SCIENTIFIC AMERICAN

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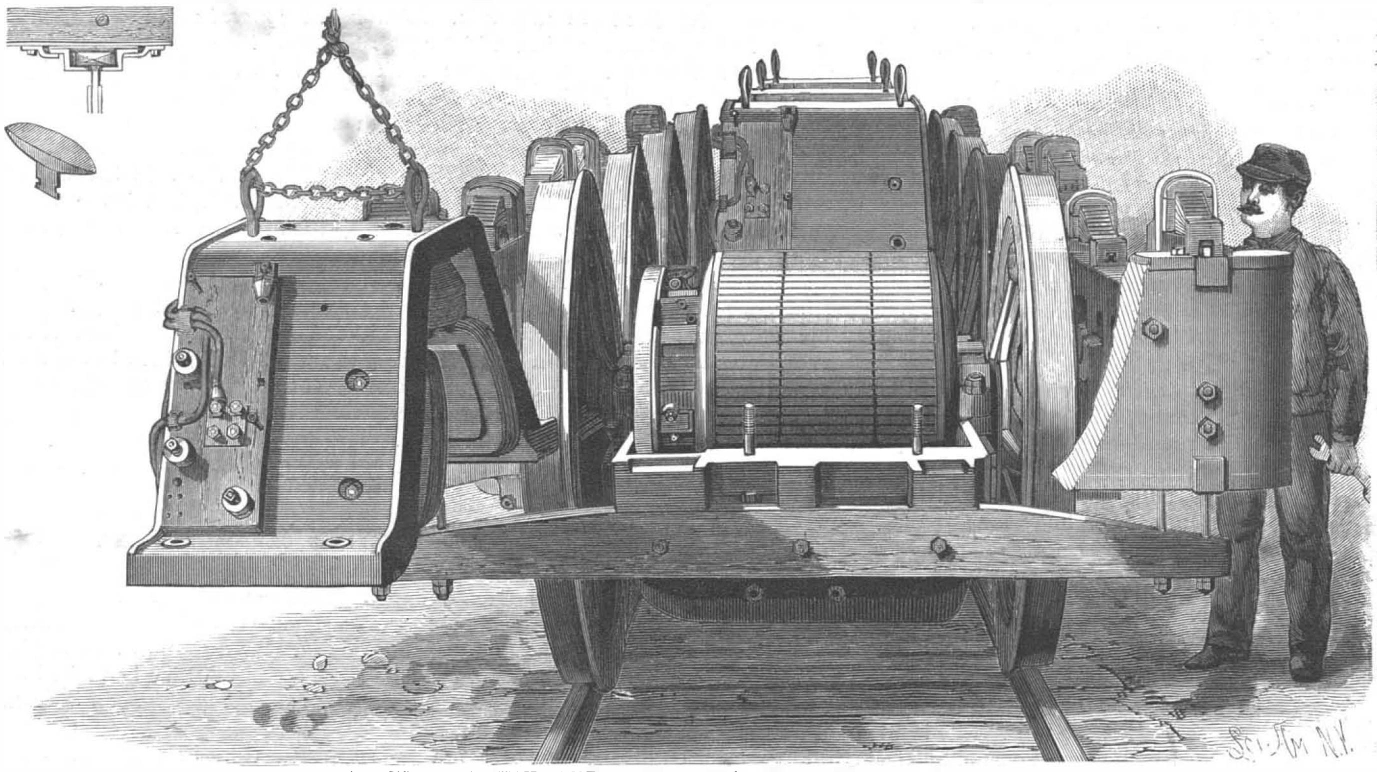
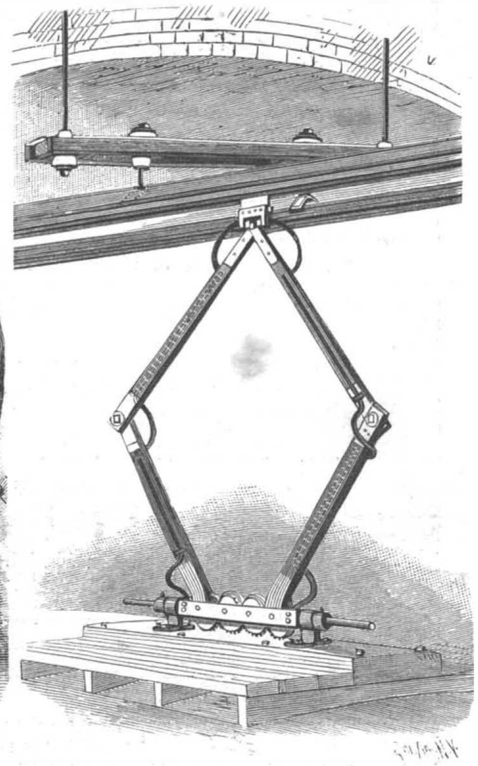


END VIEW OF TRUCK AND MOTOR—TOP FIELD FRAME LIFTED OFF.



THE TROLLEY CONNECTION.

THE NEW ELECTRIC LOCOMOTIVE OF THE BALTIMORE AND OHIO RAILROAD COMPANY.—[See page 87.]

Scientific American.

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NEW YORK, SATURDAY, AUGUST 10, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 1023.

For the Week Ending August 10, 1895.

Price 10 cents. For sale by all newsdealers.

REMARKABLE SPEED OF THE UNITED STATES CRUISER COLUMBIA.

The United States cruiser Columbia arrived at New York on the 2d inst. after a passage of 6 days 23 hours and 49 minutes, from Southampton—the fastest time ever made by a war ship on so long a voyage; but not equal to the record voyage of the merchant steamer New York, which was over 16 hours quicker, namely, 6 days 7 hours and 14 minutes.

The average speed of the Columbia on this trip was 18·41 knots per hour. This we believe is the fastest ocean voyage ever made by an armed vessel.

It has been claimed that the trial trips of our war ships showing high speed rates for short periods of time, say three or four hours, were deceptive in respect to performances over long routes. It has been found that some of our ships showing 18 or 20 knots on the builders' trial have thereafter been unable to make more than 12 or 14 knots. The navy department has been repeatedly challenged to show what its fastest boats could do on an ocean voyage, for only by such a test could it be ascertained whether we really possessed any vessel that properly could be classed as a commerce destroyer, capable in an emergency of overtaking the fast merchant steamers.

The department has put in evidence what the Columbia can do; that she is the fastest cruiser afloat is now demonstrated. The country is to be congratulated on having in its possession a ship that can be relied upon for high speed. We wish we had more of them—one at least for every important harbor in our country.

On her original trial trip the Columbia made 22·81 knots per hour for 100 miles and was said to have burned 30 tons of picked coal per hour. She is a voracious coal consumer.

The Columbia was launched at Cramp's shipyard in Philadelphia on July 27, 1892. The cost was $2,725,000.

The vessel is 412 feet long and has a beam of 58 feet. She has a normal draught of $22\frac{1}{2}$ feet. Her displacement is 7,400 tons. She is a triple-screw ship.

She has three sets of vertical triple expansion engines of the inverted cylinder type, each capable of developing a working force of 8,000 horse power. Under forced draught, 20,550 horse power has been developed.

The engines have a stroke of 42 inches. The diameters of the high, low, and intermediate pressure cylinders are respectively 42, 59, and 92 inches. She carries four smokestacks. There are ten boilers. Six of these are double ended, $15\frac{1}{2}$ feet in diameter by $21\frac{1}{4}$ feet long. Two others are $11\frac{2}{3}$ feet in diameter by $18\frac{1}{4}$ feet long. The remainder are 10 feet in diameter by 8 feet long. They carry a pressure of 160 pounds.

WORTH REPEATING—ELECTRICAL.

No insulator of magnetism is known.

One ampere will deposit 18·35 grains of copper in one hour.

The pull of a magnet is increased by reducing its polar surface.

Electro-magnets with long limbs are practically no better than those with short limbs for sticking on to masses of iron.

It is said that electric lamps run by storage batteries last twice as long as lamps operated directly from dynamos.

Any galvanometer having a resistance which is large in proportion to the current to be measured can be used as a voltmeter after calibration.

In making a spark coil, or, in fact, any electrical apparatus, the main requirements necessary for success are patience and determination to construct each part thoroughly.

The strength of the solution in each cell of storage battery should be tested with a hydrometer once a month. When the battery is fully charged, it should indicate 22° Baume.

In an arc lamp, supplied with a direct current, the consumption of the positive carbon is in round numbers one inch per hour, and of the negative carbon one-half that amount.

Aluminum has the least electrical resistance for a given length and weight and mercury has the greatest; but for a given length and sectional area, annealed silver has the least resistance and bismuth the greatest.

Before beginning to charge a storage battery, it should be gone over carefully, and any cell that is not up to the standard should be taken out of the circuit, and put in working condition before being replaced.

S. P. Thompson says: "You will get the given amount of magnetism and traction, with the least amount of magnetizing force, when you have the area (of the magnet) as great as possible and the length as small as possible."

In the construction of a voltmeter, it is usual to allow a resistance of fifty ohms for every volt to be measured. This gives sufficient accuracy for most purposes, as the error is within 3 per cent of the total readings.

According to Thompson, a thin, round disk of iron, laid upon the flat, round end of an electro-magnet (the pole end being slightly larger than the disk), the disk is not attracted, and will not stick on, even if laid down quite centrally.

In all quick-acting electro-magnets, and in magnets for alternating currents, the core should be laminated, to prevent eddy currents. Sometimes, however, when the alternations or pulsations are not very rapid, the eddy currents are prevented, by making the core tubular and slitting it through lengthwise on one side.

Joule made an electro-magnet having an iron core 1-25 of an inch in diameter and ¼ of an inch long, bent into the shape of a semicircle, and wound with three turns of uninsulated copper wire, 1-40 of an inch in diameter. It weighed ½ grain and carried 1,417 grains, which was 2,834 times its own weight.

The cotton thread used for the filaments of incandescent lamps is parchmentized before carbonization, by passing it slowly through a solution of sulphuric acid two parts, water one part, and finally washing it in water until every particle of the acid is removed. The parchmentized thread, after drying, is reduced to a uniform diameter by drawing it through dies, after the manner of wire drawing.

A thermopile, for experimental purposes, may be made of pieces of German silver and copper wire, twisted and hard-soldered at the ends, forming series of pairs, and arranging the wires thus joined in the form of a many-pointed star, so that the German silver and copper wires alternate, the ends of the series being left unconnected. The inner points of the star are heated over a kerosene lamp. The wires may be No. 16 and 6 inches long.

THE HORSELESS CARRIAGE RACES.

In our last issue we announced that the Chicago Times-Herald and the Engineer, of London, had made arrangements for two races, one to be held in the United States and one in England. We are now able to give the rules of the American contest, which is to be held on November 2, 1895, the race being between Chicago and Milwaukee.

It must not be supposed that in this contest the question of speed is the only requisite to be considered. It is the earnest desire of the proprietors of the Times-Herald that the contest shall add to the sum of our mechanical knowledge in this branch of transportation. Applications for admission to the competition continue to come in, and from all indications there will not be less than seventy-five carriages. Recent advices from France make it probable some of the vehicles which won prizes and honorable mentions in the Paris-Rouen and Paris-Bordeaux races will be sent over here, so that American inventors will have opportunity to measure the merits of their constructions against European ingenuity.

The list of prizes is as follows:

First Prize.—$2,000 and a gold medal, the same being open to competition to the world.

Second Prize.—$1,500, with a stipulation that in the event the first prize is awarded to a vehicle of foreign invention or manufacture, this prize shall go to the most successful American competitor.

Third Prize.—$1,000.

Fourth Prize.—$500.

The third and fourth prizes are open to all competitors, foreign and American.

The contest will be governed by the following rules:

1. The date of the contest will be on Saturday, November 2, 1895. The judges may postpone the contest if in their judgment the state of the weather or the condition of the roads will not permit a fair trial.

2. The contestants will start at some point in or near the city of Milwaukee and will finish at some point in or near Chicago, not farther south than the south limit of Lincoln Park.

3. The contest is limited to automatic carriages, or, as they are more commonly known, "horseless carriages." There will be eligible to competition any and all vehicles having three or more running wheels, and which derive all their motive power from within themselves. No vehicle shall be admitted to competition which depends in any way upon muscular exertion, except for purposes of guidance. Competing vehicles which derive their power from petroleum, gasolene, electricity or steam, and which are provided with receptacles for storing or holding the same, will be permitted to replenish the same at Waukegan, Ill., and at Kenosha, Wis., but at no other points.

4. No vehicle shall be admitted to competition unless it shall comfortably carry not less than two persons for the entire distance, one of whom may have charge of the vehicle and the manipulation of the same.

5. No vehicle shall be admitted to competition except that it be free from danger, not only to its occupants, but to spectators and the public users of the highway. The judges at their discretion may debar any vehicle which from its construction gives evidence of defects which would render the adoption of its type an evident impossibility.

6. For the purpose of limiting the contest to vehi-

cles of practical utility, a preliminary test of all vehicles entered for competition shall be held by the udges on or about Saturday, October 26, under such rules as the judges may determine on, and for such a distance as they may decide. At this test the judges may debar such constructions as in their opinion do not possess features entitling them to further consideration. It is stipulated, however, that all motor vehicles which won prizes or honorable mention in the Paris-Rouen contest of 1894 or in the recent race between Paris and Bordeaux shall not be compelled to compete in the preliminary test, but shall be admitted upon proper application to the final competition on November 2.

7. In making awards the judges will carefully consider the various points of excellence as displayed by the respective vehicles, and so far as possible select as prize winners those constructions which combine in the highest degree the following features and requisites, rating them of value in the order named:

A. General utility, ease of control and adaptability to the various forms of work which may be demanded of a vehicle motor. In other words, the construction which is in every way the most practical.

B. Speed.

C. Cost; which includes the original expense of the motor, and its connecting mechanism, and the probable annual item of repairs.

D. Economy of operation, in which shall be taken into consideration the average cost per mile of the power required at the various speeds which may be developed.

E. General appearance and excellence of design. While it is desired that competing vehicles present as neat and elegant an appearance as possible, it should be assumed that any skilled carriage maker can surround a practical motor with a beautiful and even luxurious frame.

8. All vehicles must be entered for competition not later than September 15, 1895. All applications should be addressed "Editor Horseless Carriage Contest, Room 511 Times-Herald Building."

The Engineer, of London, offers prizes which will aggregate 1,000 guineas, or $5,000, for a race between automobile carriages which will be held in England in 1895. Particulars as to the awards, the date and place of the race, and the rules governing the contest will be announced hereafter.

Richard Morris Hunt.

The celebrated American architect Richard Morris Hunt passed away at his Newport home July 31. He was among the first Americans who went to Paris to study architecture; and upon his return to his own country after ten years of professional study and active work, he found himself well equipped for the practice of his profession here. Among the men who profited by Mr. Hunt's instruction were Prof. William B. Ware, of Columbia College, George P. Post, Frank Furniss, Henry Van Brunt and Charles Gambrill. Mr. Hunt had recently received the gold medal of the Institute of British Architects, conferred by Queen Victoria, being one of only seventeen foreigners who have been so honored. He was born October 21, 1828, in Brattleboro, Vermont. After completing his course at a school in New Haven he attended the Boston High School and then the Latin School. Having always shown a marked leaning toward architecture, he was sent to a Geneva school, where he studied drawing under Samuel Darier. From there he went to Paris, where he became a student at the Ecole des Beaux-Arts and a pupil of Hector Lefuel, who told him as he completed his course with honor, "If other countries teach you as well as France has taught you, you will do great things."

His travels took him through Europe, Asia Minor and Egypt, and when he returned to Paris in 1854, he was appointed inspector of the vast buildings which were being erected by Lefuel to connect the Tuileries to the Louvre. A few years later he returned to this country and at once began an active professional career. His first important work was in assisting the late T. U. Walter in preparing plans for the completion of the Capitol at Washington. He was one of the founders of the American Institute of Architects and also of the Architectural League. Among his buildings are the Lenox Library, the Tribune Building, and the Vanderbilt mansions, all in New York City, the Yorktown Monument, the Theological Library and Marquand Chapel at Princeton, the Brimmer buildings in Boston and many private residences. Mr. Hunt built several of the finest palatial residences in America, including a number in Newport. He also built the Administration Building at the Chicago Exposition. Mr. Hunt was rich in honors. He was elected to associate membership of the Academie des Beaux-Arts of Paris. He was one of the three foreign members of the oldest artistic society in the world, the society of St. Luke at Rome. He was a member of the Institute of British Architects and received their gold medal. He was a member of the Jury of Fine Arts at the Paris Exposition of 1867, the Centennia and the recent Columbian Exposition. He was made a Knight of the Legion of Honor in 1882. Harvard College conferred on him the degree of LL.D.

Cycle Notes.

In Paris there is a system of newspaper delivery by tricycle.

Holbein, on July 7, covered 297 miles in 24 hours on roads between London and Petersborough.

The best one mile time made by a bicycle, it is said, was by Wilber J. Edwards, at Livermore, Ga., in 1 m. 34¼ s., February 9.

The great boom which cycling has taken this year will make the "wheelman's vote" of considerable importance during the coming compaign. Shrewd politicians will not let the opportunity pass without making a bid for votes by offering improved highways and concessions for which the wheelman has been pining for years. To the wheelman is largely due the credit of starting the present effort which is being made to get better highways. Before the advent of the bicycle, very little was done in the way of improved roads which were worthy of the name. The League of American Wheelmen has exerted a powerful influence in this direction, as they have in their ranks professional men, merchants and bankers and enterprising people who know what they want and mean to have it.

The mail carriers of Oakland, Cal., use bicycles for the gathering of letters from the street boxes. Mr. T. J. Foster, who has the government contract for carrying the mails between North Temescal and Oakland, has been using the wheel in his work for over a year. The government requires in its bids that the mail contractor shall specify how the mail shall be carried. When Mr. Foster put in his application, he answered the requirement by agreeing to carry the mail on a "wheeled vehicle." Mr. Foster got the contract and he has carried the mail by what he terms a "wheeled vehicle" ever since. The mail pouch is carried strapped to the forward brace of the machine and its weight varies from 20 to 50 pounds. Ten trips a day are made between Oakland and Temescal and the total distance traversed daily is about 25 miles.

It has been reported at various times that Mr. Thomas A. Edison has invented an electric attachment for propelling bicycles. Mr. Edison denied this statement as follows:

"I know how the story started," he said. "I have been experimenting with an attachment to a bicycle for my own personal use and for special conditions. My house in Llewellyn Park, Orange, is about one-sixth of a mile from my laboratory, and 80 feet higher up on the mountain side. So, in order to save myself a heavy pull when I went home in the middle of the day, I designed a heavy spring just large enough for the purpose, which was to be wound up by power from the laboratory engine and attached to the bicycle before I started up the hill. I wanted this spring to supply most of the energy for the ascent. Of course, there is nothing electrical about it at all; it is a purely mechanical construction.

"The device is to be so arranged that when riding down hill, or even on the level, the rider can at will throw the spring into gear and by degrees wind it up to its limit. Then, when a hill is to be climbed, or the rider wishes to stop working for a short distance on the level, he can turn on the power and let the spring give back some of the energy stored up in it. It can be so arranged that the spring can be wound up gradually so as not to make pedaling much heavier than on a level, and should, I think, be of sufficient power to carry a rider 1,000 feet or so on a good road with no upward grade without his doing any work."

The Geographical Congress.

The Sixth International Geographical Congress opened in London July 27, and remained in session eight days; five of these congresses have been held, beginning at Antwerp in 1871. Two of them were held in Paris in 1875 and 1889, the Congress of 1881 was held at Venice, and that of 1891 at Berne, Switzerland.

The Congress was held in the Imperial Institute near the South Kensington Museum; the Congress was formally opened by H. R. H. the Duke of York, who is honorary president of the society and who delivered an address of welcome to the delegates. The Americans who were introduced by Ambassador Bayard were General A. W. Greely, W. W. Rockhill, Third Assistant Secretary of State, Charles P. Daly, President of the American Geographical Society, Professor William Libbey, Jr., of Princeton University, Mr. Hayden, Miss E. R. Skidmore, Mr. C. C. Adams of the Brooklyn Institute, Miss Arleen Bell, Lieutenant Commander W. S. Cowles, naval attache of the United States Embassy, and Mr. W. C. Whittemore. Judge C. P. Daly, President of the American Geographical Society, replied on behalf of the visiting delegates.

In addition to the various papers and addresses, there was an interesting exhibition held in connection with the Congress. There was exhibited a series of maps showing the development of English cartography from the earliest period. There was also exhibited an interesting series of portraits of explorers and geographers from the fourteenth century down to the present day. Among those who read papers and took part in the discussion were Henry M. Stanley, Sir John Kirk, Henry G. Bryant, Captain F. Lugard, Elise Reclus, and Slatin Pasha, who escaped last winter from Omburman, where he was for a number of years held prisoner by the Mahdists; Professor Penck, Professor Wm. Libbey, Jr., Dr. G. Neumayer, Admiral Markham, Herr B. A. Andrée, General A. W. Greely, and others. One of the chief subjects of discussion were the reports upon Professor Penck's proposed map of the world on the scale of one to one million. The French delegate called attention to the fact that England's foot and inch measurement was a great hindrance to the adoption of Professor Penck's plan, and urged that it was most desirable that the metric system should be generally adopted. The French delegates to the Congress were authorized to accept the Greenwich standard meridian on condition that the metric system be used in preparing the great terrestrial map.

Science Notes.

The scientific expedition through Idaho to the Yellowstone National Park, conducted by Professor M. J. Elrod, resulted in some new discoveries.

One of these is a tapeworm, of the group Cestodes, being a new species of the genus Andrya. This worm was discovered in a porcupine which was being skinned, some thirty or more being taken from it. It was determined by Dr. C. W. Stiles, Washington, D. C. The porcupine was shot by one of our correspondents, Mr. C. H. Robinson, of Chicago.

The other specimen is a new species of dragon fly, or the genus Enallagma, collected by Mr. C. C. Adams, and when identified was as yet undescribed save in manuscript. A description has been printed in the last few weeks. This insect was found at Ogden, Utah. It was determined by P. P. Calvert, of the University of Pennsylvania.

A Woman Archæologist.

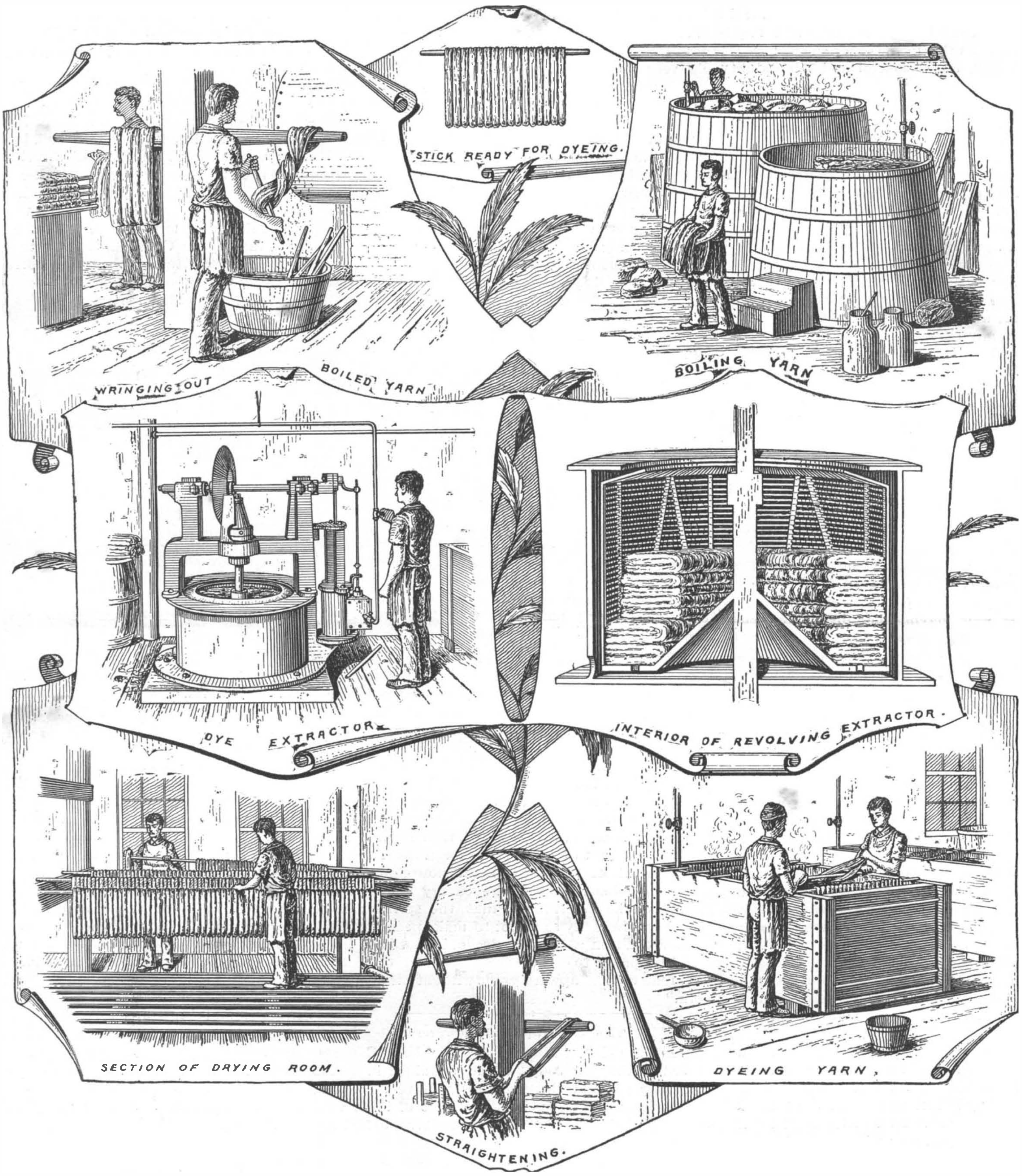
In those sciences, such as archæology, antiquarianism, genealogy and heraldry, where the chief elements of success are infinite patience, conscientious study, a fine memory and broad general culture, women have always manifested signal ability. The greatest of modern times, according to Margherita Arlina Hamm, in the Mail and Express, was undoubtedly the late Dr. Amelia B. Edwards, whose researches in Egyptology put her on a par with Champollion, Brugsch Pasha and other great Egyptologists. She has been followed by at least a score of other women of high talent and of genius, who have contributed vastly to the knowledge and culture of the age. Among these are Mrs. Anna Haxtun, of New York, in genealogy and heraldry; Miss Robbins, of Philadelphia; Mrs. Savage, of Boston; Mrs. Sammis, of Brooklyn; Miss Evangeline Hathaway, of Maine; Dean Smith, of Bernard College; Mme. Alice Le Plongeon, of Brooklyn; Mrs. French Sheldon, of Boston; Miss Gordon Cumming, of Edinburgh; Mrs. Grey, wife of Bishop Grey; Mrs. Little, of Shanghai, China, wife of Explorer Little; and Mme. Vanbery, of Russia. The latest addition is Mrs. Nuttall, of Washington, who read one of the great papers before the American Folk Lore Society. Mrs. Nuttall has made a special study of ancient Mexican folk lore and "Mexicology," if the name may be coined. She finds that most of our published knowledge on the former subject comes to us chiefly from the old Spanish monks who crossed the ocean either with us or just after the Spanish Conquestadores, and more especially from Bernardino de Sahagum, who went to the land of the Incas in 1529, and Fray Jesus Ildefonso, who lived and taught in Mexico, Yucatan, and Central America in the following century. Outside of these two able writers, who seemed to have all the virtues of first-class reporters, no single writer has added much to our store of knowledge. A great many monks, explorers, and travelers have collected one or two tales or legends apiece, which have been duly published, but up to date this scattered material has not been brought together in one volume.

Mrs. Nuttall has collected a very large amount of information, and has also gathered a number of curious myths, legends, and traditions which have come down from the Mexican civilization. There now appears to be every reason for believing that we shall soon have an accurate knowledge of the ancient Mexican life. What with Mrs. Nuttall attacking the subject directly, Mme. Le Plongeon indirectly through the Mayas and Yucatanese; Cushing from the Zunis, the northern races or nations, and the German philologists from the Kichean, Kichekilean, Gutahilean and Guatemalan civilizations of the south, it cannot be many years before the circle of knowledge will be completed and a perfect picture the result.

AT the Pasteur Institute in Paris 1,387 persons were treated during 1894, seven of whom died. This is 261 less than in 1893. Two hundred and twenty-six of the patients were foreigners, 128 coming from England and only one from Russia.

DYEING AND BLEACHING COTTON AND WOOLEN YARN.

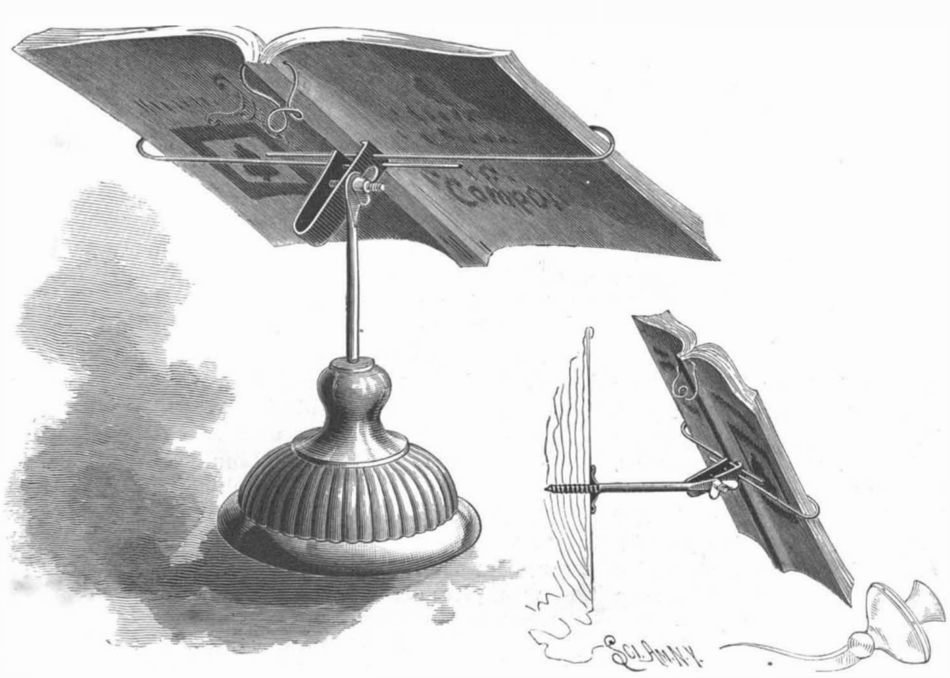
Yarn is manufactured principally in the Eastern and Southern States, the cotton yarn coming from the Southern and the woolen yarn from the Eastern States. The material to be dyed and bleached comes packed to the dyer in bales or bags weighing from 250 to 300 pounds, each bale containing about 60 bundles. These bundles contain 32 skeins weighing about 5 pounds each. The wood colors principally used for dyeing are logwood, cutch or gambier and fustic, also the extract of sumac. Other ingredients mixed with the wood colors, such as bichromate of potash, sulphate of iron, soda ash, bluestone, and muriate of tin, produce an endless variety of colors. Aniline dyes are also used with these ingredients for producing different shades. Gambier comes from the East Indies and is made from the trunk of a tree, the material being mixed with bichromate of potash, producing a shade of brown. Logwood and fustic come principally from Guatemala. By humoring logwood with sulphate of iron, bichromate of potash, soda ash, and bluestone it will produce shades ranging from a drab to a black. Fustic is manufactured from a tree and comes in a ground form, it producing, when mixed with muriate of tin, shades ranging from a straw to a deep yellow color. The ground sumac leaves come principally from Sicily. The common aniline colors will fade. Most of the stock has to be prepared with tannin, sumac, and cutch to form a foundation for taking the dyes. The light colors, such as drabs, ecru, light blues, cream colors, light olives, pink or yellows, do not need any preparation. For fast coloring alizarine, diamine and diazo are used. The first process is the preparation of the yarn for dyeing. This is performed by boiling the material in wooden tanks for three hours. About 700 or 800 pounds of the yarn is placed in these tanks, which are about from 6 to 8 feet in diameter and about from 5 to 6 feet in height. The material is then covered over with boards, upon the top of which are placed a number of heavy weights or stones, which keeps the yarn from floating. The boiling water is then turned on and the mass allowed to boil the required time. The skeins are then taken out after cooling and the water wrung out of them. This is performed by hanging a number of the skeins on a wringing post, the operator passing a dye stick about 3 feet 4 inches in length and 2 inches in diameter through them and giving the skeins a twist. They are then straightened out by giving them a snapping movement. After being prepared, if necessary, as stated above, the material is placed in the dye tubs. These tubs are about 10 feet in length, about 2½ feet in width and about 3 feet in depth, and hold about 350 gallons. About 24 of these sticks of yarn, weighing 100 pounds, are placed in the tub at a time, the ends of the sticks resting on the sides of the tub. An attendant stands on each side of the tub, each taking one-half of the material on the first stick in his hand at the top, drawing it upward and over and letting it fall down into the dye. This is repeated until each stick of yarn has been turned bottom up. The sticks are then shifted back again to the end of the tub, and the same process performed again four times. The dye water is heated to a temperature of from 120° to 150° F. For every 100 pounds of material the water is run off and a fresh solution placed in the tub. If aniline coloring is used for dyeing, it will require from ¼ ounce to 5 pounds to dye 100 pounds of material. From the dyeing tub the yarn is placed into a water extractor. The material amounting to about 100 pounds is placed into a circular copper basket which revolves around on the inside of the iron frame of the machine. When the apparatus is set in motion, the 6 foot friction wheel bears against the conical shaped leather head connected to the top of the basket shaft, causing the basket to revolve around at the rate of about 500 revolutions per minute. The water is extracted from the material in about 5 minutes. The basket is about 42 inches in diameter and about 2 feet in depth. The circular sides are composed of ¼ inch copper wire about ⅜ of an inch apart, the pieces of wire being set into strips of lead connected to the top and bottom of the basket. The bottom of the basket is made of iron about 1 inch in thickness, and is perforated with a number of 1 inch holes through which the water passes to the bottom of the machine. The copper top of the basket is about 8 inches in width and about ⅛ of an inch in thickness. After the operation is over, the basket is cleansed with water. The material is taken from the basket to the drying room and hung on poles. The drying room is about 30 × 50 feet. The poles are about 12 feet in length, the skeins of yarn being separated so as to dry evenly. About 4,500 pounds can be hung on these poles at a time, it requiring about 6 hours for them to dry in a temperature of about 200° F. After drying they are taken and put up into 25 pound bundles and shipped. In the bleaching process the material is first boiled for 3 hours in caustic soda and then washed thoroughly in cold water. It is then put into chlorate of lime for from 1 to 5 hours and then soured off with sulphuric acid for about 20 minutes, the yarn being washed again with cold water. Five hands can dye about 1,500 pounds of yarn daily. The sketches were taken from the plant of John Dawson, New York City.



DYEING AND BLEACHING COTTON AND WOOLEN YARN.

TAYLOR'S PATENT BOOKHOLDER FOR TELEPHONE DIRECTORIES, ETC.

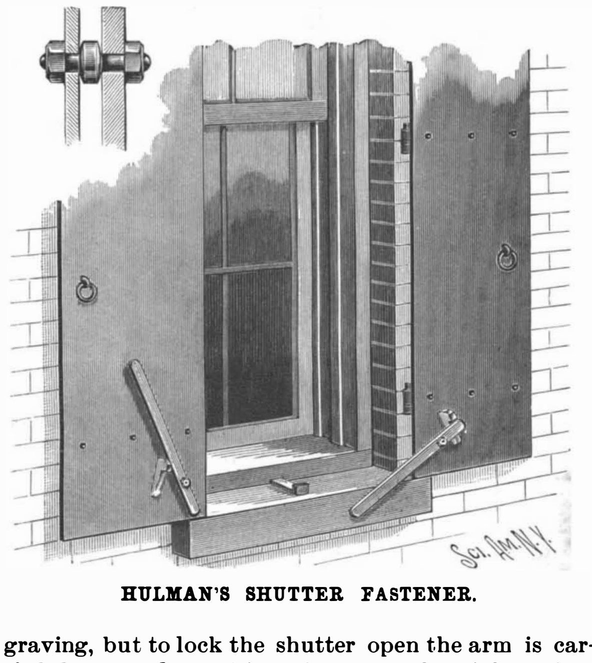
The illustration represents a practical, simple and inexpensive holder, by the use of which telephone directories may be held in open position at the place desired while one is using the instrument, leaving both hands free for taking notes, holding the receiver, etc. It is, of course, obvious that the device may also be employed to hold books, magazines, manuscripts, etc., as may serve one's convenience in reading at any time, the holder being readily adjusted to any angle or any degree of inclination desired. It is manufactured by Messrs. Blake & Johnson, of Waterbury, Conn., has a heavy base to prevent tipping, is nickel plated, and forms an ornament suitable for any library or office. The standard, of heavy wire, may be either screwed into the base or into a wall, as shown in the separate views, and has a flattened outer portion against which is held, by a thumb screw, a V-shaped clamp, the inner ends of the arms of which are turned inward to form jaws to grasp the back of the book. Movable with but slight friction through holes in the clamp are wire rods, having bent-over outer ends, adapted to lie out flat to support the book in open position, or to be bent over the edges of the open leaves, as shown, holding the book spread out open at the desired place. The makers of this device are builders of presses, rivet machines, rolling mills and automatic machines for working wire or sheet metal, and are also manufacturers of rivets, studs, pins, screws, etc., from wire.



TAYLOR'S PATENT BOOKHOLDER FOR TELEPHONE DIRECTORIES, ETC.

AN IMPROVED SHUTTER FASTENER.

The illustration represents a simple and effective device for holding open a shutter, permitting it to be readily closed when desired. It has been patented by M. Anton Hulman, of Terre Haute, Ind. A locking arm is pivoted on the shutter near its lower inner edge, and the pivot pin is provided with a collar separating the arm a slight distance from the shutter, as shown in section in the small figure, there being lock nuts on both ends of the pivot pin. When the locking arm is not in use it is carried to an upper position and rests upon a keeper, as shown at the left in the engraving, but to lock the shutter open the arm is carried down to the position shown at the right, when it engages the window sill, the short end of the arm being then engaged by the keeper to prevent the arm from dropping too low.



HULMAN'S SHUTTER FASTENER.

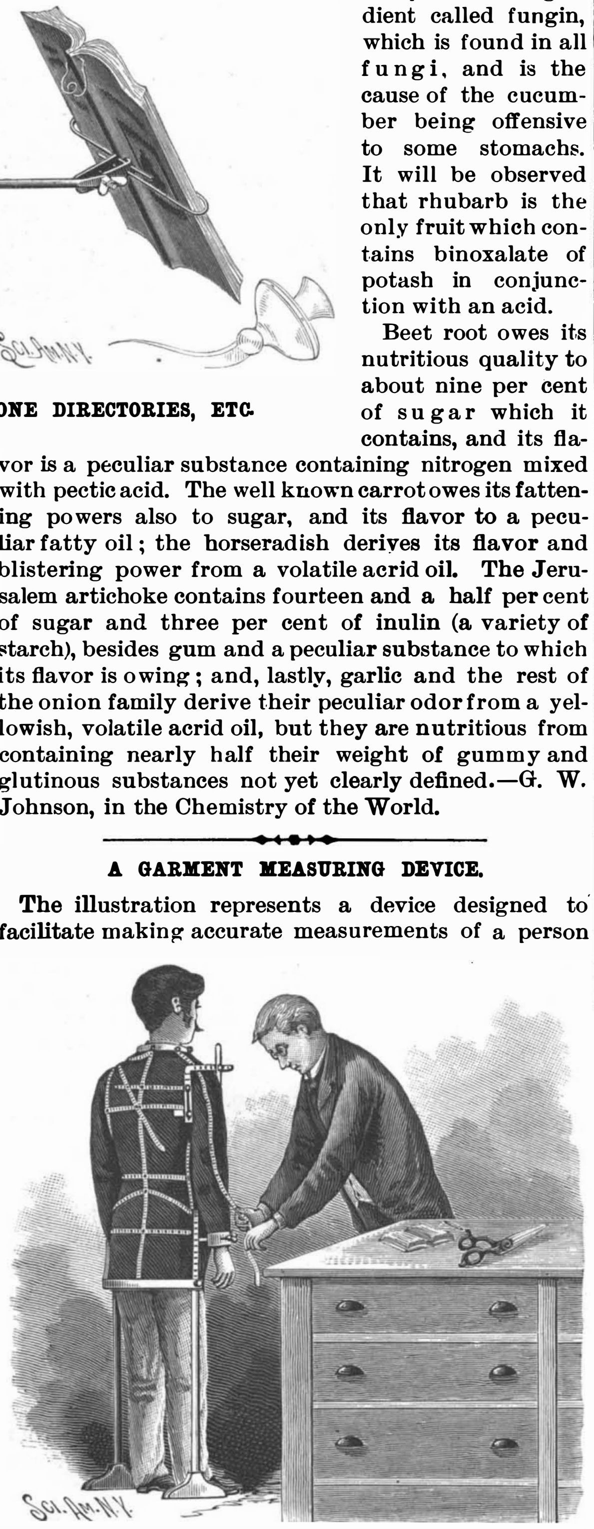
The Acids of Fruits.

The grateful acid of the rhubarb leaf arises from the malic acid and binoxalate of potash which it contains; the acidity of the lemon, orange and other species of the genus Citrus is caused by the abundance of citric acid which their juice contains; that of the cherry, plum, apple and pear from the malic acid in their pulp; that of gooseberries and currants, black, red and white, from a mixture of malic and citric acids; that of the grape from a mixture of malic and tartaric acids; that of the mango from citric acid and a very fugitive essential oil; that of the tamarind from a mixture of citric, malic and tartaric acids; the flavor of asparagus from aspartic acid, found also in the root of the marshmallow; and that of the cucumber from a peculiar poisonous ingredient called fungin, which is found in all fungi, and is the cause of the cucumber being offensive to some stomachs. It will be observed that rhubarb is the only fruit which contains binoxalate of potash in conjunction with an acid.

Beet root owes its nutritious quality to about nine per cent of sugar which it contains, and its flavor is a peculiar substance containing nitrogen mixed with pectic acid. The well known carrot owes its fattening powers also to sugar, and its flavor to a peculiar fatty oil; the horseradish derives its flavor and blistering power from a volatile acrid oil. The Jerusalem artichoke contains fourteen and a half per cent of sugar and three per cent of inulin (a variety of starch), besides gum and a peculiar substance to which its flavor is owing; and, lastly, garlic and the rest of the onion family derive their peculiar odor from a yellowish, volatile acrid oil, but they are nutritious from containing nearly half their weight of gummy and glutinous substances not yet clearly defined.—G. W. Johnson, in the Chemistry of the World.

A GARMENT MEASURING DEVICE.

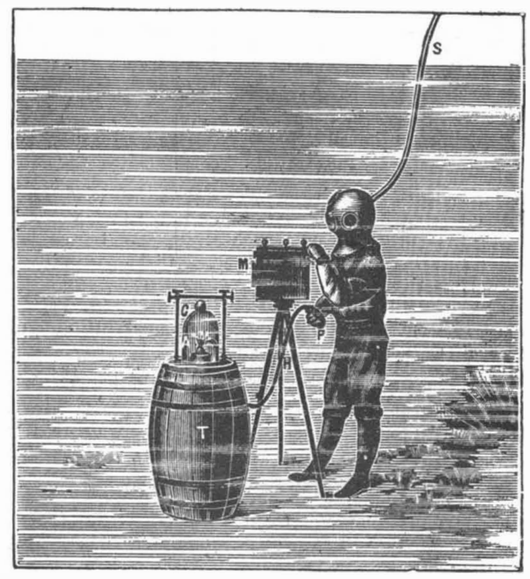
The illustration represents a device designed to facilitate making accurate measurements of a person for the correct draughting and cutting of coats, vests, etc. It has been patented by Harris Kantorovitz, of No. 1136 Whisner Street, Philadelphia, Pa. It consists of two upright telescopic standards, one to be placed at each side of the person to be measured, and forming supports for several other pliable measuring attachments adjustable on the standards, and conveniently arranged for taking the different measurements required. A sleeve hole measuring device is carried by one of the standards, there being a strip projecting horizontally therefrom, while also supported by the standards is a breast strip, a back strip being secured to the neck plate, breast strip, and the strip carried by the sleeve hole device. A shoulder tape is secured to the breast strip at the front and rear, the attachment at the rear being at the point where the back strip unites with the breast strip, and a shoulder strip is secured to the shoulder tape at the front and to the breast strip at the rear.



KANTOROVITZ'S GARMENT MEASURING DEVICE.

SUBMARINE PHOTOGRAPHY.

Mr. Louis Boutan has made some interesting experiments in submarine photography. He is an ardent student of zoology, and during the investigations he made on the shores of the Mediterranean he was so impressed with the beauty of the sights offered that he concluded to make some effort to represent them by pictures as well as by words. His first experiments were made at a slight distance under the surface of the water, where the intensity of the light is still sufficient for the production of photographs; he constructed a camera and an instantaneous shutter especially adapted for use in water. Finding it desirable to take pictures at greater depths, Mr. Boutan resorted to the employment of artificial light, and employed an apparatus whose construction is shown in the cut.



SUBMARINE PHOTOGRAPHY.

The apparatus comprises a barrel, T, containing oxygen and carrying a glass globe, C, in which is placed a lamp, A, having a wick impregnated with alcohol. The operator, by pressing the bulb, P, at the end of the tube, H, may throw some magnesium powder into the flame, or otherwise produce a flash light within the globe, C. The operator puts on a diving suit provided with the usual air supply pipe, S, and places his camera, M, which is watertight, in proximity to the oxygen barrel, T, so that he can readily actuate the shutter and the flash light apparatus.

FLOWERS PERFUMED ARTIFICIALLY.

A few years ago we had the novelty of flowers colored artificially with the brilliant and chatovant dyes that modern chemistry offers us. But beauty is only a vain ornament in flowers when it is unaccompanied with a delicious odor. What good is this display of bright colors that delights the eyes if this flower has no odor or if it exhales an insupportable one?

It has, therefore, been asked whether chemistry would not be capable of divesting certain flowers of their offensive odor and of communicating to them an agreeable perfume. It was almost certain that art would give such flowers what nature had refused them. The thing is not new, as might be thought, for it is something that taxed the brain of the ancients.

Father Ferrari tells us that one of his friends, a fine wit and great philosopher, undertook to deprive the African marigold of its ill odor, and that he succeeded with a little pains. He soaked its seeds for two days in some rose water in which he had infused a little musk, then allowed them to dry slightly and sowed them. These flowers were not entirely deprived of their bad odor, but were, nevertheless, slightly improved. He then sowed the seeds of these plants after preparing them as above stated. The result was the production of flowers that, as regards fine odor, were capable of competing with jasmines and violets.

APPARATUS FOR PERFUMING FLOWERS.

The Liberté, of Lille, of September, 1851, gives the following data: "One may begin to correct the bad odor of a plant before it springs up, that is to say, when the seeds of it are sown. Sheep's dung is soaked in vinegar, and into this is put a little musk, civet or ambergris in powder. The seeds, or even bulbs, are put into this liquid and allowed to macerate for a few days. Experiment has demonstrated that the flowers that appear exhale a very sweet and very agreeable perfume. If it is desired to be successful to a certainty, let the young plants be sprinkled with the same mixture in which the seeds were put to soak.

"As regards plants that spring from the root, from budding and from layering, the operation is effected on the stalk, precisely the same as with colors.

"As regards trees, the trunk is pierced with an auger, and, before the sap ascends, the material whose taste and odor it is desired that the fruit shall acquire is put into it with the consistence of honey. From what we have said, a perpetual infallibility must not be expected. Art does not do all that it wishes nor in the manner that it wishes, but must regulate itself according to the mechanism of nature."

At present the odor of flowers is strengthened by moistening them with an alcoholic solution of the corresponding essential oil or perfume manufactured artificially. This is done upon a large scale with violets, roses, hawthorns, etc. For such "doctoring" the artificial oils of rose, violet, etc., are advantageously employed. For fixing the odor, which would prove fugacious, glycerine is employed. Some manufacturers sell the perfumes for flowers already prepared. Let us mention in this line "violettine," composed of 100 grammes of alcohol, 100 of glycerine and 10 of essence of violet; and "geranioline," a similiar preparation in which the essence of violet is replaced by geraniol or artificial oil of rose.

In order to renew flowers exhausted by time or carriage, their extremities are immersed in vessels containing a weak solution of sal ammoniac. After this, their youth is renewed with a little essential oil.

Another method of strengthening the odor of flowers before shipping them or placing them on sale is as follows: They are put into a wooden box cooled internally with ice. In the bottom of this box there debouches a tube provided with perforations and through which is sent a current of carbonic acid gas charged with the odor characteristic of the flower. This current is produced by the evaporation of the liquid carbonic acid contained in the cylinder, A, and the flow of which is controlled by the regulator, B. The carbonic acid gas, slightly heated in passing through the worm, C, which is heated by petroleum, bubbles up through the essential oil contained in the receptacle, D, and finally passes into the box, M, where it gives up to the flowers the perfume with which it is charged.

Upon continuing the experiment for a certain length of time, the flowers are rendered more or less fragrant. In order to facilitate the fixation of the perfume, the flowers are impregnated with a small quantity of glycerine.

Some ingenious dealers have ventured upon the supernatural, and endeavored to give a flower an odor other than the one that it usually exhales. If the flower is but slightly or not at all odoriferous, its smell is masked with an intense perfume through the method just indicated. It is in this way that one has been able to have lilacs possessing the odor of the rose, pinks having the perfume of the violet and humble corn flowers exhaling the aristocratic odor of the jasmine—in a word, all that the imagination can permit of attempting.

What is more curious is that the investigation of workers in this line has no limits. Who would have imagined that a chemist would have had the patience to seek a method of depriving flowers of their characteristic odor and substituting a different perfume therefor? The thing is delicate and not at all easy, and does not succeed with all flowers. It merits mention, nevertheless. It suffices to immerse the flowers in bromated water in order to divest them of a portion or the whole of their fragrance. After this they are washed and then perfumed with the odor desired, by means of one or the other of the two methods that we have just spoken of.

In conclusion, we may say that an endeavor has been made to perfume flowers by capillarity, just as they were formerly colored. As the essential oils are insoluble (or at least but slightly soluble) in water, they are converted into soluble chemical derivatives by a preliminary treatment with anhydrous sulphuric acid. This process is applicable to but a few essential oils.

The only practical means are those that consist in immersing the flowers in an odoriferous bath or exposing them to a current of perfumed carbonic acid gas.—La Nature.

A FEW drops of oil of turpentine added to the usual hydroquinone developer is said to act as an exceedingly active accelerator, and one which gives remarkable density.

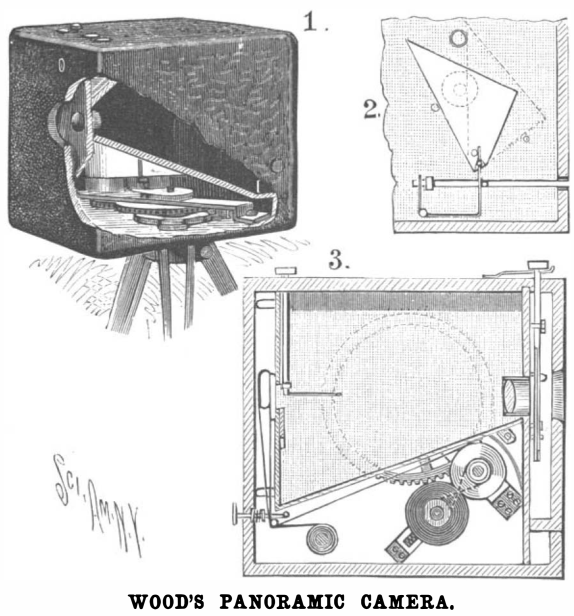
A PANORAMIC CAMERA.

A camera arranged to obtain single views or panoramic views, in series or in a continuous view, is represented in the accompanying illustration, the camera casing being revoluble and having a dark chamber into which extends the lens, and there being a slide in the back of the chamber and a film-feeding device outside of it, to feed the film over the slide intermittently or continuously. The improvement has been patented by Horatio G. Wood, of Newport, R. I.

Fig. 1 is a perspective of the camera with a portion of the casing broken away to show its interior, Fig. 2 showing the shutter mechanism, and Fig. 3 being a central sectional plan view. The dark chamber into which the lens projects has an inclined bottom and side, and at its rear is a removable slide over which passes the film, different slides being used for making snap shots and panoramic views, and there being in the slide a slot adapted to be opened wide or partly closed by a plate.

A spur wheel is fast on the axis of the camera, and the spur wheel revolves a film roller with which cooperates a second film roller having spring-pressed movable bearings. As the camera casing is turned in one direction by the operator the film is passed in the rear of the slot for exposure.

The casing may be revolved either by hand or spring power and for a full revolution or only a part of a revolution, as desired. A marker also marks the film after a view, whether in the form of a snap shot, serial panoramic view or continuous panoramic view. The shutter is preferably a triangular piece of sheet metal, pivoted on the front face of a partition just inside the front of the camera casing, its open position being indicated by dotted lines in Fig. 2. In taking



WOOD'S PANORAMIC CAMERA.

a continuous panoramic view the operator gives a full turn to the camera casing, the shutter being then in open position, and the film-carrying wheels being rotated by the gear wheel to carry forward the film during the exposure, the lens moving to an extent equal to the movement of the film, and both being so timed that a new surface on the film will be presented to the rays of light as fast as they are changed in the lens.

Metallic Sodium Produced by an Electrolytic Leak.

The Boston correspondent of the Western Electrician writes as follows of an interesting discovery in the Hub:

The accidental sounding of an automatic fire alarm in a Washington Street business house recently has brought to the attention of the Boston Board of Fire Underwriters a possible new source of danger from electric wires. According to the reports, for some time past a slight smoke has been seen issuing from the casement about the electric light wires in the basement of the Pray building at the point where the wires enter from the street. When the insurance inspector arrived and the casement was removed, it was found that a peculiar substance had accumulated about the wires, which, when moistened and struck with any hard substance, would give off flashes of fire. All around this point the woodwork was covered with a thick liquid which had dried in places to a white substance resembling discolored salt, and which was slippery to the touch and strongly corrosive. The wood itself was soft and badly discolored. As this case was thought to be of considerable importance, the matter was placed in the hands of Forbes & Glidden, electrical and chemical engineers, who immediately began an investigation. The deposit discovered about the wires proved, upon analysis, to be mainly metallic sodium. This substance is exceedingly combustible, and unites so readily with water that its presence in a damp cellar would be impossible under ordinary conditions. When it unites with water hydrogen gas is given off, and at the same time a considerable amount of heat is generated. Under certain conditions this heat would be sufficient to ignite the hydrogen gas. Hydrogen gas and air would form an explosive, and hence the greatest danger lies in the liability of an explosion if the gas should become ignited.

The explanation of the appearance in a damp cellar of a substance so combustible and unstable in the presence of moisture as metallic sodium is given as follows: The metallic sodium was undoubtedly the product of an electrolytic decomposition of impure sodium hydrate. This sodium hydrate came from the cement mortar used in laying the brick wall of the basement upon which the wires were supported. Some of the hydrate may have possibly worked its way through the wall from the cement used in the foundation of the paved street immediately adjacent. The electric current which caused the electrolytic action was due to a leak inside the casing from one of the mains. The leak was produced by the action of the sodium hydrate on the insulation covering the wires. This covering was what is known as weatherproof insulation, which consists of a cotton braiding covered with tar. Such a material is readily attacked by sodium hydrate, and its insulating properties destroyed. Moreover, the sodium hydrate itself furnishes a good path for the current when it has once penetrated through the insulation. This case is especially interesting in connection with several of the explosions which have occurred in underground conduits, usually attributed to a leak in the gas mains. In the London papers recently it has been suggested that metallic sodium may possibly have something to do with these explosions. This, however, appears to be the first instance in which the appearance of metallic sodium has been proved and a complete explanation of an actual case given.

A Woman Miner.

A correspondent of the Mining and Scientific Press, writing from Carson, Nevada, says:

I have spent the month of June in the Humboldt Mountains, looking over good gold prospects. The main claim is called the "Lost Mine." It was opened thirty-one years ago, prior to the advent of the railroad. A shaft was sunk on the vein about 25 feet, it averaging about $75 per ton gold. At that time it would not pay, owing to the excessive cost of mining material and labor. During the past four years persistent searches were made for the mine, but each time were abandoned, until this spring when a cultured woman of the new age appeared in the person of Mrs. Ida M. Strobridge, in company with a young man lately employed on her father's ranch near Humboldt. She is a most remarkably bright woman, and will climb a precipitous cliff where the average man would not dare to venture. In addition to mining she looks after the business or her father's cattle ranch, and is quite a sportswoman and would probably carry off the first prize in a shooting tournament, as she brings down her game every time. She wears a handsome brown denim costume, which she dons in climbing the very steep and rugged cliffs of the Humboldt Mountains. She has located five claims on the lode, laid out a new camp and named it after her father, "Meacham," and reorganized the district anew as the "Humboldt;" she has four men to work and is superintending operations herself. She has also located the water and springs flowing over the claims, which are nine miles east of the Central Pacific Railroad, at the Humboldt House. Such is the New Woman.

The Lost Mine can be traced a distance of 2,200 feet along the vein from 12 to 18 inches wide, and crops out from 6 to 24 feet in height. It is a white and rose colored quartz, which, when broken, shows the free gold quite plainly, and assays range from $6.50 to $340 per ton; the average is about $85 per ton gold. Mrs. Strobridge is now engaged running a tunnel under the shaft where the vein is showing up finely, and if the present appearance is maintained the New Woman will in due time be reckoned as a millionairess, and all by her indomitable will and perseverance. She is now sacking ores for shipment.

Atlanta Exposition Notes.

It is now less than two months before the gates of the Cotton States International Exposition will be thrown open, so that the work is being rapidly pushed forward. The force of laborers has been increased and there is no longer any doubt by the 18th of September the opening day, the Exposition will be ready for the rush of visitors. Arrangements have been made by which a wire will be run to Gray Gables, and President Cleveland or some member of his family will touch the button at his summer home on Buzzard's Bay, which will start the fair in motion. It is the purpose of the management to make the opening day of the Exposition a notable occasion in the history of Atlanta. All business houses of the city will close at noon.

A regular hospital will be established on the grounds and an ambulance corps will be organized to take care of any persons suffering from sudden illness or accident. A display of Confederate relics will be one of the interesting features.

A NINETY-SIX TON ELECTRIC LOCOMOTIVE.

With the view, principally, of escaping the nuisance of smoke and gases from a steam locomotive in drawing passenger trains through a long tunnel, the Baltimore & Ohio Railroad, with the co-operation of the General Electric Company, has brought into its service a powerful electric engine, illustrated on our first page. Three of these electric locomotives were ordered, and one of them has for the past few days been doing duty conveying passenger and freight trains through a tunnel 7,339 feet long, commencing at the Camden Street depot in the city of Baltimore, and over tracks at each end of the tunnel, which brings the total haulage by electric traction up to about three miles. The service calculated upon from these electric locomotives is the transfer of about 100 trains each way daily, each passenger train having a maximum weight of 500 tons, including the steam locomotive connected with the train, to be moved at a speed of 35 miles an hour, and freight trains, weighing 1,200 tons each, to be moved at a speed of about 15 miles an hour on an 0·8 per cent grade.

The powerful machine which has been constructed for this work bears with its entire weight of 96 tons, or 192,000 pounds, on its eight driving wheels, which is considerably more than twice the weight on the driving wheels of the heaviest steam locomotive. It has two trucks and eight driving wheels of a diameter of 62 inches each outside of the tires, the wheel base of each truck being 6 feet 10 inches; the length over all, 35 feet; and the height to top of cab, 14 feet 3 inches.

The cab is of sheet steel, sheathed inside with wood, and is in two parts, each supported upon one truck. There is a sloping shield on each side of the cab, forward and aft, one shield carrying a headlight and bell and the other a headlight and whistle.

There are four motors, two to each truck, or one to each axle, and a good deal of the detail of one of the motors is shown in one of our views, the top field frame being lifted away from the armature and the bottom field frame in position. The driving gear consists of a cast steel spider shrunk on and keyed to a cast steel driving sleeve, forming the core of the armature, each arm of the spider having a double rubber cushion with a chilled cast iron wearing cap, the cushion being forced into the arms of the spider and the cap, and the arms of the spider being thus held in engagement with the spokes of each driving wheel.

The motors are supported on carriers bolted to the field magnets, and rest in adjustable hangers carried on half elliptical springs placed on top of the frame and bumpers. Each motor has six poles and six sets of carbon brushes, the latter being connected to a yoke revolving through 360 degrees, and readily accessible. The field spools are incased in sheet iron cases and fitted over the pole pieces bolted to the field frame.

The armatures are built of sheet iron disks, series drum wound, and known as ironclad, each insulated winding being embedded in an insulated slot cut into the outer surface of the armature body, and held by a wooden key. The armature, with the commutator, is mounted upon and keyed to the hollow sleeve carried on the journals on the truck frame. The inside diameter of the sleeve is about two and a half inches larger than the axle, and when normally placed the motor rests in a position concentric to the axle, the clearance between the axle and the sleeve allowing a flexible support, and the rubber cushions permitting the armature to run eccentric to the axle when the motor departs from its normal position on account of unevenness in the track. As will be seen by our illustration, the field frame is readily removable for inspection or repairs.

The trolley support, shown in one of our views, is diamond shaped and compressible, contracting and expanding as may be necessary, and leaning to one side or the other as the locomotive runs on one side or the other of the overhead conductor. Contact with the conductor is made by a sliding, shuttle-like, brass shoe, shown in a small figure, and the current is brought to the locomotive by cables connected to the shoe and fastened to the trolley support. The conductor is a simple form of iron conduit or trough, erected overhead on trusses outside the tunnel, and in the tunnel attached to the crown of the arch. It is formed of 3 inch iron Z bars ⅜ inch thick, riveted to a cover plate ¼ inch thick and 11½ inches wide, and is made in sections 30 feet long, weighing about 30 pounds per foot. The insulation of the conductors is effected by conical porcelain insulators supported in transverse frames, and the supports of the frames are themselves similarly insulated where they are secured to the arch of the tunnel, thus affording a double insulation. The feeder cables are of bare standard copper of sixty-one strands each of 1,000,000 circular mils (one inch) cross section.

Each motor is rated at 360 horse power and takes a normal current of 900 amperes at a pressure of 700 volts. The controlling devices and measuring instruments occupy the interior of the cab, the controller being of the series parallel type. Above the controller are the instruments which tell the driver the amount and pressure of the current the motors are taking, and a slot in the floor enables him to keep his eye on the commutators. The reversing lever projects through the upper plate of the controller cover, and the resistances are placed around the frame beneath the floor of the cab. The locomotive is equipped with a 1,200 to 3,500 ampere automatic circuit breaker and one 2,000 ampere magnetic cut-out, a 5,000 ampere illuminated dial Weston ammeter, and one illuminated dial Weston voltmeter. The compressed air for the whistle and brakes is supplied by an oscillating cylinder electric air pump, the air tanks being placed at each end of the complete locomotive. The interior of the cab is illuminated by clusters of incandescent lights.

The power house, which is also equipped with an electric lighting plant for lighting the tunnel, is in the immediate neighborhood of the tunnel entrance, and is 30 feet high and 322 feet long. It has an engine room 223 feet long by 57 feet wide, and the dimensions of the boiler house are 98 × 69 feet. In the latter, in six batteries, are twelve 250 horse power Abendroth & Root water tube boilers. Five engines and generators have been provided for, and four are now in place. The engines are of the tandem compound Reynolds-Corliss type, and have 24 and 40 inch cylinders. Directly coupled to them are 500 kilowatt General Electric multipolar generators, adapted to run with the engine at 110 revolutions a minute, and from these generators the current is taken over cables of 1,000,000 circular mils (1 inch) cross section to a switchboard on a platform at the south end of the engine room. From the positive receiver or bus on the switchboard eight cables of stranded copper pass to an overhead structure immediately outside the power house, where connection is made to three feeder cables and to an overhead conductor. The negative bus is similarly connected to the rails, which are double bonded with No. 0000 wire, and also to return cables laid in a wooden box between the tracks.

The tunnel, for use in which this locomotive was built, runs under Howard Street, one of Baltimore's principal thoroughfares, and was driven without any interference to the surface traffic, the vertical shafts being sunk to the tunnel through the cellars of houses along its line. The only severe cave-in occurred in the vicinity of the Baltimore City College, which was ruined. A new college was built by the contractors on the site of the collapsed building. Work on the tunnel was begun in September, 1890, and it was finished early this year. It is 27 feet high and 22 feet wide, and cost $7,500,000.

Further particulars of this remarkable electrical equipment will be found in the current issue of our SUPPLEMENT.

The History of the Jacquard Loom—How French Designers Study.

The history of the introduction of the Jacquard loom is a most instructive lesson on the advantage of free intercourse and rivalship between different countries. The inventor of that beautiful mechanism was originally engaged in a plaster quarry, afterward working at cutlery, type founding and weaving, having been a man who had never turned his mind to automatic mechanics, till he had an opportunity, by the peace of Amiens, of seeing in an English newspaper the offer of a reward by the Society of Arts, to any man who would weave a net by machinery. He forthwith roused his dormant faculties and produced a net by mechanism; but not finding the means of encouragement in the state of his country, he threw it aside for some time and eventually gave it to a friend as a matter of little moment. The net, however, got by some means into the hands of the public authorities and was sent to Paris.

After a considerable period, when Jacquard had ceased to think of his invention, the prefect of the department sent for him and said, "You have directed your attention to the making of net by machinery." He did not immediately recollect it, but, the net being produced, recalled everything to his mind.

On being desired by the prefect to make the machine which had led to the result, Jacquard asked three weeks time for the purpose. He then returned with it and requested the prefect to strike with his foot on a part of the machine, whereby a mesh was added to the net.

On its being sent to Paris, an order was issued for the arrest of its constructor by Napoleon, in his usual sudden and arbitrary way. He was placed immediately in charge of a gendarme, and was not allowed to go to his house to provide himself with necessaries for his journey. Arrived at the metropolis, he was placed in the Conservatoire des Arts, and required to make the machine then in presence of inspectors; an order with which he accordingly complied.

On his being presented to Bonaparte and Carnot, the former addressed him with an air of incredulity in the following terms: "Are you the man who pretend to tie a knot in a stretched string?" He then produced the machine and exhibited its mode of operation.

He was afterward called upon to examine a loom on which 30,000 francs had been expended for making fabrics for Bonaparte's use. He undertook to do by simple mechanism what had been attempted in vain by a very complicated one; and taking for his model a machine of Vaucanson, he produced the famous Jacquard loom.

He returned to his native town rewarded with a pension of 1,000 crowns, but experienced the utmost difficulty to introduce his machine among the silk weavers, and was three times exposed to imminent danger of assassination. The Conseil des Prudhommes, who are the official conservators of the trade of Lyons, broke up his loom in the public place, sold the iron and wood for old materials, and denounced him as an object of universal hatred and ignominy. Nor was it till the French people were beginning to feel the force of foreign competition that they had recourse to this admirable aid of their countryman; since which time they have found it to be the only real protection and prop of their trade.

It is in the production of the patterns of silk goods that the French have a decided advantage over other nations; they have probably little or none after the design is put into the loom.

The modes in which taste is cultivated in Lyons deserve particular study and imitation in this country. Among the weavers, the children and everybody connected with devising patterns, much attention is devoted to everything in any way connected with the beautiful, either in figure or color. Weavers may be seen in their holiday leisure gathering flowers and grouping them in the most engaging combinations. They are continually suggesting new designs to their employers, and are thus the fruitful source of elegant patterns. There is hardly any firm of consequence in Lyons in which there is not a partner who owes his place in it to his success as an artist.

The town of Lyons is so conscious of the value of such studies that it largely contributes to the government establishment of the School of Arts, which takes charge of every youth who shows an aptitude for drawing or imitative design of any kind applicable to manufactures. Hence all the eminent painters, sculptors, even botanists and florists of Lyons become eventually associated with the staple trade, and devote to it their happiest conceptions.

In the principal textile school of Lyons every one of the students receives from the town a gratuitous education in art for five years; comprehending delineations in anatomy, botany, architecture and loom pattern drawing. A botanical garden is attached to the school. The government of France also greatly assists said textile school of Lyons by money. The school supplies the scholars with everything but the materials, and allows them to reap the benefit of their works. The professor of painting is a man of distinguished talent, well known to connoisseurs.

The French manufacturer justly considers that his pattern is the principal element of his success in trade; for the mere handiwork of weaving is a simple affair with the Jacquard loom. He therefore visits the school and picks out the boy who promises by taste and invention to suit his purposes best. He invites him to his house and gives him a small salary to be gradually advanced.

After three or four years, if the young artist's success be remarkable, he may have his salary raised, and when his reputation is once established, he is sure of the offer of a partnership. Such is the general history of many of the school boys of Lyons.

Even the French weaver prides himself upon his knowledge of design; he will turn over several hundred patterns in his possession and discourse on their relative merits, seldom erring far in predicting the success of any new style. By this disposition the minds of silk weavers in France become elevated and refined, instead of being stultified in gin shops, as those of our weavers too frequently are.

In flower patterns the French designs are remarkably free from incongruities, being copied from nature with scientific precision. They supply taste to the whole world in the extent of their exportations.

In the Lyons school, collections of silk fabrics may be studied extending over a period of four thousand years, with explanations of the modes in which every pattern was produced, from the rude silk of the Egyptian mummies to figured webs of the last year.—Textile Record.

Electricity on the Japanese War Vessels.

The firing of great guns and the explosion of shells appears to have the effect of disarranging some of the electrical devices on war ships. The Japanese legation in Paris has forwarded to the French government a report relating to the recent naval combats, in which it is stated, with regard to the electric installations on board the Mikado's warships, that the interruptions of current which took place were not caused, as has been said, by the recoil of the guns, but by the bursting of Chinese shells. The working of the ordnance maneuvered by electricity was not interfered with. The electric wires used for igniting charges were, however, broken by the vibration set up by the firing of the heavy guns.

THE FAN AND MAGNETIC CLOCK.

The idea of indicating the time by means of a fan spreading out progressively dates back to the sixteenth century. What was sought by the clockmakers of that epoch, in employing this system, was especially a method of obtaining the hours of the natural day, that is to say, of the rising at the setting of the sun and of its setting at its rising. The fan, according to the season, had to give the hours so much the longer in the daytime in proportion as they were shorter at night, and vice versa.

We own an engraving representing "Honoratus Joannis Caroli Hispp. Magister, preceptor of Charles, prince of Spain, son of Philip II, born 14th January, 1507, died Bishop of Osma, July 30th, 1566." Near the individual, and placed upon the table, there is a Renaissance clock in the form of an ostensoir. The upper half of the dial of this piece (Fig. 1) is divided into twelve sectors, six black and six white, which alternate with each other. The rest of the dial is black. The twelve sectors are formed by the blades of a double fan, whose function is as follows: The day hours are marked by the white blades of the fan and those of the night by the black ones. The change is made at the rising and setting of the sun, and is effected through the passage of the white blades under the black ones, or vice versa.

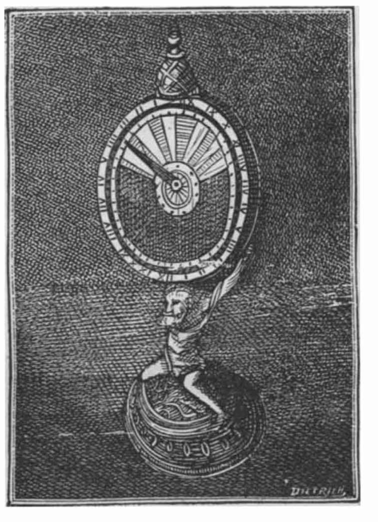


Fig. 1.—FAN CLOCK OF THE SIXTEENTH CENTURY.

For the equation of the hours, that is to say, in order to obtain long hours during the long days of summer and short night hours at the same epoch, the white blades are uncovered so much the more in the daytime and become so much the wider in proportion as those of the night are narrower. The hand in its uniform motion will therefore take less time to pass over the night hour, since its travel is more reduced, and, on the contrary, will take more time for the day hours. The engraving represents the dial at the very moment of the function. This dial, conformably to quite a widespread usage, especially in the clockwork of the epoch, marks periods of six hours only. Hence the six white and six black sectors solely. The movement of the hand is likewise interesting to study. It is of the return kind, and the falling back is produced at the end of each semicircular course.

We shall explain the system of sudden recoil further along in speaking of a fan of our invention that works on the same principle. The dial of this little Renaissance clock seems to be oval. We do not know whether this is an effect of perspective or whether it was really thus. But had it been so, that would not have rendered it impossible for the fan to work, for the difference between the inscription of a circle in an oval could be concealed by the rim, and the semicircular movement of the fan could, nevertheless, be perfectly effected.

In the eighteenth century the thing was executed anew, or, at least, the same idea was exploited.

In fact, we find what follows in the literary memoirs of the Academy of Inscriptions (1753): "Pontus de Tyard, who died Bishop of Chalons, distinguishes clocks that marked, and perhaps struck, twenty-four hours from those that marked but twelve. He calls the former entire and the latter half clocks. Mr. Fardoil, who died thirty years ago, was pleased to renew this invention. He made a clock in which the dial twice marks the twelve hours borne separately upon two sorts of fans, the blades of one of which recede from each other in proportion as those of the other approach each other alternately, according to the duration of the hours that follows that of the days and nights. This clock is now in the cabinet of Mr. D'Ons-en-Bray."

Without having otherwise occupied ourselves with the different systems that we have just indicated, it has seemed to us interesting to construct a clock formed of a fan whose continuous spreading would give the time with accuracy. The piece that we have executed (Fig. 2) consists, then, of a fan that opens progressively, and that, having spread to its full extent, suddenly closes. The fan consists of thirteen blades, upon each of which an hour is painted. Taking figure six as a starting point and point of arrival, midday is, therefore, found at the center of the semicircular course of the fan, which operates in twelve hours. It became necessary for us to have thirteen hours, seeing that the jump backward takes place at just six o'clock, that is to say, when the fifth hour has completely left the final figure six exposed. It is then that, on closing, the first blade presents the first figure six during the period of its hour, in allowing the seventh to be progressively seen. Consequently, the first and last blades carrying the same number make in reality but one.

The system of sudden recoil is very simple. It consists of a snail, which, in making its revolution in twelve hours, actuates a lever at the end of which there is a rack that engages with a pinion carrying the first blade of the fan. When the revolution of the snail is accomplished, and after it has raised the lever to the culminating point that corresponds to six o'clock, the lever falls into the notch of the snail and the rack returns upon itself. With a well regulated movement, this system operates perfectly, and is capable of giving the hour with precision.

We have thus been able to obtain not only a timepiece curious as to its working, but also an extremely decorative object, possessing a certain artistic character (Fig. 2). We have placed the fan in front of a plaque covered with velvet and slightly inclined, which conceals the movement placed behind.

Baron Grollier de Serviere describes in his work upon the curiosities of his grandfather's cabinet, "a clock consisting of a tin plate, upon whose rim are engraved the hours as if upon a dial (Fig. 3, No. 1). After filling this plate with water there is thrown into it an image of a turtle made of cork, which goes to seek the hour and mark it with its snout. After it has found the hour it stops. If it is removed therefrom it immediately returns, and if it is left there, it imperceptibly follows the edges of the plate in always marking the hours. This apparatus is so much the more surprising in that there is apparently nothing to cause the little turtle to act upon the water." Here the description of this piece ends.

We have thought it interesting to search out the method of obtaining such a result and have constructed the clock shown in Fig. 3, No. 2.

The movement, which is placed horizontally in the box that supports the tin plate, carries along a magnetized disk, which effects its revolution in twelve hours. At its section there are two magnets, one a north pole and the other a south pole. The little cork turtle is provided beneath with a small magnetized steel pin, so that, once floating upon the water in the plate, the turtle is attracted between the two magnetized poles and always in the same direction, that is to say, the head toward the hours engraved upon the rim. It afterward follows these magnets in their circuit.

We must remark that the tin plate is entirely independent of the copper box in which the movement is placed, and that the plate may be laid upon the latter in any way desired, provided, however, that it be done in such a way that there shall be an absolute concordance between the place of the magnet and the hour that it is to cause the turtle to mark.—M. Planchon, in La Nature.

Fig. 2.—FAN CLOCK CONSTRUCTED BY MR. PLANCHON.

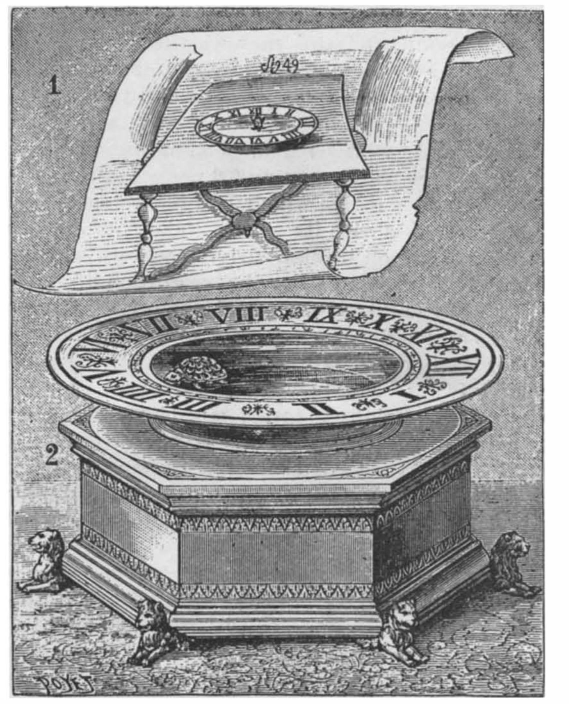


Fig. 3.—MAGNETIC CLOCKS.

No. 1. Mr. Serviere's Clock. No. 2. Mr. Planchon's Clock.

Ocean Towing of Petroleum Tanks.

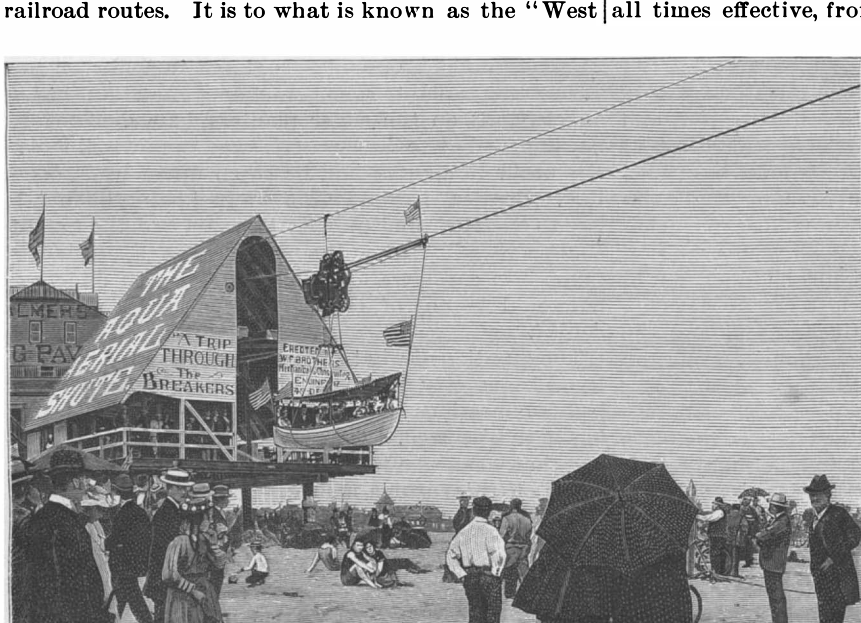
Recently a tanker sailed from America having in tow a barge laden with a full cargo of oil in bulk, and which is being towed to this country. The possibility of this course has only been made evident by the success of an apparatus called the Shaw and Speigle steam towing machine. This machine has been used in the towage of barges up and down the Western Atlantic seaboard, and it has been so eminently successful that the chief coal and ore transport companies in America have adopted it. Its distinctive feature is that by means of its driving and cushioning steam cylinders there is provided an elastic steam cushion, without which the hawser would be continually straining and frequently breaking. A manila hawser, although it is more elastic than the steel hawser, is very bulky to handle or to stow on a barge, and it also becomes very expensive on account of its ordinary wear and tear. A steel wire hawser will last apparently for an almost indefinite time without stranding or even straining, as appears from practical use. In its principle and mode of working the tow barge is borne entirely by the steam pressure in the cylinders. The wire hawser is wound on a drum that is driven by a pinion gear on the crankshaft of the engine, which meshes with the gear on the drum shaft. This machine has a regulating reducing steam valve, in which the opening is increased or diminished according as the strain on the hawser increases or diminishes. The action of the machine is as follows: In a seaway as the vessel pays off, thus increasing the strain on the hawser, the drum begins to revolve and to pay out the hawser; this action opens the regulating valve and increases the steam pressure in the cylinders until the pressure is sufficient to equal the strain. Then, if the strain decreases on the hawser, the pressure in the cylinders will revolve the drum and wind the hawser in. In this way the machine is prevented from paying out the whole of the hawser, and only enough is paid out to relieve the extra and momentary strain on the hawser, and thus prevent its injury or its breaking. When the tow barge casts off the hawser, then the regulating valve is disconnected, and the machine becomes in effect a simple hoisting drum to be started to wind up the hawser. It is claimed that for ocean steamers this invention is also well adapted, as better assistance can be rendered to disabled vessels to bring them to port than can be offered by any other means heretofore available. The salvage gained by the saving of one ship would pay for many of these machines. The barge to be brought across is No. 58, having a capacity of 3,000 tons of oil.—Chem. Tr. Jour.

THERE is a lighthouse to every fourteen miles of coast in England, to every thirty-five in Ireland, and to every thirty-seven miles in Scotland.

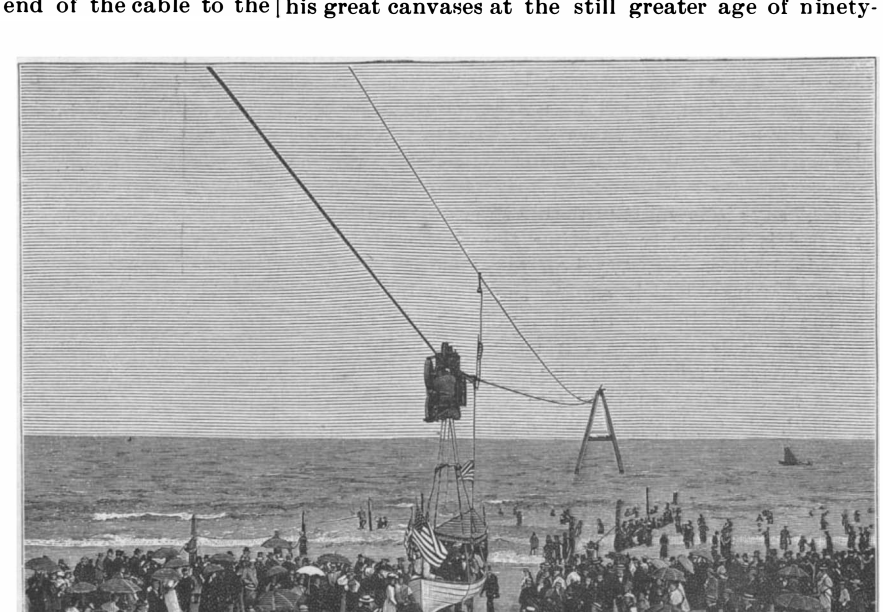
THE AQUA AERIAL TROLLEY.

Those seeking means to amuse the public at seaside resorts through novel and inexpensive methods have at Coney Island a most promising location for the exploitation of their ideas. Its proximity to New York and Brooklyn causes it to be visited daily during the summer season by many thousands of excursionists, it being but an hour's sail on well appointed steamers through the beautiful New York Bay and the Narrows, or a little more than a half hour's ride by numerous railroad routes. It is to what is known as the "West End" of the island that the masses, intent on an outing of only a day, or perhaps of a few hours, at but slight expense, find their way in the greatest numbers. It is here that a large building was erected for amusement purposes in the form of a gigantic elephant, where a three hundred feet high tower, with commodious elevators, affords the visitor an extended sea and land view, where the Boyton water toboggan slide was this year put in operation, where numerous gravity roads with tortuous curves and dizzy inclinations vie with miniature elevator wheels in humble imitation of the great one erected at Chicago, and where the merry-go-rounds and a thousand lesser attractions and shows are provided for the crowds, all of them with an accompaniment of noise which would in but few cases pass for music. It is here that the aqua aerial trolley, shown in our views, has been erected, and it has already proved itself to be quite an attraction. It has been put up and is being operated by W. F. Brothers, mechanical engineer, of this city.

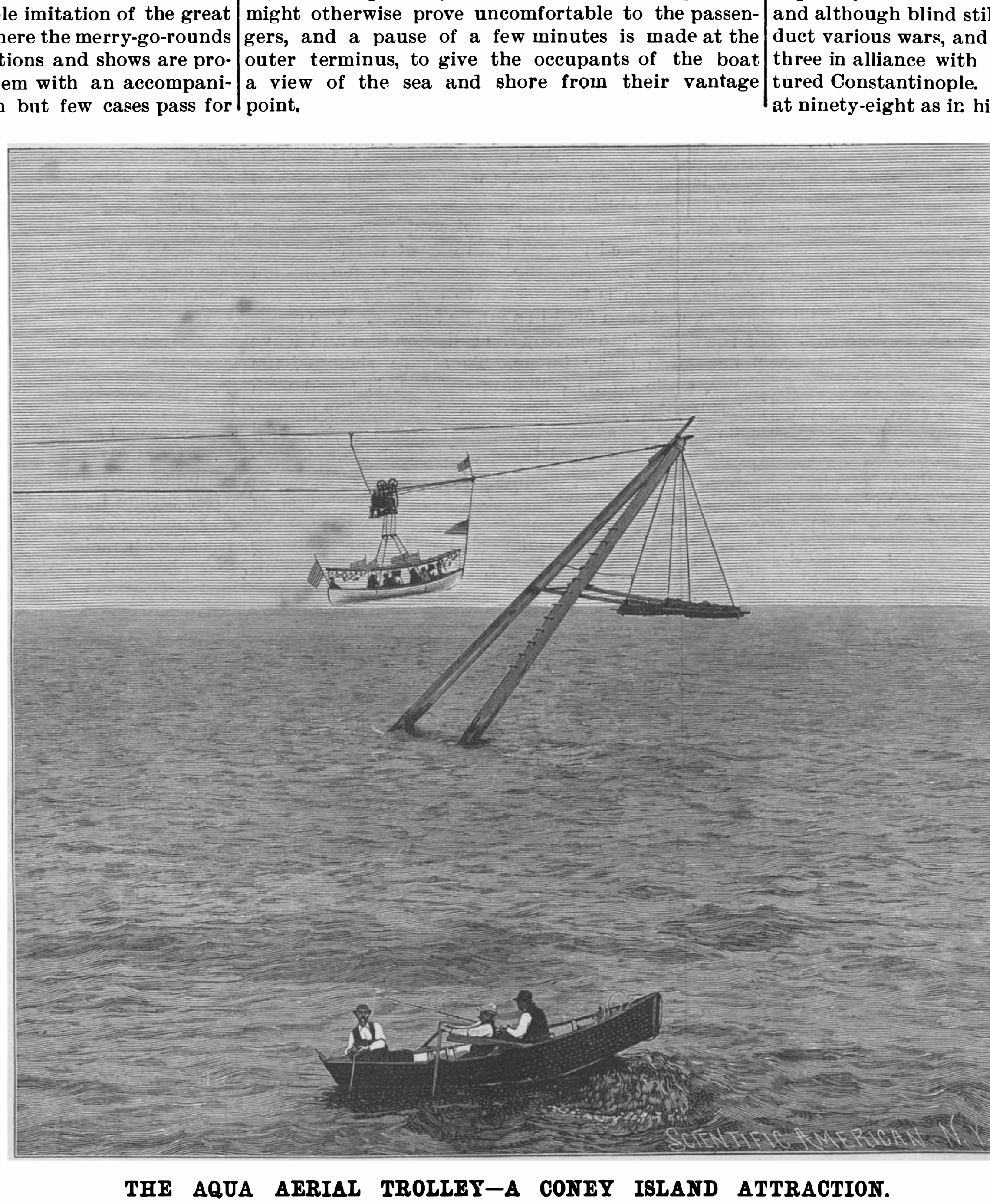
The cable over which the trolley travels is 1¾ inches in diameter and 825 feet long. It is attached at its outer or seaward end to the apex of a pair of anchored shears, inclined outward at an angle of about 90 degrees, the timbers of the shears being each 104 feet long. The tops of the shears are from 60 to 65 feet above the surface of the water, according to the state of the tide, and to help to counteract the strain of the cable upon them a weight of five tons, consisting of bags of sand, is suspended upon a platform from their highest point. At the land end the cable passes over bearings of a corresponding height and is made fast around piles in the rear of the trolley house. The motor, suspended in a frame close to the pulleys by which it is supported from the cable, weighs 1,200 pounds, the frame also carrying the operator, and the current being received through a small trolley traveling upon a separate conductor. It is a ten horse power motor, the current being supplied from a dynamo run by an engine in a rear building. Our illustrations represent the manner in which the boat is suspended from the motor trolley, a friction brake and gear upon a shaft connected with the motor allowing the operator to raise and lower the boat at will, with any load which the boat may happen to have on. One of the views represents the boat so lowered near the beach. The traction upon the cable of the pulleys from which the motor car is suspended is at all times effective, from one end of the cable to the other, and the motion is steady and even, although in going up the steeper inclines, as the car approaches either end, the motion is slower. The motor car itself, however, was used to carry out the five tons of counterweight used on the suspended platform, the car traveling to the very apex of the shears, and the platform being 30 feet beyond the shears, at the point where the weight was deposited. In the regular trips of the trolley the boat is carried at a height which will just escape touching the tops of the breakers, for a high roller might otherwise prove uncomfortable to the passengers, and a pause of a few minutes is made at the outer terminus, to give the occupants of the boat a view of the sea and shore from their vantage point.



AQUA AERIAL TROLLEY—STARTING OUT.



AQUA AERIAL TROLLEY—LETTING DOWN BOAT ON THE BEACH.



THE AQUA AERIAL TROLLEY—A CONEY ISLAND ATTRACTION.

Longevity and Activity.

An item in an exchange reminds us that great men usually carry their full mental vigor and activity into their great old age. M. Chevreul, M. De Lesseps, Gladstone and Bismarck are evidences of this anthropological fact. Pius IX, although living in tempestuous times, reached a great age in full possession of all his faculties, and the dramatist Crebillon composed his last dramatic piece at the advanced age of ninety-four years, while Michael Angelo was still composing his great canvases at the still greater age of ninety-eight, and Titian at ninety still painted with all the vigor of his earlier years. The Austrian general Melas was still in the saddle and active at eighty, and would have probably won Marengo but for the inopportune arrival of Desaix. The Venetian Doge Henry Dandolo, born in the beginning of the eleventh century, and having lost his eyesight through the treachery of the Greek Emperor, Manuel, when a young man while on an embassy to Constantinople, was, nevertheless, subsequently raised to the highest office in the republic, and although blind still managed successfully to conduct various wars, and at the advanced age of eighty-three in alliance with the French besieged and captured Constantinople. Fontenelle was as gay spirited at ninety-eight as in his fortieth year, and the philosopher Newton worked away at his tasks at the age of eighty-three with the same ardor that animated his physical prime. Cornaro was as happy at ninety as at fifty and in far better health at the age of ninety-five than he had enjoyed at thirty. These cases all tend to show the value and benefits to be derived from an actively cultivated brain in making a long life one of comfort and of usefulness to its owner. The brain and spirits need never grow old, even if our bodies will insist on getting rickety and in falling by the wayside, but an abstemious life will even drag that old body along to centenarian limits in a tolerable state of preservation and of usefulness.

The above list can be lengthened out with an indefinite number of names, but it is sufficiently long to show what good spirits and an active brain will do to lighten up the weight of old age. When we contemplate the Doge Dandolo at eighty-three animating his troops from the deck of his galley, and the brave old blind King of Bohemia falling in the thickest of the fray at Crecy, it would seem as if there was no excuse for either physical, mental, or moral decrepitude short of the age of fourscore and ten.—Nat. Pop. Review.

Correspondence.

Tending Toward Zero.

To the Editor of the SCIENTIFIC AMERICAN:

Your valuable paper of July 20 contained a letter from Mr. David H. Wyckoff, on "Force and Energy." Among other things he says: "Our earth has continued in its revolutions and circles around the sun, as well as all the bodies in our solar system, for all ages past without deviation." Scientists tell us this is not the case. They say that the tides are affecting the motion of the earth on its axis. The moon causes the water to heap up under it; this water remains nearly fixed under it and must act as a friction brake on the earth. Sir Robert Ball, in a recent issue of the SCIENTIFIC AMERICAN, called attention to this fact. Again, Professor Balfour Stewart, in his "Conservation of Energy," says it is most probable that the luminiferous ether is gradually affecting the motions of the heavenly bodies. Mr. Wyckoff says farther: "The power or energy which causes the lightning's flash, and the thunderbolt, with all its destructive effects, is the same now as it was a thousand years ago." Now this energy comes from the sun, since it is by the process of evaporation that the water particles are electrified. But scientists say the energy of the sun is not as great now as it was a thousand years ago. This is according to the Helmholtz theory of condensation, which is generally accepted.

Again he says: "Who knows but that some genius may arise who will grasp the situation and comprehend the power or energy that moves the worlds?" The external force that moved the worlds has long since ceased to act. We do not know what this force was, indeed the nebular hypothesis assumes that the mass of matter had a rotary motion. The worlds are not moving from an external force, but in virtue of their inertia, like a rifle bullet that is moving long after the force that gave it motion, namely, the powder, has ceased to act.

Professor Balfour Stewart farther says, "There is a tendency in all motion to be changed into heat." Heat is ever equalizing itself by radiation or other ways. When all forms of energy have been changed into heat and the universe gets to be of equal temperature, heat will no longer be convertible into other forms of energy, as it is now. For it is a well known law in physics that if we are to coax work out of heat, it must pass from a higher to a lower temperature. So it is easy to see that the available energy is tending toward zero, as the SCIENTIFIC AMERICAN has said.

The law of conservation of energy, when applied, is sometimes obscure; but when given careful study, always works out true. If our practical mechanicians were well informed on this great law, they would cease to dream of this sea serpent, perpetual motion, and employ their inventive powers in more hopeful ways. It is to be feared when they attempt such a machine they are as ill advised as that brother of immortal memory who tried to lift himself over a fence by pulling at his boot straps.

It is true "wonders have been accomplished in the last fifty years," but none of them have conflicted with the established natural laws. Nature seems to have "no holes in her armor." A. R. MURRAY.

Marietta, Ga., July 24, 1895.

The Photographic Decoration of Glass and Porcelain.

BY WILLIAM GAMBLE.

The decoration of glass and porcelain by photographic means is readily attainable by certain processes, but to secure vitrified photographic images involves difficult and somewhat intricate processes. Where it is simply desired to make transparencies on glass for window decoration, or pictures on opal for framing, the means are ready to hand, as prepared sensitive plates are obtainable commercially in various sizes, and, clear instructions being inclosed, no trouble should be experienced in getting results. Such plates will not, however, stand cleaning or washing, so that they soon either become dirty, and are damaged in attempts to clean them, or they fade and discolor. A more permanent and rather easy way of transferring a photographic image to porcelain or opal is to varnish the plate with copal, and then squeegee, face down upon it, a toned and fixed print on the usual sensitized albumenized paper while wet. It is allowed to dry for about four hours, and then the back of the paper is moistened with a damp sponge, when it can be peeled off, the albumen adhering to the varnish. This should then receive a protecting coat of varnish.

Another method is the carbon process. Carbon tissue, a paper coated with gelatine mixed with pigments of various colors, may be purchased ready sensitized. It is exposed under a negative soaked in cold water, and then squeegeed to the glass, or opal, or porcelain support, which should previously have been coated with a thin sizing of gelatine (1 ounce in 18 ounces of water, with 20 grains of bichromate of potassium dissolved in 2 ounces of water added). The plates, after being coated with this mixture, are allowed to dry in the sun or in a strong light. Development is effected with warm water, the gelatine washing away in proportion to the action of the light, that unacted upon being completely washed out. When dry a very perfect picture is left, and it is permanent so far as the fading action of light is concerned, but still susceptible to damage through moisture.

A very hard waterproof enamel picture can be made on glass, porcelain, or opal by the following process, which has the advantage of not requiring any special appliances. Two ounces of the best gum arabic are dissolved in 10 ounces of water. Ten grains of chromic acid dissolved in a little water are added, and finally 1 ounce of a saturated solution of bichromate of ammonium. When the ingredients are fully dissolved and mixed, stir in as much finely powdered asphaltum as will give the solution a good body. It must be of such thickness that, when flowed on a plate, the grain appears homogeneous, and not in minute particles. The plate should preferably be coated with a whirler. If heat is used in drying, care should be taken not to make the plate hot, or the film will refuse to develop. Exposure is made under a negative as usual, and the printing will be fairly rapid. Development is effected by gently laving with water. Slightly warm water can be used if the development does not easily progress. When the image is clear in all details, the plate should be dried, and then placed in an ordinary oven on a bed of sand or plaster of Paris. Heat is gradually applied until the proper tint is reached. The resinous powder known as "dragon's blood" could probably be equally well incorporated with the gum solution so as to give a red picture.

Another simple way of forming a kind of enamel picture is to prepare a photo-lithographic transfer rather "full" of ink. The ready coated paper for transfers may be purchased, and is sensitized on a bath of bichromate of potassium, 1 in 20. When dried, this paper is exposed under a negative or positive in line or in half-tone stipple. The next stage is to black the film all over with a thin coat of photo-transfer ink, applied with a velvet or composition roller. On immersing the print in water, and rubbing gently with a sponge, the superfluous ink will wash away. When quite clean the paper is allowed to dry, and is then transferred in the usual lithographic manner by pressure. If the picture is not too large, it may be transferred to porcelain by damping the transfer until slightly tacky, then attaching it to the object which is to receive the image, laying on top a piece of thin card and rubbing the back strongly with a burnisher, taking care that the transfer paper does not slip. Such a transfer having been secured, it should be dusted with resin, and slightly heated to make the resin tacky. Any finely powdered, vitrifiable color mixed with a little flux can then be burshed on with a soft camel's hair brush, and will adhere to the lines. The plate is then placed in a muffle furnace until the color is fused. A porcelain glaze is afterward applied, to protect the image and give increased luster.

The production of purely photographic enamels is a more complicated process than any of the foregoing. One method involves the production of a collodion positive, which is transferred to the plaque or other surface, and then fired in a muffle furnace. The result of the firing is to destroy the collodion film and leave the metallic silver image. To secure richness, the image, while on its collodion support, is toned with chlorides of iridium and gold. After firing, the picture is flowed with a porcelain glaze several times, until the desired brilliancy is obtained. Such a process requires an intimate photographic knowledge, and especially of that now neglected branch, the collodion processes.

For the worker who is not so advanced the following process would promise better. A solution is made up as follows:

Gum arabic	7 drachms
Grape sugar (glucose)	3 drachms
Bichromate of potash	5 drachms
Water	10 drachms

This solution is filtered and used as soon as possible, as it will not keep more than three days. The plaque, which must necessarily be flat, is flowed with clean water, and the solution poured on so as to drive the water before it. The drying requires considerable heat, such as applied by an oven. With regard to the printing, it must be borne in mind that a positive gives a positive and a negative a negative image. The tablet, when thoroughly dry and while still hot, is placed in contact with the positive, which must also be warmed. The printing is exceedingly rapid: in the most brilliant sunshine less than a quarter of a minute. As soon as the tablet is removed from the frame it begins to absorb moisture from the air. It thereby acquires tackiness, so that when powder of any kind is brushed on, the powder adheres in proportion to the action of the light; that is to say, most powder adheres to the shadows and least to the high lights. The powder is kept in motion till the image is fully charged, which should be in about one minute. If the film has become too tacky by development being delayed, the picture will be smudgy. When the image has been fully developed the superfluous powder is dusted away and the film coated with plain collodion. When this is well set, the tablet is placed in water to allow the gum and bichromate to dissolve out. The film is then dried, and, assuming that the powder employed is of a vitrifiable nature, the tablet is placed in a muffle and heat applied until the fusing point is reached. A porcelain glaze is afterward applied.—The Technical World.

A Furnace Wanted to Burn Molasses.

The New Orleans Times-Democrat says there are 25,000,000 gallons of molasses stored in tanks on the various sugar plantations throughout the State that is an elephant on the sugar planters' hands. They do not know what to do with it. They cannot sell it, for any profit in sight would be eaten up in transportation. Besides, it would require a cool half million dollars to barrel it, and putting this sum and the freight charges together, when the present price of molasses is taken into consideration, the shipper would find that he would be out of pocket after his labor was concluded.

The question of what disposition to make of this molasses is a knotty one to the sugar planters, and at the last two meetings of their association no other subject has been discussed. The planters say that it is a problem that has to be solved, for before the next crop is taken off this surplus molasses has to be got rid of in order to make room for the new crop. Heretofore the stuff has been dumped into the river or swamps. In the latter method it has been found that the molasses sours and makes life disagreeable to those living five miles away, while in dumping it into the river or streams, people living on the banks complain of it as a nuisance.

It is being fed to stock, but from statistics there is not enough stock by one-third on the various plantations to consume it. Suggestions have been made to distill it into alcohol, but the planters find that it would require such an outlay of money to erect a distillery to distill fine alcohol so as to compete with the world's markets that it would not pay. It has also been suggested that as molasses is excellent stock food, that it be shipped to central distributing points where stock is raised in large numbers—Texas, for instance—by means of tank cars. This suggestion has met with favor, and some day the experiment may be tried.

The only solution, however, in sight seems to be the discovery of some way in which the molasses can be burned as fuel. When this problem is solved, the planters believe that molasses will then be valuable. Experiments have been tried in burning molasses as fuel, and they have been successful, but it has been on such a small scale that it will not pay in its present crude form. What the planters want is an invention which will successfully allow molasses to enter the furnace in such a manner that it will burn rapidly, will not gum the carrier, and, in fact, do its duty without injuring the furnace in any respect. There is a fortune in sight for the man who works out this invention. A system of spraying the molasses on the bagasse as it goes along with the carrier to the furnace is, from all accounts, the only system that will suffice.

At a recent meeting of the Sugar Planters' Association W. O. Coleman, a practical engineer, made a suggestion as to one good use molasses could be put to. He said that while in Texas, at a point near Houston, he built a number of furnaces. In one he experimented with different stuffs furnaces are made of. He tried asbestos, fire clay, and a solution consisting of common red clay, molasses, and salt water. After a time he found both the asbestos and the fire clay peeling off from the intense heat, but the clay mixed with molasses was as intact as the day it was first plastered in. In making this solution he used one-half gallon of molasses to one bushel of clay, with salt water sufficient to soften to the proper degree.

Molasses Pavements.

Perhaps the oddest pavement ever laid is one just completed at Chino, Cal. It is made mostly of molasses, and if it proves all of the success claimed for it, it may point a way for the sugar planters of the South to profitably dispose of the millions of gallons of useless molasses which they are said to have on hand. The head chemist of a sugar factory at Chino, Mr. E. Turke, was led to make certain experiments, of which the new sidewalk, a thousand feet long, from the factory to the main street, is the result. The molasses used is a refuse product, hitherto believed to be of no value. It is simply mixed with a certain kind of sand to about the consistency of asphalt and laid like an asphalt pavement. The composition dries quickly and becomes quite hard, and remains so. The peculiar point of it is that the sun only makes it drier and harder, instead of softening it, as might be expected. A block of the composition, two feet long, a foot wide, and one inch think, was submitted to severe tests and stood them well. Laid with an inch or so of its edges resting on supports, it withstood repeated blows of a machine hammer without showing any effects of cracking or bending.

[FROM SCIENCE GOSSIP.]

NOTE ON MELICERTA RINGENS.

BY W. H. DALLINGER, LL.D., F.R.S., F.R.M.S., ETC.

This small and beautiful denizen of our ponds has become so familiar an object to the amateur, and has so long commanded the interest and close observation of the student, that it may fairly be supposed nothing short of prolonged and systematic study could tell us more concerning it than from so many contributors is now known. Apart from the beautiful results obtained by the insight and patient researches of Gosse ([1]) confirmed and enriched by scores of subsequent observers, it may be doubted if anything more thorough could be done than that by Mr. Charles Cubitt ([2]) and Judge Bedwell ([3]), on the characteristic and really wonderful features of this rotifer, all of which has been carefully considered and analyzed by the chief authority on this subject, Dr. C. T. Hudson ([4]).

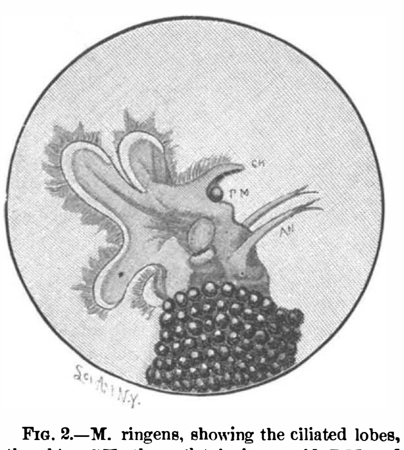


FIG. 2.—M. ringens, showing the ciliated lobes, the chin, CH, the pellet in its mould, PM, and antennæ, AN. Copied by Dr. Dallinger from figure by Dr. Hudson.

Nor is there any claim in this note for the addition of any fact to our previous knowledge; it is simply a demonstration of the manner in which a detail familiarly known to be constantly carried out is accomplished.

No greater perplexity presented itself to the earlier microscopists in the study of this and similar forms than the extreme limits of space involved in the use of objectives of considerable magnifying power.

For many years the habits and activities of Melicerta ringens have afforded me the keenest pleasure and interest, and to many of these I have applied with admirable results the advantageous properties of the apochromatic system; and there is one point in which it has yielded an interesting result.

In the summers of 1893 and 1894 I was fortunate enough to come upon an exceedingly abundant supply of these organisms, and they were not only very plentiful, but extremely vigorous; moreover, many of them were evidently of greater age than those I had usually seen. This was manifest in the great comparative length of some of their tubes, and the remarkably graduated sizes the pellets presented from the base to the top edge; also in the confluence or "weathering" of these in the lower and middle rings, and in the numerous growths of algæ, diatoms, conferva, and other things upon the tubes.

An average one drawn from life is shown in Fig. 1. The intense and rapid action of the cilia arrested even an eye familiar with the object; and the lobes assumed a great variety of soft and beautiful curves, not unusual but never so frequently seen before. A very common one of these is shown in the illustration.

It is not too much to assume that the readers of this journal are familiar with all the actions of this beautiful rotifer as a brick maker and a tube builder. It is familiar to all that by the cilia about the edge and upon the bosom of her petal-like lobes she obtains a vertical stream of particles which are with wonderful delicacy separated into material serving for food and material serving for the manufacture of the pellets, which are afterward used as "bricks" to build her tube in a succession of rings. We may perhaps be pardoned none the less for borrowing a figure from Dr. Hudson (Fig. 2) which shows the ciliated lobes, the "chin" (CH), the pellet in its mould or cup (PM), and the antennæ (AN).

Mr. P. H. Gosse says: "Below the larger petals (that is, on the ventral side) there is a projecting angular chin (CH, Fig. 2) which is ciliated; and immediately below this is the little cup-like organ, . . . a small hemispherical cavity. . . . On my mixing carmine with the water the course of the ciliary current was readily traced, and formed a fine spectacle. The particles are hurled round the margin of the disk until they pass off in front through a great sinus between the larger petals. . . . If the atoms be few, we see them swiftly glide along the facial surface, following the irregularities of outline with beautiful precision, dash round the projecting chin (CH, Fig. 2) like a fleet of boats doubling a bold headland, and lodge themselves one after another in the little cup-shaped receptacle beneath (PM, Fig. 2). . . . The contents of the cup are whirled round with great rapidity" ([5]), and become the bricks or pellets with which the tube is built. Now the fact that these pellets or "bricks" were deposited in rings, constituting the familiar tube, is a mere commonplace of the natural history of minute life. In his first and most original paper, Mr. Gosse, having seen the brick produced, says: "I now watched the animal with eager expectation, and presently had the satisfaction of seeing it bend forward its head, as I had expected, and after a second or two raise it again, when I saw that the little cup had lost its contents. . . . This process I saw repeated many times in succession, until a goodly array of pellets were laid, . . . but very irregularly" ([6]).

Again, in regard to a young melicertan, "A pellet was quickly formed and instantly deposited at the foot; the same operation was repeated with energy and industry, so that in a few minutes a row of pellets were seen forming a portion of a circle around its foot base" ([7]).

Again, the pellet having been formed, "Suddenly now we see the animal bend itself forward, till the cup is brought into contact with the upper edge of the case, it remains so bent for an instant, and then as quickly resumes its upright position. The cup, however, is now empty; for the consolidated pellet . . . has been left on the edge of the case" ([8]).

In the same way that most careful and acute observer, Judge Bedwell, tells us in regard to the deposit of the "brick," that "it does it so quickly, that before you have got over the agitation and surprise which its unexpected and rapid change of position causes you, the act, like a conjuring trick, is over, and the animal is in its old position again, with an empty pellet organ hard at work at a new brick" ([9]).

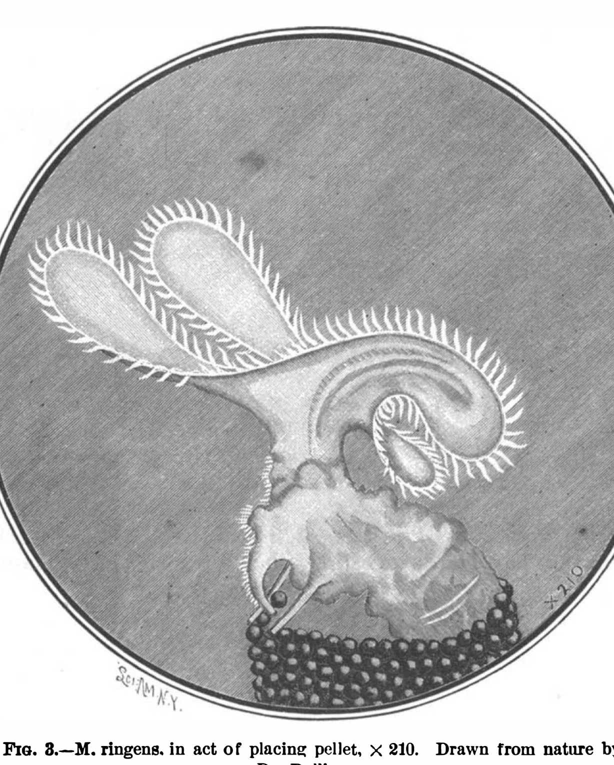


FIG. 3.—M. ringens. in act of placing pellet, × 210. Drawn from nature by Dr. Dallinger.

It will of course be clear, and is fully known to every observer, that it must be a matter of difficulty to see distinctly what are the details of this bricklaying, effected, as it is, so rapidly. The prime elements of success are sharpness of definition, with sufficient magnification, and ample room for the activities of the rotifer.

With plenty of vigorous specimens in full activity, and by happy incidence, one well placed and building, taking a 24·0 mm. objective, we may commence with the initial magnification of the lens (10·5 times), and we may go on to 250 or more diameters without change of focus or disturbance of the object; and by patience and repeated observation, we may at last observe all the simple details of the placing of the brick.

Judge Bedwell made the observation that a small pimple-like protuberance armed with setæ and lying between two hooks, on the opposite side of the cup in which the brick is made, possibly determines the place in which the brick is to be deposited; for "when the pellet is ready the animal turns round and deposits it at the spot with which this pimple . . . was in contact at the moment before the animal began to turn" ([10]).

This is undoubtedly true; in the cases observed by him it may have been always true, but in the many observations made through two summers I found that it was never so with the first brick of a new ring, but with the exception of three instances was always the case with every other pellet of the ring. What happened is shown in Fig. 3. The brick was ready, being always formed in from three to four minutes, then the rotifer twisted swiftly round about half the circumference of her tube, pressed the side of her body against the side of the tube she had just turned herself from, arched her body over, laid her antennæ parallel with each other and near enough to each other to form a sort of double rail or frame, down which the pellet could roll or slide, and guiding it to the exact spot to which it was destined to go. Then with the end of her "chin" she pressed it into position, much as, with a finger, we may press an electric knob, and then instantly rose, mostly turned rapidly to its former position, and again proceeded to the construction of another pellet.

When we remember that the dot of an "i" in this type will probably more than represent the superficial area occupied by the organism, all these refinements of operation must surely awake interest in the mind, and cause the least thoughtful to perceive that size is merely a finite mental concept and in no way affects the perfection of the adaptations with which a living organism is endowed.

REFERENCES TO WORKS QUOTED IN THIS ARTICLE.

([1]) Trans. Micros. Soc., vol. iii, 1852, p. 58; Quart. Journ. Micros. Soc., vol. i, 1853, p. 71; Pop. Sci. Rev., vol. i, 1862, p. 474. ([2]) Month. Micro. Journ., vol. iii, pp. 240-1; ibid., vol. v, 1871, p. 205; ibid., vol. viii, 1872, p. 8. ([3]) Month. Micro. Journ., vol. xviii, 1877, p. 214; J. R. M. Soc., vol. i, p. 245. ([4]) J. R. M. Soc., vol. ii, 1879, p. 6; "The Rotifer," by C. T. Hudson and P. H. Gosse, two vols., 1886. ([5]) Tenby, pp. 314-315. ([6]) Trans. Micro. Soc., vol. iii, 1852, p. 62. ([7]) Quart. Journ. Micros. Sci., vol. i, 1853, p. 75. ([8]) Popular Sci. Rev., vol. i, 1862, p. 485. ([9]) Month. Micros. Journ., vol. xviii, 1877, p. 221. ([10]) Month. Micros. Journ., vol. xviii, 1877, p. 221.

The Vesicating Constituent of Croton Oil.

In a communication made to the Royal Society, Mr. Wyndham R. Dunstan, M.A., F.R.S., and Miss L. E. Boole, Lecturer on Chemistry in the London School of Medicine for Women, record the results of an experimental inquiry into the nature of the vesicating constituent of croton oil. According to the research of Buchheim, and more recently of Kobert and Hirscheydt, the vesicating action of croton oil is due to an acid closely allied to oleic acid, which has been given the name of crotonoleic acid, and which is now prepared for medical purposes on a large scale in Germany. The process consists, broadly, in the formation first of barium crotonoleate, and the subsequent decomposition of this with dilute sulphuric acid, and extraction of the liberated crotonoleic acid as a viscid oil with ether. By a process of fractional precipitation, using lead salts, the above investigators were able to separate from this so-called crotonoleic acid a large proportion of inactive oily acids, till at last they were successful in obtaining, by a series of operations in which alcoholic extraction and separation by means of lead oxide were made use of, a resinous substance having extraordinary power as a vesicant. The composition of this resin is expressed by the empirical formula $C_{13}H_{18}O_4$. All attempts to crystallize or to obtain crystalline derivatives failed. It is a hard, pale yellow, brittle resin, nearly insoluble in water, light petroleum, and benzene, but readily dissolved in alcohol, ether, and chloroform. In regard to its constitution it is concluded that the vesicating constituent of croton oil is a lactone or an anhydride of complicated structure.

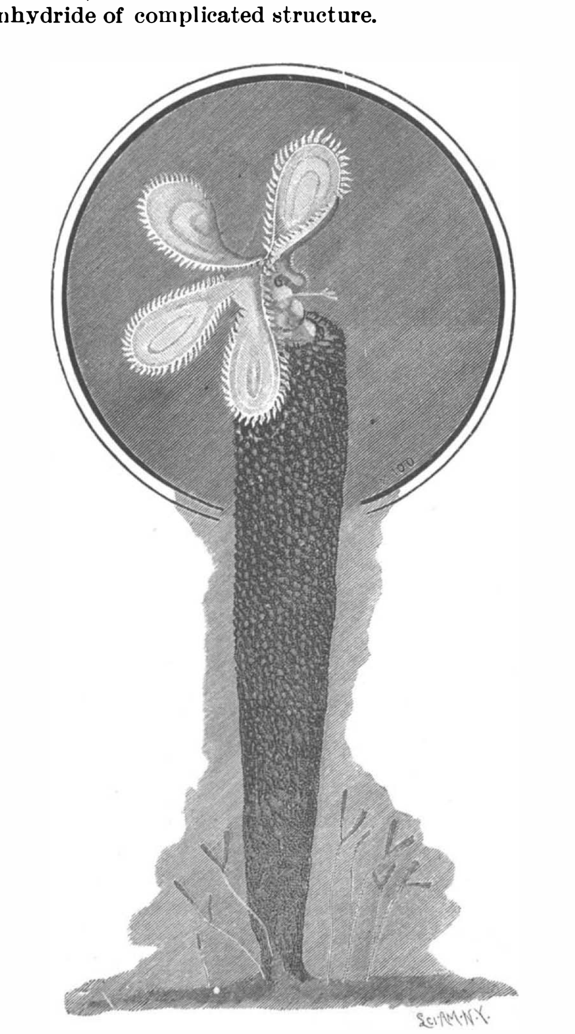


FIG. 1.—Melicerta ringens, × 100. Drawn from nature by Dr. Dallinger.

Photographing the Heavenly Bodies by an Ordinary Camera.

We first of all desire to disabuse the mind of the average photographer that, in order to practice celestial photography, one must necessarily be possessed of very costly instruments, such as elaborate and large astronomical telescopes, and equally elaborate equatorial stands, with clockwork for driving the same, which are undoubtedly necessary in the observatory in which it is desirable to get out of the heavens all that they contain. But our desire is at present to point out how a vast amount of real pleasure is to be obtained by practicing celestial photography with such a camera, lens, and stand as all photographers are supposed to possess.

The dimensions of camera in which we have found the balance of advantages to reside is that for 5 by 4 plates, the lens used in conjunction with it being a portrait one, which works with great rapidity of action, covering the above named plate without any diaphragm. When we state it to be the well known No. 2B of Dallmeyer, our readers will at once realize that its aperture is two and three-quarters inches and its intensity great.

From our experiments on the moon with this lens, we find the concentration of light so great as to permit of an instantaneous exposure being given. As every one knows, the moon sails across the heavens with an apparent quick motion, a motion that will be more readily appreciated if it be examined by a telescope fixed on a stand. With a lens such as that just mentioned, and on a clear night, an exposure of such short duration may be given as to enable a well exposed negative to be secured—one which, when examined under a compound microscope, shall show, in a well marked manner, all the salient features of our satellite. This cannot be obtained if the exposure be prolonged, in consequence of the lunar motion, owing to which any departure from instantaneity will give an elliptical instead of a circular shape.

It need scarcely be remarked that by employing a lens of longer focus than the one mentioned a larger image will be obtained; but, unless the angular aperture of the objective be equal to the shorter one, this will be at the expense of rapidity, unless, of course, the camera be mounted on an equatorial stand, when the exposure may be prolonged to any necessary extent.

We have spoken of a high class equatorial stand as being expensive. So it is for observatory work, but for ordinary photography it need not be so. It is quite possible to construct one of a somewhat rude appearance for a few shillings, but which will be capable of doing good work. We will describe one of this class, which we had made some time since.

The legs are hinged to a very strong table, on which are two spirit levels standing at right angles to each other. Raised up at a slope from the table is a strong tube, which is fixed very securely. The angle at which it is raised must be equal to the latitude of the place where operations are to be performed. This can easily be ascertained from any good map, in which the lines of latitudes will be found given at the right and left sides. For example: At Kirkwall it would be found to be 58° 59'; at Edinburgh, 39° 56'; at London, 50° 31', and so on. The tube, when thus erected, forms the polar axis, for it must always point to the pole star, and it must be supported in a steady position by a strong strut. We may here note that the pole star is not absolutely stationary in the north, but it is quite near enough to serve our present purpose.

A rod, which carries the table for the camera, is fitted to pass smoothly into the upright tube spoken of, so as to allow the camera to revolve. The table on which the camera sits, and to which it is attached by a thumbscrew, is folded, and is hinged at the front, so as to be capable of being directed up or down and pointed to any object in the heavens. When this is done, a pinching screw secures the hinged part, to which the camera is attached, at the angle found necessary.

No other adjustment is needed for that particular object, which may be the moon, a constellation, or planet. By rotating the camera slowly on its axis, a celestial body may be kept motionless on the sensitive plate for a protracted period. When the lower end of the polar axis terminates in a fine point fitting into a socket, and friction is thus diminished, it is surprising with what ease a heavy camera is made to revolve even by such a flimsy motor as one of those round lever clocks which are sold everywhere at two to three shillings.

To give the proper motion to the camera is a matter of the utmost importance. One way in which we had an equatorial camera stand made, and by which the camera could be made to rotate by hand with a wonderful degree of exactness for a brief period, was by having attached to, and projecting from, its side a segment of a finely toothed wheel, into which geared an "endless screw" terminating in a handle, one revolution of which caused the segment of the wheel to revolve to the extent of one tooth, the camera being, of course, carried forward in a corresponding degree. It is important that a powerful little telescope be mounted on the same stand as the camera. In the eyepiece of this must be fixed cross hairs, and the eye and hand of the operator must be so tutored that, when the image of, say, the moon is seen on the cross hairs, it must be kept in exactly the same spot by the rotating of the handle of the endless screw referred to.

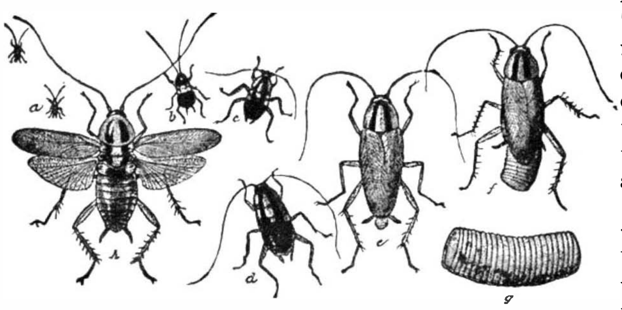
A very pretty negative of a constellation, suitable for employing as a lantern slide, may be taken instantaneously by the portrait lens already alluded to, or one possessing similar characteristics. In this case a stand, although convenient, is not an absolute necessity. The first thing one will notice is that, whereas with an instantaneous exposure the principal stars of a constellation will only appear in the negative, yet, if the exposure be prolonged, the number of those photographed will be increased; while, by prolonging the exposure still more, stars so remote and weak as to be incapable of being seen by the eye at all will be visible in the photograph. This, as we have formerly pointed out, is the principle underlying the new astronomy.

When the subject is wanted to be magnified to a considerable extent, a tele-photo lens will be found to be an improvement upon the ordinary photographic lens.—Br. Jour.

CROTON BUGS INJURIOUS TO OFFICE PAPERS.

ANSWER BY PROF. C. V. RILEY.

The somewhat mutilated and compressed specimens sent for identification by Mr. H. C. Stoddard, of Villisca, Iowa, are recently hatched specimens of the well known Croton bug (Ectobia germanica). It is not at all surprising that he did not recognize them, as at this stage they look sufficiently unlike the adult bugs, being of a pale color, with the thighs of the legs more swollen relatively. This is one of the cockroaches which is most frequently found in offices, libraries, etc., where it is well known to do very considerable damage. It is a European species, and derives its common name in this country from the fact that



The Croton Bug, or German Cockroach (Phyllodromia germanica); a, first stage; b, second stage; c, third stage; d, fourth stage; e, adult; f, adult female with egg case; g, egg case, enlarged; h, adult with wings spread. All natural size, except g. (After Riley.)

it first made its appearance in numbers about the time of the completion of the Croton system of water works in New York City. The insect is fond of moist places, and is often carried by pressure through water pipes without injury. It is very prolific, and, owing to its small size, can hide and breed in drawers and in cracks and crevices where the larger American cockroaches are rarely found. At maturity its color, while varying somewhat, is of a rather light brown, with two darker longitudinal stripes on the thorax. Like other cockroaches, it is nearly omnivorous, but prefers animal to vegetable matter.

In the city of Washington and further south, the croton bug eats everything that contains paste and is particularly injurious to books which are bound in cloth, on account of the large amount of paste used in making the cloth covers. But wall paper, photographs, and all sorts of stationery material suffers from its injuries. I have given an account (Insect Life, Vol. I, p. 67) of the severe injury done to important files in the Treasury Department and in the United States Coast and Geodetic Survey, where the insects had become an intolerable nuisance by eating off the surface and particularly the red and blue paint from drawings of important maps. From this article I quote the following as to remedies:

"Without condemning other useful measures or remedies like borax, I would repeat here what I have already urged in these columns, viz., that in the free and persistent use of California buhach, or some other fresh and reliable brand of Pyrethrum or Persian insect powder, we have the most satisfactory means of dealing with this and the other roaches mentioned.

"Just before nightfall go into the infested rooms and puff it into all crevices, under baseboards, into the drawers and cracks of old furniture—in fact, wherever there is a crack—and in the morning the floor will be covered with dead and dying or demoralized and paralyzed roaches, which may be easily swept up or otherwise collected and burned. With cleanliness and persistency in these methods, the pest may be substantially driven out of a house, and should never be allowed to get full possession by immigrants from without.

"For no other insect have so many quack remedies been urged and are so many newspaper remedies published. Many of them have their good points, but the majority are worthless. In fact, rather than put faith in half of those which have been published, it were better to rely on the recipe which T. A. Janvier gives in his charming article on 'Mexican Superstitions and Folk-lore,' published in a recent number of Scribner's Magazine, March, 1889, Vol. V, No. 3, p. 350), as current among the Mexicans:

"To Get Rid of Cockroaches.—Catch three and put them in a bottle, and so carry them to where two roads cross. Here hold the bottle upside down, and as they fall out repeat aloud three credos. Then all the cockroaches in the house from which these three came will go away!"

Cells.

The spectacle of energy and vigorous growth which the garden and field afford at the present time should fill every thoughtful mind with reverent wonder. Man, when he projects some complicated building filled with apparatus and conveniences for varied purposes, plans it all out with skillful care, and then by the aid of innumerable workmen, all skilled in their various departments, fashions and shapes the needful materials, and by building the fabric up piece by piece, finally triumphs in his completed work. If, however, he wants to duplicate or enlarge it, precisely the same process has to be gone through again, and the first work only aids him as a pattern.

In Nature, however, we find the most complicated fabrics apparently making themselves; and having one of these in our possession, we may, as it were, pull a brick out of the factory wall, stick it in the middle of a suitable site, and lo! it will begin splitting itself up and spreading around until we begin to see the plan of another factory developing; everything be adjusted to a nicety as the performance goes on, until finally all is complete and in full working order. Can anything be more marvelous than this? and yet it is going on all the time, and if any reader fails to grasp the fact, let him get a mirror and see such a factory in himself. These wonderful bricks are the cells; and of course in man himself the marvel is the greater that some of the cells which contribute to build him up, i. e., his brain cells, are the fathers of the inorganic fabrics which dot the world with cities and towns, and seam it all over with the beneficent mycelium of rail and road which at once engenders and fosters their extension.

In the vegetable kingdom this power of self-construction in the cell is easily studied in some of its lower forms by means of a microscope; some of the translucent water weeds especially display very clearly the delicate network of cells which constitute their comparatively simple structure. Valisneria spiralis does so to perfection, and the circulation of the sap from cell to cell is shown very clearly. A very simple object, showing not only how the cells multiply, but also in a small degree that inscrutable wonder of building to plan, is the prothallus of a fern, the little green scale produced by the spore. A periodical examination of one of these from the time it is a tiny dot up to that of the full-size scale, will show distinctly all the stages of self-shaping, and also the differentiation into root hairs, and the reproductive organs, which may be regarded as the machinery above alluded to. A few spores scattered on a piece of damp clay are easily handled and examined from time to time without detriment. From such a simple manifestation it becomes easier to carry the mind to the more complex cases where plants not merely build themselves up into stems, leaves, and charming flowers, but more marvelous yet, constitute themselves subtile chemical laboratories in addition, in which the deadliest poisons, beneficent medicines, or nutritious food and stimulants are all alike formed from the same soil constituents by Nature's own alchemy. The selfsame family, indeed, may embrace both extremes, the deadly nightshade and the tomato to wit, or, more wonderful yet, one and the same fruit, such as a peach, may yield a store of delicious food in its flesh, while hiding the deadliest of poisons, prussic acid itself, in the kernel. Truly, when we consider these things the spectacle of a plant in full growth is one of overwhelming interest, as active evidence of the creative power of which we know so little though we see so much.—The Gardeners' Magazine.

The Torpedo Fish.

At the last meeting of the Academy of Science, Professor D'Arsonval, of the College de France, read an interesting paper on a series of experiments which he made lately with the torpedo fish.

A fish 30 cent. in diameter he found could give out a shock of twenty volts. Professor D'Arsonval applied some small electric lamps to the fish and they were lit by the discharge from its body. In some instances the discharge was so powerful as to carbonize the lamps.

The electric current generated by the torpedo fish is sufficiently powerful to kill small fish coming in contact with it. The electric discharge can even go as high as 120 volts.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR FENDER.—Daniel F. Nial, Troy, N. Y. At the front of the car, beneath the dashboard, according to this improvement, is swung a hinged apron, covered with netting, the apron being adapted to swing inwardly and pass over any body in the path of the car, but the swinging of the apron pushes a bar which causes a fender scoop in front of the wheels to be instantly depressed by springs, the scoop being adapted to pick up a prostrate body and carry it until the car is stopped, the device being inexpensive and its operation entirely automatic.

CAR FENDER.—Saul Garlick, Brooklyn, N. Y. This fender is suspended from and slidingly mounted in hanger plates hung beneath the car, the plates oscillating up and down with the movement of the fender, so that the latter may be easily adjusted to project forward at the right angle to pick up an object with which it comes in contact. The fender has a net sufficiently springy to protect from injury one falling on it, and when not in use may be pushed back out of the way beneath the car.

SLACK ADJUSTER.—Alonzo Chubb, Jr., La Crosse, Wis. For automatically taking up the slack in the brake mechanism caused by wear of the brake shoes, connections, etc., this inventor provides a device for automatically controlling the travel of the piston in the brake cylinder, the device being controlled by pressure from the brake cylinder and auxiliary reservoir. There are two connected pistons of different area connected with a part of the brake rigging, the larger piston controlled by pressure from the brake cylinder and the other by pressure from the auxiliary reservoir.

CAR ARRESTER.—Paul Schuster, New York City. To prevent cars on side tracks from running into the main line when set in motion by wind or other cause, a block and an auxiliary movable inclined rail are arranged in connection with the side track adjacent to the switch, so that when the arrester is in operative position the moving car will strike the block with one wheel and another wheel will move up the rail, the car being derailed if its momentum is too great to be thus stopped. The device can be rapidly thrown from the inactive to the active position.

Electrical.

TELEPHONE TRANSMITTER.—Zorah E. Patrick, Chicago, Ill. A conical shell has its base fastened to the front of the case, according to this improvement, a body of variable resistance being fixed rigidly on the side wall of the shell and within the case, and an electrical circuit passing through the body of variable resistance. A flanged mouthpiece is secured in front of the shell by a ring and clamp screws. The cone is not a part of the circuit, and is not necessarily of metal, being used only to support the box of variable resistance to allow only certain mechanical vibrations to be imparted thereto.

TROLLEY STAND AND POLE.—Lawrence C. Seelye, Fort Edward, N. Y. This improvement embraces oppositely arranged spring-pressed toggle arms, springs being secured to the arms and to an adjacent support, a device actuated by the swinging of the arms disengaging the springs and a lock alternately fastening them. The construction is such that the pole is pressed vertically against the wire, but may be automatically dropped if the trolley leaves the wire. The trolley easily follows the curves of the wire, against which the trolley wheel is held with an even pressure.

Mining.

ORE CONCENTRATOR.—William H. Moore, Deadwood, South Dakota. A conveyor screw is, according to this improvement, mounted to rotate in the curved bottom of a rocking pan having side wings, each with transverse partitions, there being above the upper end of the pan a pivoted sieve, and means of imparting a sudden jerk or shake to the sieve as the pan is rocked. There is an oscillating clear water trough for alternately discharging jets of water on the side wings, and the frame of the concentrator extends over a flume connected with the stamp mill.

Mechanical.

HAMMER NAIL HOLDING ATTACHMENT.—Harry J. Lewis, Rusk, Texas. Workmen with but one hand can, with this improvement, fix the head of the nail to the hammer in such position that the nail may be conveniently started, preparatory to driving it home. A clamp around the handle near the hammer head has a longitudinal projection carrying arms on which are fulcrumed spring-pressed jaws having serrated ends, between which the nail may be readily placed with one hand, and held with sufficient firmness to facilitate starting it in the place where it is to be driven.

SECTIONAL NUT.—John E. Boegen, South Bay City, Mich. This nut comprises sections having opposite threaded jaws at one end and cam slots at the other end, opposite cams in the slots, one in each slot, normally bearing at opposite points in the slots, and the bearing points being aligned with the longitudinal axis of the nut. The cams are adapted when turned to bear on the cam surfaces in the slots at points diametrically opposite to the points at which they bear normally. Means are provided for rotating the cams, and the improvement is particularly applicable to vises, or may be used in connection with any screw-working oppositely arranged parts.

SCROLL FORMER.—Peter C. Forrester, Leavenworth, Kansas. This is a tool for forming scrolls in sheet metal or similar material, the shaping section of which is of a helical formation, the scrolls diminishing in width from the inner coil outward, and the inner and longest coil having a pocket to receive one end of the material to be shaped. The coils are spaced one from the other, forming an opening between the adjacent walls, and the tool is simple and inexpensive, while designed to quickly produce a scroll of any desired configuration.

TOOL FOR BINDING METAL STRIPS.—This is a further invention of the same inventor, of a tool especially adapted for use in Venetian iron work. It has two handles, one with ears forming a yoke, a removable support having a shaping surface and an extension engaging a slot in the bottom of the yoke, and a plunger having movement in the yoke to and from the shaping surface. The second handle, pivoted in the yoke, has a shank engaging the plunger. The tool cuts and forms clips and quickly binds them around the iron work, being adapted to enter grooves, curves, scrolls, or any place in ornamental iron work, to clamp the parts together by a clip.

Miscellaneous.

BICYCLE SADDLE.—Henry and Frederick Mesinger, New York City. The saddle bar, according to this invention, has at its front part a pin or screw and at its rear a cantle plate, while the rattan seat is composed of lengthwise and transverse strips, the lengthwise strips being secured at their rear ends to the cantle plate and their forward portions being looped around the screw or pin. This saddle may be cheaply manufactured, permits a good circulation of air, owing to the open network of the rear half of the seat, and is sufficiently elastic to afford a most comfortable seat.

CYCLOMETER.—Alexander D. Ruff, Owingsville, Ky. The hands and numbering wheels of this instrument are operated by a crank shaft connected by a rod with a lever fulcrumed at the front wheel, a clamp arm attached to the hub of the bicycle wheel carrying a friction roller engaging the lever. The device is simple and not liable to get out of order, and indicates the distances traveled in miles and fractions of miles in such way that the rider can at all times see how far he has gone.

OAR LOCK.—Jacob Peterson, Two Harbors, Minn. This is a device designed to facilitate the use of the oars for bow-facing rowing as well as rowing in the ordinary manner. Sockets receiving the oar are connected with toothed sectors in mesh, the sectors being pivoted in a horizontally swinging frame and the sector frame being pivoted on a vertically swinging base. By means of a locking device the sectors may be held rigidly connected and their frame released to swing on the base, or the frame may be locked to the rocking base and the sectors released to turn on their axes.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

SCIENTIFIC AMERICAN BUILDING EDITION.

AUGUST, 1895.—(No. 118.)

TABLE OF CONTENTS.

1. A Colonial house at Scranton, Pa. Perspective elevation and floor plans. Cost complete $4,500. E. G. W. Dietrich, architect, New York City. A simple yet pleasing design.
2. A cottage at Residence Park, New Rochelle, N. Y. Two perspective elevations and floor plans. Architect, Mr. G. K. Thompson, New York City. A unique example for a cottage dwelling.
3. Perspective and floor plans of a Colonial cottage at South Orange, N. J. Built by H. E. Matthews, Orange, N. J. A neat design, with some novel features.
4. A Colonial house at Summit, N. J. Perspective elevation and floor plan. Architects, Messrs. Child & De Goll, New York City.
5. A cottage in the suburbs of Brooklyn, N. Y., erected at a cost of $7,500 complete. Perspective elevation and floor plans. Architects, Messrs. J. C. Cady & Co., New York City. An artistic design.
6. Two perspective elevations and floor plans of "Lover's Dell," a residence recently erected in New Jersey. A pleasing example for a modern Colonial dwelling. Architect, Oscar S. Teal, New York City.
7. A residence at Sea Side Park, Bridgeport, Conn. Two perspective elevations and floor plans. An exquisite design. Architect, Mr. W. R. Briggs, Bridgeport, Conn.
8. A residence in the Colonial style, recently erected at Chester Hill, Mt. Vernon, N. Y. Three perspective elevations and floor plans. A picturesque design. Lewis H. Lucas, architect, New York City.
9. Ground plan and perspective view of Holy Trinity Church, Harlem, N. Y. Architect, Mr. Wm. A. Potter, New York City.
10. A residence at Montclair, N. J., being an additional view to those of the same house published in the May issue.
11. Miscellaneous contents: Waterbury electric heat regulator, illustrated.—A sanitary bathtub, illustrated.—Finishing floors.—Pompeian bath room.—Seasoning of stone.—Improvement in warm air furnaces, illustrated. — An improved domestic water service system, illustrated.—An improved door check and spring, illustrated.—The wood of most uses.—The hollow handle glass cutter, illustrated.

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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.

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(6591) F. L. R. asks: Will more rain fall into a vessel when the wind is blowing it at an angle of 45 degrees or when it is falling vertically? A. There is little or no difference in the quantity of rain falling into the horizontal rim of a vessel from a slanting or from a vertical fall. The lines of descent of the rain drops are closer in a slanting fall in proportion to the angle of descent, and this closeness of the raindrop lines of descent corresponds with the decreased area of the vessel open to the rain falling in an inclined direction.

(6592) E. T. says: Will you please tell me, through the columns of your valuable paper, how many tons blow can be given with a 300 pound cast iron block or hammer dropping 6 feet? A. The static effect of a falling weight depends upon the distance at which the weight is arrested. If the weight or hammer strikes a hard and immovable body, the force is immense in comparison with the slow arrest of the hammer as in pile driving. In the case given, the force in foot pounds is 6×300=1,800 foot pounds. If the fall is arrested at the distance of a half foot after contact, the force of the blow is equal to 3,600 pounds; and if at 1-12 of a foot, it is 12 times 1,800 pounds or 21,600 pounds—over 10 tons.

(6593) F. A. H., Haverhill, Mass., is referred to our rule regarding the name and address of correspondents printed at the head of this column.

(6594) H. G. B. says: Will you kindly give me a formula for polishing shells to preserve the enamel and glisten? A. Porcelainous shells are so hard as to require the apparatus of a lapidary to cut or polish them, but they are generally so smooth as to require no rough grinding. They may be polished by using a felt wheel and applying putty powder. Nacreous shells or those of the pearl variety may be filled and cut without a great deal of difficulty. Pieces to be turned are first roughly shaped on the grindstone, then turned and polished with pumice stone, putting on the final polish with rottenstone. Irregularly shaped pieces are filed and ground, then smoothed with pumice stone and water, and finished with rottenstone. The rottenstone is sometimes mixed with sulphuric acid full strength, or slightly diluted, to heighten the polish.

(6595) E. H. B. asks how to make hektograph sheets. A. Soak 4 parts of best white glue in a mixture of 5 parts of water and 3 parts of solution of ammonia, until the glue is soft. Warm the mixture until the glue is dissolved and add 3 parts of granulated sugar and 8 parts of glycerine, stirring well and letting come to the boiling point. While hot, paint it upon white blotting paper with a broad copying brush, until the paper is thoroughly soaked and a thin coating remains on the surface. Allow it to dry for two or three days, and it is then ready for use. An aniline ink should be used for writing, and before transferring to the blotting paper, wet the latter with a damped sponge and allow it to stand one or two minutes. Then proceed to make copies in the ordinary way. If the sheets are laid aside for two days, the old writing sinks in and does not require to be washed off.

(6596) D. B. S. says: Can you give me the treatment for what is known as "cold sore"? A. Cold Sore, Herpes labialis, generally known as "breaking out," attacks the margins of the lips and most frequently accompanies a cold in the head. It is too well known to need description. Treatment: Oxide of zinc, 10 parts; oxide of bismuth, 20 parts; powdered starch, 20 parts; oxide of iron, 2 parts; silica, 20 parts; oxide of aluminum, 8 parts; oxide of magnesium, 10 parts; powdered chalk, 10 parts. The above should be mixed into a fine powder, and then be made into a paste with an equal quantity of glycerine; this should be gently rubbed into and spread over the parts nightly.

(6597) E. W. says: Can you inform me how to make lemon water ice? Half pint lemon juice, ½ pint water, 1 pint sirup, peels of 4 lemons rubbed on sugar (or the yellow rind pared or grated off, and the juice squeezed to it in a basin), let remain for an hour or two, strain, mix, and freeze; whip the whites of 3 eggs to a strong froth, with a little sugar, as for meringues; when the ice is beginning to set, work well in; freeze to required consistence; if to be served in glasses, the meringue may be added after it has been frozen.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

July 30, 1895,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Acid, apparatus for purifying nitric, W. Dieterle. 543,826
Alarm. See Burglar alarm.
Alkali cyanides, process of and apparatus for making, H. Y. Castner ... 543,643
Alloy, electrodeposition of, H. J. Altman ... 543,824
Back band hook, L. Stowe ... 543,514
Baling press, A. Roop et al ... 543,632
Basin, catch, G. F. Kuhns ... 543,740
Bath, R. Drury ... 543,469
Battery. See Voltaic battery.
Bearing for spring vehicles, body loop, W. F. Morton ... 543,698
Bearing, roller, H. A. Berger ... 543,718
Bearing, roller, R. A. Berger ... 543,719, 543,720
Bed, folding, J. H. Morrison ... 543,499
Bed pan, obstetric, J. W. Vaughn ... 543,516
Bedstead clothes supporting attachment, W. C. Guilford ... 543,576, 543,577
Bending roll, Sellers & Lewis ... 543,815
Bicycle, G. B. Thomas ... 543,515
Bicycle brake, J. Christensen ... 543,723, 543,724
Bicycle chain lock, H. G. Geistwite ... 543,547
Bicycle, safety, J. E. James ... 543,484
Blind fastening, L. W. Jordan ... 543,808
Blind slats, machine for cutting and trimming window, F. H. Van Houten ... 543,712
Block. See Building block.
Boiler cleaner, C. S. Garrigus ... 543,527
Boiler cleaner, F. L. Smith ... 543,541
Boiler furnace, E. Powell ... 543,631
Boiler furnace and tiles therefor, steam, J. L. Gill, Jr ... 543,528
Boiler furnace, steam, H. Korten ... 543,739
Bolster standard, T. H. Bennett ... 543,457
Bolt cutter, C. S. Hill ... 543,649
Bonbon dipping machine, L. Hirschfeld ... 543,733
Book, sales, J. C. Browning ... 543,669
Book stand or holder, G. W. Parker ... 543,810
Boring joists for electric light wiring, machine for, J. G. & R. H. Henderson ... 543,625
Bottle, R. B. Yerby ... 543,518
Boxes, mechanism for making match, J. P. Wright ... 543,714
Brake. See Bicycle brake. Car brake. Wagon brake.
Brake beam hanger, H. B. Robischung ... 543,703
Brake shoe, electric, W. B. Potter ... 543,653
Brakes and rheostats, device for automatically operating, J. P. B. Fiske ... 543,524
Building block, J. E. Meyenberg ... 543,582
Building set, E. Von Leistner ... 543,580
Burglar alarm, J. H. Finley ... 543,618
Burglar alarm, J. Given ... 543,548
Button, cuff, J. E. Hills ... 543,807
Buttonhole cutter, A. S. Vose ... 543,635
Cable traction, gripping mechanism for, R. W. Wallace ... 543,760
Can. See Oil can.
Cane, sling for unloading sugar, N. Ancoin ... 543,666
Car brake, A. Barker ... 543,716
Car brake, electric, G. B. Damon ... 543,544
Car brake, railway, R. T. F. Dodds ... 543,522
Car fender, T. Houghton ... 543,687
Car fender, G. H. Modemann ... 543,775
Car hot box indicator, railway, L. Lyndon ... 543,743
Car ventilator, automatic, G. H. Maynard ... 543,581
Carburetor, J. Clingman ... 543,611
Carriage jack and wrench, combined, W. A. Stowell ... 543,660, 543,661
Cash register and indicator, H. Cook ... 543,725
Casting metal, J. A. Potter ... 543,700
Chair. See Reclining chair.
Chair, A. P. Brown ... 543,640
Chair, W. G. Magee ... 543,744
Chimney cleaner, S. A. Wood ... 543,791
Churn, C. R. McGahey ... 543,537
Cigar bunchine machine, Hagen & Wieland ... 543,600
Clasp. See Garment supporter clasp.
Clipper, hair, F. Bangerter ... 543,668
Clock winding mechanism, electric, W. S. Scales ... 543,707
Clothes line connection, J. Cehfus ... 543,467
Coal shovel, M. L. Tate ... 543,710
Coatings for iron or steel, manufacture of preservative, Walters & Stone ... 543,636
Cock, R. M. Dixon ... 543,646
Coffee pot construction, W. Blankner ... 543,520
Coil, reactive, E. E. Stark ... 543,564
Conduits, manhole for underground, J. F. Cummings ... 543,613
Copyholder for record books, etc., P. P. Powell ... 543,781
Corn cutter, L. M. Weaver ... 543,517
Coupling. See Pipe coupling. Thill coupling.
Crane, overhead traveling, T. R. Morgan, Sr ... 543,557
Cross sill support and bracket clamp, G. Wenzelmann ... 543,663
Cuff, C. C. Copeland ... 513,671
Curtain stop, W. V. H. Willson ... 543,664
Curtain stretcher, lace, J. O. Chenoweth ... 543,644
Cutter. See Bolt cutter. Buttonhole cutter. Corn cutter. Rotary cutter. Rut cutter.
Cycle pedal, E. M. Graham ... 543,806
Die press, W. A. Turner ... 543,711
Digger. See Potato digger.
Disinfecting telephone apparatus, contrivance for, R. Lamarche ... 543,490
Display attachment, counter, I. Rosenberg ... 543,657
Diving apparatus, H. Schon ... 543,756
Door lock and latch, J. H. Preston ... 543,506
Dough cutting machine, J. J. Pfenninger ... 543,504
Drawing, sketching, and designing table, Laughlin & Hough ... 543,492
Dredger, L. W. Bates ... 543,637
Drill body clearing machine, twist, M. C. Johnson 543,486
Dry kiln furnace, W. Ketcham ... 543,531
Drying machine, W. Hartley, Jr ... 543,578
Duplicating apparatus stand, A. D. Klaber ... 543,830
Dust, shavings, etc., from air, apparatus for separating, A. W. Banister ... 543,796
Dye, black azo, Moeller & Oelschlaegel ... 543,747, 543,748
Dye, brown azo, Pathe & Israel ... 543,539
Dye, yellow, C. Schraube ... 543,784
Earthenware, process of and apparatus for glazing, W. A. Long ... 543,741
Easel and pencil case, combination desk, G. W. Platt ... 543,812
Eccentric, J. H. Baker et al ... 543,667
Effervescent compounds, preparing granular, T. Kerfoot ... 543,601
Egg tester, E. H. Layman ... 543,493
Electric motor and brake mechanism therefor, J. P. B. Fiske ... 543,525
Electric motor starting or stopping device, J. P. B. Fiske ... 543,523
Elevator, N. P. Otis ... 543,630
Elevator safety device, Burroughs & Otis ... 543,641, 543,642
Elevator safety device, T. M. Clark ... 543,569
Elevators, electrical controlling system for, C. O. Mailloux ... 543,495
Elevators, valve mechanism for hydraulic, C. L. Cookson ... 543,590
Engine. See Gas engine. Wind engine.
Engine lubricating apparatus, Chuse & Heep ... 543,645
Extension table, J. Zalikowski ... 543,794

DESIGNS.

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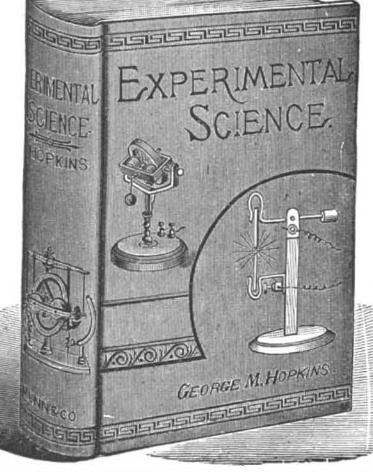

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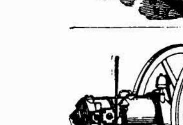

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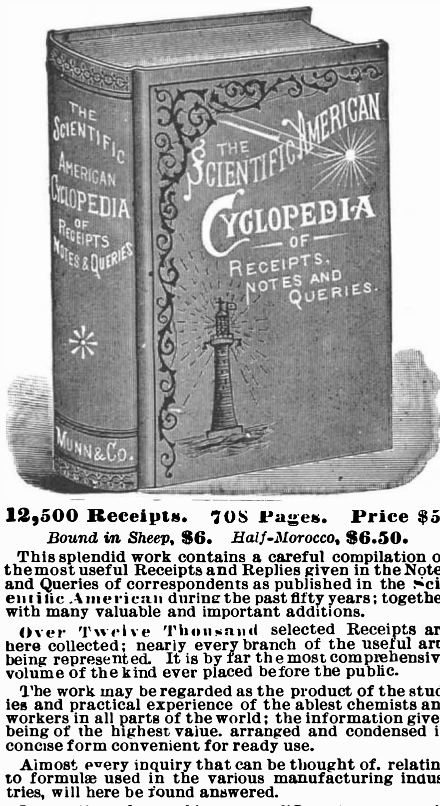

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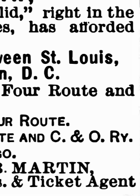

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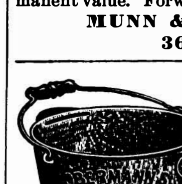

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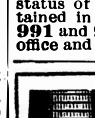

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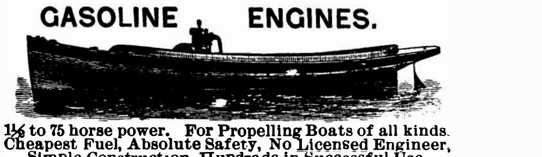

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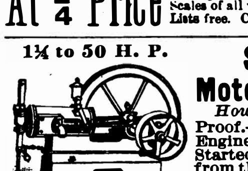

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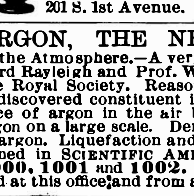

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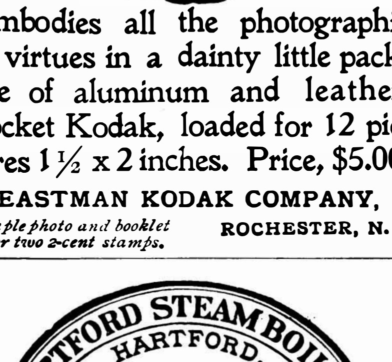

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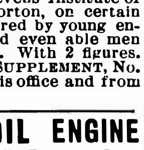

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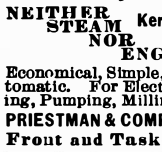

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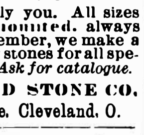

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