Philadelphia's Water Works from 1798 to 1944

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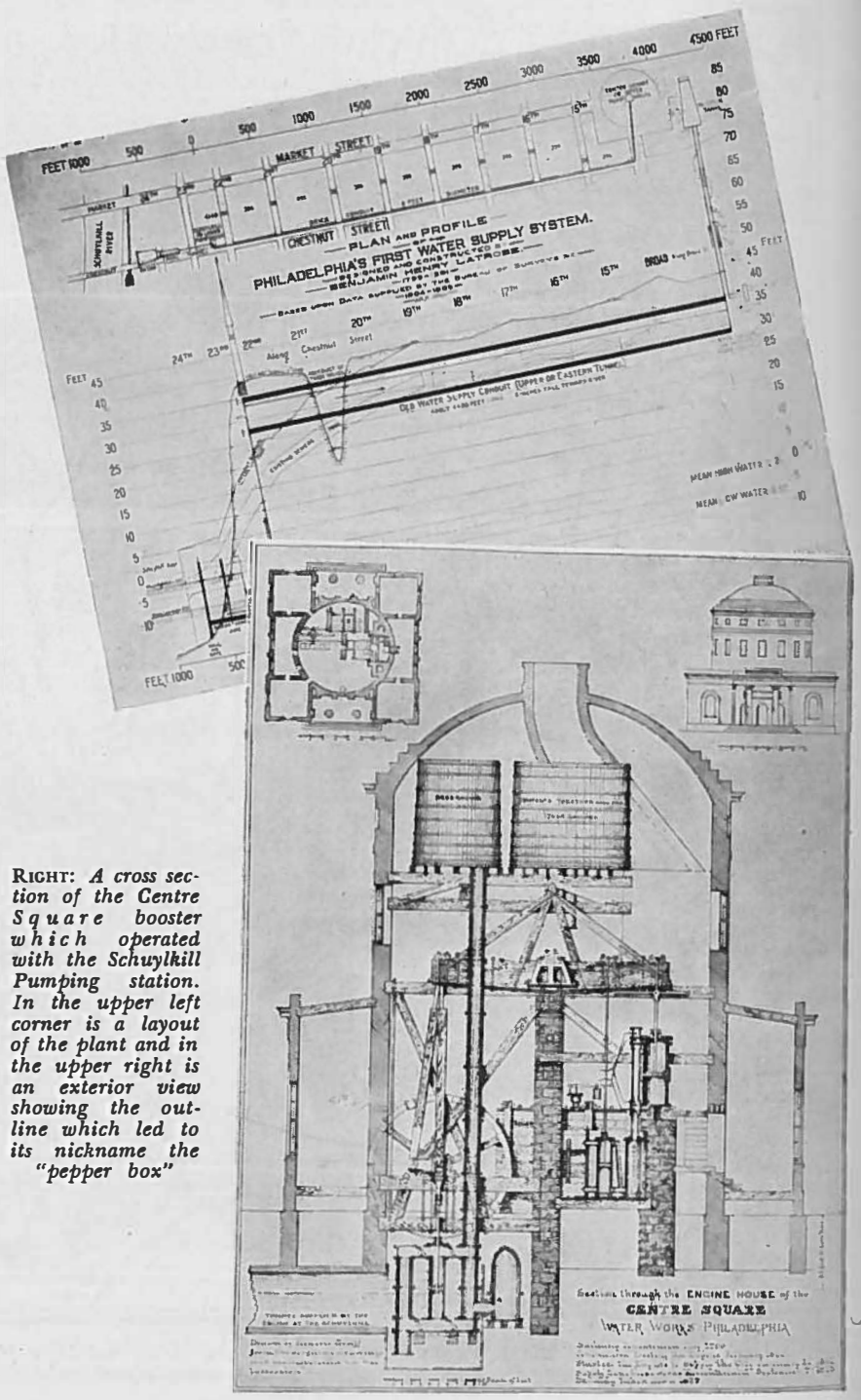
THE Bureau of Water of the City of Philadelphia is today one of the world's largest public utilities, yet it had very humble beginnings. Back in 1798 when the City of Philadelphia was young and comparatively small, the city fathers retained a pioneering engineer, Benjamin Henry Latrobe, to survey the possibilities of constructing a municipal water works system and from his plans in the following year evolved the first of the Philadelphia water works. This consisted of a large pump house for water power near the banks of the Schuylkill and an edifice of marble at the Centre Square to operate in conjunction with it as a booster station. This latter structure showed conscientious efforts to make it architecturally attractive, nevertheless, it bore the disparaging name of "the pepper box," in allusion to its circular form and appearance.

The water supply system had at first but little encouragement from the people generally and as an inducement the city was offered water free for a term of years. As late as 1803, only $960 annual rental was collected whereas nearly $300,000 had been expended on the enterprise. In 1814, there were 2,850 dwellings receiving water and paying a rent of $18,000 while the cost of supplying the water was $24,000—scarcely the kind of ledger the modern water works man would enjoy keeping. Three years later the city expanded its modest utility by installing pumps at the Chestnut Street Wharf on the Schuylkill River and the Bureau of Water came into being. About the first act of this young Bureau was to determine that this source of supply was not suitable and in 1815 it built a steam pumping plant further up stream at Fairmount where the water was purer. This plant was steadily improved with subsequent reductions in operating costs until in 1827 the annual cost of supplying the water was but $1,478, while the water rents from the city had risen to $33,560.

Our great citizen, Benjamin Franklin, early foresaw the need of a fresh supply of water for Philadelphia, and recommended the use of the Wissahickon Creek. However, as foresighted as he was, he did not realize how much Philadelphia would grow. If we were to use his suggested supply today, we would drain it in a week.

There was little or no desire expressed by the citizens of Philadelphia for any other than their good well water till after the yellow fever of 1793. Then, when thought was alive to every

BELOW: *Diagram showing Philadelphia's first water system*



RIGHT: *A cross section of the Centre Square booster which operated with the Schuylkill Pumping station. In the upper left corner is a layout of the plant and in the upper right is an exterior view showing the outline which led to its nickname the "pepper box"*

suggested danger of disease, the fact that well water was no longer safe was increasingly recognized. After river water was introduced, many were still very slow and reluctant to give up their cold well water for the tepid Schuylkill water. Later numerous pits used for other purposes destroyed the pure taste of the well water and finally led to their total abandonment and a consequent increase in the use of the municipal water supply.

As Philadelphia rapidly outgrew its boundaries and absorbed many adjacent communities, the city gained several pumping stations, including those of the communities absorbed and others constructed by the Bureau of Water. The former have been replaced but the two sources of supply used at that time, the Delaware and the Schuylkill, are the same used today.

As time went on, the Schuylkill water shed developed, its wooded areas became largely cut over, and the river's flow level decreased proportionately. As a result, more and more water had to be taken from the Delaware River. Finally both supplies became increasingly contaminated and filtration was introduced starting on a partial scale in 1899 until in 1911 when all the water was filtered.

Operation and Organization

This public works unit, as it stands today, is the result of the development of the original units of the system with the addition of such improvements from time to time as the installation of rapid sand filters to replace certain of the original roughing filters, and the substitution of electric power for steam in some of the pumping stations.

The mechanical operation of the present water works is separated into three divisions: pumping, filtration, and distribution. There are five major and nine auxiliary pumping stations each having its zone of service. However, the auxiliary stations have equipment and flexibility which permit them to interchange in the case of an emergency.

The Bureau also maintains two stations for the purpose of charging the fire-line pipe system in the industrial and congested areas of the city. These stations are operated only in the event of a fire, and then for the purpose of maintaining a high water pressure at the outlets of the fire hydrants. These hydrants allow hose delivery directly without the use of fire department pumpers.

The functions of the Bureau of Water are the operating, extending, and maintaining of the city's water supply system and delivering the required quality and quantity at the proper pressures to the consumer and to the fire protection system.

The Modern System

The filtration plants have now expanded until there are five covering an area of 92 acres. One of these at Torresdale is the largest slow-sand filter plant in the world.

The purification process includes the use of chemicals and three types of filters: preliminary, mechanical, and slow sand. The effluent is sampled and analyzed daily. An interesting added feature of our filtration and purification plants has been the Ozone experiments conducted at the Belmont plant to control tastes and odors. The equipment was installed by the Ozone Processes Co., Inc., of Philadelphia. Reports show very satisfactory results. The characteristic residual from the ozone type of treatment is sweetish or purely chlorinous. The water is free from disagreeable taste more than 80 percent of the time. The remaining taste disappears before the water reaches the consumer.

Distribution is the final mechanical stage of the system. To convey this service to outlets there are 2,500 miles of pipe controlled by 49,800 valves and furnishing, in the event of fire, water to 20,500 fire hydrants, and an additional high pressure system of approximately 65 miles with 2,000 high pressure valves and 1,000 hydrants.

The largest means for water conveyance is a 10-foot 7-inch masonry conduit about 3 miles in length. The steel feeder or express mains range from 30- to 93-inch size and the cast iron mains are 4- to 60-inch size.

Population Stabilized

At the turn of the present century the average daily consumption was above 300 mgd and at present is only slightly greater. This halt in the increase of water consumption is due to two factors: a stable population, and a continuous water leak detection survey which includes pitometer surveys, hydrant to hydrant and house to house inspections which enable the location and repair of water leaks.

It is well that the population of Philadelphia is stable for our plant capacity does not greatly exceed the present consumption rate. Engineers are now working on plans for the expansion of facilities and funds for this expansion have been made available by an $18,000,000 bond issue. But because the material for building these extensions is difficult to obtain the contemplated improvements have been temporarily slowed up.

We are with every means at our command doing what we can to keep the demand for water within the available supply.

Combined with the plants of the water works and operated by the Bureau of Water are the Northeast Sewage Disposal Works, the Frankford Grit Chamber, and the Southwest Sewage Disposal Works, the Mingo Creek Pumping Station and the Southeast Pumping Station, the latter serving to prevent the overflow of

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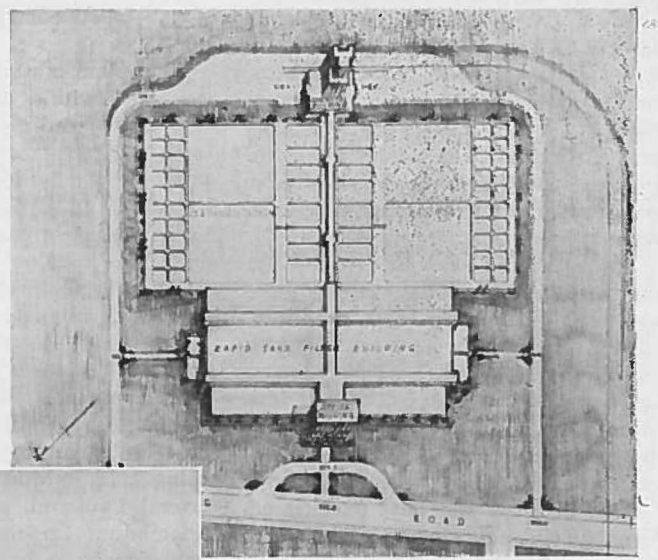

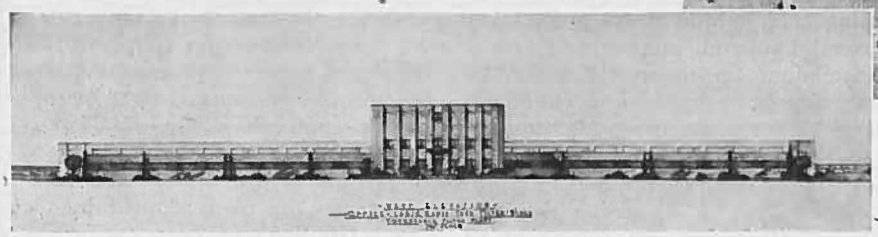

These are the proposed new additions to the Torresdale plant. It is at this plant that the largest slow rate filters are located. The new plant will have a rapid sand filtration system.