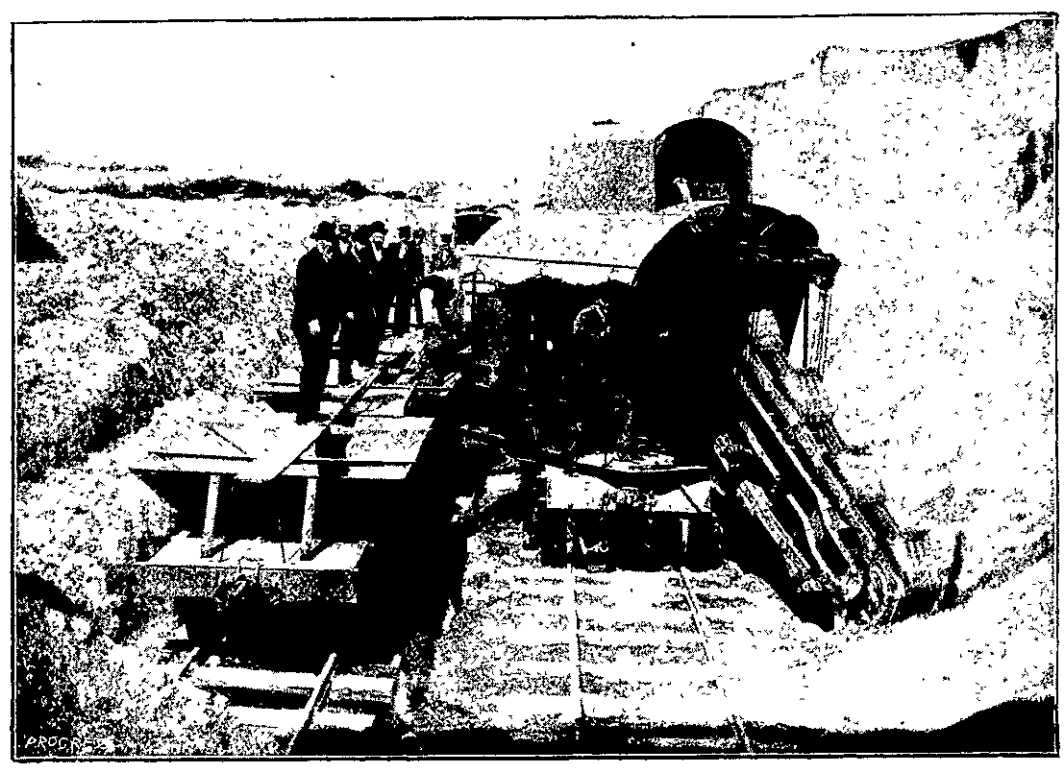
Inventions.

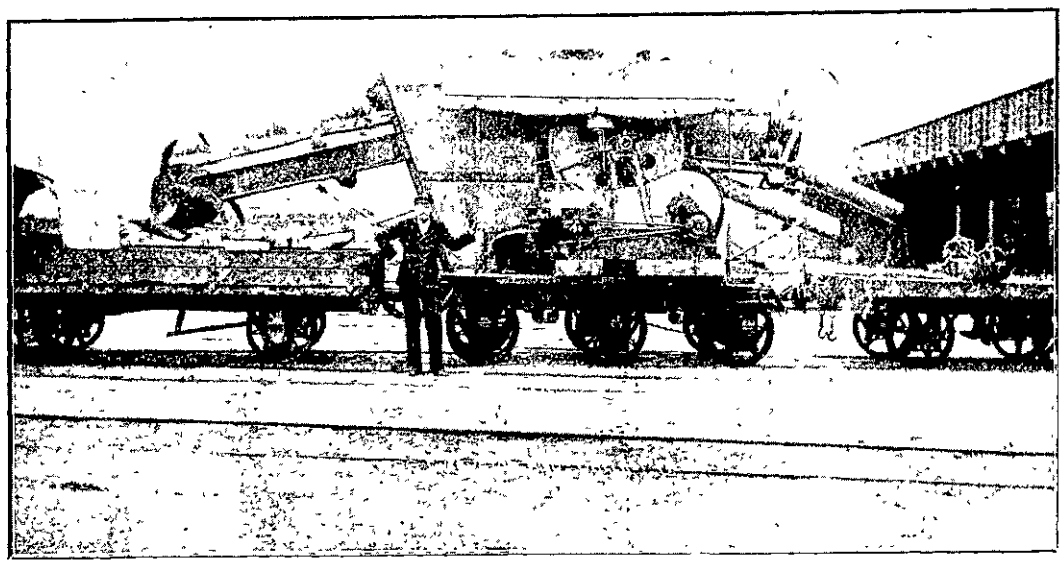
THE QUERTIER EXCAVATOR AND BALLAST FILLER.

Our illustrations show a most ingenious machine invented and designed by Mr. Hilary Quertier, for the purpose of excavating gravel ballast and delivering it into trucks. It will be seen that the machine is carried upon a railroad truck, and comprises a chain of buckets by which the gravel is taken out of the pit, or from a working face alongside the line, and delivered to a screen by which it is separated according to size of the stones, and then delivered into ballast trucks which, for convenience, are run upon a separate track parallel with the rails upon which runs the excavator. By this method the excavator can be taken along a train of trucks, filling one after the other from the working face, the machine being "locomoted" by ingeniously contrived driving gear from an oil engine, which is used as the motor power for the machine. If desired the ballast, instead of being put through the screen, may be delivered directly into shutes conducting it to the ballast trucks.

In evidence of the great saving effected by the employment of this apparatus, it may be cited that on the 23rd January last at Edievale, in eight hours, the Quertier excavator, working in a pit of an average depth of 2ft. 6in., excavated and filled 72 ballast trucks, containing a total of 360 cubic yards, the only labour employed being one driver and one truckman to load. The same quantity of ballast filled by manual labour in the same time would require at least 28 men. The relative cost being ten times as great by manual labour as by the machine. The illustrations show the machine made up in a train for travelling and at work in a gravel pit.



THE QUERTIER EXCAVATOR AT WORK IN A GRAVEL PIT.



THE QUERTIER EXCAVATOR READY FOR TRAVELLING.

The Escalator, or Moving Stairway.—In the large buildings of New Zealand, the general means of transit to and from the different floors is per the ordinary elevator. In America, however, the elevator promises to have a powerful competitor in the escalator, or moving stairway. This contrivance, which in outside appearance exactly resembles an ordinary stairway, may be described as a continuous series of rigid steps placed above an endless sprocket chain. Its capacity for passenger carrying is, of course, dependent upon the speed. Travelling at the normal rate of slightly over one mile per hour. The power required to drive the escalator, including hand rails, is normal—less than 10 h.p.; to this must be added the duty, depending upon the number of passengers. The escalator may be constructed as one continuous machine, with landings at each floor, and so arranged that steps which carry passengers up may perform a like service later in carrying others down; or separate machines may be installed in various locations affording the best opportunity for displaying merchandise. The motion of the escalator is so smooth and constant that it does not interpose the least obstacle to the free movement ot the passenger, who may walk in either directions or assume any attitude to the same degree as upon a stationary staircase. The apparatus is noiseless in operation, and is in constant motion, with a speed at which the passenger may with facility step upon or from it, and in absolute safety. After a very few trips upon the escalator all novel sensation disappears, and its use evokes no other than attends the use of a stationary staircase.

The "Hampel" Manure Distributor is one of the latest machines introduced into England by Messrs. J. and H. Keyworth and Co., of Tarleton street, Liverpool. This can be used for sowing superphosphates, kainite, ground lime, bones and all kinds of artificial manures, its leading advantages being lightness of draught, simplicity of construction, equality of distribution, and capability of adjustment. The machine has a hexagon steel sowing shaft with small iron spades, a second shaft being provided for the purpose of stirring damp manures. It sows 8ft. wide, weighs 4 cwt., and is priced at £10.

A new process in the manufacture of copper tubes, sheets, and wire has just been perfected by Mr. Sherard Cowper-Coles, metallurgist, of London, which is likely to effect some remarkable reductions of cost and extension of the use of copper. By a new method of electro-deposition, for which the inventor holds patents in all parts of the world, the finished tubes, sheet, and wire can be produced in one operation, including the refining from crude copper. It is claimed that the process is at least ten times faster than any existing electrolytic process, whilst the plant required is simple and free from mechanical complications, and in consequence the cost of the production is enormously reduced.

Acetylene Purification.

P. Gril proposes in his French patent, 334111 of 1903, to extract from crude acetylene made from calcium carbide, the organic compounds of sulphur, the basic compounds ormed by polymerisation, and the phosphine which it usually contains. For this purpose ten parts of chromic acid are dissolved in thirty parts of nitric acid, and the solution is absorbed in 100 parts of kieselguhr. Messrs. L. M. Bullier and L. Maquenne, who have investigated the origin of the impurities usually present in crude acetylene made from calcium carbide, state that the compounds of phosphorus come from the calcium phosphide in the latter material. They find that this phosphide, and the analogous calcium sulphide, only occur in carbide when it is made by the usual "basic" process—*i.e.*, when the charge fed into the electric furnace contains lime in excess. If the carbide were prepared with carbon in excess it would not be so contaminated. The white haze which is produced when C_2H_2 containing PH_3 (phosphine) is burnt in a closed room, consists of ammonium phosphate. Ammonia is of itself an objectionable gas, and if it enters into a purifier containing material intended to extract phosphorus, it reacts with that material and lowers its efficiency. The source of the sulphur is not yet traced. The SH_2 was formerly said to come from calcium monosulphide, or from aluminium sulphide; but it appears more likely that it is formed when a triple compound of carbon, sulphur, and calcium comes in contact with water. A troublesome mechanical impurity is lime dust from the gas generator, which is difficult to remove even by a water washer, and is visible in the luminous acetylene flame if the gas has been passed through tubes containing wool moistened with HCl or H_2SO_4. The lime dust deposits at the burner orifices and gradually decreases their effective diameter.

Luigi Mascarelli has examined the "explosive compound" formed, amongst other substances, on slowly passing acetylene through nitric acid of specific gravity 1.52, and finds it to have the composition $C_4H_2O_7N_6$. When heated with caustic potash this substance gives off ammonia, and on being heated with light petroleum it also suffers decomposition.

The Financial News has unearthed a proposition which should render the financial future of shipping enterprises magnificent in the extreme. It appears that a Victorian genius suggests coating the bottom of steamers with quicksilver, thereby forming a magnificent amalgamating plate, to gather the gold as the boat travelled. On arrival at the port of destination the cargo is discharged and the ship goes into dock for a clean-up. The author of this brilliant idea has, our contemporary states, expressed his desire to accept the position of battery manager and amalgamator. But he is not at all up-to-date. He should issue a circular and become his own ship-owner, and then secure a dry dock, thus keeping the wealth "in the family."