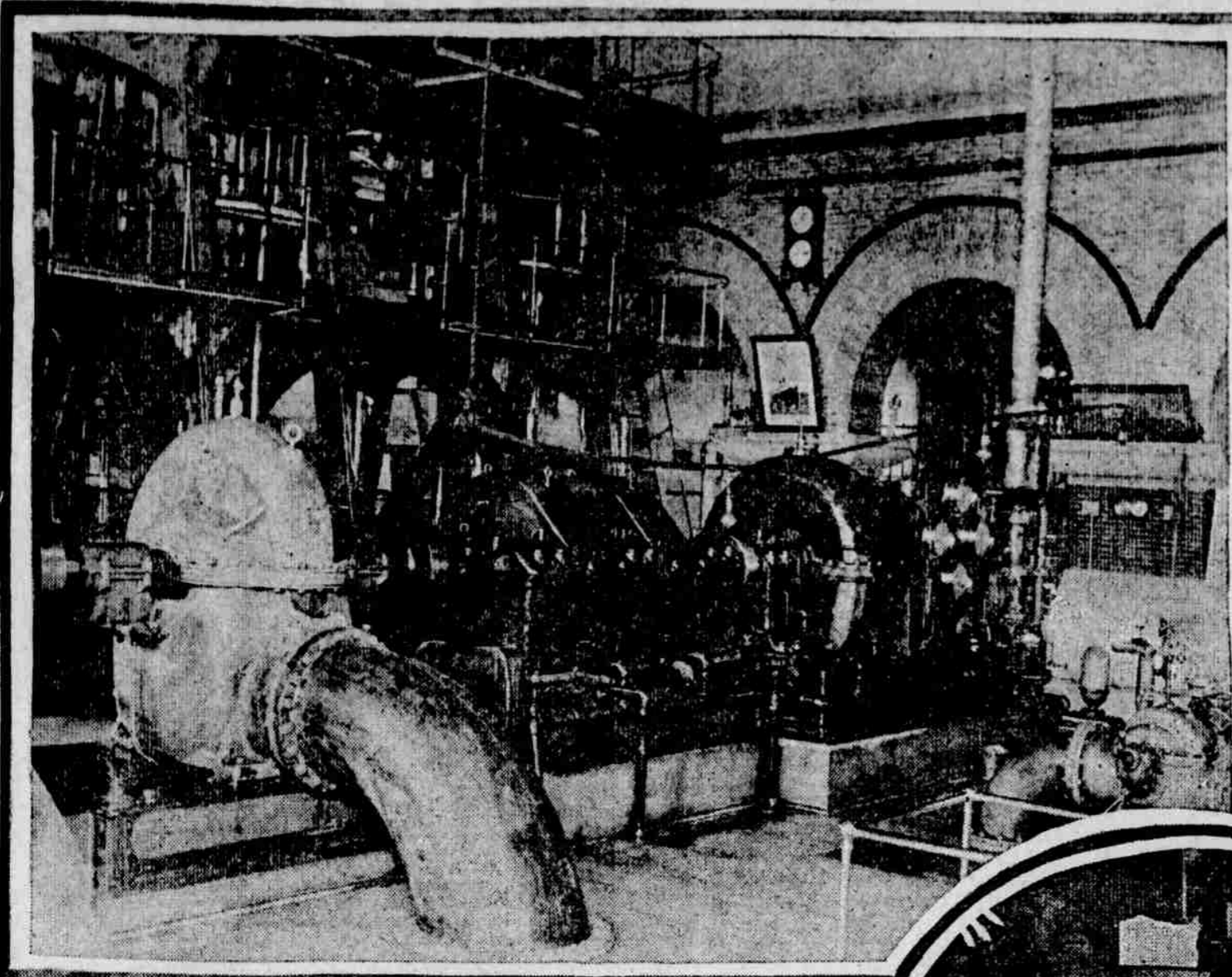
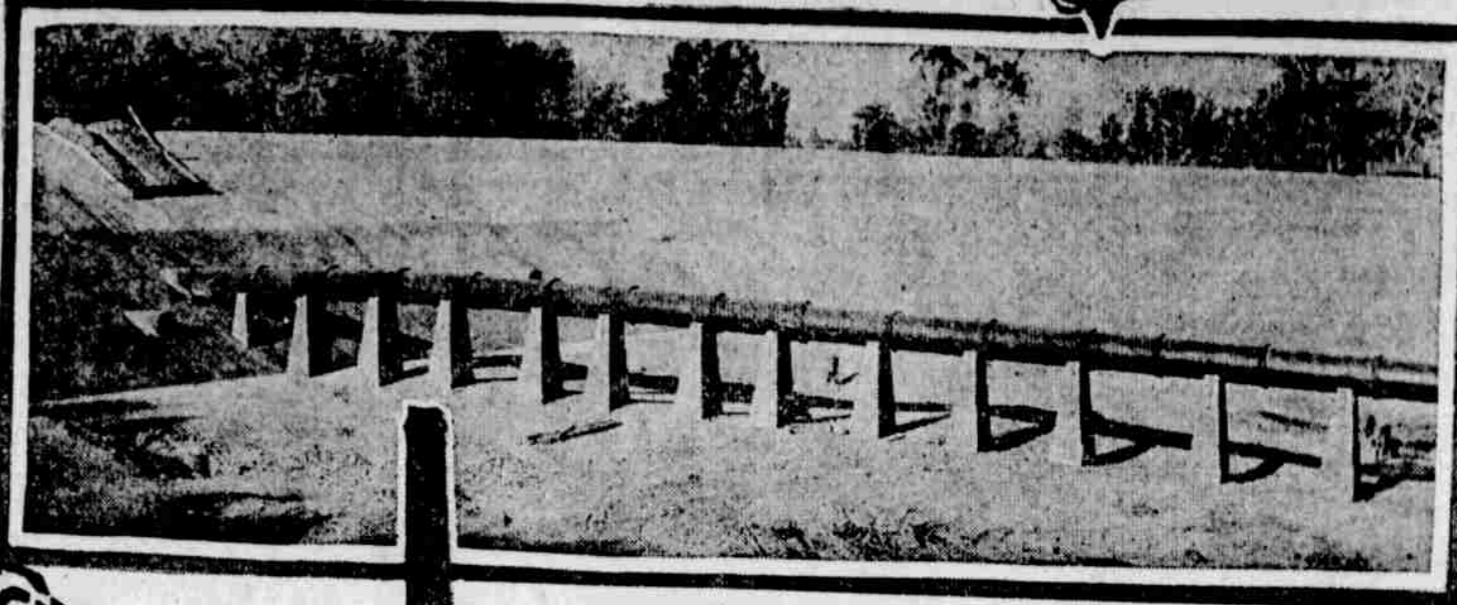


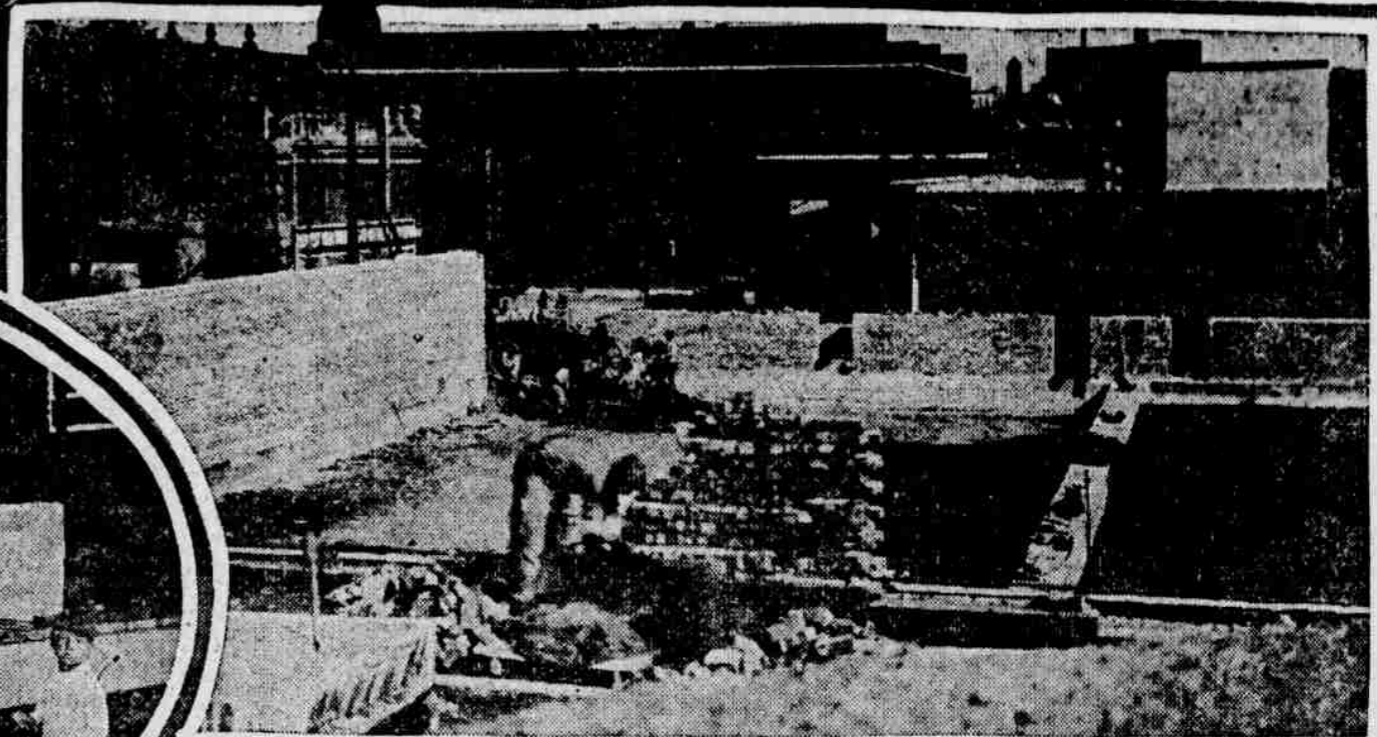
Omahans Watered, Warmed and Cooled by own Plant



Heart of system which pumps water through hundreds of miles of mains and service pipes. New turbine in foreground



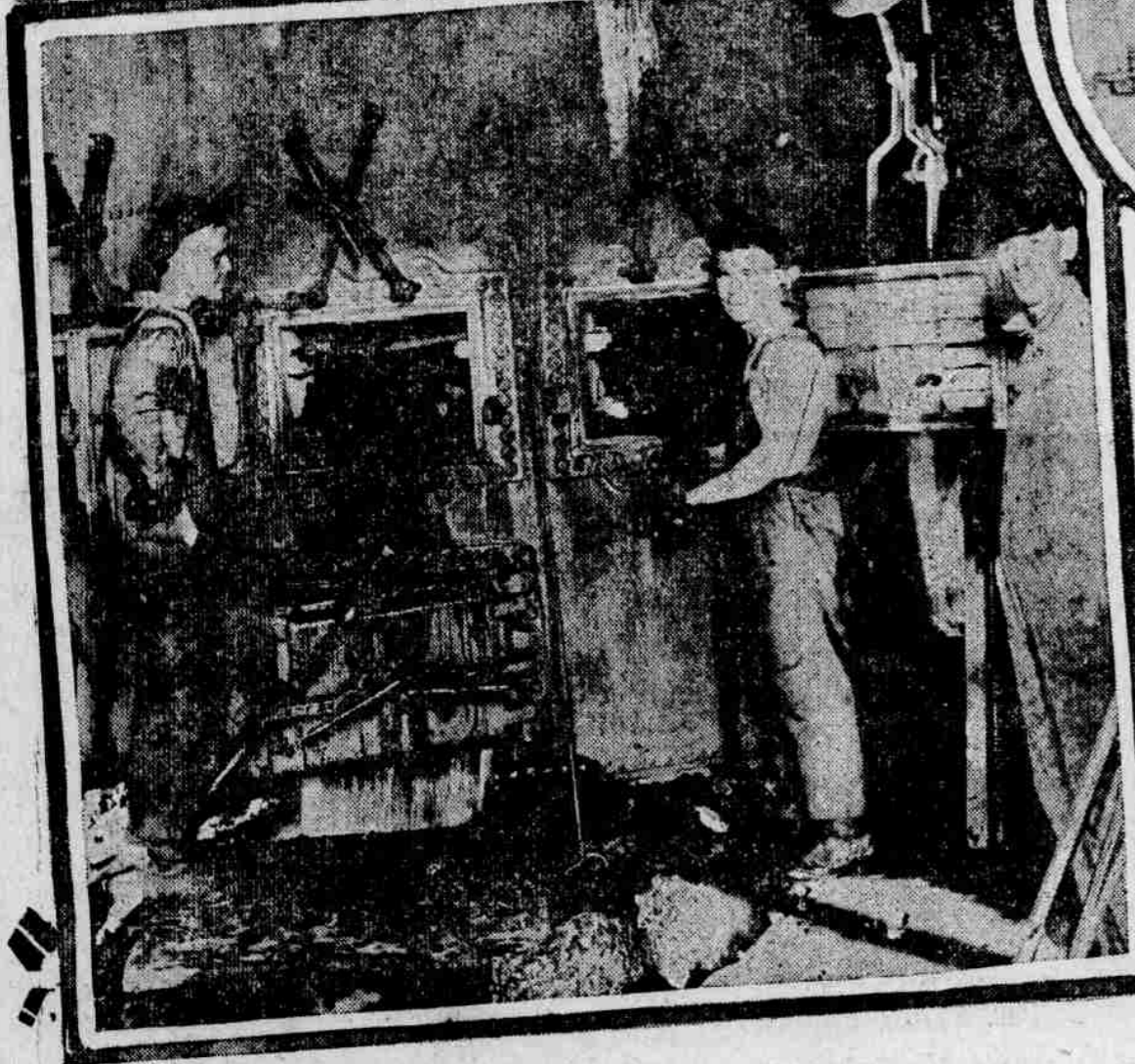
New 20,000,000 gallon city water basin nearing completion at Florence.



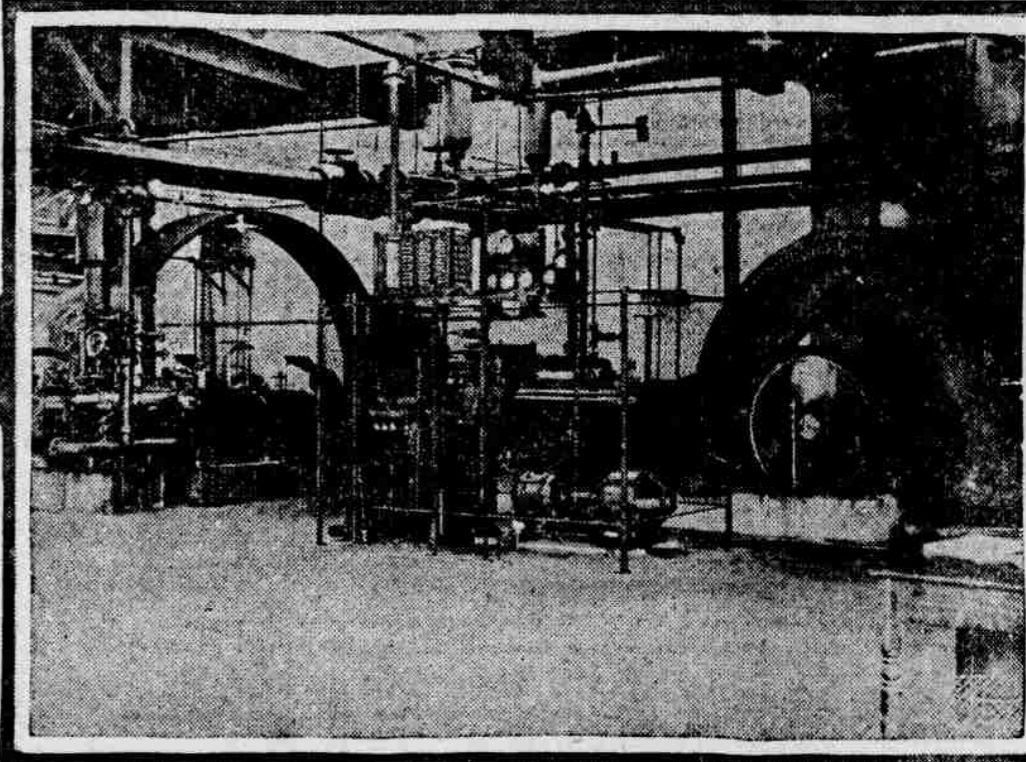
Site of new 20,000-ton municipal ice storage house under construction at Twenty-first street and Poppleton avenue. Water pumping station, and ice plant in background.



This is how one customer transports ice from the munny market.



Drawing clinkers is the toughest job at the gas plant.



Where the "wheels go round" in the municipal ice plant.



"Pulling ice" at the city plant. One can contain a 400 pound cake of ice.

By EDWARD BLACK.

Water, gas and ice plants of the Metropolitan Utilities district, one of the largest corporations in Nebraska, are owned and controlled by 200,000 residents of this city; and if the value of these plants should be prorated, each man, woman and child would have an equity of \$67.50.

To facilitate operation of these municipal utilities, owners agreed to elect six directors who administer affairs of the system through a general manager who has 300 subordinate workers.

Approximate value of the system is \$13,500,000, the water plant being estimated at \$8,000,000, gas plant at \$5,000,000 and the ice plant at \$500,000. The volume of business for the three departments is nearly \$3,000,000 a year.

Improvements completed this year, and now under way, aggregate more than \$500,000. The capacity of the municipal ice plant was increased from 100 to 200 tons a day by an extension of building and equipment costing \$150,000. Another ice storage building, with capacity of 20,000 tons, is being erected at a cost of nearly \$175,000. A new sedimentation basin at Florence is being completed at a cost of \$60,000. An additional carbureted water gas set and other improvements at the gas plant, already started, will require an outlay of \$225,000, according to an estimate.

37 1/2 Miles of Mains.

Beneath the surface of hundreds of miles of streets, which traverse 37 1/2 square miles in greater Omaha, there are 375 miles of water supply mains from four feet to six inches in diameter; and 335 miles of gas mains, from one foot to four inches in diameter. Connecting with these water and gas mains there are

1,000 miles of small pipe serving 35,000 water patrons, 35,000 gas patrons and 3,600 hydrants.

The large pumps of the water system send out more than 8,000,000 gallons of purified water to nearly every building in this city, during the year. It is estimated that the total water service this year will be 8,250,000,000 gallons. The highest daily average for a month this year was in August, when it was 28,000,000 gallons. January was the lowest, with an average of 19,800,000 gallons a day. The daily maximum for this year was reached on a day in August, when the city required 30,000,000 gallons for bath tubs, sprinkling lawns, making lemonade and for many other domestic and commercial uses.

Plant Acquired in 1912.

The water plant was acquired on July 1, 1912, after years of litigation. To finance the purchase and provide necessary improvements, \$7,500,000 "Omaha Water Works bonds" were issued and sold from the proceeds of which \$6,319,261 was paid for the plant. Out of the accumulation of net earnings the city has taken up and destroyed \$608,000 of water bonds. The water department treasury now contains a surplus of approximately \$1,500,000, including working capital. This will increase from year to year and eventually will be used to meet the bonded indebtedness on the water plant.

There are six sedimentation basins at the Florence water plant, with a total capacity of 85,000,000 gallons, and three basins at the Walnut Hill station, with total capacity of 24,000,000 gallons. Basin No. 7 is being completed at Florence. It will cost \$60,000 and will add 20,000,000 gallons to the reservoir capacity. This new basin will have steel reinforced concrete lining.

Maintained to Capacity.

The Florence basins are always maintained to capacity. Water is taken from the Missouri river in

an average condition of turbidity expressed as 3.218 parts per million. This water is pumped in through intakes which are located north of the Minne Lusa station, and is forced to the highest basins, which are 307 feet above the river. Most of the sediment leaves the water in these two high basins. As the water leaves these basins, lime and alum are added, producing coagulation, which carries down into the successive basins the remainder of mud and sand. From the last basin the water flows to the high pressure pump, at the inlet of which chlorine is applied to kill bacteria. The averages of chemicals used during the year in the treatment of city water are: Lime, per gallon treated, .82 grains; sulphate of alumina, 2.65 grains; chlorine gas, per million gallons, 2.59 pounds.

The pumps in the Florence station are the heart of the water system, the main pipes and service pipes forming the circulatory system. These pumps send forth millions of gallons every day without interruption, first through 48-inch and 36-inch mains. The smaller pump shown in the foreground of one of the illustrations is of the modern turbine type. The larger, reciprocating pumps are shown in the background. The turbine has a capacity of 30,000,000 gallons a day, as against 20,000,000 for each of its companion pumps.

Water Repumped.

One-third of the water sent from the Florence station is repumped at the Poppleton avenue and the Walnut Hill stations into direct pressure mains which supply the higher parts of the city. Two electric pumps are maintained at the Walnut Hill station for emergency use.

If it were possible to visualize the network of 375 miles of water supply mains of the city, an interesting arrangement would be revealed. The 48-inch main from Florence is the large artery of the system. It is divided at Ames

avenue into two 36-inch mains, one of which extends to the Poppleton avenue station. From that station a 30-inch main serves the packing houses and stock yards district. A 36-inch main from Florence cross-connects with the 48-inch main in a manner which permits "detouring" water when making a repair. To prevent interruption of service over an extensive area when repairing a break, the system has been equipped with 3,500 stop valves. The value of these stop-valves was demonstrated recently when a break occurred in North Omaha. The interruption of service was limited to the space between two stop-valves and water was brought in from another direction to serve many patrons who otherwise would have been affected.

Big Coal Supply.

The energy confined in coal is the force which delivers water to 200,000 Omahans. A large supply of coal always is maintained at Florence. On November 1 of this year, it was estimated that this coal supply would last 100 days. The Florence station uses from 60 to 70 tons of coal a day.

The gas plant was acquired by the city, July, 1920, the bond issue for the purchase being \$5,000,000. A subsequent issue of \$1,000,000 gas bonds was authorized for improvements and enlargements, but those bonds have not been sold. Directors of the utilities district were advised by experts that the plant had outgrown its requirements. To meet the increasing demands for gas,

the directors have started improvements which will cost \$225,000. It has been proposed to adopt another method of manufacturing gas, which would entail considerable first expense and would yield coke as a byproduct.

C. D. Robison, supervising engineer of the utilities district, explained that carbureted water gas is the kind now manufactured. Elements entering into this process are steam, coke and gas oil.

Three Gas Sets.

"Principal pieces of apparatus necessary in a carbureted water gas works," said Mr. Robison, "are generator, carburetor, superheater and wash box, known collectively as a carbureted water gas set, of which there are three at the Omaha works, and an additional set is being installed; steam boiler, scrubbers, condenser, relief holder, exhausters, tar extractors, station meters and storage holders."

A generator at the Omaha plant is 11 feet in diameter, 17 feet deep, and lined with 18 inches of firebrick to keep in the heat. The average heat carried in the generator is 1,800 to 2,000 degrees Fahrenheit, and at the fired heat is from 2,400 to 2,800 degrees. This intense heat is obtained by application of coke and an air blast.

Removal of large clinkers twice each day from the grates is a difficult task, requiring a gang of seven or eight men, stripped to the waist.

"They attack these clinkers with heavy bars and sledge hammers,"

Mr. Robison explained, "and break them up so that pieces may be removed from the fire bed. This is the most difficult and hardest work at the gas works, and in summer weather it is very trying on the men."

"Blue Water Gas" Formed.

"When the temperature in the generator is high enough, steam is forced through the fuel bed, decomposing or breaking up the white hot coke. The oxygen in the steam combines with the carbon to form carbon monoxide and the hydrogen in the steam is set free. The result of that action is 'blue water gas,' which is combustible, but of small heating value."

"The next piece of apparatus is the carburetor, of the same size as the generator, filled with fire brick set checkwise. The blue gas is led into the top of the carburetor, where it is met by a spray of gas oil, which, in the process of the white hot checker brick and surrounded by the blue water gas, is changed first to a vapor and then to a true gas. In the superheater, the third vessel in the set, is completed the gasification of the oil."

Oil tar is extracted from the gas. It is cooled and sulphureted hydrogen and some of the other sulphur compounds are removed by a mixture of oxide of iron and shavings, or corn cobs. The gas then is measured through the station meters and it is passed into the storage holders. These holders are of telescopic design. When the gas is pumped into a holder the inner section is pushed up, and when this section rises to its full height, a cup on its bottom engages on a grip of the next section, and other sections rise, until the holder is filled."

Governors Regulate Pressure.

In Omaha about one-third of the gas is sent out at holder pressure, meaning it is carried to the consumer by the pressure from the storage holder. Gas is served to outlying districts by pumps and the pressure is regulated by district governors.

"These district governors," Mr. Robison said, "are set in large brick manholes at various street corners. It is only by the most constant and painstaking attention that they can be kept in condition to deliver gas from the medium pressure or pumping mains into the low pressure mains which supply the consumers at a constant and satisfactory pressure. If the pressure is too low or varies too much, the service will not be satisfactory no matter how good the gas may be."

"Because of insufficient mains, inherited from the old gas company, and because of the increase in the quantity of gas being used, pressure in many sections of Omaha is not as great nor as regular as it should be, and nearly all complaints of 'poor gas' are not due to the quality, but to unsatisfactory conditions as to pressure. A thorough study now is being made of the entire situation, but some time will be required to make the improvements necessary to give good pressure to all parts of the city."

First Munny Ice in 1918.

Omaha made its first municipal ice August 26, 1918, at the plant, Twentieth street and Poppleton avenue. It is estimated that more than 45,000 tons will be sold by the city this year. The highest amount of municipal ice sold in one day this year was 496 tons, on a hot day last summer when 23 "jitney" stations were doing a "land office business."

The munny ice plant now has a daily output capacity of 200 tons. The new 20,000-ton ice storage house will increase the total storage capacity to 30,000 tons. The ice department management expects to have 30,000 tons on hand when the retail season opens next spring. The average period of the retail ice season is 100 days. With a storage of 30,000 tons on hand next spring and a daily production of 200 tons, the ice department anticipates an ability to supply 500 tons of ice a day during the next summer season.

In his report for the year 1920,

the state auditor of public accounts reported the value of the ice plant at \$247,019, which does not include the improvements made this year. Ice sales during 1920 were \$168,542 and the net profit for that year is shown as \$55,711. Ice is sold at the plant and at the "jitney" stations at 30 cents per 100 pounds, or smaller quantities at the rate of 15 pounds for 5 cents. Some of the ice is sold at wholesale, to dispose of the excess over storage when the small stations are not open.

Ammonia Process Used.

Ice manufactured at the municipal plant is produced by the ammonia process. Ammonia is delivered in steel drums in liquid form and is discharged into a receiver at the plant. It is expanded in iron pipe coils which are surrounded by salt brine. Cans filled with city water are lowered into the brine. The expanded or evaporated ammonia, passing through the coils, absorbs the heat from the water in the cans. The circulation of the cold brine around the cans freezes the contents into cakes of ice of standard weights of 400 pounds. The cans are raised by an electric hoist and are submerged into a dipping pit of warm water to release the ice which is discharged from the cans to a refrigerator storage room. The brine is used as a cold circulating medium because it will not freeze. The ammonia, which is released into the coils at a pressure of 190 pounds, vaporizes during its function of producing a low temperature and it is recovered for further use.

The ice department expects to open more "jitney" ice stations next season. These stations are operated on the "cash and carry" plan. On a summer morning it is a common sight to see a line of children with small wagons and men with wheelbarrows and automobiles waiting to be served. To supply the emergency ice needs during the hot weather, the public station at the plant is opened from 10 to 12 on Sunday mornings. On a Sunday morning last summer 1,200 were served in two hours at the plant.