



STEPHENSON'S EMBOSSED PLATES FOR LOCOMOTIVE FIRE-BOXES.

An improvement in the construction of locomotive fire-boxes has been patented by Mr. J. F. Stephenson, the Assistant-Locomotive Superintendent, Southern Division of the North-Eastern Railway. The invention relates to the staying of fireboxes and the manufacture of plates for the same, the stays retaining ample hold of the plates without renewal until the plates are worn down to the lowest point consistent with safety. The lifetime of fireboxes and furnaces is thus considerably lengthened, thereby effecting great economy in maintenance and removing a source of anxiety to locomotive engineers. The improvement is accomplished at a very slight additional cost, as will be seen by the accompanying diagrams.

The plates of a boiler exposed to the action of fire, particularly those which form the sides of the firebox, are usually supported by staybolts passed or screwed through them and secured to the outer shell or to other plates separated from the former by a water or steam space. As the plate and the head of the staybolt become corroded, scaled, or burnt the hold of the stay on the plate and the plate itself are so much weakened that the latter frequently gives way, and serious accidents sometimes occur from this cause. The object of the invention is to strengthen such plates in the parts through which the staybolts pass, to give the staybolts a better hold therein, and to protect the stays as well as the strengthened portions of the plates from the destructive action of the heat. For this purpose those parts of the plates through which staybolts are to pass are subjected to a squeezing action produced either by pressure or blows between blunt punches and hollow dies so that the metal of the plate is at each stay place hollowed in on the one side and made to project as a boss on the other side. In some cases the stay bosses produced as above described are subjected to a further squeezing between punches and dies, so as to thin the middle of the boss and swell it out laterally. The embossing may obviously be effected by passing the plates between rollers having suitable hollows and projections; also, when the metal will permit, the required bosses may be formed by casting them on the plates, soldering or welding them thereon. Through each boss a hole is made and a screw-thread cut in it for the reception of the staybolt, the head of which appears on the side of the plate that is to be exposed to the action of the heat, whilst its screw-thread extends throughout the whole depth of the boss that projects on the other side. The hole in the boss may be countersunk to receive the partly-coned head of the staybolt, which can thus be partly sunk into the body of the embossed plate. Plates thus prepared and stayed may be much thinned down by the action of the heat, and the heads of the staybolts quite burnt away, and yet the stays retain a good hold by the depth of screw-thread still remaining in the

bosses which project on the side of the plate that is not exposed to the destructive action. Fig. 1 represents a section of the embossed plate at a staybolt; Fig. 2 represents the same when worn out; and Fig. 3 represents the ordinary staybolt and plate when worn out.

## Watchmakers' and Jewellers' Work.

**CHARCOAL ASSAY.**—By this process an assay accurate enough for small quantities, can be made in a short time. Suppose you have melted and refined some gold filings, you now have the gold and silver, and wish to know the carat. Try it on the "touch-stone" and approximate its quality. Weigh *very* carefully 12 grains; reduce this by means of fine silver to 8 k., or a little less; melt this into a shot and flatten on a clean piece of steel, then anneal and roll into a thin ribbon, coil it loosely like a watch spring, then anneal and put in a glass retort; cover with nitric acid one-half, water one-half; boil for 10 minutes, then pour off the solution again, rinse well and then boil for five minutes in pure nitric acid; rinse several times with hot water. Dry the gold and melt it into a shot, then weigh this shot. Twice the weight will be the carat of the metal. It is unnecessary to say that the utmost care must be taken as to weight and the manipulations to succeed in arriving at accurate results by this process.

**TOUCH STONE.**—Obtain a piece of silica or "black stone," as it is called, from the lapidary and have it made smooth on one side. Solder on the ends of brass wire a small piece of 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 22, k. gold. You may not need all of these, 10, 12, 14, 16, 18, 20, 22 k. will answer. Be sure that these pieces are alloyed correctly. Take the gold you wish to test, rub it on the stone, the same as you would rub a pencil on paper, it will leave a streak. Now after forming something of an estimate by its looks, as to its quality, (suppose you think it 14 k.) rub point 16 k. on one side and 12 k. on the other, and place the acid on each streak the same instant. If the 12 k. streak disappears first, the object streak next, and 15 k. last, you may infer that the gold is better than 12 k. and poorer than 16 k. Try again with 13 k. and 15 k. and judge as before.

**TO REMOVE THE DEVIL OR TIN FROM THE STOCK.**—Just before pouring the gold throw a small piece of corrosive sublimate in the pot, stir well with a long piece of pointed charcoal, and allow the pot to remain on the fire about half a minute afterward. This will take tin from the alloy; while the tin is in, the gold will not roll without cracking. To remove emery or steel filings, &c., from gold, when melting, use a small piece of glass-gall, it will collect them in the flux.

**TO TEMPER BRASS, OR TO DRAW ITS TEMPER.**—Brass is rendered hard by hammering or rolling; therefore, when you make a thing of brass necessary to be in temper, you must prepare the material before shaping the article. Temper may be drawn from brass by heating it to a cherry red, and then simply plunging it into water, the same as though you were going to temper steel.

**TO TEMPER STAFFS, CYLINDERS, OR PINIONS, WITHOUT SPRINGING THEM.**—Prepare the articles as in the preceding process, using a steel plug. Having heated the key-pipe to a cherry red, plunge it into water; then polish the end of your steel plug, place the key upon a plate of brass or copper, and hold it over your lamp with the blaze immediately under the pipe till the polished part becomes blue. Let cool gradually, then polish again. Blue and cool a second time, and the work will be done.

**TESTING.**—The acid to be used is nitric, slightly diluted, with the addition of a small quantity of salt. You should have two or three bottles containing fluid of different strength; for 22 to 18, use the above; for lesser grades dilute with more water. After a little practice a good observer can arrive within half a carat of the quality.

**TO REMOVE QUICKSILVER FROM RINGS, CHAINS, &c.**—Sometimes quicksilver will get on a piece of work and completely cover it. This makes the article very brittle, as well as spoiling its appearance. Heat the article gradually and under the spot where quicksilver is on—avoid the flume. It will entirely remove it.

**TO TIGHTEN A RUBY PIN.**—Set the ruby pin in asphaltum varnish. It will become hard in a few minutes, and be much firmer and better than gum shellac, as generally used.