as its upper end. It is therefore claimed by the manufacturers that this construction not only secures the parallelism of the jaws, but that it also renders them very effective.

We call the attention of all workmen who appreciate a good vise to the above described style. They will agree with us that no tool is more useful, but at the same time more abused than the vise, and it is on account of this abuse that this tool is so frequently found to be not in really good order. This, however, is often caused by a defective principle on which they are made, and often from defective material, the jaws not being hard enough; but very often it is the fault of those using the vise. We find, however, that a handsome tool like the above commands respect, and that workmen are not so apt to abuse it as a tool which is so defective as to disgust and often exasperate them.

The larger kinds of these vises are intended especially to fill the wants of ship, locomotive, car, and bridge builders, and others who execute heavy work. The smaller kinds are intended for pattern-makers, cabinet-makers, wheelwrights, and carriage builders. They were on exhibition at the last fair of the American Institute in this city, where they were subjected to severe tests in regard to their strength and power, and the result was the award of the highest prize—a medal of superiority.—*Manufacturer and Builder, vol. ii., p. 54.*

Mechanics.

ECONOMY CLOTHING BOILERS.

The following are the results of some experiments conducted several years ago, at the Newport Iron Works, Middlesborough-on-Tees, Eng., to test the value of a good lagging—Jones' non-conducting cement. The boiler (vertical) was connected with a puddling furnace, and was not protected by a roof. It was worked at 50 pounds per square inch, and in the second experiment the whole of the shell, an area of about 280 square feet, was coated with the composition. During the experiments the weather was fine and warm, and the coal used, the iron produced, the time of the experiments, and all other circumstances, were exactly similar in the two cases. A water meter was attached to the feed-pipe, and this showed the exact amount of water evaporated with and without the covering. The results were as follows:

BOILER NOT COVERED.

Total water vaporized per meter, Monday to Saturday, 11,690 gallons.

Total time, 126 hours=92¾ gallons=14.8 cubic feet per hour.

BOILER COVERED.

Total water vaporized, Monday to Saturday, 16,060 gallons.

Total time, 126 hours=127.5 gallons=20.4 cubic feet per hour=5.6 cubic feet per hour more than when the boiler was uncovered, a difference which plainly shows the immense loss of heat under the latter circumstances.

Experiments by Jacob Perkins long ago proved that in case of pipes filled with steam at 100 pounds per square inch, 100 feet of surface exposed to the atmosphere is, under ordinary circumstances, sufficient to condense per hour the steam produced by the vaporization of a cubic foot of water.

Regarding this experiment *Engineering* says: "It will be seen that a square foot of ordinary heating surface has about one-fifth the heat-transmitting power of a square foot of freely exposed cooling surface; or supposing that in any given boiler the areas of heating and cooling surface are equal, the effect of the latter, if freely exposed, would be to reduce the evaporative efficiency of the boiler 20 per cent."

The exposed surface of a boiler, or its cooling surface, in no way differs from its heating surface; it is subject to the same laws, and, under similar circumstances, would produce similar effects. That a square foot of cooling surface withdraws from the contents of the boiler a less amount of heat than is imparted to them by an equal area of heating surface, is merely due to there being a less difference between the temperature of the atmosphere and that of the contents of the boiler, than there is between the latter and temperature of the gases in the flues. Other circumstances being equal, the transmitting power of any given area of boiler surface varies directly as the difference in the temperature on the two sides of it, any increase in this difference enabling the surface to transmit a proportionately increased amount of heat in a given time.

WELDING OF METALS AT LOW TEMPERATURES.

Some time ago, in order to estimate the amount of hydrocyanic acid in a solution, Mr. Charles A. Fawcett, of Glasgow, Scotland, precipitated it with silver nitrate. After having filtered and washed the precipitate, he reduced it to the metallic state by heating to the required temperature. Just as he was about to allow it to cool he noticed a small piece of dirt among the reduced silver. In order to separate them he took a thin platinum wire and pushed the silver to one side, but on attempting to take the wire away the silver remained in contact with it. As he thought this curious, he tried the following experiment: He took a piece of silver foil, about one centimeter square, placed it in an inverted porcelain crucible lid, and heated it to about 500° C.; then he brought into contact with it the extremity of a thin platinum wire, and to his astonishment the wire raised the silver from the lid, and it remained in contact when cold.

The silver being so much below its melting point, its behavior puzzled him, so he wrote to Sir W. Thomson for an explanation. On witnessing the experiment, Sir William pronounced it a remarkable case of "cohesion," the two metals, in fact, "welding," although the temperature was far below the melting point of silver. Mr. Fawcett says that the experiment can be performed successfully at lower temperatures than 500° C., if smaller pieces of foil are taken; and that other metals, for instance, copper and aluminum, cohere to silver in the same manner as platinum, but less strikingly.—*Scientific American.*

NEW LIGHT ON STEEL MAKING.

It would seem that the presence of more than one or two-tenths per cent. of phosphorus in pig iron is no longer to be considered, as heretofore, an insuperable obstacle to its conversion into ingot steel. It has been fully established that as much as 0.32% of phosphorus can be tolerated in very mild steel, and, as it is well known, large quantities of Martin steel made from old iron rails and pure pig have, by the aid of ferro-manganese, been manufactured on this principle. The difference between the cost of changing old iron rails, and that of using pure materials, is, however, in most localities not sufficient to cover the extra expense of using ferro-manganese.

It remained, however, an axiom with steel makers that no removal of phosphorus could be hoped for in any direct steel process till it was announced from the Blaenavon iron works that there were means by which phosphorus could be removed with certainty and economy, and that intensity of temperature was no obstacle to its removal. In confirmation of the Blaenavon experiments, we learn that very important results have been obtained in Belgium with M. Ponsard's ferro-convertisseur lined with one of the Blaenavon basic preparations. The maintenance of the necessary highly basic slag was effected by the addition of lime and a certain amount of ore, as prescribed by Mr. Thomas, the patentee of the process, who assisted at the operations. In the first cast of four tons, notwithstanding that the operations were conducted under very unfavorable circumstances, an analysis of the steel showed that 90% of the phosphorus contained in the pig had been removed. An examination of samples taken at intervals shows a progressive decrease of phosphorus in the bath and its transference to the slag; the amount of silica in the latter being kept at about 22%. A somewhat more basic slag is, however, generally preferred. The second cast gave very similar results. As the Ponsard apparatus is able to deal with pig very low in silicon there appears to be now no class of pig which may not be considered as available for the manufacture of steel. The only impurity which is not removed almost completely is sulphur, though this is eliminated to a considerable extent; fortunately, however, sulphur is readily removed in the blast furnace. We understand it is now in contemplation to regularly work the Ponsard converter in combination with the new basic process on the highly phosphoretic pig of Belgium and Germany. This will give an economy of from 30 to 50 francs a ton over the use of Bessemer pig, and give a fresh life to the drooping fortunes of the manufacturers of phosphoretic pig.—*Iron Age.*

BLACK FINISH FOR BRASS.—Optical and philosophical instruments made in France often have all their brass surfaces of a fine dead black colour, very permanent and difficult to imitate. The following, obtained from a foreign source, is the process used by the French artisans: Make a strong solution of nitrate of silver in one dish and of nitrate of copper in another. Mix the two together and plunge the brass into it. Remove and heat the brass evenly until the required degree of dead blackness is obtained.