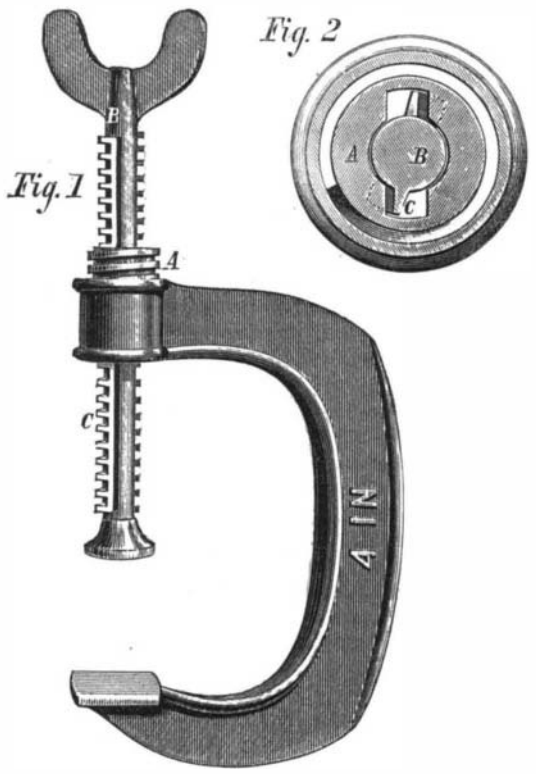
IMPROVED ADJUSTABLE CLAMP.

This is one of those simple and yet very effective little devices which is sure to meet with a ready application from all having occasion for its use. The shape, clearly shown in the annexed engraving, is such as to insure strength, stiffness, and convenience in handling, and the material used is malleable iron. The socket on the upper extremity of the frame is threaded to receive a screw, A. Through the latter passes the clamping rod, B, along the sides of which are cast a series of projections, as shown at C. These enter grooves at the side of the rod orifice through the screw, so that the rod may be moved up and down through the latter with ease. In use, however, the object to be clamped is



placed between the frame and the enlarged lower end of the rod. The latter is then pushed down against the object and turned to the right. The projections, C, then enter notches made along the sides of the grooves in the screw, and consequently carry the latter around with the rod, thereby forcing the same tightly down upon the work. The sectional view, Fig. 2, will render the arrangement of grooves and projections clearly understood. A quarter turn to the left disengages the projections on the rod from the notches, so that the rod can at once be drawn back.

It is unnecessary to point out the advantages resulting in saving of time in turning down screws, as well as the firmness with which the clamp holds its work. The invention is made in various sizes, and is, of course, applicable to a variety of uses, by cabinet makers, carpenters, and others. A vise for wood workers' use has also been introduced, we understand, constructed on the same principle. The present invention is sold by the trade.

Further particulars may be obtained by addressing Hammer & Co., Branford, Conn.

FURNACES, THEIR CONSTRUCTION AND MANAGEMENT.

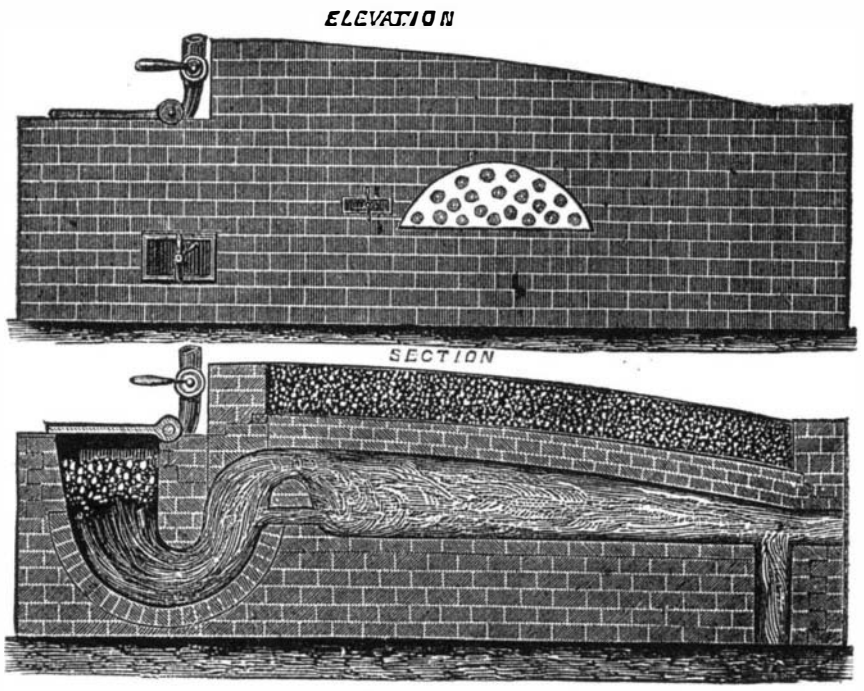
READ BEFORE THE EDINBURGH AND LEITH ENGINEERS' SOCIETY BY MR. CHARLES FAIRBAIRN.

Dr. Joule, in some experiments conducted some time ago, ascertained that a grain of zinc consumed by a galvanic battery generated sufficient power to raise 145 6 lbs. 1 foot high. Now it has been proved that a grain of coal consumed in combustion exerted a power of nearly 1,400 foot pounds. This is nearly ten times the power given out by the zinc. It is said, however that thermo-electric engines utilize the initial force supplied about four times better than heat engines, which would make a grain of zinc give about two fifths of the power of a grain of coal. But zinc costs from forty to fifty times as much as coal, while it gives only two fifths of the efficiency.

During a number of years I have been trying experiments with furnaces, with a view to the economy of fuel. As opportunity occurred, the furnaces I experimented on have been of various kinds, but lately they have been what are known as reverberatory furnaces, chiefly used for puddling and reheating iron.

I do not suppose that any person who has not had an opportunity of seeing a furnace in operation could believe that the effect would be so powerful; the inner lining actually acquires a white heat, thus serving as an accumulator, which is given out again when the temperature of the fire is reduced (as in the case of a fresh charge of fuel), and at the same time assisting to bring the fresh fuel into active combustion more rapidly; the heat is again returned to the fire bricks, and kept ready for future use.

Doctor Siemens, in his celebrated gas furnace, has been very successful in economizing fuel in very large iron manufacturing establishments. The Siemens furnace requires great care in its management, and is said to be more useful for heating large masses of iron for forgings or long bars than for puddling or the intricate processes of iron manufacture. However suitable for large establishments where a great number of furnaces have to be supplied with gas, it is clearly too cumbrous and costly for smaller places, and the question arises—can we not effect, approximately at least, a similar result in single furnaces to what is done by the Siemens furnaces? I think so. Regarding the quantity of air required in the ordinary furnace for the combustion of coal, I suppose that very few people have any idea of the magnitude of the demand. It is generally given as 300 cubic feet, or 24 lbs. of air to 1 lb. of coal. Let us place this in another light. In my own establishment in Gateshead I have seven furnaces, each of which uses about one tun of fuel per day, in all about seven tuns; therefore 7×24=168 tuns of air required. Again, a pound of coal requires about 300 cubic feet of air. If we imagine the 168 tuns of air made into a long stream of one square foot in area, the total length will be 21,381 miles in length. Another great cause of the loss of heat, as before stated, is the quantity of heat continually passing away to the chimney. One difficulty—that is, regulating the supply of air to the furnace—can only be overcome by artificial means, either by a fan blast or steam jet. I believe the time is fast approaching when the supply of air to furnaces will be regulated in this way as the most efficient and economical, and as obviating a great many of the faults of our present furnace. The idea is old enough. However, the arrangement of furnace I will describe presently may or may not be new. I never saw it before, nor am I aware that anything of the same kind has been tried, and to it I have added a supply of air by means of a blower. In this furnace, of which the drawing is a longitudinal section, the coal is introduced from the top, and is always on the top of the incandescent fuel, at the side of the furnace furthest from the place where the flame makes its escape. The hearth is of fire brick, and during the meal hours all the ashes and clinkers are removed by the hole in the side of the furnace. The area of the hearth is about two thirds of the area that it was previously; the blast was introduced above the new coals, and passes through them. As the coals begin to ignite, all the inflammable gases are forced through the fire, and at the same time mixed with air. The advantages with this kind of furnace seem to be the following: (1) The whole of the gaseous products are made available; (2) there is entire absence of smoke, in consequence of perfect combustion; (3) there is a smaller quantity of air required, probably about one fourth less, that is, about 18 lbs. to 1 lb. of coal; (4) no increase of temperature above the external air is required in the chimney, and the escaping heat from the furnace can be used for other purposes; (5) a higher temperature in the furnace, and more rapid circulation of heat; (6) the perfect control which the attendant has over the furnace as regards temperature, getting the fire lighted and into operation in less time, when they have not been in use. There is also another very important point in connection with this method of making reheating furnaces—that the air can be so nicely adjusted by means of the blast and damper as to insure that nearly all the oxygen will be taken up by the carbon and gases, in consequence of which the iron is heated with scarcely any loss from oxide or scale. The balance of pressure can be made so that, even where there are unprotected inlets to the interior of the furnace, the flame can be made to come to the edge of the open space. I believe the efficiency of the furnace might be largely increased by using hot air, which might be done by passing it through pipes or brickwork placed in the flues; for if we have the heat of the furnace at 2500°, and the entering air heated to 500°, the result would necessarily be a great saving. On this point we have the experience of blast furnaces as an indication of what might be saved by this means alone.



FAIRBAIRN'S FURNACE.

The application of this method of constructing furnaces is more difficult to existing steam boilers, and this we can only accomplish by constructing a separate combustion chamber, in which the gases could be properly ignited before passing below the boiler.

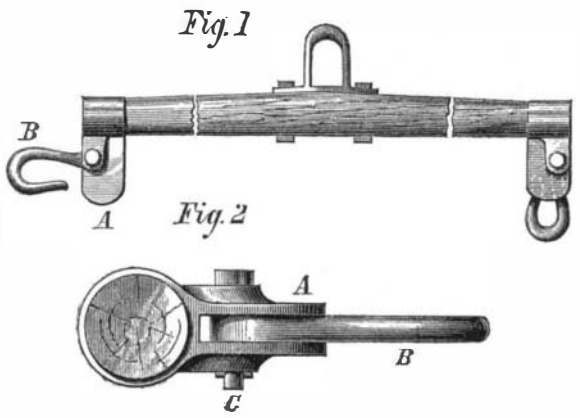
[We are indebted to *Engineering* for the engraving.—EDS.]

STARLING'S FERRULE AND HOOK FOR WHIFFLETREES

This is a simple device for attaching lugs or traces to whiffletrees, the operation of which is clearly indicated in the annexed engravings.

The ferrule is fitted to the end of the whiffletree in the usual manner. Upon the forward side is a slotted lug, A, shown enlarged in the end view, Fig. 2, to receive the eye of a hook, B, which is secured by a pin, C. The portion of the lug through which the pin hole is formed, and between the aperture and the ferrule, is constructed thick enough to give sufficient strength. The part, however, in front of the pin hole, and upon its inner side, may be made thin, as said parts serve only as a guard to cover and protect the point of the hook when it is extended forward or swung inward, as shown in Fig. 1. This thin portion does not project along the outer edge of the lug; so that, when the hook is swung outward, its point will be uncovered and the trace readily attached.

When used in plowing, the iron pin may be replaced with a wooden one, so that, should the plow strike an obstacle



the pin may break and thus prevent injury to the plow. Patented through the Scientific American Patent Agency, June, 2, 1874. For further particulars address William Starling, Hallock, Peoria county, Ill.

New Prussian Guns.

The *Gazette* of Cologne, Germany, says, of the new Prussian field guns: They are of the same diameter and caliber as the former pieces, but weigh 391 kilogrammes instead of 260, while the new projectiles weigh 6½ kilogrammes instead of 4½, and have an initial velocity of 500 instead of 360 meters. The trials made with the new gun against the old one were highly satisfactory; at the distance of 1,500 metres, the number of pieces of shells in the target was in the proportion of 2 5 to 1, and balls and pieces of sharpnels 3 to 1; but these advantages have been obtained at the expense of lightness and handiness. The whole, gun, charge, and carriage, weighs 1,725 kilogrammes, instead of 1,575, a diminution of mobility equal to about one twelfth. In order to test the importance of this fact, it has been decided that the horse batteries, attached to cavalry divisions, which are to execute grand manœuvres toward the end of September, shall be supplied with the new pieces. The manœuvres are to take place at Frankfort-on-Oder, Magdebourg, Haguenau, and Brumath.

French Saw Making.

The Paris makers have almost a monopoly, we understand, in the making of ribbon saws, and of late years they have given much attention to the production of all kinds of saws and other articles made of sheet steel. Among others, M. Dugoujon, who has steam works at Paris, has patented a number of improved modes of manufacture. The blades, after being rolled cold several times, in order to render the grain close and the metal homogeneous, are heated in special furnaces, from which the air is carefully excluded, and when at the proper temperature are plunged in a bath of colza oil; this is done in a dark chamber. The tempering is effected with the aid of machines, which cause the blades to pass between cast iron plates, heated to a fixed temperature, according to the nature of the article to be produced. The teeth of the saws are cut by machinery, which require only laborers to attend it. Since the war, which deprived the establishment of some of its best men, M. Dugoujon has effected the planishing and grinding of circular and other saws and many similar articles by machinery, and, it is said, with great advantage with respect to regularity and stiffness.

Another introduction is the mechanical reduction of the joints of ribbon saws. The breaking of the joint is the only inconvenience about this useful instrument. The workman, in reducing the welded part by means of the file, scarcely ever left it of exactly the same thickness as the rest of the blade; thus it either created extra friction or was liable to break.

By the new method the reduction is made by grinding instead of filing; and as that is effected longitudinally, instead of across the blade, the thickness is rendered perfectly uniform. This invention is said to save 60 per cent in wages, besides the cost of files.