LOWERING THE TRACTION TUNNELS UNDER THE CHICAGO RIVER.

BY L. F. WILSON.

After a number of large steamers had come down the Chicago River from Lake Michigan to the elevators and docks on the south branch, had been loaded, and then in attempting to return had grounded on the tunnels which had been built by the traction companies with their roofs too close to the top of the water, steps were taken to lower these tunnels. This work was begun in 1906. To date, the success of the project, considering the three tunnels as a whole, is a trifle doubtful.

The La Salle Street tunnel was built in three arches, affording an arch each to the incoming and outgoing tracks and a third for a foot-way. This tunnel was built in 1869-71 and is, or was, 1,890 feet long. It has always been a serious barrier to heavily-loaded steamers in low water, but within the last few years the draft of lake-going vessels has been increased to a point where it is impossible to bring them over the top of this tunnel even at high water.

In the work of lowering, the center arch was attacked first, but hardly any progress was made before a leak developed. This was stopped only a day or two before the tunnel was completely flooded by another leak in the old and imperfect masonry. It was then decided to abandon the project. The roof of the tunnel was blown off with dynamite from the surface of the river, and the structure is now no more than a brick trench in the bottom of the river bed.

In the cases of the Van Buren and Washington Street tunnels a greater degree of success was attained. The specifications called for 10 feet more water over the roof of each tunnel in the channel of the river, making the depth at that point 26 feet. It was only necessary to lower 220 feet of the roof out of the 1,600 feet comprising the length of these tunnels. The floors, however, had to be graded from the street level at each end. The Van Buren Street tunnel was built in 1892, and although it is a trifle shorter than the Washington Street bore (about 100 feet) it had cost just twice the sum in building; and while the Washington Street tunnel is twenty-three years older, it is still in better condition than either of the others. It is an odd fact that the engineer in charge of the present work on the Van Buren Street tunnel is the son of the man who originally designed it.

The minimum headroom in this tunnel is 20 feet. A new roof 10 feet below the old is placed under the center of the river, and is supported by steel columns set into the old wall and surrounded with concrete. On these columns, beams made up of angles and plates were carried across the arch. Upon the beams was placed a layer of reinforced concrete, which was waterproofed on the upper side. At the ends of this new roof, bulkheads were united with the old brick arch. This was a simple job, but the greatest difficulty was encountered in grading the floor from street level at each end to a point 10 feet lower under the river. The old brick arch stood on a foundation of blue clay only a few inches below the floor, and in cutting down below this it was found that no more than five-foot sections of clay could be taken out at one time, as it was calculated that there is a pressure of 18 tons per square foot on the walls of the arch at the bottom, and it was feared that the walls would crumble if the clay were removed in large sections. Trenches 5 feet wide and 10 feet deep were cut in the blue clay across the tunnel and under the walls. These were then filled with concrete to form both the floor and a more solid foundation for the arch. To haul out the clay, a narrow-gauge railway was built, and hoisting machines placed at each end to pull the cars out onto a staging and dump them into wagons, which carry the material to the lake front.

The work had not progressed very far before it was discovered that there was danger of cutting into one of the freight tunnels of the Illinois Tunnel Company which the engineers knew nothing of. A new grade was struck, and two feet

of concrete left to separate the floor of one tunnel from the ceiling of the other. The accompanying sketch and photographs show clearly the methods used in this work, which is so nearly finished that the old roofs may soon be blown off.

A patent has recently been taken out in France by

Cutting Recesses in the Side Walls to Receive the Steel Columns.

M. Bonnet, for a method of obtaining carbon in an amorphous fused condition. The apparatus claimed consists of a vessel of bronze or other metal containing two carbon electrodes, between which is a rod of pure carbon. Beneath this rod is a smaller vessel containing carbon bisulphide, which, when vaporized, will produce a high pressure in the vessel, but will not have any action upon the carbon. The carbon bisul-

Diagram Showing Method of Lowering the Tunnel.

phide is first converted into vapor by means of a slight electric current, and as soon as there is a high pressure from this cause, a high-tension current is passed through the vessel, with the result that in a few moments the carbon rod is fused and converted into the form of black diamond.—Knowledge and Scientific News.

The New Roof Supported on Steel Columns Set Into the Side Walls.

LOWERING THE TRACTION TUNNELS UNDER THE CHICAGO RIVER.

Home-Grown Pearls.

BY CHARLES A. SIDMAN.

There are many peculiar industries and trades, but probably one of the most peculiar of these is a pearl oyster farm. Japan, the land of odd objects, dwarf trees, and ancient temples, boasts of possessing such a farm. The pearl oysters are found more or less along the whole coast. There are some localities famous for producing them in quantities, and many fine pearls have been obtained.

There was a time when fishing for these precious shells was carried to an excess, so that the yield of pearls dwindled to almost nothing. To overcome this difficulty, the desirability of cultivating the pearl oyster was suggested, and met with instant favor. Experiments were carried out with great success, the result being that to-day the pearl oyster farm has millions of pearl oysters on its culture ground, and is able to place annually a large crop of pearls on the market.

This pearl oyster farm is in the Bay of Ago, on the Pacific side of Japan. The bay, like all in which the oyster grows in abundance, is a very quiet piece of water with a most irregular, highly broken up coast line full of deep running inlets, and coves, affording most favorable shelter. The farm is arranged in two parts, the first part

containing the young up to the age of three years, and the second part holding those that are over that age.

The breeding season of the oyster is from July to August, and before this comes around, namely, in May to June, stones are placed over the bottom of the grounds in the shallower parts, in order that the young may attach themselves to them, and by August the tiny shells are discovered attached to these stones by their byssus, the number increasing steadily with the season.

The shells are allowed to lie as they are until November, and then those that are near the shore are removed, with the stones on which they are anchored, into depths greater than five to six feet. This is necessary to protect them from cold, from the effects of which they are apt to die in the course of the winter if left in the original places. The young shells are then left quietly and allowed to grow for three years, or removed to deeper water, where they have more space and find more food.

At the end of three years, when the young oysters are from two to three inches long, they are taken out of the water, and the operation of putting nuclei in the shells is performed, after which they are again put back into the sea and spread out at the rate of about thirty to every six square feet. They are left alone for four years more, and at the end of that time, or seven and a half years from the beginning of their life, they are taken out of the water and opened. The "cultivated pearls" are thus harvested and put on the market.

There are many enemies of the pearl oyster, as well as unexpected difficulties in the raising of them. They are attacked by a small worm which eats their shells, are eaten by octopuses, and enveloped by growing sponges which kill them.

Many of the cultivated or culture pearls are either half pearls or only a little more than half pearls, but as regards luster, shape, and size, are most beautiful.

Renovation or Restoration of Fat Substances or Fat Vegetable Oils.—Over the rancid oil, heated to 95 deg. F., from 1 to 1.25 its volume of 90 per cent alcohol is poured and in the course of half a day vigorously shaken three times, so that each time an emulsive-looking fluid is produced. On the following day, the fluid, now divided into two layers, is separated and the oil again shaken up with half its volume of 90 per cent alcohol. This process is repeated according to circumstances three to four times, until the oil treated is pure and tasteless. By distillation, the fatty acids the alcohol has taken up can be separated from it. This method cannot be employed with castor oil, which is soluble in alcohol, nor for cod liver oil, in which the virtue lies in the fatty acids; the same objection applies to croton or heavy bay oil.