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THE NEW YORK WATER SUPPLY.

In a recent issue we spoke of the fear that might be reasonably entertained that the new aqueduct, as dependent upon the Quaker Bridge reservoir for its supply, would not fulfill the popular anticipations. We gave grounds for the belief that it might prove detrimental in many respects, and a failure as regards purity, pressure, and sufficiency of the water to be delivered by it. An exhaustive paper on the subject was given in the SUPPLEMENT of the same week, by Mr. R. D. A. Parrott. On this our article was in great measure based. In the New York *Times* of the 17th inst., we find a discussion of Mr. Parrott's paper. The *Times* finds that the points in it are well taken, and while hesitating to pass judgment on his suggestions for a new watershed in the Catskill Mountains as a question within the scope only of an engineer, seems fully to appreciate the benefits to be derived from the appropriation of so thinly settled and mountainous a region for a watershed.

The exactness of Mr. Parrott's figures are fully appreciated by our contemporary. The subject in general is one that will bear ample discussion. It is a subject of congratulation that it has been begun while there is yet time to adopt the new aqueduct as a connection between the city and a new region of water supply.

ARRANGEMENT OF WIRES IN CITIES.

At the recent convention of the National Electric Light Association, no little time was occupied in a discussion of the expediency of burying the wires. The sense of the convention was decidedly opposed to the project at the present time. The speakers, for the most part experienced electricians and practical men, urged many cogent reasons for delay; and it seems only fair, since what is known as the public's side of this question has found such full and frequent expression in the popular press, that the other should receive something like the attention and consideration it deserves. Since the bill fixing the time for the compulsory burial of the wires passed the New York Legislature, the electrical companies have been threatened with similar exactions in other parts of the country, and affairs have now assumed what, under the circumstances, must be considered a grave aspect. It was believed by many, the electrical companies included, that by the time the New York law went into effect, a practical means would have been found to operate the wires underground. Unhappily, this has not been the case, if we are to believe the best authorities. Continued experiment and study, while they have done much to remove the obstacles in the way of success, have not yet resulted in finding a solution of the problem in hand.

None of the speakers at the recent convention claimed that the project was impossible nor even impracticable, but that experimentation had not yet shown the time for burying the wires to have arrived. That is all. If the service is to be a popular one, economy is as important a factor as efficiency, and it is, therefore, as necessary to keep down the expense of the service as it is to check induction, leakage, and retardation. When we consider the fact that air is the best insulation and the ground the worst, it is scarcely reasonable to look for an expeditious and easy conquest in the struggle for a similar service underground as the public has become accustomed to receive over the aerial lines. To put all the wires in the metropolis underground is a great and costly undertaking; and to proceed with it without the most conclusive evidence of the practicability of the means employed would be hazardous, to say the least.

As a striking illustration of this, we have the experience in Washington. Two years ago the wires in that city were taken down and buried in plaster, and for a time so much success was had that it was used as a principal and, it must be said, a powerful argument in support of the assertion that an efficient means of burying the wires had been found. It seems, however, that the system has proved defective and troublesome, good service has been the exception, and recently it was found necessary to take them out on F Street and suspend them on poles in the old way. On Pennsylvania Avenue, too, there has been much trouble of late with the underground wires, and, according to one of the speakers before the recent convention, the electrical generators—we speak now of lighting apparatus—have frequently been found to be running dead on account of difficulties, the nature and location of which it has not always been easy to discover.

Cost is an important factor in the sinking of the wires. The Philadelphia authorities are so well aware of the expense of underground construction that, though ordering all private companies to bury their lines, they make an exception in the case of the lines belonging to the city, because of the large sum required.

Again, that description of arc light wire which is used for aerial lines costs only 1½ cents a foot, whereas, so says an authority, that for use underground costs 6 cents. The conduit now being laid in the New York streets, which is a series of ducts, ten to a prism, is in most of its essentials purely experimental. Proof of this is shown by the reports and contracts that have been made, and which leave some of the most important problems in the way of efficient and cheap service to be solved during the progress of the work; problems, it may be said, which skillful and experienced electricians have been unsuccessfully struggling with for many a day.

This is one way of burying the wires; and while it may satisfy the requirements of the statute books, it may not, when completed, give a like content to the general public, in whose interest the law may be presumed to have been made.

Progress of the Daft Electric Railway Motor.

A new and more powerful electric locomotive for the experimental section of the Ninth Avenue elevated railway, in this city, is now nearly ready for operation. The intermediate conducting rail, which is now of iron, is to be replaced by a bronze rail, as the rusting of the iron rail interfered with the conductivity. When these improvements are completed, the motor, it is believed, will prove to be a great success.

The Daft motor has been used for over a year in Baltimore on the Hampden Street Railway, which is two miles in length, and is one of the most difficult roads in the country to operate. There is one grade of 353 feet to the mile on an 89 degree curve; another of 319 feet to the mile on a 75 degree curve; and a third of 275 feet to the mile on a 40 degree curve. With horses and mules, they were able to make only four miles an hour. With the electric motor, eight are made. The cost of operating with horses and mules during eight months and twenty days was between $4,700 and $4,800. With the Daft motor during a like period, 32,907 more passengers were carried, and the cost was only $3,160. The motors that do that work each weigh 5,000 pounds, draw nine tons, and cost $2,500.

Crater Lake, Oregon.

A party sent out under the command of Captain Clarence E. Dutton, of the army, has succeeded in making a complete survey of Crater Lake, in Oregon, a body of water whose shores, with the possible exception of one point on the south, have never before been touched by the feet of white men. The party's boats were hauled 100 miles by mule teams, dragged by a detail of soldiers up the snow-clad sides of the ridge which surrounds the lake, and lowered by ropes from the crest to the water, 900 feet below. One hundred and sixty soundings were made, the result of which gave the general character of the lake bottom. Two large submerged cinder cones were found, respectively 800 and 1,200 feet high, the rest of the bottom being flat. Captain Dutton believes this to be the deepest body of fresh water on the continent. The greatest depth attained by the sounding line was 2,005 feet. He writes to Director Powell, of the Geological Survey:

"As regards the origin of the basin, I now have a decided opinion. It has, I think, been formed in much the same way as the great *calderas* of the Hawaiian Islands, by the melting of the foundations of the original mountains, the blowing out of the molten material in the form of light pumice and fine tufa. It cannot have been formed by an explosion, like Krakatoa and Tomboro, for there is no trace of the fragments anywhere in the country round about. But the pumice and tufa which surely emanated from this crater are seen in vast quantities anywhere within a radius of twenty to sixty miles, and in quantities ample to fill the whole vast crater twice over. The age of the crater is wholly post-glacial. I have found at the extreme crest of the wall on the western side splendid examples of glacial striation, while the old moraines are half a mile to a mile below. That the age of the *caldera* cannot be great is evident from the fact that though the walls are crumbling at a very rapid rate, the talus has not only not reached the water surface anywhere, but the sounding discloses little of it at the bottom."

Photometry.

In a note to the French Academy of Sciences, M. Charpentier points out a curious defect of the human eye, which is of great consequence in photometry. Take two sources of light, red and green; let them form on the photometer screen two disks of apparently equal brightness. Now approach the screen so that the disks appear to the eye to be larger; the green appears the brighter of the two. If the disks appear smaller, the red gains in brightness.

A new photometer has been introduced by Messrs. Yeates & Son, of Dublin. It consists of two prisms of solid paraffine connected together on one side, but with a layer of silver foil between them. This foil acts as a reflector for each, while, at the same time, it prevents light rays traveling from one prism to the other. When two illuminants are to be compared, they are placed on either side of the double prism until the illumination of each paraffine surface is equal. The distances of the two lights can then be measured, and the result recorded in the usual way.

A Successful Gas Locomotive.

For several months past, a locomotive propelled by gas has been in successful operation on one of the street railways at Melbourne, Victoria, Australia. A paper on the subject was lately read by Mr. John Danks before the Victorian Engineers' Association, from which we extract the following:

It was when talking over and comparing the great cost, with its labyrinth of ropes, wheels, and heavy machinery, of the cable system with the heavy engines used in Sydney, it occurred to us that by the application of the gas engine and a quantity of gas stored under pressure and carried to keep the engine supplied, a motor could be made to work roads of ordinary grades as effectively as the cable, and of not more than one-third of the weight of an ordinary steam motor. We put our ideas into form, and saw that by the application of friction gearing for giving motion to the wheels, we could allow the engine to continue working in one direction, and so avoid the delay of stopping and starting. Having matured our plans and having got the consent of the Commissioners for Railways to make use of the Alphington line, we procured a 3½ horse power Otto gas engine, and constructed the experimental car which the president described at the last meeting. The president was greatly interested in our first gas tramcar; we invited him to inspect and test it in any way he thought proper, and we placed it at his disposal for that purpose. He took great pains in experimenting and making notes of its performances, and very kindly furnished us with the result of his investigation, a copy of which, with his permission, I will now lay before the members of this society. During a period of some ten weeks, we ran a number of experimental trips, and exhibited it to all who wished to see it. Being anxious to put our invention to a more practical test, we entered into an arrangement with the government to carry passenger traffic and to work the Alphington line as a tramline. Under the arrangement, it was stipulated that we should supply a motor which would draw a carriage in which the passengers should be carried; for this purpose, we constructed a new motor with a six horse power engine and fitted with friction gear similar to our first experiment. The motor weighs 4½ tons, and the carriage 35 cwt., making a total of 6¼ tons without passengers. The supply of gas is carried in four copper containers each 16 inches in diameter and about 6 feet long, which were tested by hydraulic pressure, before being used, to 200 pounds to the square inch. The total cubical capacity of the four containers is 28 feet. These containers charged with gas compressed to ten atmospheres, or say 150 lb. per square inch, represent 280 cubic feet of gas stored, which is sufficient for a run of fifteen miles. We have never yet exceeded the pressure of 100 pounds, which we find gives ample supply to carry us to Alphington and back twice. We have, for compressing the gas, an engine and compressing pumps fixed near the line; with this we take the gas from the Metropolitan Company's main and force it into receivers, where it remains under pressure until required for use. When the motor requires a fresh supply of gas, it is brought opposite the receivers, and the containers on the motor are connected by a short India rubber hose to a pipe leading from the receivers. A tap is then turned, which allows the gas to pass from the receivers to the containers until the pressure is equal, when the tap is closed, the hose disconnected, and the motor is again ready to resume duty. The time required to charge the containers does not exceed two minutes. The engine, compression pump, and receivers need not be near the line; they may be placed one or two hundred yards away, in any convenient place, and the gas under pressure led to the line through a high pressure pipe. The time usually taken in running the distance from Clifton Hill to Alphington, some 2½ miles, is about sixteen minutes, and the same time is occupied on the return journey. The heaviest gradients are 1 in 50, of which there are three, and the sharpest curve is 18½ chains radius. The number of trips run each day is eight, or a total of about 40 miles per day, except Saturday, when an extra trip is made. The motor has now been working about four months, and the average consumption of compressed gas is 702 cubic feet per day, as measured by the meter through which it is taken.

The tram wheels are 2 feet in diameter, made of cast iron, chilled, and cast from a pattern found at one of the foundries. The friction wheels are also of ordinary cast iron, and are actuated for going forward, going back, or stopping by the movement of one lever. The motor runs round the carriage at each end of the line. We have, on one or two occasions, had as many as 40 passengers at one time, but I regret to say that good loads are very much the exception, the traffic on the Alphington line at this time of the year being very light. The repairs up to the present time have been almost *nil*.

The power of the gas engine is derived from a fuel which has no weight, of which a large quantity can be carried without adding to the load, and the supply of it has been shown can be replenished with the greatest ease. No boiler, coal, or coal bunker is required, and one man, not necessarily a mechanic, is all that is needed to take charge. It is true that the motor we have working is running upon a railway, and there may and no doubt would be more power required to work it on a street tramway. This, however, appears to be but a question of a larger engine; if a 3 horse will not do the work, then a 6 horse, and if a 6 horse will not do the work, then a 12 horse. It is only a question of more power and a larger expenditure of gas, which the president has shown is not a matter of great importance. The fact of our having run a motor 40 miles a day for 4 months has, I think, established the principle, and has proved to a demonstration what can be done.

The Salt Mountain of Palestine.

BY SELAH MERRILL, LL.D., U. S. CONSUL, JERUSALEM.

Palestine possesses a remarkable salt mountain situated at the south end of the Dead Sea. The length of this ridge is six miles, with an average width of three-quarters of a mile, and the height is not far from 600 feet. There are places where the overlying earthy deposits are many feet in thickness, but the mass of the mountain is composed of solid rock salt, some of which is as clear as crystal. How far this deposit of salt extends below the surface of the ground, no one at present knows. At some points, this ridge, which is on the shore of the Dead Sea, approaches very close to the water, and at others it recedes until it is fifty or more yards from it. Just here the water of the Dead Sea is much more salt than it is at the north end, where the Jordan enters the lake.

This salt is a government monopoly. The same is true of the salt that is contained in solution in the Dead Sea itself. If Arabs or the natives of the country were found getting salt from the shores of the Dead Sea or from this salt mountain, they would be arrested at once. Most of the salt used in Hebron, Jerusalem, and elsewhere in this part of Palestine, comes from these sources, but it is gathered under the direction of government officers, and the revenue is supposed to go to the government.

In this salt mountain, to say nothing of the salt of the Dead Sea, there is a mine of wealth; and if capitalists were allowed to come in and work it, the prosperity of this part of the country would thereby be greatly increased.

I have examined personally this salt mountain, and talked with the Pasha of Jerusalem, who is also the Governor of Palestine, as to the desirability of companies being formed which should prepare this salt for use and ship it to the markets of the world; but at present the Turkish government is hostile to any such project.

Specimens of salt from this salt mountain were sent by me to the care of the Department of State, designed for the exposition at New Orleans in 1885.

Jerusalem, August 9, 1886.

Electric Boat.

The Spark, which has recently been launched at the Royal Gunpowder Factory, Waltham Abbey, is an electric boat about 25 ft. long and 5 ft. beam. It was designed by the superintendent, Col. W. H. Noble, R.A., mainly as a means of lighting up some of the powder houses in the factory, which are at a considerable distance from the dynamos used for general electric lighting purposes.

The details of construction have been worked out by Mr. Thomas Webb, the chief engineer in the gunpowder works, who has given much attention to the subject of electric lighting. The lighting and motive powers of the boat are derived from a battery of accumulator cells, stowed under cover amidships, and a small 1½ horse power motor, which turns the shaft to which the screw propeller is attached. The accumulator cells were supplied by the Electrical Power Storage Company, of which Mr. Drake is the manager, and are those known as No. 23 S type. Each cell consists of a wooden (teak) box 7⅜ inches in length by 8¼ inches in width by 10¼ inches in height, and weighs 45 lb. complete. Inside the box are a number of lead plates of special form surrounded by acidulated water, which is poured in through a small hole in the top of the box. Two strips of lead project about a couple of inches from the top of the box; these are the positive and negative poles, and by attaching the positive pole of one box to the negative pole of another, and so on, a number of boxes are coupled together so as to form a battery.

When a current of electricity is passed into a battery of this construction, certain chemical changes take place, and the battery becomes capable of retaining, or rather absorbing, the electric energy due to such a current and of subsequently discharging or giving it out in the form of light, heat, or power as required. In fact, a certain quantity of electromotive force is, so to speak, bottled up, and a battery of accumulator cells thus takes the place of a gasometer as regards lighting and of a steam boiler as regards motive power. The total number of cells in Colonel Noble's boat is 30, and these are connected together as above described and stowed away under a kind of deck in the center of the boat. To charge the battery, the boat is brought up one of the factory canals alongside the "dynamo house," and the two wires leading from this electric generator are attached respectively to the positive and negative poles of the battery. The dynamo, which is driven by a steam engine, is then started, and a charge of electricity is run into the battery until the acidulated water assumes a milky appearance and begins to give off gas bubbles. The battery has now taken in as much electromotive force as it is capable of absorbing, and the poles are disconnected from the dynamo.

The boat is now ready for use, and the poles are connected with the motor or dynamo electric discharger in the stern through a "reversing switch," controlled by a handle, which when turned in one direction causes the motor to act and the screw to go ahead, and in the other direction to go astern. Now, if it be desired to light up any powder house, the boat is run alongside, the poles disconnected from the motor and reconnected to the wires which communicate with the electric incandescent lamps in the house. Most dangerous operations are carried on in many of these houses, and hitherto no light of any description was permitted even to approach them. The consequence was that as soon as it became dark all work had to cease. With the aid, however, of the electric light accumulator boat and special safety lamps, work can now be carried on by night as well as by day. The speed of Col. Noble's boat is from five to six knots an hour, and so far as can be judged from the trials made up to date, it is a perfect success.—*London Times.*

A Watchmaker's Epitaph.

As one of the "Curiosities of Literature" connected with watches, we may cite the following, which can be seen in the churchyard at Lydford, Devonshire, England:

"Here lies in a horizontal position
The outside case of
George Routledge, Watchmaker.
Integrity was the main spring and prudence
the regulator of all the actions of his life;
Humane, generous, and liberal,
His hand never stopped till he had relieved
distress;
So nicely regulated were his movements that
he never went wrong,
Except when set a-going by people who did not
know his key;
Even then he was easily set right again.
He had the art of disposing of his time so
well
That his hours glided away in one continued
round of pleasure,
Till in an unlucky moment his pulse
stopped beating.
He ran down Nov. 14, 1801, aged 57,
In hopes of being taken in hand by his
Maker,
Thoroughly cleaned, repaired, wound up, and
set a-going
In the world to come, when time shall be
no more."

Penetration of Light in Water.

Further experiments have been made by MM. Fol and Sarasin to determine the depth to which light penetrates the water of lakes and seas. Their method of observing consisted in placing gelatino-bromide photographic plates at different depths under the water; the plates being lowered by a sounding lead, and protected from the action of the sea water by a varnish. Experiments were made about 1,300 to 1,400 meters off the Cape of Mont Boron, at Villefranche in the Gulf of Nice, and in water about 550 meters deep. During April the limit of penetration of the daylight about midday, during fine weather, was found to be about 400 meters; an observation which confirms the previous conclusions of the authors as given in our columns. Other observations showed that there is a penetration of 300 meters all the time the sun is above the horizon, and of 350 meters during eight hours of the day. According to experiments of Bunsen and Roscoe, the active intensity of blue sky on April 21, at Vienna, was 33 at 8:30 A.M., 38 at noon, and 14 at 6 P.M., while that of the sky and sun together was 75 at 8:30 A.M., 133 at noon, and 15 at 6 P.M.

Gun Forgings and Armor Plates Called for by the Government.

The Secretary of the Navy has recently issued proposals inviting the steel manufacturers of America to compete in furnishing the government with gun forgings and armor plates suitable for the new vessels which Congress has authorized to be built. In the official advertisement, which will be found on another page, it is stated that no bids will be considered except such as engage to produce "within the United States" the steel required, and the bidder must prove that he "is in possession of, or has made actual provision for, a plant adequate for its fulfillment." Nearly 6.000 tons of steel, of the highest quality and sizes, difficult of manufacture, are thus called for, and its production here will tend to still further stimulate the activity in the iron and steel business, which has become so pronounced within a few weeks past.