forty bushels from the kilns. In my opinion, this is largely due to lack of care or knowledge on the part of the pit burner, as with the same care and attention, and with a thorough knowledge of the work, there does not seem to be any good or valid reason why the results as to quantity should not be about equal. Apart from this, however, in our own experience of pit burning, the coal produced was of a better quality than that obtained in the kilns (*i.e.*, where the work was well done). We found the coal dense and close, and practically solid to the centre, and this class of coal develops at least 15 per cent. to 20 per cent. more gas than the ordinary coal obtained in kiln practice. It will not consume as rapidly, and gives a greater and more enduring heat, and has proved itself as economical, even where an equal quantity per cord was not obtained, as compared with kiln practice.

In manufacturing coal in pits the process of firing is practically the same as that practised in kilns, a canal being made to the centre in which to insert the fire, and a "chimney" built to the top along which light wood (or brands) is placed.

The whole is then covered with eight or ten inches of evergreen branches, leaves, and sand or earth. After the fire is thoroughly started, the top or the centre over the chimney will fall in, owing to the total consumption of the wood at that point, and a supply of hardwood is kept on hand, which is driven into this hole as soon as the covering shows a tendency to fall in. After it is thoroughly refilled, a fresh covering is put on, then vents are opened along the sides toward the base. The condition of the coal inside is ascertained by feeling with an iron rod, and as the burner finds it at any point properly "cooked," he can open it and withdraw a portion of the coal, covering the balance rapidly and carefully again in the same manner as at first. This process is kept up until he knows by the color of the smoke and by the inserting of his "try rod" that the whole is properly "cooked." It is all then carefully covered in and allowed to cool and die out.

This mode of burning coal requires very careful and constant watching, owing to the liability to fire. As I have already said, the practice in Sweden is to use wood for pit purposes in nine or ten foot lengths, and when we took up the question of getting the farmers and others in our district to make coal in this manner, we had them follow the usual Swedish process in cutting, but from various reasons, principally owing to the density of our woods, the burning of shorter lengths has proved more satisfactory, and our best results have been obtained from wood cut in four or five feet lengths, and a portion of it split, and also by using smaller pits.

The pits which we first operated contained as much as forty-seven to fifty cords, but the results were unsatisfactory, the process proving too slow and too many brands being made. The coal obtained, however, was fairly good. Our burners then resorted to smaller pits containing from 20 to 25 cords of 4-ft. wood. These burned faster and gave better coal. Where our men had had experience in the work, the coal was clean and solid, and, as pointed out, gave better results in the furnace than ordinary kiln coal.

In pit and kiln practice we have used the following woods:—Maple, birch, beech, soft maple, white birch, tamarac, hemlock, balsam, and in point of value these can be reckoned in the order named. Our principal consumption has been in maple, birch and beech, with which our district abounds. In practice in kilns and in pits, both, we have found it possible to use 25 to 30 per cent. of soft wood, but for furnace purposes we prefer not to go above that, as the coal made from the softer woods is more friable, and will not carry a heavy burden of ore.

RETORTS.

In the United States attempts have been made to manufacture charcoal in retorts or closed vessels, in which the wood is placed, and the charring done by external heat. In a report on this system, made by a prominent expert, he mentions that one system is to erect a furnace, and supply it with a number of vertical cylindrical vessels, which are handled with a crane. The vessels are filled with wood, tightly sealed, lifted into the furnace, and connected by means of nozzles with conduits leading to condensers. After the fire has been maintained a sufficient length of time to properly char the wood, the vessel is lifted out and allowed to cool, another taking its place in the furnace. In this method the retorts serve also as cooling vessels, but they must be handled carefully, and the outlets for gases must be disconnected and closed at each change.

Another plan consists of a cylindrical retort hung from trunnions over a furnace. It is raised to a vertical position to receive the charge of wood, and reversed to discharge the charcoal into the cooling vessel, where the process is completed. The difficulty of filling these retorts and maintaining them, makes this plan undesirable.

A system largely employed in North Pennsylvania and South New York, consists of a series of cylindrical vessels set permanently in a horizontal position over furnaces. These retorts are filled with wood either thrown in, or in improved retorts, placed in a crib which has been previously loaded. When the carbonization has proceeded sufficiently, the coal is withdrawn into a cooling tank, which is hermetically sealed, until such time when the danger of the mass taking fire is greatly reduced.

Other forms have also been followed, but as far as I can ascertain, none of them has ever proved commercially successful, and the old-fashioned kiln and pit systems still seem to be for general charcoal purposes the most economical, and, in fact, the only systems by which charcoal can be successfully manufactured for general commercial purposes, or at least for the manufacture of iron.

BY-PRODUCTS.

Of late years considerable attention has been given to by-products obtainable in the manufacture of charcoal, and it has been found that with a chemical plant attached to a battery of kilns, that every cord of wood can be so handled that the exact weight that went into the kiln will practically be taken out, when everything is taken into consideration. What by-products can be drawn from a charcoal kiln would be too numerous to mention. In fact there seems to be very little that cannot be taken out of the wood in this way, but for commercial purposes the principal by-products, and those to which most of the companies using a chemical plant have given their attention, are wood, alcohol and acetate of lime, and these have been found to be, I believe, profitable, and it is very probable that within a very short time every battery of kilns will have its chemical plant adjoining, and the smoke that is now wasted will be drawn down and distilled, so that nothing will be lost. When this is done, the value to the country of a cord of wood will naturally be largely increased.