which rise consid-

erably above the

level of the top of

the embankment.

Every yard of

this material.

fully one-half of

which is rock, has to be laboriously

excavated, loaded

into cars, hauled

by locomotives

out of the reser-

voir and deposited wherever the con-

tractors can ob-

tain permission to

dump it. An im-

pressive idea of

THE WATER SUPPLY OF NEW YORK CITY.

The water supply of the city of New York is in many respects the best metropolitan work of its kind in existence. There is no other capital city whose inhabitants receive such an abundant per capita supply of pure water for general domestic use ; and it is satisfac-

sufficient to meet the city's needs in the near future, there are important works in progress which will give a water supply far in excess of the city's immediate requirements and sufficient to cover its probable growth for many a decade to come.

Nature has provided a magnificent supply of pure water in the those in Central Park. This will give the city a reserve of three billions of gallons, or about fourteen days' supply.

The site chosen for the new reservoir lies on the high ridge of land which runs in a general north and south direction between the New York & Putnam and the stretches of rising ground, such, for instance, as that tory to know that, while the existing reservoirs are Harlem railroads. It will be known as the Jerome upon which the old Jerome Park club house stands,

In spite of the natural depression of the ground, there is no part of the site where the natural surface is less than 16 feet above the bottom of the proposed reservoir, which will in general be 311/2 feet below the top of the embankment. Moreover, there are several



Fig. 1.-TYPICAL SECTION OF RESERVOIR EMBANKMENT.

annual rainfali of the watershed of the Croton River, and when the city authorities were considering, some sixty years ago, the question of providing a larger water supply, they selected this locality for the new reservoir. If we bear in mind how much smaller New York was in the decade 1830 to 1840, when the new work was undertaken, than it is to-day, we shall appreciate the forethought and enterprise which led the authorities to build a costly reservoir fully forty miles north from the city and lead the waters across the intervening distance in a solid masonry viaduct. The Croton aqueduct, or, as it is helped to lessen the labor of digging out and embank-

famous race course was once a favorite resort of the people of New York. The club house, the stables, the grand stand and the track itself are all included within the high water line of the proposed reservoir, and the rock drills, steam dredges and dump cars of the contractor will soon have removed every vestige of a memorable landmark.

From an engineer's point of view, the site is well adapted to the purpose. It forms a general depression on the summit of the ridge, and Nature has now called, the old aqueduct, is a familiar landscape ing this huge artificial basin, the depth of which will will have to dispose of nearly 10,000,000 cubic yards or

Park reservoir, taking the name of the park whose the vast amount of excavation that has to be done before the floor of the reservoir is reached may be gained from the large engraving showing the double conduit at the northern entrance to the reservoir. In this illustration the floor level is situated at the foot of the masonry walls and at the bottom of the deep excavation. All the material above this level has to be taken out over a bottom area of more than 150 acres. The total estimated excavation is 6,500,000 cubic yards, of which fully one-half is solid rock, and, as excavated rock occupies about double the space that it does in the solid mass, the contractors







Fig. 3.-SECTION THROUGH DOUBLE CONDUIT BELOW MAIN GATE HOUSE.

ter known as Broadway), and the unbroken service which it has rendered for more than half a century testifies to the excellent quality of the work. The maximum capacity of the aqueduct when running entirely full is 90,000,000 gallons in 24 hours.

In 1890 the new aqueduct, with a capacity of 313,000,000 gallons per day, was completed. This structure, unlike the old one, which was built almost entirely upon the side hill and above ground, was constructed as far as possible in tunnel, and was carried. as far as practicable, in a straight line from Croton

charge directly into a terminal gate house, situated at One Hundred and Thirty-fifth Street and Amsterdam Avenue, from which the water is led by 48 inch pipes into the city mains and into the Central Park SEDGWICH reservoirs. The latter have a capacity of a billion gallons of water, or sufficient for five days' supply of ACQUEDUCT BBRI the city. As a matter of fact, however, the high water level of these A MARIA S. OLD ACQUEDUCT reservoirs is only 115.00 feet above the sea, and before they can be entirely exhausted, the pressure fails and the remaining water ceases to be available on the higher floors of the city buildings. For this reason the actual supply is limited to three and a half or four days, and in the event of a failure in the Croton reservoir or of the two aqueducts above mentioned, the city would be brought within measurable a practically impervious surface; but, to prevent any the northern entrance of the reservoir is reached. distance of a water famine. Although such a con- possibility of leakage, an inner wall or diaphragm of tingency as the failure of both aqueducts or of the first-class masonry will be built in the center of the em- pact masonry structure, as shown in the large front reservoir is remote, the aqueduct commissioners have bankment, starting from bed rock and rising with a batwisely determined to enlarge the reservoir capacity at ter of 1 in 24 to well above the high water line. The core the city end of the line by constructing an additional wall adds no appreciable strength, however, to the dam,

feature to travelers over the old Albany post road (bet- | be 261/2 feet and its area nearly 175 acres, by surrounding it for half the total distance with rising ground. The other half of the distance will be shut in by an embankment whose typical cross section is shown in Fig. 1. The embankment will be built of earth, put down in 6 inch layers and well rolled and tamped. The gravel walk at the top will be 20 feet wide and the sides will be carried out with an even slope of 2 to 1 and $2\frac{1}{2}$ to 1. The outer face will be sodded, and the inner face will be covered with 6 inches of concrete, above which will be laid a paving of granite blocks, the concrete paving being carried up to the "wave line," 21/2 reservoir to the Harlem River. Both aqueducts dis- feet above the high water line. This work will provide the reservoir site on their way to the city, the former

material. The excavation is being done with powerful steam dredges and shovels, and the site of the reservoir is at present well covered with a whole network of tracks. These lead into a main track which passes out of the reservoir and into the surrounding districts to the east, where the waste material is being used for filling in low-lying land and in raising the grade of city streets. Ultimately this track will be carried well down toward the Long Island Sound, and the many millions of cubic yards of material yet to be taken out will be deposited several miles away from the work.

Both the old and the new aqueducts pass through

at the ground level, the latter some 100 feet below the surface. As the bottom of the reservoir will lie below the old aqueduct foundation, it will be necessary to remove the latter structure altogether. At a point about a mile to the north of the reservoir the new aqueduct is at the ground level, and it is here that it is depressed and carried in a tunnel to the deep level above mentioned. At about the center of the reservoir a vertical shaft, known as shaft 21, rises from this aqueduct to the bottom of the reservoir. At the point to the north above mentioned, where the change of grade occurs in the new aqueduct, a gate house has been put in and a surface branch aqueduct will be built, which will run parallel with the old aqueduct, until Here the two aqueducts will be continued in one compage engraving. This will be built upon the solid rock and will run through the reservoir from north to south, dividing it into two equal and entirely separate reservoir which will have about double the capacity of which resists the thrust of the water by its own gravity. basins, the top of the structure being level with the



Fig. 4.-MAP OF JEROME PARK RESERVOIR AND VICINITY.



A WEEKLY JOURNAL OF PRACTICAL INFORMATION ART, SCIENCE MECHANICS, CHEMISTRY, AND MANUFACTURES. Vol. LXXVI.-No. 20.] NEW YORK, MAY 15, 1897. [*3.00 A YEAR. WHERLY.



ROCK CUT NORTH OF THE GRAND STAND LOOKING WEST.



STEAM SHOVEL CUT AND CONTRACTOR'S POWER HOUSE, FORMERLY PART OF JEROME PARK CLUB HOUSE.



DOUBLE CONDUIT FOR CARRYING WATERS OF OLD AND NEW AQUEDUCTS INTO RESERVOIR. BOTTOM OF EXCAVATIONS IS AT LEVEL OF FINISHED FLOOR OF RESERVOIR. THE WATER SUPPLY OF NEW YORK CITY-JEROME PARK RESERVOIR.-[See page 314.]



HEAVY ROCK EXCAVATION TO THE WEST OF OLD AQUEDUCT.



STEAM DREDGE EXCAVATING FOR FOUNDATIONS OF DOUBLE CONDUIT. THE WATER SUPPLY OF NEW YORK CITY-JEROME PARK RESERVOIR.-[See page 314.]

top of the embankment, or 5 feet above high water level.

At the center of its length, and opposite the shaft 21 leading down to the new aqueduct, a large main gatehouse will be built, from which a short conduit will lead across to connect through this shaft with the new aqueduct below ground. To the south of the main gate house the new aqueduct is continued as a double barrel conduit, each barrel being 11 feet in diameter, and the old aqueduct is carried above these at its former elevation. as shown in Fig. 3. At a point 1,500 feet to the south of the gatehouse one conduit leads into the western and the other into the eastern half of the reservoir. By this arrangement three separate systems of distribution of the water are secured. The reservoir may be filled or the water distributed directly from either the old or the new surface aqueducts, or from the subterranean aqueduct through shaft 21, the operations being all controlled at the main gate house. The construction of the dividing wall of the reservoir is shown in the two cross sections, Figs. 2 and 3, and it will be seen that the arrangement is such as to afford two entirely independent reservoirs, each with its own separate system for feeding and distributing the water.

main central gate house; two of which will leave the reservoir at Van Cortlandt Avenue to the northwest, two at Sedgewick Avenue to the west, and two at Jerome Avenue to the southeast, one of which will lead to a high service pumping station. A gate house will be built at each point of exit. The main gate house connections will be so arranged that these pipes may be supplied with water from either basin of the reservoir or directly from either the old or new aqueduct. The 48 inch pipes, with the aid of the proposed pumping stations, will serve the annexed district to the north of the Harlem River, and it is also proposed to carry a line from these pipes south across the Harlem River to connect directly with the city mains on Manhattan Island. This would give an independent source of supply in case of any accident to the present aqueducts where they cross the Harlem River.

When the Jerome Park reservoir is completed it will form an extensive lake of water over a mile and a quarter in length and more than half a mile in width; and the winding gravel walk on the top of the embankment

will afford a continuous promenade fully three miles long. The contract calls for the completion of the work in 1901. A few years later than this the great Croton dam which is now building at a point a few miles below the old Croton dam will be completed, and the new lake thus formed will hold over 30,000,000,000 gallons. If we add to this the capacity of the various auxiliary storage reservoirs scattered throughout the Croton watershed, and that of the reservoirs at Jerome Park and Central Park, we reach a grand total of 75,000,000,000 gallons as the future available supply of New York City.

The work is being carried out under Mr. A. Fteley as chief engineer. Mr. A. Craven is in charge of construction at Jerome Park, and to these gentlemen, together with Mr. F. S. Cook, assistant engineer, we are indebted for valuable facilities in the preparation of the present article.

A TOY BIRD THAT FLIES.

The naturalness and easy movement of the wings of the little toy bird shown in the accompanying illustration, as the operator pulls gently on the end of the supporting string over which the bird moves, in accordance with the movement of the wings, always attracts pivotally connected with an extension of a member of Six lines of 48 inch pipe will radiate from the observers when this toy is shown on the streets, as it the inner one of two pairs of lazy tongs, and this mem-



A TOY BIRD THAT EFFECTIVELY SIMULATES A BIRD FLYING.

RECENTLY PATENTED INVENTIONS. Electrical,

VALVE GEAR.-William Engberg, St. Joseph, Mich. The gear provided by this patent is more especially designed for use in water supply pipes con necting a pumping station with a distant stand pipe. It is provided with a controlling device comprising an electric circuit containing two relays, an electric magnet for each relay and an armaturel ever, and two slida ble bars adapted to be engaged and locked by the corresponding armature levers, the bars controlling the position of the valve. An alarm is sounded at the pumping station in case the valve is opened or closed accidentally.

AMALGAMATOR. - William Wright, New York City. This invention provides for an amalgamating plate over which the material is adapted to pass, waterdistributing tubes being arranged to discharge water over the receiving surface of the plate, the tubes having carbon outlets, and the plate and tubes being in an electric circuit, while mechanism is provided for changing the direction of the current. When the amalgamating sur face becomes clogged the current is reversed, in order to loosen the sediment and provide at all times for a clean surface to which the gold shall adhere.

Mechanical.

MOTOR REGULATOR. - John G. Ball. Chesterville, Ohio. A simple device, adjustable for various purposes, is provided by this invention, and consists of a frame in which is rotatably mounted a wheel having a series of weights secured to its periphery, arranged in such a way that the wheel is overbalanced on one side. An adjustable sweep rod connected to a crank arm or axle of the wheel is adapted to be engaged with mechanism having an attachment to a pump rod or similar device, a spring being adjustably connected to the sweep rod. The device is adapted for use with pumps for wells of different depths, churns of different sizes, and similar machinery where it is designed to operate a rod vertically and at varying rates of speed

parts of the bearing block are drawn together to take up the internal wear around the journal, the outer lower edges of the block will be depressed to take up the external wear. The improvement affords a ready means of correcting both the internal and external wear of the bearing block.

MAKING CYCLE GEAR CASES. - Horace W. Dover, Northampton, England. For making gear cases of xylonite, celluloid, etc., this invention provides a finishing tool for bringing the roughly moulded article to its final form. The tool comprises a male die or plunger, a matrix formed of a middle member inclos ing the bottom and ends, with two loosely pivoted side members, and means for forcing and holding the die in the matrix, and for closing the sides of the matrix upon the article on the die. The plunger is forced home and the sides of the matrix closed in with the aid of heat, preferably while the tool is immersed in water at a temperature to soften the material, the material being caused to set in the moulded form by cooling the mould in cold water.

Agricultural.

STOCK WATERING DEVICE. - Joseph Seiler, Maple River Junction, Iowa. A device adapted for attachment to a tank, barrel, reservoir, or other source of supply, is provided by this invention, for use in connection with a trough or tank, cutting off the supply from the latter when the water has reached a certain height. It has a T-shaped body, with a plug in its vertical member, the outlet nozzle having a valve adapted to be closed by a trip rod which extends beyond the outlet end and engages a float. When the water in the trough gets bethe

means of base blocks, transverse rods serving as stops for the wheels, the base racks being adapted to be held at right and acute angles to the vertical racks, and the whole device being adapted to befoldedin comparatively small compass. A wide space between the wheel-sup porting bars provides room for the handle bars of the everal bicycles.

BICYCLE TIRE.-James C. Cole, London, England. This invention provides a tire made of segments or balls or oblate or flattened spheroids or ovals, preferably made of India rubber and inflated, but with the balls partially lined with a strong textile or inextensible lining. There are flanges or ribs on the balls for their attachment to the wheel, and the lining of the ball is of such width that its extensible part is only about that which may be flattened by contact with the adjacent balls. It is designed that the balls so made shall be extensible only in or about the direction of the circumference of the wheel.

PRESERVING FOODS -Francois O. Jacob, Paris, France. To preserve solid organic alimentary substances from fermentation and decomposition, this inventor makes use in certain cases of an acid reaction and in others of a basic or neutral reaction. The proces is especially designed to facilitate the preservation of meat, fish, fruit, vegetables, etc , and the substances to be preserved are treated with carbonic anhydrid and formaldehyde, under pressure, either successively or simultaneously. It is said that meat thus treated can be kept in the open air for more than a month, and is without smell and contains no toxic principle or anything contrary to the hygiene of a limentation.

WINDMILL. — Rudolph Bratka, Minne-sota Lake, Minn. The wheel of this windmill is mounted on a vertical axis and turns in a horizontal plane, the blades of the wheel being pivoted on arms radiating from the axis, and swinging from a horizontal to a vertical position as the wheel turns. Each blade is actuated by a spring, and as the spokes or arms move toward or into the wind the force of the springs is overcome and the blades are thrown horizontally, but when the arms pass the line in which the wind is blowing, the springs change the position of the blades, allowing the wind to act with the greatest possible efficiency on the wheel. CHIMNEY.-Le Roy C. Hedges, Elmood, Ill. This is a metal-framed chimney which is light, strong, and ornamental, and designed to support and strengthen other portions of the building, while being fireproof, inexpensive, and easy to repair when nec. essary. The invention comprises a casing in which is a draught flue, brackets on the casing supporting the joists. etc., while there are tiles on the brackets bet veen the casing and the ends of the joists and floor, There are openings near the floor and ceiling of each compartment, and heat radiators through which the products of combustion pass, the chimney being designed to be a fuel saver as well as an effective heat distributor for

has been by numerous venders within a few weeks past. The toy is one of the most recent of the many novelties which are constantly being exhibited by the sidewalk salesmen in the streets of New York and other large cities, and in the construction of some of which a surprising degree of skilland ingenuity are displayed. The cord leading from the aperture below the mouth of the bird is attached at its outer end to a hook in the wall or other support, while its inner portion passes over an idler and around a pulley, to which it is attached. This pulley is a little smaller than another at its side, as shown in Fig. 2, both pulleys being fast on the same shaft, and a cord from the larger pulley passes over an idler and out rearwardly, having at its end a finger piece, on which the operator pulls in manipulating the toy. The cords are wound in opposite directions on their pulleys, so that the unwinding of the cord from and rotating of the larger pulley winds up the cord on the smaller pulley, and causes the bird to move forward on what seems to be only a single length of cord, the backward movement taking place by gravity when the pull on the string is released. The movement of the wings is effected by a crank on each outer end of the pulley shaft, the crank being

ber having also a pivotal bearing on a cross bar which turns in bearings on the outer side of the toy, just under where the wings are hinged to the body. The larger pair of lazy tongs is pivotally connected to the outer portion of the wing, giving a longer sweep thereto than to the inner portion of the wing, with which the smaller lazy tongs are connected, and the pivotal connection of the lazy tongs with the bearing in the cross bar gives an oscillatory movement to the wings which constitutes a very good simulation of the natural movement of the wings of a bird in flight. A high degree of mechanical skill is shown in the putting together of this little toy.

An electric speed indicator which is designed specially for warships is described in the Revue Industrielle. The principle is that a tiny magneto, driven off the main shaft, gives a current which varies with the speed. A galvanometer introducea anywhere in the circuit, therefore, if properly graduated, gives the number of revolutions per minute, and the direction "ahead" or 'astern."

LAMP LIGHTING DEVICE. - Carl F. Bergmann, Jersey City, N, J. For lighting the wicks of bicycle lamps, more particularly, this invention provides a novel attachment which will facilitate the easy and protected ignition of the match, and guide it into contact with the wick to be lighted. A guide tube penetrates the wall of the lamp near its burner, and near the inner end of the tube is a spring-pressed scratching device adapted to ignite an inserted match, the tube heing completely closed when the match is withdrawn, and thus prevent ing air currents from flaring the flame of the lighted wick.

SEWER GAS TRAP.-Henry McEvoy, New York City. This invention provides a simple form of trap that will be sealed automatically by water or by a valve movable into a discharge pipe. This valve is mounted on a tubular arm which extends through the valve, and the tubular arm connects with awater inlet tube designed to communicate with a water supply pipe. The connection of the tubular arm and its valve is such that, as water evaporates from the elbow and bowl, a small amount of water is admitted to replenish the a mount evaporated and maintain a liquid seal.

LADDER AND COT.-Leonard G. Fath, Springfield, Mo. This is a combination device to be used by a slight adjustment as a cot, a step ladder, or an extension ladder, a cot surface of woven wire, etc., being discarded when the device is used as a step ladder. The device is made of two principal parts, a step ladder portion and a pair of parallel bars, both the side pieces of the ladder portion and the parallel bars having three pivot holes one near the middle and one near each end, whereby adjustment as a cot may be effected by means of pivot

MOULD.--Robert H. Wilson, Boonton, N. J. This improvement consists of two plates having the mould formed in their opposing surfaces, and provided with automatic centering means by which they are made to register by simply sliding the cope upon the mould until stopped by the centering devices. There is also provided a removable and insertible pouring gate and riser, which is made in one piece of a refractory earthy material, and which protects the mould at the points where the heat of the metal is most likely to affect it. also enabling the gate to be easily removed

JOURNAL BEARING.-Richard M. Melhuish, London, England. This bearing comprises a standard having an opening in which a bearing block is seated to move, a plate holding the bearing block in place, and the bearing block being longitudinally opened In its ander side, whereby, when the slightly separated cal and base rack bare pivotally connected together by rooms directly connected with it.

ow a certain leve t lifts the water to flow in from the reservoir. The device may also be attached to and used in connection with a hydrant.

SORTING MACHINE FOR PEACHES, ETC. -John P. Wilson, Hamburg, N. J. This machine has carriers adapted to move over the assorting table, but which may be stopped at any point to make sure that the fruit or vegetables are of a size adapted to find an exit. Means are provided for regulating the fee'l to the assorting table, and the basket, crate, or bag holder occupies at first an inclined position, gradually assuming an upright position as the bag, etc., becomes filled, there by preventing the bruising of the fruit or vegetables. The carriers may be readily and easily set in motion, and their motion is preferably continuous.

Miscellaneous.

BICYCLE RACK. - George Hirschman. Sr., and George Hirschman, Jr., Morristown, N. J. A portable rack of simple and mexpensive construction, and adapted to support a number of bicycles, has been devised by these inventors. The device comprises verti-

bolts and link rods

FIRE EXTINGUISHER.-Arthur H. Durand, Montreal, Canada. This is a portable fire extinguisher which operates by the admixture of an acid with a solution of bicarbonate of soda to generate carbonic cid gas. The invention provides an acid receptacle formed by a contraction of the vessel containing the alkaline solution, and so arranged that the acid can be slowly admitted, and not all at once, the pressure being thus so regulated as to avoid danger of bursting the extinguisher, which sometimes happens from the sudden generation of an enormous volume of carbonic acid gas. A small extinguisher is thus provided which will be perfectly safe and of sure operation, and the machine may be readily recharged at any drug store, as no pieces are broken or out of order after use

BUSHING AND HOLDER FOR RUBBER GAS BAGS .-. John Heavue and Elmer E. Cisco, Brooklyn. N. Y. This invention relates to flexible gas bags temporarily employed for plugging gas mains during repairs, and provides a bushing adapted to be inserted in the opening in the main and a cap for attachment to the oushing to close it, and with means to hold the neck of the gas bag, holding the latter in place when inflated in