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LIGHT-SHIPS ACROSS THE ATLANTIC.

In a recent number of the SCIENTIFIC AMERICAN, a correspondent signing himself C. G. R. advises the establishment of a chain of light-ships across the ocean, electrically connected with the shore. This plan is good but not original, having been suggested about a year ago by a member of the Institution of Civil Engineers (English). The latter, however, confined himself strictly to the scientific aspect of the scheme; but it would not be difficult to show that from a nautical standpoint, also, it is far from impracticable. The experience with light-ships proves that a vessel, if properly constructed, may be made to ride out the fiercest storms at anchor save upon rare occasions, and the light steel cables of recent construction have been successfully used to anchor ships in the deepest water "off soundings." Let us suppose a chain of light-ships, seven in number, to be stretched across the ocean from the Grand Banks to the shores of Ireland. Then the distance between shore and ship and between the ships themselves would be about 250 miles. Each ship would ride to a mushroom anchor, which would permit it to swing to the tide without fouling its anchor. Only a small dynamo-electric machine and engine would be required to keep an arc light aglow in the tops.

The deep sea cable extending along the whole line and connecting the light-ships with the shore could be brought to the surface near each ship and buoyed, so that electrical connection could be made or broken at will. Each vessel would have permanent moorings; the anchor cable being made fast to a buoy and not to the light-ship itself, so that, in case of peculiarly unfavorable conditions of weather, such as a hurricane, for instance, a light-ship could slip her cables and run before it or be hove to under a small trysail, or permitted to drift to leeward under a floating anchor, regaining her moorings when opportunity offered.

The advantages of such a system of light-ships must be apparent even to the most pronounced landsman. The stations being only 250 miles apart, no ship upon the high-seas, if following the alignment of the light-ship, need at any time be more than 125 miles from telegraphic communication with the shore or from succor in case of mishap. This would be only an eight hours' run, and even much less for a first-class steamer, and about twelve hours' run for a sailing vessel with a fair wind.

The position of each light ship would, of course, be accurately determined and laid down on the U. S. Coast Survey and Admiralty charts, and the masters of sailing ships that had been beaten about in storms and thick weather would be enabled to get their latitude and longitude without relying upon the chance of speaking a steamer. It would only be necessary to read the number of the nearest light-ship by the aid of their glasses, and a reference to the chart would then give them their true position, whence they could take a new and correct departure. The progress of the great Atlantic liners could be telegraphed daily to both America and Europe, if kept within sight of the light-ship, and that painful suspense which now attends the breaking of a shaft or rudder would rarely, if ever, be experienced.

Dispatches, if urgent, could be sent to ships in mid-ocean. In the case of fast going steamers, it would, of course, be impracticable to stop for these, nor would such a course be necessary, because by means of what is known as the "wig-wag" system of signaling ordinary messages could be rapidly exchanged between a light ship and a passenger steamer. This "wig-wag" system is based upon the principle of the Morse telegraphic alphabet, the dots and dashes of the latter being represented by waving a flag to the right and left by day and passing a white light to the right and left of a red at night.

Freighters and ocean tramps, instead of roaming over the seas inquiring of vessel after vessel where the best freights were being paid, could receive advices in mid-ocean from their owners or agents as to the most advantageous market.

MAKING A TUBE.

Straight tubes of sheet metals of all diameters from one-eighth of an inch up, of oval, and square, and octagon, as well as of cylindrical cross section, are rapidly produced in sheet metal manufactories either drawn in presses without seam, or formed in dies and rapidly soldered along the seam. These are sold at hardware and tool stores at a price much lower than a single one could be made by hand. But there are occasions when the machinist requires a tube of some non-standard diameter, or he needs a tapering pipe that cannot be readily found in stock. In order to form one a mandrel of the proper inside dimensions must be prepared—an ordinary iron mandrel. Cut a slip of paper about half an inch wide to meet around the mandrel, with an addition to its length of the thickness of the sheet metal to be used. The length of this paper slip is the width of the sheet metal to be cut to form the tube. If the tube is to be a tapering one, cut two slips, one for each end, place them the proper distance apart on the sheet metal to form the length of the tube, and draw lines from ends to ends.

After cutting out the metal form, bevel with a file the inner edges of the plate, so that when rolled up the outer edges will meet, while the inner edges do not quite come together, but have a V-shaped channel. The tube may be formed by laying the sheet over a V-shape score in a block of wood, placing the mandrel on its center, and beating on the mandrel with a mallet or a soft metal hammer; and the edges of the sheet may be made to meet by lightly coaxing with the copper or Babbitt metal hammer. When the edges meet, secure them with loops of fine wire, twisting the ends. See that the seam of the tube is clean, and then spread on it, inside, a paste made of borax calcined on a plate of iron or a pan of iron over the fire and mixed with water. Sprinkle on the seam inside some spelter solder, or the wire solder that is found at hardware stores; heat over a brisk flame fire, preferably of charcoal, and the solder will melt and make a good joint. Cool the completed tube, remove the binding wires, immerse the tube in a bath of one part, volume, of sulphuric acid to four parts water for a few minutes; wash in clean water, and scour with sand or emery.

HORACE LORD.

Horace Lord, the superintendent of Colt's Works, Hartford, Conn., died in that city Feb. 28, after a brief illness. Perhaps as much of the wonderful success of these celebrated works was due to him as to any other person excepting Col. Colt himself; for Mr. Lord was not only a practical mechanic, but also the inventor of a number of machines and of improvements in the methods of production of the famous revolving chamber pistols that are so intimately associated with the name of Col. Samuel Colt. Mr. Lord was connected with Col. Colt from the first beginning of the pistol business in 1851 as assistant superintendent, and subsequently as the chief superintendent. Although Mr. Lord was a prominent and public-spirited citizen of Hartford, and one of the most noted among those connected with Masonry and Temperance, a strong Union man, and a stanch abolitionist, he will be remembered by the public generally for his connection with the great Colt's works, and by his friends as a kind hearted, generous, genial man. He was in his seventieth year at the time of his death, but his wonderful vitality gave him the appearance of a much younger man.

HOW SHALL THE ERIE CANAL BE IMPROVED?

Whether or no the Erie Canal should be deepened and widened is one of those questions on both sides of which much may be said, and which not even the most experienced are able to decide with anything like certainty. There can be no doubt that the deepening of the water and the enlargement of the locks would be followed by an increase in the business of the canal; but would this increase of business compensate for the extraordinary outlay required?

Less than a fifth of the freight between Buffalo and New York now takes to the canal, whereas thirty years ago it carried nearly nine-tenths. Is this because the canal has been permitted to remain unimproved, or is it because the growing commerce demands greater facilities and a quicker mode of transit? The whole question was under discussion at two recent meetings of the American Society of Civil Engineers, and the fact that able and well informed men were found espousing both the one side and the other, and that no decision was finally reached, shows that it is one of more than ordinary difficulty.

The discussion was brought about through the reading of a paper on "The Radical Enlargement of the Artificial Waterway between the Lakes and the Hudson River," by State Engineer E. Sweet, M. Am. Soc. C.E. Mr. Sweet is in favor of enlarging the canal so that it can accommodate the largest vessels now navigating the lakes, and so as to even anticipate the lake vessel of the future of still greater draught. He thinks the canal should have a depth of 18 feet at least, with a width at the bottom of 100 feet. But this is by no means all that would be required to make the canal the most natural highway for that great Northwestern commerce to which, in Mr. Sweet's opinion, it would under more favorable conditions fall heir.

Mr. Sweet roughly estimates the cost of this work at $125,000,000 to $150,000,000, and its annual tonnage at from 20,000,000 to 25,000,000 tons. He believes that with the canal so improved it would be possible to bring freight to New York from Chicago in quicker time and at less cost than is now required to bring freight from Buffalo by canal. Against these radical improvements many, and it must be said some very good, reasons were urged. The large lake vessels, having a capacity of 90,000 bushels of grain, would cost in the neighborhood of $100,000 and require large crews; they would move slowly in an artificial waterway, the round trip between Lake Erie and the Hudson requiring possibly a month and sometimes more, and this would make the expense so great as to give the Welland Canal a palpable advantage. Indeed, as the cost of transfer of grain does not exceed one-quarter of a cent per bushel from lake vessels to canal boats, it is

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difficult to see how there could be much, if any, advantage in not breaking cargo and using large vessels for the round trip.

What seemed to be the most feasible plan of those suggested was that of obtaining a uniform depth of 10 feet in the canal, which it was estimated would not cost more than $2,000,000 or $3,000,000 at the outside, and using steam canal boats. With this depth, these could be made to carry from 18,000 to 20,000 bushels of grain, and make the round trip between Lake Erie and New York in from 8 to 10 days.

DOCTOR DOWLING ON PNEUMONIA.

The presence of this dread disease has been very great in many parts of the country during the last few weeks, and in this city it has proved quite fatal, taking away a number of our most respected citizens. Dr. J. W. Dowling, Professor of Diseases of the Heart and Lungs in the Homœopathic Medical College of New York, was interviewed the other day by a representative from one of our daily newspapers, and in answer to an inquiry from his interviewer replied:

"There is beyond a doubt a great deal of pneumonia now prevalent. How much of it there is cannot be definitely known, as physicians are not required to make report on this disease to the Board of Health. There are two distinct sorts of acute pneumonia," the Doctor proceeded to state. "The one is due to an extension of bronchial catarrh from the air tubes to the lungs proper. This may come from a cold, and generally does. It attacks children, old persons, and people who are prone to pulmonary diseases. This is the broncho-pneumonia, and may be complicated with other troubles. This exists at all times, but is more prevalent in cold, damp, and changeable weather, and makes a shorter finish of people who are predisposed to pulmonary troubles, or who are on the road to the grave with consumption, etc. The other form of pneumonia is what is known as croupous pneumonia, and here the disease starts directly in the lungs, and the symptoms are a severe chill, followed by fever and bloody spittle. This form of pneumonia is infectious in so far as it is the result of a specific poison which produces pneumonia and nothing else. It is not contagious, but does sometimes appear to be epidemic. I should say that not over 10 per cent of those who are attacked die of this complaint. This is a general estimate, and it includes all those who are stricken down in this city. In our school of practice," says the Doctor, "we have been very successful in treating this disease. Our treatment has been with aconite, phosphorus, and bryonia, with flaxseed jackets and hot fomentations in some cases. We are careful in avoiding the morphine treatment and the administering of stimulants, which the old school believes in. Only this month I brought through an old lady seventy-six years of age who was attacked with croupous pneumonia involving the lower and middle lobes of the right lung.

"These poison germs which I spoke of may exist in your body now or in mine, and yet a good condition of bodily health may enable us to keep off the disease, and the germs have no chance to develop themselves. It may be that exposure to cold, or trouble, or overexertion, or grief, or any one of a thousand ways in which the vital energy may be reduced, will cause the croupous form of pneumonia to show itself. Dissipated people are particularly subject to it. No, I would not say exactly dissipated people, but men who take their three or four glasses of whisky a day and seem to be in the very best of health, and yet are very far from being so. They fall very quickly when the attack comes on. To a physician's eye, when he comes to look into the history of the case, the explanation is very simple. The sudden changes in the weather bring on those reductions of bodily vigor and energy which permit the germs to develop quickly in the lining of the lungs and in the substance of those organs, and owing to lack of resisting power, the result of indiscretions, death soon follows. All persons should be very careful at this time in avoiding exposure to this changing atmosphere and these violent weather conditions, and to live carefully, and then with proper care and timely application of remedies this particular form of pneumonia is not very difficult of control. In cases where it seems to be contagious, the history of the subsequent cases will show this reduction of vital energy to which I have referred."

An Aeronautical Exhibition.

The Aeronautical Society of Great Britain proposes to take a practical step toward the attainment of the end for which it was established, by holding an Aeronautical Exhibition at the international one to be opened at the Alexandra Palace next month. The Aeronautical Exhibition itself will, however, not begin until June. The objects for exhibition will be: 1. Models of designs for the accomplishment of aerial navigation by mechanical means only. 2. Models of designs for the accomplishment of aerial navigation partly by buoyancy and partly by mechanical means. 3. Models constructed to elucidate either of the two last objects, which are capable of flight and carrying their own motive power. 4. Machines constructed upon a scale calculated to carry a weight equal to that of a man, upon the principles advocated by the inventors. N. B.—The practicability may be demonstrated by the flight of a model of similar character, and of weight-carrying capacity sufficient to enable a judgment to be formed as to the probable efficiency of the large machine when actuated by the power necessary for its support and propulsion, whether by manual or mechanical methods. 5. Light motors. N. B.—It may be observed that light motors are in request for other purposes than aerial navigation. But for the latter object it is essential that extreme lightness shall be a condition. Therefore only a motor possessing that qualification in proportion to its power with the smallest consumption of fuel (in the case of steam) or other adjuncts, and capable of working up to one horse power at the least for twenty minutes, will be deemed deserving of the prize. 6. Balloons, navigable or otherwise. 7. Balloon material and appliances for propulsion or otherwise. 8. Kites or other aerial appliances of that character, for saving life at sea, for traction, or otherwise. 9. Objects of interest connected with aeronautics.

The Washington Monument Alleged to be in Danger.

We have received from Mr. John C. Goodridge, Jr., an engineer of great experience in the construction and repair of heavy foundation works, a pamphlet in which he not only criticises very severely the mode followed in underpinning the Washington Monument, but shows substantially that the present foundation is so weak and unreliable that the structure is liable to give way at any time and fall to the ground.

His criticisms appear to be worthy of notice. If the monument is in a dangerous condition, prompt precautions should be taken to guard the approaches to the work from the public, and operations for strengthening the supports should be undertaken without loss of time.

Mr. Goodridge states that his attention was called to the subject as early as 1877, when he submitted to the Joint Commission a plan for the insertion of a strong and substantial foundation, also a copy of his patent explanatory of his general system.

Thereafter, as appears by official reports, Engineer Casey's plan was adopted by the Commission, and the work was begun. The Casey plan appears to have been derived from the Goodridge method in its general features, except that the parts of the Goodridge plan which secured real strength and solidity in the foundation were left out.

In his original proposal to the Commission, Mr. Goodridge describes his plan as follows:

"First.—To inclose the present foundation with a circumscribing wall of beton of high tensile strength, the beton wall going below the present foundation.

"The strength of this wall may be increased by the insertion of iron rods, chains, etc.

"Second.—From the circumscribing wall tunnels are carried to the foundation, and under it if necessary.

"The details of this process are described in the patent which I inclose. The ribs may be increased until the foundation is entirely encircled with beton, or inverts may be made between them. The shape of this new and sub-foundation may be likened to a cart wheel laid flat on the ground, the monument being on the hub.

"By this method you not only get a large area, but from the center being higher (as a wheel is dished), the outer circle must be forced apart, and the earth behind it forced out, before any settling can occur.

"Such a structure would be like an inverted saucer, and a monolith.

"We replaced the foundation of the Portage Bridge on the Erie Railroad, and it has answered perfectly. The bridge was 240 feet high, and trains constantly passing. Some of the piers were in a rapid current in the Genesee River."

Colonel Casey describes the plan adopted as follows:

"It is believed the work can be successfully accomplished by introducing the masonry in thin vertical layers, not over four feet in width, having first tunneled under the structure with drifts of that width and the required height and length. These layers can be connected to each other by dowel stones set in the faces of the layers as the work progresses, and with panel depressions in the alternate layers, into which the intermediate layers would be moulded. The material of the layers will be strong Portland cement concrete except, possibly, for a short distance just under the old foundation, where rubble masonry may be forced in and wedged up under the stones of that structure."

Commenting on the above, Mr. Goodridge says:

"The shaft is 55 feet square, resting upon a loose mass of rubble masonry without tensile strength, and is stated in the reports of the engineers as unable to bear any transverse strain.

Under this shaft of 55 feet square is left an opening 45 feet square. The walls of the monument are 15 feet thick, and the new foundation extends but 5 feet under this wall, leaving that portion of the shaft giving the greatest pressure as a dead load to be carried by the clay portion of the upper soil. It is evident that the greatest weight comes just where the new foundation stops. This new foundation or footing course extends outside beyond the line of buttresses, forming a leverage caused by the greater pressure at the center of the monument. These separate sections have no sustaining bond to hold the mass together, and it is within the strong possibilities that this, by making new positions, will cause a new set of strains which the structure is unable to bear.

It is evident that the pressure is greater immediately below the monument than on the outside of the concrete footing course, and in this construction more than in ordinary masonry, because the blocks of concrete are unconnected and placed side by side. There are no superimposed courses with overlapping joints. Now, all the concrete footing course that extends beyond the buttresses has not only less pressure than the other portion, but from that fact makes a point of enormous leverage, the tendency being to force the central portion down and out, tearing apart the lower portion of the old foundation, and crowding the top of it together through the medium of the buttresses. Leaving out the detrimental effect of the concrete footing that goes beyond the line of buttresses, and considering the foundation to end there, we have as the area covered by buttresses 101½ feet square, equal to 10,302 square feet, disregarding fractions. Deducting from this the unsupported portion of 45 feet square in the interior, we have remaining 8,277 square feet to carry the weight of 21,953 pounds, or nearly eleven tons, to the square foot on the bottom of the concrete footing course and on the soil beneath it.

We will have added to our constant load over three tons of wind pressure per square foot, which, with the load, makes about 28,000 pounds, or fourteen tons, per square foot.

If the concrete footing blocks had extended to the center of the monument, then the load would have been distributed in a different manner. As the main pressure of the weight of the monument comes near the inside of the footing course, and as such pressure must exceed the pressure on the perimeter of the foundation, we look to find a greater settlement at the inner point. We have enormous leverage transmitted through the buttresses to the old foundation, which from the reports given of it must be unable to withstand such a force; while the strains on the old shaft will be brought to new points by the changes of position, and lead to its dismemberment.

In regard to the concrete foundation, we are told that it is composed of one part cement, two parts sand, three parts pebbles, four parts broken stone. My occupation since 1870 has been the manufacture of beton and concrete, and since 1875 almost entirely in strengthening foundations, etc., and I have never thought it safe to use so weak a material as the one described. The only advantage that I can see in the proportions is that the numerical order is an aid to the memory of the mixers, and perhaps lessens the strain on the mind of the engineer. It is difficult to understand how such a mixture could be thoroughly compacted; and when we find that the upper portion was rammed in in gunny bags, we do not know how all the vacuities could be filled, except by the settling of the structure above it. Taking the load and the wind pressure combined, we have a distributed pressure on one side of the monument of nearly 200 pounds to the square inch; it will be in excess of that in some portions at certain points.

How long such a structure can stand under the pressure as described is simply a matter of supposition. Experience shows, as stated in one of the reports on the Washington Monument by Government engineers, that even on overloaded soil 'protracted time is necessary to produce sensible results.'

It has been demonstrated that a monument can be raised to the height of 555 feet on such a soil as underlies the Washington Monument, but that it can be sustained there, is still to be proved."

Notice to New Subscribers.

Most subscribers to this paper and to the SCIENTIFIC AMERICAN SUPPLEMENT prefer to commence at the beginning of the year, Jan. 1, so that they may have complete volumes for binding.

Those who desire it can have the back numbers of either edition of the paper mailed to them, but unless specially ordered, new subscriptions will be entered hereafter from the time the order is received.

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