

a complete guarantee against flaws, etc., in the parts of which the pile is formed. The second point is to heat the pile wholly by gas, as in the regenerative furnace. In this furnace the iron may be almost melted, but never burnt, as it is exposed only to heat, and not to an oxidizing flame as in a common heating furnace. With clean surfaces to begin with, and a bath of intensely hot but non-corrosive gas, the iron may be made as plastic as the softest wax, and its perfect welding may be insured. This is attended with no loss or injury by burning, and for large masses and quantities of iron there can now no longer be any doubt that the gas furnace affords also the cheapest as well as the best mode of heating. The third point in forming large forgings is to subject them to sudden and powerful hydraulic pressure, as may now be done by the various hydraulic forging presses, one of which, as now fitting at Messrs. Platt Brothers', at Oldham, we not long since illustrated.

Experience has shown that the forcibly pressing together of clean surfaces of wrought iron at a white heat insures perfect welding, and is, in fact, the next thing to founding in wrought iron. Wrought iron, when sufficiently carburized to be fusible, is commonly called "homogeneous metal," and in this form it appears to be wanting, too, in dynamic strength, although it is believed to be stronger in this respect than cast steel. Great pressure is of very great value in the case of steel ingots. Mr. Ramsbottom has greatly improved the quality of Bessemer ingots by squeezing them in his enormous "cogging machine," which we illustrated a few months ago (Vol. I., p. 42). Mr. Whitworth is, we believe, about to employ great pressure in the manufacture of cannon; and Messrs. Firth & Sons, of Sheffield, are also about pressing cast-steel shot. The advantage might not prove wholly of the same kind in the case of pressing wrought iron while hot, but it would secure perfect welding where, by the means pointed out, care had been taken to prevent the formation of scale.—*Engineering*.

Division of Profits.

A firm in Manchester adopted the plan of dividing its profits, over fifteen per. cent. on capital invested, among its workmen. The *London Spectator* says:—

"The first result was a sudden decrease in waste, the men not seeing why they should waste their own property any more than any other master's; and waste is, perhaps, next to bad debts the greatest source of manufacturing loss. The next was an advance in the pace of the work done, the men putting their hearts into it as hired people will not do, and scolding each other for neglect, as if each man was overseer. The last was a great increase of orders, every man being as anxious to obtain work, and profitable work, or, as he himself expressed it, to 'carry some'ut to bonus,' as if he had been the sole master. The result was a first dividend at the rate of fifteen per cent per annum. and four or five per cent over for division among the men."

This plan is worthy of earnest consideration, as likely to work well for both employer and employee.

Esparto Grass for Paper.

The import of Esparto grass for paper continues to increase. Last year the imports into England were 51,522 tons, against 19,190 tons in 1853. Mr. West, the British Secretary of Legation at Madrid, says:—"This grass, which grows wild in almost all parts of Spain, resembles very much the common spear grass which is found on the sandy sea-shores of Lancashire. Its botanical name is, I believe, *Stipatenacissima*. It has long been used in Spain for making matting, cord, baskets, etc., and appears to have been used for such purposes by the Phœnicians, who gathered large quantities from the coast of Spain."

Granulation of Blast-furnace Slags.

For the past two years the granulation of blast-furnace slags has been successfully accomplished in France, the whole of the inconvenience usually arising from the accumulation of masses of vitreous matter being thus avoided. The slag is simply permitted to run into water instead of running upon the ground, as usual. The water used is the waste from cooling the tweers, etc. A suitable pit is formed to receive the water, and the molten slag is run through a gutter into it—of course, becoming finely divided and friable. The slag-sand is raised by an endless chain of buckets, and removed in carts, or otherwise. It is useful for making mortar and silicious bricks, as well as for agricultural and a variety of other purposes. The invention of the process is due to Mr. Minary, and may be seen in use at the works of the Franche-Comte Forges Company, in the department of Jura. The sands vary in color from dingy-gray to dark brown or black, and weigh about 1,200 kilogrammes the cubic inch.—*London Mining Journal*.

Useful Receipts.

Black Ink.

Ink of the very finest and most intense black may be prepared by adding a very minute portion of vanadic acid, or vanadate of ammonia, to a solution of nut-gall. This ink is much more lasting than ordinary ink.—*London Engineer*.

Permanent Ink for Writing in Relief on Zinc.

Bichloride of platinum, dry, one part; gum arabic, one part; distilled water, ten parts. The letters traced upon zinc with this solution turn black immediately. The black characters resist the action of weak acids, of rain, or of the elements in general, and the liquid is thus adapted for marking signs, labels, or tags which are liable to exposure. To bring out the letters in relief, immerse the zinc tag in a weak acid for a few moments. The writing is not attacked, while the metal is dissolved away.

To Render Wood Uninflammable.

Make a saturated solution of potash, and thicken it with paste as for distemper painting, then add sufficient clay to give it the consistence of thick cream, adding yellow or red ochre or other mineral coloring matter, if desired, for the sake