to metallic iron without fusing or melting. These particles of iron are automatically passed from the second or reducing cylinder into the melting hearth in which is a bath of molten metal or slag.

The gas and reduced particles of iron enter the hearth through a fire clay pipe which is protected in front by the furnace lining, and by a forced down draught of deoxidising gas. The particles fall into the molten bath of metal or slag, where they are either melted or converted into steel, or fused and "balled up" as the case may be.

The deoxidising gas covers and protects the reduced ore as it falls into the hearth, and thus effectually prevents any possibility or reoxidation before the finely divided iron particles become absorbed in a bath of metal or slag.

No chemical reaction takes place in the furnace, and as a consequence the refractory basic lining is calculated to retain its form for a long time Electro-pyrometers are used in the working plant so that the temperature may be carefully watched, and valves are provided for regulating the heat in the various parts of the furnace.

Such, in brief, is a rough outline of the manner in which commercially pure, malleable iron, or steel, of any desired quality, may be drawn from the furnace in two or three hours after the iron-sand or crushed ore has been passed through the hopper. And by this direct process results may be assumed of even greater magnitude than eventuated from the Bessemer or Siemens inventions.

Experts who have studied the new process affirm that amongst the many advantages that will accrue from it will be: —Reduced cost of plant by the direct method, as the outlay will not exceed one fifth of the cost of a blast furnace; the saving of fuel by about two fifths; the saving in fluxes by about nine tenths; the cost of labour will be reduced to a minimum, as the process from the feeding hopper to the ingot truck is absolutely automatic; and last, but by no means least, the saving of time. By the Moore-Heskett process pure iron or steel can be made within three or four hours, while the indirect process requires from thirty to forty hours. The saving claimed is equal to 25% as against blast furnace and converter process.

From a perusal of the above it will be found that by a fairy-like process, over which, by the way, the Company waves the wand of its patent rights, the intermediate stage of pig iron is done away with. It is claimed that any ore may be treated by the method, but that the New Zealand iron sand, as a consequence of its extreme natural fineness, is particularly adapted for treatment. Enormous deposits of magnetic iron sand exist on the beaches of the West Coast of Australia, and so clearly is its value recognised that the Government has offered to take sixty-five thousand tons of iron smelted from the sand at English prices, with carriage and expenses added, and to give, moreover, a bonus of £1 per ton for the first twenty thousand tons produced as an encouragement to the establishment of iron works there, conditionally upon a plant of a certain value being erected.

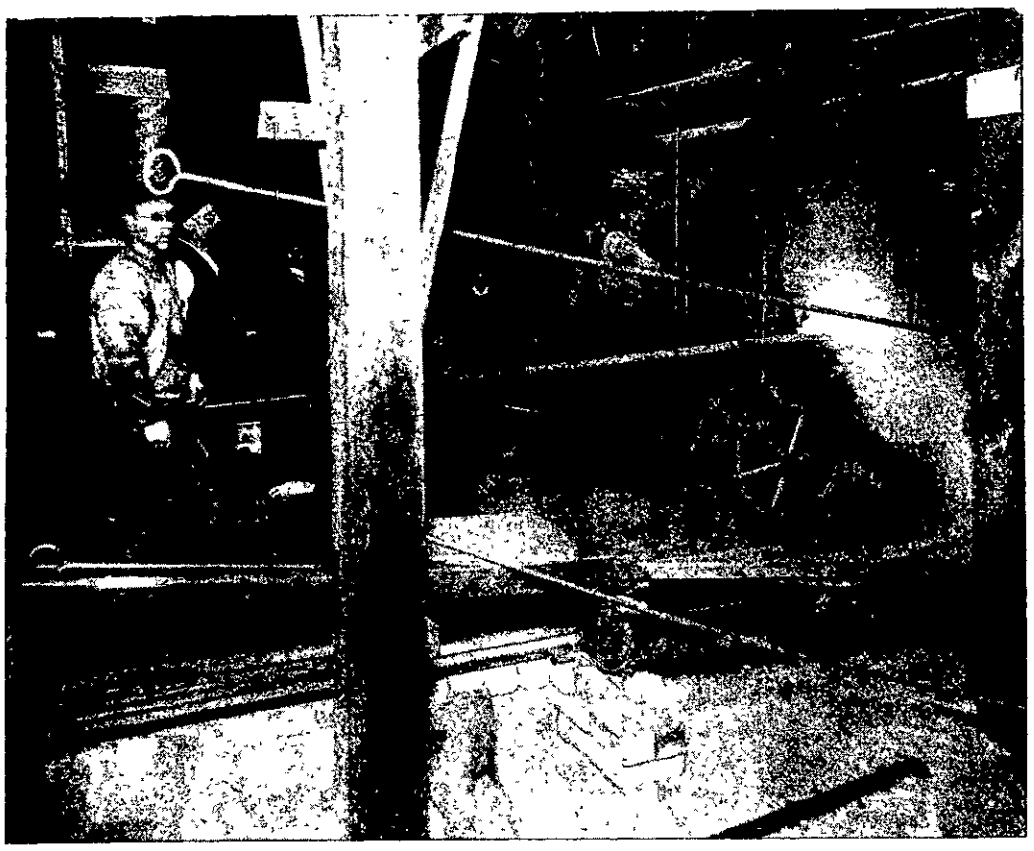
As the magnetic sand under the new process is treated automatically and without the addition of any fluxing agent, the profits due to saving of cost in this direction alone should be considerable.

Arrangements are being made for the erection of a plant in New Zealand, the scheme being financed by Sydney investors. The Company has also obtained a lease of three hundred and fifty acres at Lal-Lal, near Ballarat, upon which there is an extensive and rich deposit of hæmatite iron ore.

We expect to hear much more of the Moore-Heskett process of iron and steel manufacture in the near future.

The Block System and Ticket Collecting.

There appears to be as much ignorance of railway terms amongst colonial journalists as is to be found in the startling effusions on railway matters that occasionally appear in halfpenny papers. A Cape Town journal, referring to the greater activity displayed by the ticket collecting staff at Cape Town and in the vicinity, proceeds to state: "Until the block system is introduced at all stations no great improvement can be expected, for a large percentage of people will rob the Government whenever the opportunity occurs, and the present suburban traffic outside the terminus gives them an abundance of chances." We are here faced with a new railway problem: How does the block system of signalling prevent people from travelling without paying their fares?



NEW DIRECT IRON PROCESS: DRAWING A CHARGE. [*Photos by Sears.*

The Turbines of the New Cunarders.

The most important feature of these vessels is the motive power. The installation of engines in a liner capable of developing some 80,000 horse power will be another triumph for British marine engineers. The power will be divided into four units, each complete in itself, and each driving a separate propeller. By this disposition, even should one set of engines fail, there will still be available sufficient power to propel the vessel at some 22 knots per hour. Each unit will develop the same horse power. Owing to the great breadth of the ship the four turbines will be placed upon the same platform, and each will drive its separate shaft. The propellers of the inner pair of turbines will be placed just forward of the rudder in the position generally occupied, while the screws of the outer pair will be situated some little distance forward.

The turbines will be of huge proportions. In the case of the *Caronia*, which is now plying between New York and Liverpool, and the machinery of which develops some 23,000 horse power, there are no fewer than 1,200,000 blades upon which the steam impinges. From this one gains some idea of the number required for these 80,000 horse-power engines. The turbine drums are some 12 ft. in length by 8 ft. in diameter and weigh 15 tons. In the case of the rotors for the low-pressure turbines an interesting record in casting operations has been created by Sir W. G. Armstrong Whitworth and Company, at the Manchester works, by their fluid-pressure system. This was the casting of a steel ingot weighing 120 tons, the largest ever made. The ingot mould, which weighs 180 tons, was filled with molten steel and was then submitted to enormous pressure in a hydraulic press, the ram of which, some 6 ft. in diameter, was brought to bear upon the mass with a pressure of three tons per square inch. The molten mass was thus subjected to a total pressure of 12,000 tons. In casting such mammoth ingots cracks and fissures detrimental to the soundness of the metal are liable to develop, whereas by the fluid-pressure system the ingot is rendered perfectly homogeneous.

Owing to the great beam of the ship it has been found possible to place the boilers four abreast and yet leave ample room for coal bunkers in the wings. The boilers are of the Scotch type and are of huge proportions, so that an adequate supply of steam can be raised in cases of emergency—if, for instance, the reserve power of the turbines were called into requisition in heavy weather.

Development of the United States Meat Trade.

PERIOD.	IMPROVEMENT IN WORKING.	ORIGINAL PROCESSES.	ORIGINAL PRODUCTS.
1860–1870 1860–1870	Steam Power, Stationary Refrigeration, Artificial Cold Storage.	Killing, Curing, Smoking, Salting, Grinding and Cooking Pickling, Rendering.	Hides and Pelts, Smoked Meats, Salt Meats, Sausages, Pickled Meats, Casings, Tallow and Lard.
		ADDITIONAL PROCESSES.	ADDITIONAL PRODUCTS.
1870–1880	Refrigator Cars.	Canning.	From matter originally consigned to the furnaces as waste. Bones, Horns, Hoofs, Fertilisers, Glue, Wool, Bristles, Hair Skins, Oleo Oil, Stearine, Suet.
1880–1890	Chemical Laboratories. Factory Inspection. Electric Lighting.	Refineries. Fellmongeries.	Bone Oils, Phosphorous, Albumen, Chemical Fluids, Pelts, Dried Beef, Tongues, Potted Meats, Mince Meats, Game, Corned Beef, Refined Oils, Soap, Cottoline, Cottosuet.
1890–1905	United States. Meat Inspection Electric Power. Medical Dept.		Pepsine, Pancreatins, Glycerine, Extracts, Poultry, Eggs, Butter, Butterine.