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THE BELGIAN SHIP CANAL.

The ship canal from Ghent to Terneuzen was originally laid out with many bends, rendering navigation difficult; it had a depth of 14 feet 4 inches and a width of 98 feet 6 inches at the water level. The works which are at present in course of execution have especially for their object the deepening of the canal to 21 feet 3 inches, with a width of 55 feet 9 inches at the bottom and 103 feet 9 inches on the water line. The slopes have a uniform inclination of 1 to 3, and the towing paths on each side are placed 6 feet 6 inches above the water level, and are 32 feet 8 inches wide. In many instances also the course of the canal has been altered and straightened for the improvement of navigation; several important diversions have been made for this purpose. The excavation has been effected by hand, by dredging, and by the Couvreux excavator, figured as below in *Engineering*.

The earth excavated was carried to spoil, and in many cases was employed to form dikes inclosing large areas, which served as receptacles for the semi-liquid material excavated by the dredging machines with the long conductors; the Couvreux excavator used will be readily understood from the engraving. It had already done service on the Danube regulation works. The material with which it had to deal, however, was of a more difficult nature, being a fine sand charged with water and very adherent. The length of track laid for the excavator was about 3 miles along the side of the old canal, which had been previously lowered to the level of the water.

Preservation of Iron and Steel from Oxidation.

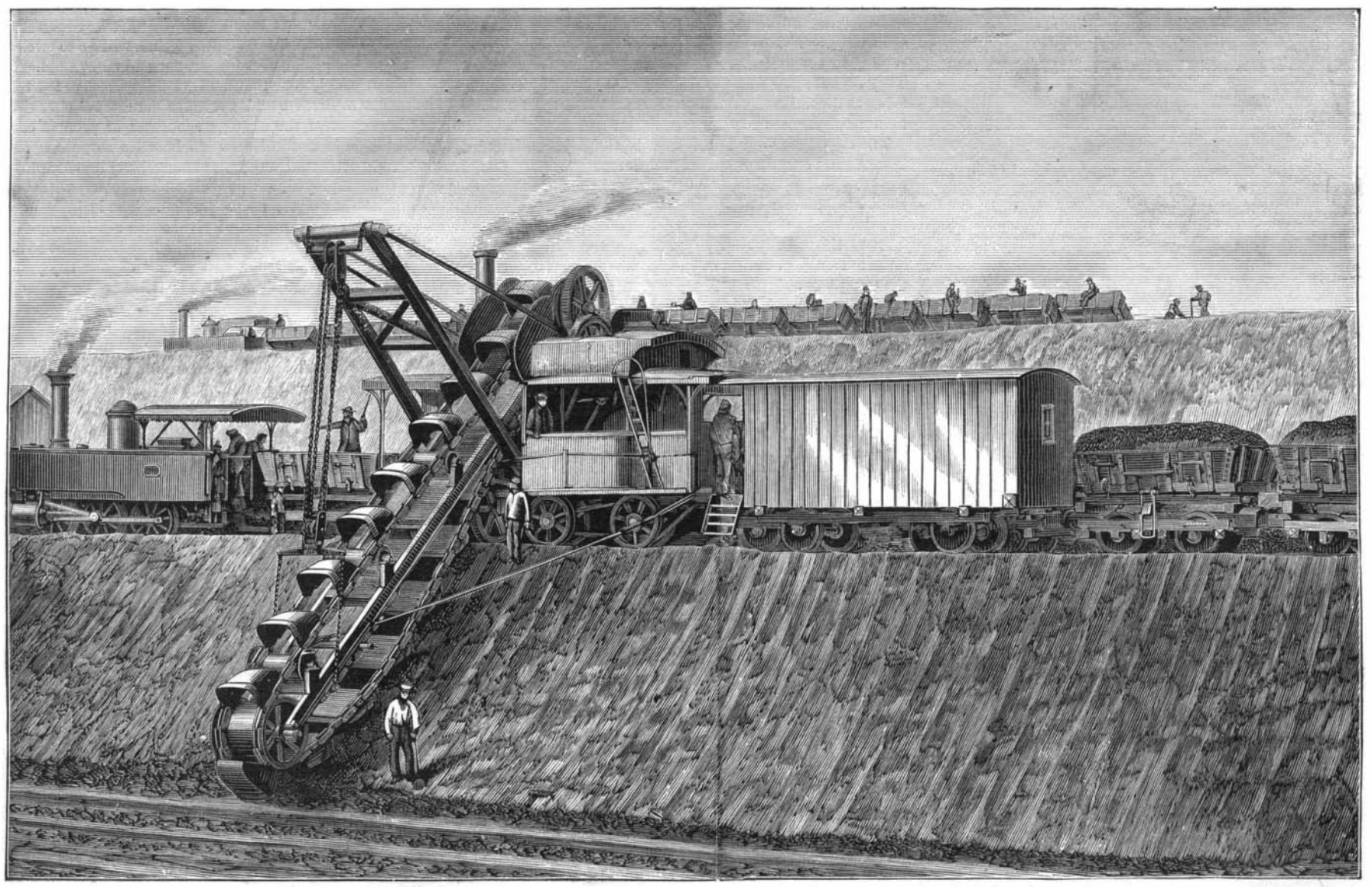
We are indebted to J. Pechar, Railway Director in Teplitz, Bohemia, for the first official report in English from the Paris International Exhibition which has come to hand. This volume contains the report on the coal and iron products in all countries of the world, and is valuable for its statistical and other information, giving, as it does, the places where the coal and minerals are found, and the quantities of each kind produced, for what it is used, and to what other countries it is exported. The able compiler of these statistics in the introduction of his report gives the following account of the means recommended by Professor Barff, of London, for preventing oxidation, which is being considerably used abroad. The writer says:

It is well known that the efficient preservation of iron against rusting is at present only provided for in cases where human life would be endangered by failure, as in the case of railway bridges and steamers. Thus, for example, at Mr. Cramer-Klett's ironworks at Nuremberg every piece of iron used for his bowstring bridges is dipped in oil heated to eight hundred degrees. The very great care which is at present taken in this matter may be judged from the current practice of most bridge and roofing manufacturers. Every piece of iron before being riveted in its place is cleaned from rust by being immersed in a solution of hydrochloric acid. The last traces of free acid having been cleared away, at first by quicklime and afterward by a copious ablution with hot water, the piece is immediately immersed in hot linseed oil, which protects every part of the surface from the action of the atmosphere. Afterward it is riveted and painted.

Notwithstanding all this, the painting requires continual and careful renewal. On the Britannia Bridge, near Bangor, the painter is permanently at work; yet, in spite of all this care and expense, rust cannot be entirely avoided. The age of iron railway bridges is still too short to enable us to draw conclusions as to the probabilities of accidents. Now, Professor Barff has discovered a process by which iron may be kept from rusting by being entirely coated with its own sesquioxide. A piece of iron exposed to the action of superheated steam, in a close chamber and under a certain pressure, becomes gradually covered by a skin of this black oxide, of a thickness depending upon the temperature of the steam and the duration of the experiment. For instance, exposure during five hours to steam superheated to five hundred degrees will produce a hermetical coating capable of resisting for a considerable time the application of emery paper and of preserving the iron from rust even in a humid atmosphere, if under shelter from the weather. If the temperature is raised to 1,200 degrees, and the time of exposure to six or seven hours, the skin of sesquioxide will resist every mechanical action, and the influence of any kind of weather. The sesquioxide being harder than the iron itself, and adhering to its surface even more firmly than the atoms of iron do to each other, there is an increased resistance not only to chemical but also to mechanical action. The surface is not altered by the process in any other respect, a plain forging retaining its roughness, a polished piece its smooth surface. If the skin is broken away oxidation takes place, but only just on the spot from which the oxide has been removed. If Professor Barff's experiments are borne out by practice, this invention may become of very great importance. It is within the bounds of probability that it may enable iron, by increasing its facility in competing with wood, to recover, at least for a considerable time, even more than the ground it has lost by the extraordinary extension of the use of steel. Iron is already being used for building purposes to a large extent; but oxidation once thoroughly prevented it will be able to take the place of wood and stone to a still greater degree. Iron roofing may be made quite as light as that of wood, and of greater strength, by a judicious arrangement and use of T iron.

Warning to Locomotive Engineers.

Drs. Charles M. Cresson and Robert E. Rogers, of this city, says the Philadelphia *Ledger*, well known as experts in chemistry and dynamics, were appointed by the Reading Railroad Company to inquire into and report upon the causes of the recent explosion of the boiler of the express locomotive "Gem," at Mahanoy City, by which five lives were lost. Their report, which is designed to cover the whole scope of a most careful investigation, is not yet made public, but they have arrived at the following specific conclusion, which we give in their own language: "We are, therefore, of the opinion that the explosion of the boiler of the locomotive 'Gem,' was produced by the projection of foam upon the heated crown bars of the furnace, caused by suddenly and widely opening the safety valve, at a time when the water had been permitted to get so low as to overheat the crown of the furnace." This is an important matter that should be carefully noted by locomotive and other engineers.



EXCAVATOR ON THE GHENT AND TERNEUZEN SHIP CANAL BELGIUM.