

covering 2 inches thick, and all other pipes with 1 inch of asbestos cellular covering. The covering is, in all cases, covered with canvas, sewed on and painted.

The piping in the power house was done by the M. W. Kellogg Co., of New York.

#### TESTS OF THE POWER PLANT.

With the kind co-operation of Professors Gill and Will-hofft, of Queen's University, Kingston, and their students, careful tests of the boilers and of the entire plant were made by Mr. C. J. Goldmark, E.E. The object of these



Fig. 1—Concrete Mixer at Work. 75 to 100 Tons per Day.

tests was to determine the efficiency and economy of the plant under the conditions of actual operation. These tests may be briefly summarized:

#### BOILER TEST.

|                                                                                           |                       |
|-------------------------------------------------------------------------------------------|-----------------------|
| Duration, 10 hours.....                                                                   | Object, economy.      |
| Water heating surface.....                                                                | 2,500 square feet.    |
| Grate surface.....                                                                        | .42 " "               |
| Murphy stokers.                                                                           |                       |
| Fuel—                                                                                     |                       |
| Kind of coal.....                                                                         | Youghiogheny stock    |
| Thermal value of dry coal.....                                                            | 13,133 B.T.U.         |
| Percentage of moisture in coal.....                                                       | .5%                   |
| Percentage of ash and refuse referred to dry coal.....                                    | 12.6%                 |
| Dry coal burned per square foot of grate surface per hour.....                            | 24.8 lbs.             |
| Draft and temperature—                                                                    |                       |
| Draft in furnace.....                                                                     | .0264 inch.           |
| Flue gas average temperature.....                                                         | 530° F.               |
| Water and steam—                                                                          |                       |
| Average temperature of feed water.....                                                    | 66.8° F.              |
| Average steam pressure (gauge).....                                                       | 146.8 lbs per sq. in. |
| Superheating—                                                                             |                       |
| Average temperature of steam.....                                                         | 523.5° F.             |
| Average amount of superheat.....                                                          | 159.5° F.             |
| Economic evaporation—                                                                     |                       |
| Water actually evaporated per pound of dry coal.....                                      | 8.07 lbs.             |
| Evaporation from and at 212° per pound of dry coal corrected for quality of steam.....    | 10.42 lbs.            |
| Evaporation from and at 212° per pound of combustible corrected for quality of steam..... | 11.93 lbs.            |

#### Horse Power—

|                                                               |            |
|---------------------------------------------------------------|------------|
| Rated h.p. of boiler (10 sq. ft. heating surface—1 h.p.)..... | 250 h.p.   |
| H.P. developed by boiler.....                                 | 292.6 h.p. |
| H.P. equivalent of boiler and superheater.....                | 314.8 h.p. |
| H.P. in excess of rating.....                                 | 64.8=25.9% |
| Efficiency of boiler and furnace.....                         | 76.6%      |

#### ECONOMY TEST OF STATION.

Duration, 11 hours.

Larger Belliss & Morcom engine (365 b.h.p.) and 250 kilowatt generator running; also Rand compressor. Both running condensing. Two boilers fired.

N.B.—The plant was not complete. There was no lagging on the steam pipes. There was no superheat at the air compressor, and only 40° F. at the large engine. The average load factor on the plant during the test was about 45 per cent. The average efficiency of the engine and generator was 86.5 per cent.

|                                                            |               |
|------------------------------------------------------------|---------------|
| Steam used per I.H.P. per hour, including auxiliaries..... | 28 lbs.       |
| Net (omitting auxiliaries).....                            | 23.2 lbs.     |
| Percentage of total steam used by auxiliaries.....         | 14.6%         |
| Dry coal per I.H.P. per hour, including auxiliaries.....   | 3.24 lbs.     |
| Dry coal per I.H.P. per hour, net corrected for drips..... | 2.67 lbs.     |
| Evaporation from and at 212° F. per lb. of dry coal.....   | 10.27 lbs.    |
| Thermal value of fuel.....                                 | 13,133 B.T.U. |

#### DISTRIBUTION OF HEAT, LIGHT, AND POWER.

The live steam, exhaust, and compressed air pipes from the power house to the different shops are housed in by a wooden covering and supported on a structural steel trestle, which also carries the electric circuits.



Fig. 2—Excavating for Heavy West Retaining Wall.

All heating is done by direct radiation, except in the machine shop, where a fan blower, driven by an electric motor, has been installed.

All steam for heating is distributed at low pressure, exhaust steam being used whenever possible. The water of condensation flows by gravity to three receivers placed in pits below floor level, and is returned to the boiler plant by Bundy pumping traps. These traps are operated by live steam from the central plant, are simple and automatic in their action, and give good satisfaction. They enable the returns to be carried on the trestle, avoiding the difficulties of underground work.

The power distribution is at 240 volts on a two-wire