them; and for this reason the force of the blows should be as near equal as possible. Another and a more important reason, however, is that the effect of the pening does not penetrate deeply; and if much of the pened surface is removed, the effects of the pening will be also removed: for, as a rule, the immediate effects of the blows do not penetrate deeper than about $\frac{1}{32}$ inch. While the work is being pened, it should be rested upon a wood or a lead block, and held so that the part struck is supported as much as possible by the block. In no case should it be rested upon an iron or any hard metal block, as that would tend to stretch the underneath face, and partially nullify the effects of the pening.

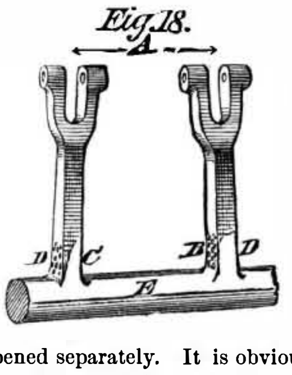
Fig. 17.



Wrought iron shafts of considerable thickness may be straightened by getting them red hot, and suddenly cooling the high side until it assumes a black color, then reheating the shaft again and repeating the cooling process, which should be performed as quickly as possible. This process, repeated a sufficient number of times, will inevitably straighten the shaft. The principle involved in this manipulation is as follows: When the shaft is red hot all over, it is also expanded all over, and the cooling contracts the spot or side cooled, which shrinks, creating a strain which draws the hot side out of its natural shape, so as to accommodate the shape of the contracted side.

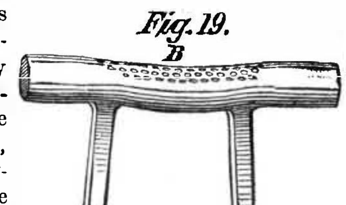
In straightening work of cast iron, pening bears an important part, especially in the case of iron patterns or light iron castings. Suppose, for example, that Fig. 18 represents an iron casting, and that the distance, A, from the center of one double eye to that of the other was too short: by pening the arms on the faces denoted by B, C, and in the place denoted by B, the distance, A, could easily be made correct. If the width at A were too great, similar pening at D D would be required. If, however, the shaft itself should be out of straight and does not require to be turned up in the lathe, it becomes a consideration whether two evils cannot be remedied by one pening operation.

Fig. 18.



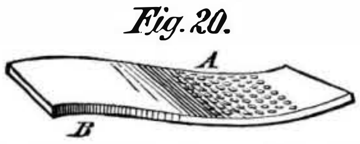
In Fig. 19, for instance, is a casting that, by warping in the shaft, has thrown the arms out of parallel, making the distance at A too great. It follows that, by delivering the pening blows as shown upon the shaft, the effect will be to straighten it, and at the same time bring the arms into line. If, after the shaft is straightened, the arms require adjusting, they may be pened separately. It is obvious, however, that, if the shaft must be pened, it must be operated upon first. As an example of straightening cast iron plates by pening, let Fig. 20 represent a warped plate. The pening marks shown at A, and similar blows delivered upon the other side in the hollow at B, would straighten it; or, in Fig. 21, if the tongues, A, B, were warped so as to stand up too high, pening at C and D would straighten them.

Fig. 19.



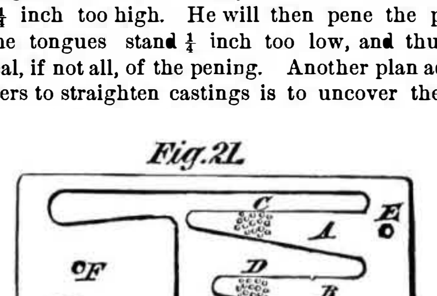
Patterns for plate castings often become warped in time from the rapping of the pattern: for example, in Fig. 21 are two holes, E and F. Into these holes pieces of stout wire are placed; the moulder then strikes the wires on all sides to loosen the pattern in the sand or mould. In course of time, the metal around these holes becomes bulged, and there is created a local tension apt to distort the pattern, so that it requires pening to straighten it.

Fig. 20.



A skillful moulder will often straighten plates in the moulding process. For example, suppose that, having cast a number of plates, such as shown in Fig. 21, he finds that the points of the tongues, A and B, always curl up in the mould to about ¼ inch too high. He will then pene the pattern so that the tongues stand ¼ inch too low, and thus save a great deal, if not all, of the pening. Another plan adopted by moulders to straighten castings is to uncover the parts

Fig. 21.



that are apt to sink in the sand. If any part of a casting has the sand removed from its upper surface while it is still red hot, that part cools the quickest and lifts up; and of this fact the moulder takes advantage, uncovering the part which experience has shown him requires to be lifted. The cause of the cooled part lifting appears to be as follows: The part cooled contracts the quickest; and to sink in the mould, it would require to compress the bed sand or else to raise the other part of the casting. The whole weight of the sand in the cope, as the top part of the mould is called, tends to keep the casting down; and when that weight is removed at any part by removing the sand, the contracted part naturally rises, because there is less resistance offered to its rising than there would be to its falling. In many cases, this cooling process is aided by the application of water, which much increases its effect; and it is astonishing, under skillful manipulation, how much a plate or casting can be shaped at will, by water judiciously employed, without causing it to crack.

Iridiated Glass—Possible Rediscovery of a Lost Art.

It is well known that. under the influence of moist air and in the course of great lengths of time, certain kinds of glass lose their transparency and become covered with opalescent layers, which are easily cracked off. This occurs most frequently with glass that has been long buried in the earth. In the collection of ancient relics exhumed at Cyprus by General Di Cesnola, there are abundant examples of glass bottles, cups, vases, etc., which are as brilliantly iridescent as is carved from the pearl shell. The reason for this change, as we have already explained, is that the alkaline base in the glass combines with the carbonic acid of the air, setting free the silicic acid of the material. Then the alkaline carbonate so formed is washed away by water, and in place of the glass we have nearly pure silicic acid. This has been proved to be the fact by actual analysis of some of General Di Cesnola's specimens.

But there is good cause to believe that the ancients were in possession of processes for producing this iridiated glass in brief periods of time; and it also appears that the glass-workers of China and Burmah have like knowledge. In April of last year, we noted the fact that specimens of the Chinese glass had been sent to M. Clemendot, a noted French chemist, for examination. We now find in the report of a recent meeting of the French Academy of Sciences that, in conjunction with M. Frémy, the above scientist has succeeded in reproducing the iridiated glass, and that numerous fine specimens have been exhibited before the aforesaid society.

The process, which is said to be certain in its results, consists simply in submitting ordinary glass for six or seven hours to the action of water containing 15 per cent of hydrochloric acid at a pressure of from 2 to 3 atmospheres, corresponding to a temperature of about 248° Fah. The beautiful glass thus quickly produced will doubtless find many ornamental applications.

Influence of Pressure on Combustion.

Some interesting observations have been made by M. Wartha on the influence of pressure on combustion. He observed the burning of six stearine candles in free air, and in an iron case under a pressure of 1·95 atmospheres. They burned under the pressure with a flame 3½ to 4⅝ inches long, and gave much smoke; their luminous power diminished, while the flame assumed a yellowish-red color. The decrease of weight after one hour of burning was found to be less than in burning in free air. This last result is opposed to the observations of Frankland, who has affirmed that the consumption of the burning material of a candle, or the like, is not perceptibly dependent on the pressure of the medium in which the combustion occurs. It is supposed that the difference of pressure in Frankland's experiments (on Mont Blanc and at Chamounix) was not sufficiently great to give a distinct difference in consumption of the burning matter. M. Wartha further put a candle to burn under an air pump receiver, with special apertures; and with increasing rarefaction, the flame was seen to enlarge, and its luminous power to diminish. At a pressure of 3¼ inches, the greatest rarefaction produced, the luminous power was quite gone, and the flame, which had now assumed threefold size, appeared to consist of three parts, an inner bluish-green cone with a violet sheath and a weakly violet mantle. The diminution of the luminous power in this case Mr. Wartha explains by the fact that, under less pressure, less of the products of combustion are separated in the form of soot.—*Nature.*

Eucalyptus Globulus.

The Central Pacific Railroad Company has lately arranged to have 40,000 trees of the above species set out along the 500 miles of the right of way of the company. This is only the first instalment, as it will require about 800,000 of the trees for the 500 miles of valley where they are to be cultivated. The immediate object of the plan is to increase the humidity of the region, and lessen the liability to droughts. It is an established fact that the destruction of our forest trees over large tracts of the country is having a direct effect on the climate, and we are glad to know that this company is replacing, at least in part, the forests which have been destroyed.

The beneficial influence exerted by the foliage of the eucalyptus in malarial districts is well known. Experiments have proved eminently successful in this direction, notably that of the English Government at the Cape of Good Hope, and of the local government of a region in Belgium. The *eucalyptus globulus*, or blue gum, is supposed to be efficacious in marsh and other fevers, and is known in Spain as the "fever tree." The bark and leaves of the tree contain much tannin, which is extracted on a large scale in Australia for European markets. A new interest has lately been given to the genus by the discovery of a body in the leaves and bark closely resembling in its properties those of cinchona or Peruvian bark (the source of quinia), and much more abundant. Vaquelin obtained, in an analysis of the leaves, an essential oil containing eucalyptal or eucalypt camphor, and a resin closely resembling resin of cinchona. This extract yielded a substance capable of neutralizing the strong acids, and forming crystalline salts. The crystals of its sulphate are almost identical in form with the star-shaped crystals of sulphate of quinia or cinchona, and present the green coloration on the action of chlorine and ammonia, hitherto supposed to be peculiar to quinia. The dried and powdered leaves and bark, and even the wood, of this tree have found employment in medicine. The wood is close grained, heavy, and of a dark color, and may be used with advantage by the cabinet maker.

TOOLS and chisels for cutting French burr stones may be tempered by heating to a dark cherry red and quenching in the following solution: To 3 gallons water add 3 ozs. each spirit of niter, spirit of hartshorn, white vitriol, sal ammoniac, and alum, and 6 ozs. common salt, with a double handful of hoof parings.