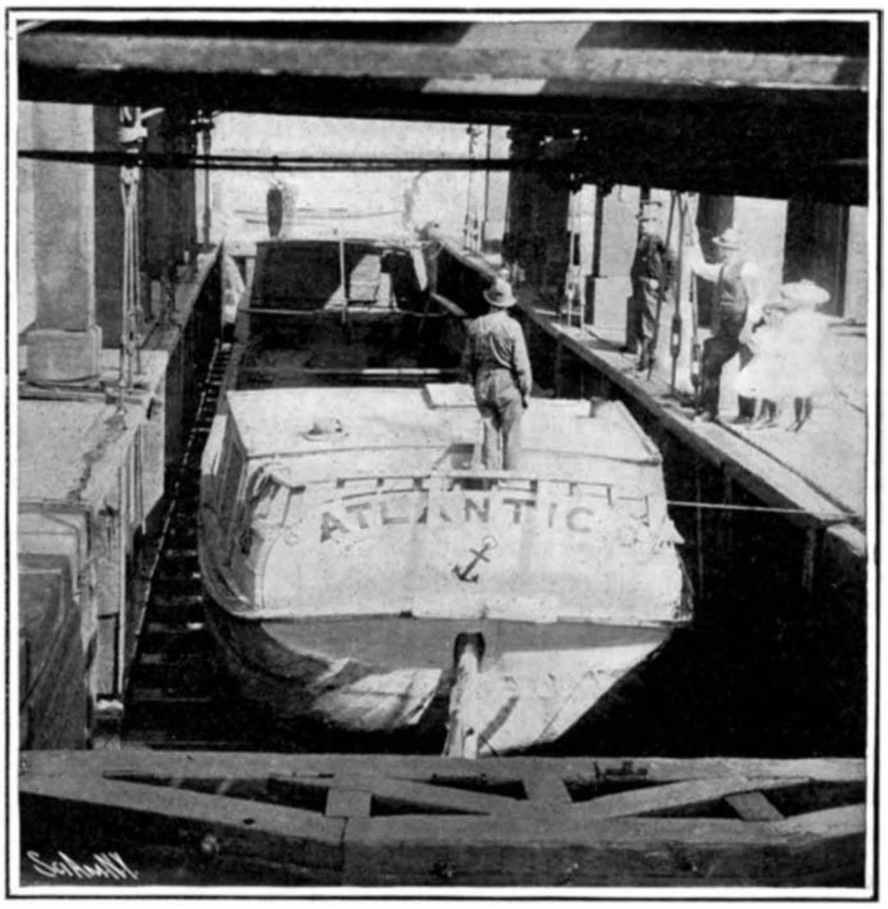
THE IMPROVEMENT OF THE OHIO CANALS.

BY W. FRANK MC CLURE.

One of the most important improvements ever undertaken by the State of Ohio is the creation of a new deep-water link between Lake Erie and the Ohio River—a work which will soon be actually under way. Eventually there will be important inland navigation, undoubtedly, from the great lakes to New Orleans by way of Cleveland and Marietta. This year's appropriations for this work by the State will go toward providing a seven-foot channel from Cleveland to Dresden, at which point the Muskingum will be tapped. The river and harbor bill, now before Congress, includes an appropriation of $8,000 for the dredging of the Muskingum and $110,000 for the building of a dam between Dresden and Zanesville, in order to give a continuous waterway from Cleveland to the Ohio River at Marietta. The people along the southern end of the Ohio canal are also agitating the improvement of the southern portion of the canal, and will bring the matter before the next legislature.



WEIGHING A CANAL-BOAT IN THE CLEVELAND LOCK.

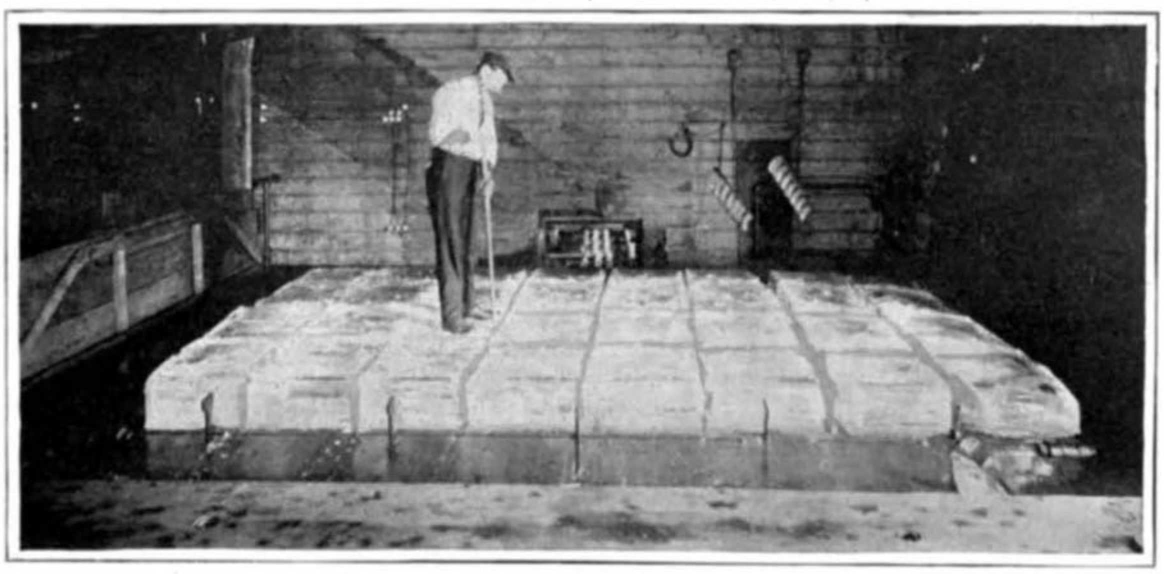
The Ohio canals, which in recent years have so deteriorated, were once an important factor in the industrial development of the State. The beginning of the original construction of this canal system dates back some eighty years, and at its inception it was considered an engineering and commercial triumph. For a little more than twenty years these canals continued to grow in usefulness. In 1861, they were leased to private parties for a term of ten years, and at the expiration of this time they were leased again for an equal period. When again turned over to the State they were badly in need of extensive repairs, and ever since they have been on the decline. It is now generally conceded by the people of Ohio that the canal system should be maintained and made more effective, and that it should remain the property of the people.

The State canal system comprises the Ohio and Erie and the Miami and Erie canals. What is known as the Ohio and Erie canal extends from the lake port of Cleveland to the Ohio River at Portsmouth, a distance of 309 miles, and in addition there are several navigable feeders. There are two summits, one being in Summit County, 35 miles from the lake level in the Cuyahoga River, and the other—Licking summit—being in Licking County, 116 miles from the Ohio River at Portsmouth. There are 42 locks between the lake and the first summit. Between this and the Licking summit—a distance of 133 miles—there are 48 locks. Between Licking summit and Portsmouth there are 53 locks. The summit in Summit County is nine miles long, 395 feet above Lake Erie, 78 feet above Licking summit, 491 feet above the Ohio River at Portsmouth, and 968 feet above the Atlantic Ocean. Over the new canal route to Marietta the distance from Dresden, where the new route will leave the old canal, to Marietta is about 90 miles. Licking summit is about 30 miles southwest of Dresden. The accompanying photograph illustrates the weigh lock of the Ohio and Erie canal. It is situated near Cleveland, at what is without doubt the busiest place on the entire system. The boat shown in the illustration—the "Atlantic"—was built in 1863 and is still in service. There are numerous boats of similar size on the canal, weighing from 35 to 50 tons, and each one carrying from 75 to 80 tons of cargo. The length of one of these boats is 120 feet. This is the longest boat that can be weighed in the weigh lock. The latter is a small, separate canal, walled off from the canal proper by a partition of masonry. At each end of the lock there is a water gate, which lies flat on the bottom of the canal when open, and which is raised by means of chains and a gearing and crank on the stone wall at one side of the lock. When the boat to be weighed has been floated into the weigh lock and the gates have been closed, the water is released by the opening of a valve, and soon the boat is resting on the iron beams, which form the weighing platform of the scales. The weight of each boat is already known, and this is deducted from the weight of both boat and cargo, and the tolls are charged on the weight of the cargo. The weighing operation completed, the first valve is closed and another is opened, and soon the water has risen to the level of the canal, and the boat is ready to be towed out of the lock and on its way again. Along the northern portion of the Ohio canal, within less than 50 miles of Cleveland, are located manufactories employing a capital of $30,000,000, all of which depend upon the canal to furnish water for their boilers. Coal is brought to these factories in canal-boats direct from the mines.

ICE-MAKING BY ELECTRICITY

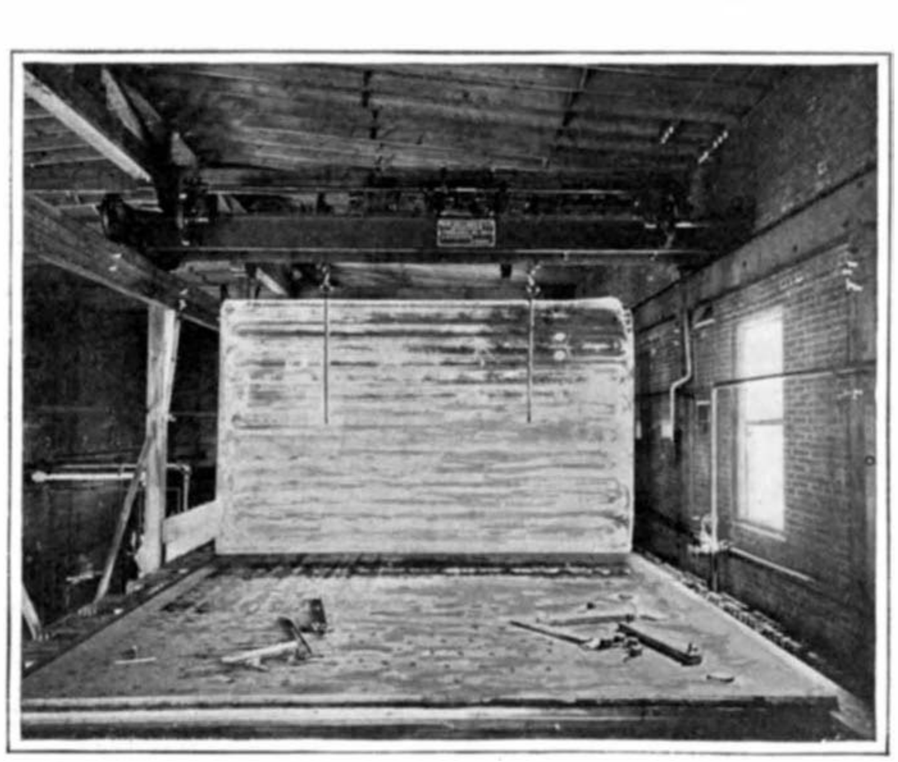
BY ORRIN E. DUNLAP.

What is believed to be the only electrically-operated ice-making plant in the United States has been installed by the Cataract Ice Company, of Niagara Falls, in a new brick building, 125 feet long, 44 feet wide, and which has a height of 28 feet. The greater part of the artificial or manufactured ice of to-day is made by one of two systems. These systems are known as the "can" system and the "plate" system. The Cataract Ice Company formerly used the "can" system, but desiring to increase its output, as well as the quality of its product, it adopted the "plate" system, and the plant it has installed is one of the most interesting in the world.



Splitting up an Electrically-Made Cake of Ice.

Interior of the Plant, Showing Tank to the Right with Cake of Ice Being Lifted by the Electric Crane.



Carrying a Cake of Ice to the Tip Table with the Electric Crane.

ICE-MAKING BY ELECTRICITY.

In Niagara Falls the popular power for the operation of factories of all kinds is electrical power, and the Cataract Ice Company has installed a 100-horse-power, 2,200-volt, Westinghouse induction motor to operate an ammonia compressor; a 5-horse-power motor of the same type, 220 volts, that operates an air compressor; a 3-horse-power motor of same type and voltage that operates the brine pump; and a 5-horse-power motor to operate an electric crane. The electric current is received from the Niagara Falls Hydraulic Power and Manufacturing Company at 2,200 volts, and for the operation of the small motors this voltage is stepped down to 220 volts.

In this Niagara Falls plant the tank occupies a space of 98 feet long, 15½ feet wide, and is 9 feet 9 inches high. This tank is divided into eight compartments, each compartment containing four plates. One of these eight compartments is emptied daily, taking out eight cakes of ice, the approximate weight of each cake being about four tons; so that the plant has a daily capacity of about thirty-two tons. The weight of the daily output varies, of course, according to the thickness of the ice. Each cake of ice made is about 15 feet 3 inches by 9 feet 6 inches wide, clear and transparent. Into each cake of ice, about six feet apart, two iron rods five feet long and about one inch in diameter are frozen, and in drawing the ice these rods are engaged by hooks at the ends of chains on the electric crane. After being raised from the compartment where it was made, each cake of ice is conveyed by the crane to the rear of the building, where it is placed on a tip table and dropped to a horizontal position. At the present time saws operated by hand are used to cut the ice into small cakes, but an electrically-operated saw is to be installed. Out of each of the huge cakes 32 small cakes are made, and these are chuted to a storage room, where the ice is kept for delivery to the company's many wagons. The plant has a storage capacity of 3,000 tons.

It is evident that in a plant of this kind, the dangers that arise from using ice from streams that are polluted by sewage are avoided. It may be claimed that natural ice is just as good as ice artificially made, if the water supply is pure in the stream or pond from which the natural ice is taken. In the plant of the Cataract Ice Company, the water is taken from the city mains. It passes through a condenser and is pumped to the top of the building, where it is discharged into a tank of large capacity equipped with live steam coils. Here the temperature of the water is raised to 160 degrees, and by gravitation the water passes down through a flat cooler, which reduces it to a temperature of about 90 degrees before passing through the filters, which have a capacity of about 15,000 gallons per day. From the filters it passes to the fore-cooler, or water storage tank. From this tank it passes, as it is used, by gravitation to the freezing compartments.

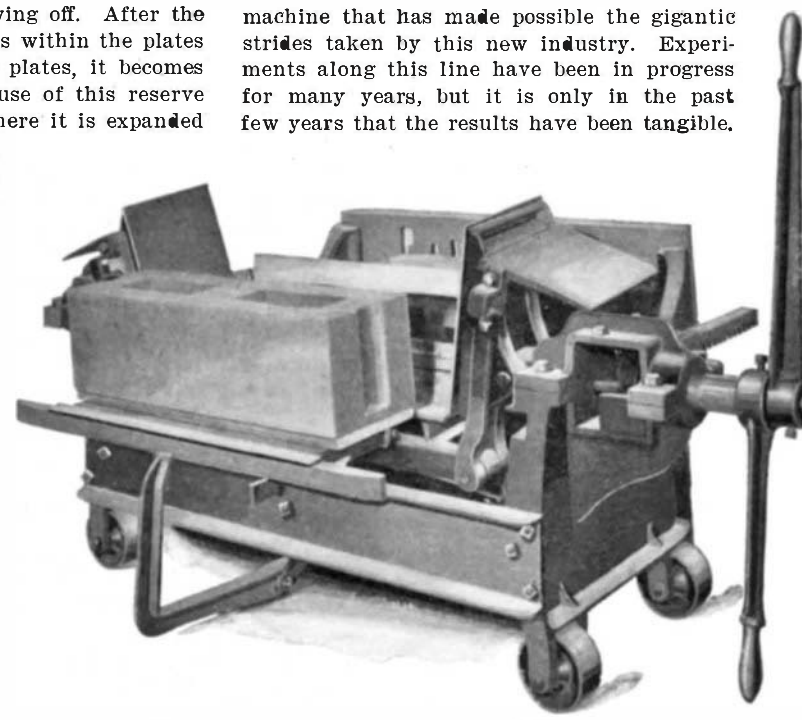
In the operation of the plant, the anhydrous ammonia is compressed, and thereby heated and converted to a gas. It is then passed to a condenser, where it is brought into contact with cold water, thus reducing it in temperature to the temperature of the water, and converting it back to a liquid. It is then expanded into the freezing coils, which are incased in the freezing plates. These plates being submerged in the water, the ice forms on their outside, and after a period of eight days a cake of ice has developed or grown. The system used is known as the direct expansion system, but by it the trouble with old direct expansion plants is obviated by the introduction of a reserve line, which is used in thawing off. After the hot gas has passed through the coils within the plates in thawing off the cakes from the plates, it becomes liquefied. It is then conveyed by use of this reserve header to another compartment, where it is expanded into the coils. It will be observed that in thawing off the plates are used as a condenser. This eliminates the possibility of the liquid gas going back to the compressor, which was the difficulty met with in operating the old style of direct expansion plate plants.

The ice made in this plant has good lasting and refrigerating qualities. As it takes eight days for a cake of ice to develop, it is evident that could the period of freezing be reduced, the plant investment would be materially lessened. Experts are now trying to accomplish this.

HOLLOW CONCRETE BUILDING BLOCKS: THEIR MANUFACTURE AND USE.

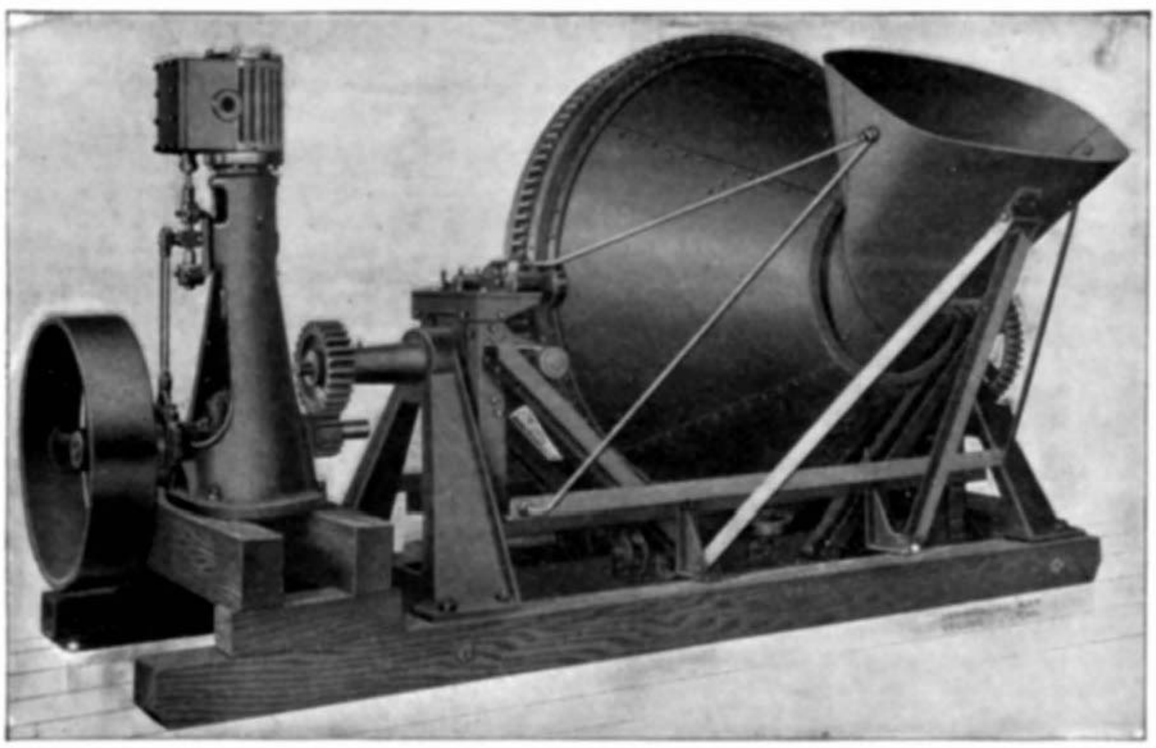
BY L. B. POWELL.

The comparatively recent advent of hollow concrete blocks into building construction is probably one of the most important innovations in the building industry, and one that is yet in its infancy. The use of concrete as building material is not recent, however, as there are still in existence dikes, dams, roadways, etc., built by the Romans of material corresponding almost exactly with our present-day concrete; it is the introduction of the hollow concrete building block machine that has made possible the gigantic strides taken by this new industry. Experiments along this line have been in progress for many years, but it is only in the past few years that the results have been tangible.



The final position of machine showing block automatically delivered, away from the molds, in a position to be carried away for "curing."

AUTOMATIC BLOCK MACHINE FOR MAKING HOLLOW CONCRETE BUILDING BLOCKS.



POWER MIXER FOR MIXING CONCRETE.

The natural cement which was formerly used in concrete construction has been almost entirely replaced by its superior, artificial cement, and it is only with the latter cement that any advantageous results have been accomplished. It is interesting to note that where formerly a European Portland cement was specified as the standard of excellence, in recent years American Portland cement has been so improved by exhaustive and expensive experiments that the domestic production is now conceded to be superior in every way to the foreign article. That an industry so new to this country, and one requiring so high a degree of technical knowledge, has leaped to first place, is doubtless due to the superiority of both raw material and method of production. Probably the best proof of the superiority of our product will be shown by a comparison of our production in 1890 of 300,000 barrels with that in 1903 of 21,000,000 barrels.

Concrete, as is well known, is a perfect mixture of an aggregate, such as crushed stone, with sand and cement, the aggregate forming the body of the mass, while the sand fills up the voids between the aggregates, and the cement fills up the voids between the grains of sand. As the purpose of the concrete is to take the place of stone, it is therefore necessary that the mixture be so perfectly proportioned that each aggregate and each grain of sand has a coating of cement paste, so that when the block has dried thoroughly, the mass will be held in perfect rigidity by the hardening of the cement bond. The aggregates used may be of either gravel, crushed granite, quartz, or trap rock, and should be clean and free from dust, clay, or iron rust, which will resist the adhesion of the cement bond. The sand should be as pure silica as possible, should be washed clean to be free from lime, vegetable matter, etc., and should be as sharp as possible. The proportions used in the mix will de-

LAYING HOLLOW CONCRETE BUILDING BLOCKS.