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SCIENTIFIC AMERICAN SUPPLEMENT

No. 772.

For the Week Ending October 18, 1890.

Price 10 cents. For sale by all newsdealers.

FLOATING STEAM-PROPELLED ISLANDS OF STEEL.

A floating island made of steel, 1,000 feet long, 300 feet wide, and drawing 26 feet of water—such is the type of ship as described by Sir Nathaniel Barnaby, constructor for the British Navy, at the recent sitting in Pittsburg, Pa., of the Iron and Steel Institute of Great Britain. With engines of 60,000 h. p. such a craft, he said, ought to make 15 knots an hour—a speed, we will add, which, though only three-fourths of that now logged under favorable conditions by crack ships, would be quite fast enough for most ocean travelers if the promise of steadiness under all conditions of weather went with it.

The plan of loading and unloading such a craft is bold and original, and carries with it an air of practicability that is its best recommendation. To build docks for such a ship would be at once inconvenient and costly, and even with these existing it would be hazardous to maneuver so unwieldy a monster in such narrow waterways as the Mersey or our own Hudson and East rivers. This being the case, the mind naturally reverts to barges and lighters. With this system of handling cargoes applied to the present type of ship the expense would be enormous, demanding, as is evident, two extra handlings, one at each end of the voyage.

Constructor Barnaby would load and unload his ship in midstream by lighters, and, instead of breaking their bulk, would take them aboard, hull and cargo, for his plan includes a clear sheet of water for them 'tween decks, a miniature harbor into which they may be floated at one port and floated off again at another. Once the lighter fleet containing the ship's cargo is properly arranged aboard, the floating basin can be pumped dry and all comfortably stowed for the voyage—the sea being let in again after the ocean has been crossed, and the cargo thus distributed in many bottoms floated ashore. The later plan is to keep lighters and steam tugs permanently floating aboard.

Let us suppose that the practicability of the system, so far as spare buoyancy is concerned, has been carefully determined, and that the basin with its waters and their burdens would not overcome the buoyancy of the ship, then surely the system has many advantages.

The present delays in stowing cargo and breaking out would be obviated, for, if a duplicate set of lighters were in use, the various sections of an outward cargo could be prepared before the ship was arrived. But far more important would be the saving of expense and convenience of distribution, once the ship was in and the various sections of her cargo broken out and floated into the stream; the lighters containing freight being dispatched to various parts of the shore line directly to the railway termini, thus saving always one and sometimes two handlings.

"I have never thought that size is a disadvantage in merchant ships, supposing they can be worked financially." This is what Constructor Barnaby told the iron and steel men. "On the contrary," said he, "the advantage arising from size in passenger ships seems to me to be so great that I do not see where we shall stop. In considering the problem, two sets of apparent difficulties confronted me, viz., those connected with the building of the ship afloat and those relating to receiving and discharging cargo. The ship would be a steel island, incapable of entering any docks. The building difficulties soon disappeared. They had no real existence. To meet the other difficulties, I propose to form shallow still-water harbors or docks within the ship, entered by gates in the sides, and to carry, always afloat there, the loaded barges and tugs; turning the barges out and taking in fresh ones already loaded at the ports of discharge and shipment.

"Such a ship would require to be fortified and garrisoned like a town. She could be made absolutely secure against fatal injury arising from perforation. The subdivisions required for this purpose might be made to serve effectually against the spread of any local fire. I do firmly believe that we shall get the mastery over the seas, and shall live far more happily in a marine residence capable of steaming fifteen knots an hour than we can ever live in seaside towns."

It may appear to those who have observed the effect of liquid in a moving basin that the commotion of the liquid in this floating harbor would tend to unsteady the ship. While this is quite true where the weight of the water approaches that of the basin, the reverse is the case where the fluid is but a fraction of the weight of the vessel containing it. For, as the constructor points out, "when a loose weight is moved about violently by the rolling or pitching of a ship, the tendency is to bring the ship to rest." Whoever may have been aboard a war ship in a storm, when a gun has broken loose, will see the force of this remark, and it is because of this now well understood principle that, as he explains, the larger ships of the British navy are being built with water chambers above the shotproof decks.

If the calculations are correct and the principle is properly applied to the 1,000 foot ship (she may be much longer than this, he says), there should not be any pitching, rolling, or heaving, however heavy the seas around her.

An important point in this discussion upon which the distinguished naval constructor is altogether silent is: How much will the presence of these floating islands upon the ocean increase the peril of navigating smaller craft? It would seem as if ordinary sail and steam traffic would be forced to forsake such paths as they traversed.

THE VISIT OF THE BRITISH IRON AND STEEL INSTITUTE.

The regular fall meeting of the British Iron and Steel Institute, in New York City, closed its session on October 3, when a great proportion of the six hundred delegates in attendance commenced a round of visiting with the object of inspecting the most prominent of the industrial establishments of the country, more particularly its coal, iron, and copper mines, its iron and steel mills, and its leading engineering works. During the five days the visitors were in New York City every facility was offered for their inspection of local objects of interest, prominent among which were the Brooklyn Bridge, the new aqueduct, and the bridges over the Harlem River, Edison's establishment at Orange, N. J., with numerous carriage parties on the beautiful uptown drives of New York City, and excursions by water to all the many interesting points so abundantly to be found in the vicinity of the city.

On the morning of October 4, a long special train whirled the visitors away over the Pennsylvania Railroad, making its first stop at the great saw and file works of Disston & Sons, the party here dividing up into groups, and, with the attendance of a numerous committee, examining into the American methods by means of which iron and steel are converted into saws and files. Mr. Joseph D. Potts, of the local committee, in welcoming the visitors, expressed the hope that they would there find "some fresh physical discoveries, and some new and successful applications of old knowledge suitable for use in similar processes at home," and that they would be "as much interested in the people who execute our industries as in the industries themselves."

From Philadelphia an excursion was organized to visit the works of the Phœnix Bridge Company, and the blast furnaces and rolling mills connected therewith, other establishments visited being the George V. Cresson Machine Works, the Harrison Boiler Works, and the shops of the Link Belt Engineering Company, a large party being also made up for a special visit to the Baldwin Locomotive Works, and another party paying a visit to the Camden Iron Works. Sir James Kitson is said to be at the head of the largest locomotive works in England, but their production only amounts to about 150 engines a year, while the Baldwin Works manufactured last year 827 locomotives, and expect to turn out 1,000 this year.

The Cornwall ore hills and blast furnaces and the big furnaces at Lebanon received brief visits during the progress of the party to Altoona, Johnstown and Pittsburg, where an international convention was held, on October 9 and 10. At the Altoona shops of the Pennsylvania Railroad several hours were spent by the visitors, who are said to have found some machines here that were entirely new to them, particularly the track indicator and dynamometers, for detecting inequalities in the rail service, or irregularities of gauge, and for recording the speed of a train and the weight pulled by the locomotive. It is said that another curiosity for the visitors was an automatic stoker and furnace into which coal is fed and from which the ashes are removed by machinery. At Johnstown the visitors were driven through the Cambria Iron Works, and for the first time saw the wonders of natural gas.

The Pittsburg sessions of the convention were held at the new Carnegie Library, at Allegheny, J. H. Ricketson, of Pittsburg, making the introductory speech, which was appropriately replied to by Sir James Kitson, who also read a letter from Sir Henry Bessemer, detailing the history of the Bessemer process, in which it was said of one Sheffield firm that "by the mere commercial working of the process, apart from the patent, each of the five partners retired after fourteen years with eighty-one times the amount of his subscribed capital, or an average of nearly cent per cent every two months."

Among the important papers presented to the convention were: One by Sir J. Lowthian Bell on "The Future of the Iron Manufacture," one by Sir Nathaniel Barnaby, chief constructor for the British Navy, on "The Protection of Steel and Iron Ships against Foundering from Injury to their Shells, including the Use of Armor," and one by Mr. A. E. Seaton on "The Development of the Marine Engine and the Progress made in Marine Engineering during the last Fifteen Years."

After their first meeting at Pittsburg the visitors were taken to the Wildwood oil field, about six miles distant, where they saw oil wells in various stages of operation, drilling, pumping and flowing, one of the wells being shot with nitro-glycerine while they were there. There were also excursions to Davis Island dam and the Ohio connecting bridge; to Wilmerding, the site of the Westinghouse Air Brake Company's works; to the Monongahela Gas Company's mines, which are lighted, mined, pumped and ventilated by electricity; to the works of the Etna Spring Iron and Steel Co.; to the Westinghouse Electric Co.; the Sable Iron Co.; the Pittsburg Steel Casting Co.; the Carbon Iron Co.; the Pittsburg Reduction Co., and numerous other establishments which contribute to make Pittsburg so interesting a field for investigation to metallurgical workers. In his address of welcome to the visitors, Mr. Ricketson gave some idea of the extent of these interests when he spoke as follows of the resources of Pittsburg: We have twenty-one blast furnaces, which in 1889 produced 1,293,435 tons of pig iron; thirty-three rolling mills, twenty-seven of which roll steel, and their production in 1889 was 1,105,573 net tons of steel, and 638,450 tons of rolled iron. Our annual capacity of steel rails is at present 550,000 tons. Our product of wrought iron pipe this year will, I am told, not fall short of 250,000 tons, while our output of structural iron and steel will be fully 165,000. We have forty-nine iron foundries, representing a capital of nearly $10,000,000. The principal electrical industry in Pittsburg is in apparatus for incandescent lighting. Of the dynamos in the United States, having the capacity for the supply of current for 1,500,000 sixteen-candle power lamps, Pittsburg alone has furnished 650,000 of this, or nearly 44 per cent. We have fifteen firms or companies making window glass, thirty-seven making flint and lime glass, and fifteen making green and black glass bottles. The 15,000 coke ovens in this district consume 9,000,000 tons of coal in making their product of about 6,000,000 tons of coke. The railway tonnage of Allegheny County, of business originating here, exclusive of what passes through, is 20,000,000 tons per annum, or a little more than 3 per cent of the total railway tonnage of the United States, which amounted in 1889 to 619,137,237 tons.

MANUFACTURE OF PLATE GLASS AT KOKOMO, INDIANA.

BY H. C. HOVEY.

The remarkable advantages furnished by the discovery of natural gas at Kokomo, Ind., have induced numerous manufacturing companies to invest capital there, the most important of which is the Diamond Plate Glass Company, whose plant now covers eight acres. The company control twenty wells of their own, together with a large tract of gas territory. They have invested $2,000,000, and employ from 600 to 1,000 men. The location is only a mile from the city, and the intervening space is being rapidly built up with a superior class of houses. The officers of the company at present are: A. L. Conger, president; M. Seiberling, general manager; M. P. Elliott, superintendent; F. M. Atterholt and W. L. Clause, secretaries; and E. G. Keith and A. G. Seiberling, treasurers. The list of stockholders is large, and the whole business is on a firm foundation, with a degree of prosperity such as to induce them to duplicate their Kokomo works at Elwood, a point twenty miles south. At Elwood the water supply will be from artesian wells; but at Kokomo water is drawn from the adjacent Wildcat River by a huge pump, with a capacity of 3,000,000 gallons per diem. The engine by which power is supplied for the works was built by E. P. Allis & Co., of Milwaukee, and has a capacity of 600 horse power.

The materials used are those that ordinarily enter into the composition of plate glass of fine quality, namely, white sand, ground lime, sulphate of soda, arsenic, and charcoal, mixed in special proportions. The melting pots are made of Missouri fireclay that comes prepared in barrels. Having been properly mixed, it is trodden by men barefoot until it gets the right consistency, when it is divided into small rolls, and piled up for use. One man has eighteen pots under manipulation at once, building up each by "spells" of six inches a day, and taking twelve days to finish the lot. This rather tedious process is necessary in order to allow time for the clay to harden as it is built up. No machinery has yet been devised competent to be substituted for the human hand in this important process. When it is remembered that a pot is required to hold from 1,000 to 2,500 pounds of molten glass while being handled by a dozen men, it is clear that the greatest care and thoroughness must be demanded in its manufacture. Every pot bears the initials of its maker, as well as the date of making, and all are allowed to stand for seasoning a considerable time before being used. The average life of a pot in constant use is about thirty days. Tuiles and stoppers are also made in the same pottery, but of a different grade of fire-clay.

There are two large furnace rooms. One room has three furnaces, with a capacity for twenty pots each, while the other has two furnaces for sixteen pots each. By recent improvements there is a great saving of fuel, as well as a material reduction in the time required for melting, and hence a corresponding diminution of the cost of manufacture. The required heat is 3,000° Fah. The natural gas is supplied from the wells by large mains, from which service pipes go to the several furnaces. It is impossible to tell the exact amount of gas daily consumed; but an estimate has been made of about 6,000,000 cubic feet. When the glass in any pot is properly melted, the pot is run out of the furnace room on a tramway to the annealing room, lifted by a crane, meanwhile being steadied by great tongs, and the contents emptied directly on the casting table. This is a heavy, flat table of iron, somewhat larger than the largest plate that may ever have to be cast upon it. At one end is a heavy cast iron roller, the full breadth of the table, and fitted so as to roll the entire length of the table by means of gearing along its sides. Narrow strips along the edge determine the height at which the roller runs above the table, and this again determines the thickness of any given plate of glass. An adjustable apparatus also fixes the breadth of the plate. The semi-fluid mass poured from the melting pot on the table is pushed before the roller, leaving a uniform layer between the moving surface of the latter and the casting table. The glass does not instantly solidify, hence the edges have a rounded appearance. A bar pressed against the end farthest from the oven thickens the plate for a few inches to enable its being pushed along without wrinkling. The roller having been rolled back to its carriage is trundled out of the way, the casting table is moved up to the edge of the annealing oven, whose heat has been carefully raised to a required temperature, and then by means of long iron pushers the red hot plate is shoved to its place. All this work has to be done with the greatest rapidity, and by men who may have been idle for an hour waiting for the turn of their gang.

I timed one operation as performed by a gang of fifteen. It took one minute and a quarter to run the melting pot to the casting table, and in two minutes and a half more it had been lifted, emptied, the glass rolled, the roller withdrawn, and the plate run into the oven. Total time, three minutes and three-quarters.

This was extraordinarily rapid work; the usual time allowed for each operation being about nine minutes, and the time for handling twenty pots being, on an average, three hours. The men are well paid, and seem to be vigorous and in good health. I was assured that serious accidents rarely happen, although slight injuries from the scorching heat or from the bits of broken glass are frequent.

Four plates may be laid at a time in each oven, and seventy-two plates may be cast in a day. There are forty-eight ovens in all, each measuring 25 by 40 feet in size; from which it will be seen that the annealing house must be very large, especially as ample space must also be allowed for manipulating the castings. When the plates have been in the oven for four or five days, the temperature meanwhile having been slowly reduced to that of the ordinary atmosphere, they are withdrawn. At this stage they have a rough, undulating appearance, and seem to be opaque, however pure and clear they may be in fact. They are now inspected for flaws, bubbles, blotches, and any other defects, which are marked for removal, or if necessary to be cut out. The edges are then squared by cutters and the plates go to the grinding room. The Dalish grinding tables are used, of an improved pattern, consisting in each instance of an octagonal revolving flat table of wrought iron, 25 feet in diameter, pierced by holes for pegging the plates to their place, across which extends a fixed bar carrying a pair of revolving runners (or "shoes"), that get their motion from friction with the edges of the more rapidly whirling table. These compound revolutions have the effect of grinding uniformly all the surfaces of the plates exposed to their action. This is done, first, by sharp sand, and then by carefully prepared emery, the table being constantly wet by a stream of water.

The process of fixing the plates for grinding is interesting. Twelve men carry the great plate by straps edgewise; while a thirteenth guides them along, taking notice that the plate does not tip too far one way or the other, and that its top does not strike anything. The largest plate yet made was in the works at the time of my visit, and measured 204 inches by 144 inches, weighing 2,000 pounds. Such a plate is valued at $500, and must be handled with great care. When all was ready, the grinding table was flooded with ten gallons of plaster of Paris, which was distributed by mops. Then the glass was slowly and very carefully lowered on to the table. What followed was unique and exciting. A dozen men mounted upon the prostrate plate and executed very odd and grotesque dances in order to set the glass properly in the plaster. This is called "the plate glass jig." When the plate, or plates, that have to be ground are set, they are pegged securely by wooden pins; and then the rotary motion begins, slowly at first, but increasing to sixty revolutions a minute. Once in a while, but not very often, a plate that has been insecurely fixed flies from the wheel, to the damage of itself and whatever it may strike. There are sixteen grinding tables in all, and each runs by an independent sixty horse power engine.

Although the sand and emery are selected and prepared with the greatest care, it is out of the question to prevent occasional scratches by coarse particles that creep in. Therefore all plates on emerging from the grinding room are inspected, and every blur or scratch is marked, to be rubbed down by hand in the rubbing room. The edges are also inspected for nicks and fractures, and properly squared. The plates then go to the polishing room. The polishing material is rouge (peroxide of iron), applied in a liquid state by weighted blocks of felt. There are twenty-eight polishing tables, so arranged with reciprocating motions that all parts of each plate are brought evenly under control of the rubbers. During these grinding and polishing operations the plate parts with about 40 per cent of its thickness as seen in the rough. After final inspection the plates are cut to the required size, packed, and shipped on cars that are run by a side track directly into the factory. Oddly enough, some of the most serious accidents have occurred during this final inspection. The plate stands on edge, with a man at each end to hold it steady, while a third does the inspecting. The men stand so far apart, on account of the great size of the plates, and the material itself is so beautifully clear, that an incautious workman or unlucky visitor imagines that nothing stands in his way, and accordingly he walks right into the glass. The result may be merely a great surprise, or it may be a fractured plate and a broken arm or abraded nose, or some other injury. In conclusion it should be added that for clearness, freedom from every kind of flaw, homogeneousness of material, and luster of finish, the Kokomo plate glass equals any other American product of the sort, and compares favorably with the best results obtained by European manufacture.

Absorption of Drugs from Ointments.

BY DR. A. P. LUFF.

The author describes some experiments he has made with the object of ascertaining to what extent drugs spread upon the skin in the form of ointments are absorbed into the general circulation. The several ointments containing soluble drugs were prepared, and each ointment was placed inside a sheep's bladder; the bladder was suspended in a beaker of distilled water, kept at a uniform temperature of 98° F. in a water bath. The ointments were prepared with three different substances as a basis, viz., vaseline, lard and lanolin. The results of these experiments are thus classified: Vaseline and iodide of potassium, exosmosis commenced at end of *one hour;* lard and iodide of potassium, at end of *nine hours;* lanolin and iodide of potassium, *nil* at end of *twenty-four hours;* vaseline and carbolic acid, exosmosis commenced at end of *two and three-quarter hours;* lard and carbolic acid at end of *seven hours;* lanolin and carbolic acid, *nil* at end of *twenty-four hours;* vaseline and resorcin, exosmosis commenced at end of *ten hours;* lard and resorcin, at end of *fifteen hours;* lanolin and resorcin, *nil* at end of *twenty-four hours.* These experiments have all been performed with sheep's bladders, but the author hopes to be able to publish the results of further experiments on the living subject. The practical lesson to be learned from this paper is that if an ointment is employed with the view of its active ingredients being absorbed, then vaseline is by far the best excipient to use; but if an ointment is employed for its local effect only, absorption of its active ingredient not being desired, then lanolin is the best excipient for such an ointment.—*Jour. of Dermatology.*

Interior Finish.

The intrinsic value of mahogany for any work where nicety of detail and elegance of finish are required exceeds that of any other known wood. Cherry also finds much favor on account of its pleasing effect with some builders, but it soon grows dull and dingy. Oak, which up to a few months ago was considered the most fashionable wood, is very attractive when first finished, but experience has taught most people that it does not take long to change all this, and instead of a light, picturesque interior, one that has a dusty, damp appearance is seen, that no amount of scraping, refinishing, and varnishing will restore to its original beauty. Ash, which is apt to present a handsome appearance at first, especially when utilized for interior decoration, is more apt to present a rusty appearance than oak. The causes that are so damaging to most other woods seem to bring out the better qualities of mahogany, which grows richer with age. Of a light tone at first, it becomes deeper and more beautiful with use, and although it may cost a little more at first, yet, considering the length of time it lasts, the expense is not, comparatively, as large as other woods which cost far less money, but that do not last nearly so long. What makes the wood even more valuable is the fact that unlike cherry, ash, or oak, it is very easily cleaned, because it is impervious to dust and dirt, and while it does not show wear, it grows brighter and richer, instead of growing duller. It is pleasing to the eye, a source of beauty, and a joy as long as it is in the house.—*The Builders' Gazette.*

HIME and Noad use for waterproofing textile fabrics a solution of cotton, or other vegetable fiber, in an ammoniacal copper solution containing four parts of copper. From this solution the copper is precipitated with zinc, when a colorless viscid solution of ammonium zincate and vegetable matter is obtained, in which the tissue is immersed to impregnation, pressed, dried, and wet-calendered.