Rock excavated for the basement, which is mainly in solid limestone, was crushed at the site and used for the concrete and on other building operations, while some was sold to contractors. For this purpose a jaw crusher was installed, with a screening plant and 100-ton overhead bin, from which stone was fed by gravity to the mixer. The cost of this crushed stone, including overhead expenses and depreciation of crusher, was $1.10 per ton.

Design and Cost—The cost of this building was 21.8c. per cubic foot, including elevators, heat, light and sprinkler equipment, a tower clock and automatic time-

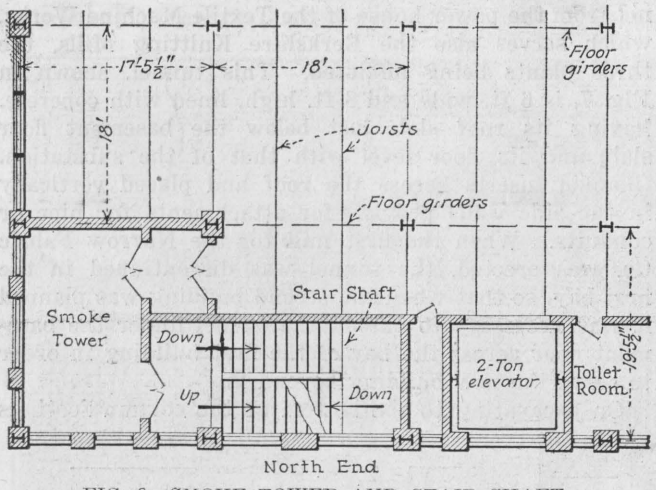


FIG. 8—SMOKE TOWER AND STAIR SHAFT

pieces on each floor. Contracts were let for the structural steel and its erection, and for the elevators, sprinkler system, roof slab and roofing. But with these exceptions the building was constructed by the force of the construction department of the Textile Machine Works, which department also acted as architect and engineer. This department was organized in 1923 to carry out an extensive building program for the three plants mentioned above, which form one of the largest combinations of textile mills in the country. It includes architects, designing and construction engineers and mechanical and electrical engineers, with a force of about ten office employees and 125 outside men during busy seasons. The work on the Narrow Fabric mill described above was all planned and carried out under the direction of J. P. Sartz, organizer and manager of the Textile Machine Works Construction Department, Reading, Pa.

A Public Water Supply Dating from 1250

Tiverton, an English borough of 9,715 people living in 2,499 inhabited houses, has had a water supply since 1250. In that year, states J. Siddalls, late borough engineer of Tiverton, in a paper before a district meeting of the Institution of Municipal and County Engineers (London *Surveyor*, May 22, p. 504) Isabella, Countess of Devon, gave a water supply to Tiverton (whether the source only or that and works also is not stated). Water was conveyed from springs at Norwood Common, 5½ miles distant, by a "leat or 'lake'" to Tiverton. "On reaching the town," says Mr. Siddalls, the water "was formerly distributed by conduits and channels through all the streets and byways," but whether general distribution was practiced as early as 1250 is not made certain. In 1880, settling tanks, filter beds and a small service reservoir were built at a point on the "leat" 2½ miles from and 200 ft. above Tiverton.

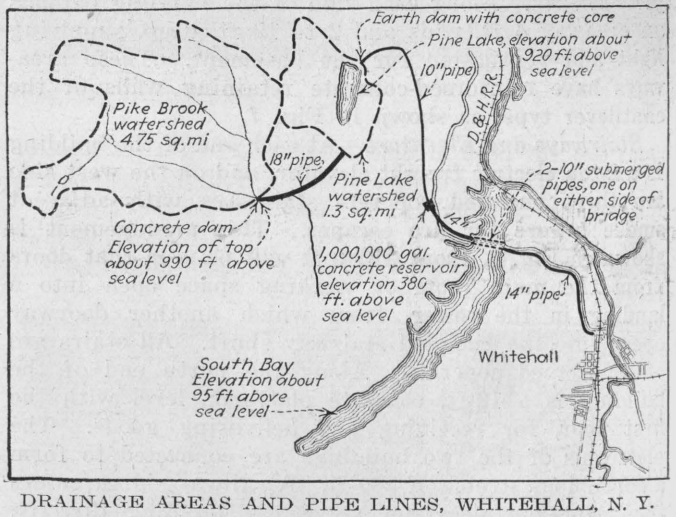
New Gravity Water Supply for Whitehall, N. Y.

Two Drainage Areas United by Diversion of Water Through Pipe Line Exposed on Rock To Low Winter Temperatures

By James P. Wells
Consulting Engineer, Rochester and New York City

FEATURES of a new water supply from the Southern Adirondacks turned into the distribution system of the water-works of the village of Whitehall, N. Y., in January, 1925, are a considerable length of water pipe laid almost unprotected on rock with an exposure to very low winter temperatures and a stretch of submerged pipe laid on the soft bottom of an arm of Lake Champlain. The new supply is by gravity, replacing one pumped at a yearly cost of $22,000. Capital charges on the $320,000 cost of the new system of 3-m.g.d. capacity will be less than the $22,000 yearly pumping cost for 1 m.g.d. from the Metawee River, immediately south of the village. The old supply was moderately hard and at times was unsatisfactory in quality. It was untreated except for chlorination. The new supply has a hardness of only 20 p.p.m. and is of high quality bacterially. The estimated population of Whitehall is 7,000 (4,917 in 1900 and 5,258 in 1920).

Since it is impossible to get an ample supply from a single drainage area between Lake George and Lake Champlain, two were drawn upon, the water from one



DRAINAGE AREAS AND PIPE LINES, WHITEHALL, N. Y.
Water diverted from Pike Brook to Pine Lake watershed and carried beneath South Bay.

being diverted into the other. Pike Brook has an elevation of about 1,000 ft. above Whitehall and a drainage area of 4½ square miles. Across this brook in a narrow notch cleft between the granite rocks a concrete arch dam 30 ft. high has been constructed. From this dam a 16-in. pipe line leads over the mountainside 6,000 ft., crosses the northern edge of the Pike Brook watershed and discharges into Pine Lake, a beautiful body of water about a mile long and a quarter of a mile wide. To make full use of this lake for storage purposes, two dams have been constructed, the lake level raised 7 ft. and an intake has been built 10 ft. below the surface. This gives 17 ft. of storage depth and 450 m.g. capacity.

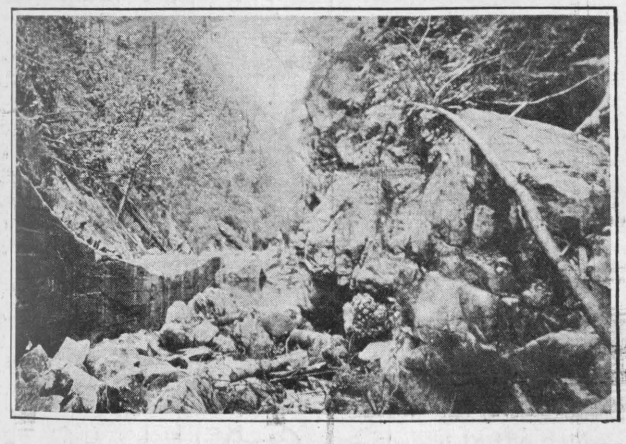
Leading down the mountainside from this lake is a 10-in. pipe line which drops 500 ft. in a little over three

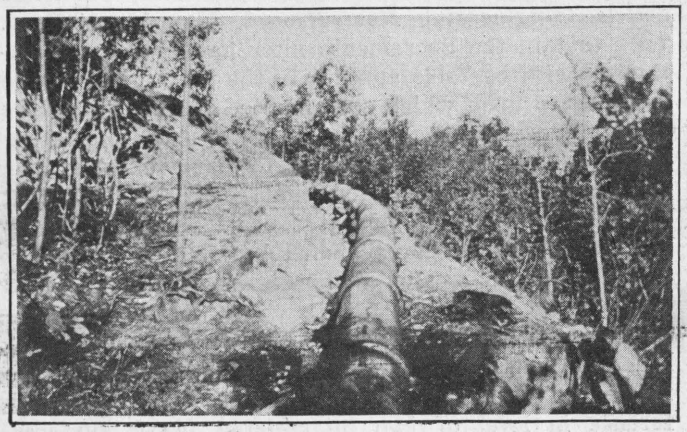
miles and discharges into a 1-m.g. distributing reservoir. From this reservoir a 14-in. pipe line extends about ¾ mile to the edge of South Bay, an arm of Lake Champlain. As already mentioned, South Bay has always been considered as the great obstacle against a water supply from the Adirondacks. From the edge of the bay two 10-in. pipes about 500 ft. apart are laid across and on the bottom of the bay, the distance being 1,800 ft. The bottom of the bay is so soft that when a pile trestle was built across the bay, some years ago, it was very easy to push the piles down into the soft deep ooze. A small part of the pipe in the softest part of the bay was laid on cribbing. When the pipe was completed and tested some leakage occurred. This was stopped in a short time and there was practically no settlement. At the south side of the bay the two pipe lines again unite into a 14-in. main which extends three miles to Whitehall.

for this reason it was not deemed feasible to develop electric power.

The 1-m.g. reservoir already mentioned serves the double purpose of reducing water pressure and providing a reserve supply of water available at Pine Lake and Whitehall. To form this reservoir a semicircular earth dam with concrete heart-wall was built on a rocky slope. The earth in the reservoir basin was excavated to form the embankment, so that the entire bottom of the reservoir is practically upon granite rock. The inside slopes were riprapped. This reservoir will be operated in connection with an existing 5-m.g. reservoir which is located southwest of the village.

As the 16-in. pipe line from Pike Brook to the edge of the Pine Lake drainage area will not run full at certain seasons of the year it was necessary to guard against débris and driftwood, which would be apt to plug the pipe at the outlet of the arch dam. As this





CAST-IRON WATER-SUPPLY MAIN, WHITEHALL, N. Y.

Left, 16-in. pipe subsequently covered with concrete. Right, 10-in. pipe left almost completely exposed in country where temperatures drop to —45 deg. F. For nearly three miles the pipe is almost wholly on top of rock.

Several features of this construction are unusual and caused scepticism in many minds. First and foremost is the 10-in. pipe line from Pine Lake to the distributing reservoir. The temperature here sometimes drops to as low as —45 deg. F. and this 10-in. pipe is on top of the rock. Many of the natives said there was no question but that the water in this exposed pipe would freeze. The contention of the consulting engineer was that there would always be water flowing through the pipe and for that reason it would be entirely safe to lay the pipe on top of the rock. There is practically no covering material within a reasonable distance of the pipe line, so that the pipe is covered very scantily, possibly with 6 to 12 in. of whatever débris was available. Already the pipe has had a severe test—water flowing through it at low velocity when the temperature was about —45 deg. F.—with no appreciable decrease in the discharge of the pipe. When there is a higher velocity due to the use of water by the village, and at the same time a covering of snow, there will be no possibility of the pipe line freezing. The 10-in. pipe, which if laid on a flat grade could not carry more than 0.2 m.g.d., will carry 3 m.g.d. with the steep grade it has.

With all this additional head available, before deciding upon the size of the pipe, an alternate plan of developing power with the water was considered. This would have required a larger pipe and a good portion of it would have been under very heavy pressure, and pipe is primarily for the purpose of carrying off the flood water, and as the dam was constructed mainly to give sufficient head to carry the water over the divide, there is no objection to not using the small amount of storage that is available back of the concrete arch dam. To keep the intake free, a gooseneck or hump has been put in the pipe immediately in front of the dam. The top of the gooseneck is about 2 ft. below the level of the spillway, so that the water at no time will be below this level back of the dam, and there will always be about 12 ft. of water over the intake. By this arrangement the intake itself will never become clogged.

To exclude animals or foreign matter from the lower end of the 16-in. pipe, it discharges into a small reservoir created by a low concrete dam, from which it is the intention to let the water find its own course to Pine Lake.

Whitehall has purchased not only the entire lake but also a thousand acres adjacent to it so that it will own the entire watershed. Pike Brook watershed is sparsely settled so there is practically no danger of contamination from this source.

The two pipes across South Bay were laid from the end of a scow. The contractor for the work was J. J. Fitzpatrick & Son of Plattsburg, N. Y. The writer was the consulting engineer and E. P. Strowger was the resident engineer for him. The Central Foundry Co. supplied the pipe.