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Contents.

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TABLE OF CONTENTS OF

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THE WATER SUPPLY OF NEW YORK.

A record of draught is of interest to show what has taken place and of importance to show what is going to take place. When represented graphically, the record would take the form of a plane curve, that is to say, if at given intervals of time an enumeration of the people was made and the volume of water required by them was ascertained, the succeeding changes in draught would be clearly indicated by a line drawn through the points of intersection of the variable and the variant. It is practicable to calculate the data as to population which would form the values of the variable quantity, and the record of consumption would form the values of the variant; but the failure of the supply has imposed a condition in the equation, and hence the utility of the prolonged curve for determining the deficiency of supply at any time and in showing the wayward course of the true curve, which changes with abruptness as the storage is occasionally replenished, but which fails ever to assume its proper position.

In 1875 the per capita demand was *ninety-five* gallons and the draught by the city had reached the maximum delivery of the aqueduct. Since this time, therefore, the antecedent condition of the variable has alone been maintained, that is, the population has continued to increase, while the extent of this increase as exhibited by a greater draught has been relegated to the mercies of a prolonged curve.

In 1880 the indicated requirement was *ninety-seven* gallons per capita, equivalent to a daily delivery of 115 million gallons; but the actual delivery was only 99 million gallons, and hence the allotment was only *eighty-two* gallons, showing a deficiency of fifteen gallons to each person, or a total of 16 million gallons in the delivery.

In 1888 the indicated requirement was *one hundred* gallons, equivalent to a daily delivery of 161 million gallons. Prior to this date an additional supply of 10 million gallons had been received from the Bronx River, so that the actual delivery was 110 million gallons per day, making the allotment *seventy* gallons per capita, showing a deficiency of *thirty* gallons to each person, or a total of more than 50 million gallons in the delivery.

When the new aqueduct is completed, the deficiency will be partially made up, inasmuch as during the winter months the customary flow-off from the Croton basin can be utilized. Until such time, however, as the storage is increased by the completion of the Sodom dam, there will be no addition to the delivery during the summer months above what it is at present, and hence a calculation for the dry season of 1889 must be based on the prolonged curve. The indicated requirement for this and the following year is *one hundred and one* gallons, but the allotment will only be *sixty-six* and *sixty-two* gallons respectively.

Now the question is suggested, will the theoretical maximum daily delivery be attained when the Sodom dam is built? Assuming that the new reservoir thus formed will be in use in 1893, and allowing that the storage is thereby increased 5,000 million gallons, then the total storage of the Croton basin will be 14,700 million gallons. In this year the population will be two million and the daily theoretical consumption 200 million gallons.

But in order to provide for this volume daily, the estimated storage is 30,857 million gallons, showing a deficiency of storage provided of 16,157 million gallons. In other words, the capacity of the Croton watershed in the summer of 1893 will be approximately 135 million gallons per day, so that the demand will still exceed the supply, and the allotment, instead of being more than one hundred gallons, will be *sixty-six* gallons.

There are no projects on foot to restore the supply to its former volume, and it may be said that no part of the work contemplated in the Croton basin can be finished in time to modify this "say so" of the prolonged curve for 1893.

We might go still farther and say that although all the projected dams be built, including the Quaker Bridge dam, which is claimed to be "the largest work of its kind in the world," still the delivery could not be brought up to one hundred gallons per capita, for the reason that the population is increasing at such a high rate that it will reach the point where the demand is equal to the maximum capacity of the drainage area in 1897, while to complete all the necessary impounding reservoirs before this date is a physical impossibility.

In the following table is given the calculated requirement of each inhabitant, based on the records of past years, together with the allotment that has been furnished and will be furnished during the summer months of the years noted.

Date.	Per capita demand, gallons.	Allotment, gallons.
1840	20	20
1875	95	95
1880	98	82
1889	100	62
1893	101	66
1897	102	56

We have seen that the per capita demand has risen from *twenty* gallons in 1840 to *one hundred* at the present time. Whether this latter rate is high or low in comparison with that of other cities is immaterial—it is plainly not due to domestic use, but to features of an industrial and commercial character and therefore intimately connected with the prosperity of the city. To limit the consumption to *one hundred* gallons per day could not be taken exception to, provided there was any occasion for such limitation; but to allow the supply to be reduced to *seventy* gallons and less is to curtail enterprise, if not to defeat manifold industries that are already established.

To recite here the lines of manufacture and shipping that are dependent on a free and abundant use of water would be substituting a pleading from the people for emphatic criticism and give an entirely false aspect to the question. There is no benefit in dealing with hypotheses as to what business advantages this diminishing of the supply has deprived the city of, or in speculating on the dangers of a scant delivery in mid-summer, when it can be shown in an incontrovertible manner that the means adopted for procuring the additional water are not going to accomplish the end. What the people want next is evidence of abundance of water coming from somewhere—the testimony as to the need of such abundance was taken many years ago. The citizen gets no comfort in learning from the prolonged curve that his quota of water is to-day 30 per cent short of what he is entitled to. Has he not a right to be astonished that after the construction of the aqueduct and the Sodom dam, his allotment will be 35 per cent less than he is bargaining for? The choice of the Croton basin, with its "dry seasons," low cycle years, and untimely flow-off, has so occupied the authorities in its defense that the city has obtained a lead by growth which, according to the prolonged curve, it is going to maintain.

DYNAMO AND COMPASS.

The recent studies of Sir William Thomson of the effects of electricity upon the compass, as described in his recent paper, though not discovering a means of wholly protecting the needle from electrical influence, serves to point out at least one of the principal causes of it, and to indicate, with hopeful distinctness, the direction in which others may perhaps not unprofitably be sought for. War ships and passenger steamers—the only ones having electrical fittings—have not heretofore been able to protect their compasses from induced currents from the charged wires or from the magnetism of the dynamos.

At times the one or the other appears to exert an influence almost directly opposed to that of the mysterious something in the polar north to which the needle owes its allegiance. Sir William Thomson says that he has discovered, beyond peradventure, that, when single wires are employed—the ship's iron hull being used for the return conductor to the dynamo—there is the greatest disturbance, the widest deflection of the needle, and that the alternating system, where carefully installed, does not, save under unusual conditions, affect the true pointing of the needle. As to the effect of constant and vagrant currents upon the ship's chronometer, we do not propose to discuss that at this time, because in most, if not all, cases of complaint, the master has not been provided with a non-magnetic chronometer.

Only those used to the sea and familiar with navigation can fully appreciate the value of the investigations now being conducted by Sir William Thomson and other equally skillful electricians. When skies are clouded, when storms are come, the compass is the mariner's mainstay, for, by "dead reckoning," he may, with something like certainty, mark his way and hit his port; getting his course by compass, time by chronometer, and speed by log. When iron ships were first floated, the card compasses in use at the time were found wholly unfit to guide them by. It would have mattered little what the deflection was if only it had been constant, but it deviated. Ritchie came to the rescue with his liquid compass, immersing the needle in a bath of spirits of wine or alcohol, and by means of compasses in series, binnacle, bow, and tops, the mean local error is easily computed. Now come electric fittings, lights, and steering gear for passenger steamers and search lights, motors, firing apparatus, and other ingenious mechanisms for battery and pilot-house of men-of-war; admirable contrivances all, yet, if no way were found for encountering the mal-influence of those currents and their generator, it is hard to see how their presence could have been tolerated afloat. The careful mariner "swings" his ship before quitting port, to adjust his compasses, and while afloat is able to mark the deviation of their needles from true north by means of tables marked on his ocean chart. But, let such interferences as the dynamo and its currents interpose, and ship and crew are in imminent danger of destruction. The nautical as well as the scientific world has, then, cause for congratulation at the discoveries made by Thomson and others.

CARRIAGE manufacturers are predicting that in the not distant future wooden wheels will be done away with, and steel wheels substituted on account of the increasing scarcity of lumber for wheels.