PRACTICAL MECHANISM.

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DRIFTS.

Of drifts there are two kinds, one being a smooth round conical pin, employed by boiler makers to make the punched holes in boiler plates come fair, so that the rivets may enter, which may be aptly termed a stretching drift, and the other the toothed or cutting drift. Of the first, it may truly be said that it is utterly destructive of the safety of any work to which it is applied, because the punching of a plate considerably weakens its strength at the narrowest section of metal, namely, between the hole and the edge of the plate, where the latter, being the weakest, gives way to the pressure of the punch. If one closely observes the surface of a piece of iron which is being punched, he will find that the scale on the surface of the iron round the hole, and especially between the hole and the edge of the plate, will be sensibly disturbed, showing a partial disintegration of the grain of the metal beneath, even if the punch is very sharp; but if the punch is dull, or the edge is in the least rounded by wear, the scale will fly off the surface of the metal in small particles, evidencing a considerable disturbance of the metal beneath and an equivalent weakening of the substance between the edge of the hole and the edge of the plate. If then, after punching, the holes do not come fair, and the plain drift is employed to still further stretch the metal, not only is the weakening process greatly augmented, but the holes are stretched oval, so that the rivets do not completely fill them, however well the riveting may be performed. The use of the plain drift is therefore totally incompatible with first class workmanship; hence a description of this tool will be altogether omitted.

Of cutting drifts, there are two kinds, the first being that shown in Fig. 156. A is the cutting edge, the width and

Fig. 156.

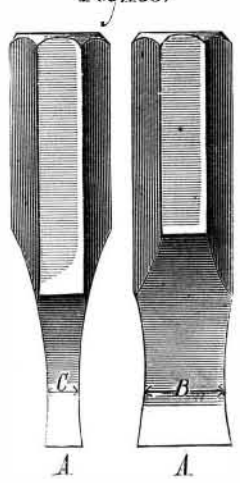


Fig. 157.

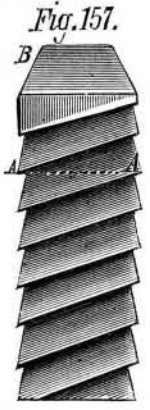


Fig. 157a

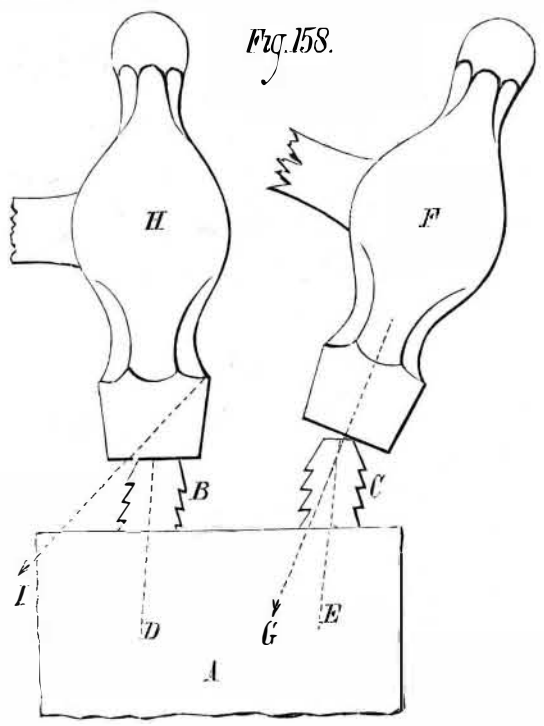
thickness at C and B being reduced so that the sides of the drift may clear the sides of the hole. The tools are filed at A A, to suit the required hole, and tempered to a brown bordering upon a purple. The hole or keyway is then cut out roughly, to nearly the required size, and the drift is then driven through with a hand hammer, cutting a clean and true hole. Care must, however, be taken to have the work rest evenly upon a solid block of iron or (for delicate work) lead, and to strike the punch fair and evenly, otherwise a foul blow may break the drift across the section at C. This class of drift is adapted to small and short holes only, such as cotter ways in the ends of keys or bolts, for which purposes it is a very serviceable and strong tool. It must be freely supplied with oil when used upon wrought iron or steel.

For deeper holes, or those requiring to be very straight, true, and smooth, the drift represented by Fig. 157 is used. The breadth and thickness of the section at A is made to suit the shape of the keyway or slot required. The whole body of the drift is first filed up, parallel and smooth, to the required size and shape; the serrations forming the teeth are then filed in on all four sides, the object of cutting them diagonally being to preserve the strength of the cross section at A A. The teeth may be made finer, that is, closer together, for very fine work, their depth, however, being preserved so as to give room to the cuttings. To attain this object in drifts of large size, the teeth should be made as shown in Fig. 157*a*, which will give room for the cuttings, and still leave the teeth sufficiently strong that they do not break. The head, B, of the drift is tapered off so that, when it swells from being struck by the hammer, it will still pass through the hole, since this drift is intended to pass clear through the work.

The method of using this tool is as follows: The hole should be roughed out to very nearly the required size, leaving but a very little to be taken out by the drift, whose duty is, not to remove a mass of metal, but to cut a true and straight hole. To assist in roughing out the hole true, the drift may be driven lightly in once or twice, and then withdrawn, which will serve to mark where metal requires to be removed. When the hole is sufficiently near the size to admit of being drifted, the work should be bedded evenly upon a block of iron or lead, and oil supplied to both the hole and the drift; the latter is then driven in, care being exercised that the drift is kept upright in the hole. If, however, the hole is a long one, and the cuttings clog in the teeth, or the cut becomes too great, which may be detected by the drift making but little progress, or by the blow on the drift sounding solid, the drift may be driven out again, the cuttings removed, the surplus metal (if any there be in the hole) cut away, the hole and drift again freely oiled, and the drift inserted and driven in as before, the operation being continued until the drift passes entirely through the hole; for the drift will be sure to break if too much duty is placed upon it. After the drift has passed once through the hole, it should be turned a quarter revolution, and again driven through, and then twice more, so that each side of the drift will have contacted with each side of the hole (supposing it to be a square one), which is done to correct any variation in the size of the drift, and thus to cut the hole true.

The great desideratum in using these drifts is to drive them true, and to strike fair blows, otherwise they will break. While the drift is first used, it should be examined for straightness at almost every blow; and if it requires drawing to one side, it should be done by altering the direction in which the hammer travels, and not by tilting the hammer face (see Fig. 158).

Fig. 158.



Suppose A to be a piece of work and B and C to be drifts which have entered the keyways out of plumb, as shown by the dotted lines, D and E. If, to right the drift, C, it was struck by the hammer, F, in the position shown and traveling in the direction denoted by G, the drift, C, would be almost sure to break; but if the drift, B, was struck by the hammer, H, as shown, and traveling in the direction denoted by I, it would draw the drift, B, upright without breaking it; or in other words, the hammer face should always strike the head of the drift level and true with it, the drawing of the drift, if any is required, being done by the direction in which the hammer travels. When it is desired to cut a very smooth hole, two or more drifts should be used, each successive one being a trifle larger in diameter than its predecessor. Drifts slight in cross section, or slight in proportion to their lengths, should be tempered evenly all over to a purple blue, those of stout proportions being made of a deep brown bordering upon a bright purple. For cutting out long narrow holes, the drift has no equal, and for very true holes no substitute. It must, however, be very carefully used, in consequence of its liability to break from a jarring blow.

REVERSE KEYS.

Crossheads, pistons, and other pieces of work which are keyed to their places upon taper rod ends, and are therefore apt to become locked very fast, are easily removed by means of reverse keys, which should always be employed for that purpose, because striking such work with a hammer, even supposing the work to be well supported underneath and copper interposed between the hammer and the work, is liable to bend and otherwise damage it with every heavy blow.

Reverse keys are simple pieces of steel, so shaped as to reverse the draft of a keyway, and are made male and female, as shown in Fig. 159, A representing the male, and B the female. The manner of using them is to insert them into the keyway, as shown in Fig. 160, in which A repre-

Fig. 159.

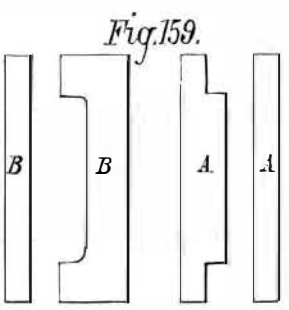
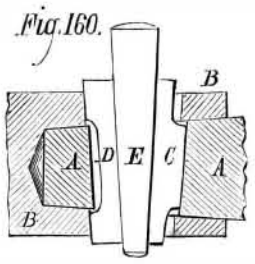


Fig. 160.



sents a taper rod end, B the socket into which A is fitted or keyed, C the male and D the female reverse key, and E an ordinary key. It will be found, on examination, that the insertion of C and D have exactly reversed the position of the draft of the keyway, so that the pressure due to driving in the key will be brought to bear upon the rod on the side on which the pressure was previously on the socket, and on the socket on the side on which the pressure was on the rod; so that driving in the key will key the socket out of instead of into its place.

The keyway in Fig. 160 is shown to have draft: that is, the proper key, when driven in, will bear one edge upon the edge of the keyway in the rod only, and not on the edge of the keyway in the socket at the small end of the cone; while at the large end, the natural key would bear against the edge of the keyway in the socket only. If, however, this condition does not exist, and the edges of the key bear equally upon the cone and the socket (on both edges and all the way through), the keyway being a solid one, that is to say, having no draft, the reverse keys may be employed, providing that C is placed so as to bear upon the edge of the keyway on the large end of the cone only, and that D is placed to bear on the edge of the keyway at the small end of the cone on the socket only, thus producing a back draft, or clearance, as it may better be termed. The key, E, should be made long, and both it and the reverse keys should be made of steel and left soft.

Carbonic Acid as a Fire Extinguisher.

Messrs. Connelly and Naylor, patentees, recently fitted up an apparatus, near the grounds of the gas works, in Pittsburgh, where, according to the *Commercial*, they conducted experimental tests in the presence of a number of citizens. In general terms, the machinery consists of a generator, where the gas is evolved; three receiving tanks, thirty inches in diameter by ten feet in length; and the connecting pipes. Some fifty feet distant was an excavation, twenty by thirty feet, partially filled with water, upon the surface of which was a skim of crude oil, to test the efficacy of the gas in extinguishing an oil fire. A pipe, about an inch and a half in diameter, and supplied with small jets every few inches, was extended along each side of this tank, a little above the surface of the water.

The first experiment consisted in lighting the crude oil, and letting it burn until the flame covered the entire surface. Immense volumes of black smoke rolled upward, the flames shot up ten or twelve feet into the air, and the heat was so intense as to drive the spectators back some fifty or sixty feet. At a signal from Dr. Connelly, when the fire was at its hottest, the engineer turned a valve, the carbonic acid rushed from the receivers with a hissing noise, through the jets in the pipes, and in two or three seconds the flame was cut off as effectually as though a coating of ice had instantly formed on the surface of the oil. As soon as the gas struck the flame, it was changed to a white steam, which made a striking contrast with the dense black smoke above it, as these two dissimilar vapors floated away and were gradually dissipated in the upper atmosphere. The second experiment was but a repetition of the first, and in both cases the extinguishment of the great volume of flame was as sudden and effectual as the snuffing out of a candle. A third experiment consisted in setting fire to a pile of shavings, kindling wood, oil barrels, etc., rendered highly inflammable by the addition of crude oil. When the fire had taken a firm hold, and was rapidly consuming the woody fiber, the gas was turned on, and the fire was out. The wood continued to smoke for a few moments, but there was no fire. The experiments were highly successful, and Dr. Connelly was warmly congratulated on his achievement.

The pressure on the receiving tanks was about 200 lbs. per square inch.

Progress of the East River Bridge.

The work on the East River Bridge thus far has cost $5,800,000; it is estimated that at least $10,000,000 more will have to be raised. This done, the bridge will probably be completed by July, 1879. The expenditure for labor and material averages about $78,000 per month.

The tower on the Brooklyn side was finished two months ago. On the New York tower, work will be suspended on December 1, for the winter; but it is stated that the structure will be completed and everything made ready for the throwing over of a temporary bridge early in the summer of next year. On this temporary structure the workmen will weave the wires into the permanent supporting cables. The galvanized ropes for the foot bridge are to weigh 12 lbs. per foot, and are to be 2⅝ inches in diameter, with a breaking strength of not less than 240 tuns. As yet no contracts for wire work have been made. The work of demolishing buildings for the New York anchorage will be undertaken in May next.

St. Gothard Tunnel.

The present state of the works here has been reported on by M. Caillaux, in connection with M. Léon Say. On the side of Switzerland they are being pushed energetically forward. The tunnel is 9·3 miles long; 2,700 yards are bored on the side of Switzerland, and 2,100 yards on the side of Italy, leaving 6·21 miles to get through. According to present calculations 1,400 days will be required for finishing the works, which it therefore is possible will be competed by the end of 1880. The approaches to the tunnel are not yet begun: they will give a great deal of trouble. The tunneling is performed by the force of falling water setting in motion compressed air-machines. These attack the rock, and drill blast holes of 40 or 48 inches in depth, which are afterwards charged with dynamite. Before the discovery of dynamite it is hardly possible to suppose that more than half a yard a day could have been bored from each side, and 15,000 working days, or more than forty years, would have been required, for a work which it is now supposed will not take more than ten. In the week from September 17th to September 24th, the whole amount bored was 54 yards, an average of 7·8 yards per day; the average of the preceding week was 7.9 yards.