

productions, but have been drifting from bad to worse, until their working capital has been completely exhausted in the endeavor to keep their works from being closed and practically abandoned." The author of the paper in question, believing that if good grounds of hope for redemption from this ruinous state of affairs can be reasonably entertained through the adoption of a slightly different method of puddling, "such a change will be gladly welcomed by a very large industrial portion of the community."

It is premised that a very large proportion of the iron ores mined in the United Kingdom are highly phosphoretic, so that, when converted into pig iron, the pig will be found to contain from 2 to 4 per cent. of phosphorus. In puddling such metal only a very limited percentage of this element has thus far been eliminated, except by careful working or by employing certain unusual ingredients. Much of the bar and plate iron made from phosphoretic pig has been very poor in quality and unreliable in use, being known to the trade as "cold short," or brittle. Consequently, such iron will only fetch the lowest prices. The object of the author is to show that, even when employing the cheapest and lowest grade of phosphoretic pig iron, a most excellent quality of bars and plates can be uniformly made by employing the method of puddling devised and introduced by Mr. Joseph Beasley, of Handsworth. During the past two years—and using phosphoretic iron only—about 20,000 tons of bars, rods, &c., have been made by this process, its quality commanding ready sale to chain and nail makers at paying prices. It moreover costs less to make, per ton of iron puddled, than by the ordinary process with the same iron. With these facts proved, "Mr. Beasley may fairly claim to have made a great revolution in the manufacture of bar iron by the puddling process."

Mr. Beasley has had much experience in the manufacture of superior qualities of iron for gun barrels, many years. Good bars, he knew were easy to produce when using good pig, if manipulated by good puddlers; but the problem to be solved was, how good bars could be made from what is known as common pig iron. An inferior and cheap description of pig iron is made in various parts of the United Kingdom from what is known as "puddlers' tap cinder," and is called cinder pig. In tapping off puddling furnaces in the usual way, much cinder has been accumulated throughout the kingdom, much of which has been regarded almost as a waste product. It was estimated by the late Sydney Gilchrist Thomas that not less than three millions of tons of this tap cinder existed in Staffordshire alone. Some of this cinder (although carrying from 45 to 55 per cent. of iron, in the form of a silicate) has been and is still used in the blast furnace like iron ore, and cinder pig is the result. The market for cinder pig is a very limited one, because of its inferior quality, as the impurities concentrated in the cinder are largely left in the pig iron produced from it. These objectionable impurities are notably phosphorus, silica, and to some extent sulphur, and when found in excess they render the

pig iron almost valueless to the puddler. First among the impurities is phosphorus, which has so strong an affinity for the iron with which it is associated, that it becomes most troublesome to eliminate it, and at the same time preserve the desirable qualities of the iron unimpaired. Analyses shows that some cinder pig-iron contains over four per cent. of phosphorus, whilst the best descriptions of Swedish and similarly fine qualities show hardly more than a trace. True, it was known that an excessive use of lime in the puddling furnace would very materially dissociate the phosphorus from the iron, but the remedy was found to be even worse than the disease, as this excess of lime not only destroyed the furnaces rapidly, but made the iron so "red short" that it crumbled under the influence of heat, and was useless to the forgerman.

The knowledge of these difficulties led Mr. Beasley to make many experiments in his search for a means of utilizing low grades of pig iron in the puddling furnace. Having had some rather negatively good results from the use of hydrochloric acid in past years, he was led to experiment still further with this material, but in a different manner than heretofore. He knew that phosphorus oxidised and ignited at a very low temperature when exposed to the atmosphere; also that in the presence of chlorine it ignited at a still lower temperature; and that its affinity for this gas would be the means of withdrawing it from the iron, if it were practicable to obtain and apply sufficient chlorine at the right moment, and at a price which, for the quantity required, would render such a method economically available. This led him to reason upon the practicability of a thorough saturation with hydrochloric acid, of the lining or fettling of his furnace as well as the slag in which the molten pig was to be worked. By these means he hoped to set free a sufficient amount of chlorine when the saturated mixture was attacked by the heat of the furnace, and thus to draw at least a portion of the phosphorus from the iron, which, combining with the chlorine, would form, in his opinion, a chloride of phosphorus, and that this, burning freely, would increase the temperature, and thus not only save coals, but also shorten the heats of the puddler. He found that a very great increase of lime, if added in proper proportions, could be used in safety as a basic addition, if it was not mingled with the saturated acid mixture with which he lined or fettled his furnace until after the hydrochloric acid had properly acted upon the fettling itself. He soon found that the hydrochloric acid must be allowed to act on the ground tap cinder or the purple ore (which he used as fettling) for several days, and that to get an uniform action throughout, this fettling material must be ground or pulverized. If the lime were applied at the same time as the acid, a chloride of lime would be formed, and the value of the lime as a basic ingredient would be largely lost, whilst, after several days' saturation, the violent action of the acid was neutralised by its absorption in the fettling material, and ground lime could then be applied with advantage. Thus he was led to use increasing quantities of lime, until he at last succeeded in using 80 per

cent. of this material without injuring the furnace sides or making the iron in the least degree red short. He also found that when the iron had begun to melt, and after the puddler had thoroughly stirred it, so that the cinder began to thicken, the addition of a few pounds of oxide of iron in the condition of rust would cause a violent ebullition, and by saturating this rust with hydrochloric acid that a much more thorough purification of the iron took place than when this was omitted. Iron treated in this way, and containing 4.31 per cent. of phosphorus, gave metal as fine in fibre and as tough in quality as best marked bars. We hope to describe this process more particularly in another article.

—Referring to the article in our issue of 25th ult., headed "Explanations Necessary," a circular from head office has been shown us by the Inspector of Agencies for the Mutual Reserve Fund Life Association. It is evidently a reply to enquiries prompted by some dissatisfied or apprehensive members, and is as follows:

SIR,—To comply with making up our annual reports of the insurance departments, we are obliged to give notice of two calls in advance. But they are our regular bi-monthly calls, which would be made upon those dates."

G. T. POTTER,  
3rd-Vice-President,  
Mutual Reserve Fund Life Assoc.  
New York, Dec. 24th, 1885.

It will be observed that this letter antedates our strictures of 25th ult., so that others than the MONETARY TIMES must have deemed explanations requisite. We still think that the circular issued will, upon the face of it, be regarded as making an extra call, and we still think explanations necessary.

—*Herapath's Journal* denies that there is or can be a working arrangement between the Grand Trunk and the Canadian Pacific railways. It denies that there can be any active rivalry between the two companies, and takes comfort in the assurance that there is room for the two systems in the Canadian Dominion. The opinion is expressed that Sir John Macdonald, while in England, may ask the British Government to aid the Canadian Pacific, to which supposititious proposal *Herapath* objects, on the grounds that this highway to the east may never be wanted by England, that the Canadian tariff is too high, and that the example would become inconvenient by being availed of by other colonies.

#### SHIP-BUILDING IN NEW BRUNSWICK.

A resume of ship-building operations now in process in New Brunswick, is given by the *St. John Globe* as under. At Courtney Bay, an 1,800 ton ship is building for Bennett Smith, of Windsor, N. S.; a ship of 1,600 tons which J. K. Dunlop has had for two years on the stocks, has not yet been launched; a barquentine of 500 tons is being built by E. McQuiggan. The yards of Stewart and Ritchie and Oliver Pittfield are idle. The only new vessel being built in Portland is a side-wheel tug-boat, which Mr. S. Thibedeau is constructing on the Strait Shore for Messrs. Glasier. Mr. D. Lynch is doing nothing in his yard,