Scientific American.

ESTABLISHED 1845.

MUNN & CO.. Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, APRIL 13, 1895.

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For the Week Ending April 13, 1895.

Price 10 cents. For sale by all newsdealers.

THE STERN TUNNELS OF THE OLYMPIA.

The following reflections have been suggested by an examination of drawings showing the method adopted for inclosing and supporting the outboard ends of the screw shafts of the United States cruiser Olympia, built at the Union Iron Works, San Francisco, Cal.

In that vessel the outboard ends of the screw shafts for a length of twenty-four feet (the distance between the forward end of the stern bearings and the stuffing boxes through which the shafts emerge from the hull of the ship) are inclosed in tubes three feet nine inches in internal diameter at their forward ends and two feet ten inches where they join the stern bearings. Each of these tubes is made of steel one-half an inch thick, and is connected to the hull throughout its length by a box or cell formed of steel plates three-eighths of an inch thick, stiffened with angle irons. This box has an average depth (measured on a line approximately parallel with the outside of the hull) of three feet ten inches at its forward end and six inches at the forward part of the stern bearing. It will therefore be evident that this cellular connecting box tapers at a much more rapid rate than the tube which it supports. This is done probably to afford the water as free a run to the screws as possible; but this intention is in no small degree defeated by the fact that the bracket arms which support the stern bearing are attached to the hull at points considerably above and below the after thin end of the cellular structure referred to, and have to be dragged through the water, and must, by whatever resistance they oppose, impair the speed of the ship.

These brackets it is true are quite similar to those in common use for many years for the support of the stern bearings of twin-screw shafts; and if there were no better method of accomplishing such support, criticism would have no claim against them; but, as is well known, there is a better way of attaining the end sought, and therefore in a cruiser whose speed at a critical time may involve her own safety and that of her personnel, such improved methods should have been adopted.

The steel tubes above mentioned as inclosing the shafts are, strange to say, not water tight, but, on the contrary, are filled with water, whose presence seems to have required the casing of the shafts (which are of steel sixteen inches in diameter) with a bronze tube (closely fitting it) one inch in thickness and thirty-one feet in length. The weight of each of these bronze casing tubes is about six thousand pounds; furthermore, the water which surrounds each shaft will weigh at least ten thousand pounds, which, added to the weight of the bronze casings of the shafts, makes a weight of sixteen thousand pounds on each side of the stern of this ship, or thirty-two thousand pounds in all, of load which must be sustained and dragged through the water, and consume power for no useful purpose whatever: moreover, in the pitching and rolling of the ship, this useless dead weight subjects the vessel to strains which are totally unnecessary, and which the adoption of modern practice would have avoided.

Just why this faulty construction has been adopted by the Navy Department is not evident. There are rumors that some of the other new vessels are to be built in the same way.

It is well known there are several vessels afloat in which the tubes inclosing the screw shafts are accessible from the interior of the ship throughout their length up to the forward end of the stern bearing, where the stuffing box is placed. This construction makes it unnecessary to incase the shafts with bronze, and allows for their examination at any time. By this construction the extra buoyancy due to the displacement of the shaft tubes is secured, and there is, of course, no strain on the vessel due to a mass of dead weight. This construction is no experiment, but has been used for several years, and so satisfactory has it been found, that the Cramp Ship Building Company have adopted it for the new American liners St. Louis and St. Paul.

In view of what has been done in the matter of shaft tunnels for twin screw vessels, it does seem that the Navy Department had taken a step (if not a tumble) backward, when it inclosed the shafts of the Olympia with tubes filled with water.

Water Consumption in New York and London.

The average daily supply of water to London during January delivered from the Thames was 100,997,567 gallons; from the Lee, 59,835,525 gallons; from springs and wells, 29,046,055 gallons; from ponds at Hampstead and Highgate, 244,452 gallons. The last is used for non-domestic purposes only. The daily total was, therefore, 190,123,599 gallons for a population estimated at 5,481,890, representing a daily consumption per head of 34·68 gallons for all purposes.

The daily consumption of water in New York City is about 183,000,000 gallons, and the population less than one-half that of London. The safe capacity of the new Croton aqueduct is 300,000,000 gallons per diem and of the old aqueduct 75,000,000 gallons.

Influenza: Do Doctors Know Anything About It?

An evening contemporary assures its readers that notwithstanding the fact that we are now in the midst of the fifth successive annual epidemic of influenza, doctors know little or nothing about it.

There is, perhaps, some justification for this in the circumstance that a good many immature practitioners, who desire to pose as scientists in excelsis, have assured the public on many occasions that science really cannot say what influenza is. But now let us ask ourselves with the downrightness of mere common sense what is it that our profession really does know, and know thoroughly, about influenza.

In the first place, we know the disease when we see it; we know also the injurious physiological and pathological changes it produces in the nervous system, the lungs, the liver and other organs of the body; we know how, by prompt, early treatment, to reduce those changes to a minimum; and we know how to repair the damage done by those changes when the disease is brought to a termination.

"But," it will be said, "if you claim to know all these things, you claim to know everything about influenza." No; we do not. We do not claim to know precisely what its cause is; nor do we profess to know entirely how to prevent it. But do we know what the cause of cancer is; or of typhoid fever; or of simple, or even of tubercular meningitis, and a hundred other things? Moreover, in the matter of prevention, can we prevent all other diseases of every kind except influenza? Can the lawyer, who thoroughly understands law, prevent crime? Can the theologian prevent sin? Can even the commercial man put an end to bankruptcy?

Influenza has now been with us for five successive years. We can recognize it, we can treat it rationally and successfully, and to some extent we can prevent it. Perhaps when Providence has endowed us with omniscience and with almightiness as well, we may be able to entirely prevent the disease as well as to cure it. In the meantime a little "silence" might be "golden" on the part of the all-knowing lay journalist.—Hospital.

To Make Woolens Waterproof.

The question of how to make a textile fabric waterproof and yet preserve as much as possible its feel, finish, and appearance, says the Industrial Record, is one which is of interest in many mills. This process is not confined to woolen goods, but is practiced upon cottons, linens, and other kinds of cloths as well. Upon dress woolens, the intention is to make the cloth waterproof and yet leave it so that it will permit the escape of perspiration and the gaseous exhalations from the body. Overcoatings, wrappings, hunting goods, and goods of this class call for such treatment, and a few points as to the method of procedure may lead to good results. So far as known there is not one to which anything like universal employment is accorded, but one or two may be mentioned which are recognized as safe and good for the purposes named.

In the first place, as to the goods to be treated, no matter what may be their nature, it is an absolute essential to success that they be perfectly clean. If there is any sort of dirt upon the fibers of the cloth or in its meshes, dirt in the shape of oils, grease, animal products, vegetable materials, burrs, etc., the waterproofing material will act upon this dirt, not being able to get down to the body of the fibers composing the cloth, and just as soon as the dirt happens to be removed the waterproofing material is removed with it.

For a cotton fabric the following will be a good mixture: Take one pint of alum and dissolve it in hot water, also take one pint of sugar of lead and dissolve in water, then mix the two and use cold water until the whole stands at about 5° B. The clear liquid which is on top is applied to the goods, while the sediment is used in making another bath. For a woolen or part woolen fabric, take fifty quarts of animal glue and dissolve in water, add to this the same amount of potash alum and mix with water to suit the finish desired. This mixture is then applied to the goods upon the ordinary sizing machine. Then take two and one-half quarts of tannin and one quart of waterglass and mix with fifty quarts of water, and apply this to the goods at about 50° C. (122° F.)

The waterproofing is done upon a sizing machine, the cloth passing down into the material and up through the squeezing rollers, or sometimes passing only through the rollers and taking what material it can in the passage. The heavier the goods are, the more necessary will it be that they should pass through the mixture and get as much as possible of it into the body of the cloth.

The making of the mixture, the coloring of it to suit somewhat the color of the goods to be treated, the passage of the goods through it, and the subsequent drying constitute the main points in the process, the rest of the treatment being similar to that for ordinary cloths which are not waterproofed. There are many recipes in use for waterproofing fabrics, but those referred to here may be said to have been proved by experience to be suitable for the desired purpose.

Iron and Steel at Welding Temperatures.

The following is an abstract of a paper by Mr. T. Wrightson, M. Inst. C.E., communicated to the Royal Society by Professor Roberts-Austen, C.B., F.R.S.

The object of this paper is to demonstrate that the phenomenon of welding in iron is identical with that of regelation in ice. The author recapitulates experiments made by him in 1879-80, described in the "Proceedings" of the Iron and Steel Institute for those years. These experiments were upon cast iron, and proved the fact that this form of iron possessed the property of expanding while passing from the liquid to the plastic state during a small range of temperature, and then contracted to the solid state, and that the expansion amounted to about 6 per cent in volume. The experiments were carried out under two distinct methods, the first being by the suspending of a cast iron ball on a spiral spring, and lowering the ball under the surface of a vessel filled with molten iron of the same quality; the change of volume was registered by the contraction of the spring as the varying displacement of the ball varied its buoyancy.

The second method was by casting 15 inch spheres of cast iron, and measuring the changing diameter as the spheres cooled, then laying down on paper a curve of changing volume, which in general character was found to be similar to the curves produced by the instrument used in the first method. This property of iron resembles the similar property of water in freezing, which, within a range of about 4° C., expands about 9 per cent of its liquid volume, and then contracts as the cooling proceeds. This property of water was investigated by Professor James Thomson and by Lord Kelvin. The former showed that from theoretical considerations there was reason to expect that in the case of a body exhibiting the anomalous property of expanding when cooled and contracting when heated, it should be cooled instead of heated by pressure or impact.

Lord Kelvin investigated the problem experimentally as affecting freezing water, and completely demonstrated the truth of his brother's reasoning. The experiments made by the author in 1879 and 1880 suggested the view that this property of ice was connected with the property of welding in iron, but this was only hypothetical, as the experiments had been made on cast iron, which probably, on account of the presence of carbon, does not possess the property of welding. Further, it was not practicable to experiment with wrought iron in the same way as with cast iron, on account of the difficulty of dealing with that substance in its liquid form. Professor Roberts-Austen has, however, given metallurgical research a recording pyrometer, and this has enabled the author to resume the investigation at the Mint, where he had the advantage of Professor Roberts-Austen's assistance and advice. The method adopted was the heating of bars in an electric welder, and as soon as the junction of the bars was at a welding temperature, end pressure was applied by mechanical power and the weld effected.

The temperature at the point of welding was observed by placing a thermo-junction at this point, consisting of a platinum wire twisted into a second wire of platinum alloyed with 10 per cent of rhodium. The electric current produced at the thermo-junction deflected a galvanometer, which by means of a mirror threw a spot of light upon a sensitized plate, which moved by clockwork uniformly in a direction transverse to the spot of light. This produced a curve, the ordinates of which represented time and temperature. These curves appear to show that a molecular lowering of temperature took place immediately the pressure was applied to the bar when in the welding condition. Photographic curves are exhibited which show that this fall in temperature varied in these particular experiments from 57° C. to 19° C., according to the circumstances of temperature and pressure.

This appears to prove that wrought iron at a welding temperature possesses the same property of cooling under pressure which was proved by Lord Kelvin to exist in freezing water, and on which demonstration the generally received theory of regelation depends. The author distinguishes the process of melting together of metals from that of weldings. Either process forms a junction, but the latter takes place at a temperature considerably below the melting point. The well known and useful property of welding iron appears, therefore, to depend, as in the case of regelation in ice, upon this critical condition, which exists over a limited range of temperature between the molten and the plastic state.

A Refractory Mixture.

M. Debois, of Reuleaux, France, has patented a mixture which, according to the Moniteur Industriel, when burned will withstand the highest temperatures. The mixture is composed of quartz or flint and sulphate of barium. The proportions are varied according to the needed resistance of the material, in some cases ground. Pudding stone is also added to the "mix." The mass when moistened will take any shape like ordinary fire clay, and is dried and burned in the same manner.

Four-Hundred-Foot Steamers.

The steamer Zenith City is one of the two 400-foot freight carriers being built by the Chicago Ship Building Company at South Chicago. This boat and the Victory, building at the same yard for the Interlake Company, a corporation made up largely of members of the firm of Pickands, Mather & Company, Cleveland, are to be practically duplicates. The Zenith City is to be owned by a syndicate formed by A. B. Wolvin, of Duluth, and which will include such well known vessel owners as David and Frank L. Vance, of Milwaukee, J. R. Irwin, of Painesville, O., F. N. La Salle, of Duluth, G. E. Tener, of Pittsburg, and John Green, of Buffalo. This is the boat that is to be fitted with Babcock & Wilcox tubulous boilers, while the duplicate steamer is to have two Scotch boilers, 14 by 13 feet, allowing 170 pounds steam pressure.

The Zenith City will be 380 feet keel, about 400 feet over all, 48 feet beam and 28 feet hold. She will have a water bottom of 54 inches. Her load from Lake Superior on present draught, 14½ feet, will be full 4,000 gross tons, and it is expected that, with a 20 foot channel a year or more hence, this will be increased in net tons to about 6,000. A feature of this boat and the Victory will be the big expanse of unbroken deck that they will present. Quarters for the crews as well as the dining room, steward's apartments, etc., will be located below deck. There will be no houses on deck, excepting the texas and pilot house forward. A turtle back covering for quarters forward will extend only to the rail, and the same will be true of the boiler house aft. Each boat will have eleven hatches, two of which will be located forward between the turtle back and the pilot house. Machinery for both the Zenith City and the Victory will be the same as that now in the steamer Kearsarge, and it will all be built by the Cleveland Ship Building Company. The engines will be triple expansion, having cylinders 23, 38 and 62 inches by 40 inches stroke.—Marine Review.

African Notes.

At a recent meeting of the Royal Geographical Society, Captain L. S. Hinde, of the Belgian service, read a paper on "Three Years' Traveling and Fighting in the Congo Free State."

The political geography of the Upper Congo basin under notice had been completely changed as a result of the Belgian campaign. It used to be a common saying, in this part of Africa, that all roads led to Nyangwe. The town visited by Livingstone, Stanley, and Cameron, until lately one of the greatest markets in Africa, had ceased to exist, and its site, when he last saw it, was occupied by a single house. Kasango, a more recent though still larger center, with perhaps 60,000 inhabitants, had also been swept away. It was represented now by a station of the Free State nine miles away, on the river bank. In harmony with this political change, the trade routes had been completely altered, and the traffic which used to follow the well beaten track from Nyangwe and the Lualaba, across Tanganyika to Ujiji, or round the lake to Zanzibar, now went down the Congo to Stanley Pool and the Atlantic. Despite their slave raiding propensities, the Arabs had during the 40 years of their domination converted the Manyema and Malela country into one of the most prosperous in Central Africa. The landscape, as seen from high hills in the neighborhood of Nyangwe and Kasongo, reminded one strongly of ordinary English arable country. There was nothing similar, as far as he was aware, in any other part of the Congo basin. In all parts of the virgin Congo forest he had visited wild coffee was so abundant and so excellent that the expedition left their tins of imported coffee unopened. The center of the Congo basin, through which stretched the 1,000 miles of navigable river and tributary, was an alluvial plain, rimmed in on all sides by rocky ridges, through which the rivers broke at points marked by falls or rapids. At some future time this vast ring of rapids might become a seat of a corresponding circle of mining centers.

At a meeting of the Linnean Society Mr. G. F. Scott Elliot, who had been absent from England since September, 1893, on a botanical exploration of Mount Ruwenzori and the country to the north of the Albert Edward Nyanza, and had returned home only on the previous day, gave an account of his journey and of the results, geographical, geological, botanical, zoological, and political, obtained by him. He took the route from Mombasa to Uganda. The country lying northeast of the Victoria Nyanza was described as a large rolling grassy plain some 6,000 feet above sea level, and well adapted for colonization. He went west from the Victoria Nyanza to Mount Ruwenzori, which is said to have an altitude of 18,000 feet, and spent four months in exploring that district under the great disadvantage of a dense cloud hanging over the mountain the greater part of the day, which often prevented the party from seeing more than 50 feet ahead. The sides of the mountain were clothed at the base with a thick growth of trees resembling the laurel of the Canary Islands; above that bamboos to the 10,000 feet level; and above that again what the explorer could only liken to a Scotch peat moss, into which the traveler sank at every step a foot or more. Large trunks like those of Erica arborea of the Canary Islands, but indicating trees 80 feet high, were noticed. Among other plants noticed were a viola, a cardamine, a gigantic lobelia, attaining a height of five feet or six feet, and a species of hypericum resembling that found in the Canaries; indeed, the similarity of the flora to that of the Canary Islands was remarkable. Mr. Scott Elliot ascended Mount Ruwenzori to the height of 13,000 feet, finding evidence of animal life and numerous insects to a height of 7,000 feet. Above 10,000 feet his Swali porters could not sleep without injury to their health, and it was only with a reduced number of men that he was able to ascend another 3,000 feet. Among the animals specially mentioned was a species of water buck (cobus), a new chameleon, a new snake, and several new insects. Mr. Scott Elliot's discovery that the Kagera River is navigable was regarded as important. Mr. Scott Elliott said he thought the route to Victoria Nyanza from the mouth of the Zambesi, by way of the Lakes Nyasa and Tanganyika, would most advantageously open communication between the Upper Nile and the coast at Chindi, and thus do more for international interests than could be expected to result from a railway from Mombasa.

Helium.

Lord Rayleigh, who so recently discovered "argon," a new constituent of the atmosphere, has succeeded in finding helium in a Norwegian mineral. This substance was believed to exist only in the sun and in a few stars. There are indications that the sun contains a few elements which an analysis of the substances composing the crust of the earth has failed to reveal, as "coronium," a line in the green part of the spectrum of the outer solar envelope which is thought to represent a gas lighter than hydrogen. This line is numbered 5,316 in the Rowland scale and 1,474 in the old Kirchhoff scale. In examining the layer of gas below the corona spectroscopists have discovered a brilliant yellow line which was formerly called "D 3," and which is situated at 5,876 on the Rowland scale. Examinations of terrestrial substances have not revealed this element heretofore, so that it was regarded as peculiar to the sun and a few stars. This substance was known as helium. Lord Rayleigh was testing a Norwegian rock specimen with sulphuric acid and a gas was evolved. This he found to consist largely of argon, but combined with it was another gas which he succeeded in identifying with the spectroscope as helium. Prof. Crookes has confirmed his conclusions. The same rock has been treated in the same way before, but the gas evolved has always been considered to be hydrogen until Lord Rayleigh made his brilliant discovery.

From its associations and the particular region of the sun where helium is found, this gas is looked upon as being one of the lightest materials composing that body, possibly almost as light as hydrogen. Nilsing is inclined to think that helium resides chiefly in the upper portion of the chromospheric sheet. This suggests the idea that, like coronium, it may weigh less than the gas with which it is associated. The researches of Gruenewald indicated that possibly both helium and coronium were components of hydrogen partially disassociated by the intense heat; but Lord Rayleigh's discovery of the gas in combination with argon at an ordinary temperature tends to discredit this theory.

The Swiss Watch Schools.

The famous Swiss watch schools are said to be the most exacting industrial institutions in the world. Their methods, which are doubtless the secret of their success, will be found very curious and interesting. In one of the most celebrated of these institutions in Geneva, for example, a boy must first of all be at least fourteen years of age in order to enter. After being admitted, the student is first introduced to a wood turning lathe, and put to work at turning tool handles. This exercise lasts for several weeks, according to the beginner's aptitude. This is followed by exercises in filing and shaping screwdrivers and small tools. In this way he learns to make for himself a fairly complete set of tools. He next undertakes to make a large wooden pattern of a watch frame perhaps a foot in diameter, and after learning how this frame is to be shaped, he is given a ready-cut one of brass of the ordinary size, in which he is taught to drill holes for the wheels and screws. Throughout this instruction the master stands over the pupil directing him with the greatest care. The pupil is next taught to finish the frame so that it will be ready to receive the wheels. He is then instructed to make fine tools and to become expert in handling them. This completes the instruction in the first room, and the young watch maker next passes to the department where he is taught to fit the stem-winding parts and to do fine cutting and filing by hand. Later on he learns to make the more complex watches which will strike the hour, minute, etc., and the other delicate mechanisms for which the Swiss are famous.