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(Illustrated articles are marked with an asterisk.)

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For the Week Ending May 28, 1892.

Price 10 cents. For sale by all newsdealers.

NEW INVENTIONS NEEDED FOR WORKING STEAMSHIPS.

In our last number we gave an account of the recent act of Congress passed for the special registration of the two great British-built steamers, the City of New York and the City of Paris. The proposed transfer of these ships, which are in fact semi-war vessels, to the American flag has excited considerable feeling in England. The transaction is there looked upon almost as if it were an unwarranted capture by the Yankees of a couple of Britain's best vessels. Our cousins appear to feel as if there were something wrong in their laws which permits Americans thus to step in and suddenly deprive them of two such large chunks of maritime prestige.

But according to the views of our London contemporary, *Engineering*, there is not much likelihood, after all, of the realization of the transfer. The authorizing act, it is true, has been passed, but our confrère avers that it will be so much more expensive for the owners to run the ships under the American flag that any actual change is improbable. For example, the wages of American firemen would be nearly double that of the English stokers, and so on through the other items for manning the ships. The loss of the British subsidy would further reduce profits, while the increased cost of the new ships which, under the act, are required to be built here would be another serious financial burden.

There are several companies of American citizens who would like to build steamers here with a view to foreign trade, but they are deterred by the greater running expenses required. Among them is the Corbin company, which aims to establish a line of steamers between Montauk, at the east end of Long Island, and Milford Haven, in Wales, which latter place, by the completion of the Severn tunnel, is now only six hours distant from London, the same as Liverpool. This line offers the shortest ocean route. The company in question asks Congress to allow it to buy foreign ships, man them with foreign cheap labor, and then sail under the American flag.

At present it looks as if recourse must be had to the genius of our inventors for the solution of the problem of ocean steam navigation in American-built steamers. We can build the ships and supply them with fuel nearly as cheaply as anybody; but we cannot run them so economically after they are built, by reason of the lower wage rates that elsewhere prevail. It remains, therefore, for our inventors to study out new and improved modes whereby mechanism may be further substituted for manual labor on ship board, and the costs of operation thereby reduced. The feeding and pay of the army of coal heavers and stokers now required on every large ship is one of the most serious items of expense. Perhaps by the use of new mechanical devices, involving it may be a rearrangement of the internal parts of steamships, much labor could be saved. The subject is worthy the attention of inventive minds.

THE NEW STEEL STEAMERS OF THE PROVIDENCE LINE.

The second of the new screw steamers, the New Hampshire, built for the Providence and Stonington line by the Harlan & Hollingsworth Co., of Wilmington, Del., has just been finished, and has had a trial speed test on the Delaware River. Taking on 600 tons ballast to bring the wheel to immersion line, she made time over the measured mile in 2 minutes 59 seconds, 2 minutes 58½ seconds, 2 minutes 57½ seconds, or a speed of over 20 miles per hour. On Saturday, May 7, the New Hampshire made an excursion trip to the lower bay with a company of about 400 guests, who did good duty to an excellent luncheon. Through the politeness of Mr. Samuel J. Clarke, superintending engineer and superintendent of construction of both the Maine and New Hampshire, we have obtained the following details of the boat and engines:

Length over all, 310 ft.; length on water line, 302 ft. 7 in.; beam moulded on load water line, 44 ft.; width over guards, 60 ft.; draught, 12½ ft.; gross tonnage, 2,400; net tonnage, 1,500; hull of steel, with seven steel bulkheads, dividing the vessel into water-tight compartments; propeller screw left-handed, four blades 13½ ft. diameter, 18½ ft. pitch; 13 in. shaft, 130 ft. long, in sections of about 25 ft., with eight thrust bearings of Magnolia metal; maximum revolutions, 100 per minute.

The engine is of the inverted direct-acting triple expansion type, with four cylinders: One high pressure cylinder, 28 in. in diameter; one intermediate, 45 in. in diameter; and two terminal cylinders, each 51 in. diameter, with 42 in. stroke. A surface condenser, of Lighthall type, with a centrifugal circulating pump, and a steam reversing gear. The high pressure cylinder has a single piston valve; the other cylinders each have double piston valves; cranks quartering. The high pressure cylinder takes steam at 160 lb.; 1st receiver, 40 lb. pressure; 2d receiver, 12 lb. pressure; terminal pressure in 3d and 4th cylinders, 0—thus utilizing steam to its utmost expansion. The engine, at 100 revolutions, develops 2,947 indicated horse power, or 1·227 I. H. P. per gross ton.

The action of the quadruple engine tends to a freedom from jar or vibration, usual with our large propellers of this class, making the after part of the vessel an exceptionally quiet part. The roughness and impact of water at the bow make the usual vibration, so that if you want a quiet berth, take an after one.

The boilers, two in number, are of the Scotch type with Purves corrugated furnaces, each 46 × 78 in., aggregating 270 sq. ft. of grate surface. Boilers 13½ ft. diameter, 11 ft. long. A blower service for the fire room and boilers when necessary. The engine room is arranged with all the modern facilities for utility and convenience for every needed service. A powerful fire pump and fire apparatus throughout the vessel. Five bilge pumps constantly working on the crosshead of the air pump. A supply pump for salt water for sanitary purposes. A fresh water supply pump for pressure service. A steam jack for turning over the shaft.

An incandescent lighting system, consisting of two Thomson-Houston dynamos of 350 light power each, driven by separate engines of 20 horse power each. Steam is reduced to 80 lb. pressure for these engines by a reducing valve. An annunciator service throughout the boat. A steam heating service in connection with both main and donkey boilers.

The fitting up of saloons and staterooms is in the most elegant style, and there seems nothing wanting to make the new boats favorites with the traveling public.

THE LARGEST MASONRY DAM IN THE WORLD.

The largest masonry dam in the world has lately been completed in India, in connection with the new water works for the city of Bombay. It is situated 65 miles north from Bombay, and stretches across the Tansa Valley. The dam is about two miles in length; 118 feet high; 100 feet thick at its greatest depth; 15½ feet at the top. The lake which will be formed when the valley is full covers an area of eight square miles, and it is expected will furnish a supply of 100,000,000 gallons per day throughout the year. The dam has been 5½ years in process of construction and from 9,000 to 12,000 men and 800 carts and animals have been employed upon it during each working season from October to May. The difficulties of construction were very great. The sand and cement of which it is composed had to be carted for many miles. Over 14,700,000 cubic feet of rubble stone were used, over 2,200,000 cubic feet of lime, and over 3,300,000 cubic feet of washed sand. The excavations of rock amounted to over 6,700,000 cubic feet. The masonry work in all was over 11,000,000 cubic feet. The contractors were Glover & Co., of Edinburgh. The executive engineer was J. B. Clarke. The water is conducted from the dam to Bombay in iron pipes 48 inches diameter, laid above ground. Each length weighs about four tons. The aggregate weight of the pipes is 50,000 tons, supplied by Macfarlane, Strang & Co., of Glasgow.

Kalsomining.

Kalsomining, or wall coloring in distemper, is best done about this time of the year, when the walls are not too cold or too hot. It may be done, says the *Paint and Varnish Journal*, any time during the winter, so that the walls do not freeze. There are a good many preparations put up for this purpose and called by various names. However, if you are where you cannot procure this, it may be prepared in following manner: White—To 10 pounds best whiting use 1½ pounds white glue, ½ pound alum and a little ultramarine blue. Put the glue in cold water, set it on the fire and stir until dissolved. Put about half a gallon of hot water over the whiting, and when dissolved add the glue, the blue and the alum, which must also be dissolved in hot water. Stir this mixture well and run through a sieve. For first coating this may be used while hot, but the other coats must be cold. If your color works too stiff, a little soap will help. All colors and shades are made by adding the dry colors. Before kalsomining, the crack and nail holes should be filled with plaster of Paris. Mix this with paste, and it will not dry so quickly. If you have a good brush and work as quickly as possible to avoid laps, you will have a good job of kalsomining. A nice stencil border run around the top of wall makes a nice finish.

Natural Gas at Salt Lake.

Natural gas has been discovered on the shore of the Great Salt Lake, within ten miles of Salt Lake City, and a large company has been organized to utilize and develop the fuel. Several wells have already been put down to the depth of 650 feet, and it is said that 50,000,000 cubic feet of gas are now flowing daily. A new town, to be named Woodman, has been laid out on the site of the wells, and a new railway is to be extended to Salt Lake City. A smelting establishment, to cost from between $1,600,000 and $2,000,000, is shortly to be erected, and a large glass factory is also projected.

Remarkable Water Powers.

Altogether the most extraordinary water power installation—so far as head is concerned—ever known has recently been made by the Pelton Water Wheel Company, in one of the famous Comstock mines, at Virginia City, Nevada. The wheel is 36 inches diameter, made of a solid steel disk with the buckets riveted on to the periphery in a way to afford absolute security, weighing complete 180 pounds.

It is running under a vertical head of 2,100 feet, equal to 911 pounds pressure, 460 feet of this head is obtained from the pipe line of the Gold Hill Water Company and the remaining 1,640 feet from the California and Con. Virginia shaft, down which the pipe line is run to the Sutro tunnel level, where the power station is located, and through which the water discharges after passing over the wheel. The wheel runs at 1,150 revolutions, with a peripheral speed of 10,804 feet per minute, or about 120 miles per hour.

The construction of the wheel amply provides for the centrifugal strain the velocity of the water gives it, running without load, when it would attain the enormous speed of 21,608 feet per minute, equal to about 240 miles per hour. A nozzle tip one-half inch diameter gives under above conditions 100 h. p. Every miner's inch of water, equal to a flow of 1·6 cubic feet per minute, gives 5 h. p., while 1 h. p. is given for every 2 lb. of metal in the wheel. It is only by comparison that an idea can be obtained of the height of a column of water due to such pressure. It is more than four times as high as the Washington monument and considerably more than twice the height of the Eiffel tower. It is safe to say that no water wheel has ever before been operated under any such head, nor any such demonstration afforded of the velocity and power of water under such an extreme pressure.

The installation made by the Pelton Company some two years ago in the Chollar shaft on the Comstock lode is in some respects no less extraordinary. This consisted of six 40 in. Pelton wheels, which run under a vertical head of 1,680 feet, driving that number of electrical generators, the power from which is conveyed up the shaft to the Nevada mill, some 2,000 feet distant. These wheels only weigh 220 lb. each, and with nozzle tips 5/8 of an inch diameter develop 125 h. p. each.

The water is first run over a Pelton wheel on the surface under 460 feet head, and is then carried down the shaft by a pipe to the Sutro tunnel level, where the underground station is located, the power from the electrical generators being conveyed to the countershaft of the mill with which the surface wheel is connected, the two distinct forces working together in perfect harmony.

A most interesting illustration of the double use of water is here given, some 400 h. p. being produced in this way from what may be termed waste water. This station has now been running more than three years without interruption and practically without expense in the way of repairs, as well as without any appreciable loss of efficiency, affording a most striking example of the advantages of water power, both by direct application and electric transmission, as well as the reliability of such a plant under such extraordinary conditions.

New Antiseptics.

Among new antiseptics from coal tar derivatives, says S. A. Walton, may be mentioned pyoktanin, methyl-violet, the most antiseptic of the aniline colors. A solution of 1 in 1,000 is used in various eye diseases, phthisis, ulcers, etc. There is a yellow variety commonly known as auramine, also used antiseptically.

Lysol is a saponified phenol derived from cresols, and contains the higher homologues of carbolic acid. It is said to possess higher antimycotic power than carbolic acid, and to be less poisonous. This preparation is much used in Germany at the present time.

Retinol, a distillation product of pine resin, is a viscid fluid hydrocarbon. It is a non-irritating and stable antiseptic.

Europhen, iso-butyl-ortho-cresyl-iodide, contains 23 per cent of iodine, and is non-poisonous.

Dermatol, a basic gallate of bismuth, forms a powerful antiseptic and dessicant.

Sulphaminol, thio-oxydiphenylamine, the antiseptic action of which is due to its decomposition in contact with the fluids of the body into sulphur and phenol.

Monochlorphenol is prepared by the action of chlorine on cooled phenol. It is a powerful antiseptic and less irritating than trichlorophenol.

Camphoid, though only a mild antiseptic in itself, is a valuable adjunct to this class of bodies, as it forms a ready method of applying antiseptics to the surface of the skin, and owing to its composition (of spirit, camphor and pyroxylin) it forms a valuable solvent for substances such as salicylic acid, resorcin, hydronaphthol and many others.

A Great Weed.

The wild potato vine (*I. pandurata*) sometimes has a root that attains the size and occasionally the form of a boy's body, and weighs thirty-five pounds.

Kite Electricity.

A notice under the above heading, published in the SCIENTIFIC AMERICAN for November 14, 1891, induces me to write down a theory which I adopted some thirty years ago, and have been teaching since then, because it fully explains several facts which formerly have been a stumbling block to the right understanding of many phenomena presented by atmospheric electricity.

Among them is the fact that a kite held by a conductive string (made so by one of the strands being a fine copper or brass wire), when it is made to ascend in a clear, dry, and cloudless atmosphere, with apparently not the least tendency to a thunderstorm in it, will always, without exception, show positive electricity, and more of it in proportion as the kite ascends higher. When a hollow metallic ball is attached to one end of a fine wire, of which the other end is connected with a proper electrometer, and the ball is thrown upward in the free open air, the electrometer will show positive electricity, and may be made to retain it for a short time when the wire is attached in such a way as to become separated from the electrometer when the ball has reached its highest point. A lightning rod arranged at its lower end in such a way that its ground connection can be interrupted will, during or before a thunderstorm, while clouds are floating over it, show alternately positive and negative electricity, but when the sky is clear and dry its electric charge is always positive. Of this I had the rare opportunity to satisfy myself by a multitude of experiments on several occasions. De Saussure repeated many more experiments in the Alps, and found always, even in the highest accessible regions, positive electricity when the sky was clear.

The conclusion arrived at, as published in the works of Biot and other eminent investigators, was that the dry, clear atmosphere was always charged with positive electricity, and this in a greater amount in proportion as we ascend higher.

This explanation was sufficient until Biot, during his famous scientific balloon ascension with Gay-Lussac, lowered a metallic globe suspended by a copper wire from the car of his balloon, and found very strong negative electricity in the higher regions. In his description of this experiment he confesses that this is contrary to what De Saussure found in the higher regions of the Alps. He tries some kind of explanation in the second volume of his "Traité de Physique," but as he, like all the electricians of his time, adhered to the theory that the air itself was charged with the electricity which acted upon the electrometer, there was a quandary left to be solved.

The credit of doing this belongs to Peltier, whose theory is that our terrestrial globe is always permanently charged with negative electricity, which, according to the law of its distribution, resides principally in its surface, and which, when the air is dry, and therefore a good insulator, will not be communicated outwardly, but will act by induction upon any conducting body insulated above the surface and cause its lower end or under side to become charged with the opposite (positive) electricity, while its upper end or top side will become charged with the similar (negative) electricity, and this by the separation of the two electricities, positive and negative, which are contained in and neutralize one another in all conducting bodies which are not so influenced. Consequently, where a rod or wire extends from the earth's surface upward, its lower end must become positive and its upper end negative by the inductive capacity of the negative earth, and this explains at once the dilemma why Biot, in his balloon, in testing the upper end of the wire, found negative electricity, while the observers on the earth's surface testing the lower end found positive electricity. The fact is that it was not the electricity absorbed from the air they had to deal with, but with electricity developed in the wire itself, by the inductive influence of the earth's constant negative charge.

I ought not to omit here the statement that Sir William Thomson (in proceedings of Royal Institution, May 18, 1860) declares that he does not agree with Peltier in regarding the earth as a negatively charged conductor. Still he admits at the end of the same explanatory paragraph that "the result we obtain every day of fair weather in ordinary observations on atmospheric electricity is precisely the same as if the earth were electrified negatively and *the air had no electricity in it whatever*."

Recently some other English investigators have gone a step further, and striking from the last suggestion of Sir William Thomson, have come to the conclusion that actually dry air at the normal pressure of one atmosphere does not and cannot contain an electric charge; also that it cannot conduct nor convey electricity, but only be perforated by the electric spark, as we do in our laboratory experiments, and which nature does in her gigantic laboratory by a flash of lightning.

This theory, striking as it is, and contrary to the usually adopted notions, is likely to prevail, as it explains fully and satisfactorily two phenomena not otherwise possible of explanation: The cause of a sudden clap of thunder from a cloudless sky and the gradual formation of a highly charged thunder-cloud in very high regions of the atmosphere. This will be the subject of a future communication.

P. H. VANDER WEYDE, M.D.

Trees.

What a strange underground life is that which is led by the organisms we call trees! These great fluttering masses of leaves, stems, boughs, trunks, are not the real trees. They live underground, and what we see are nothing more nor less than their tails. Yes; a tree is an underground creature, with its tail in the air. All its intelligence is in its roots. All the senses it has are in its roots. Think what sagacity it shows in its search after food and drink. Somehow or other, the rootlets, which are its tentacles, find out that there is a brook at a moderate distance from the trunk of the tree, and they make for it with all their might. They find every crack in the rocks where there are a few grains of the nourishing substance they care for, and insinuate themselves into its deepest recesses. When spring and summer come, they let their tails grow, and delight in whisking them about in the wind, or letting them be whisked about by it; for these tails are poor passive things, with very little will of their own, and bend in whatever direction the wind chooses to make them. The leaves make a deal of noise whispering. I have sometimes thought I could understand them, as they talk with each other, and that they seem to think they made the wind as they wagged forward and back. Remember what I say. The next time you see a tree waving in the wind, recollect that it is the tail of a great underground, many-armed, polypus-like creature, which is as proud of its caudal appendage, especially in summer time, as a peacock of his gorgeous expanse of plumage.

Do you think there is anything so very odd about this idea? Once get it well into your heads, and you will find that it renders the landscape wonderfully interesting. There are as many kinds of tree tails as there are of tails to dogs and other quadrupeds. Study them as Daddy Gilpin studied them in his "Forest Scenery," but don't forget that they are only the appendage of the underground vegetable polypus, the true organism to which they belong.—*Dr. O. W. Holmes.*

Generals Hawley and Hurst as Inventors.

Senator Teller has proposed an amendment to the naval appropriation bill, appropriating $50,000 to enable the Secretary of the Navy to have constructed one 8 inch 50 caliber steel rifle, firing a high explosive projectile of great velocity. In order to test the gun, the secretary is authorized to use the $50,000 appropriated in March, 1889, for testing guns for secondary batteries. The amendment stipulates, however, that no part of the money shall be expended until the owners of the patent of the gun agree to construct them exclusively for the government. The gun is known as the Hurst high explosive 8 inch rifle, and is the result of five years' experiments begun at the navy yard in Washington by the inventor, and conducted in private by him. In the experiments Senator Hawley, of Connecticut, took a prominent part. He has great faith in the two charges of powder, one of the difficulties to be overcome being in providing a suitable gas check for the projectiles. This General Hawley succeeded in patenting, and at first took the patent out in his own name and afterward on joint invention with General Hurst. The gun provided for by the proposed amendment will fire the Hawley projectile, which will be filled with dynamite, gun cotton or some other high explosive, and have, it is said, a range greater than that of any gun of similar caliber constructed in this or any country.—*Army and Navy Register.*

A Queer Case.

Three fifteen-year-old patent applications of Thomas A. Edison for telephone transmitters went to issue last week, after such long delay that the English patents, applied for after the American, had been examined, granted, gone to issue, run their term of 14 years, and expired before the American patents were issued. It is a nice legal question whether these patents had not expired by limitation of law before they were issued. The courts will probably so hold. There is not so much ground for suspecting intentional and fraudulent delay in the interference proceedings as there was with the Berliner patent, issued some months since, but we concur with the *Engineering News* in their opinion that such decisions are a great reproach to our patent practice and to the state of the law.

FROM the last annual report of the Bell Telephone Company, it appears that the number of instruments in use at the close of the year 1891 was 512,407—a large increase over the previous year. The total earnings for the .year were $4,375,290. The expenses were $1,505,872, leaving the net earnings at $2,869,418. The extension of the long-distance telephone system is rapidly progressing.