SCIENTIFIC AMERICAN

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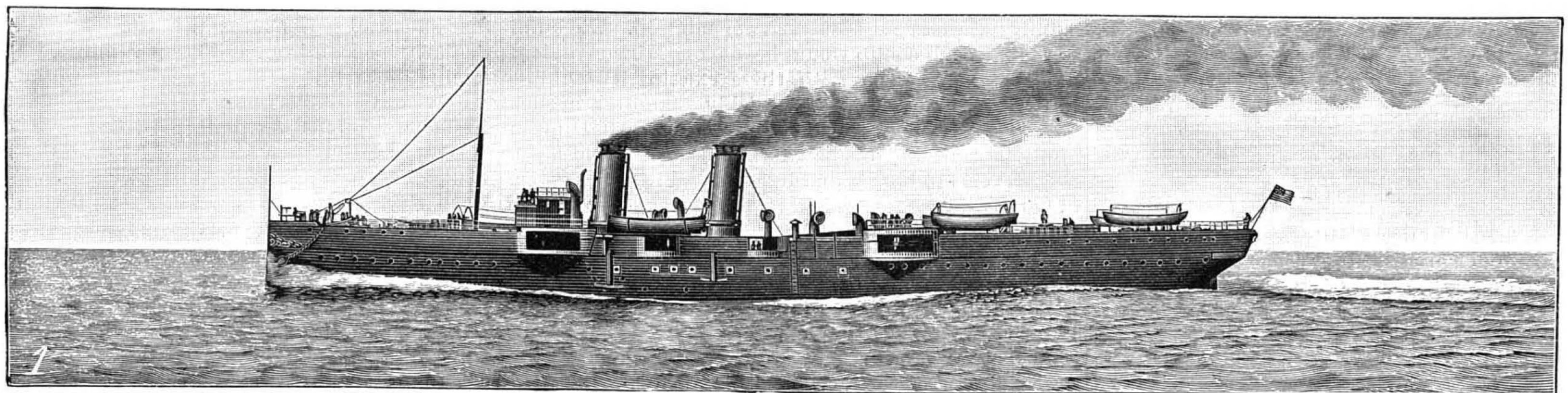
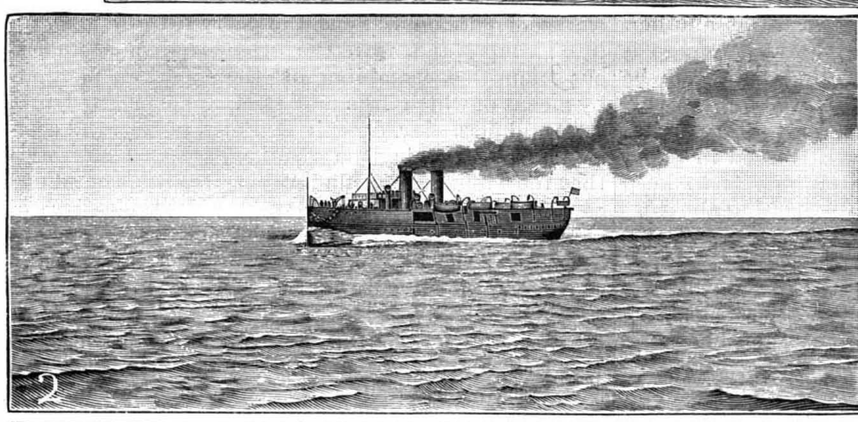
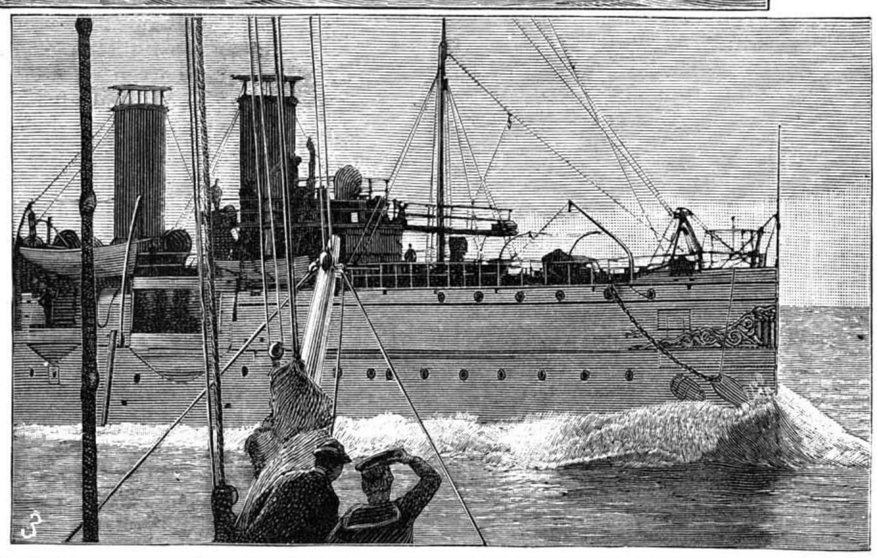
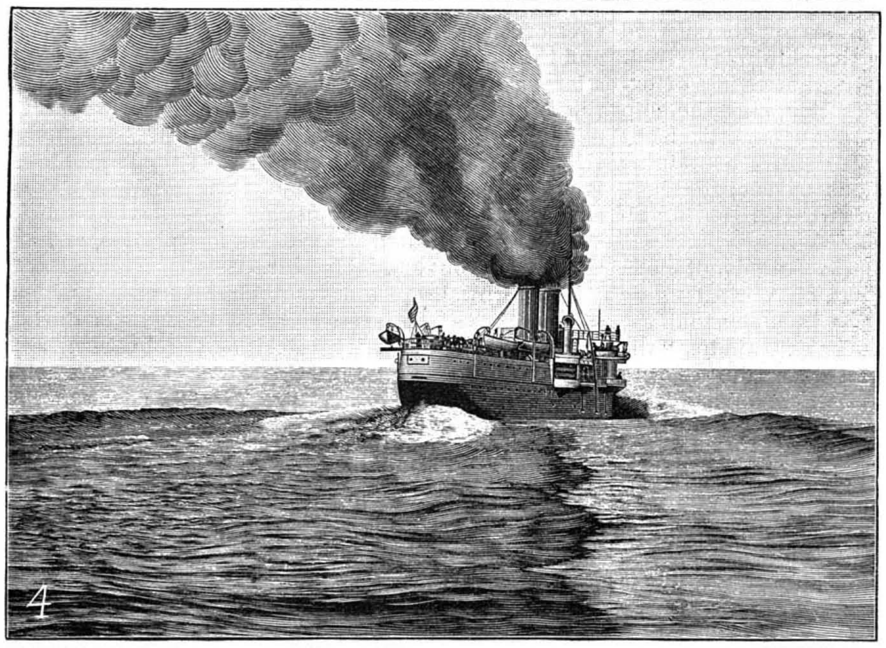
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

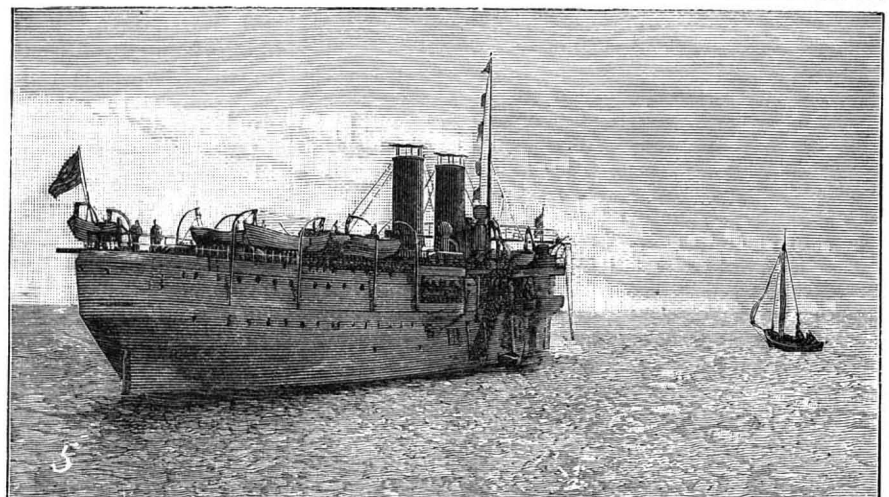
Vol. LXIII.—No. 16. ESTABLISHED 1845. | NEW YORK, OCTOBER 18, 1890. | $3.00 A YEAR. WEEKLY.

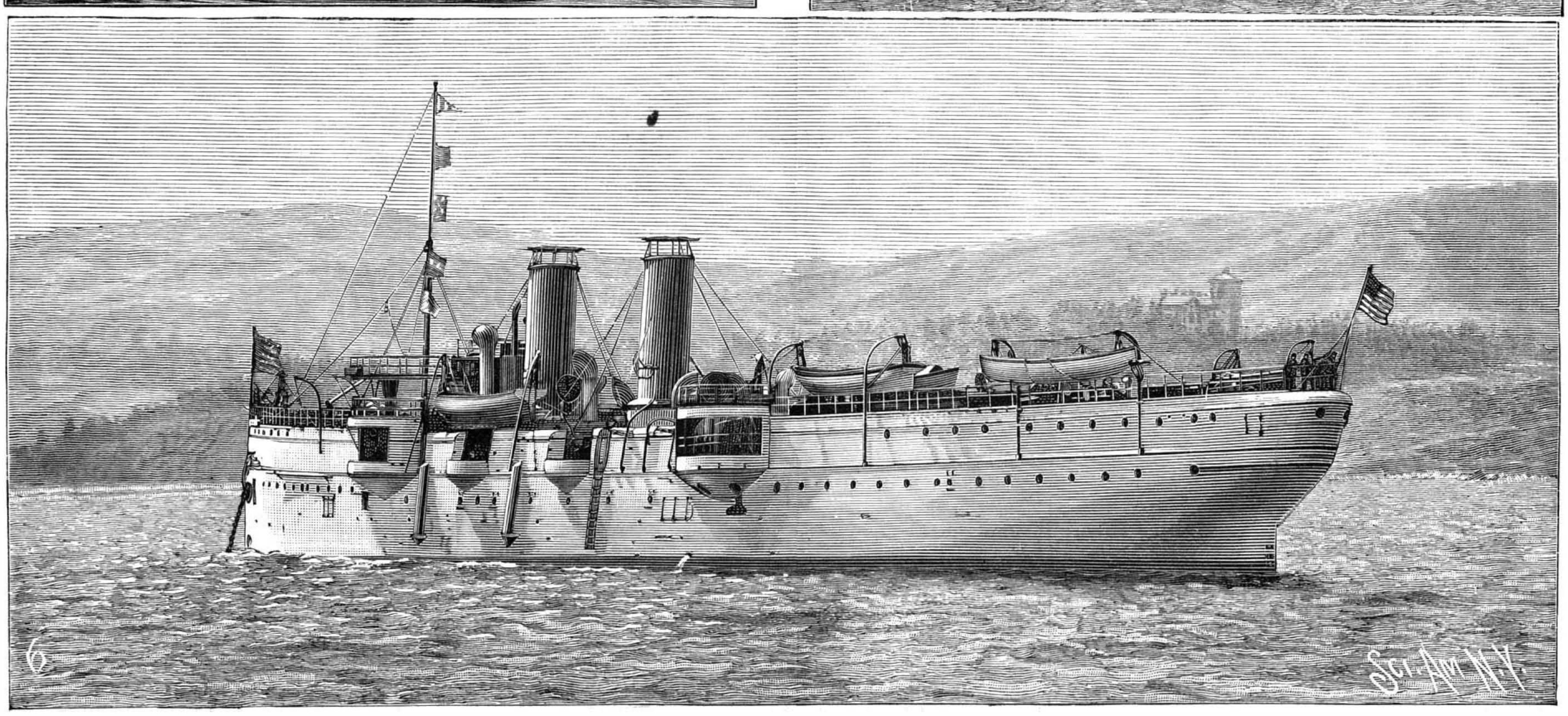












1. The San Francisco at sea, under full headway. 2. Under full headway—view two-thirds bow on. 3. Bow view, at moderate speed. 4. Rear view, showing remarkable wave lines. 5. At anchor—stern view. 6. The vessel at anchor—broadside view.

THE U. S. STEEL CRUISER SAN FRANCISCO.—[See page 244.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

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

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.......... ....$3 00
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is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus last page.

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NEW YORK, SATURDAY, OCTOBER 18, 1890.

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(Illustrated articles are marked with an asterisk.)

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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. Atterbolt 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.

THE DAGUERRE MEMORIAL.

Our illustration is a reproduction from a photograph of the memorial, made by Professor T. C. Smillie, of the National Museum, which appeared in a late number of the *Photographic Times.*

How this memorial came to be erected was through a motion by J. F. Ryder at the tenth annual convention of the Photographers' Association of America, at Boston, Mass., on August 7, 1889, that a committee be appointed to solicit one dollar subscriptions from amateur and professional photographers throughout the country, for the purpose of erecting a monument or tablet to the memory of Daguerre. It was further decided that it be placed in the Smithsonian Institution at Washington, D. C.

The chairman of the committee, Mr. H. McMicheal, worked zealously to secure subscriptions. In January of this year, the design we illustrate, that of J. Scott Hartley, sculptor, of New York, was fixed upon by the committee, and the work was awarded to him, to cost $6,000.

The memorial was successfully completed, and dedicated to the United States in the National Museum at Washington, D. C., on August 15 last in the presence of a large gathering of photographers, and representatives of the French government. Mr. H. McMicheal on behalf of the Photographers' Association presented it, and Secretary of the Interior J. W. Noble accepted it for the government, giving an extended account of Daguerre's work, and dwelling on the importance of his discovery.

The memorial consists of a granite base and globe, the whole standing 16 feet high. The design in bronze represents the figure "Fame" placing the bronze medallion bust of Daguerre, as if it were a picture, encircled with a wreath of laurel, at the foot of the globe, the ends being carried over the globe.

The bronze figure is 8 feet 4 inches high. The medallion bust is one and a half times life size.

On two sides of the base are the following inscriptions:

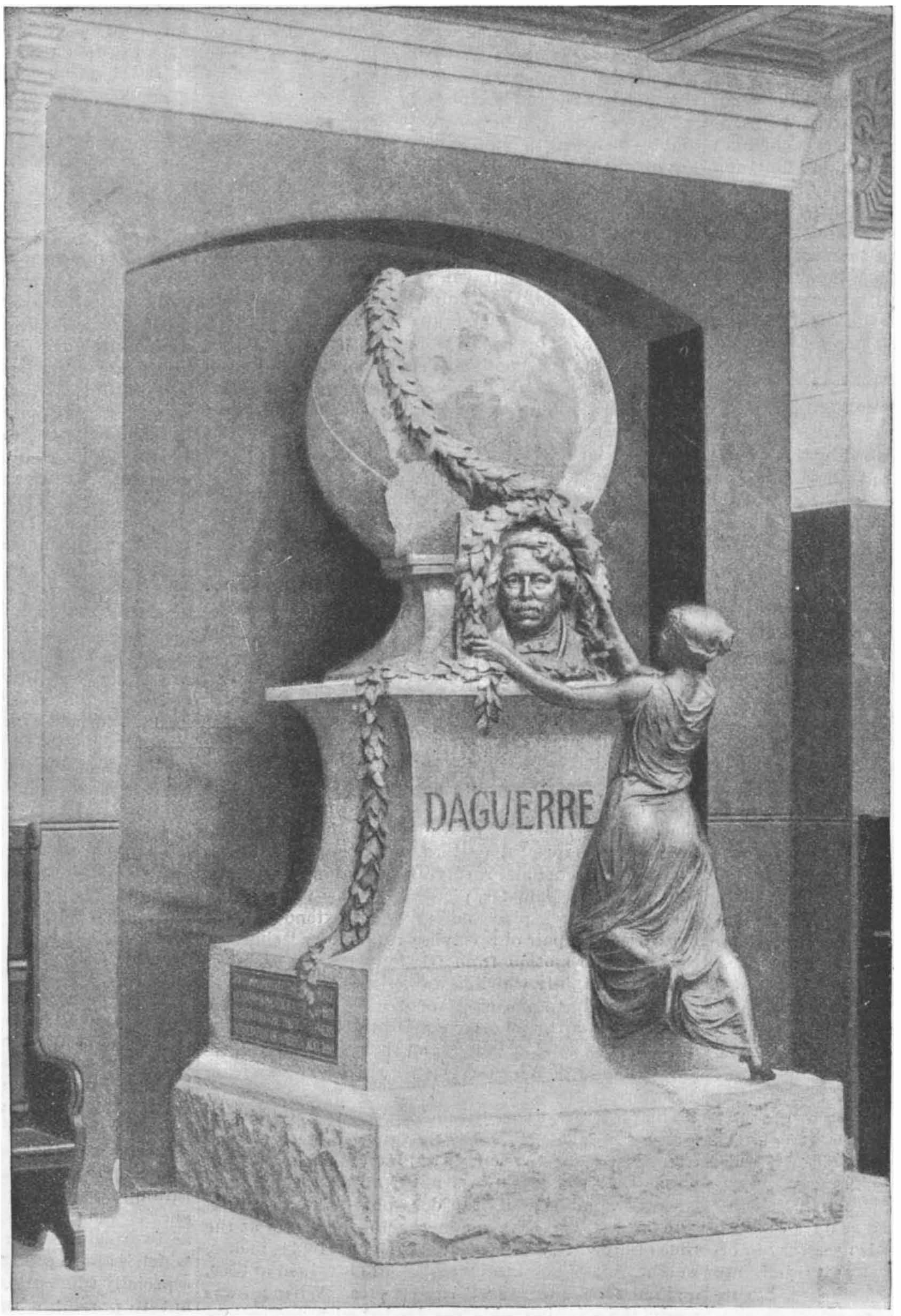
"To commemorate the first half century of photography, 1839-1889."

"Photography, the electric telegraph, and the steam engine are the three great discoveries of the age. No five centuries in human progress can show such strides as these."

"Erected by the Photographers' Association of America. August, 1890."

The object of the design is to show the universality of Daguerre's discovery.

The memorial is located in a prominent niche in the rotunda of the museum, where it is sure to be seen by many thousand visitors. It forms a fitting tribute to the memory of Daguerre, and also commemorates most appropriately the close of fifty years of photography.



THE MONUMENT TO DAGUERRE, RECENTLY INAUGURATED AT WASHINGTON.

Ramie for Silkworms.

According to the *American Druggist*, a discovery has been made by a lady at Columbus, S. C., that may have a marked effect upon two great industries. For a number of seasons this lady has amused herself by feeding silkworms and sending a few pounds of cocoons to the Women's Society for the Encouragement of the Silk Industry in Philadelphia. The extraordinary warmth of last winter caused the eggs to hatch far in advance of the season, and as the young leaves of the mulberry and the Osage orange had not put forth, our amateur was at a loss what to do. Seeing that the foliage of the ramie in a neighboring field was putting out, she gathered some and put the worms upon it. They fed ravenously, and she kept up the supply until the Osage orange leaves appeared. Then she divided her worms equally, feeding one set with ramie, the other with Osage orange. She kept the cocoons separate and sent them to Philadelphia. The experts there were astonished at the size of those spun by the ramie eaters, and wrote to the lady to know what she had done to secure them. They were not only larger, but the silk was finer. If further experiments should prove that ramie leaves can be depended on for silkworm food, then a great impetus will be given to the production of this valuable article in the South, while it will add to the profits of those who raise that plant for its fiber.

Electrical Railways.

What type of motor will finally usurp the electrical field is a question engaging the attention of some of the cleverest mechanicians on both sides the ocean. The charged rail system, the pioneer in the new field of locomotion, was seen at the very start to be crude, and, save under conditions where there could not be a profitable traffic, as in sparsely settled districts, impracticable. And who believes the overhead trolley system now so extensively developed all over the country has come to stay? Granting that it furnishes a cheaper, more expeditious and convenient means of transit than horse traction, it is yet cumbersome, requires a deal of expert attention and, worst of all, is uncertain and failing during a portion of the year.

The storage battery system has long been looked to by many as the coming system. As a laboratory experiment it has always given promise, but the great loss of power between the steam engine at the generating station and the axle of the motor made the idea of using such a motor in actual service untenable. Storage battery traction projectors, instead of being disheartened at the prospect for economical service, have steadily kept on improving the battery and apparatus, from time to time a public trial or private test serving to mark their progress, till now when its conditions, looked upon wholly from an economical standpoint, if it does not warrant the substitution of independent cars for those operated by trolley, has yet enough promise to dissuade to a very considerable extent those who would extend the present system. Among the many evidences of this is the following, coming to us from Boston:

"Such is the recent development of electrical devices that the West End railroad hesitates about erecting any more overhead wires for conveying the electrical current in propelling their street cars. Rapid progress is being made in improved storage batteries, improved motors and other appliances, and now that the inventive genius of the Yankee nation is brought to bear on electrical devices, we may not wonder at any miracle which may be accomplished. In fact we already hear of a storage battery constructed on purely scientific principles, which cannot be exhausted by any reasonable draught upon its capacity. The missing link just now is a proper method of applying the force thus stored."

Those who have ridden in a cable car will tell you that it leaves nothing to be desired, being quick and smooth going. But the cable car can't be backed nor moved off the rails and around an obstruction. This makes its use impracticable upon the crowded thoroughfares. The storage battery car, on the other hand, is as easily backed as driven ahead, it can be run off the tracks if need be, moved around an obstruction and replaced again. It has no trolley wires overhead to snap or get out of order, does not rely, as the trolley cars do, upon the transmission of a continual supply of energy, and cannot, therefore, be brought to a standstill because of leakage in the snow or cross-circuiting. On the Fourth Avenue street car line in New York city, experiments have been making for a long time with storage battery motors, and although there always has been an inclination to exaggerate their virtues from an economical standpoint—the electrical company declaring they run twenty-four miles without recharging of batteries, and the car men reducing this by a half—it is certain that they have been of late much improved, while yet not by any means so efficient in the utilization of power as at least one other system in this country and another in Britain.

Then again there is the primary battery. Many believe, and it would seem with reason, that that will in the end prove cheaper, as it certainly would prove more convenient than its secondary prototype. In England and France, as well as in this country, there have been recent improvements in this battery, first in the direction of a greater potential, and second in that of reducing the cost of the energy at the end of the drawbar of the motor. He would be a bold man who should predict which type would finally prevail, but it requires neither courage nor more than ordinary perception, from a careful study of present conditions and promises, to assert that the chances of the electrical storage battery taking the place of all other systems of street car traction are, to say the least, good, and improving all the time.—*The Safety Valve.*

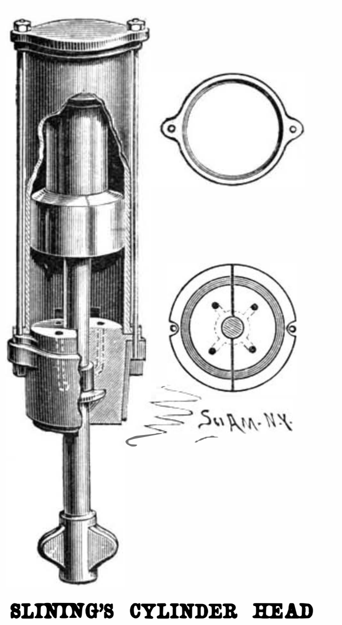
ANACARDINE is a gray dyestuff discovered in the seed of "anacardium" by Klimosch & Weiss, which dyes linen, wool and silk in the cold extremely fast to air, light, washing, hydrochloric and sulphuric acids, giving different shades with alkalies and milk of lime. It consists in the thick caustic oil which is easy to extract from the anacardium seed by alcohol. It is said to give an excellent bottom for indigo, if laid down for 2 to 5 hours in a hot bath of bichromate of potash before entering the vat. With nitric acid it gives shades of yellow.

Industrial Uses of Carbonic Acid.

At Krupp's works, at Essen, liquid carbonic acid, CO_2, is used in heavy gun making. Krupp discovered that by casting steel under pressure (some 1,000 lb. to the square inch), and rapidly cooling the metal by means of carbon dioxide, he could obtain heavy pieces free from defects. The pressure of 1,000 lb. to the inch is obtained by heating the vessel containing the liquid up to 30° Centigrade. It has been found by experiment that by heating up the liquid to 2,000° Centigrade, a pressure of 18,000 lb. to the inch may be obtained. The Krupp guns are built up of three cylinders, shrunk one on another. The cold portion over which the heated cylinder is being forced is kept cool during the operation by means of the cold resulting from the expansion of the liquid into the gaseous form. In like manner, in breaking up an old gun, the steel core is, by the same means, reduced to a very low temperature, the shrinkage due to which loosens the core and allows it to be drawn out.—*Industries.*

AN IMPROVED CYLINDER HEAD FOR ROCK DRILLS.

The cylinder head represented in the illustration is one which can be used for fibrous or leather packing, permitting it to be employed on drills driven by steam or air. It has been patented by Mr. George J. Slining, of Negaunee, Mich. It is applied on the usual rock drill cylinder, and has a bushing made in two equal parts and provided with an annular flange fitting on a corresponding flange of the cylinder. The exterior of the bushing is made slightly conical, and on it fits a yoke with apertured lugs, as shown also in one of the small views, through which pass bolts which also pass through corresponding recesses in the flange of the bushing and are secured to the head on the other end of the cylinder. In the center of the bushing are recesses in which is placed the packing, provided with an annular flange fitting a corresponding annular recess in the bushing. Recesses in the bushing and in the packing form channels which extend inward and open at their inner ends into the interior of the cylinder, as shown in one of the small views, so that the compressed air or steam may pass through the channels and press the packing firmly in contact with the piston rod. The construction is very simple and durable, and the head can easily be removed for inserting new packing when desired.

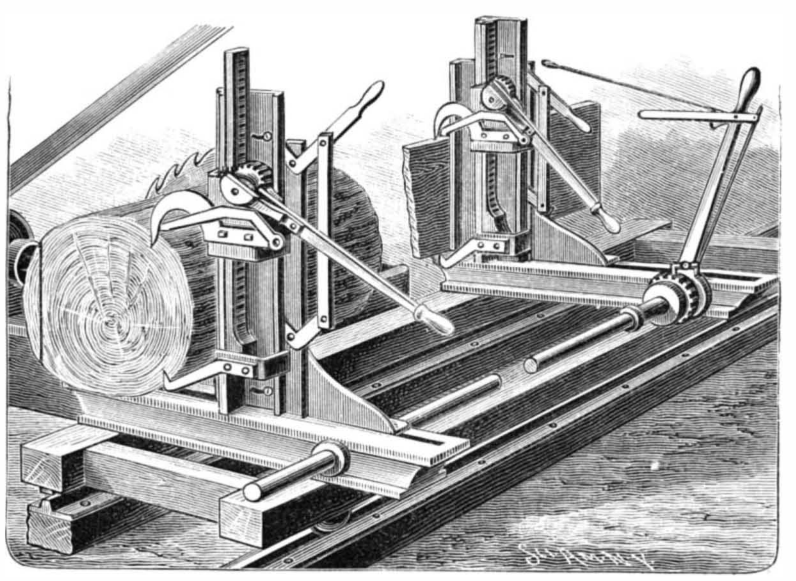


SLINING'S CYLINDER HEAD FOR ROCK DRILLS.

For further information relative to this invention address the patentee, or Mr. Samuel Mitchell, Negaunee, Mich.

Philadelphia the Great Carpet City.

The Philadelphia *Press* says the textile industry is the greatest of all industries in Philadelphia, and the largest branch of that industry is carpets. The trade has been in a flourishing condition, and in one ward in the city more carpets are made than in all England combined, the former home of the industry. There are at least one hundred and fifty mills in the city producing goods worth probably $40,000,000 a year, employing fully seventeen thousand persons.



BENSON'S SAW MILL DOG.

AN IMPROVED SAW MILL DOG.

The illustration represents a saw mill dog designed to permit of freely moving the log up or down in case of knots or crooks striking the collar of the saw, without releasing the saw. It has been patented by Mr. Marcus E. Benson, of West Plains, Mo. On the head block is a standard on which is held a horizontally adjustable frame, the frame having upper and lower slots through which bolts are screwed into the standard. To conveniently move the frame to adjust the dogs, upper and lower pivoted levers are employed, connected together by a link, the upper lever having a handle for conveniently actuating both levers. The frame has flanges forming guideways engaged by a vertical sliding carriage carrying the upper dog, and on the carriage is a transverse shaft having a gear wheel meshing with a rack sliding vertically on the inner face of a flange of the frame. The rack is supported at its lower end on a coiled spring, and on the lower end of the rack is secured a carriage similar to the upper one, and carrying the lower dog. A lever is loosely fulcrumed on the shaft carried by the upper carriage, and on this lever is held a pawl adapted to engage the gear wheel, there being held on the opposite side of the lever a spring-pressed arm with segmental edge adapted to be pressed in contact with a similar edge on the carriage.

On the shaft is also loosely fulcrumed a cam, supported on an arm fastened to the lever, so that the cam turns with the swinging of the lever. In operation, by the moving of the lever into a vertical position the pawl is disengaged from the gear wheel, and the carriage may be moved into its uppermost position. When the lever is turned horizontally, the pawl engages the gear wheel, when the weight of the carriage causes the rack to slide downward until the lower dog is below the top of the head block, permitting the log to be rolled thereon. When the lever is again turned vertically to disengage the dog, the rack is pushed upward by the coiled spring at its lower end, moving the lower dog with its point into the log, and permitting the operator to move the upper carriage so that the point of the upper dog engages the log from the top, the swinging downward of the lever causing the points of both dogs to be pressed into the log. When the lever is moved upward to disengage the points, the cam presses on a releasing arm engaging the rim of the log alongside of the upper point, so that the latter is easily withdrawn.

Fluorography.

Fluorography is a process of transferring lithographic or phototypic prints to glass by means of fluorated inks, which, in contact with sulphuric acid, disengages hydrofluoric acid, which eats into the glass. The phototype is inked with the following compound:

	Grammes.
Soap	50
Glycerine	200
Tallow	50
Water	100
Borax	25
Flourspar	50
Lamp black	15

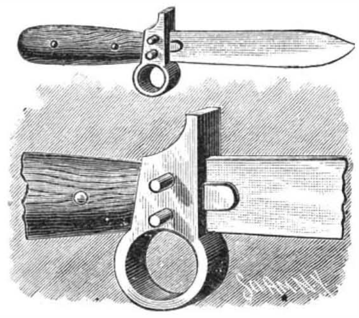
Negatives are taken and transferred to the glass. The latter is surrounded with a border of wax and covered with sulphuric acid of a density of 64° or 65° Baumé. After fifteen or twenty minutes the acid is poured off and the glass is washed with water and cleaned with a solution of potassa, then washed with water again and dried with a cloth. According to the *Revue de Chimie Industrielle et Agricole*, this is the process that gives the best results.

Height of Clouds.

Prof. Moller, of Carlsruhe, has made some interesting observations on clouds. The highest clouds, cirrus and cirro-stratus, rise on an average to a height of nearly 30,000 feet. The middle clouds keep at from about 10,000 to 23,000 feet in height; while the lower clouds reach to between 3,000 and 7,000 feet. The cumulus clouds float with their lower surface at a height of from 4,000 to 5,000 feet, while their summits rise to 16,000 feet. The tops of the Alps are often hidden by clouds of the third class, but the bottom of the clouds of the second class, and especially of the thunder clouds, often enfold them. The vertical dimensions of a cloud observed by Prof. Moller on the Netleberg were over 1,200 feet; he stepped out of it at a height of about 3,700 feet, and high above the mountain floated clouds of the middle class, while veils of mist lay in the ravines and clefts. The upper clouds were growing thicker, while the lower ones were dissolving, and soon it began to rain and snow.

A SIMPLE AND READILY APPLIED KNIFE GUARD.

The device shown in the cut is designed for use on knives, fishing rods, handles of hammers, and other tools, to facilitate obtaining a firm hold of the article to be grasped, and permit of suspending it from one of the fingers when desirous of using the hand for other purposes. It is a guard provided with a thumb rest and a ring, and is secured to a knife by transverse rivets through the cutting blade. From the front of the guard two lugs extend forward and fit snugly on the sides of the blade, forming a shield, while the rivets are preferably extended on either side, so that when used on a carving knife the latter may be laid down without touching the table or table cloth. Instead of applying the guard as shown, it may be arranged with the thumb rest and ring on different sides relatively to the handle, as may be preferred on special kinds of knives, according to the work to be done.



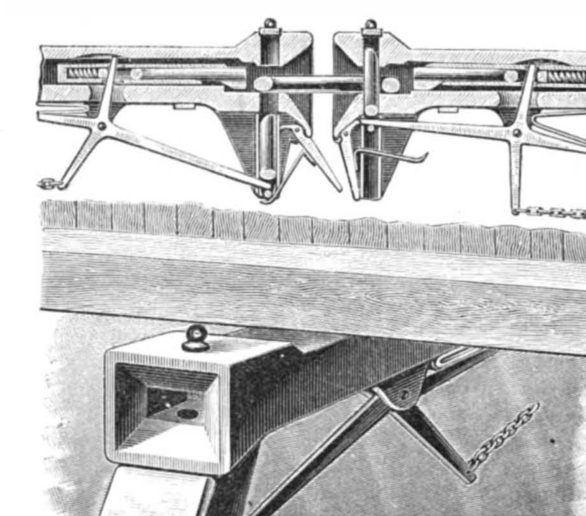
BAILEY'S KNIFE GUARD.

For further information relative to this invention address Mr. William P. Bailey, the patentee, Stowe, Vermont.

AN IMPROVED CAR COUPLING.

The device shown in the accompanying illustration is designed to be operated from the sides or top of the car, to work in any climate without easily getting out of repair, and to be applicable to all styles of cars, coupling with cars of different heights that use a link in coupling. It has been patented by Mr. Aaron Lougheed, of Port Arthur, Ontario, Canada. The drawhead has a flaring mouth, near which is a vertical tubular pin aperture extending from top to bottom of the coupler, and through a projection on the bottom, in which moves the coupling pin, the aperture being closed at the top by a removable cover, to exclude snow and ice. A guide rod or apron is pivoted below the mouth of the drawhead, and is held by a spring to extend downwardly and outwardly when the car is uncoupled, this spring being held at one end in a pocket on the inner side of the rod, and extending through slots in the vertical projection on the under side of the drawhead. The spring thus extends across the aperture below the pin, which rests upon it, holding the rod in position, as seen to the left in the top view, so that if a lower car is to be coupled to a higher one, the link of the lower car will strike the guide rod and be directed thereby into the mouth of the coupling. The slots in the vertical projection extend to the bottom of the drawhead to receive the free end of the spring, and the end of the arm of a forked lever pivoted between ears farther back on the bottom of the drawhead. The pin is slightly tapering at its lower end and has a horizontal slot to receive the end of the arm of the lever.

Within the rear recess of the coupler is a loosely fitting sleeve, having a shoulder which fits a corresponding shoulder in the bottom of the recess, and holds the sleeve and a slide-rod within it in the forward part of the coupler. The slide-rod is movable longitudinally in the sleeve, and is held forward therein by a spiral spring, the latter being retained in the sleeve by another arm of the lever pivoted between ears on the under side of the drawhead, this arm projecting upward through a recess in the drawhead and through slots in the sleeve and slide-rod. The outer end of the slide-rod has a depending tongue, fitting a groove in the outer end of the sleeve, so that when the rod is pushed inwardly, the incline of the tongue raises the



LOUGHEED'S CAR COUPLING.

slide-rod and the sleeve, that they may slide backward.

The pivoted forked lever, one arm of which extends forwardly through the pin and another upwardly through the sleeve and slide-rod, has also two rearwardly extending arms, one of which is connected with a mainspring, while the other is connected in any suitable manner with a lever at the side or top of the car. One end of the mainspring is suitably attached to the coupler frame or car bottom, while its lower end is bent over one arm of the forked lever, so that when the shoulder of the sliding sleeve is released from the shoulder in the bottom of the recess, the upright arm of the lever is forced inwardly, with the sleeve and slide-rod, while the forwardly extending arm of the lever is raised, as shown at the right in the top view, forcing the pin upward across the recess to engage a link that may be inserted therein. When the pin is raised by the action of the spring, the guide-rod or apron swings inwardly, the spring attached thereto following the pin up the slot, while the forwardly extending horizontal arm of the forked lever engages the upper prolongation of the guide-rod to hold the latter in the position shown at the right in the top view.

THE U. S. STEEL CRUISER SAN FRANCISCO.

The general satisfaction with which the reports were received of the signal success of the new steel cruiser San Francisco, in her recent trial trip, was no doubt due, in some measure, to the fact that the vessel was entirely constructed on the Pacific coast, and affords the first practical demonstration of the facilities presented on that portion of our seaboard for such work. Experts declare that the vessel has finer lines than any other ship of our new navy, and her machinery worked so admirably that great expectations are entertained of her proving to be in actual service materially faster than any other vessel of her class. As to the first point, the different views presented in our first page illustrations afford ample basis for examination and comparison, by all who have made it an especial subject to study such features of a ship's construction, as they affect its stability, speed, and economical efficiency.

The wave lines of the San Francisco, as seen in the broadside view at the top of the page, when the vessel is under full headway, and in the smaller views below, looking more directly on the bow, show an amount of apparent resistance of the water at the stem of the boat greatly in excess of what is usually looked for in fast vessels, while there is a correspondingly deep depression along the amidships section. The stern view is also remarkable from the prominence of the wave lines presented, and the great distance from the vessel to which such disturbance extends. This characteristic of the new cruiser, as faithfully reproduced from photographic views, is more striking when comparison is made of the wave lines thus produced with the much smaller comparative disturbance of the water made by the progress of the far larger and more powerful new steamers of the White Star and Inman lines. The wave lines of the new cruiser seem, indeed, much more like those of Mr. Gould's fast steam yacht, the Atalanta, than they do like those of a steamer of more than four thousand tons displacement, and in any final judgment as to her efficiency, this notable characteristic is well worth, and will undoubtedly receive, careful consideration.

When the San Francisco came into San Francisco harbor after her successful trial trip, she received a regular ovation from vessels and all along the city front, there being conspicuously displayed all over the yards and on the buildings the figures of her fast time, "20·6." This, however, was only the record for the last ten knots over the course, the official record being 19·7 knots per hour for the four hours' consecutive run.

Commodore John Irwin, Chief of the Board of Naval Inspectors, who went on the trial trip, expressed his belief that after the machinery had been used somewhat a higher speed could be made, adding, "It is the most perfect vessel I ever boarded. Her performance in steering, turning, and reversing is perfect." In the turning and reversing trials, there were, first, two tests of turning in a circle, with both engines going ahead. The time consumed in completing the circle was 5 minutes and 32 seconds on the first trial and 6 minutes 10 seconds on the second trial, the diameters of the circles being estimated at from 250 to 350 yards, and the tests showing the maneuvering qualities of the vessel to be remarkable. The next tests consisted in throwing the helm hard over and reversing one engine while the other went ahead. Although the engines were moving at a rate equal to a straight-ahead speed of 13½ knots an hour, the vessel seemed to turn almost as if on a pivot, the diameter of the circle actually made being less than the ship's length. Two circles were thus completed in 6 minutes and 2 seconds and 6 minutes and 12 seconds respectively. Although the tests made with the hand steering gear on the quarter deck were not successful, and this apparatus will be changed, the tests made with the hand and steam steering gear in the pilot house and conning tower, and in the extreme after part of the ship, below the protective deck, were perfectly successful, and the naval officers aboard expressed surprise at the ease with which the cruiser could be handled. The last test was to reverse both engines suddenly and send the vessel astern. When this trial was made, the engines were making seventy-five revolutions a minute, and ten seconds after they were reversed they were making sixty-eight revolutions in an opposite direction, the vessel beginning to move backward in forty-five seconds, having changed her direction within her own length.

The San Francisco is a sister ship of the Philadelphia and Baltimore, and was built at the Union Iron Works, San Francisco. The contract for the vessel provided that the builders should receive $50,000 additional for each one quarter knot made over 19 knots an hour, and they therefore earn $100,000 over the contract price, which was $1,426,000. The dimensions of the vessel are: Length over all, 328 feet; length on load line, 310 feet; breadth, 49 feet; draught forward, 16 feet 9 inches, draught aft, 20 feet 11 inches; displacement, 4,038 tons; horse power, natural draught, 7,500 horse; forced draught, 11,000 horse. The weight of her machinery is 914·12 tons, that of the Baltimore being 956·12 tons, and that of the Philadelphia 851·62 tons. The San Francisco developed on her trial trip 17·46 horse power per foot of grate surface, against 14·89 for the Baltimore, and 13·44 for the Philadelphia.

The San Francisco has a protective deck for its full length, sloping down to its sides about four feet below the water line, the sloping sides being two and a half inches thick and the top portion one and a half inches thick. The machinery and all the vital parts of the ship are below this deck, under which, along the sides, the space is used for coal bunkers. The vessel also has a double bottom and many water-tight compartments. She is driven by two three-bladed built-up screws of fourteen feet diameter each and two horizontal triple expansion engines. She has three hollow masts with two military tops for Gatling guns, and her armament will consist of twelve six-inch breech-loading rifled guns, four Hotchkiss revolving cannon, one one-pounder rifle, and two Gatling guns. She will require a crew of 300 men.

Is the Earth in Danger?*

Of course, danger—if danger there be—may be anticipated as proceeding either from within the earth itself or from without it, and the question arises at the outset: What is there in the center of our planet? Well, it has been imagined that the earth is, in reality, a hollow sphere, lighted by the two subterranean planets, Pluto and Proserpine, and even peopled with plants and animals. The celebrated Halley published a paper in the *Philosophical Transactions* on "The Structure of the Internal Parts of the Earth and the Concave Habited Arch of the Shell"! Holberg, the Norwegian dramatist, embodied a quaint satire upon the inhabitants of the upper earth in a scientific romance respecting the physical scenery, people, and institutions which had been discovered on a journey into the nether world. The more notorious Captain Symmes repeatedly invited Sir Humphry Davy and Baron Humboldt to undertake a subterranean expedition to the interior regions through a cavernous opening which he maintained was to be found near the North Pole. The ancients believed the center of the earth to be the abode of the spirits assigned to Hades. Lord Lytton has, in his famous novel, "The Coming Race," described the inhabitants of an imaginary nether world, and Jules Verne has published an account of a supposititious journey into the interior of the earth—both writers giving their vote in favor of the theory of the hollowness of our globe.

On the other hand, by far the greater number of philosophers, scientists, and writers have entertained the idea that the interior of the earth is a molten mass—a fiery conglomeration. To begin with, the younger Pliny attributed earthquakes and volcanoes to the presence of vast igneous forces imprisoned in the earth like smothered embers or cavernous furnaces. Plato also believed in an internal lake of fire. Robert Hooke went so far as to explain the catastrophe of Sodom and Gomorrah, and even the deluge itself, by earthquakes, which he referred to subterranean action. Then again Dr. Daubeny ascribed the phenomena of volcanic eruptions and earthquakes to the action of water rushing underground from neighboring seas, and chemically combining with metallic masses in the caverns of the earth. Dr. Mantell grouped together volcanic eruptions, abysmal fissures, hot springs, new islands, and water spouts as connected expressions of the same terrestrial force, due alike to the reaction of the interior heat of the globe upon its surface. Saussure, Daniell, Marcet, De la Rive, Reich, and other thermometricians announced the general conclusion that the temperature of the earth increases as we descend, at the rate of about one degree in every fifty feet—so rapidly indeed that at the center the hardest rocks and metals would be melted in an instant. Though it is generally admitted by scientists that the central fire of the earth is cooling, still the process is so gradual that the circumstance is not infrequently left entirely out of consideration. The great French naturalist Buffon represented the earth as a blazing fragment of the sun, struck off by a comet and left to whirl and cool for ages, and Cordier, Fourier, and Humboldt described our planet as a liquid ball of glowing metal and lava gradually cooling and shrinking within a solid crust.

In the face of these learned conjectures as to the composition of the central regions of our earth, one may well ask, Is our planet in danger? and examine the arguments *pro* and *con*. Humboldt asserted that the solid crust of the earth is, comparatively with the fiery mass within, no thicker than an egg shell! Pliny declared it the greatest of miracles that a day could pass without a general conflagration. Sir Humphry Davy threw out the suggestion that the inflammable metals beneath the crust of the earth only needed contact with hydrogen, afforded by neighboring springs, in order to fuse the surrounding rocks into such a substance as lava; and Dr. Daubeny has argued, from the weight of the globe and the prevalence of volcanoes in maritime regions, that its vast metallic contents are but like smothered fuel for kindling afresh and exploding in jets of mud and fire. Many of the early geologists predicted the dissolution of the earth. The only problem was: In what way would the catastrophe come about? It had long been a sacred tradition, both pagan and Christian, that the world would ultimately be consumed by fire. Buffon anticipated, from the gradual refrigeration of the earth, a reign of perpetual winter, and recent physicists have conjectured that the day will wane more slowly as the cooling earth spins more feebly, until at length, like the moon, it shall flutter upon its axis as a dead world, with the same pallid face ever turned toward the sun. On the other hand, La Place has demonstrated that, since the time of Hipparchus (2,000 years), the mean day has not shortened by the 3-100th part of a second. But the most popular theory of all is that which attributes the eventual end of the world to the destructive agency of fire. Buffon maintained—presumably as an alternative to his theory above mentioned—that igneous and aqueous forces would gradually submerge existing continents under the ocean, and reproduce others like those we inhabit. It is only natural that the repeated failures following attempts to fix the date of the predicted dissolution of the earth should have converted a religious foreboding into scientific skepticism, at first expressed in vagaries wilder than the fabled descent into Avernus. At the same time, however, the conjectures of philosophers and scientists above cited are sufficiently startling to warrant the serious question, Is the earth in danger?

* *World and its Wonders.*

Vinegar Eels.

Dr. G. Lindner discusses the occurrence of the "eels" common in weak or impure vinegar. The males and the females respectively measure 1–1½ mm. and 1½–2½ mm. in length. The worms move actively in a fluid medium, creep slowly in thick concoctions, or coil together in complicated knots. They thrive well on a diet of egg, withstand even tolerably strong vinegar, are killed at once by pure acetic acid, are very slightly perturbed by artificial digestive cultures, live well on fruits, bulbs, etc. The females reproduce viviparously or oviparously, according to the nutritive medium and the temperature, but soon die after reproduction, nor are the males long-lived. They flourish best between 60° and 80° Fah., are killed by a temperature over 107° Fah., or under the freezing point; on light and air they are very slightly dependent, but to drought very sensitive. After desiccation for three or four hours no revivification even of the eggs was observed. The worms have great powers of adaptation to the most diverse conditions. Their natural home seems to be in moist mud and in putridity, but they are rare in drinking or running water. That millions of germs float in the air is a fable. How they get into the vinegar is uncertain, but they probably insinuate themselves at certain stages of its manufacture. In vinegar prepared from wine by the quick process they are very rare. The "vinegar eels" are not exactly dangerous, but it is at once safe and more appetizing to make sure either that the vinegar is of the better sort, or at least boiled and filtered.—*The Microscope, translated from a German paper.*

The New Orleans Terminal Railway and Bridge.

The House committee on commerce has reported favorably the bill to authorize the New Orleans Terminal Railway and Bridge Company to build a bridge over the Mississippi above New Orleans. The bill provides for a high-level bridge with continuous spans, but having only two main piers in the river. The width of the central span shall be not less than 1,400 feet and the clear height of the central span not less than 120 feet at the center and not less than 120 feet for a distance not less than 250 feet on each side of the center. The clear height of the central span shall not be less than 110 feet at the two river piers, and the side spans 97 feet at the shore piers, all to be measured above high water.

Correspondence.

The Fastest American Horses.

To the Editor of the Scientific American:

The gray stallion Alabaster *trotted* a mile at Independence, Iowa, August 29, in 2:15—fastest four-year-old stallion record. The bay stallion Roy Wilkes *paced* a mile at same place and time in 2:08¼—fastest *stallion* pacing record. Maud S. holds the world's record trotting—2:08¾. Johnston (gelding) holds the world's pacing record—2:06¼. W. R. ALLEN.

Pittsfield, Mass., Sept. 26, 1890.

Blue Writing Paper—a Device Wanted.

To the Editor of the Scientific American:

Ruled black lines will not show through *blue* paper. Is there any contrivance that you or any of your multitude of readers know of as a guide for writing in perfectly horizontal and equidistant lines on unruled *blue* paper? As yet, I know of none such. If there is nothing of the kind, do you not know of a Yankee or other genius who could invent an apparatus or something, or devise a way, manner, and means for writing in straight and parallel lines on unruled *blue* paper? CHARLES MARSEILLES.

Exeter, N. H.

Filling Glass Jars with Hot Preserves.

To the Editor of the Scientific American:

Query No. 2435, F. S. M., asks the best way to keep glass jars from breaking when filling with hot preserves.

My wife puts up a great deal of preserves, and never broke one glass since she adopted the following plan, which seems very ridiculous at first:

"Rinse in cold water, inside and outside, and at once, while cold, pour in the boiling 'stuff.'"

You may think this unreliable; but all my neighbors and relatives do it just the same.

St. Cloud, Minn. J. B. ROSENBERGER.

Aluminum as a Battery Plate.

To the Editor of the Scientific American:

In your issue No. 17 of the last volume you ask your readers to give their experience as to the fitness of aluminum plates for battery use. I have used one of my own construction, with bichromate of potash and sulphuric acid fluid. I was at the time experimenting to find a solder for aluminum, but failed. Making much use in my practice of electric and galvanic apparatus, when one day, using a one-cup Faradic battery, the carbon broke, and it occurred to me to try an aluminum plate, and it worked quite well, and I used it for about two years off and on. This was in the year 1874. The aluminum plate did show wear. May be it was not quite pure, as at that time I had to pay a high price for every ounce I bought.

New York, N. Y. ERNST F. HOFMANN.

Work of Amateur Electricians.

To the Editor of the Scientific American:

Seeing that you would like to hear from amateur electricians, I thought that I would take up some of your valuable space to record the doings of four or five boys in this city.

We have organized a little "Electrical Club," purchased a back-geared engine lathe, and have set up quite a laboratory in a vacant room, which is lighted by electricity from sixteen 6 c. p. lamps, run by storage battery. We have meetings once every two weeks, at which members report the progress of the intervening time.

All members have free access to the laboratory and tools during spare hours, the tools having almost all been furnished by the parents of the boys.

Between us we have made an 8 light dynamo, with compound winding; but I cannot give correct figures about it.

A Thompson mirror galvanometer, with a mirror of the radius of 4 feet 6 inches, and a milliamperemeter are among the other products of the shop.

We want the data for a storage battery to light three 6 c. p. lamps which we can charge by 12 cells of gravity battery.

Please give us the required figures as to method of connecting primary battery, etc.

THE SPRINGFIELD ELECTRICAL CLUB,
By JOHN S. STEWART, *Secretary.*

Springfield, Ill., Sept. 16.

[The information sought will be found in "Experimental Science." See advertisement in another column. —ED.]

The Kerosene Lamp and its Defects—a New Invention Greatly Needed.

To the Editor of the Scientific American:

Another of those frequent kerosene oil tragedies has just occurred in West Ringe, N. H., where a woman and child have been burned to death.

Being in the lamp and oil stove business, I think it advisable to furnish a few hints in connection with the immediate cause of such disasters. Before proceeding further, I must remark that the present system of burning oil both in lamps and oil stoves seems like a satire upon this progressive age.

A flame oxygenated by air currents to the fiercest heat is placed directly in contact with a brass tube through which all the oil consumed has to pass. Of course, this tube being always made of brass, is one of the most rapid conductors of heat, and soon becomes excessively hot. A better device for generating explosive gas could hardly be conceived.

The worst of it is that the gas thus rapidly generated falls into the oil fount and is all ready for an explosion the moment that the smallest part of it comes in contact with fire. A slight current of air will often convey some of this gas to the flame, when a conflagration or explosion is almost sure to follow.

If the numerous inventors who read your instructive journal could substitute some device for the present mechanical and scientific outrage, something not too complicated and expensive, I risk nothing in asserting that such a device, if brought before the public in a business way, would become universal.

The horrors just referred to have now become so frequent that they receive only a brief and passing notice in the daily papers. KEROSENE.

Charlestown, Mass.

The London Metropolitan Railway Fire.

The fire on the Metropolitan Railway September 15 may certainly take rank as one of the most extraordinary occurrences that ever engaged the attention of Captain Shaw and his brigade. It is not the magnitude of the fire so much as its character, and the circumstances that led to it, which claim consideration. The scene of the disaster was a road bridge crossing the railway, about 300 yards to the north of the Farringdon Street station, and leading from Clerkenwell Road to Clerkenwell Green. Underneath the bridge were two double lines of railway, one pair serving for the Great Northern, the Midland, and the London, Chatham, and Dover traffic, while the other carried the Metropolitan trains. The two systems of traffic were separated by a brick pier, supporting the center of the bridge. In contact with this pier was a timber shed, as long as the bridge was wide, and containing about twenty barrels of naphtha, the property of the Metropolitan Railway Company. Overhead was the bridge, massively constructed of brickwork and iron girders, the latter of considerable size. It was a strong bridge, and in among the girders were two immense gas mains, the largest being the rectangular equivalent of the 48 inch main running from Beckton to Fulham—a distance of fifteen miles. The other was equal to a circle with a diameter of 36 inches. These were both trunk mains, having no service pipes, and carrying gas at high pressure.

It will be seen that everything was admirably arranged for a species of volcanic outburst at some time or other; and so it came to pass. There was all the greater risk of an explosion from the circumstance that the naphtha store was in a confined situation, where ventilation would be difficult. The weather was warm, the shed was shut up for forty hours, and in the meantime became filled with inflammable vapor from the volatile naphtha or "spirit." The custodian of the stores opened the shed on Monday morning, and, perfectly unsuspicious of danger, struck a match. In an instant the vapor took fire, the naphtha blazed up and exploded, and the tremendous flame, accompanied by enormous volumes of smoke, speedily roused the whole neighborhood. The fire brigade were quickly on the spot, but water was of little use against so inflammable a liquid. The iron girders of the bridge became distorted by the terrific heat, the two great pipes were fractured, and torrents of burning gas added to the fury of the conflagration. The roadway sank, and the traffic of an important thoroughfare was stopped, while the railway trains were also interfered with. Fortunately the central depot of the gas company was near at hand, and from this spot the chief distributing engineer, Mr. Foulger, was able to send messages along the private wires of the company in all directions, so as to summon help, and control the working of the valves connected with the various mains.

A strong body of men, employed by Messrs. Aird & Sons, contractors to the company, was promptly set to work by Mr. Foulger to cut off the flow of gas. The task was a heavy one, and fraught with some danger; but it was bravely and successfully accomplished. The roadway at each end of the bridge was laid open, so as to expose the mains where their form was circular. A hole was then bored in each of the four portions, and through each of these apertures an India rubber bladder was introduced in a state of collapse. The bladders being inflated by the action of powerful bellows, the passage through the mains was completely blocked. Gas no longer escaped from the eastern section, neither could air enter the mains on the western side of the bridge. So well did Mr. Foulger govern the valve arrangements in different localities, that the pressure was kept up in the mains running from the bridge westward, and all danger of an explosive mixture with atmospheric air was prevented. The gas being thus effectually dealt with, it only remained for the naphtha to burn itself out, leaving a shattered bridge and an intercepted roadway.—*The Engineer, London.*

Miss M. North.

The death is announced of Miss Marianne North, the accomplished artist, botanist, and traveler. She was born at Hastings in 1830, the eldest daughter of the late Mr. Frederick North, M.P. Miss North early developed a strong taste for natural history and a desire for travel, and in 1865 she went with her father to the East. For two years they resided in Egypt, Syria, and Palestine, and after Mr. North's death, in 1869, his daughter devoted herself to painting as a profession. In 1869–70 she executed a large number of landscapes in Sicily, and in 1870 visited Canada, the United States, and Jamaica. Her sketches made in these places were the foundation of the present collection at Kew. She next went to Brazil to paint the flora of the country, and she was received with much distinction by the Emperor. Teneriffe, India, and Ceylon were then visited, the result being a splendid collection of studies. A selection from them was exhibited before the Royal Society.

In November, 1877, Miss North went to India, and on her return, two years later, she offered her entire collection of pictures to the authorities of Kew, in trust for the nation, and she engaged to build at her own cost a gallery for their reception. The offer was accepted, the hanging of the paintings was superintended by the artist herself, and on July 8, 1882, the gallery was thrown open to the public. There are upward of 700 paintings, and, according to the testimony of Sir J. D. Hooker, it would be impossible to overrate their usefulness and scientific importance.

On August 4, 1882, Miss North left for the Cape, to study the vegetation of South Africa. Early in 1883 sixty new paintings were sent to Kew, and in June the collection had so increased that a new room was added to the building. On September 24, 1883, Miss North left London for Mahe, the principal island of the Seychelles group, where trees and flowers flourish which are unknown elsewhere. Here also she made many valuable sketches. She subsequently visited, in pursuit of her artistic and scientific objects, California, Borneo, Java, Australia, and New Zealand. A final journey undertaken to South America brought on a long and painful illness, from which Miss North never recovered, and she died a few days ago at her home in Gloucestershire, leaving a work which few can surpass.

The American Orthopedic Association.

At the recent meeting, the president, Dr. De Forest Willard, of Philadelphia, after welcoming the members, narrated his experiences in the observation of orthopedics in Europe during the past summer. He congratulated American orthopedic surgeons upon their decided superiority as regarded the application of general and surgical knowledge and the benefit to be derived from operative measures in the correction and relief of deformities. The safety, rapidity, and ease with which many bodily defects could be rectified by the knife and chisel, and the great advances made in the practice of antiseptic surgery, were, as a means of relief, more fully appreciated by Americans than by others. He would, however, give all credit to Macewen for his advocacy of osteotomy, while to Lister belonged the honor of securing that advance which in surgery in its varying applications had revolutionized surgical practice. In regard to mechanical advances, the invention and application of mechanical measures for the correction of deformities, for securing rest, for traction, for immobilization, and for the proper treatment of joint diseases, Americans could justly maintain that they were in the first rank. He then alluded to the orthopedic section of international medical congress, which had been established through American efforts. The most novel idea associated with this particular branch of the work shown at the exhibition of Berlin was the ivory joints of Gluck, by which he proposed to replace the excised portions of bone. These joints were intended to remain permanently in position, and to maintain the proper functions of the limb. While the subject was only yet in its experimental stage, in both theory and practice, yet he deemed it worthy of consideration. Dr. Bely's apparatus for the correction of deformities of the chest arising from lateral curvature of the spine by weight pressure exercised upon the individual in a stooping posture was highly commended. The president closed his remarks by referring regretfully to the death of two of the members, Dr. Lewis Hall Sayre, of New York, and Dr. David Prince, of Illinois.—*N. Y. Med. Jour.*

IT is said a good cement for joining parts of apparatuses, etc., permanently solid and waterproof, and which resists heat, oils, and acids, is made by mixing concentrated sirupous glycerine with finely powdered litharge to a thick, viscid paste, which is applied like gypsum. Glass, metal and wood can be cemented together by it.

THE HOWLING MONKEYS AND THE PINCHES IN THE BERLIN ZOOLOGICAL GARDEN.

Visitors to our Zoological Garden do not often see American monkeys, except the importunate capucine, which presses to the bars with its whining, begging cry, and the dwarfish marmosets, which always run away to their boxes, making a frightened noise like the twittering of a bird; and, therefore, it is with great pleasure that I have increased the large collection of monkeys here by the addition of a few specimens from the new world, thus giving the public some idea of the riches of the animal kingdom of South America. The accompanying engraving shows two remarkable specimens, the howling monkey and the pinche.

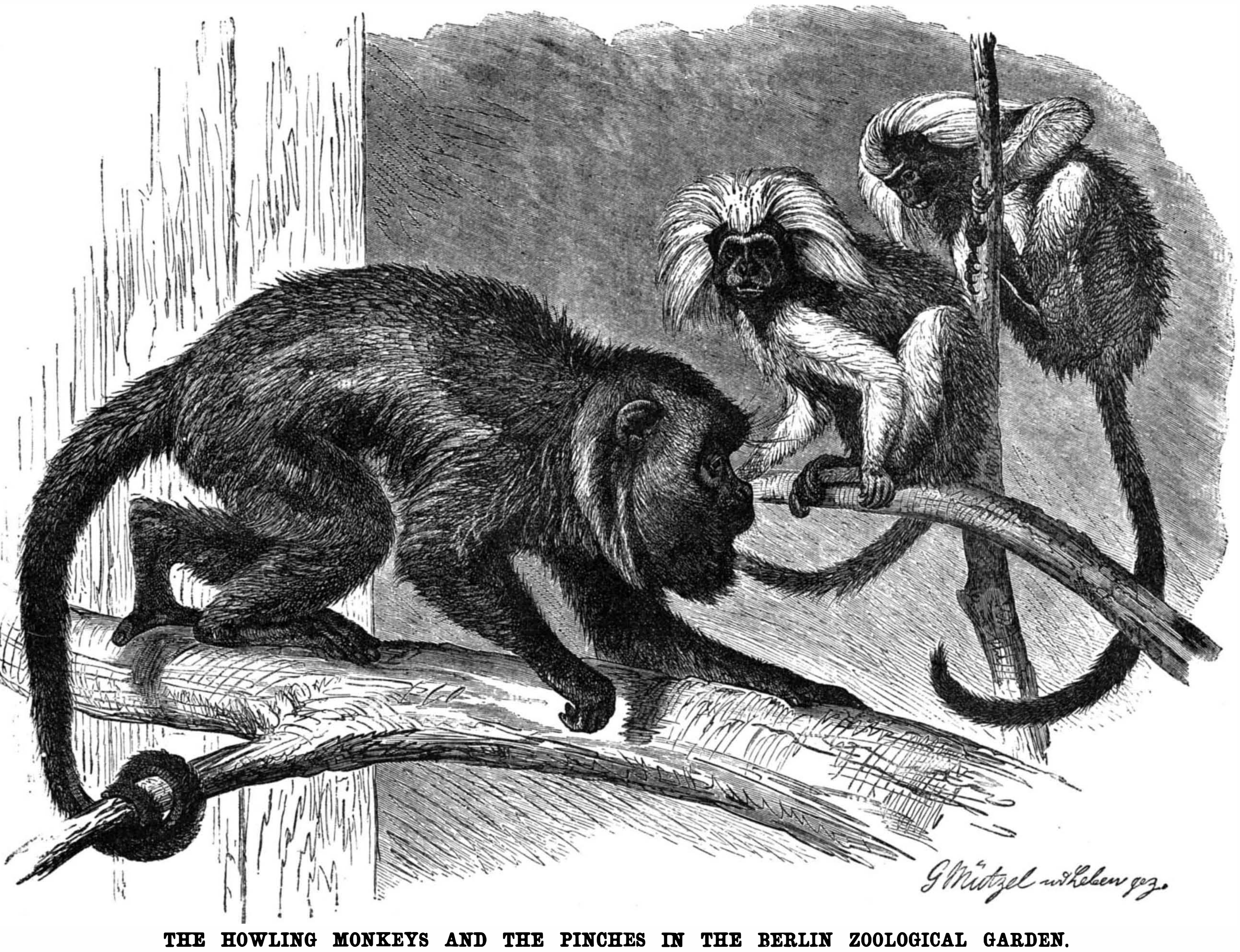
It is very difficult to keep the howling monkeys. They are seldom brought alive to Europe, and even if they do outlive the voyage, they usually live only a few weeks in our monkey houses. Nevertheless, when a specimen was offered me under particularly good conditions, in the early part of the year, I decided to buy it. He was a strong and quite well grown fellow, about the size of a small cat, healthy and lively, that is, as far as it is possible to speak of liveliness in connection with a full grown howling monkey. The phlegm of his nature is so great that nothing could force this creature to make a quick movement, to say nothing of a great spring. When my charge is enticed from the top of his cage by my call or a dainty morsel in my hand, it is always a trial of patience for me, for he requires considerable time simply to make up his mind to start. No move is ever made by grasping the perches and bars of the cage until the body has been firmly anchored by means of the tail. How can anything that is so accustomed to being held from behind hasten forward? This use of his tail is certainly the main reason for his slow, awkward movements. According to all South American travelers, this same slow movement characterizes the howling monkey in his native haunts.

He might be said to vegetate, doing only what is necessary for the support of life, but this dull, listless existence is interrupted from time to time by the dreadful howls which give it its name. This "howling" seems specially remarkable when we consider the otherwise quiet life of the animal. Schomburgk and Hensel give an amusing description of the way in which, after having finished a meal, the oldest male, the leader of the band, begins to walk back and forth seriously on a horizontal limb, with his tail raised and uttering interrupted howls which sometimes resemble the grunting of swine and sometimes the roar of the jaguar. As these sounds follow each other quicker and stronger and the climax of the solo is reached, the whole chorus joins in lustily until the sound is terrible in the still wood, and meanwhile the bearded singers gaze at one another in the most stolid, serious manner. The howls of these monkeys are heard so far (Humboldt gives the distance in one particular case as nearly a mile, which was paced off from an isolated cluster of trees) that it is only natural to draw the conclusion that a voice so out of proportion to the size of the animal must be due to peculiarities of construction, and this is the case, for the hyoid bone is changed, in this animal, into a hollow, resounding drum, and the larynx is provided with several pouches which catch the voice. Besides these remarkable anatomical peculiarities the mycetes are characterized by the possession of a muscular, partially bare tail and a well developed thumb on the fore hands.

The howling monkeys inhabit nearly all parts of South America, but are particularly numerous in the eastern portion of the continent. In the Brazilian forests they are, according to Hensel, among the commonest of the animals which are invariably met on every hunting expedition.

The pinche (*Hapale œdipus*, Wagn.) is quite the opposite of the bristly, bearded, dark, uniformly colored howling monkey, being a trim, light colored little creature. Its white limbs show very prettily against the dark trunk, and the "artist-like" mane falling smooth on its neck forms a strange background for the dark face with its bright eyes. This long hair on its head is the main characteristic of the little creature, and distinguishes it from its nearest relative, the golden maned marikin—the whole of whose body is covered with long hair—and the numerous other monkeys which the pinche closely resembles in its organization. The monkeys of this family differ from the ordinary monkeys in their dwarfish stature, the long, curved and pointed claws with which all their fingers and toes are provided, and in the formation of the thumb, which is not opposable. On the whole these monkeys bear a close resemblance, in their forms and movements, as well as in their lack of intelligence and their restless, anxious dispositions, to the rodents, especially those that climb, such, for instance, as the squirrel. According to the reports of explorers, their resemblance to the squirrel, in the way that they move among the trees, climbing the trunks in a screw-like path, etc., is striking, and they are, therefore, called squirrel monkeys.

The differences between the different species of this family are mostly external, and all that can be said of the family in general applies also to the pinche. It is a very interesting little dwarf monkey, which at first receives much attention, especially from ladies, but much of this good impression is lost on better acquaintance, on account of its lack of intelligence as compared with other monkeys. As the pinche is the least hardy of all the frailer monkeys, it is a rare sight in our zoological gardens, and I consider it a remarkable piece of good fortune that a couple of these little things have been kept here in good condition for more than a year. Whether this is due to the fact that they have been fed according to the advice of Brehm, I cannot say. All the different species of monkeys of this family inhabit limited districts which are often sharply defined by great rivers, and the pinche is no exception to this rule, for it is found in a very limited portion of the South American continent, coming from New Grenada, where it lives secreted among the trees, just as the squirrels do, and in this quiet life they are molested only by the eagle and man.—*Illustrirte Zeitung.*



THE HOWLING MONKEYS AND THE PINCHES IN THE BERLIN ZOOLOGICAL GARDEN.

The Electric Erygmatoscope.

At a recent meeting of the Académie des Sciences, M. G. Trouvé described an electrical appliance devised by him to facilitate the inspection of the geological strata pierced by the boring tool. The apparatus consists of a powerful incandescent lamp inclosed in a cylinder. One of the hemicylindrical surfaces of this cylinder constitutes the reflector, while the other, which is of thick glass, allows the luminous rays to pass through it, and light up the successive strata through which the lamp descends. At the base of the instrument there is an elliptical mirror, while the top is open, so as to enable an observer placed at the head of boring and armed with suitable glasses to see on the mirror the reflected image of the stratum illuminated by the lamp, which is arranged so that its upward rays are intercepted. The whole apparatus is suspended from a cable formed by the two conducting wires. This cable is wound on a drum, the trunnions of which are insulated from one another, and connected to the leads, current being obtained by two rubbing contacts attached to the poles of a portable battery. This arrangement enables the instrument to be raised and lowered without difficulty and without interrupting the observations. The erygmatoscope as at present arranged gives excellent results down to a depth of over 600 feet, and with a more powerful lamp it could be used at still greater depths.

Impermeable Glue.

To make an impermeable glue, soak ordinary glue in water until it softens, and remove it before it has lost its primitive form. After this, dissolve it in linseed oil over a slow fire until it is brought to the consistence of a jelly. This glue may be used for joining any kinds of material. In addition to strength and hardness, it has the advantage of resisting the action of water.—*Revue Industrielle.*

TRIAL OF THE NEW JACKSON JET BOAT EVOLUTION.

The new boat of Dr. W. M. Jackson, called the Evolution, propelled in a peculiar manner, namely, by means of a very small water jet under a very high pressure, went on a trial trip on the 9th inst., in New York harbor, and is reported as operating very well, although on this occasion she came far short of attaining the great speed anticipated by her owners. The propulsion of vessels by means of the hydraulic or water jet is a very old system, dating back nearly to the year 1700, since which time it has been tried in various forms by different inventors, earliest among whom in the application of steam power to the system were Rumsey, 1787, who had a fifty-foot jet boat on the Potomac which made three to four miles an hour. Subsequently the celebrated James Watt was an experimenter in the same line. Many others have made essays, and a few vessels of considerable size have been tried, the same principle of propulsion being employed, namely, the drawing in of a water supply at any convenient part of the boat and the expulsion of the same in the form of a jet at the stern of the vessel.

By the use of the water jet the mechanism needed for the propulsion of vessels is considerably simplified, since all that is needed is a boiler and the simplest form of steam pump. The ordinary propellers and paddle wheels are dispensed with.

In most of the experiments heretofore tried with the hydraulic jet as a propeller, the endeavor has been to make use of as large a jet as possible, economy of power being obtained this way, as was believed.

Thus in the Hydromotor, Dr. Fleischer's jet boat, built in Germany in 1879, a vessel of 105 tons displacement, 110 feet long, 17 feet beam, 6 feet draught, engine of 100 horse power, the area of her jet was 0·29 of a square foot; her speed was 9 knots.

The Thornycroft jet boat for torpedo service, built in London in 1882, was 66 feet 4 inches in length, beam 7½ feet, draught 2½ feet, displacement 14½ tons. Driven by a turbine with a jet 9 inches in diameter. The engines developed 167 h. p. and the speed attained was 12½ knots per hour.

The steam jet-propelled lifeboat Duke of Northumberland, lately illustrated in the SCIENTIFIC AMERICAN, is 50 feet long, 12 feet beam, draught 3 feet 3 inches, displacement 21 tons, 170 horse power. Driven by a turbine. Speed 10 knots per hour.

When Dr. Jackson's attention was called to the subject, he instituted a series of hydraulic experiments by which he became satisfied that the previous experimenters had traveled on the wrong road, and that the correct plan was to use a very small jet of water under a very high pressure. To carry out this idea, in 1887 he fitted up a small boat named the Primavista, of 50½ feet length, 5½ feet width, and 3 feet draught, 11½ tons displacement. She was provided with a ten inch Worthington simple duplex pump, a Roberts tube boiler of about 50 h. p. The water jet, discharged at the stern, was only a quarter of an inch in diameter. The water was expelled under a pressure of 690 lb. to the square inch, and the boat is stated, by parties interested in selling the stock of the company, to have attained a velocity of ten miles per hour. The alleged success of the Primavista satisfied Dr. Jackson that he had "struck ile" in the matter of steam navigation, and under the guidance of an able Wall Street stock promoter a company was formed with a view to the building of a new vessel, large enough to demonstrate, beyond all question, the great superiority of the high pressure jet over all other methods of propulsion. Over one hundred thousand dollars in clean cash was contributed toward the new enterprise, among the subscribers being a number of our best business men.

They were given to understand that the new plan was likely to effect a complete revolution in the art of propelling ships, that rudders, paddle wheels, screw propellers, and at least one half of the other cubersome machinery now required, would be done away with, a great increase of speed would be attained, and the time-honored theories and studies of marine engineers would be upset and thrown overboard. It was on this basis the Evolution was evolved, and her speed was to be at least thirty miles an hour. She is a handsome boat of 106 ft. 6 in. length, 23 ft. beam, 3 ft. draught, and 100 tons displacement. She is propelled by a 44 inch Worthington steam engine and pump, a Roberts safety tube boiler, 1200 indicated horse power, water jet discharge 1000 gallons per minute, velocity of jet 609 ft. per second, diameter of jet ¾ of an inch, hydraulic pressure on the jet 2500 lb. to the square inch. These are figures that have been furnished to us by parties interested, but we have had no opportunity of verifying them, as scientific reporters cannot at present be admitted on board.

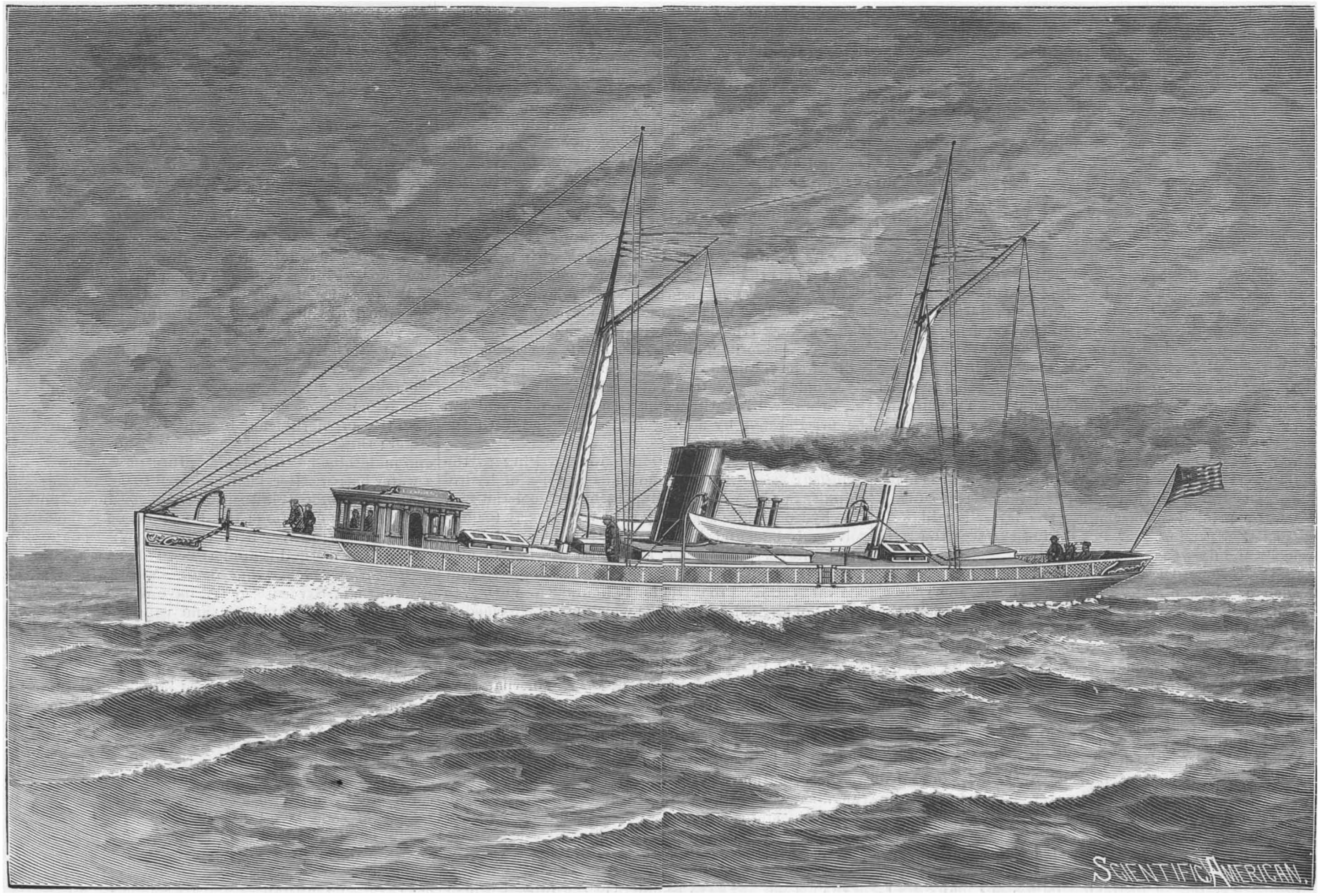
The man who expects to beat the best types of propeller boats by means of a ¾ inch jet of water has a hard row to hoe. The indications are that the Evolution cannot come up to the scratch. She has had a preliminary trial under low pressure. She has made a voyage down the harbor and back from Tabor's wharf, Brooklyn, to Hoffman Island, say 25 miles, and has achieved, as we are informed, a velocity of ten miles an hour, with a hydrostatic pressure of 500 pounds per square inch on the propelling jet. The horse power used on this trial we have not learned, but suppose it to have been about 250 horse power, and if so the boat will not, when running under full pressure, have any such high speed as her owners have claimed and expected. So far as tried she seems to have done as well, perhaps better than other jet boats, considering the smallness of the jet of the Evolution.

Like the jet-propelled lifeboat Northumberland, illustrated in the SCIENTIFIC AMERICAN of September 6, the Evolution can be easily steered without using her rudder, simply by turning the jet pipe. She can also be quickly backed, turned on her own center as a pivot or moved broadside on. It is to accomplish important movements like this that we have heretofore urged our naval authorities to put jet pipes into our war ships. So obvious an improvement should not be longer delayed or neglected.

Probably the boats that at present come nearest to the Evolution in size and power are the standard English torpedo boats and our government torpedo boat Cushing. The latter has a length of 138 feet, depth 10 feet, draught 5 feet 3 inches, displacement 117 tons. Maximum speed, 22½ knots per hour. Her engines have developed 1,700 horse power, driving the ordinary propeller. She carries, in addition, powerful pumps, capable of throwing 14½ tons of water per minute, by which it is supposed she could be kept afloat even if an enemy's shot were to make a 9 inch hole in the hull.

Pipe connections should be made with the pumps so that the water jet could be used to assist the quick turning of the vessel. And the experiment might also be tried on the Cushing by using the jet as an auxiliary in the propulsion of the boat.

The standard English torpedo boats are 130 feet long, 13½ feet beam, 1,150 horse power, speed over 23 knots. Some of the German torpedo boats exceed this speed. One of them, the Adler, a boat built for the Russian government, has a speed of 26·55 knots, or about 30 miles per hour. She is 150 feet long, 17 feet beam, displacement 150 tons.



THE NEW JET-PROPELLED BOAT EVOLUTION.

To cure a felon, says a correspondent, mix equal parts of strong ammonia and water, and hold your finger in it for fifteen minutes. After that withdraw it and tie a piece of cloth completely saturated with the mixture around it and keep it there till dry. If this treatment is adopted when the ailment is at first realized, the pains will cease at once.

Notes on Dyeing and Bleaching.

Bleaching by Electricity.—In Carl Kellner's new method of bleaching by electricity, he does not prepare a bleaching solution, and then treat with it the fiber to be bleached, but he impregnates the fiber with a solution which will, on electrolysis, give a bleaching agent, and then passes the moist fiber between the poles of an electrolytic apparatus, which, as a matter of convenience, is made in the form of revolving cylinders, several pairs of which are arranged in a horizontal line, and the fiber is passed successively between them.

Coal Tar Colors.—In a recent issue of "Notes on Indian Economic Products," published by the Indian government, Dr. George Watt, the reporter on economic products, has something to say about the increasing use of alizarine and other coal-tar dyes in India; and, like a good many other writers nearer home, he condemns them unsparingly. He is wholly in favor of the native Indian dyes and dyestuffs, and speaks admiringly of "the soft delicacy and harmony of color which formerly characterized the Indian fabrics," a feature we must confess we have failed to discover in those specimens of Indian fabrics that we have seen. We consider the colors, although in a few instances very fine, as a rule crude and not very harmoniously blended, while the design and its execution have usually been far from satisfactory. It seems like thrashing a dead horse to repeat that the coal-tar colors of to-day are quite as fast as, and much more brilliant and more easy of application than, the old-fashioned natural dyes. Dr. Watt gives a list of 193 dyestuffs indigenous to India; we wonder how many of these are fast.

Both the Rouen and Mulhouse societies have for many years past offered a prize for a new binding material to act as a substitute for albumen in calico printing. Mr. Richard Leigh's invention of a fixing size consists of two parts. The first relates to a size or vehicle for fixing colors on to cloth, which is made by dissolving resin in alkali, adding to this a solution of casein in alkali; or, instead of this, a solution of gum and a chrome salt; this, with the requisite color, is printed on the fabric. The second part is rather novel; a size is made by using gum, glue, or starch, mixing this with a chrome salt, and powdered resin or other resinous substance not soluble in water. This mixture is ground together with the requisite coloring matter, and, after printing, the fabric is passed over hot drying plates, when the resin is melted and fixes the color on the fabric. Or, instead, the printing color is made without the powdered resin, and this latter is dusted on the printed surface while the latter is still wet; then after passing over hot drying surfaces the resin melts and fixes the color as before.

Azo Colors.—Of late several azo-coloring matters, such as cloth orange, cloth reds, anthracene yellow, azo-green, etc., have been placed on the market, the makers of which recommend them to be dyed on wool mordanted with chrome and oxalic acid; the shades obtained being much faster to soaping and milling than if they were dyed in the usual way in a bath of Glauber's salt and acid. Lepetit now recommends the reversal of this practice, namely, that the wool be first dyed in the usual way in a bath of oxalic acid and Glauber's salt, and then the latter fixed in a boiling bath of bichromate of potash. The shades obtained are, if anything, slightly darker than if dyed on chrome-mordanted wool, but they are decidedly faster to soap, acids, etc.

New Indigo Vat.—Mr. Ashworth, of Manchester, has produced a new vat for dissolving indigo. He says the ordinary system of dissolving indigo has many drawbacks, which make it inconvenient and expensive. Schutzenberger's hydrosulphite vat also possesses some disadvantages, chief among which one infers that on adding lime it gives a precipitate of hydrate of zinc which makes the vat muddy, and then any reoxidized indigo cannot be recovered from it. Mr. Ashworth gets rid of these disadvantages by taking 150 lb. of bisulphite of soda, containing about 33 per cent of actual sodium bisulphite, $NaHSO_3$, and treats it with 8 lb. of zinc dust; when the solution is complete, the precipitate is allowed to settle and the clear liquor is decanted. To this sufficient sulphide of soda is added to precipitate all the zinc as zinc sulphide, thus leaving a solution containing only hydrosulphite of soda, which may be used to dissolve indigo. There is no doubt this new vat, by its freedom from zinc, will possess some advantages over the old hydrosulphite vat.

Ozonin, a New Bleaching Agent, by Dr. Ludwig Schreiner, of Stuttgart, seems to possess wonderful properties. The doctor takes 22 parts of hydrate of potash and dissolves them in 126½ parts of water, boils, and adds 125 parts of resin; when this is dissolved, 150 parts of oil of turpentine are added, and after stirring, this is dissolved; then 126½ parts of peroxide of hydrogen are added; the product is ozonin. If the peroxide is replaced by water, a solution possessing bleaching or oxidizing properties is produced. Ozonin, according to the patentee, possesses greater oxidizing powers than either turpentine alone or peroxide of hydrogen alone. Thus he says that if a solution of indigo oxide (whatever that may be) and caustic soda with sulphuric acid be taken, 5 drops of ozonin will destroy the color in half an hour, while peroxide of hydrogen takes 10 drops and requires 48 hours, and the resin-soap-turpentine solution takes 5 drops and 12 hours. Evidently ozonin has 24 times the strength of the latter mixture and 192 times that of the peroxide of hydrogen. A solution of 1 grm. of ozonin in 1,000 grm. of water is said to powerfully bleach textile materials; it is claimed to have disinfecting and antiseptic properties. The same patentee says that a bleaching agent can be made by agitating together 1 part of turpentine with 1,000 parts of water, soaking the materials to be bleached in this emulsion, exposing them to the air, and repeating these operations as often as necessary.

A New Mordant.—M. Chevallot purposes to use the resinates of alumina and zinc, the first for basic colors, the second for acid colors. These he produces direct on the tissue by first impregnating it with a 1 per cent solution of resin in caustic potash; then immersing the tissue in a solution of acetate of sulphate of zinc. By double decomposition, resinate of alumina or of zinc, as the case may be, is formed on the tissue, which is then ready to be dyed. Chevallot speaks of the resinate of alumina as giving water-resisting properties to the tissue; this has long been known, but is not used in practice.

New Yellow Colors.—The Clayton Aniline Company have commenced the production of new fast yellow coloring matters capable of dyeing unmordanted cotton. When sulphur is heated with paratoluidine, two bodies are produced, named respectively dehydrothioparatoluidine and primuline base, the properties of which have been described by A. G. Green in the *Journal* of the Chemical Society. These bodies are capable of being converted into coloring matters; in this way the dehydrothioparatoluidine is converted into its sulphonic acid by treatment with sulphuric acid; this is then diazotized and then combined with another quantity of the same sulphonic acid; or the base is dissolved in sulphuric acid, and after azotizing, combined with the dehydrothioparatoluidine sulphonic acid. The coloring matters, as sent out, are the sodium salts of the sulphonic acids so formed; and they will dye unmordanted cotton a fast yellow. They are soluble in water, from which the free sulphonic acid can be precipitated by adding acids. Alkalies turn the yellow color to red.

Hyposulphite Bleach.—Dommerque, writing to the *Moniteur Scientifique*, recommends the use of hydrosulphite of soda as a bleaching agent for wool and silk. The hydrosulphite is already used very largely for dissolving indigo, and it is made by taking 300 lit. of bisulphite of soda of 35° Bé., and throwing in zinc dust. In about an hour the reaction is completed, but the vat is allowed to settle for 12 hours before using, to permit of any sulphite of zinc which may be formed to settle out. The liquor is used as the bleaching agent. The wool or silk is first scoured in the usual way, then immersed in the new bleaching liquor and left there for six hours; the bleaching is at the end of that time usually finished. The bleached goods require to be well washed, so as to free them from any unaltered hydrosulphite, as this would on subsequent exposure become oxidized, and the oxidation is usually attended by the evolution of sufficient heat to seriously impair the fiber. A washing in weak hydrochloric acid removes any stains which are sometimes caused by the sulphite of zinc not having been allowed to settle out. The process has been in use for some time with, it is said, satisfactory results, not only as to the character of the bleach, but as to economy of the process, which does not exceed that of any other bleaching process, while it is much easier and more convenient to work.

Nitroso-dioxynaphthalenes are the subject of a patent of Fr. Bayer & Co. These are produced by treating 1—8 dioxynaphthalene and its isomers, of which we believe some 13 are known, with nitrous acid made from sodium nitrite and acetic acid. These bodies are obtained in the form of pastes, and they can be used for printing cotton and dyeing wool. For printing, they are mixed with thickening, acetic acid, and acetate of chrome, iron, or alumina; printed, steamed, soaped, and washed in the usual way. For dyeing wool, the latter fiber is first mordanted with bichrome or alum as usual, then dyed with the nitroso product. The specification gives no particulars as to the shade obtained; probably this varies with the mordant, and with the particular isomer of the dioxy compound used. Brown and black will be the shades principally produced. Dioxine, of Messrs. Leonhardt & Co., is a similar compound, and, although not quite sure, we think that Gambine B of Messrs. Read Holliday & Sons belongs to the same series.

Weighting silk for dark shades is done by alternately working the silk in solutions of tannin substances, such as catechu and sumac, and then in solutions of tin, when there is formed on the silk a tannate of tin. This method has been practiced for years, and is described as the general method in all text books on dyeing; yet we find a Lyons firm, in taking out a German patent, calmly saying that the general rule is to mix all the ingredients together and take the silk through this. Now, under these circumstances, the silk could not be weighted, and, what is more, as the tin and tannin would combine to form a tannate of tin which would be precipitated to the bottom of the bath, there would be a direct loss of valuable material, a circumstance pointed out by the patentees. These gentlemen, then, propose that, to avoid this, the silk be first passed through a solution of lead, bismuth, nickel, copper, manganese, or antimony salts, which mix and agree with chloride of tin. In this there is no particular novelty, it having been done before; the patentees, however, allude to an addition of magnesium chloride to the bath, which is rather a novel addition, and as it is claimed that there is no loss of material from precipitation, it is evident that it must act as a solvent, and keep the various agents in more perfect solution than is commonly the case. Whether this is so or not we are not in a position to say; but it is curious that in the claim to the patent no mention is made of this addition of magnesium chloride. It is claimed that while the weighting of the silk is well and efficiently done, there is considerable economy in the use of the weighting agents.

Dissolving Aniline Colors.—Jules Persoz, in the *Moniteur de la Teinture*, describes a method for rendering soluble, in benzine, bisulphide of carbon, and similar solvents, the basic aniline colors. As a rule, these bodies, such as magenta, methylene blue, green, etc., are salts, chloride, or oxalate, of a color base. Persoz's method consists essentially in converting the color base into a fatty salt of an oleate, and these fatty salts are soluble in the liquids named. It is a well known fact to candle makers that the aniline colors are not soluble in paraffin and petroleum products of any kind, but that most of them are readily soluble in stearic or oleic acid, and then they can be mixed with the paraffin in any proportion. Persoz has two methods. First, he isolates in any suitable way the base of the color, dissolves this in the oleic acid of commerce in the presence of a small quantity of alcohol, which is afterward distilled off. The product is an oleate of the color base, and is soluble in benzine. The second method he gives the preference; in this he prepares the color oleate by double decomposition from soap. He takes 32 grm. of white Marseilles soap, air-dried, dissolves it in about 2 liters of water, and a similar quantity of methylene blue dissolved in 2 liters of water; these are mixed cold, then heated to the boil, and maintained at this temperature for 30 minutes on a water bath. After being allowed to cool, the oleate of the blue is found in suspension in the liquid and is separated by filtration; the precipitation is complete, the filtrate being very little colored. With slight difference, the method is applicable to all basic colors.

Bleaching Powder and Soda.—Messrs. Pennock & Bradburn, of Syracuse, N. Y., have a new process for making bleaching powder and caustic soda in one series of operations. They treat salt with nitric acid, and so convert it into nitrate of soda, the gases resulting from the operation, consisting chiefly of nitrosyl chloride and chlorine, are passed into a vessel containing nitric acid and manganese dioxide, whereby nitrate of manganese and chlorine are formed; this chlorine is converted into bleaching powder in the usual way. It is claimed for this new process that all the chlorine is converted into bleaching powder, whereas there is a considerable loss in the methods now in use. The nitrate of soda is mixed with two or three times its weight of oxide of iron, and furnaced at a red heat in an oxidizing furnace. The nitrate of soda is completely decomposed, the gases are oxidized by passing over oxidizing substances, and are condensed into nitric acid to be used over again. The residue in the furnace is lixiviated and yields caustic soda of good strength and quality. The nitrate of manganese is heated, and the nitric acid and oxide of manganese thereby recovered.—*Dyer and Calico Printer.*

Aerating Milk.

The New York Dairy Commissioner says that milk can be sent further and will be in a better state for use when aerated down to the temperature of the atmosphere than when chilled and sent on ice.

The process is very simple, and consists in allowing the milk to run from one receptacle to another in fine streams, so as to come thoroughly in contact with pure air. It should not be done in the barn or stable, but out of doors where the air is purest. If nothing better is at hand, let it run through an old colander two or three times. A better arrangement is a set of perforated pans one above the other, through which the milk may run in fine streams. It is held that tyrotoxicon poison is generated in cream for the want of proper aeration, and that unaerated milk is the great enemy of infants and the great cause of cholera infantum.

MUCILAGE OF GUM ARABIC.—To make a clear, almost odorless, and permanent mucilage, Francke neutralizes the free acid present in the gum with lime water. Instead of water he uses a mixture 20 per cent lime water and 80 per cent distilled water.

Grain Elevators in the Argentine Republic.

Consul Baker, of Buenos Ayres, reports that the elevator and grain deposit in that city, which goes by the name of the Buenos Ayres Central Produce Market, is a very large and imposing structure. The building covers an area of 47,000 square meters under roof and is three stories high, with capacity for the storage of 238,000 cubic meters. It fronts upon the Boca or Riachuelo port, with a fine dock along the landing. The total area of the premises embraces over 30 acres, or 127,478 square meters. Besides being a deposit, it is also a general market for all kinds of grain, wool, hides, and other varieties of the produce of the country. This market is not only a center for all the different railway companies, each one having its tracks running into the deposit, but it is also arranged, by separate entrances, to receive bullock carts coming with produce from the interior. Vessels for foreign ports are loaded directly from the elevator, and its machinery for handling grain is of the first order, the greater portion having been brought from the United States. This immense edifice, although already partially in use, is not yet completed, and its total cost, it is estimated, will be in the neighborhood of $5,000,000.

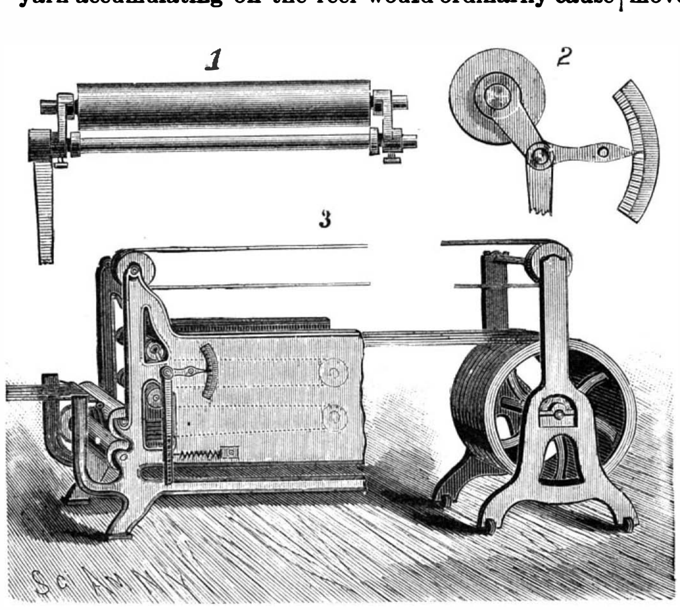
The elevator in Rosario, province of Santa Fe, is called the "Graneros de Rosario" (Rosario granary), and has been in operation several years. It is situated opposite the depots of the Central Argentine Railway, thus making it very convenient for handling grain arriving by that road from the richest agricultural districts of the province. It is eight stories in height, and in most of its details is constructed like many of the elevators of Chicago. Capacity upward of 300,000 bushels.

Besides this, there are now almost completed in Rosario an elevator for the Buenos Ayres and Rosario Railway and another for the Argentine Central Railway. The contractor for these is Mr. J. C. McLennan, of Chicago. The capacity of these is 250,000 bushels each. The machinery is all from the United States, and mostly furnished by the Buckeye Company, Salem, Ohio, and Poole & Hunt, of Baltimore. The cleaning apparatus is from Moline, Ill., the belting from the Boston Rubber Company, and the steam pumps from George Worthington, New York. They will each cost in the neighborhood of $300,000, and everything in connection with them is of the most modern style.

A TENSION INDICATOR FOR YARN DRESSERS.

The device shown in the accompanying illustration is designed to enable the operator to see at a glance how much tension is required on the winding reel. It has been patented by Mr. Thomas J. Sands, of No. 27 Orchard Street, Utica, N. Y.

A roller is mounted in bearings in arms secured by binding screws to an oscillating shaft, as shown in Fig. 1, the latter shaft being mounted in suitable bearings attached to the side frames of the yarn dresser. On one end of the oscillating shaft is a downwardly extending arm having at its outer end a series of apertures, to one of which is secured one end of a spring, attached by its other end to the side frame, as shown in Fig. 3, this arm having a pointer, shown also in Fig. 2, to indicate measurements on a graduated scale. The yarn dresser is in direct connection with the winder, and when the reel begins to take up the section of yarn, the yarn accumulating on the reel would ordinarily cause

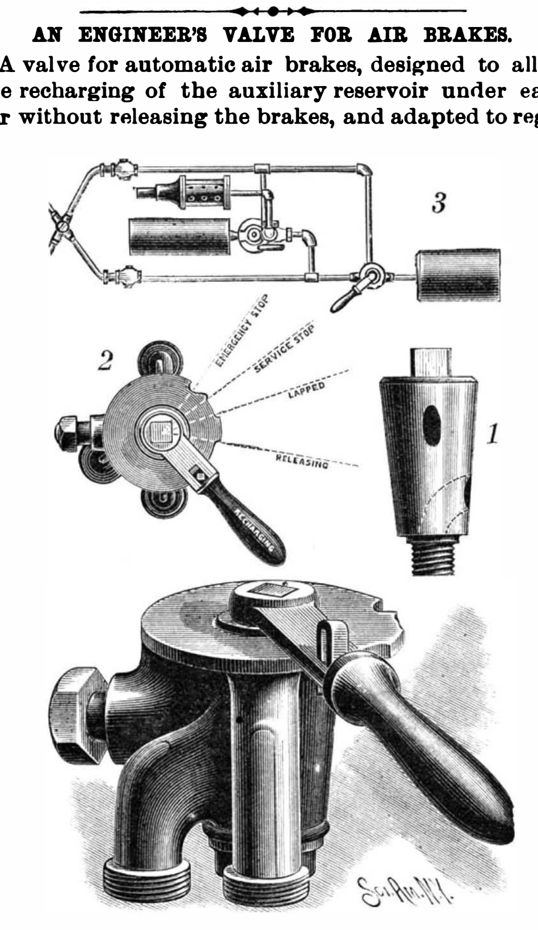


SANDS' TENSION INDICATOR FOR YARN DRESSERS.

the latter to tend to take up more yarn than would be delivered by the dresser, producing a strain on the yarn. This is avoided by adjusting the tension device on the belts operating the reel of the winder, causing the belts of the reel to slip as the diameter of the reel is increased, the slightest abnormal strain on the yarn in the direction toward the reel causing the roller to swing and the shaft supporting it to oscillate, whereby the pointer changes its position on the scale, and the operator can see at a glance how to adjust the tension to cause the roller to assume its natural position. This adjustment is effected by means of the spring in connection with the series of apertures on the arm extending downwardly from the oscillating shaft.

AN ENGINEER'S VALVE FOR AIR BRAKES.

A valve for automatic air brakes, designed to allow the recharging of the auxiliary reservoir under each car without releasing the brakes, and adapted to regu-



LEEMAN & JONES' VALVE FOR AIR BRAKES.

late the force of the brakes by releasing or reapplying at any time without fully releasing, is shown in the accompanying illustration, and has been patented by Messrs. Charles E. Leeman and Albert W. Jones, of Salida, Col. Fig. 1 is a side view of the valve plug, Fig. 2 being a plan view of the improvement applied, while Fig. 3 shows its application to the Westinghouse system. The valve body has opposite pipes connected with the main air reservoir and the train pipe respectively, with a third pipe also connected with the train pipe and with the exhaust opening of a triple valve, by which communication is established between the main air reservoir and an auxiliary reservoir. The valve plug has a transversely extending opening adapted to connect the inner end of the pipe from the main air reservoir with the upper end of the pipe connecting with the train pipe, and in the plug is also arranged an opening which leads from one side of the plug to the center and through its lower end to the outside. The latter opening has one side angular, with the other side curved, the angular side gradually permitting the air to escape, to prevent all jerks in applying the brakes. This opening is adapted to register with the pipe connected with the triple valve and with an extension of the pipe connected with the train pipe. When the operator desires to recharge the auxiliary reservoir, he moves the lever to the position shown in Fig. 2, moving it to the second position to release the brakes, and to "service stop" to apply them, etc. By the use of this valve it is designed to place the control of the brakes and train entirely in the hands of the engineer, without necessity for adjustment by the trainmen, to use as small or great amount of pressure as desired on the brakes of each car, while the brakes may be applied gradually without jerking of the train.

Experiments with Fibrous Plants.

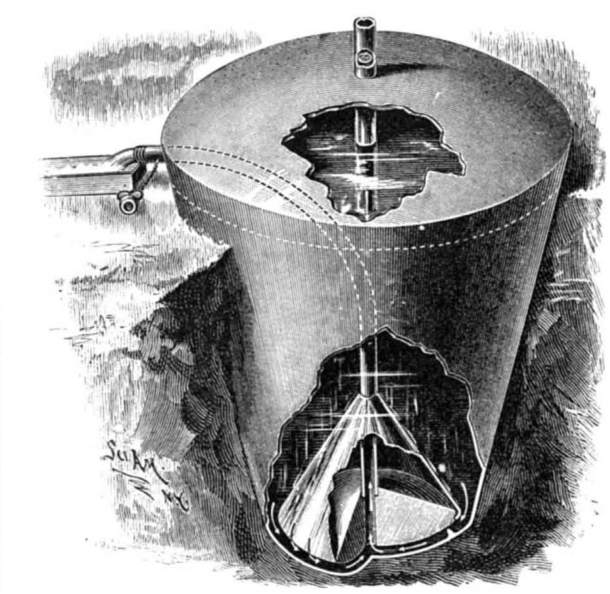
At London, in the Lambeth district, a factory in charge of Mr. Taylor Burrows has been started for the treatment of various kinds of fibrous plants. If the work prospers, textile manufacturers in all other countries must be greatly interested. There have been many attempts to substitute different fibers in the manufacture of textiles for silk or wool, and occasionally they have been successful, but oftener have failed, and this new factory has been established with a view to testing these sundry fiber-bearing plants by existing machinery and processes, and to discover wherein the treatment has hitherto been defective, and, if possible, to meet it.

A London journal writes of the new enterprise as follows:

"For want of time, money or knowledge, or of all three, a useful or even valuable addition to our stock of fibers may so far have been lost. Samples of fibrous plants of every species can now be submitted for carefully supervised trial, and if the present machines or processes prove unsuitable in some little detail or other, the defect will be discovered and remedied. In like manner advice will be given as to the best machines and methods of treating fibrous plants, and the opportunity will be afforded of studying the various processes of production and of acquiring a knowledge of the most scientific methods of preparing fibers. In fact, the present enterprise promises to develop into an important public technical school, for it is proposed to establish branches in textile manufacturing and cognate centers. The various processes to be carried out at the model fiber factory comprise the rapid retting and ungumming of fibrous plants; automatic breaking, scutching, combing and hackling; spinning into simple or mixed yarns; cottonizing and woolenizing fibers to imitate fine cotton or wool, suitable for the manufacture of various mixed and cheap fabrics, as well as for fine and costly goods; bleaching and dyeing the same, and the rapid drying of fibers by means of cold air. The factory consists of a spacious warehouse and storeroom for machines and samples, with offices annexed, and a large machinery and operating room, with a laboratory and an engine and boiler room. There is also a spinning machine in order to test the various fibers in this respect, and to see how they are likely to meet the requirements of a commercial article. Another important improvement is also being introduced at this factory, and that is the rapid retting of flax. The usual method of retting is to soak the flax in water for about three weeks. By the new process this will be effected in about a couple of hours. This quick action is brought about by submitting the flax to the influence of heat and moisture."—*Bradstreet's.*

AN IMPROVED CISTERN.

The accompanying illustration represents a cistern designed to be self-cleaning at each rainfall, and provides for the flowing off of the water from the bottom of the cistern as the fresh water enters at the top. It has been patented by Mr. Caleb S. Johnson, of Beaufort, S. C. The supply tube or rainwater pipe extends a short distance below the cover and is provided with a strainer, while through one side of the body, near the cover, is projected a curved tube to the lower end of which is secured a block having a vertical bore. A


JOHNSON'S CISTERN.

conical deflector is attached to the block and to the lower end of the curved tube, the block being supported by suitable feet upon the bottom, whereby a space is obtained for the reception of sediment. The deflector has apertures near its base and apex, intersections within governing the current thus produced, and is designed to cause any sediment in the water to pass downwardly in contact with its sides as it falls to the bottom, to be thence forced out upwardly through the central curved pipe when the cistern fills, or is to be flushed for cleansing purposes.

Steel Car Wheels.

The following test of steel car wheels made by the American Steel Car Wheel Co. took place recently at Boston, in the presence of several prominent railway superintendents: A 33 inch car wheel was placed on two solid iron blocks, rim resting on each block. A weight of 525 lb., falling at a height of 17 feet, struck the hub 25 times without any effect except battering the metal. It was then dropped 10 times on the rim without a fracture. Then a weight of 1,400 lb. was tried, falling at a height of 17 feet, struck the wheel 11 times, but failed to break it, showing it to be practically indestructible. At another exhibit, in order to test the expansion and contraction of the metal, a wheel was buried in sand and a charcoal fire built around the tread until it was brought to a red heat. Then it was taken out and exposed to the atmosphere, which had no effect on it whatever. This demonstrates that the wheel is a safe one. These wheels are in extensive service.

The "Medical Age" thus Defines Rest.

Rest is *repose*, or *inaction*, of a portion of the organism, during which the waste caused by the wear and tear of work is repaired—repose of a *portion* of the body, for during life we never find the whole at rest. From the time that the first blood globule begins to oscillate in the rudimentary blood vessel until the last sigh dies away in the stillness of eternity, there is no such thing as complete rest.

Human beings are so constituted that they cannot exercise all their faculties at one time. They stand on one foot and rest the other; listen with one ear and then the other; look with one eye while the other is loafing; walk until tired, and then sit down to rest; and when weary of an easy chair, get up and take a walk to "stretch the limbs." They talk until their tongues are tired, and then stop to think of what they will say next. So they go on throwing one set of wheels out of gear to let them cool off and get oiled up, while they set another portion of the machine running. Even in sleep, in which they come the nearest to complete rest, they are still hard at work. While the brain is standing almost still, the senses locked up, and the muscles relaxed, there are countless thousands of busy laborers at work, oiling up the whole machinery, replacing a worn-out cog here and there among the wheels, and sweeping out the dust and debris worn off by the friction of the machinery of this great manufactory of thoughts, words and deeds. When the day workmen stop, the night laborers go on duty, and some of the most skilled artisans are busy during sleep repairing the tissues.

The work that we do during the day with our heads and hands is what we get credit for; but when we rest and sleep, there is an important work going on. That branch of labor performed while we rest is unseen, and, for that matter, unknown by the majority of us, and hence is often neglected.

We are so constituted that the normal, healthful exercise of our faculties gives pleasure. It is pleasant exercise to eat when one is hungry; to rest when weary; to walk when the brain is fresh and clear. In fact, to do anything rational, when thoroughly prepared by previous rest, is agreeable. This is not only true of head and hand work, but also of the natural exercise of the feelings and emotions. When trouble comes, the feelings are wounded, relief is found in complaining and sorrow, and pain is washed away by tears. The Omnipotent set a limit also to human sorrow and suffering. These storms of affliction break over the healthy man or woman, and subside after a shower of tears and give place to the sunshine of hope and happiness. It is the weary and worn who cannot rise above their troubles, who go fretting and sighing in search of rest.

A well preserved nervous system can stand an occasional attack of righteous indignation in which considerable strong temper or passion may be manifested, if time is taken to fully cool off between the heats. It is the continual fretting, grumbling, and growling, without intervals of rest, that is wearing and injurious.

The law of harmony between work and rest, when fully obeyed, not only maintains strength, but develops it. All intelligent people know that fact, but many fail to think of it in such a way as to be governed by it. To exercise the muscles of the arms until they are tired and thoroughly rest them, and again exercise and rest, makes them grow stronger and bigger. So with the brain, it becomes stronger under well regulated exercise and rest.

Let us give a moment's attention to the various ways of resting.

First and most important of all, "Nature's sweet restorer, balmy sleep." Of all the ways of resting, this is the most complete and important. The time devoted thereto should not be regulated by hours so much as by the requirements of the individual. Some one, perhaps Franklin, said six hours for a woman, seven for a man, and eight for a fool. A little girl friend when told this, said, with much wisdom, "I like the fool's share." While admitting that some sleep too much, the majority get less than they need. Sleep should be taken with great regularity, and be free from all disturbance. Sleepless nights are often spent because of being too irritable from fatigue to rest.

One ought to stop work long enough before retiring to cool down to the sleeping point. Hunger, too, will chase away sleep. We would not recommend late suppers, but some easily digested food taken at bedtime, when needed, will often secure a sound night's sleep. We are told that "He gives His beloved ones sleep," and we know that there is much truth contained in this passage. The consciousness of being right and having done well is the best anodyne, the best sleep producer. There is none too much sleep for the righteous, but there is less rest for the wicked who violate the natural laws.

In addition to the good night's sleep, it is a good plan to take a short nap in the middle of the day. It divides the working time, gives the nervous system a fresh hold on life, and enables one to more than make up for the time so occupied. It is well to guard against too long a sleep at such times, since such is apt to produce disagreeable relaxation. There has been much discussion regarding the after-dinner nap, many believing it to be injurious, but it is nevertheless natural and wholesome.

Much can be accomplished in the way of resting, short of sleep. It is very important to economize the opportunities for rest during working hours in the day. The great principle which underlies daily rest is relieving of one portion of the organization from duty while the others are at work. This can be done to a great extent. When the muscles are tired and worn from mechanical work which requires but little attention of the brain, stop motion and set the brain at work. The laborer can read, think, and speak while his weary limbs are at rest. His brain need not be idle because the hammer or chisel has dropped from his weary hand. On the other hand, a man can work with his hands when his head is tired. The bookkeeper whose head is weary with business facts and figures by five o'clock in the afternoon has considerable time in the evening to sing, play, dance, dig in the garden, or black his boots, all or either of which he may do while his head is partially at rest. There is another very important way of obtaining rest mentally, that is by changing from one occupation to another. The dexterous gold beater when he finds one arm getting tired takes the hammer in the other; and so may the man who hammers thoughts out of his brain exercise one set of mental functions while the others are at rest. One may read until tired, and then write; may acquire knowledge until weary, and then teach to others.

R. S. V. P.

"I always make it a point," remarked a manufacturer to a representative of *Age of Steel*, "to reply to every communication of a business nature addressed to me. It doesn't matter what it is about, provided only that it is couched in civil language. I do this because courtesy requires that I should; but aside from that, I find also that it is good policy. Time and again in my life I have been reminded by newly secured customers that I was remembered through correspondence opened with me years before, and many orders have come to me through this passing and friendly acquaintance with people. On the other hand, I have known plenty of business men whose disrespectful treatment of correspondents has been bitterly remembered and repaid with compound interest. Silence is the meanest and most contemptuous way of treating anybody who wishes to be heard and to heaŕ, and resentment is its answer every time."

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(2505) Reader asks (1) for a formula for taking greasy spots out of clothing without injury to the cloth. A. Use benzine or chloroform. Apply it with a sponge in a circle all around the spot, then apply more until the spot is reached, when you must sponge it off thoroughly. 2. What is a good glue for mending broken dishes? A. Try cement as below or using the whey from one-half pint of milk curdled with vinegar. Mix with it the white of an egg and pulverized quicklime. After applying, dry in the air and then over a fire. 3. What are the ingredients of artificial honey? A. Soft water 6 pounds, pure best honey 3 pounds, white sugar 20 pounds, cream of tartar 80 grains, essence of roses 24 drops. After 5 minutes' boiling take from fire and add the well beaten whites of 2 eggs, and when it is nearly cold add two pounds more of honey. Sometimes a decoction of slippery elm bark is added, but it is liable to cause fermentation in hot weather.

(2506) C. F. C. H. asks for the formula for cementing meerschaum. A. Dissolve caseine in a solution of water glass (silicate of soda) and stir into it calcined magnesia and use at once. Caseine is prepared by allowing perfectly skimmed milk to stand until it curdles, when the caseine is filtered out and washed on the filter. To simplify above a little fresh cheese may be boiled in water and mixed with slaked lime and ashes, using 10 parts cheese, 20 parts water 2¼ parts lime and two parts wood ashes.

(2507) J. T. N. writes: 1. Will you give receipt for laundry starch? A. We refer you for laundry work to the SCIENTIFIC AMERICAN, Vol. 62, No. 9. 2. A receipt for laundry blue, dye or liquid forms. A. Solid bluing formerly consisted of a mixture of indigo and starch. At present artificial ultramarine is largely used. Liquid bluing may be made by dissolving 1 ounce of soft powdered Prussian blue in 1 quart rain water in which ¼ ounce oxalic acid has been dissolved. A teaspoonful is enough for a large washing of clothes. 3. Name a good book on flavoring extracts. A. For information on flavoring extracts we can supply you with "A Treatise on Beverages," by Sulz, price $10, which contains information on the above named subject. 4. And one on perfumes. A. We can supply you with "A Comprehensive Treatise on Perfumery," containing a history of perfumes, by Cristiani. Price $5.

(2508) R. S. asks (1) how to make prepared flour. A. For every 4 pounds of flour add ½ ounce each of baking soda and tartaric acid. 2. Whether it can be mixed without going to the expense of buying machinery for the purpose of mixing same. A. It is a question of mixing. It must be most thoroughly and perfectly mixed. Add the chemicals separately and in small portions distributed through the flour, and pass the whole through sieves to insure mixing.

(2509) D. S. McK. asks (1) how water color paint is made (red, blue, and green), the kind flour barrel heads are painted with. A. The colors may be mixed with weak size, or an oil paint thinned with turpentine may be used. 2. How phosphorescent paint is made, *i. e.*, the kind that shows a sort of a light in the night (often found on match safes). A. You refer to Balmain's luminous paint. Papers on its use, preparation, etc., will be found in our SUPPLEMENT, Nos. 229 and 249. 3. What form will compressed air assume when it is pumped into an air-tight vessel? Does it become warmer or cooler, and does it hold its warmth or coldness for any length of time? A. It becomes warmer, but soon loses its heat by conduction through radiation from the sides of the receiver.

(2510) C. N. V. asks: In burning rock for hydraulic cement, with soft coal, what proportions of rock and coal are used? Are the rock and coal put in the kiln in layers or mixed together? A. The burning of cement rock is referred to in Gillmore's "Limes, Hydraulic Cements and Mortars," page 127. 3,500 pounds of anthracite he states is sufficient to produce 30,000 pounds of cement. The fuel and stone are placed in layers, the stone not exceeding a thickness of 6 inches. Bituminous coal will not vary greatly in results from anthracite.

(2511) J. H. N. asks: 1. How many cubic feet of gas can be produced from 50 pounds of dry oak wood and from 50 pounds coal (the kind used ordinarily under steam boilers)? A. About 225 cubic feet in each case. 2. Which gas is of most value for heat purposes? A. The coal gas.

(2512) J. H. P. asks (1) how long a patent holds good in the United States without renewal. A. 17 years. 2. Whose work on electric lighting and power you would recommend for a person having slight experience, on wiring and care of dynamos? A. We refer you to our catalogue of electrical books sent on application.

(2513) J. W. T. asks: What paint or other substance, resinous or mucilaginous, will withstand the action of ammonia for a protracted period, that is, will serve as a coating or packing for uniting a valve and its seat, and which will be readily separable at a moderate pressure, and without regard to the time in which the device containing the ammonia may remain undisturbed? A. Ourbest suggestion is for you to try a solution of gutta percha in bisulphide of carbon.

(2514) W. D. T. asks if there is any known way to electroplate iron? A. Regular electroplating processes are used for iron. It is necessary to give it a thin deposit of copper before silvering. The same is advisable before nickel plating. Steel knives are silver or nickel plated in great quantities, and many other iron or steel articles are electroplated.

(2515) M. F. W. asks (1) how to clean deer horns without polishing them with sand paper. A. Use a soft woolen cloth and ground pumice stone and water. 2. What is the best blacking for boiler fronts? I have been using asphalt, and it scales off after a week or two. A. If in good condition, use stove polish or simply wipe off from time to time with greasy waste.

(2516) J. R. J. asks for the best and cheapest receipt to make the commercial acetate of chrome, 30° B. A. It is simply made by mixing together solutions of lead acetate and of chrome alum or of sulphate of chromium. Of the salts there are required for 250 parts chrome alum or for 98·2 parts chromium sulphate (dry) 284 parts lead acetate. By evaporating or adding water its strength may be adjusted. The chromium sulphate gives the finer product.

(2517) C. H. K. & E. W. D.—Typewriter copying ink may be made from aniline colors dissolved in alcohol and added to glycerine. Dilute with water and apply to the ribbon. Castor oil may be used instead of glycerine.

(2518) C. H. M. writes: What is the ordinary or mean cost in this country of one electric horse power per hour or per day, where coal is used as a fuel, and the elastic current is generated by a steam engine running a dynamo? When we are told that it requires so many electric horse power per hour to effect a given purpose we would like to know, approximately at least, what this represents in cost. A. Any specific estimate would be for most cases misleading. It would vary not only with the cost of coal and of labor, but also with the size of the works. The larger the works the lower would be the cost of generating power. The following data give a basis for estimates. Fuel consumed per horse power of boilers per hour, 2 to 5 pounds, loss on generating dynamo 10 per cent, loss on customer's motor 10 per cent, loss in transmission variable from 1 per cent upward. Labor the same as for any steam plant of similar size. Superintendence variable.

(2519) O. A. K. asks for the principle by which the true per cent of proof spirits is calculated, having given the indication of the hydrometer and the temperature. For example: Say the hydrometer shows indication to be 110 and the thermometer indicates temperature of 82°, what is the true per cent of the spirits and how calculated? A. The direct readings of the hydrometer you speak of refer to proof spirits. A mixture of 50 parts alcohol and 53·71 parts water contracts on mixing and the resulting liquid contains one-half its volume of alcohol. This is proof spirits, *i. e.* spirit containing 100 per cent of proof spirit. If the hydrometer reads 110, the spirit is 10 over proof or is equal to 110 per cent of proof spirit, or about 55 per cent of pure alcohol. The temperature has to be allowed for and corrections applied by tables, issued with full instructions and explanations by the United States Treasury Department. If you will test your spirits at 60° Fah., no correction is necessary, and the direct reading may be taken as above.

(2520) J. H. H. asks how the Archimedian screw is constructed—the diameter of the tube, the diameter of the cylinder about which the tube is coiled, and at what angle the screw must be placed to insure successful operation. A. It may be made by winding a tube around a cylinder or by dividing a hollow cylinder by a helicoidal partition. Taking the case of the cylinder, the element or line drawn from the center of a convolution through the axis to the center of the opposite lower convolution determines the working angle. The screw must be placed at such an inclination that this line will be a little inclined to the horizon, the end corresponding to the highest convolution of the screw being lower than the other. They are used at an angle of 45° to 60°. In our SUPPLEMENT, No. 596, you will find an example of their use in practice.

(2521) W. M. C., Nantucket, says: There is a valley on the outskirts of the town where, by putting one's ear to the ground, a noise is heard like the cooper's hammer, as he drives a hoop on a cask. I can trace it back over a hundred years. It can be heard only in that spot. Can you tell me the reason and do you know of a similar case? A. It is probably an acoustic effect like the roar of the sea in a conch shell. Possibly akin to the singing sands, which make a noise by the blowing of the wind.

(2522) H. H. H. asks: Does sound exist independent of the sense of hearing? Will a lump of iron, if dropped in the ocean where it is six or eight miles deep, sink clear to the bottom, or will it, at some great depth, remain stationary? A. Sound, as we understand it, does not exist independently of our ability to hear. It is caused by vibration which may exist in all conditions and intensities, but is not realized as sound until recognized through the organs of hearing. The lump of iron will sink to the bottom of the sea at all depths.

(2523) S. V. F. asks: A man buys twenty pencils for twenty cents. The prices are two for a cent, four for a cent, and four cents each. How many of each did he get? A. This problem can be done easily by using two simultaneous equations each of three unknown quantities and by tentatively assigning values to one quantity, determining the others. The answer is three pencils at 4 cents, two at four for a cent and fifteen at two for a cent. The equations are $x+y+z=20$ and $4x+\frac{1}{2}y+\frac{1}{4}z=20$. Possible values of x are 1, 2, 3, and 4—to be used tentatively.

(2524) C. H. L.—For removing ink, a mixture of tartaric and oxalic acids is often used. Javelle water is also of use for some cases.

RECENTLY PATENTED INVENTIONS.

Engineering.

HYDRAULIC STEERING APPARATUS.—Perry Small Boston, Mass. Combined with an arm pivoted on the rudder post are two plungers pivotally connected therewith and extending into pivoted cylinders alternately filled with liquid under pressure, the apparatus being simple, durable and effective, and designed to conveniently accurately and surely manipulate the rudder.

ROCK DRILL. — John J. Martin and Patrick Cunningham, Pinos Altos, New Mexico. This is a drill with a rounded serrated end forming two downwardly projecting lips, and having two oppositely projecting curved cutting edges between the lips, making a drill designed to work rapidly be durable, and especially designed to work in hard rocks.

Railway Appliances.

CAR COUPLING. — Benjamin S. Redding, Greensborough, Ala. This is a coupler in which a sliding block supports the pin, a weighted lever projecting the block under the pin when raised, there being also guide pulleys and a flexible connection passing from the pin, the entire device being composed of but few parts, so arranged that friction is reduced to a minimum.

TRAIN ORDER.—Clarence E. Biddison, Goodland, Kansas. This is a train order holder in which orders written upon manifold paper may be quickly and conveniently inserted and easily read by day or night, the device also embracing a signal to remind the engineer or conductor that the train is not to leave until the work has been completed.

Mechanical.

WRENCH. — Walter L. Gibson, Turnbull, Fla. This is an improvement on a former patented invention of the same inventor, a movable jaw with two faces being pivoted on a fixed jaw, a block on the fixed jaw being adapted to be engaged by one of the faces, and the position of the movable block being changed by the opening of the movable jaw.

HIGH GRADE WATER POWER.—Alexander H. and Allie Quain and George P. Warner, Albany, Oregon. This invention covers the making of cuts in the bed of a river to serve as canals or flumes, in combination with walls and penstocks, to utilize the power of falls or rapids where it would be otherwise difficult or impossible.

Agricultural.

CHECK ROW CORN PLANTER.—Marshall W. Hart, Yellow Bud, Ohio. This is a machine designed to plant both ways of a field and check row without a wire, while being compact, durable and economic, with the drop slides and markers being operated simultaneously from the same drive shaft.

SEED PLANTER. — Wilmer G. Burchfield, Altus, Ark. This is a hand implement for gardeners' and farmers' use, and consists of a drill rod mounted to turn and having a bit and its seed box with spout arranged at the side to drop the seed into the opening made by the bit, being especially adapted for conveniently and rapidly planting seed in hills in the garden.

SHEARING MACHINE.—Robert L. Renz, Poplar Creek Agency, Montana. The frame of this machine has fixed and movable cutters, with a guard plate and horizontal swinging clamping arm pivoted on the frame and swinging across the guard plate to hold it in position, the knives being readily removed and replaced for sharpening or for repairs.

HAY PRESS. — Charles O. Newton, Homer, N. Y. Combined with a baling chamber with movable side and hinged door are sliding bars connected with the side and door, pivoted cam levers being engaged by the bars and adapted to bear against the movable side, with other novel features, designed to afford a simple, cheap, and durable press, generally applicable for farm use.

HAY PRESS.—John F. Smith, Brownwood, Texas. This press is made with a horizontal frame having at its open end a pivoted and weighted abutment, a plunger being adapted to reciprocate in the frame and a toggle lever connecting the plunger with the closed end of the frame, there being means provided for actuating the toggle lever, the device affording a simple construction for baling hay or other material.

LAND ROLLER.—Daniel Kint, Alpena, South Dakota. This is a device in which the sets of rollers are journaled in chains to permit them to swing up or down according to the nature of the ground over which the rollers pass, while the driver's seat is so situated as not to be affected by the passing of the rollers over uneven ground, and the animals pulling the roller will not be struck by the tongue, the rollers being self-adjustingly mounted in the frame.

Miscellaneous.

SUSPENDER CATCH.—John O. Folsom, Canon City, Oregon. This invention relates to an improvement especially designed for the tips of suspenders, and furnishes a device capable of automatically locking itself when the suspender tip is applied and ejecting the tip on the movement of the lock lever of the catch, the catch when worn not injuring the garments coming in contact with it.

CORSET CLASP. — Frank B. Converse, New York City. This invention covers a novel construction of corset clasp fastenings, designed to afford efficient clasps which may be readily fastened and will safely withstand diagonal or vertical strains tending to loosen or disconnect them, while allowing the corset to be easily unfastened and removed.

POCKET KNIFE. — Joshua W. Harris, Fredericksburg, Va. This is an improvement in handles for knives, screwdrivers, gimlets, small saws, etc., and has a securing bar, which may be shut up in the handle, but is adapted for engagement with the shank of a tool.

PAPER WEIGHT. — Henry P. Krell, Leadville, Col. This is a transparent block having at one of its sides or faces a receptacle for a calendar slip, which is visible but excluded from air and dust, the device being simple and ornamental.

GAME APPARATUS. — Frederick Pries, Florence, Neb. The frame of this device holds a vertical tube, and a swinging car is pivoted to the frame in line with the tube, the car having a central bottom perforation, and balls being dropped down the tube into numbered cells of the car.

BELL CORD ATTACHMENT. — This invention has been patented by Mr. Wallace Tiler, Chicago, Ill. It is designed to provide a simple and convenient means for the speedy attachment of a bell cord by its ends to coupling sections, so that the cord will be held sufficiently secure for legitimate use, but which will permit of the removal of the cord ends from the coupling when the cord is subjected to an abnormal strain.

ACCORDION.—In accordions, as heretofore constructed, the tremolo device was actuated by the performer, who manipulated with one or more of his fingers a separate mechanism, called a tremolo stop, connected with the fluttering valve of the air duct, and to do this during the execution of a piece of music, the playing had to be interrupted to enable the performer to set the tremolo. Mr. John F. Stratton, of Brooklyn, N. Y., has patented a device which avoids this interruption and enables the performer to keep on playing without stopping to set the tremolo.

STOVE GRATE. — Charles L. Beers, Scranton, Pa. This invention provides for the ready removal of the grate sections from their bearings, with side guards on the water front and a supplemental or false back plate, whereby different kinds of grates can be used in the same bearings or supports, and whereby also the several parts of the grate are interchangeable.

CRATE. — Charles P. Ward, Guilford, Ind. A sectional crate, to be utilized for packing berries and other small fruits, is provided by this invention, which covers a sectional, durable and economical device for locking the sections of the crate to place, while utilizing portions of the locking device as handles for the sections.

MEAT TENDERER. — Edson J. Severance, Morrison, Ill. This is a device for numerously puncturing the meat without bruising it, being a compact and neat implement designed to cut the substance and intimately subdivide its fiber with teeth which may be readily taken apart for cleaning and quickly restored to a working condition.

REMEDY FOR ASTHMA. — Charles Iselin and Daniel Callahan, Riverside, Cal. This is a composition of matter to be used as a medicine before breakfast and before going to bed, and includes brandy, honey, olive oil, and other ingredients, united and taken as described.

ATOMIZER. — Robert W. Coffee, Bedford City, Va. This is a device designed to thoroughly atomize water by the use of steam, and adapted for use as an ordinary hand hose, whereby the vapor may be directed to any suitable point in a compartment in which it is used, being particularly adapted for use with tobacco, where heavy steam is to be discharged, freed as much as possible from its heating quality.

BASE BALL SCORE. — Warren A. Browne, Hempstead, N. Y. Combined with a pole is a series of variously colored sectional score blocks capable of surrounding and sliding on the pole, a sliding sleeve supporting the blocks, with mechanism for raising and lowering the sleeve, whereby the score may be kept and announced to all witnessing the game, while the device is so simple as to be understood by all.

SHUTTER WORKER. — Edwin T. Keener, Moberly, Mo. This is a device for opening and closing window shutters or blinds from within the building without raising the windows, and is designed to be simple and economical, opening the shutters partly or entirely as may be desired, and holding them at any wished-for point of adjustment.

WHIFFLETREE HOOK. — Charles W. Blackburn, Tombstone, Arizona. This is a device comprising a frame with a hook at one end, in which a keeper plate is pivoted, having at one end a tongue to close the hook of the frame, the draught holding the hook and tongue with the latter closed, while by slacking up and turning the hook upward it may be tilted to permit the removal of the trace.

FOUR-WHEELED VEHICLE.—Alfred W. Johnson, New Brunswick, N. J. This invention covers the attachment of the body to the running gear in a way designed to avoid side lurch, thus improving the vehicle in point of steadiness and making it easier of draught, a horizontal rocker being employed combined with bolts attached to the running gear at each side of the center line of the vehicle.

BANJO.—Charles J. Kelly, Providence, R. I. In this instrument the tail piece has a front cross bar provided with knobs, whereby the ends of the strings may be secured and held by friction without tying knots, making a simple and positive means of attaching the head, strings and tail piece, in a manner designed to produce a better tone than when the parts are attached in the usual way.

JAIL BUCKET. — Donald McDonald, Louisville, Ky. This is a device designed to present a cleanly and sanitary arrangement, the bucket having a tight cover with a hollow arm or spout which enters a ventilating pipe which at the same time affords a strong support for the bucket.

LANTERN. — Samuel B. Field, Plainfield, N. J. This is a lantern especially adapted for signaling purposes, and is so made that the bearer may easily and at will display a white or green or other colored light, the lantern having slideways with different telescopic transparent colored shades surrounding the burner, and means for conveniently moving the shades.

FOUNTAIN PAINT CARRIER.—William C. Shaw, White Plains, Md. The fountain or reservoir of this device is adapted to be worn on the body of the user, and connected therewith is a dip can or cup in which a brush may be freely inserted, the paint being supplied as desired, and the whole device being designed to facilitate any kind of painting in exposed situations.

VENDING APPARATUS.—Adolphus Mayer, Brooklyn, N. Y., and Max Mueller, New York City. This is a coin-operated machine to deliver tickets or stamps, and is designed to provide a positive uniform feed, and for the printing of the time of delivery upon the ticket, with better safeguards against fraud than have heretofore been possible.

MEASURING GAUGE. — Edward G. Angell and Lorenzo F. Picard, Juniata, Neb. Combined with a plate adapted to be secured to a faucet and a tube pendent therefrom is a sliding tube carrying a valve, levers acting on the tube, and means for locking them in position to hold the valve closed, the device being especially designed to facilitate the drawing off and measuring of thick liquids, as varnish, oils, etc.

SAFETY FASTENER FOR WATCH CHAINS, ETC.—James A. Armentrout, Staunton, Va. In this device a ring or eye is provided in connection with a pivoted plate having prongs movable through the back plate of a case and adapted to engage the fabric or material of which the pocket is composed, the whole device being readily attached or detached.

TROUSERS STRETCHER. — Arnold Wyman, Brooklyn, N. Y. This device consists of two pivotally connected members having shoes at the outer ends and a stop on the lower edge of one member in the path of the lower edge of the opposite member, in connection with a suspension device, to preserve the shape of the garment through its own weight when suspended by the device, either with or without an attached weight.

NECKSCARF. — George L. Dale, New York City. Combined with a corrugated scarf tip is a stop on the shield through which the tip is to pass, the members of the tip being compressed in passing through the stop and then expanding and locking the tip in place therein.

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