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NEW YORK, SATURDAY, APRIL 6, 1901.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

PROSPECTS OF THE NEW ERIE CANAL.

In reply to a committee from the Commerce Convention in Syracuse, Governor Odell has expressed himself as being opposed to the policy of urging the Legislature to authorize the construction of the Erie Canal along the lines of the scheme which was strongly indorsed by his predecessor. As an alternative, the Governor is in favor of the completion of what is known as the project of 1895.

The canal, with the exception of such work as has been done in carrying out the 1895 scheme, is in the condition in which it was left after the enlargement of 1862. It has a depth of 7 feet, a bottom width of 52 feet and is capable of accommodating boats of 240 tons, with a capacity of 8,000 bushels of wheat. The plan of 1895, which is the one now indorsed by the Governor, provides for the deepening of the canal to 9 feet, with top and bottom widths of 73 and 49 feet, thereby providing accommodation for boats of 450 tons, with a capacity of 15,000 bushels of wheat. It provides for a single pneumatic, or some other form of single mechanical lift at Cohoes and Lockport, together with other changes at important points along the route of the canal. The estimated cost of this project is $2,161,645.

The alternative scheme, which was reported upon about twelve months ago by the Special Committee on Canals, calls for the enlargement of the canal to a depth of 12 feet, and a bottom width of 75 feet, with capacity for barges of 1,000 tons carrying 33,335 bushels of wheat. The scheme is estimated to cost $62,000,000; and it was drawn up on these ambitious lines because it was felt by the committee, in view of the recent completion of the Canadian system of canals with a minimum depth of 14 feet throughout, and in view of the strenuous effort which is being made to divert the Western wheat trade to Canadian ports, that the time had come to enlarge the Erie Canal sufficiently to enable it to compete successfully against its well-equipped rival. It was found that the 9-foot canal, while it was a decided improvement, as far as it went, would be altogether inadequate to meet the present emergency. The larger scheme, it was urged, would have a capacity of 20,000,000 tons per annum, and that the saving on that tonnage as compared with the present canal would be $12,200,000 per annum. The proposed canal could carry freight at a third of the cost by rail, and, as compared with the lowest rail-rate ever quoted, the saving across the State of New York, on a prospective tonnage of 20,000,000 tons, would be about $18,000,000 per annum.

After a careful study of the question, the Governor says he is satisfied that, on account of the strong opposition in some sections of the State against any further use of the State's money for canal purposes, it will be impossible to secure favorable legislation for the expenditure of the $62,000,000 required for the larger scheme. He is satisfied that the 9-foot canal would be regarded by the Legislature in the nature of a compromise, and that the necessary money for its construction could be secured.

We thoroughly agree with the Governor in his conviction that if anything is to be done in the way of improvement in the Erie Canal, it must be done at once, and that if the question should be allowed to lie dormant a few years longer, it might be impossible to secure appropriations of any kind for canal improvement. At the same time, we cannot but feel that if the citizens of this State, particularly those that live in what are known as the "granger counties," could be induced to look upon the question broadly, and not merely from the viewpoint of local interests, they would see that the construction of the 12-foot canal would promote the interests, not only of the terminal points at Buffalo and New York, but indirectly, by the multitudinous and far-reaching benefits which always accrue from a general increase of trade, the interests of the whole State. It is scarcely to the point that Governor Odell should draw a contrast between the crowded state of the canal docks in his boyhood's days and their comparatively deserted condition just now. In those days, not only was railroad competition less severe, but the canal, as such, was adequate in conveniences and methods to the necessities of the time; whereas to-day in its present condition, it is as much out of date as a system of one-horse street cars would be on the Broadway surface line in this city. With a 12-foot canal and 1,000-ton barges, the economic conditions of operation would be so vastly improved that we think the Governor would soon witness a return to the prosperous conditions of an earlier day.

WATER-TUBE BOILERS IN THE BRITISH NAVY.

At a time when our naval authorities are adopting the water-tube boiler, exclusively, for use in our new warships, the recent adverse report of the British Admiralty Committee against the use of the Belleville water-tube boiler cannot but excite great interest in this country. Indeed, the British navy is so vast, and its constructors and engineers have been in the main so successful in producing permanent types of vessels, that a reversal of their policy, involving the practical condemnation of the boiler power of the numerous and powerful ships that have been built during the past four or five years, has produced a pronounced sensation throughout the whole naval world.

The determination to adopt this boiler was made after a series of trials carried out in one of the gunboats of the navy, and the "Powerful" and "Terrible," cruisers of over 14,000 tons displacement and 22 knots speed, were the first important vessels in which it was placed. Following close upon the trials of these ships came the announcement that the Admiralty had decided to install the Belleville boiler in all future battleships and cruisers. The "Powerful" and "Terrible," however, had not been long in service before complaints began to be heard against the performance of the new boilers under daily service conditions. There were difficulties in maintaining the desired steam pressure, and they proved to be very extravagant in coal consumption. Although a consumption of fuel of about 1.8 pounds per indicated horse power per hour was given out as the result of a trial, it was found that the average consumption of the same ship, when cruising, was between 2.5 and 2.8 pounds per indicated horse power per hour. When we compare this with the consumption of 1.3 pounds, actually recorded last season on the fastest transatlantic steamer, and with the consumption of 0.97 pound recently achieved on a 400-mile trial of one of the freighters of the Inch Line of steamers, it can be seen that an adverse report from the Admiralty Committee was a foregone conclusion. We cannot do more than briefly summarize the more important findings of the committee, and must refer our readers to the current issue of the SUPPLEMENT for the full report.

In the first place, the committee are of the opinion that the advantages of the water-tube boiler, from the military point of view, are so great that, provided a satisfactory type can be found, it is preferable to the ordinary cylindrical type. They do not consider that the Belleville boiler has any such advantage over other types of water-tube boilers as to lead them to recommend it. The principal objections of the committee to this type are that the circulation of the water is defective; that an automatic feeding apparatus of a delicate and complicated kind is necessary; that a great excess of pressure is required in the feed pipes and pumps over the boiler pressure; that the water-gages do not reliably indicate the water-level; and that the up-keep of the Belleville boiler has so far proved to be more costly than that of the cylindrical boilers; while the additional evaporating plant required and the greater coal consumption on ordinary service as compared with cylindrical boilers, has hitherto nullified to a great extent, the saving of weight effected by its adoption. Lastly, the evidence before the committee showed that a large proportion of the coal expended in the navy is used to distill water and for other auxiliary purposes; and for such purposes the cylindrical boiler is considered to be more suitable and economical than any type of water-tube boiler. The report recommends that, as regards future ships that may be authorized, the Belleville boilers should not be fitted; as regards ships recently ordered, on which not much work has been done on the boilers, the boilers be not fitted; while the boilers are to be retained on completed ships and on those under construction, in which any alteration would delay completion.

While condemning this particular type, the committee is fully alive to the manifest military advantages of water-tube boilers as such; and they recommend an extended trial of four types of straight-tube boilers, which are now being adopted in foreign navies. These are the Babcock & Wilcox, the Niclausse, the Dürr, and the Yarrow large-tube boiler. It will thus be seen that a large section of the most recent ships of the British navy is equipped with a boiler which its own expert committee condemn, a fact which proves that in naval, as in many other matters, it is well to make haste slowly.

LONGITUDINAL FRAMING FOR THE HERRESHOFF CUP-YACHT.

Each of the two yachts that are being built for the defense of the "America" cup will present decided features of novelty among boats of their size and purpose. The Crowninshield yacht, as we pointed out in our issue of March 30, presents novelty of form, being for a 90-foot craft a wide departure from the Herreshoff model, and a purely original creation. The new Bristol boat, on the other hand, will adhere closely to the "Columbia" in form, but will differ radically from her in construction, her designer having broken away from traditional ideas—at least, in yacht construction—by substituting longitudinal framing for the transverse framing by which, from time immemorial, the boat-builder has given his craft the necessary strength. In the transverse system, as followed in "Independence," the form of the boat is preserved by 79 frames, spaced 21½ inches apart (not 2½ feet, as, by a typographical error, was stated in our last issue), and the longitudinal strength is afforded by tie-rod trussing in the overhangs, by side and bilge stringers, and by the natural resistance to distortion of the hull and deck plating, acting in a general way as a tubular girder. On this system, the transverse framing is the fundamental feature, and the longitudinal system is subsidiary to it. In the new Bristol boat, the main framing is longitudinal, and the transverse frames are worked in as subordinate and auxiliary. The result is a reduction in the total weight of material for a given strength. The idea is new in yachts, but not in naval architecture, Brunel having built the "Great Eastern" half a century ago on this system. It is stated that Herreshoff has reduced hull weights 25 per cent as compared with "Columbia." This is manifestly impossible; if he has saved from 7 to 10 per cent, he has done well.

OUR ADVANCING TRADE.

Although the recent increase in the exports of iron and steel manufactures from the United States has been simply phenomenal, there is at present no sign of falling off of the rate of increase. An analysis of the February export figures shows that for the eight months ending with February, 1901, the total export is six and a half millions greater than the truly phenomenal figure of last year, and nearly three times the total for the eight months ending with February, 1891, which means an increase of 10 per cent in a single year, and 333 per cent in the decade. In the eight months ending with February, 1901, iron and steel formed 3 per cent of the total domestic exports, whereas in the eight months just ended they formed 7 per cent. These total figures are particularly gratifying when it is known that the exports cover a great diversity of products, thus proving not only that our manufacturers are rapidly increasing their output, but that they are each year fabricating a large proportion of the product, and thereby securing for themselves and for the labor employed the greater share of the profits arising from such manufacture. Thus, ten years ago, such articles as typewriters, cash-registers, pumping machinery, electrical machinery, and other articles requiring a high degree of manufacture, had no place in the export schedules of the United States; whereas now they constitute an important part of our annual exportations of iron and steel, and are steadily increasing both in volume and in the number of foreign markets in which they find profitable sales. To take a single instance, we may quote electrical machinery, in which in 1891 no exports whatever were recorded; while in 1900 the figures for the transactions of two-thirds of the year had reached about $2,500,000. For a similar period in the present year they had risen to over $3,500,000. Another gratifying feature is the fact that the area of distribution steadily and rapidly enlarges. Exports which formerly went only to the principal countries of Europe are now shipped to China, Japan, Australasia, Africa, and the islands of the South Sea, where such articles as sewing machines and typewriters find a market in the most distant islands.

SYLVICULTURE AND THE SUEZ CANAL.

In an interesting article on the above topic, the Revue des Questions Scientifiques describes as follows the highly successful efforts of the Suez Canal Company to protect the banks and approaches of that great highway of the world's commerce by a systematic planting of trees and shrubs of various sorts.

The Suez Canal Company is utilizing to great advantage saplings, shrubs, and large trees in order to consolidate its banks, and to preserve the maritime canal from the encroachments of the desert. The operation began in 1897, and was continued from year to year with the improvements suggested by experience.

For the purpose of diminishing the effects of erosion at the edge of the banks of the maritime canal, and of the swells caused by the passage of vessels, there has been planted at the water's edge a reed of unusual dimensions, the Arundo gigantea, which speads its roots rapidly in the water and quickly attains a height of from ten to twenty feet. Farther back, on the slopes of the banks, there is employed with success several varieties of tamarisks (T. gallica, T. nilotica, T. articulata), whose branches take root when the sand hills just cover them, and which are intermingled with herbaceous plants like the orach (Atriplex halium) and the alfa (Stipa tenax).

In addition to the foregoing precautions it was necessary to protect the canals from the encroachment of the desert sands driven by the wind. To accomplish this there has been established, at about 350 feet from the water's edge, hedges formed of arborescent species, and 170 feet long. The filao, with horsetail leaves (Casuarina equisitifolia), an Australian tree quite well naturalized in Egypt, the acacia of the Nile (A. nilotica), the eucalyptus globulus et robusta; the cypress of Lambert; the caoutchouc and Bengal fig trees (Ficus elastica, F. bengalensis); poplars, mulberry trees and even the sycamore generally thrive well on these plantations, especially in silicious soils; this, however, is due to artificial irrigation obtained by cutting ditches from the fresh water canals derived from the Nile for the sustenance of the inhabitants.

Vegetation is more rebellious where the soil is found to be argillaceous, compact or too solid. In order to overcome this the lime-bearing waters of the Nile have been brought down, after much labor, and now a number of tamarisks, willows, orachs and other trees thrive well.

On the banks where the swells of passing vessels would endanger the young plantations of reeds, they are sheltered, for the first few years, by hurdles which are taken elsewhere when the plants thus protected have acquired sufficient strength.

THE HEAVENS IN APRIL.

BY HENRY NORRIS RUSSELL, PH D.

Although Mars is now some time past opposition and more than eighty million miles distant, he is still the most interesting object in our evening skies; and this not so much for what we know about him, as what we imagine.

The belief in his habitability, rather strengthened than diminished by the discoveries of recent years, but as yet incapable of proof or disproof, finds its most appealing presentation to the public mind in the idea of possible signaling between men and the inhabitants of the planet.

Let us for the present assume that such intelligent inhabitants exist, and that the Martian canals are their work. We may then go on to consider what signaling to them involves, and whether it would be mechanically possible.

At the outset we are limited to two ways of signaling—by means of light, and by the electric waves of the same nature but enormously longer period used in wireless telegraphy, since these alone, of all earthly means of communication, can pass through interplanetary space. Of these two, light is by far the most promising, as the unaided eye can detect a far smaller amount of energy in that form than the most delicate instruments can in the form of electric waves.

When Mars is nearest us, the earth is almost directly between him and the sun. In consequence we can only see Mars at night, and his sunlit side is turned toward us. From Mars, on the contrary, only the dark side of the earth can be seen, and that in the Martian daytime. Therefore signals from the earth to Mars would have to be made by artificial light, while those in the reverse direction might be made with reflected sunshine. Moreover, our signals would be obscured by the glare of the Martian sky close to the sun; while theirs would have only the light of the planet and stars to interfere with them. For both these reasons it is much easier for the Martians to signal to us than for us to reply, and therefore we will first calculate on the supposition that they are flashing to us with reflected sunlight.

It is surprising how small a mirror will suffice to produce signals visible at a considerable distance in broad daylight. One three inches in diameter gives flashes which are conspicuous to the naked eye ten miles away. Indeed, this is the system of heliographing messages of which we have heard so much from South Africa. The writer has no available data as to the minimum size of mirror which can be used. It is, however, probably safe to allow an inch of diameter of the mirror for each ten miles of distance if the signals are to be clearly read by the naked eye, and we will use this ratio in our work.

In the case of Mars the signals would be observed with large telescopes transmitting perhaps 10,000 times as much light as enters the naked eye from the same object. In consequence the Martians' mirror need have only 1-10,000 of the area or 1-100 of the diameter that our heliograph rule would require. We need make no extra allowance for the fact that the Martian signals are to be observed at night, since they would be seen against the bright background of the planet's disk, just as the terrestrial flashes are seen against sunlit sky or hills.

Our final ratio is then one inch of mirror diameter for each thousand miles of distance. Now the least possible distance of Mars is 35,000,000 miles. The mirror with which its inhabitants signaled to us would therefore have to be at least 35,000 inches or nearly 3,000 feet in diameter. To produce such a piece of glass is clearly far beyond the present resources of human engineering. It seems possible, however, that beings who could construct the Martian canals could also make such a mirror, but once made its mounting would present still greater trouble. It would have to be set up so that its plane was equally inclined to the directions of the earth and sun, and moved by some sort of gigantic clockwork, to counteract the planet's rotation just as telescopes have to be moved on earth. To make flashes by covering up the whole enormous structure, or by tilting it, seems hardly possible; but this end could be attained by a mirror composed of parallel strips, like the slats of a window blind, which could all be turned out of their plane at once, and later brought back to place by relatively simple mechanism; the whole to be mounted in a great frame moved by the clockwork spoken of above. No firm on earth would take the contract for such an apparatus; but it does not seem impossible that the human engineering of a few centuries hence might be equal to the task. So we reach the interesting conclusion that it is not inconceivable that men residing on Mars might be able to heliograph messages to us; and we cannot deny the same ability to the Martians, however unlike us they may be.

How hopeless the task of signaling to them would be we can now see. What gigantic conflagration, what combination of all the searchlights of the world, could produce a ray equal in intensity to a solid beam of sunlight a thousand yards across? How could we point them all correctly? And how interrupt their light at will? Remembering that these are the conditions for sending a message from Mars and that it is much more difficult to signal in the reverse direction, we may give up once for all the idea of any regular communication between the two planets.

THE HEAVENS.

As we once more watch the heavens at 9 o'clock on the evenings of the middle of the month, we see that we must soon bid good-bye to many of our old friends among the stars.

Canis Major, Orion, Taurus, and Perseus are all close to the horizon, and before another month has passed we shall lose them all. Cassiopeia, in the far north, escapes a similar fate only because her diurnal circle about the pole does not quite dip below our horizon. Auriga, Gemini, and Canis Minor are higher in the western sky, and we shall not lose them for some time yet.

Ursa Major and Leo are at their highest, fairly on the meridian. Lower down on the east is Virgo, with the brilliant Spica, and the arc of fairly bright stars between it and Leo. Below this is the little but conspicuous quadrilateral of Corvus, the Crow, who is perched on the back of Hydra, whose whole length can now be seen stretching from Canis Minor to Libra.

Arcturus is well up in the east, and Vega has just risen. Between them are the graceful circlet of Corona Borealis, and the extensive constellation Hercules, and below are parts of Ophiuchus and Serpius.

THE PLANETS.

Mercury is morning star all the month. His greatest elongation occurs on the 3d, when he is unusually far from the sun, but as he is also south of him, he rises only about an hour before sunrise.

Venus is morning star till the last day of the month, when she passes through inferior conjunction and resumes the rôle of evening star. She is too close to the sun throughout the month to be well seen.

Mars is still in Leo, moving westward till the 4th, then slowly eastward. He comes to the meridian about 8 P. M., and does not set till nearly three in the morning.

Jupiter is in quadrature with the sun on the first; that is, he is 90 degrees west of him and on the meridian at 6 A. M. Saturn comes to a similar position on the 5th. The two planets are getting quite close together in the constellation Sagittarius and will remain so for some months.

Uranus is farther west, in Scorpio, and rises about 11 P. M. on the 15th. Neptune is in Taurus, nearly opposite the planet last named.

THE MOON.

Full moon occurs on the evening of the 3d, last quarter on that of the 11th, new moon on the afternoon of the 18th, and first quarter on the forenoon of the 25th. The moon is nearest the earth on the 18th, and most remote on the 4th.

She is in conjunction with Uranus on the night of the 8th, Saturn on the morning of the 11th, and Jupiter on the afternoon of the same day; with Mercury on the morning of the 17th, Venus on the afternoon of the 18th, Neptune on that of the 23d, and Mars on the morning of the 27th.

AUTOMOBILES IN NEW YORK.

The above was the title of an address by G. Herbert Condict, before the New York Electrical Society. on March 27, at the new station of the Electric Vehicle Transportation Company, corner of Forty-ninth Street and Eighth Avenue, in this city. Before a very large audience, standing in an electric runabout for a platform, Mr. Condict related briefly a few facts concerning the rise and growth of electric transportation. He remarked that there were at the present time four hundred and fifty automobile vehicles in New York, as compared with about four thousand horse-drawn. In the next twenty years it was a possibility that no horse-drawn vehicles would be permitted in the streets, and so the vast expense of keeping the latter clean would be saved.

It was during seasons of snow and ice, when the smooth pavements were slippery, that the demand for electric vehicles was the greatest, and frequently overtaxed the facilities of the company. At these times, on one occasion, as many as four hundred calls an hour had been received. The company, of which Mr. Condict is the chief engineer, decided in the spring of 1900 to secure larger quarters, and began the work in August of last year of transforming half of the great building on Eighth Avenue, between Forty-ninth and Fiftieth Streets, formerly used as the Eighth Avenue car stables, where over 1,500 horses were accommodated, into an enlarged station covering three acres, equipped with motor current transformers, which take the Edison alternating current at 3,200 volts and deliver direct current at 110 volts; a special switchboard, which controls the current supply to six hundred separate sets of batteries, with room to spare for controlling one thousand batteries at a time; electric motor automatic water pumps for supplying the roof tank which produces the hydraulic pressure for elevating the sets of batteries and transferring them to and from the vehicles; an immense battery room, ventilated by two large electrically-operated fans in the roof; two great electrically-propelled cranes spanning the room, arranged with separate motors, for lifting and lowering individual sets of batteries from or to the charging fingers on the floor; a battery repair room, a well-equipped machine shop on an upper floor, a motor room for repairing and adjusting motors and parts to vehicles, a blacksmith shop, a paint shop, and adjoining the machine shop a long room having a double trolley wire overhead, on which runs a trolley carriage, and from it the current is conveyed by a flexible wire to a cab for testing the motors and the running of the vehicle without a battery.

When a vehicle comes in for the day the battery is transferred to the charging room, and the vehicle is washed and sent up stairs. There it is carefully inspected, the rubbed plate battery connections are brightened with sandpaper, the motors are cleaned, the vehicle trimmings examined, and the tires blown up. It is then ready for the next day's business.

So complete are all the arrangements that it was stated within fifteen seconds of the receipt of a telephone call a cab is started on the way to answer it.

The station and the system is regarded as the largest in the world, and is the most unique and perfect in all its appointments for the rapid handling of individual batteries and inserting and withdrawing them from vehicles. It represents the possibilities of the practical use and application of electricity on a large scale as applied to transportation. This system was illustrated in the SCIENTIFIC AMERICAN, March 25, 1899.

METHOD OF DETECTING HYPO IN PHOTOGRAPHIC WORK.

The importance of thoroughly eliminating the hypo from negatives or prints in photographic work is so well recognized that it need not be insisted upon, and it will therefore be useful to give a method which has been brought out in the Belgian Photographic Bulletin for detecting small traces of hypo in the washing water and thus observing when the operation is finished. Into a deep tray is poured a small quantity of the water or solution in question and a few pieces of granulated zinc are thrown in, after which add a few drops of hydrochloric acid. Place above the tray a filter paper wet with a solution of acetate of lead. If the least trace of hyposulphite remains in the solution the paper will become brown, and afterward assume a black metallic appearance. This action is due to the formation of hydrogen sulphide, which escapes to the surface and colors the paper by forming lead sulphide. In this way it is always easy to determine when the washing is finished or to examine a solution suspected of containing hypo.