THE

AMERICAN

ANNUAL CYCLOPÆDIA

AND

REGISTER OF IMPORTANT EVENTS

OF THE YEAR

1862.

EMBRACING POLITICAL, CIVIL, MILITARY, AND SOCIAL AFFAIRS; PUBLIC DOCUMENTS; BIOGRAPHY, STATISTICS, COMMERCE, FINANCE, LITERATURE, SCIENCE, AGRICULTURE AND MECHANICAL INDUSTRY.

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ment and efficiency of the Royal College of Surgeons, and in the exercise of the duties of coroners. In short, he made the "Lancet" felt as a power which would be exercised on the side of right, the removal of abuses, and the reform of practices, which injured and dishonored the medical profession. In 1839 he was chosen coroner of Middlesex, which office he held until his death. His ability and eloquence, displayed on several occasions, led his friends to request that he would become a candidate for the representation of Finsbury in Parliament. He was defeated, however, in 1832, and again in 1834, but in January, 1835, was elected, and continued to hold his seat until 1852, when he retired from Parliamentary life. While in Parliament, he always spoke and voted for the abolition of all taxes upon knowledge, and was influential in obtaining a select committee to enquire into the state of medical education and practice, the report of which had great influence on the progress of medical reform.

WATER WORKS.—Boston, Cochituate Water Works. The expenditures, on account of the Water Works, to January 1, 1863, are $9,526,121.29, from which there should be deducted sundry credits by the city, and amounts received for water rates, $3,515,303.23, leaving the actual cost of the works, January 1, 1863, $6,010,818.06. The total amount received for water used during the year ending January 1, 1863, was $364,036.37. The average daily consumption of water during the year has been 16,600,000 gall., which daily consumption is 1,589,304 gall. less than in the year 1861. The consumption has decreased over one million gallons per day, but the receipts for water used during the year have considerably increased. This saving of water is mainly owing to the number of water meters placed in establishments where large quantities of water are used.

During 3½ days in May, water was wasted from the lake into Sudbury river, amounting in all to 33,200,000 gallons, equal to about 2 days' supply for the city. This was the total amount of waste for the whole year.

During the year there has been a gain of 5 ft. of water in the lake, equal to about 60 days' supply—nearly ⅙ of the number of days in the year—but there has been about ⅕ more than the average annual rain fall, showing an amount used equal to the average annual rainfall, and also showing all that the lake can be relied on to furnish annually is used. More storage room is needed with the present means of supply, as well as a new source of supply.

According to Mr. J. P. Hall's measurements of rain fall in Boston, the average annual amount for 29 years previous to 1852 was 42.24 inches; and for ⅓ of that time the annual amount was less than the average of 41 inches. In 1828 it was only 32.41 inches.

From 1852 to 1862, inclusive—51.61 inches. A similar increase has taken place, to a greater or less extent, at neighboring places.

Brooklyn Nassau Water Works.—Water has been introduced and distributed by means of these works since 1859, but it was not till May, 1862, that the whole works were completed and transferred by the contractors and constructing board to the city.

The works were constructed under the charge of James P. Kirkwood, Esq., chief engineer, by Messrs. H. S. Welles & Co., contractors. The sources of supply are several ponds along the south shore of Long Island, as follows:

Name of Pond.	Area of Pond and Grounds. Acres.	Water Surface. Acres.	Surface above Tide in feet.	Drainage Area. Square Miles.	Minimum Summer Delivery, N. Y. Gallons, per Diem.
Hempstead..	$26\frac{58}{100}$	$23\frac{52}{100}$	$10\frac{6}{10}$	$25\frac{79}{100}$	8,500,000
Rockville....	$15\frac{5}{10}$	8	12	$8\frac{21}{100}$	2,800,000
Valley Str'm.	$23\frac{2}{10}$	$17\frac{78}{100}$	$12\frac{8}{10}$	$6\frac{38}{100}$	2,600,000
Clear Stream.	$1\frac{8}{10}$	$1\frac{07}{100}$	$11\frac{5}{10}$	$8\frac{87}{100}$	800,000
Brookfield....	$11\frac{88}{100}$	$8\frac{75}{100}$	$15\frac{4}{10}$	$8\frac{87}{100}$	2,000,000
Jamaica.......	$67\frac{335}{1000}$	40	$7\frac{8}{10}$	$10\frac{88}{100}$	3,300,000
	$146\frac{295}{1000}$	$99\frac{12}{100}$		$60\frac{33}{100}$	20,000,000

The average rain fall over this drainage district has been, for the past 37 years, $39\frac{6''}{100}$ inches.

The minimum rain fall was, in the year 1835, $28\frac{78}{100}$ inches. The maximum, in the year 1859, was $59\frac{68}{100}$.

Main Conduit.—This starts at Hempstead pond, and leads as directly as the character of the ground admits to the pump well—total length 12⅓ miles; dimensions, 8 ft. 2 in. wide, by 6 ft. 4 in. high; the top is semicircular, and the bottom an invert of 1 ft. versed sine, side walls vertical 15 in. It is built this size, 2,092 ft. when it receives the water from Rockville pond by a circular conduit 2 ft. in diam. and 8 in. thick. The main conduit is here enlarged by increasing the width 6 in. and the height 3 in., and continues this size 14,094 ft., to the next branch, from Valley stream, 2½ ft. diam. The main is here increased in width 6 in., and in height 8 in., and the entire arch is laid 12 in. thick: it continues this size 4,371 ft., to the next branch of the Clear Stream, 2 ft. in diam. The main is again increased in width 2 in. and in height 1 in., and thus continues 5,400 ft., to the Brookfield branch, 2 ft. diam. The main is here enlarged to a width of 9 ft. 8 inches, and a height of 7 ft. 1 inch., and thus continues over 13,500 feet., to the junction of Jamaica pond branch, 3½ ft. diam., and 8 in. thick. The fall of the conduit to this point is 1 in 10,000. It is built wholly of brick, except in a few short pieces across embankments, where the side walls are strengthened by stone, and a spandrel backing. From this point to the pump well the conduit is 8 ft. 8 in. high, and

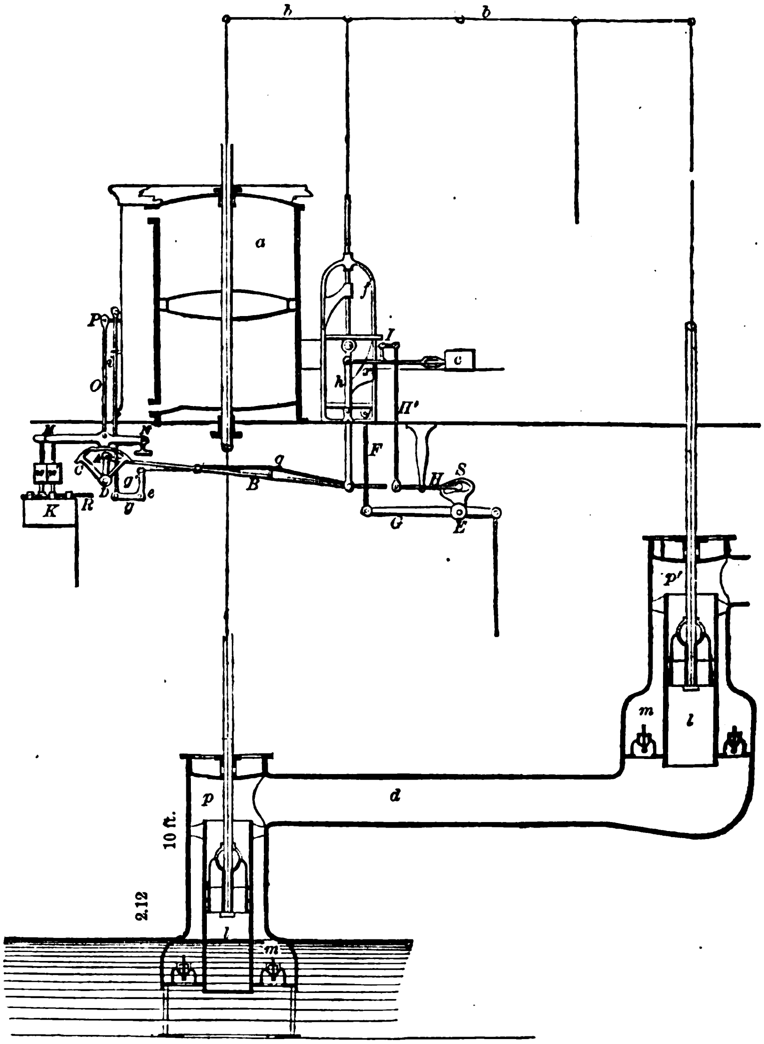
10 ft. wide, side walls 8 ft. high, with a fall of 6 in. to the mile: the distance is $4\frac{848}{1000}$ miles.

At the pump wells there are at present 2 engines erected, which, according to the contract, were each to afford a duty of not less than 600,000 lbs., raised 1 ft. high with 1 lb. of coal, and capacity of 10 million New York galls. of water to be raised into the reservoir in 16 continuous hours. The first engine was tested Jan. 1860, and the duty was found to be 607,982 lbs. ft. per lb. of coal; the capacity, for 16 hours, 10,293,102 gallons delivered into the reservoir; diameter of steam cylinder, 90 inches; length of stroke of piston and pumps, 10 ft.; diameter of barrel of pumps 36 in. The 2nd engine was tested in Jan. 1862, and the duty was found to be 619,037 lbs. ft. per lb. of coal, and the capacity, for 16 hours, 10,652,366 galls.; diameter of steam cylinder, 85 inches; stroke and diameter of pumps same as No. 1 engine.

The two engines differ somewhat in detail, but in general construction are represented by (Fig. 1), which is a section of the No. 2 engine. The engines were built by Messrs. Woodruff & Beach of Hartford, after designs by Mr. Wright.

In the fig. *a* is the steam cylinder with pis-

Fig. 1.



ton, steam, and exhaust ports, like other engines. In the bottom of the steam cylinder is a stuffing box, through which the steam piston rod passes, and is coupled below to the rod of lower pump, *p*. *b* is the beam, to the one end of which the piston rod is connected by a cross head and links. The upper pump rod is connected to the other end of beam in the same manner as the steam piston rod. *f* is a frame moving with the beam in guides, which, in combination with the water cylinder, *c*, and roll levers, *h*, works the steam and exhaust valves. *e* is the lower rock shaft, which is connected to the upper or main rock shaft (hung in bearings between the side pipes) by the arms, *gg'*, and rod, *i*. The lower rock shaft is operated from the lower ends of the roll levers, *h*. The piston of the water cylinder, *c*, is connected to the roll lever near its upper end. *C* is a segment, one part of the face being formed on a longer radius than the other (the difference being equal to the lift of the steam valves), and fastened at the centre to the rock shaft *D*. This segment is adjustable by hand, and its office is to close the steam valves, early or late in the stroke, as may be required. The rock shaft *D* is connected, through the arm *A*, by the rod *B*, to an arm on the rock shaft *E*. This latter shaft is operated from the frame, *f*, by the rod *F*, and lever *G*. The valves of the water cylinder, *c*, are operated from the rock shaft *E*, by the cam arm *S*, and rods *H* and *H'*, and right angled arm, *I*. The steam valves are operated by the cataract, *K*, which consists of two small open water cylinders (one for each steam valve), fitted with pistons and weighted with the weights *w*, *w'*. Each plunger rod is connected to one end of a lever, *M*, the other end, *N*, being the fulcrum; this lever is connected to the steam valve stems by the rod *O*, and arm *P*. When the steam valve is closed, it is kept so by a latch bolt, *R*, inserted into a socket in its cataract plunger rod, the latch being moved into gear by a spring on the back of it, and withdrawn by an arm on the rock shaft *e*.

Assuming the piston in the steam cylinder to be at half stroke, and the lower steam valve being still open, the different parts of the gearing described above, and depending on the motion of the beam for theirs, will also be at half movement, but the cataract plunger attached to the lower steam valve will be at the bottom of its cylinder, and the latch, *R*, withdrawn. Now, when the piston has reached that part of the stroke when the lower steam valve ought to be close, and the remainder of the stroke be performed by the expanding steam, the closing face of the segment, *C*, moves under the lever, *M*, by the operation of its connecting rod and arm—as before described—closing the lower steam valve instantly through the rods *O* and *P*, at the same time carrying its cataract plunger to the top of its cylinder, being held there by the latch bolt. The piston continues moving upward until it has reached the point where the lower exhaust and upper steam valves should open: the former operation being performed by the inclined plane, *x*, on the inside of frame, *f*, coming in contact with the roll on the upper end of the lever *h*, moving it out of the perpendicular, at the same time giving a like movement in an opposite direction to the lower end of the lever, which opens—through the rod *q*, and the lower and upper rock shafts—the lower exhaust valve.

The water cylinder, *c*, now comes into play, finishing the operation by carrying the roll lever to its extreme movement quickly, liberating by its action through the rod *q*, and arm on rock shaft *e*, the latch bolt of the upper steam valve cataract plunger, permitting the latter to fall open by the gravitation of its weighted plunger rod, and admitting steam on the upper side of the piston, checking it in its course, and forming a cushion; the valve still being open, the movement of the piston is reversed, and the downward stroke commenced. When the piston has reached the point of "cutting off," the upper valve is instantly closed by the same operation as that described above for the lower steam valve.

The lower pump, *P*, is placed in a well below the engine room floor, and directly under the steam cylinder; the upper pump, *p'*, is also beneath the floor, and connected directly to the opposite end of beam. This pump has a nozzle, *n*, to which the forcing main is joined. Each pump is constructed of two barrels, *l* and *m*; the inside one, *l*, being the working barrel, fitted with a bucket and double-beat valve, and the annular space between them being connected to the suction by 8 double-beat valves.

Their operation is as follows:

The lower pump on its up stroke lifts the water above its bucket through the connecting pipe, *d*, and through the annular valves and valve of descending bucket of upper pump, at the same time charging itself below its bucket by suction. On its down stroke, the upper pump is lifting the charge above its bucket, and filling the space below it by suction; the lower pump again ascends, performing the above operation, each pump moving on its up stroke a column of water about 36 inches in diameter, 10 feet toward the reservoir.

The total expense during the past year of pumping at Ridgewood, including all labor, fuel, repairs to engines and engine buildings, has been \$23,976 $\frac{30}{100}$. The total number of gallons pumped into the reservoir, has been 1,962,131,200. This shows the cost of pumping, including all repairs to engines and engine buildings, to have been \$12 $\frac{22}{100}$ per 1,000,000 gallons, or one cent and two mills per 1,000 gallons. This should be increased by the amount due to interest on the cost of the engines, engine house, pump well, coal sheds, railroad track, and engineer's house, which was about \$300,000.

Engine No. 1 has been in operation during the year 2,137 hours, delivering 1,197,866,650 gallons. No. 2 has pumped 1,399 hours and delivered 774,641,700 gallons. It will be seen by this that the amount of water pumped the past year exceeds that of 1861 by 23⅓ per cent. The amount of coal consumed when pumping, has been for engine No. 1, 3,376,550 lbs., and for engine No. 2, 2,070,808 lbs. Duty in lbs. raised one foot high per pound of coal, for engine No. 1, 526,936 feet lbs., and for engine No. 2, 555,628 feet lbs.

The water is raised about 163 feet into the Ridgewood Reservoir, a double reservoir, constructed with earth banks whose inside slopes are lined with stone laid in cement.

The area of water surface is of the

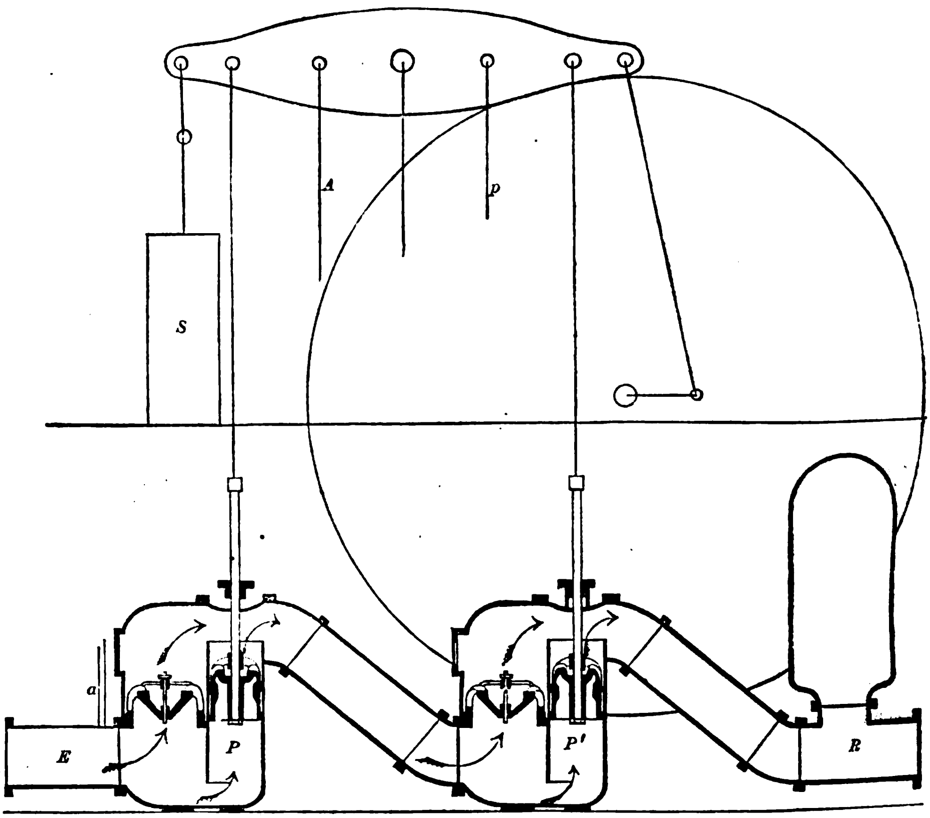
Eastern Division..................	11¾ acres.
Western "	13¾ "
Total water area............	25¾ acres.

The height of the surface of the water, when the reservoir is full, or the water 20 feet in depth, is 170 feet above the Navy Yard high water mark. The total capacity of this reservoir, when full, is 161,000,000 gallons.

From the Ridgewood Reservoir the water is conveyed to the city by a single 36-inch main. For the supply of a portion of the city above the level of the Ridgewood Reservoir, another engine has been erected at Prospect Hill, with a reservoir at the summit, with earth embankments and brick and cement lining. Its area of water surface is $3\frac{1}{3}$ acres; depth of water, 20 feet; capacity, 20,036,558 N. Y. gallons; height above mean tide, 198 feet. No distributing pipes are yet laid from this reservoir, but it is kept full as a store reservoir against accident to other parts of the work which might reduce the supply or diminish the head in the mains. The engine supplying this reservoir is represented in outline in (fig. 2).

The engine is of the crank and fly-wheel variety. The steam cylinder, *S*, is fitted with slide valves, and a cut-off controlled by a governor. The pumps are constructed on the same general principles and mode of action as the

Fig. 2.



pumps at Ridgewood. They are 2 pumps attached to opposite sides of the working beam; they have valves in their buckets, and in channels at the sides of the pump. The pumps are placed in a branch main, and the water flows into and through the pumps under a considerable head, variable with the draft upon the mains in other parts of the city. There are 2 air chambers: one shown at *R* on the rising main, the other, and a somewhat larger one, is connected by a branch pipe with the induction pipe at *E*. At *A* are the connections with the air pump. At *p* the connections of a small single-acting plunger pump to supply the boiler feed, and return the injection water to the main. *P* is the lower pump; *P'* the upper.

STEAM CYLINDER.

Length of stroke,	4 ft. 6 in.
Diameter of cylinder,	24 inches.

PUMPS.

Length of stroke (average),	3.466 feet.
Diameter of barrels,	20¼ inches.

FLY WHEEL.

Diameter of,	20 feet.
Length of crank,	27 inches.

Duty pr. test, May, 1862, 649,577 lbs. ft. pr. lb. of coal, for 93 consecutive hours; capacity for the same time 14,557,027 N. Y. gallons delivered into the reservoir.

CINCINNATI.—The average daily consumption has varied from 4,675,300 gallons in February, to 6,793,414 in August, the daily average for the year being 5,643,087 gallons, or about 37½ gallons per head, for a population of 150,000, supplied by the works. The rate as at present charged for manufacturers is 12 cents per 1,000 gallons, to be reduced after the 1st of July next to 9 cents per 1,000 gallons. The demands upon the works are steadily increasing, and the full capacity for supply will be taxed until the new engine is brought into operation. The water is pumped from the river by steam power, and additional works are in progression on which $134,000 have been spent during the last 2 years. The non-condensing engines of the Cincinnati works consist of two cylinders each 21 inches bore and 10 feet stroke. The two condensing engines have each a cylinder 45 inches diameter, and 8 feet stroke.

DETROIT.—The expenditures to January 23d, 1863, for construction of water works was $621,283.51. The whole quantity distributed during the year 1862, 999,945,329 U. S. galls. Average daily distribution, 2,725,877 galls., or 45 galls. to each inhabitant of a population of 60,000. The water supply is by means of pumps from the Detroit river, and a new engine has been contracted for, and is nearly finished.

Wood Distribution Pipes.—Tamarack logs have been used for conveying water in this city for 35 years past. When the works were purchased and reconstructed by the city, in 1840, iron mains were used, but tamarack pipes were laid for general service, about ½ of which are still in use. The others were mostly removed to give place to iron pipes of greater capacity, and but few were removed in consequence of being decayed. Of the 18½ miles laid subsequently, 15 miles have failed through neglect in the selection of the logs, or laying them too near the surface of the ground, and have been removed. Consequently from 1852 to 1857 no logs were laid, when, in consequence of the rapid growth of the city and expansion of the settled portions of its limits, a demand was made to supply near 2,000 families residing in sparsely settled districts beyond the lines of water pipes. To supply them by means of even the minimum (4-inch) size iron pipe would have been unremunerative. An investigation was therefore made as to the failure of the wooden pipes, and it was found that the best logs were those that were first laid about 17 years before, which had been well selected, and laid at sufficient depth, and as the cost of wooden pipes was but ⅓ that of iron, at this reduced price, the water rates would repay the outlay. A small steam engine and Wykoff's tubular boring machine were bought, since which time 29 miles of logs have been laid, mostly in districts that could not otherwise have been supplied with water from the works with any present prospect of remuneration. The logs are sound green tamarack, not less than 6 inches diameter at the small end, and 8 feet in length. The joints are made with cast-iron thimbles, and the lines are laid 5 ft. below the surface of the earth, mostly on stiff compact clay, and when the soil is sandy the logs are bedded in clay. The entire cost per foot laid has been 15$\frac{2}{10}$ cts., which includes the cost of shop, engine, and boring machine.

The average annual rain fall at Detroit for the past 23 years is 43$\frac{1}{10}$ inches.

NEW HAVEN.—Water works have been recently completed for the supply of the city of New Haven, Conn. Water was introduced into the distributing mains Jan. 1, 1862, and there are now laid 24 miles of distributing pipes.

Mill River, the stream from which the supply of water is obtained, has a water shed of over 56 square miles, and a minimum flow of 12,000,000 gallons per day.

The water is backed up by the dam for about 2½ miles, forming Lake Whitney. During the past year the quantity of water in the lake has never been less than 500,000,000 gallons; its average depth is about 20 feet. The dam is a well-built structure of its kind, being laid up with heavy stones, protected from the action of the water by a layer of concrete and that again by a gravel bank. The pipe chamber, built of hydraulic masonry, contains the gate, screens, and pipe through which the water is conveyed into the pump house. The elevation of this pipe above the base of the dam is 17 feet, which leaves 13 feet of water available to the uses of the company, and this is the lowest point to which it is practicable to draw the supply.

The water of the lake, after passing through screens in the pipe chamber in the dam, enters the pump house through a 4-feet iron pipe. This pipe is surrounded by a brick arched culvert, of sufficient size to allow easy access to all parts, and connects with 2 large cast-iron tanks containing a series of gates. These tanks are again connected by cast-iron pipes with the two cast-iron fore bays, and also with the rear valve boxes of the pumps. From the forebays the water is conducted upon the wheels, through gates placed at various points, so that the surface water can be used upon the wheels, no matter what its elevation may be.

There are 2 pitch-back wheels 30 feet in diameter, constructed of wood and iron. The buckets are 6 feet long, and of wrought iron, 80 in each wheel. The wheel shafts are 14 inches, and their bearings 12 inches in diameter. The power is communicated by a driving wheel to a pinion on the crank shaft, giving to the pump piston a stroke of five feet. The 2 crank shafts are furnished with a coupling, by means of which either pump can be worked by either wheel, or one pump by both wheels.

The pumps consist each of a single cylinder 16 inches in diameter. The ordinary velocity at which they are worked is 12 strokes per minute, delivering 1,000 gallons. The speed may be increased with safety so as to deliver 1,500 gallons per minute. From the pumps the water passes through the force main, of cast iron, 16 inches in diameter, and 3,100 feet long. The force main contains 2 check valves, one at an elevation of 30 feet, and the other near the reservoir.

The reservoir, situated on Sachem's Hill, at an elevation of 125 feet above mean high water, is in the form of an ellipse, whose diameters at the water line are 488 and 244 feet, with a depth of 19 feet, the walls being carried up 4 feet above the water line. Its capacity is 10,000,000 gallons. It is built in two divisions. The bottom and inner slopes are covered with 18 inches of clay puddle; upon this is placed a layer of concrete 4 inches thick. The concrete on the sides is protected by a stone wall 12 in. thick, laid in cement. The outer slopes are turfed. The slope wall is covered by a coping 2 feet wide, and upon the top of the banks is a gravelled walk 6 feet wide. The whole width at top is 10 feet. The inner slopes 1 to 1, and the outer slopes 1½ to 1. At the east end of the division bank is placed the influent chamber, which consists of two apartments. The water is delivered by the force main into one of these, which contains the screens; from thence it passes in pipes of cast iron, 12 inches in diameter, through the other apartment, which contains the gates into the reservoir, or by means of a wrought-iron and cement pipe 16 inches in diameter, into the effluent chamber. By the arrangement of these pipes and gates the flow of water is controlled and directed into either division of the reservoir, or into the effluent chamber, without passing through the reservoir, and a special casting, which may be placed in either chamber, so connects the force and distributing mains, that in the event of accident to both divisions of the reservoir and one of the chambers at the same time, the supply of water to the city will be uninterrupted.

The 16-inch distributing main connects with the effluent chamber; placed at the west end of the division bank, is a duplicate of the influent chamber, with the exception of its depth. This peculiar arrangement of chambers, pipes, and gates is very complete, and calculated to meet any emergency, providing amply for future enlargement of capacity, as well as for present use. It gives to the works when needed 2 16-inch force tubes; 2 16-inch and 2 12-inch distributing mains. Upon the occurrence of fire, at a time when, from any cause whatever, the water in the reservoir is low, the full head of 129 feet may be given without delay.

One third of the distribution is in cast-iron pipes, and the remainder is of the cement pipes manufactured by the Patent Water and Gas Pipe Company, Jersey City, New Jersey. The pipes are made from sheet iron, lined on the inside with cement, and coated on the outside with the same material. The lengths of pipe are connected by sheet-iron bands, similarly lined and coated with cement; the bore of the pipe presents an even surface throughout the entire length of pipe, and forms a conduit of uniform size.

New York *Croton Aqueduct.*—Various improvements, under the charge of A. W. Craven, chief engineer, have now been in progress for a series of years to increase the average supply and to guard against any contingencies of accident to the aqueduct or failure of supply from the river.

High Bridge Improvement.—As originally constructed, the supply was conducted across High Bridge by 2 siphon pipes of 3 feet in diameter, involving great loss of head, and consequent capacity of aqueduct on this side of Harlem River, and of supply. To obviate this a new pipe has been introduced.

The new pipe is 7 feet 6⅝ inches interior diameter. It is made of wrought-iron plates, each 8 ft. by 6 ft., and ½ an inch in thickness. These plates are butted together, and the joints made by horizontal and transverse straps on the outside, each strap being 9 inches in width and ½ of an inch in thickness. There are 4 rows of ¾-inch rivets in each strap. In the interior, the rivets are countersunk to the plane of the pipe, thus affording a smooth surface and avoiding unnecessary friction. Both the exterior and interior surfaces are well painted, to preserve them from rust. The pipe is supported by cast-iron stanchions and saddles, placed between the 2 3-feet pipes now there. These stanchions are 12 feet apart longitudinally, and are of sufficient height to allow 2 feet of clear space, between the old pipes and the new one, for the free movement of workmen in repairs, &c. The tops of the stanchions or pedestals are 2½ feet square, and are planed to a smooth and accurate surface, to permit the proper action of the rollers. At the centre of the bridge, the pipe rests upon the pedestal, without the intervention of rollers. For the rest of its length, in each direction from the centre, there are 3 cast-iron rollers on each stanchion. Upon these rollers rest the saddles, which come into immediate contact with and support the pipe itself. The base of each saddle is of the same size as the top of the pedestal, and is in a similar manner planed to a smooth and uniform surface.

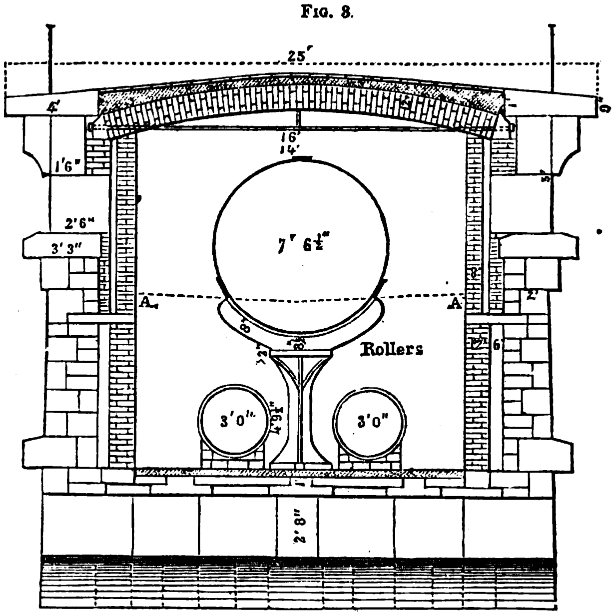
At each end of the bridge, and built into the masonry connecting the pipe with the gate-house, there is a cast-iron cylinder, into which a cast-iron ring, which forms the end of the pipe, is inserted and fitted as a piston. Thus there is a movable joint at each end of the pipe, which, together with the rollers between the planed surfaces of the pedestals and saddles, fully provide for the longitudinal contraction and expansion of the pipe, under any variations of temperature to which it can be subjected. The three rollers on each pedestal are kept in their proper relative position to each other by an iron frame. The surfaces of contact in the pistons and cylinders, at the ends of the pipe, are faced with brass.

Fig. 3 represents a vertical and transverse section of the bridge, at the centre of one of the arches. It shows the former construction of the top of the bridge and the line of the former gravel covering over the pipes, and also shows the contemplated change in the sides and the proposed covering arch. All the masonry above the line of the old coping, and all the interior brick work, above the points marked A A, will be new work. When finished, the whole interior will be an open chamber, with sufficient space around all of the pipes for examination and repair. This chamber will be lighted and ventilated from the roof, and approached by doors, cut into the masonry at the sides of the north end of the bridge, which will be large enough to admit the introduction of cast-iron pipe or wrought-iron plate, or any other material for repairs. The roof will be of brick, abutting against cast-iron skew backs, kept in place by wrought-iron tie-rods. The arch will be made water tight by a covering of concrete and asphaltum.

To keep up the supply of water to the city during the progress of the work in connecting the new pipe, it was necessary to change the entrance gates of the old pipes, from the front to the side of each gate chamber, and to do this, also, without drawing off the water from the aqueduct and gate chambers. A caisson or coffer dam of wood was framed and sunk to its position, against the inner face of the west wall of each chamber, leaving a narrow space between the masonry and the inner face of the coffer dam. The water from this space was then pumped out. The west walls were then cut away and rebuilt, with the proper variation for new gates, and the reception of the mouth pieces for the two 3-feet pipes. From these points, two new lines of pipes were carried round, on the outside of the gate houses, and down to the floor of the bridge, to the point at which the removal of the old pipes was necessary. Here the pipes were, one at a time, cut off, and connected with the new lines leading into the side of the gate house. The water was then passed through the old pipes by these new connections, and the fronts of the gate houses were free for further operations. The masonry of almost the entire fronts (below the water line) was removed in the same manner it had been from the sides, and the new construction went on without interruption. During the whole of this work, there was at no time a stoppage of the entire flow of water into the city. It was not shut off at all, for any of the operations, at the gate-chambers themselves.

Manhattan Valley Improvements.—At this valley there is an interruption of the brick conduit similar to that at High Bridge. As originally constructed, the water was conducted across this valley in 2 3-ft. siphon pipes, to which was added, in 1858, a 4-ft. pipe. This year a fourth pipe has been added, 5 feet diam., of cast iron, in lengths of 12 ft. 5 in., and $1\frac{3}{8}$ inches in thickness. The average weight of each length is 11,226 lbs., and the aggregate extent of this line, measured as laid, is 4,116 ft.

FIG. 3.



The New Reservoir.—The water was formally introduced into the new reservoir on the 19th of August, with a celebration by the civic authorities, and speeches from the mayor (Mr. Opdyke), and from Myndert Van Schaick, for many years president of the Croton board, and from many others. The reservoir is probably the largest purely artificial construction in the world. Its water surface, when full, is 96 acres, its depth 37 ft., and its capacity

1,029,000,000 N. Y. galls. It has been built on the most substantial plan and in the most careful and skilful manner possible. The puddle trench is carried down to and founded on the solid rock throughout its entire circuit. The interior slopes are protected by a facing of hydraulic masonry.

There are three gate houses. The first of these gate houses is that by means of which the water is taken out of the old aqueduct, at the corner of 9th av. and 92nd st. The old aqueduct has been opened for the space of 46 feet, and a chamber built, combining two sets of gates—one set permitting the water to pursue its old course through the old aqueduct to the present receiving reservoir at 85th st., and the other set diverting the water into the new junction aqueduct, which leads to the new reservoir. There are 5 gates to each channel, so arranged that all the water can be passed either into the old or new reservoir at pleasure, or a portion sent to each. From this junction gate house to the north gate house of the new reservoir, the aqueduct is 2,629 feet in length, and similar, in the form of its sectional area, to the old aqueduct. In order to carry this structure across the 9th av. and through 92nd st., without interfering with their grades, it was necessary to place it about 7 ft. below the regular level of the old aqueduct. When, therefore, the old aqueduct runs full, there will be a pressure on the top of the new one, due to that height. The masonry has been accordingly strengthened to meet this pressure.

The junction aqueduct terminates at the north gate house of the reservoir. This gate house, situated at the north end of the central or dividing bank of the reservoir, serves the double purpose of an inlet and an outlet gate house. The water is received into an induction chamber, which is furnished with 2 sets of gates, 5 in each set. Through these gates the water is discharged immediately into either or both of the divisions of the reservoir, at pleasure. Directly below the induction chamber are the inlet channels from the 2 divisions of the reservoir to the fore bays, which are the entrances to that portion of the gate house which is arranged for the discharge of the water into the city. These fore bays are divided into spaces 7 ft. in width by 12 ft. in length. The fore bays are built of granite. In front of the gates which let the water into the main outlet chambers, grooves are cut in the sides of the fore bays for a double set of screens of copper wire gauze, and for the insertion of temporary coffer dams, should they ever be required. Beyond the gates is the back bay, into which water passes from both divisions of the reservoir. This back bay is so arranged, however, that the whole of it can be filled with water from either division at pleasure. And, again, it can be divided in itself, so as to use but one portion of it at a time, should it be necessary. The rear wall of the back bay separates that portion of the gate houses into which the water flows from the portion of it called the pipe vault. In this wall are inserted the mouths of the outlet pipes. In the pipe vault beyond, and through which the pipes pass into the city, are the stop cocks controlling the pipes and other arrangements for division and shutting off water, should repairs to the stop cocks or pipes be required. The vault is entered from the top of the bank by a circular staircase, through a well large enough to admit the lowering of pipe, or stop cocks, or other material. Underneath the whole of this structure passes the main sewer, to receive the overfall of water from the waste weir, which is also included in the general plan of the gate houses.

Passing under the floor of the gate house, there is also a pipe, 3 ft. in diameter, leading from each division of the reservoir to the main sewer, at a point beyond the pipe vault. These pipes are not in any wise connected with the distribution pipes, but are intended only to draw off the water from either division, when necessary. 4 distribution pipes lead from this gate house to the upper part of the city, each 3 feet in diameter.

The south gate house is situated at the south end of the bank dividing the reservoir. It is arranged only for distribution, and has, therefore, no induction chamber for the purpose of delivering water into the reservoir. In all other respects it is similar in design and character of work to the north gate house, except that it has 6, instead of 4, outlet or distribution pipes, each of which is 4 ft. in diameter.

Both gate houses are built on the natural solid rock. The outer exposed walls and the sides of the fore bays, the openings for the gateways, screens, &c., the wells for the waste weirs and their approaches, the mouth pieces to the pipes, and the braces in the fore bays, are of granite. The walls under the banks are of gneiss and brick, the other face walls and arches are of brick, while the foundations and the interior of the walls are of concrete. The tops of all the walls of the gate houses are covered with a floor of granite 1 ft. in thickness. On this floor will be placed the gearing for working the gates below, a vertical distance of 44 ft. The gates and gate frames are of cast iron, with the sliding parts faced with brass. There are upper and lower sets of gates, by which a circulation in the water can be effected, and which at the same time will facilitate other operations. With a view to provide for every possible contingency, there is no portion of the whole work which cannot be examined and repaired without shutting off the water from the city for a moment.

There are now 5 main pipes supplying the city from the old receiving reservoir, as follows: 1, $2\frac{1}{2}$ ft. in diam., from the west side of the reservoir, passing down 8th av.; 1, $2\frac{1}{2}$ ft. in diam., from the east side, passing down 3d av; 2, each 3 ft. in diam., passing down the 5th av., and 1 pipe, 3 ft. in diam. where it leaves the reservoir (but connected with the four-feet pipe immediately after), passing down the 4th avenue.

With these five pipes a corresponding number of the effluent or distributing pipes from the south gate house of the new reservoir are to be connected; so that, when this is done, the whole water distribution of the city can be supplied from both, or either of the reservoirs, at pleasure; and, so far as the new reservoir is concerned, with either division of it, as any emergency may require.

INTEREST ON CROTON DEBT.

Payable from Sinking Fund.

Amount in 1859	$512,193 85
" 1860	447,901 39
1861	476,404 29
	$1,436,502 03

CROTON WATER RENT.

Income from	1859.	1860.	1861.
Water Registrar	$759,250 65	$767,169 62	$765,954 35
Receiver of Taxes	30,708 39	22,850 02	22,861 62
Clerk of Arrears	31,546 95	32,901 17	20,840 53
	$821,505 99	$822,920 81	$809,656 50
	822,920 81		
	809,656 50		
	$2,454,083 30		
	1,436,502 03		
Surplus	$1,017,581 27		

Present debt, December 31, 1861 .... $9,917,605 00

This statement shows that in three years the Croton revenue paid into the sinking fund nearly two and a half millions of dollars, and the sinking fund paid the interest on the then existing Croton debt of nearly one and a half millions of dollars, leaving $1,017,581.27 surplus; and that the present Croton debt is only $9,917,605, notwithstanding the very large aggregations of expenditures on improvements and repairs of the works which make the opinion credible, that the total amount of expenditures on the works exceeds $24,000,000, though the aqueduct and its dependencies cost originally, according to engineer Jarvis' last report, only $9,000,000.

Philadelphia.—From early summer until about the middle of November, there was not sufficient water in the River Schuylkill, except at limited intervals, to drive the machinery at the old Fairmount Works. During this period, it has been only with the unremitting operation of the engines and pumps at their fullest capacity that the Kensington Spring Garden, and Twenty-fourth Ward Works have been enabled to supply their districts; and even then not always successfully, nor adequate to the demands of the population. Generally, there is no difficulty in furnishing a full supply to the entire city during seven months of the year, with the works and facilities at present in operation. But this is the utmost extent of their entire reliability, and during the warmer months, it is not without difficulty that an adequate supply can be maintained in any year.

The Fairmount Works.—The 8 old wooden wheels and their pumps were originally designed and intended to raise the water to an elevation of about 96 feet, and such was the service performed by them satisfactorily for some years after their completion; but, since the construction of the Corinthian Avenue Reservoir, making an additional altitude of 27 feet above that of the reservoirs, as designed in the original plan of the works, these pumps have frequently been much overworked.

On the security of the dam at Fairmount depends the entire ability of the Fairmount, Spring Garden, and Twenty-fourth Ward Works to supply their respective districts.

The new wheel house and machinery are completed, and the new pumps have been in operation at intervals since the month of June last, and work satisfactorily, but they cannot become fully available until the capacity of the ascending main is increased to a degree better corresponding to the area of the pumps. The six new pumps are each of 18 inches diameter, and the number of gallons pumped during the year was 3,564,724,753; average number of gallons raised per day was 9,766,369.

The engines and pumps at the *Spring Garden Works*, with one exception, are much worn, and their efficiency much impaired by constant and frequently excessive service, almost without interruption from the time of their construction. In 1862, Nos. 1, 2, and 3 pumped 1,897,391,360 gallons, and the Cornish engine, No. 4, pumped 1,141,136,060 gallons. In the performance of this work, the former three engines consumed 5,777,571 lbs. of coal, and the latter one engine consumed 2,547,161 lbs., and the number of gallons of water pumped during the year was 3,038,527,420; average number of gallons per day was 8,324,732. Average duty for the year, 32,998,333 pounds raised one foot high with 100 lbs. coal. Total amount of coal consumed by engines, 8,895,459 lbs.

The *Kensington Works* draw their supply from the Delaware. Such is the demand upon them that if it is decided that they shall be continued, it will be soon necessary to have an additional ascending main, of such capacity as to anticipate, at least in some measure, the greater demand that must arise. There are at present at these works two engines, one of which is a condensing engine, driving a pump of 19 inches diameter; the other is a non-condensing engine, driving a pump of 18 inches diameter. The single ascending main is 13,300 feet long, and 18 inches in diameter, being capable of carrying the water from one pump only. During the warm season, more water is required in the district than this one main can safely supply. The average maximum capacity of the pumps is rated at 3,000,000 gallons each per twenty-four hours. The daily demand has reached as high as 3,780,290 gallons, and the least demand in any day of the past year was 2,954,770 gallons, and the number of gallons of water pumped during the year was 909,126,-

440; average number of gallons pumped per day, 2,490,757.

Average duty for the year, 22,778,385 pounds raised one foot high by the consumption of 100 lbs. of anthracite coal. Total amount of coal consumed by engines, 1,662 tons 4 cwt. 1 qr.

Such is the rapid increase in the demand in the district supplied by the *Twenty-fourth Ward Works* that it is difficult to provide for it satisfactorily. On account of there being no reservoir, nor any other facilities for storage, and the fact that there is only one main from the works to the stand-pipe, the demand is supplied directly from the pumps, and requires the constant and unremitting operation of one engine, the other being kept in constant readiness in case of accidents. The number of gallons pumped during the year was 420,507,810; average number of gallons raised per day, 1,152,076.

Average duty for the year, 38,525,000 pounds raised one foot high by the consumption of 100 pounds of anthracite coal. Total amount of coal consumed by engines was 933 tons 18 cwt. 19 lbs.

Number of gallons pumped by all the works during the year, 7,932,886,423. Average number of gallons pumped each day, 21,733,935.

WINDISCHGRATZ, Alfred Zu Prince, formerly commander-in-chief of the Austrian armies, born in Brussels, May 11, 1787, died at Vienna, March 24, 1862. He entered the military service in 1804, received the command of the Cuirassiers of the Grand Duke of Constantine for his brilliant conduct at Leipsic, and distinguished himself during the campaign of 1814 at Troyes. He was promoted to be major-general in 1826, and made general of division and lieutenant field marshal in 1833. In 1848 he led the armies which bombarded Prague, Pesth, and the Austrian capital in succession, but meeting with reverses in Hungary he was driven from Buda-Pesth in 1849 by Görgey, and in April of that year was deprived of his command. Fierce and cruel, he never treated the Hungarians with the least leniency, and his latter days were saddened by seeing the principles against which he had fought so obstinately, carried out, at least partially, by the Government. On one occasion, during the first session of the Reichsrath, he ascended the tribune of the Upper Chamber, and prophesied new catastrophes, the necessary consequence, he said, of the statute of February, and announced his readiness to protect Austria as heretofore with his sword, but meeting with no response he retired henceforth to private life. In 1851 he published a work defending his conduct in the Hungarian campaign entitled "*Der Winterfeldzug Von* 1848–'9 *in Ungaru.*"

WISCONSIN, one of the most thriving Northwestern States, increased in population during the ten years ending June, 1860, 470,490, when the whole population was 775,881. (*See* United States.)

The Governor of the State, Harvey, was inaugurated on the 1st of January, 1862. He had been elected by the Republican voters on the first Thursday of November, 1861, by a majority of 8,320 over the Democratic candidate.

The Legislature convened on the 9th of January. The members of the Assembly and half of the Senate had been elected in November previous, and were divided as follows:

	Senate.	House.
Republicans	22	43
Democrats	11	34
Union	—	23

The governor in his message recommended economy in the expenditures, the introduction of military drill in public schools, and the establishment of an armory and arsenal at Milwaukie, on the Lake Michigan.

The following resolutions expressive of the views of the majority of the Legislature on Federal affairs were adopted with seven dissenting votes in the House and nine in the Senate:

Whereas, The language of joint resolution number 4, adopted by the Legislature of 1859, is in some of its parts identical with those of the Kentucky resolutions of 1798;

And whereas such language is liable to be so misconstrued and perverted as to lead to misapprehension of the purpose of its adoption, and to favor secession;

And whereas there is evidence in the fact of such Kentucky resolutions having been endorsed by and incorporated into and made part of several of the Democratic national and State platforms, and especially by that recently promulgated by the Democratic State Convention of Indiana, that the true intent and meaning of such language has been misconstrued and perverted; therefore,

Resolved by the Assembly, the Senate concurring, That we regard the action of the rebellious States of this Government, in their attempt to destroy the Union by the pretended lawful right of secession, as unwarranted by the spirit of the Constitution, and utterly subversive of the well-established principles of good government.

Resolved, That no State of this Union has a right to defy or resist the laws of the Federal Government, but should yield a willing and hearty support to the enforcement of the laws, unless such laws are unjust or deleterious in their operation, in which case the only rightful remedy lies in their repeal or lawful abrogation.

Resolved, That joint resolution number 4, of the Legislature of Wisconsin of the year 1859, in theory enunciates the dangerous doctrine of nullification and resistance to the lawfully constituted authority of the Federal Government, and is incompatible with the safety and perpetuity of the Union.

Resolved, That said joint resolution number 4, of the Legislature of this State of the year 1859, entitled "Joint resolution relative to the decision of the Supreme Court of Wisconsin," be and the same is hereby repealed.

On the 5th of April a resolution passed the House with one dissenting vote tendering to the President of the United States an unqualified approval of his course from the day of his inauguration.

A bill was brought before the Legislature at this session to repeal the "Personal Liberty" law of the State. But no final action was taken upon it until the extra session in July, when it was passed, and the law repealed. (*See* Annual Cyclopædia, 1861—Personal