

partment of Health, Edward C. Cromwell states that the water of Back river, which receives the final effluent of the plant, has a dissolved oxygen content varying from 80% to 180% saturation during the open season. The super-saturation is due to the prolific growth of large quantities of algae feeding upon dissolved organic matter, so that the algae

growth is an important factor in the re-aeration of the water receiving the effluent.

The raw sewage has a biochemical oxygen demand of 222 parts per million and the final effluent an average of 29 p.p.m. The trickling filter effluent has a dissolved oxygen content of from 1 to 4 parts per million.

Mount Airy Waterworks

Old plant rebuilt, giving mixing chamber, coagulating basins, rapid sand filters, clear water reservoir, wash water tank and pumping plant

By Preson P. Phillips*

Mount Airy, North Carolina, is located almost at the foot of the Blue Ridge mountains and is often called the "Granite City" because here is located what is said to be the largest open-face granite quarry in the world. The city has grown very rapidly during the past few years and the present population is estimated at 7,500.

In 1903 the Rucker-Witt Tobacco Co. furnished the first public supply to the city, from a deep well drilled near the center of the present city. In 1904, this supply proving inadequate, a well 25 feet deep and 40 feet in diameter was built around a spring just outside the city, the water from which was pumped to a wooden tank erected on a hill at the northern edge of the town. This supply in turn was found to be inadequate and in 1905 a small intake dam was built across Creasy's Branch, which had a watershed area of one-quarter square mile, and the water led to the "town well" already referred to.

By 1910 the supply was again inadequate and a small intake dam about three feet high was built

across Tumbling Rock Branch, which had a watershed area of about 1 square mile, and this water also was led through an 8-inch spiral steel pipe 4,600 feet long to the old well.

In 1913 the first filter plant was built and an elevated steel tank with a capacity of 150,000 gallons replaced the old wooden tank, and the water was treated with sodium hypochlorite. In 1922 a Wallace & Tiernan chlorinator was installed, and in 1924 a large concrete coagulating basin designed to treat 1,000,000 gallons per day was built.

The supply of water again proving inadequate in 1925, a 21-foot earth dam was built just above the old intake on Tumbling Rock Branch, giving a reservoir with a capacity of 10,000,000 gallons, and a new 200,000-gallon elevated steel tank was added to the distribution system. However, the watershed of Tumbling Rock Branch did not warrant an impounding reservoir of this capacity, and its yield was not sufficient for the demands of the town, and the next year it was found necessary to pump raw water from a creek during a dry spell.

Realizing that some radical move was necessary

*Designing Engineer, Gilbert C. White Co., Durham, N. C.



IMPOUNDING RESERVOIR ON TUMBLING ROCK BRANCH, MOUNT AIRY WATERWORKS

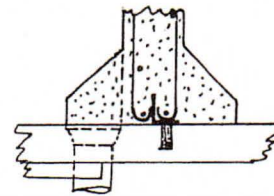
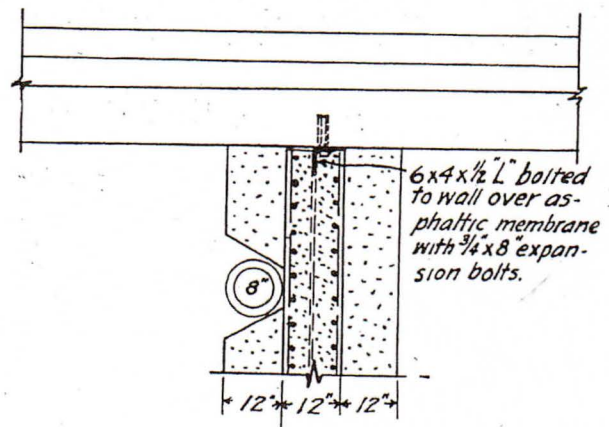
to permanently increase the water supply to the demands for the next few years, the Gilbert C. White Company was asked to report on the supply. These engineers reported on the incapacity of the watershed of Tumbling Rock Branch; also that the filter plant was badly scattered, some parts of it obsolete and others inefficient, the only structure found worth retaining in a new plant being the coagulation basin and the clear water reservoir. They reported that the best source of supply that would guarantee sufficient water for years to come was Lovill's Creek. Above a point about three miles from the city, selected for the intake, the watershed had an area of $22\frac{1}{2}$ square miles and the estimated flow of the creek without storage was about 3,000,000 gallons a day. They recommend the adoption of this supply and the construction of a modern filtration plant of adequate size.

This report was adopted and construction of the new plant began January 1, 1927, and was completed in August.

The point at which the intake was constructed was just above an old dam built for power by a flour mill, which point is considered an ideal site for the construction of an impounding dam in the future, when increased consumption may render it necessary. With the dam, this site will provide the town with more than 4,500,000 gallons of water per day. From this intake the water flows by gravity through three miles of 14-inch cast-iron pipe to the filtration plant, which is located at the site of the old brick well.

The new plant consists of a mixing chamber, three coagulating basins, three rapid sand filters, a pump house containing laboratory and chemical storage and feed machines, a clear-water reservoir and a wash-water tank.

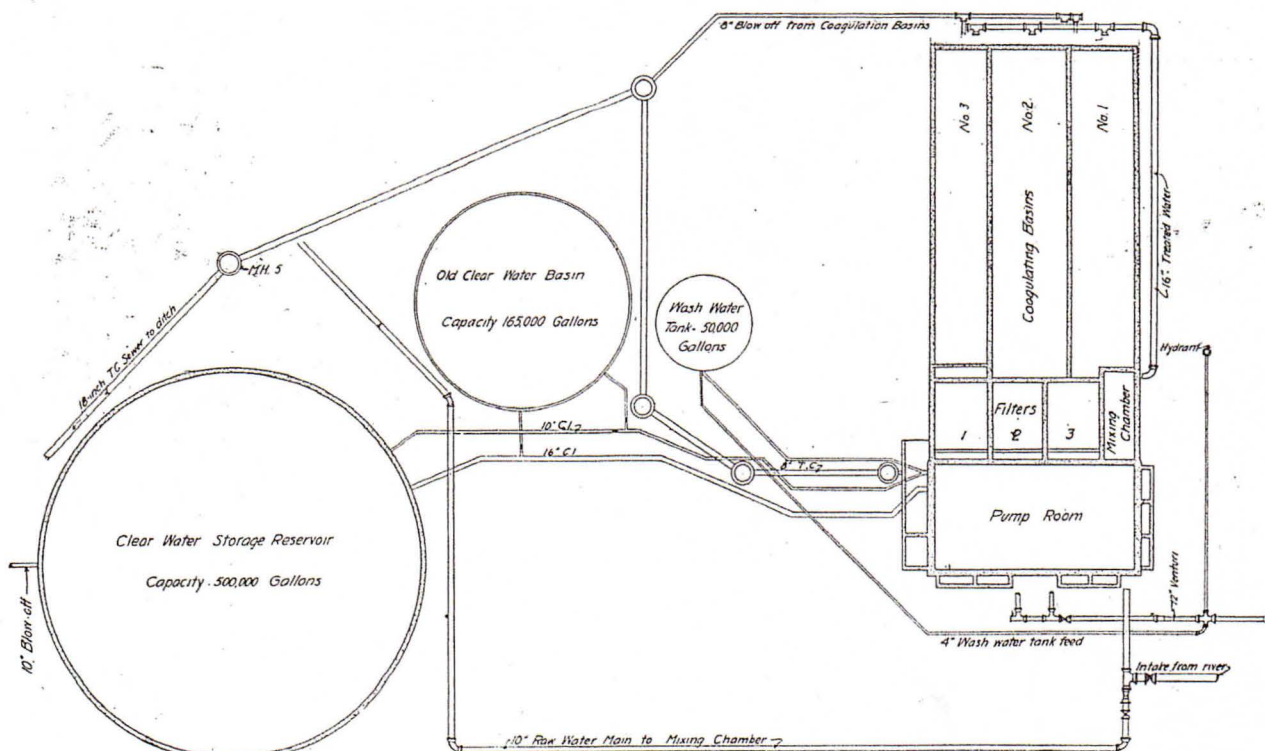
Mixing Chamber: The mixing chamber is rect-



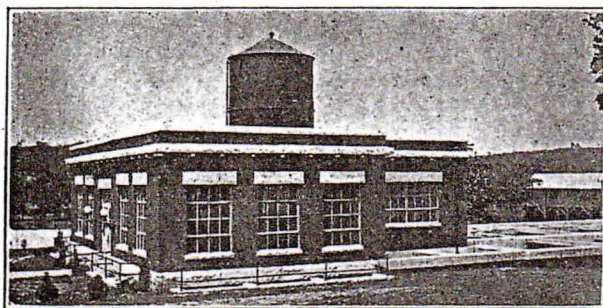
JOINT OF NEW WALL WITH OLD IN COAGULATING BASINS

angular, with over and under baffles, designed to give a retention period of about fifteen minutes when operating at the rate of 1,500,000 gallons per day.

Coagulating Basins: The old coagulating basin and mixing chamber were combined and re-divided to give two coagulating basins each about 16 ft. by 72 ft., and a new coagulating basin 12 ft. by 72 ft. was added, giving a total retention period of five hours when operating at the rate of 1,500,000 gallons per day. These are so arranged that any one of the three basins may be drained for cleaning;



GENERAL LAYOUT OF NEW WATER PLANT FOR MOUNT AIRY



BUILDING HOUSING FILTER PLANT

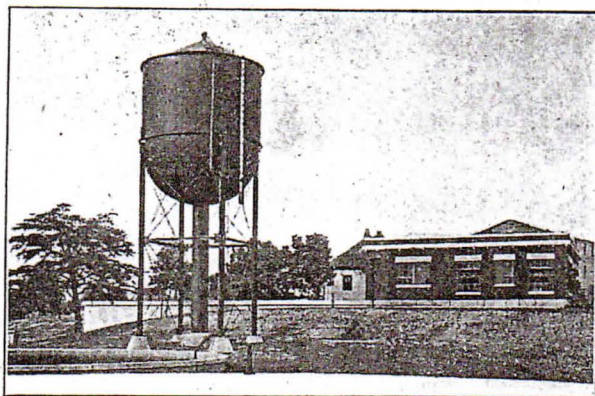
and so that any one of the three filters may be operated with any one of the coagulating basins.

In connecting the new dividing wall to the outside walls and to the floor, a six-inch by four-inch angle was bolted over a four-inch asphaltic membrane with three-quarter inch expansion bolts, the new twelve-inch wall being centered on these angles. This gave practically a water-tight joint. The same method was used in connecting the new coagulating basin to the old one.

Filters: The filters are the usual rapid sand filters using filter equipment furnished by Roberts Filter Manufacturing Company of Darby, Pa. They consist of three half-million gallon units adjoining the coagulating basins, with necessary piping and operating tables, and are under the same roof as the pump room.

Pump House: Pumps, laboratory, dry feed machines, chemical storage and filters are all housed in the same two-story building. The filters are all on one side of the pipe gallery, this being a part of the pump room, which makes the piping very accessible.

Under the pipe gallery for the full width of the

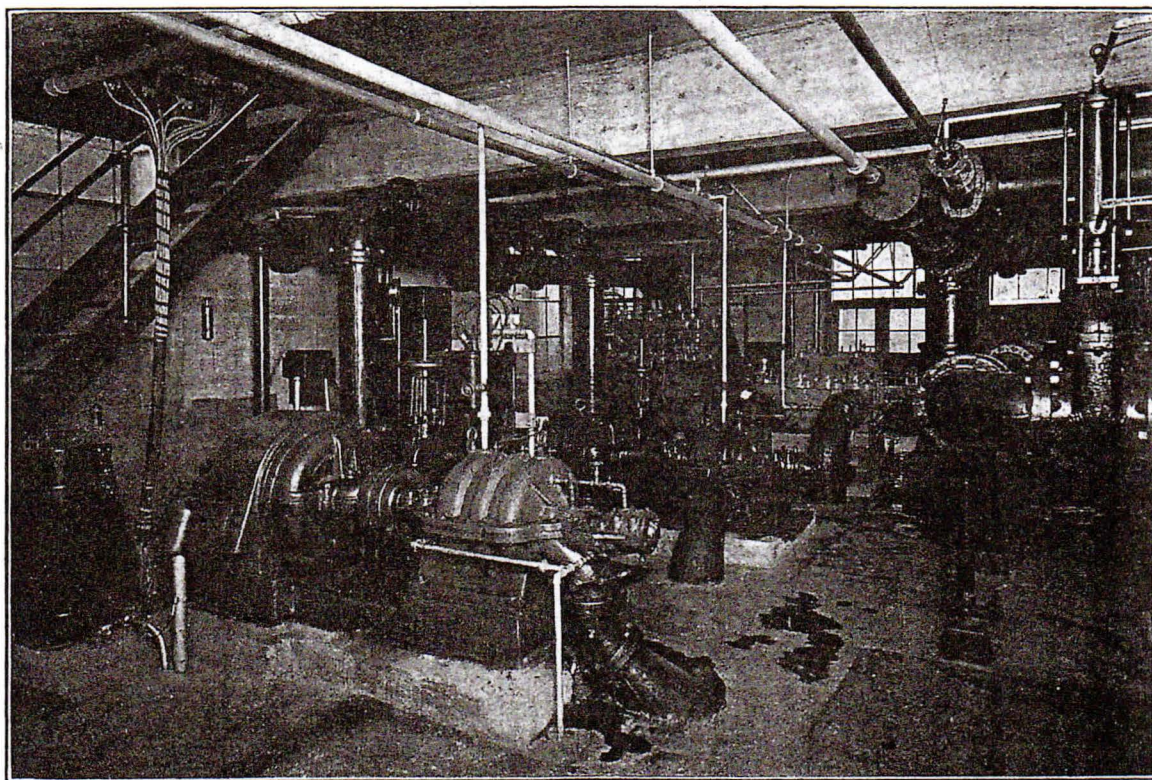


WASH-WATER TANK, FILTRATION PLANT AND SUPERINTENDENT'S HOME

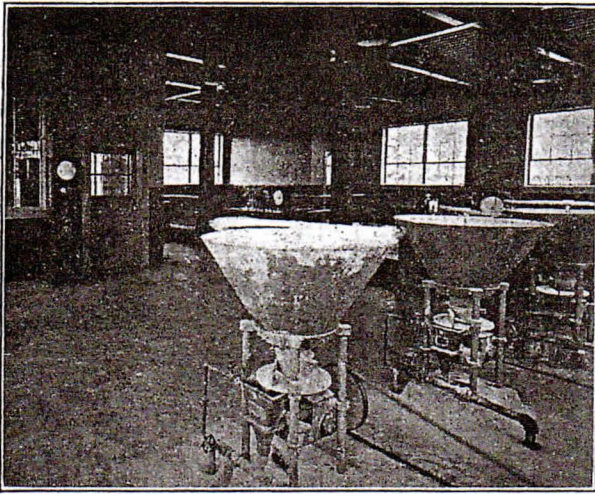
pump room is the suction well and filtered water conduit. The suction pipes from the pumps drop directly into this well through the floor.

The top of the suction well is below the elevation of the water in the clear water reservoir, and especial precautions were taken to prevent leakage into the pump room through the top of this well. In order to assure this, the top of the well, reinforced for upward pressure, was built six inches below the finished floor. Over this was laid heavy split wall tile or furring tile, leading to the edge of the well, at which point was put a line of drain tile surrounded by stone and leading to a manhole outside of the building. No leakage has developed to date. The floor of the pipe gallery was laid on top of this tile at the same elevation as the pump room floor.

There are three pumps: one old motor-driven pump with a capacity of 675 gallons per minute; an old gasoline engine-driven pump with a capacity of 1,500 gallons per minute for emergency fire use;



PUMP ROOM AND PIPE GALLERY

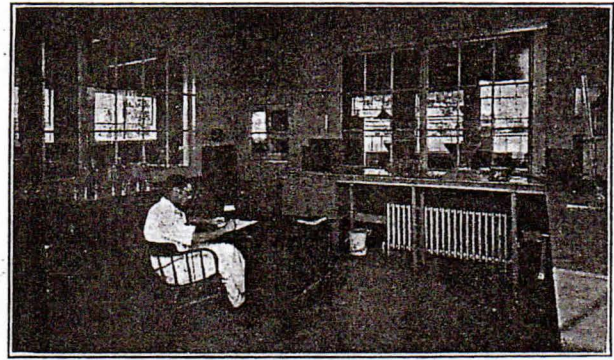


OPERATING FLOOR, SHOWING CHEMICAL
FEED MACHINES

and one new motor-driven pump with a capacity of 700 gallons per minute.

In the pump room is located a 12-inch Venturi meter for measuring the raw water, connected to a recording floor stand on the operating floor; also a 12-inch Golden Anderson automatic controlling float valve for controlling the raw water as it enters the mixing chamber. An Arcola heater with radiators at various points was installed to heat the building.

Operating Floor: The second floor of the pump room houses the laboratory, a chemical storage room, three dry-feed machines, chlorine room and raw water indicator. The laboratory is very complete and is separated from the rest of the floor by a hollow tile and glass partition. The dry feed machines are used to feed alum and soda ash or lime. A chlorine room is built over a portion of one of the filters and the chlorine is fed into the filtered water as it passes into the effluent conduit over the suction well.



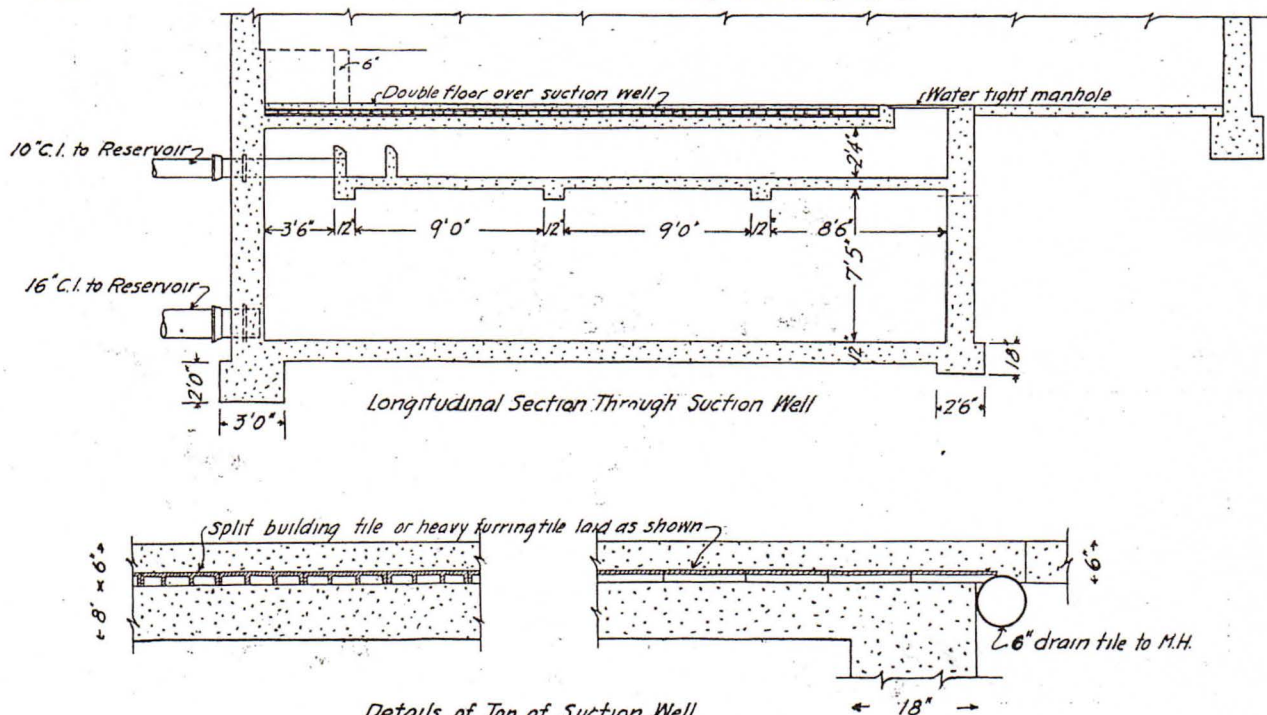
LABORATORY

Clear Water Storage: A new circular, covered, clear-water reservoir with a capacity of 500,000 gallons was constructed. Piping from the clear water conduit was so arranged that a portion of all filtered water must go to the reservoir and return to the suction well; thus the water in the reservoir is kept circulating at all times. The old clear-water reservoir will be continued in service and will be covered at a later date.

Wash-Water Tank: In the old plant no wash-water tank was provided, the filters being washed exclusively by a wash-water pump. A new elevated steel tank with a capacity of 50,000 gallons has been provided for washing the filters of the new plant.

General: Mount Airy granite being available and quite reasonable in price, the building proper was built of face brick and trimmed with this granite, making a very attractive structure. The old brick raw-water well was filled, and all the grounds around the plant graded and seeded. A seven-foot Cyclone fence was erected around the whole plant.

The total cost of the plant was around \$140,000. The general contractors were Tucker and Laxton, Inc., Charlotte, N. C.



Details of Top of Suction Well
CONSTRUCTION OF WATER-TIGHT ROOF OF SUCTION WELL