

Inventions.

A NEW REFINING PROCESS.—At a recent meeting of the Société de l'industrie minière, M. Thiollier communicated the details of a method of refining pig, and finishing iron and steel, by the action of damp hydrogen. To assure himself that the well-known laboratory experiment may be carried out on a large scale, he has erected experimental works near Paris, having four furnaces with cast-iron retorts capable of treating about one ton at a time. The retorts are coated inside and out with a vitrifiable substance to prevent oxidation, and loss of gas through the pores of the metal. Hydrogen is introduced through small metal tubes, and, in order to prevent all danger of explosion, the air in the retort is displaced by carbonic acid gas before the hydrogen is allowed to enter. After being annealed for a few hours in an atmosphere of hydrogen at a dark-red to cherry-red heat, malleable cast iron acquires all the properties of steel. Coarse steels may be changed into fine tool steel. On wrought iron the action is slower. The cost is estimated at two francs per 100 kilos of poor-quality iron.

ARTIFICIAL FUEL.—The process of Mr. E. F. Loiseau for making artificial fuel from coal-dust is in successful operation in Philadelphia, where from 80 to 300 tons, according to size of the lumps, are made daily.

The process of manufacture may be briefly outlined as follows:—

The coal-dust is fed into hoppers, together with about eight per cent. of bituminous slack, from which it passes through a series of four cylindrical revolving drums, in which it is thoroughly dried. From these it is carried to a receptacle situated near the press. The dust, still at a temperature of about 140° F., is then thrown into the mixing apparatus, in which it is thoroughly stirred by revolving shafts with blades, while the proper quantity of pitch and coal-tar is added from a reservoir in which it is maintained at a temperature of 180° by steam heat. The pitch is mixed with a certain quantity of coal-tar to give it the proper toughness. When thoroughly mixed with the melted pitch, the mass is plastic, and can readily be moulded into any desired shape. It is then carried to the press, where it is delivered between rolls having moulds upon their surfaces, from which the egg-shaped lumps are discharged. When discharged from the press, the lumps are quite hot, and have to be cooled by jets of water.

As thus prepared, the fuel is compact and very hard. Formerly clay was used as a cementing material, but now no incombustible or ash-producing material is required. The fuel is said to be even superior to the natural coal; and this opinion is borne out by an analysis which gave the following results:—

	Chestnut anthracite.	Loiseau fuel.
Carbon	73.40	82.01
Hydrogen	3.69	2.56
Moistures	0.44	2.41
Ash	17.95	10.47
Nitrogen and oxygen by difference	5.12	2.55
Theoretical calorific power, British thermal units . . .	12,539.50	13,853.00
Equivalent to the evaporation, from and at 212°, of lbs. water . . .	21.76 lbs.	14.33 lbs.

THE EXHAUST STEAM INJECTOR.—Mr L. J. Groves read a paper before the Institution of engineers and shipbuilders in Scotland, March, 20, describing the exhaust steam-injector. It resembles the feed-water injector of Henri Giffard both in principle and in its general construction. It forces the feed-water into the boiler by the action of the exhaust-steam at nearly atmospheric pressure, at the same time heating considerably the water passing through the instrument. It differs from the usual forms of Giffard injector in having the "mixing" or "combining" nozzle split in such a manner that it lies open when the apparatus is not working, but closes up to form the standard form of nozzle when the instrument starts into operation. The steam-nozzle is much larger than that of the common instrument, and has a central spindle, of cone shape, to direct and concentrate the jet. The instrument starts automatically when the engine starts. It draws cold water, and forces it into a high-pressure boiler at a temperature of 190° F. (88° C.) On a locomotive it has forced feed-water into the boiler at a temperature of 277° F. (136° C.), against a steam pressure of ten atmospheres.

A NEW PROJECTILE.—Mr. J. D. Cable of Pittsburg, Pa., has applied for letters patent for a shell which, as a destructive weapon, is claimed to be unequalled. It is a nitro-glycerine bomb, and is described as follows: A heavy conical shell is first cast, and so arranged that one end is much heavier than the other. One end is closed with a tightly-fitting cap screwed after charging. The interior of the shell is divided into three compartments, each separated by a heavy plate-glass cap. The division furthest from the open end is filled with sulphuric acid, the next with glycerine and the outer one with nitric acid, these three elements being the component parts of nitro-glycerine. A small opening through the center of the cap fitting the open end of the projectile admits a steel rod, to each end of which is firmly attached a small circular piece of metal, the inner end resting against the first glass cap. The outer cap is then screwed on and the projectile is ready for service. According to the principle of gravitation the heavy end naturally strikes the ground first, the steel rod is driven through the plate-glass partitions, the chemicals are mingled and a nitro-glycerine discharge takes place. The inventor claims that if such a projectile should strike a vessel it would have a disastrous effect, and as a means of reducing intrenchments it would be serviceable beyond measure.

THE POWER OF A STEAMSHIP.—The Oregon, of the Guion line, is to be the most powerful and the fastest of the transatlantic passenger-steamers. Her displacement is about 11,000 tons. Her engines have three cylinders, and are of 13,000 horse-power. The boilers contain 74 furnaces, consume about 300 tons of coal per day, evaporate 2,700 tons of water, require 6,000 tons of air to support the combustion, or a volume of nearly 175,000,000 cubic feet, and the power developed is sufficient to raise about 200,000 tons one foot high per minute. The ship will make 20 nautical miles (knots) per hour, against an estimated resistance of 94 tons, or twenty times the resistance overcome by the most powerful locomotive. The Atlantic will be crossed in six days in good weather.

ZINC COATING FOR IRON.—Attention has been drawn to MM. Neugean and Delaite's process of protecting iron against rust. A very fine powder of metallic zinc is mixed with oil and a siccative, and applied to the iron by means of an ordinary brush. In many cases one coat is sufficient; two coats are at any rate guaranteed to secure a protection against the corrosive action of the atmosphere as well as of sea water. The zinc coating gives the iron a steel-grey appearance, and it does not interfere with subsequent painting. MM. Neugean and Delaite received a diploma at the Paris Electric Exhibition of 1881, and now recommend their process for iron structures, bridges, lamp-posts, &c., and also for iron ships. If this process really affords the protection it claims, nothing need be said in recommendation of it, since it can hardly be surpassed in simplicity and cheapness, and is capable of application in cases where galvanizing, the Bower-Barff, and similar processes would hardly be practicable. A good mixture, of which only the necessary quantity ought to be prepared, consists of 8 parts by weight of zinc, 71 of oil, and 2 of a siccative.

The framework of a curious hall chair is composed entirely of elk horns mounted in silver. The back and seat are of embossed leather, and the bordering is studded with brass nails.

Educational.

ADMISSION TO STUDY FOR THE PROFESSIONS.

The following letter addressed by Dr. Heneker to William White, Esq., as Batonnier of the Quebec Bar, in regard to the preliminary examinations for admission to the study of the professions, having been laid before the Protestant Committee of the Council of Public Instruction, it was unanimously resolved:—

"That the letter read by Dr. Heneker be adopted by this Committee as expressing its views, and be printed in the *Record*, and for general circulation."