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Legislative Engineering.

BY JOHN C. TRAUTWINE, JR.

By "Legislative engineering," I mean engineering by legislative bodies composed of laymen, as distinguished from engineering by engineers.

Directly or indirectly, all public works are under the charge of the public itself. But there are differences in the degree of directness, in the extent to which control of the works is delegated by the public to specialists, and in the manner in which such delegation is secured.

This delegation of control may come about either by choice or by compulsion.

In despotic countries it is brought about by compulsion. The public is not asked whether or not it will delegate the control of its works to specialists. But, as civilization advances

and as the magnitude and complexity of public works increase, the people appreciate more and more the advantages and the necessity of delegating the control of the works to those better qualified to conduct them than the public at large can possibly be.

Hence, in civilized countries, the delegation of control comes about by the choice of the people. No one thinks of calling a town meeting to decide upon the location of a fire hydrant. But the question still remains, to whom and to what extent shall the control be delegated?

In Philadelphia, as in most other places, the control of public works was early delegated to a body of laymen, selected to represent the people and in Councils assembled, and the Councils, in turn, appointed officers, supposed to be specially qualified to supervise the works. These officers carried out the instructions of the Councils.

If the Councilmen had had the intelligence to recognize, and the moral strength to avow, their limitations, all might have been well. But, even in their early days, we find the City Councils indulging in the pastime of hampering the experts in charge of the works, either by actual interference or by the simpler and always fashionable method of starvation.

Thus we find Benjamin H. Latrobe, the engineer who built our city's first water works, writing, in November, 1804, to Nicholas I. Roosevelt, who built the pumps in those works:

"First, the subcommittee of the Watering Committee must assent to an arrangement,—then comes the Watering Committee itself—then the Common Council, and the Select Council,—all avaricious, unjust, ignorant and proud."

The hundred years' history of the Philadelphia water works, from their completion in 1801 to the present time, is a striking monument of the folly of permitting the legislative branch to hamper the operations of the executive.

More than twenty years ago, namely, on June 1, 1885, a few men, zealous for the city's interests, and recognizing the hopelessness of the then existing system, succeeded in having passed through the Legislature, and signed by the Governor, the City Charter, known as the Bullitt Bill.

I ask your attention especially to the following provisions of this charter:

"The executive power shall be vested in the mayor and in the departments authorized by this act."

"Water works * * * shall be under the direction, control, and administration of the department of public works."

"Councils shall, by general ordinances, provide for the proper and efficient conduct of the affairs of the city by the mayor and several departments, and the boards thereof, but they shall not pass any ordinances directing or interfering with the exercise of the executive functions of the mayor, departments, boards, or heads, or officers thereof."

Here, in so far as a layman may presume to read and understand a legal document, the city charter not only distinctly forbids direction of, or interference with, the administration, by Councils, but as distinctly lays upon Councils the duty of finding the means for carrying out the plans of the administration for carrying on the city work.

Not only does the law make these provisions, it is to the interest of the city that the law should be enforced.

During Mayor Warwick's administration, and the early months of the next administration, I had the honor of trying to serve the city as the Chief of its Bureau of Water.

I quote as follows from my annual reports of that period:

1895.—"During recent years, the pumping machinery has been driven to its utmost, and it has been impossible to give it the advantage of that systematic and thorough repair which it so urgently needs."

1896.—"While we have thus far escaped the disaster of widespread conflagration, it cannot be long before the restriction of the supply by reason of inadequate mains, must become a serious menace to the thickly settled and poorly supplied business portions of the city.

"The No. 4 Worthington high-duty pump, removed in 1894 from Spring Garden to Belmont, remains without other protection than the rude house of boards placed over it by employees of the Bureau, and, owing to lack of proper boiler facilities, we have been unable to economize in fuel by using the high-duty attachment.

"At Belmont and at Roxborough high service stations, we are dependent upon one pump, any accident to which would

throw the station out of service, and deprive the district of water."

1897.—"The water service of this city is in a critical condition.

"Between continued starvation, on the one hand, and enormously increasing waste on the other, it is made to appear, as stated in your report of 7th October last, that we are compelled to negotiate with corporations and individuals to secure, for the citizens of Philadelphia, a pure and abundant supply of water.

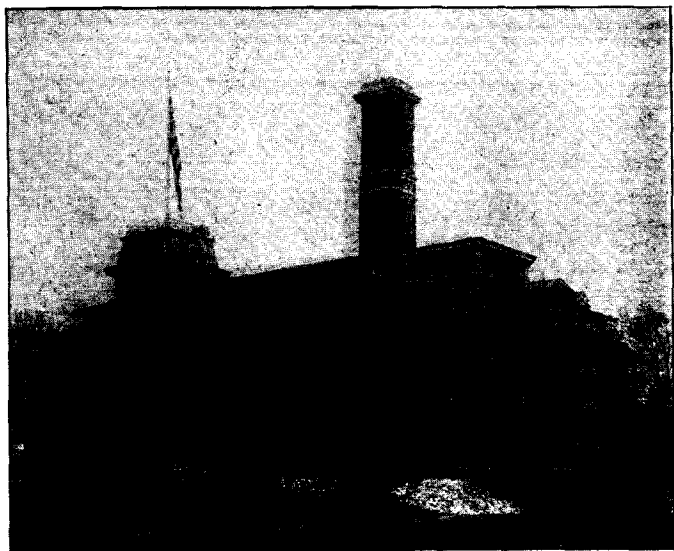


Fig. 1—Temporary frame shed, protecting high-duty pumping engine at Belmont, 1895 to 1899. Appropriation for proper protection refused.

"As a matter of fact, the city holds in her own hands the key to the solution of her water problem.

"The consumption has again overtaken our pumping capacity; and there will, almost certainly, be a shortage of water at many points during the coming year."

1898.—"The large high-duty pumping engine at Belmont station still remains protected only by a rude frame house erected over it by employees of the Bureau in 1895, our appeals, (repeated in 1895, 1896, 1897 and 1898), for the few

thousand dollars required for its proper protection, having been refused.

"In each of my four annual estimates, I have asked for \$35,000 for the construction of proper coaling facilities for the Queen Lane pumping station. The appropriation having been annually refused, we are compelled to haul the coal through the park in carts, at an annual additional expense of about \$9,000."

At the time, the slender engineering force prepared detailed plans for the needed coaling facilities.

In the face of these quotations, it will hardly be claimed that the legislative branch was not advised as to the conditions and needs of the works.

The following statement shows (1st) these needs, and (2nd) the extent of the appropriations granted by the legislative branch, in response to the representations of the executive:

ESTIMATES AND APPROPRIATIONS.

For Extensions.		
	Estimates.	Appropriations.
For 1896.....	\$2,484,150	\$0
" 1897.....	3,339,450	0
" 1898.....	3,735,050	0

It will be noticed that, naturally enough, the estimates for extensions and improvements increased from year to year, as the demand for water increased, and as all appropriations for meeting this demand were withheld.

You will recollect that their honorable bodies were strongly minded to pass an ordinance appropriating \$50,000,000 or thereabouts to the Schuylkill Valley Water Company, in consideration of a "snake" which that Company proposed furnishing to the city, and that the scheme was frustrated only by the timely or untimely exposure of extensive bribery operations, which had resulted in the purchase of many of the city's representatives.

I had devoted all the time at my command to exposing the worthlessness of the Schuylkill Valley Water Company's scheme, but these considerations seemed to have not the slightest weight with the City Councils.

In 1898, \$500,000 were appropriated "for the purpose of constructing a reservoir, furnishing pumping machinery and

mains for that portion of the city lying west of the Schuylkill River;" notwithstanding that it had been shown that the existing pumping machinery was unable to keep even the small old reservoir full of water, and that it had been found necessary to cut off that reservoir from the distribution in order to keep in it any water at all.

An appropriation of \$25,000 was made also for the purpose of cleaning the reservoir, notwithstanding that it had been pointed out that the accumulation of sediment in the reservoir

"PROFESSIONAL," MILWAUKEE.

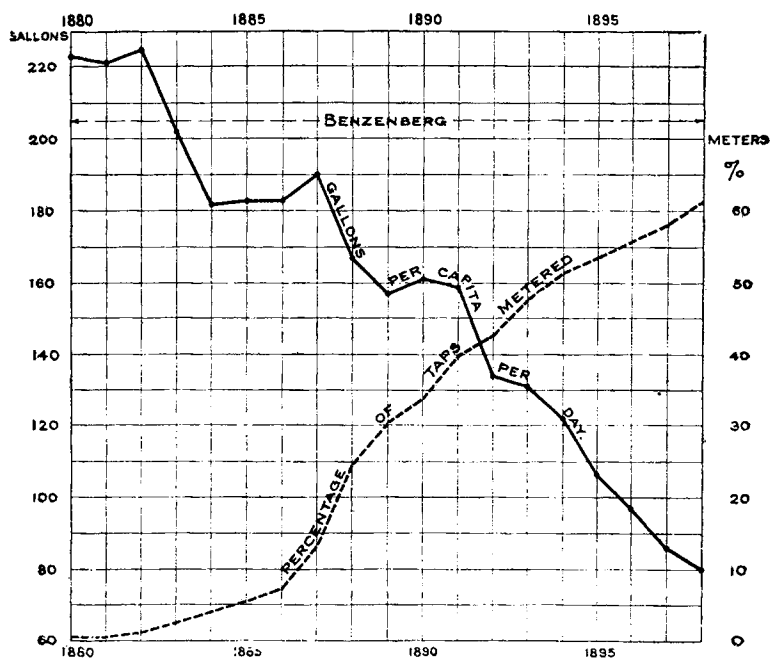


Fig. 2

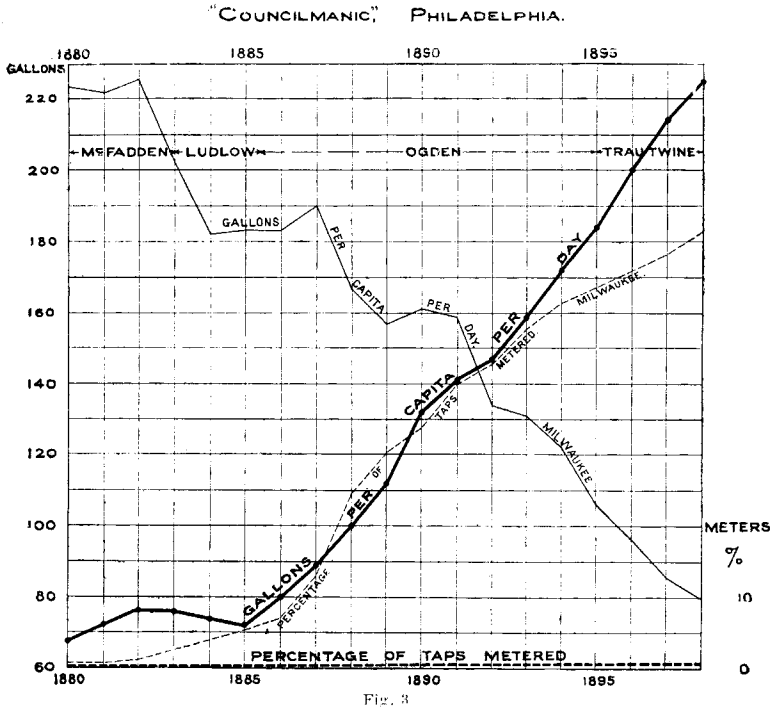
showed that the water was *depositing* it there, and *not taking it up*, and that, if the reservoirs were cleaned to-day, they would have in them, to-morrow, a deposit of exactly the same material.

The contrast between legislative and professional engineering is well shown in the comparison between the experiences of Milwaukee and Philadelphia.

In Milwaukee, from 1880 to 1898, under the strong manage-

ment of Mr. George H. Benzenberg, the percentage of taps metered was increased from practically nothing to 61 per cent., the daily per capita consumption falling, in the meantime, from 220 to 80 gallons.

In Philadelphia, during the same years, and under the legislative system, the percentage of taps metered remained practically at zero, and the daily per capita consumption increased from 68 to 225 gallons.



The next two figures, representing Milwaukee and Philadelphia respectively, show the contrast still more forcibly.

Here the percentage of taps metered are plotted as abscissas instead of the years, as in the figures above.

It will probably be objected to these figures of consumption, as applied to Philadelphia, that they are exaggerated. Every little while, someone discovers that the pumps in Philadelphia are not raising all the water which is claimed for them, and the Bureau of Water is held up to public scorn for "falsifying its

reports." Whereas everybody knows, and the Bureau is constantly insisting, that the figures are known to be exaggerated, and that this is because of the lack of proper facilities for measuring correctly the quantities raised by the pumps.

Naturally, I have drawn largely upon my own experience in the foregoing recital, but it is not to be supposed that my complaint is a personal one, or that I alone have been the sufferer.

During the years 1880 to 1898, three others besides myself had charge (more or less nearly nominal) of the water works,

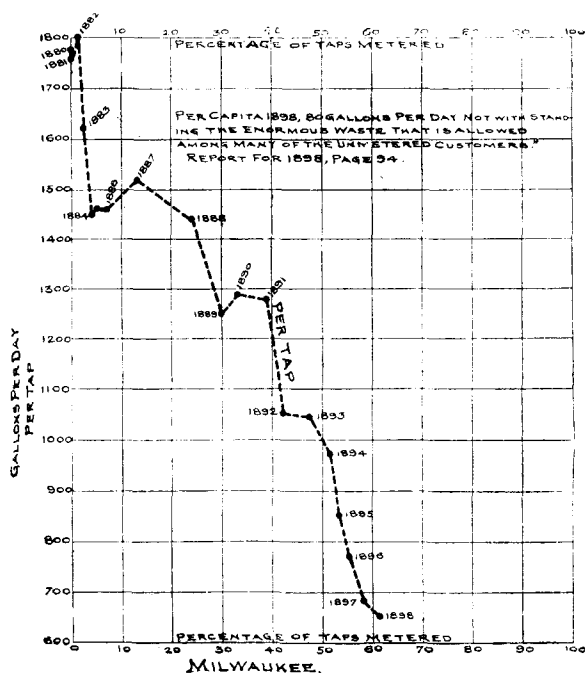


Fig. 4

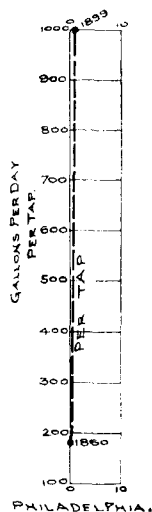


Fig. 5

and since my administration, both Mr. Hand, in the Bureau of Water, and Major Gillette, in the Bureau of Filtration, have had experience of the pernicious activity of the City Councils in meddling with the public works.

In transmitting to Councils his report for 1885 Colonel William Ludlow, Chief Engineer of the Philadelphia Water Works, said:

"I regret that the termination of my official connection with

city affairs and present departure for another field of duty, leave me without adequate time or opportunity to enhance the possible usefulness of this report by formulating therein certain detailed statements and discussions relating to the water service of the city, additional to those which have heretofore been presented; but the apprehension of a duty in this respect partially unfulfilled is tempered by the consideration that my reports for the years 1883 and 1884 contain a large body of important data and recommendations, of which the greater part still remain unacted upon, and that if the conduct of affairs in the future shall proceed with the deliberateness which has marked the securing of urgently needed improvements in the past, so protracted a period will be required for their practical execution as to render superfluous any material additions thereto at the present time."

Upon the assumption of office by the late Mayor Ashbridge, the city purse-strings, for reasons best known to the city fathers themselves, were suddenly and freely loosed; and, in his first annual report, that dated January 20, 1900, we find Chief Hand saying:

"The appropriations granted during the past year provide adequate means to avert serious disaster, and to remove some of the critical features of the works, which for several years, have been sources of great anxiety. This condition is very gratifying, especially when it is remembered that, for the last three summers, it has been difficult, owing to insufficient appropriations for needed extensions, etc., to prevent absolute water famine in some districts."

So striking was the contrast between the new conditions and the old, that Chief Hand found deep cause for thankfulness in the ability "to avert serious disaster, and to remove some of the critical features of the works."

But any city, following the antiquated practices adopted for Philadelphia by their Honorable Bodies, will find its facilities constantly overtaken by the growing consumption; and the lavishness, which enabled Chief Hand "to avert serious disaster" in 1899, seems to have waned very shortly thereafter, as witness the following quotation from his reports, for 1903 and 1904:

1903.—"Urgent recommendations were made for appro-

priations with which to purchase new engines, boilers, and other appurtenances necessary to furnish a sufficient supply of water during the heated term and during extremely cold weather, but, I regret to say, that no provision has yet been made for these important purposes.

"No appropriations whatever were made for extensions during 1902 nor 1903, and no such provision has since been made for 1904.

"The delay in making important additions to the pumpage systems, necessitated, from time to time, by the growth of the city, and the proportionate increased requirements of its water supply, can only lead to additional crippling of the service by overworking the machinery.

"The water supply has been maintained throughout the city as effectively as the water facilities at my command would permit."

1904.—"The above predictions of 1903 have been abundantly verified by numerous and serious breakdowns of the pumps and engines at all our large stations, crippling the service to such an extent that in some instances weeks, and even months, were required to make the repairs.

"Extensive repairs are needed to all the machinery at this station (Queen Lane), but it is impossible to make them, owing to inability to shut down for a sufficient length of time to prosecute the work thereon.

"This bureau has been very much hampered by lack of funds with which to purchase and lay service mains in all parts of the city."

Yet, upon the occasion of a recent Councilmanic visit of inspection, these gentlemen expressed themselves as aggrieved because they had not been kept informed as to the conditions and needs of the works.

In March last, Major Gillette informed Councils that the immediate placing of a water meter on every tap in the city, at a total cost of about \$5,000,000, would save to our people about \$10,000,000, namely: \$4,000,000 in cost of completing the works, and \$6,000,000 in capitalized cost of pumping, besides hastening the day of filtered water.

Whereupon their Honorable Bodies resolved, with practical unanimity,

"That we unqualifiedly enter our protest against the use or installation of water meters in connection with the water supply of the city.

"That we stand ready and willing to vote all the funds necessary for the perfection of our water supply and the completion of the entire system of filtration, but not for one dollar toward the purchase or installation of water meters in connection with that system."

Their motto evidently was:—"Millions for tribute—but not one cent for defense."

These utterances brought forth the following editorial comment from *Engineering News*, the foremost engineering periodical of the country:

"The resolutions afford so striking an example of popular prejudice and ignorance that they are well worth putting on record for the benefit of engineers and city officials elsewhere."

In a recent interview, solicited by a reporter of the *Public Ledger*, I gave expression to my views on this subject, and I regretted to find my remarks prefaced by the headlines: "Blames Councils for Poor Water Supply."

In his domestic and business capacity, the average Councilman is a harmless and necessary creature. So, Shakespeare informs us, is the domestic cat, yet we do not upon that account place the cat in charge of the canary bird.

It must not be supposed that the writer is engaged in a tirade against municipal legislators in general, or against those of Philadelphia in particular. City Councils are generally large and mixed bodies, composed almost or quite exclusively of laymen. Some of these laymen, in Philadelphia at least, are men who would do honor to any legislative assembly, men with sufficient intelligence to recognize their limitations, and sufficient moral strength to avow them; men who realize that professional questions should be referred to professional men, and who would secure such reference if they could. But the rank and file are made up largely of young men without visible means of support other than their Councilmanic seats, which have been given them by the "leaders" as compensation for services performed or expected, or both, and who themselves in time develop into professional politicians and "leaders." Politicianism is their business, and upon what can be made out

of it they depend for their livelihood. In most cases the dear people (by order of the "leaders," of course,) have repeatedly and enthusiastically returned these gentlemen to their seats by overwhelming majorities, no matter how notorious has been their disregard of the public welfare. Who, then, can blame them if they industriously ply that vocation to which the sovereign people have called them?

The writer asks merely whether it is well that these bodies, in defiance of the City Charter, should be intrusted, by the people, with the control of public works; and the City Councils of Philadelphia have done service to the cause of good government by demonstrating, in the examples before us, that it is not.

In this connection, I quote as follows from remarks by Mr. Edwin F. Smith, Chief Engineer of the Schuylkill Navigation Co., published in 1899:

"Here we have a governing body of nearly two hundred men, 'butchers and bakers and candlestick makers,' professional politicians, few of whom have not an axe to grind, caring little whether they serve the interests of this great city or not, so long as their bread is buttered on the right side.

"The remedy is to take this water question out of Councils. If it was ever intended under the Bullitt Bill that Councils should constitute themselves a Board of Engineers, and devise plans, legislate in the interest of schemers, and even do the detail office work of the Department of Public Works, it is a great mistake that it should be so, and the sooner it is changed the better for those who are still left among the living. I do not believe that it was the intention of the author of the Bullitt Bill that it should be so. If it was, why do not Councils plan the Delaware avenue improvements, the Reading subway, and other municipal work? Well, plainly it is either because there is no money in it for them, or because they are only experts in water works construction.

"When the Bureau of Water is given the same power and working force as the Bureau of Surveys, and when Councils keeps hands off everything except granting appropriations and legislating for the public safety, we will have relief from bad water."

Please bear in mind that these remarks come from an intelli-

gent and educated engineer of long experience and sound judgment, a man eminent for his conservatism, and in no way connected with the Bureau of Water.

THE PRODUCTION OF MICA IN 1905.

The production of mica in 1905 made an important advance over 1904, according to the annual report of the United States Geological Survey, which has been compiled by George O. Smith. Production was limited to six States—North Carolina, Colorado, New Hampshire, Georgia, South Dakota and New Mexico, the order named indicating their relative rank. The total output of sheet mica for these States, as reported to the Survey, was 851,000 lbs., with a total value of \$185,900. Of this quantity North Carolina is credited with 669,000 lbs., valued at \$85,000. The increase in production over the previous year was largely in other States, while the larger increase in value may be accounted for in part by high prices reported by producers in those States. A decrease in the average price for the North Carolina product is due to the increasing proportion of small mica produced for electrical uses. The total production of scrap mica in the United States in 1905 was 856 net tons, valued at \$15,255, an increase in value over the production for 1904. North Carolina's output of scrap mica for 1905 was 175 tons, valued at \$2,375. The separation of the production figures for scrap mica and for the smaller sizes of sheet mica becomes more difficult as the use of these small sizes increases.

The production of sheet mica in 1904 was 668,358 lbs., valued at \$109,462, and of scrap mica 1069 net tons, valued at \$10,854. Thus the value of the aggregated product of mica in 1905 was \$201,155, as compared with \$120,316 in 1904.

The value of imported mica now used in the United States is twice that of the domestic article. In 1905 1,506,382 lbs. of the unmanufactured mica, valued at \$352,475, and 88,188 lbs. of cut or trimmed mica, valued at \$51,281, were imported, making a total of 1,594,570 lbs., valued at \$403,756.

The three principal uses of mica are for electrical insulation, glazing and decoration. The first-named application probably leads in present importance, but the other two uses date back to ancient times, mica antedating glass and also being early used to secure decorative effects.

The increasing use of mica in electrical manufacture has largely modified the demand made upon the mining industry. Small sizes of sheet mica can now be utilized in the manufacture of insulators in lamp sockets, lightning arresters, switch boxes and fuse blocks. More important even is the extensive use that is made of composite mica, micanite, molded mica and other varieties of built-up mica sheets. In the manufacture of material of this class thin laminæ of irregular form and different sizes are arranged and cemented together to form thick sheets of any desired size.

The use of mica for stove windows formerly constituted the principal demand for sheet mica, but this has decreased somewhat in recent years.