and much spluttering. Then a slag-buggy is wheeled up to the side of the crucible, which is then tapped. The hole, which is stopped with fire-clay, is opened by driving a pointed iron rod into it, which breaks the clay. The rod for this purpose is of ⅜″ iron and 10″ to 12″ long, and upon tapping there will be a sudden spurt of matte to the distance of four or five feet. When sufficient has been drawn off, the opening is stopped with a ball of fire clay made on the point of another rod of the same length and pressed firmly into the tap-hole. The tapping is done at regular intervals, the object being never to let the matte overflow at the slag-lip; care also being taken never to lower the level of the crucible so much that the slag will flow out at the tap-hole. The floor of the smelting house is covered with iron plates, so as to prevent burning when the matte or slag falls upon it. The slag is wheeled out and dumped and from its bulk soon increases to a considerable size, so that much care is required to so arrange the dump that as little labor will be required as possible in its disposal. The matte, after running into the matte-buggy, is wheeled out and allowed to cool, when it is dumped and afterwards broken by sledge, ready to be loaded on the cars for transportation. The slag-buggies are merely large pots about 18″ in diameter and two feet deep, which are hung on two wheels, to which is attached a handle for drawing. The pots are larger at the mouth than at the bottom and are made of cast-iron ½″ thick.

The capacity of a blast-furnace is dependent on many varying causes and is to a considerable extent independent of shape or size, though its tuyere area is, of course, the most important function in determining the amount to be smelted. Next to the fusibility of the charge, the pressure and volume of the blast have the principal influence in this determination, provided the fuel is the same and of sufficient density to stand the pressure of the blast. Both ore and fuel are spread in layers over the whole area of the furnace, which procedure is quite different from the old plan.

Large and high furnaces naturally require heavier charges, and it is still an unsettled point as to whether deep or thin layers of fuel and ore serve the best purpose, while some claim that they should be to a certain extent mixed. A proper charge for a 36″ furnace is 500 to 800, while a 42″ will take 1,200.

In Canada we have not as yet carried our copper smelting any farther than the production of rich mattes, but these are all shipped either to New Jersey or Swansea, to be there refined. This refining is done chiefly by the reverberatory furnace. Underlying the whole process is the fact that copper has a greater affinity for sulphur than for oxygen, while the other metals generally present in the matte have a stronger affinity for oxygen than for sulphur, and thus we can understand how it is that metallic copper