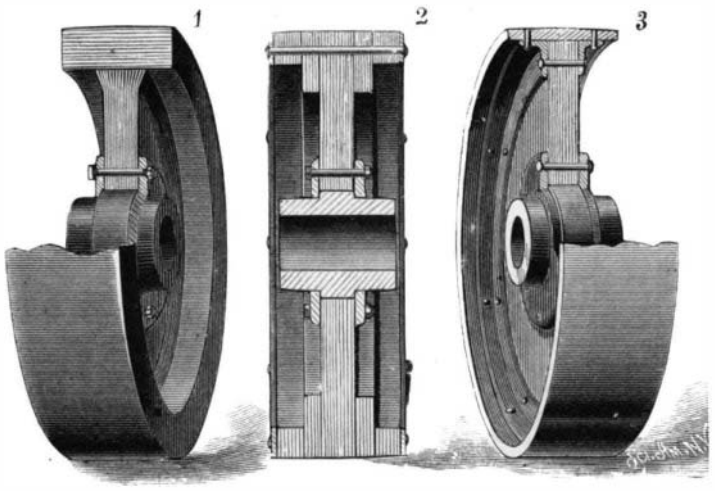
THE AMERICAN PAPER PULLEY.

This invention has attracted much attention among manufacturers for the past few months. The strength and inflexibility of paper, when pasted or glued together in blocks, and subjected to heavy pressure, had been fully tested in the paper car wheel, and it is singular that inventors have been so tardy in discovering its utility in the construction of belt pulleys. On the 31st of last October, three patents were granted to E. B. Martindale, of Indianapolis, Ind. One for a composite pulley, formed of a cast iron hub, a web or body made of paper, pasted and pressed into a solid block, of the thickness to give it the required strength, and this web surrounded by a wrought or cast iron rim, secured to the web by means of knees or flanges riveted through the rim and the paper. By actual tests, it has been found that the rim having a uniform bearing upon the paper body, it is more steady, even, and perfect than any iron pulley heretofore made. The other two pulleys patented by Mr. Martindale, are, with the exception of the hub, made entirely of paper. One is made with a web or body the same as that used for an iron faced pulley, the web forming a part of the face. Paper or pasteboard is then cut into rings and pasted and pressed upon either side, of sufficient thickness to make the required width of face. The rim thus formed is riveted solidly, and turned up to receive the belt. The other is made in much the same manner that paper vessels are made by pasting and pressing sheets of paper, or by rolling and calendering the same together in shape required for the pulley. The engravings represent these pulleys.



THE AMERICAN PAPER PULLEY

These pulleys are now in use, and a factory established by the American Paper Pulley Company, for making them at Indianapolis. The inventor claims for the paper pulley that it possesses the following advantages:

1. Cheaper than either wood or iron. 2. Less liable to break than iron, and does not warp or come apart like wood. 3. It is less than one-half the weight of iron, relieving the line shaft of extra weight and friction. 4. The belt never slips upon it, and may therefore be run much looser than upon an iron pulley, thereby, it is claimed, saving 25 per cent of power.

The Bull Direct Process.

A process for manufacturing iron and steel directly from the ore, invented by Mr H. C. Bull, is attracting some attention in England. The furnace is worked exclusively with gas, delivered into it in a very highly heated state directly from the producers. Highly heated air is also introduced in sufficient quantities to burn about 10 per cent of the gas, and maintain the furnace at the high temperature necessary to allow the withdrawal of the iron or steel and cinder in a fluid state. Under this system, the gases rising through the ore and flux are carbonic oxide and hydrogen, in equal volumes, together with the nitrogen derived from the air which is blown into the furnace. These gases being produced entirely outside the furnace, there is no zone of gasification, but only the zones of fusion, reduction, and carbonization.

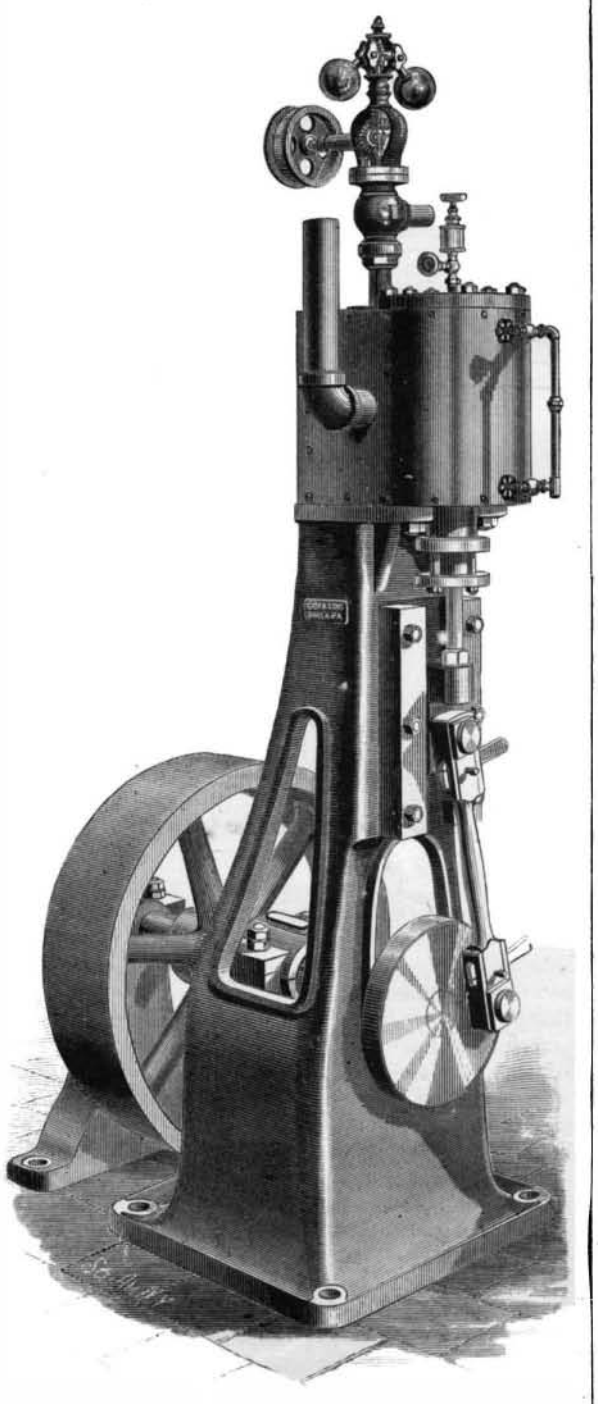
During the year 1881, the Société John Cockerill, of Seraing, Belgium, built an ordinary blast furnace 6 feet in diameter in the bosh, and 21 feet high, fitted with Cowper hot air blast stoves, and ordinary water gas producers of the cupola type, when 3,534 kilogrammes of iron were produced in twenty-four hours, under this process with the gas, as against 645 kilogrammes by means of the ordinary blast furnace without the gas. The silicon was reduced from 3·40 to 0·15, the sulphur from 1·61 to 0·33, the phosphorus from 1·76 to 1·10, the manganese to *nil*, the combined carbon to 0·52, and the graphite to 0·17, which proved that the mildest grades of ingot iron and steel, suitable for rails, cutlery, and the highest class tools, could be produced from the most inferior ores directly in the blast furnace. At the same time, the output from the furnace was increased enormously, and the quantity of fuel required was decreased in almost the same ratio.

A Safe Safety Lamp.

M. Marsaut, member of the Société de l'Industrie Minerale de Saint Etienne, has been experimenting with various so-called safety lamps, especially the Mueseler, with a view to ascertain why it is that they do not afford an absolute guarantee of safety. He found that, in a state of repose in an explosive mixture of air and gas, the explosion which takes place under the diaphragm of the Mueseler lamp, and which generally extinguishes it, passes through the diaphragm on an average fifteen times in a hundred, and communicates the explosion to the exterior almost once in every hundred times. The number of times that the flame passes through the diaphragm is nearly fifty per cent of this number in a certain series of tests, and explosions occur on the outside in five per cent of the cases. This discovery easily accounts for many accidents, the causes of which have until now remained a mystery. As the results of these investigations, M. Marsaut has constructed a modified type of lamp in which no less than 5,500 explosions have taken place without their being communicated to the outside, and under conditions in which the other lamps, including the Mueseler, failed to stand the test. The special feature of this new lamp is a metal shield formed by a hollow cylinder of sheet iron, closed at the top by wire gauze, which completely surrounds the ordinary gauze of the lamp. At the lower portion of the shield is a series of apertures which permit the air necessary for supporting combustion to enter the lamp. This air, in order to reach the flame, must follow a tortuous course, and thus the danger caused by oblique, downward, and rapid currents is completely neutralized. The horizontal diaphragm, which is one of the characteristics of the Mueseler lamp, is suppressed, and is replaced by a simple washer for supporting the chimney. A wire gauze with 929 meshes to the square inch completely envelops the chimney of the Marsaut lamp, and takes the place of the diaphragm in the Mueseler.

IMPROVED VERTICAL ENGINE.

The engine shown in the annexed engraving is of original design, built from new patterns in a thorough and substantial manner, and is so arranged that all of the parts are readily accessible. The engine frame is rigid, and the engine is self-contained and very compact. All of the important parts are made of steel, and the journal boxes and other wearing parts are of the best brass. Wherever there is wear there is a suitable adjustment for taking up lost motion. The main shaft is extra large, and has long bearings. The cylinder is provided with the usual drain cocks and stop valve, and the engine has a governor, and is provided with oil cups wherever they are necessary. The base is very firm, so that no special foundation is necessary in order to set up one of these engines. We are informed that they are all tested with steam before leaving the works. They are made in several sizes, viz., 4, 6, 8, and 12 horse power, with cylinders 4 x 6, 5 x 7, 6 x 8, and 8 x 10 respectively; also a 10 x 10. Larger sizes are in process of construction. This engine is in all respects first class, and well calculated for every-day use the year around. The first three sizes are mounted on a base with the boiler if desired, making a very complete and compact engine.



COX & SON'S VERTICAL ENGINE.

Further information may be obtained by addressing Messrs. Cox & Son., 204 North Fourth St., Philadelphia, Pa.

The Strontia Beds of Sicily.

The introduction of strontia into the sugar industry in recent times has brought this comparatively rare mineral into considerable importance, especially where beets are used for making sugar. Most of the mineral comes from Sicily, and the following description by one who has been there, and taken from the *Chemiker Zeitung*, will be read with interest:

At present all the celestine that is exported comes from Favara, near Girgenti. There the strontium sulphate is found on a high plateau of considerable extent, in the strata of the lower miocene, which, in Sicily, usually carry sulphur. They consist of limestone, calcareous marl, and gypsum, through which is scattered the sulphur, mostly in a finely divided state, more rarely in pieces as large as peas or nuts. At Favara the sulphur is almost entirely missing, and the limestone is partially replaced by strontium sulphate. The stratification of the rocks is almost horizontal there, and the top strata are much weathered and decomposed. The lighter minerals are washed away by the water, while the celestine, being heavier and less acted upon, is left in blocks on the surface. The latter differs but little in appearance from the accompanying limestone, but can be easily distinguished even by the inexperienced from its greater specific gravity (3·9), which has gained for it the name of *cu chiummo* (*come piombo*, like lead) in the dialect of the people.

At present only the mineral that lies exposed is collected, no mining operations being undertaken to obtain it. The inhabitants bring it to several stations on the Palermo and Girgenti Railroad, where it is bought up by dealers at about $7 per ton. At Porto Erupedocle it is again sorted, and any adhering gangue removed, and then it is shipped to Hamburg, or other foreign ports.

The export in 1880 was only 1,000 tons, and in 1881 about 4,000 tons. A factory is being built at Rosslau, in Alsace, for converting the Sicilian mineral into caustic strontia and its carbonate.

No strontianite—*i. e.*, strontium carbonate—is found in Sicily.

Chemistry of the Electrical Accumulators.

With the attention that is now directed to the storage of electricity, the following description of the *chemical* action of the Plante and Faure accumulator as given in a German exchange will not be without interest.

If a plate of lead, coated with a little peroxide of lead, be placed in sulphuric acid, it will soon become covered with sulphate of lead as a result of local currents between the peroxide and the lead, or by simple chemical solution, so that in Plante and Faure's battery the peroxide is gradually destroyed *independently* of the main current. This action takes place very slowly, because the sulphate of lead is deposited between the lead and the peroxide, and hence greatly diminishes the local current. If no sulphate of lead were formed, the peroxide of lead would soon be all consumed. The sulphate of lead is subsequently reduced by the hydrogen, forming spongy lead. By repeated charging, the quantity of finely divided substance increases.

In a similar manner, if two electrodes that are covered with sulphate of lead be immersed in dilute sulphuric acid, and a current passed through them, one will become covered with spongy lead, the other with peroxide formed from the sulphate.

The peroxide formed upon the positive lead plate of the secondary battery becomes covered with a comparatively impenetrable layer which prevents the further production of peroxide; hence Plante leaves his battery at rest, which favors this formation of sulphate of lead.

In this way all the sulphuric acid can easily be taken out of the solution. A considerable quantity of oxygen—more than half—will not be absorbed. According to Kabath, the interior plates of lead foil are rapidly crumbled, but the particles remain hanging between the outer plates.

A Large Gold Bar.

The Bank of California lately received a bar of gold weighing 511½ pounds troy, and valued at $114,000. Its length was 15 inches, width 6 inches, depth 7 inches. It was shipped by the North Bloomfield Hydraulic Mining Company, of Smartsville, Nevada County, California, and is said to have been the largest gold bar ever cast in the United States.