A REMARKABLE MEXICAN CONCRETE CONDUIT AT GUADALAJARA.

BY FRANK C. PERKINS.

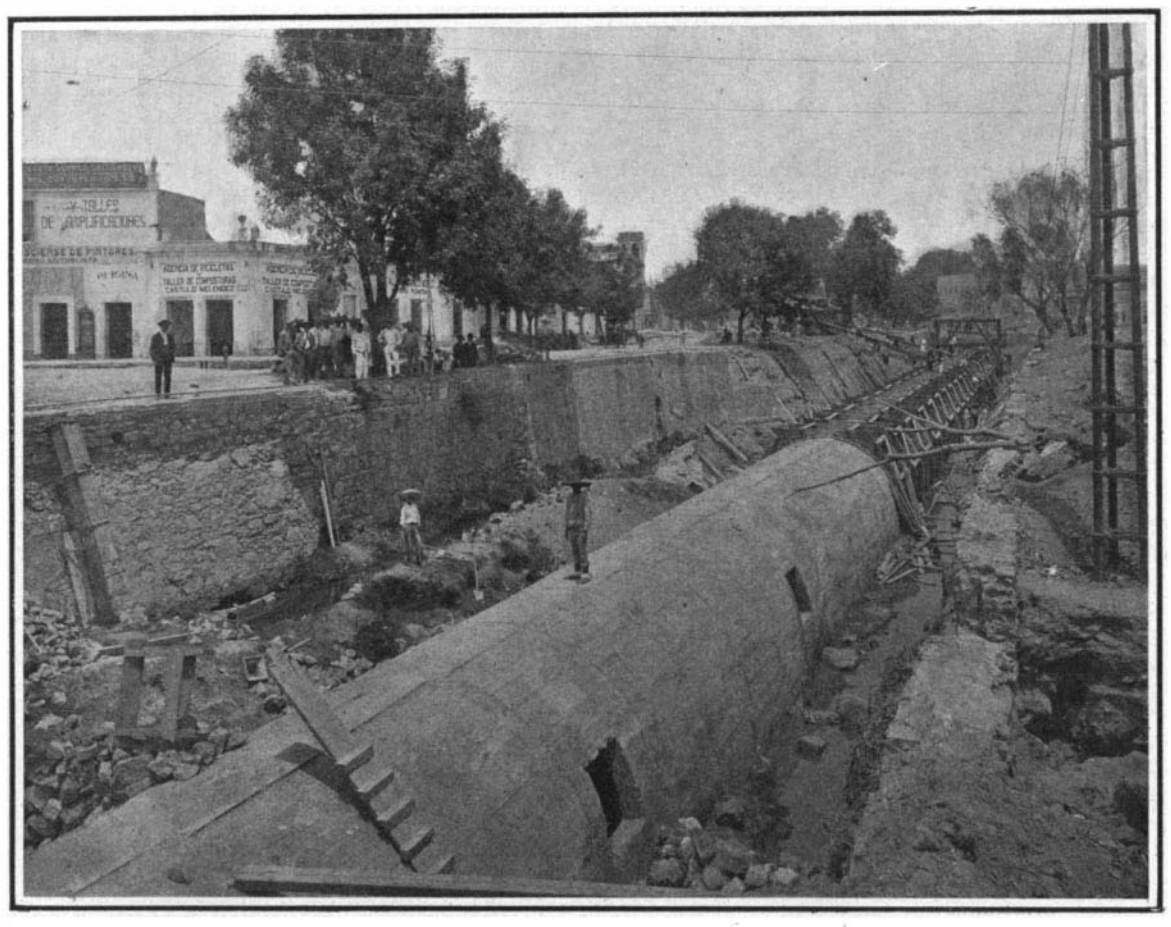
In the Rio San Juan Ravine, which passes through the heart of the city of Guadalajara in Mexico, a circular concrete conduit has been constructed to serve as a storm water drain. This reinforced concrete conduit is of novel construction, and on account of its design and size is of special interest. It is somewhat over 13 feet in diameter and is circular in form for most of its length, the upstream section, however, being flattened in order to avoid a large amount of excavation in rock.

This Mexican concrete conduit is nearly a mile in length. It passes to one side of the center of the city for about a mile, and drains nearly 17,000 acres. It has a grade of 4 feet per thousand feet, and has a thickness of 10 inches of concrete, reinforced by double rings or round corrugated bars. These bars are placed one foot apart longitudinally, in two circles, the inner and outer bars alternately. The bars each measure one-half inch in diameter.

It is stated that the total concrete in the conduit measures 13,000 cubic yards, the steel used for reinforcing weighing 300,000 pounds. In the construction of this conduit, 40 per cent of river sand was utilized and 60 per cent of sand made from crushed rock. Three parts of this sand are used with three of crushed rock and one of cement, the latter being of the Hidalgo brand, made at Monterey, Nuevo Leon, which is said to be about the only factory producing Portland cement in Mexico.

One of the accompanying illustrations shows a portion of the completed conduit and the moving of the high exterior forms by means of traveling gallows frames. This system of molds and the apparatus for shifting them is simple and very efficient.

Other illustrations show the erecting of forms inside of the reinforcement, which is supported on concrete blocks, as well as the method of placing the reinforcing bars in position. There was a test made of the strength of the conduit about 25 feet in length when a week old by passing a roller weighing 32,000 pounds over it, and also by allowing the roller to stand upon it for 120 minutes. After this severe test it was found that no crack developed, the earth filling over the top of the conduit in the test being about three feet in depth.



Part of the completed conduit.

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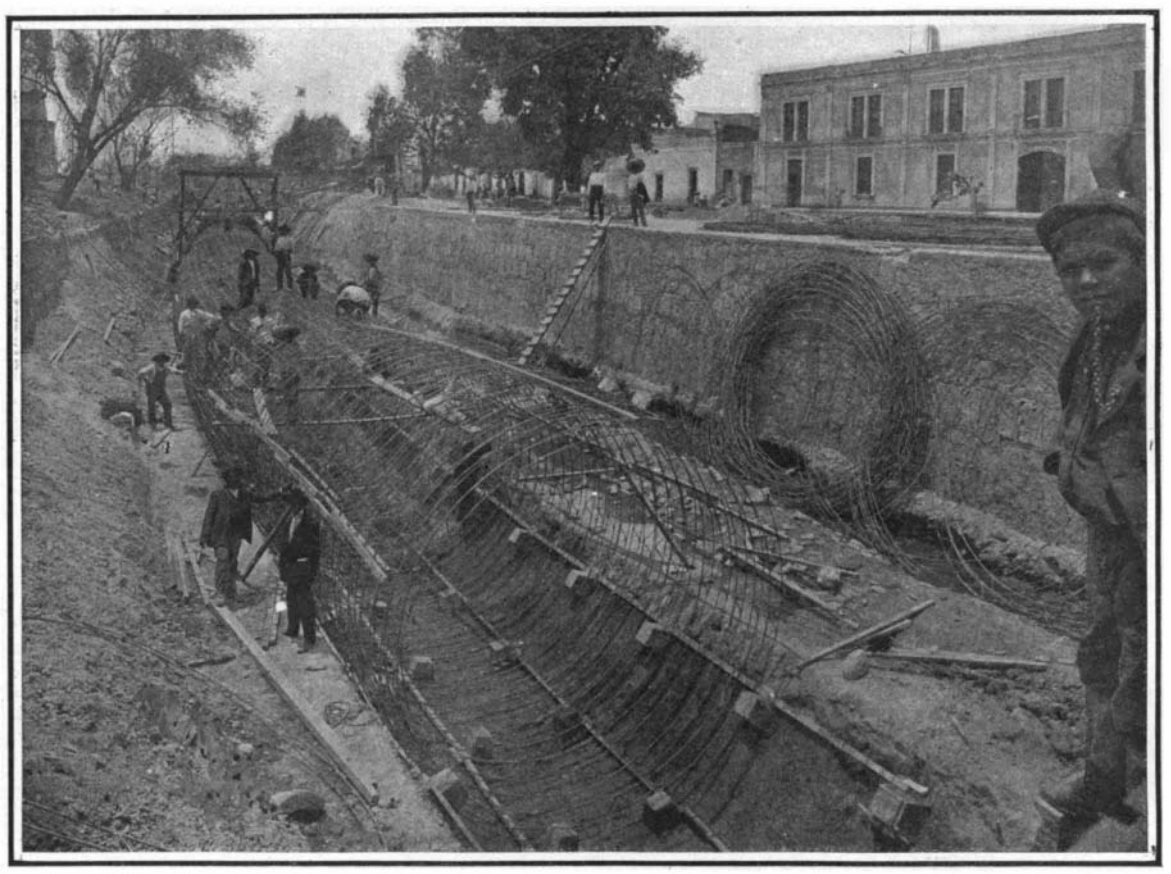
Cultivation of Edible Fungi in Forests.

In many districts of Perigord, in southern France, the black truffle (*Tuber melanosperum*), the most highly-prized species, is artificially propagated. For this purpose the tubers are dried, cut into small pieces, mixed with water, and ground to a thin paste, small quantities of which are spread upon green hazel or oak leaves, which are buried in the earth under oak trees. The first truffles appear five or six years afterward. In Germany the black truffle is found only in the west. The truffles which grow in central Germany are of inferior species, hence Prof. Mayr recommends the artificial propagation of black truffles, according to the Perigord system, in the warmer parts of Germany, especially where oaks abound, as the production of truffles is dependent upon the presence of deciduous and particularly of oak forests. The mushroom also grows well in the forest, but its artificial culture is usually carried on elsewhere. Experiments made by Mayr for the purpose of colonizing the mushroom in localities in the forest where it does not grow naturally have met with no success, although they have been continued for five years. The attempt at colonizing was made by taking up the mushrooms immediately before the ripening of the spores, and transplanting them to the desired spot, on which the spores necessarily fell. On the other hand, Schroeder, in a recent article, has described his success in transplanting the craterelle (*Craterellus nucleatus*), which in flavor is surpassed only by the Perigord truffle. Selected spots in the forest planted with spores of this fungus bore abundantly.

In Japan, Mayr has had opportunity to observe the artificial propagation of the most delicious of all Japanese fungi, the *Agaricus shitake*. The cultivation of this fungus is the only form of forestry practised in extensive districts in Japan. Young trees of various deciduous species, or boughs as big as a man's arm or leg, are cut immediately after the fall of the leaf, allowed to lie about one hundred days in the forest, and then sawn into logs three or four feet long, in which deep incisions are made. The spores of the fungus, which are present everywhere in these districts, penetrate the incisions, and develop a mycelium which converts the wood into a white brittle mass. The mushrooms begin to appear upon the surface of the logs in the following autumn, but appear more abundantly from the second to the fifth year, growing both from the incisions and from the unwounded bark. Mayr has recommended the cultivation of the Japanese mushroom in Germany, and has made experiments by inserting bits of mushroom-bearing wood, brought from Japan, into holes bored in boughs cut from deciduous trees. The experiments proved that the beech, the hornbeam, and the birch are best suited for the culture of the fungus, but that the young cultures are greatly injured by snails, and also by the competition of native fungi.—Prometheus.



How the reinforcing members are placed in position.

Ammonia from Atmospheric Nitrogen.

A new process for producing ammonia from atmospheric nitrogen has been developed from experiments in the synthesis of hydrocyanic acid, which were made by Waltereck and Eschweiler, of Hanover.

In these experiments, in which a dry mixture of hydrogen and nitrogen was passed over iron at a dull red heat (about 900 deg. F.), a small quantity of ammonia was always formed. This result was subsequently confirmed by Sir William Ramsay. Ammonia was formed only at the beginning of the reaction, but it was found that larger quantities of ammonia could be obtained by passing a mixture of air and coal gas over oxide of iron, and this result led to a series of experiments with various oxides of nickel, cobalt, copper, cadmium, silver, lead, bismuth, chromium, and iron. The most interesting results were obtained with oxides of bismuth, chromium, and iron. The oxide was inclosed at first in an ordinary combustion tube, afterward in an iron tube. The mixture of equal volumes of air and coal gas was moistened by passing through distilled water heated to 176 deg. F., as a certain quantity of moisture was found advantageous. The yield of ammonia varied greatly with the temperature, the best results being obtained between 570 and 660 deg. F.

It was observed, however, that the production of ammonia diminished as the oxidation of the iron increased, so that it was necessary to reduce the iron from time to time by passing hydrogen or carbon monoxide through the tube at a high temperature.

Experiments were then made for the purpose of finding some other sufficiently cheap substance, the oxidation of which would produce the same result, without requiring repeated reduction. Coke, wood charcoal, peat, and lignite were found to satisfy these requirements fairly well. With coke the process is very slow; much more satisfactory results are obtained with peat. One specimen of peat, containing 26 per cent of water and little more than 1 per cent of nitrogen, furnished 8 per cent by weight of sulphate of ammonia. In a large number of experiments made with a horizontal iron retort, such as used in the analysis of coal, 10 per cent of sulphate of ammonia was obtained. As this was more than the nitrogen of the peat could furnish it was inferred that part of it must have been derived from the nitrogen of the air. This conclusion was confirmed by experiments with carbonized sugar, which contained no nitrogen. In the experiments with peat and other forms of carbon the air was mixed, not with coal gas but with steam.