SCIENTIFIC AMERICAN

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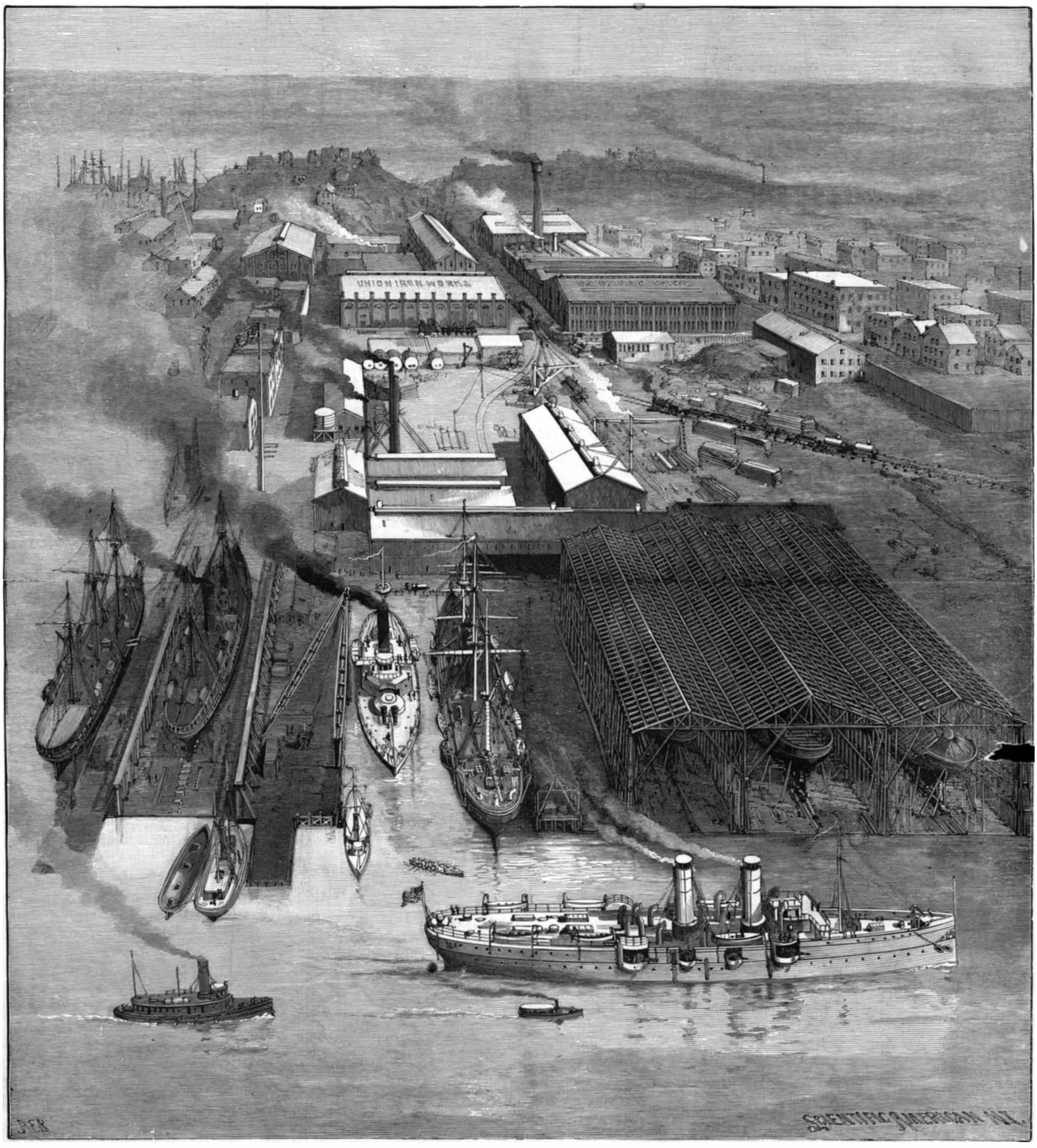
A GREAT PACIFIC COAST SHIPBUILDING PLANT.

The extensive iron and steel working establishment shown below, with its great facilities for the building of high-powered modern war ships, covers an area of twenty-three acres in South San Francisco and on San Francisco Bay, which is here about seven miles wide. The bay is about forty miles long and twelve miles wide in its widest portion, and is connected with the Pacific by a strait five miles long and one mile wide, which has gained the famous appellation of the Golden Gate, forming, as it does, a magnificent and easily defensible entrance to one of the noblest harbors in the world. The city of San Francisco lies partly on the strait and partly on the bay, and the latter is connected by a strait on the north with San Pablo Bay, at the head of which, about twenty miles distant from the city, is Mare Island, where there is a United States navy yard, with buildings, machinery, and improvements representing two-thirds the value of the Brooklyn yard.

The Union Iron Works had its small beginning in the first foundry, scarcely more than a blacksmith shop, started in San Francisco by Peter Donahue, in 1849. In 1865 the firm name was changed to Prescott, Scott & Co., and in 1885 the business was removed from the city proper to the larger site at present occupied in South San Francisco, the style being changed to the



SHOPS AND SHIP YARD OF THE UNION IRON WORKS, SAN FRANCISCO, CAL.

Union Iron Works, with G. W. Prescott, president; Henry T. Scott, vice-president and treasurer; and Irving M. Scott, general manager.

The full equipment of the works for the special purpose of building iron and steel ships, and armored war vessels of the greatest power, has been so recent that it is believed the plant in these respects is fully equal to that of any other establishment in the United States, and will compare favorably with any other in the world. The buildings, except the sheds, are all of brick, and cover an area of more than four acres, the covered works, including ship yard, slips and dry dock, embracing an area of nine acres. The fitting, erecting, boiler shops and foundry are all spanned by heavy traveling cranes, to lift from twenty to fifty tons each, and the equipment includes special machine tools in large variety, some of them weighing over 100 tons each. The works are underlaid throughout with a high pressure hydraulic system, employed in lifting, forging, riveting, shearing, etc., and an ample electric light plant supplements the abundant light and ventilation afforded by well planned construction. An interesting feature of the works is the great hydrulic dry dock and slip, having an area of 30,450 square feet. A working force of fifteen hundred hands is employed in the various departments.

The building of mining machinery was for a long time the principal business of the establishment, and in this specialty the Union Iron Works continues to hold a leading position. From these works have been sent out the principal proportion of the mining machinery for the great Comstock mines, and most of the other mines in Montana, Utah, Mexico, and all through the Pacific Coast and Territories, as well as in South America and other parts of the world where mining operations are carried on upon a large scale. The making of compound engines, stationary and marine, early formed a leading branch of the business, and it is one in which the company have, in late years, obtained a degree of excellence which places them, by general acknowledgment, among the prominent engine builders of the country.

But it is rather on account of the contracts undertaken by the Union Iron Works in the building up of our new navy that the establishment now occupies a position of so much general interest. Here were built and equipped the highly successful cruisers Charleston and San Francisco, and here also was built the monitor Monterey, now receiving her finishing touches, and being supplied with what are believed to be some of the most perfect of high-powered guns yet made anywhere. In addition to this work there is now on the ways one of the largest of the new battle ships, the Oregon, to have a displacement of 10,000 tons, and to cost, exclusive of armament, nearly four million dollars. She will carry four 13-inch breech-loading rifles, weighing sixty tons each, and protected by seventeen inches of armor, and will have seven tubes for the discharge of torpedoes. Work upon this vessel is now being energetically pushed forward, and the company will unquestionably be active competitors for any further work the government may have to offer upon the various war vessels yet to be built.

The Tinkering Crank.

There is a great deal of truth in what the *Manufacturers' Gazette* says about some men who never seem to be happy and contented unless they are tinkering. They are always watching for a chance to use a monkey wrench or hammer, and not only waste valuable time, but do more toward spoiling the machinery in their charge than years of constant wear will ever do. If a machine is out of order, or there is some part that needs tightening up or repairing, the tinkerer takes his monkey wrench and screwdriver and goes at it, regardless of where or what the trouble is. He spends an hour or two twisting and turning nuts and bolts, and when he gets tired of this amusement concludes that everything is all right and starts up the machine, only to find that he has not improved it any by tinkering. Then he goes at it again. Such men are not profitable workmen. The competent and experienced man never tinkers. If the machinery needs fixing he does not go about it in a haphazard manner, but looks it over carefully until he locates the trouble, and then does what is needed, without making a bad matter worse by acting upon the supposition that because one part is out of order the whole machine needs tinkering.

Brooklyn Institute of Arts and Sciences.

According to the report of the Brooklyn Institute of Arts and Sciences, the present membership numbers 3,869, showing an increase of 1,039 over the membership of 1891.

The membership is divided up as follows among the different departments:

Archeology, 115; architecture, 255; astronomy, 113; botany, 154; chemistry, 135; electricity, 215; engineering, 126; entomology, 50; fine arts, 361; geography, 137; geology, 140; mathematics, 47; microscopy, 133; mineralogy, 117; music, 114; painting, 80; philology, 442; pedagogy, 206; photography, 170; physics, 154; political science, 404; psychology, 144; zoology, 67.

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NEW YORK, SATURDAY, JULY 2, 1892.

Contents.

(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 861.

For the Week Ending July 2, 1892.

Price 10 cents. For sale by all newsdealers.

A NEW SCHOLARSHIP AT SIBLEY COLLEGE.

The Frederick William Padgham Free Scholarship in Mechanical Engineering has recently been established in Sibley College by Mr. Amos Padgham, of Syracuse, N. Y., in memory of his son, lately deceased. The young man was a graduate of the public schools of Syracuse, an apprentice with Professor John L. Sweet, and, later, a graduate of Sibley College and Cornell University. He was employed after his graduation by the C. W. Hunt Co., of New York City, and made for himself an excellent record. He died suddenly, of typhoid fever. He was an only son, and this beautiful monument is erected by his father in his memory as the best and most permanent, as well as the most useful, possible.

The provisions of the deed of gift are that it shall be open to competition, first, to scholars from the public schools of Syracuse; next, none such appearing, to any competitors from the State of New York. The superintendent of schools of Syracuse and the principal of the high school in that city are to be kept informed of the opportunity thus offered their scholars to enter upon a course of study in mechanical engineering in Sibley College.

This adds one more to the already long list of scholarships at Cornell. The State provides one at each annual examination in each assembly district. Five hundred and more young men and women are enjoying these opportunities, for which the State pays simply the interest on about a half million dollars which it holds as the proceeds of the sales of the land grant of the Morrill Act of 1862. More correctly, the State receives, through the generosity of the United States, and at no cost to itself, 512 scholarships in Cornell University. The university receives about $50 each for them, and pays out about $300, annually, to provide them. The State has, as yet, contributed nothing to this cause out of its own treasury. There are, besides the above, about fifty other scholarships granted by the members of the early boards of trustees, by President White, and by other private contributors. The State scholarships give free tuition, and the others pay to the successful competitor for them $200 a year, which suffices, usually, to pay all necessary costs at the university. There are, also, at Cornell, fifteen university fellowships, paying from $400 to $500 each. Those taking the higher grade of fellowship are often allowed to travel abroad for study. There would seem to be little reason for the son or the daughter of any citizen of the State of New York failing to secure an opportunity to obtain a good education, either liberal or technical, or both, at Cornell University, if really possessing talent and character. All the university scholarships and fellowships are named for their givers, or in accordance with their wishes, and thus constitute the most beautiful and durable of monuments to the men thus honored.

NITRIC ACID BACTERIA.

The development of bacterial study during the last few years has been very striking. The methods of attack supplied by the gelatine culture, divided plate and microscope brought the subject within the scope of ordinary laboratory manipulation, and took it to a certain extent out of the region of the recondite, which is so unfavorable to rapid study and early acquirement of results. The most extensive processes of decomposition and fermentation are now found to depend upon these exceedingly minute beings. Insignificant as they are in size, they derive their importance from their numbers, from their enormously rapid propagation—twenty minutes sometimes answering for the lifetime of a complete generation—and from their power of bringing about with certainty some of the most difficult of chemical combinations.

The production of ammonia or of nitric acid from the nitrogen of the air has long been a dream with inventors. Hitherto neither combination has been practically effected, and they have seemed almost impossibilities. It was found inexplicable in view of this fact that some plants seemed to derive nitrogen from the air, for it was not easy to see how their green foliage could effect the fixation of nitrogen.

This problem of the fixation of atmospheric nitrogen by plants has been a much-debated subject for many years. Here the bacteria have appeared in the beneficent role of nourishing and supporting plant life. It has been found that plants undoubtedly do absorb the nitrogen of the air, so that it enters into the combinations of their tissues, and this power is dependent on the presence of certain bacteria about their roots. If the soil is void of these colonies of low organisms, then no fixation of atmospheric nitrogen occurs. The presence of these microbes is indicated by swellings and tuberosities on the roots, which tuberosities are thickly colonized with the microbes, but these swellings are to be taken rather as a sign of health than of disease.

Again, for different plants it has been found that different organisms are essential, or at least that for each plant there is an especially beneficial form of microbe that supplies it more thoroughly with nitrogen than any other. The importance of these operations can-

not be overestimated. The nitrate beds of Chile, representing the accumulated wealth of geological ages, are being rapidly depleted to supply nitrogen to the crops of Europe. The distillation of coal in our gas works gives a small amount of ammonia as a by-product, which is saved and utilized also as a fertilizer. Slaughter house refuse and ground fish from which oil has been extracted are other sources of nitrogen which are used in fertilizers. To all this there must be an end, for it is all essentially destructive. But if we can cultivate microbes which will draw upon the exhaustless air for nitrogen, and will then feed plants therewith, the nitrogen problem of the future, one destined to be as serious as the coal problem will be, may eventually be disposed of.

While nitrogen in fertilizers is very often supplied in combination with hydrogen as some compound of ammoniacal type, the plant cannot absorb it until it has become oxidized into nitric acid. This process is termed nitrification. It has recently been found that nitrification is dependent on bacterial agency, and that to produce nitric acid from ammonia compounds two distinct bacteria are required. One performs the first and most difficult step, and combines the nitrogen with enough oxygen to form nitrous acid. The next microbe takes up the incomplete work and adds enough oxygen to the molecule of nitrou acid to form nitric acid. In this form it is quickly absorbed by the plant. The absorption is so rapid that only traces of it can be found in soil in which vegetation is growing.

The nitrification process is one of destruction as well as of building up. The ammonia type molecules are destroyed and in their place the nitric acid ones are built up. The offensive products of sewage, the products which nourish disease germs, and which with every probability we may recognize as the supporters of typhoid fever and other infections, are of the ammonia type. In the nitrifying organisms we have the agents for destroying the injurious products of sewage. If proper conditions are supplied, the army of microscopic beings will attack and destroy the disease germs, or at least their nutriment, and will transform the noxious sewage into a valuable fertilizing agent.

Some of the advanced processes of sewage treatment are based on these facts. The sewage is delivered over the surface of the land and allowed to percolate through it. If supplied in proper quantity, the nitrifying organisms are supplied with nutriment and dispose effectually of the sewage. The great point is believed to consist in a proper rate of supply of material. Too little sewage will starve the microbes, while too much must not be supplied for them to dispose of.

Potassium nitrate, or saltpeter, is made in nitrification beds. Animal refuse of all kinds is mixed with mortar and lime, and the heap is watered with liquid manure, and eventually the saltpeter formed is washed out of it, and is recovered by crystallization. The agents that produce the salt are the bacteria, whose part in settling the destinies of nations by making saltpeter may now be recognized. The great storehouse of nitrates, the South American nitrate beds, were probably produced in a similar way in the past, and wars are being fought, and sulphuric acid is being made, through the agency of the products of the work of the bacteria of the past.

The quick succession of generations, which are sometimes less than half an hour in duration, seems to offer the biologist a field for studying changes in life due to environment. But little has been done here. To a limited extent a change can be produced in the constitution of some microbes, but the degree of development is very small.

THE FORTY-FIRST ANNUAL MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The annual meeting of the A. A. A. S. for the present year will be held in the city of Rochester, N. Y. The University of Rochester will be the place of meeting, by the courtesy of the trustees of that institution. The meeting will begin on Tuesday, August 16, and daily sessions are recommended by the council for the 17th, 18th, 19th, 22d, and 23d of August, from 10 to 12 A. M. and 2 to 5 P. M. The meeting will be called to order by the retiring president, Prof. Albert B. Prescott, of Ann Arbor, Mich., who will introduce the president-elect, Prof. Joseph Le Conte, of Berkeley, Cal. The usual addresses of welcome, announcements of committees, etc., will be followed by organization of the sections under the vice-presidents as follows: Section A, astronomy and mathematics, J. R. Eastman; Section B, physics, B. F. Thomas; Section C, chemistry, Alfred Springer; Section D, mechanical science and engineering, John B. Johnson; Section E, geology and geography, H. S. Williams; Section F, biology, S. H. Gage; Section H, anthropology, W. H. Holmes; Section I, economic science and statistics, S. Dana Horton. Public addresses and excursions will be included in the programme, which is not yet fully formulated. Before the meeting, the American Microscopical Society will hold its annual meeting, August 9, 10, 11, and 12, under the presidency of Prof. M. E. Elwell, of Chicago, Ill., and the Geological Society of America, on August 15 and 16, will hold its annual meeting under the presidency of Mr. G. K. Gilbert, of Washington, D. C. On the two last named days the Society for the Promotion of Agricultural Science, under the presidency of Prof. I. P. Roberts, of Ithaca, N. Y., and the Association of Economic Entomologists, under the presidency of Dr. J. A. Lintner, of Albany, will hold their annual meetings. Further particulars may be obtained by addressing Secretary F. W. Putnam, Salem, Mass.

POSITION OF THE PLANETS IN JULY.

MARS

is morning star. He is by far the most important member of the solar family in July, for, at its close, he is within four days of the opposition so long anticipated. The reason why he comes so near the earth at the present opposition may be simply stated, and, as these conditions occur only at intervals of fifteen or seventeen years, great importance is attached to them. The earth is in aphelion on July 1, when she is 3,000,000 miles farther from the sun than she was when in perihelion on January 1. Her eccentricity, or the distance between these two points, is comparatively small, and is of little account, her orbit being almost a circle. Such is not the case with Mars, whose eccentricity is the largest of any planet in the system excepting Mercury. Mars is in perihelion on September 7, when he is 13,000,000 miles nearer the sun than when in aphelion. If the earth is nearly at her greatest distance from the sun and Mars is nearly at his least distance from the sun when an opposition occurs, the two planets must approach each other. This is the situation of affairs in the coming opposition when Mars, the earth, and the sun are in line, with the earth in the middle, Mars being about 35,000,000 miles from the earth. Although near at this time, it is possible for him to approach nearer, as he would if his opposition and perihelion were coincident. The opposition of 1877 took place nine days after perihelion, and was made illustrious by the discovery of two Martian moons. The opposition of 1892 will take place thirty-four days before perihelion, the conditions not being quite as favorable.

Our nearest outside celestial neighbor will, however, make a majestic appearance as he comes into view above the southeastern horizon on July evenings, marvelous in size, glowing with ruddy light, and brilliant in the martial colors that denote his imperial rank. Observers with the unaided eye cannot fail to be impressed with his unusual size and luster. The chief interest of the occasion will, however, center around the telescopic Mars, and the most powerful instruments in the world will be directed toward his ruddy face. Much will be expected from the Lick Observatory, although the astronomers there have failed thus far to see the double canals on the Martian disk, which have been perceptible to four European observers, Schiaparelli, Perrotin, Terby, and Stanley Williams. It must be remembered that the Martian supremacy of 1892, which culminates at opposition, August 4, continues only about two months, through July and August, the months preceding and following the greatest event of the year. The planet is small and traveling rapidly away from the earth, soon becomes dwarfed by distance, and returns to his ordinary mediocrity. Many observers will remember the opposition of 1877, a few will remember that of 1862, the attention of the whole civilized world will be drawn to that of 1892; but when the next grand opposition of 1909 comes round, half of the present inhabitants of the earth will have looked their last upon the glory of the heavens as seen from this planet; half a generation will have passed on.

THE OCCULTATION OF MARS.

The moon increases the interest aroused by the near approach of Mars in occulting the planet, the phenomenon being visible in this vicinity, and the time favorable for observation. The occultation occurs on the 11th, when the moon, two days after the full, with her bright edge foremost, hides the planet from view. The immersion takes place on the 11th at 11 h. 5 m. P. M. The emersion takes place on the 12th at 0 h. 7 m. A. M., the occultation continuing 1 h. 2 m. We give the data in Washington mean time, as at other places the time will vary on account of the moon's parallax, or her difference in direction when seen from different points. Our satellite, in almost full-orbed radiance, will approach the ruddy planet, almost, if not quite, putting out his light when she is in near vicinity, as observers will note, unless the visual power is exceptionally good. An opera glass will be an effective aid in observing the phenomenon, but a telescope will be far better.

The right ascension of Mars on the 1st is 21 h. 25 m., his declination is 20° 32′ south, his diameter is 21″.8, and he is in the constellation Capricornus.

Mars rises on the 1st at 9 h. 53 m. P. M. On the 31st he rises at 7 h. 52 m. P. M.

JUPITER

is morning star. If Mars take the precedence, Jupiter ranks next, for an important event occurs in his July course. He is in perihelion on the 24th at 7 h. P. M. The giant planet then reaches that point in his vast orbit when he is nearest the sun, being 42,000,000 miles nearer to him than when he is in aphelion. This event can occur only once in about twelve years, the time of Jupiter's revolution. His last perihelion passage was in 1880. If his perihelion and opposition occurred at the same time, the planet would be at his best and brightest, but as his opposition takes place in October, he will be more than two months past perihelion when he comes into line with the earth and the sun. In 1880, there were but eleven days between the two events, and Jupiter adorned the sky with a majestic grace that Venus at her brightest could scarcely surpass. He is in quadrature on the 15th, being 90° west of the sun. He then rises about midnight, and will be a superb object to those who watch for his advent.

The moon, on the day of her last quarter, is in close conjunction with Jupiter on the 16th, at 6 h. 26 m. P. M., being 29′ south. The conjunction is invisible, but when the planet rises about 11 o'clock on that evening, the moon will not be far away from the brilliant star.

The right ascension of Jupiter on the 1st is 1 h. 24 m., his declination is 7° 26′ north, his diameter is 37″.4, and he is in the constellation Pisces.

Jupiter rises on the 1st at 0 h. 14 m. A. M. On the 31st he rises at 10 h. 19 m. P. M.

MERCURY

is evening star. He is in conjunction with Venus on the 1st at 2 h. 50 m. A. M., being 4° 36′ north. He is at his greatest eastern elongation on the 29th, at 3 h. A. M., being 27° 14′ east of the sun, and is visible to the naked eye in the west as evening star. As his northern declination is small and he will be above the horizon only an hour after sunset, it will be difficult to find him unless observers are enthusiastic and possess unusually good eyesight.

The right ascension of Mercury on the 1st is 7 h. 40 m., his declination is 23° 22′ north, his diameter is 5″.2, and he is in the constellation Gemini.

Mercury sets on the 1st at 8 h. 23 m. P. M. On the 31st he sets at 8 h. 11 m. P. M.

SATURN

is evening star. There is nothing of special interest in his July course, and when the month closes he sets two hours later than the sun. The moon is in conjunction with Saturn on the 28th, at 0 h. 1 m. A. M., being 1° 39′ north.

The right ascension of Saturn on the 1st is 11 h. 43 m., his declination is 4° 15′ north, his diameter is 16″.0, and he is in the constellation Virgo.

Saturn sets on the first at 11 h. 12 m. P. M. On the 30th he sets at 9 h. 19 m. P. M.

VENUS

is evening star until the 9th, and then morning star. She is in inferior conjunction with the sun on the 9th, at 1 h. 24 m. P. M., closing her brilliant career as evening star and commencing an equally brilliant course as morning star. She takes a low rank on the July annals, but will not remain long in retreat. She rises at the close of the month two hours before the sun, as observers who are early risers may see for themselves.

The right ascension of Venus on the 1st is 7 h. 36 m., her declination is 18° 50′ north, her diameter is 57″.0, and she is in the constellation Gemini.

Venus sets on the 1st at 7 h. 59 m. P. M. On the 31st she rises at 2 h. 58 m. A. M.

URANUS

is evening star. He is in quadrature on the 24th at noonday, being 90° east of the sun. The moon makes a close conjunction with Uranus on the 3d, at 4 h. 3 m. P. M., being 47′ north. She makes a second conjunction with the same planet on the 31st, at 0 h. 33 m. A. M., being 31′ north. The moon occults Uranus on the same dates for observers who see her in her geocentric position.

The right ascension of Uranus on the first is 14 h. 0 m., his declination is 11° 43′ south, his diameter is 3″.6, and he is in the constellation Virgo.

Uranus sets on the first at 0 h. 37 m. A. M. On the 31st he sets at 10 h. 36 m. P. M.

NEPTUNE

is morning star. His right ascension on the 1st is 4 h. 34 m., his declination is 20° 27′, his diameter is 2″.6, and he is in the constellation Taurus.

Neptune rises on the 1st at 2 h. 35 m. A. M. On the 31st he rises at 0 h. 40 m. A. M.

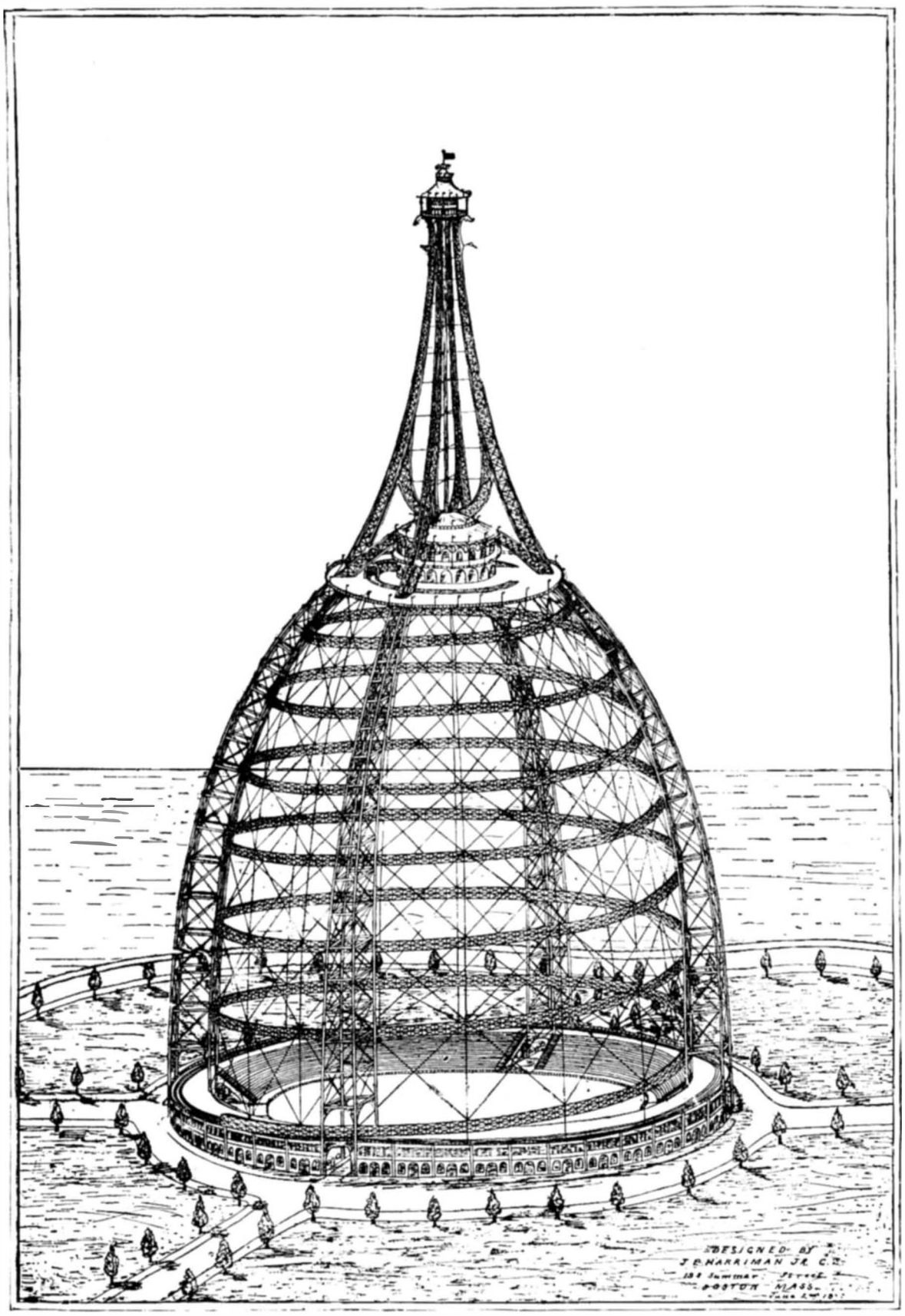
Mars, Jupiter, and Neptune are morning stars at the beginning of the month. Mercury, Venus, Saturn, and Uranus are evening stars.

Ovid's Recipe for Wrinkles.

Take equal parts of bean and barley meal and mix with raw egg. When the mass is thoroughly hard and dry, it should be ground to a fine powder and made into an ointment with melted tallow and honey. A thick layer of this applied to the face every night was warranted to smooth out all wrinkles and make the skin as soft as a baby's.

A PROPOSED WORLD'S FAIR TOWER.

Mr. J. E. Harriman, Jr., a civil engineer of Boston, is the author of the accompanying design for a tower for the Columbian Exhibition at Chicago next year. It is intended not only to serve as an observatory tower, but combined with it is the novel feature of a winding slide "from the bottom to the top of the main tower," which is to be ascended by electrically propelled cars, to an elevated main building, from which another tower is raised as an observatory, and is ascended by elevators which rise perpendicularly in a central shaft to the top. The descent is made by gravitation from the main tower in the same shaft by which the cars run up, as it is a double tunnel, with one floor above the other and open latticework sides, which gives an opportunity to view the scenery both in ascending and descending. The slide itself is to be on about a five per cent grade, and the cars can be controlled by a conductor and automatic brakes and switches. The tower may vary in height from 100 to 1,000 feet high, but in the drawing from which our print is made the main tower is about 300 feet high, and the observatory about 200 feet high, in all about 500 feet. The slide is about 1¼ miles in length. The bottom space of the tower is designed to be utilized for an arena or amphitheater, having a seating capacity of about 10,000, with four large entrances. The whole space under the seats of the theater may be utilized for exhibition stalls, stores, hotel purposes, etc. The area covered by this structure would be about one and a half acres.



HARRIMAN'S PROPOSED TOWER FOR THE GREAT EXPOSITION.

Coloring Brass Blue.

A cold method of coloring brass a deep blue is as follows: 100 grammes of carbonate of copper and 750 grammes of ammonia are introduced in a decanter, well corked, and shaken until solution is effected. There are then added 150 cubic centimeters of distilled water. The mixture is shaken once more, shortly after which it is ready for use. The liquid should be kept in a cool place, in firmly closed bottles or in glass vessels, with a large opening, the edges of which have been subjected to emery friction and covered by plates of greased glass. When the liquid has lost its strength, it can be recuperated by the addition of a little ammonium. The articles to be colored should be perfectly clean; especial care should be taken to clean them of all trace of grease. They are then suspended by a brass wire in the liquid, in which they are entirely immersed, and a to-and-fro movement is communicated to them. After the expiration of two or three minutes they are taken from the bath, washed in clean water, and dried in sawdust. It is necessary that the operation be conducted with as little exposure to the air as possible. Handsome shades are only obtained in the case of brass and tombac—that is to say, copper and zinc alloys. The bath cannot be utilized for coloring bronze, copper-tin, argentine, and other metallic alloys.—*Chem. Tr. Jour.*

Distillation of Wood.

The Burrell Chemical Company, working the inventions of Elbert J. Burrell, was organized in 1888, and by the first of January, 1889, it had completed and put in operation its chemical plant at Newberry, Mich. The above mentioned plant consists at present of 64 charcoal kilns, having each a capacity of about 36 cords of wood, and a wood alcohol plant proper, consisting of a large alcohol house, an engine house, and three series of condensers. The kilns operated by the Burrell process of charring yield 48 bushels of charcoal per cord of wood—a gain over the old method of 20 per cent in charcoal. By the Burrell process there is also an additional advantage in the fact that wood is more completely reduced to charcoal, not more than three cords of brands remaining out of 37 cords of wood. In the wood alcohol part proper the smoke—taken from the kilns by means of a chimney and smoke main—is converted into wood alcohol, a perfect substitute in mechanical arts for grain alcohol. The three principles at work successively in converting smoke into wood alcohol are condensation, distillation, and refining. By the Burrell process every cord of wood charred is made to yield more than two gallons of wood alcohol, worth in the United States $1 per gallon at wholesale. At the chemical plant in Newberry, Mich., 7,000 gallons of refined alcohol are made every month. Berry Bros. of Detroit, wholesale dealers in paints, varnishes, etc., take the entire output. Various other by-products are made by the Burrell Chemical Company. From a crude form of the alcohol a valuable coloring material is made which has a ready market. Operated in connection with a charcoal furnace, or with any smelting works where charcoal is used as a fuel, a Burrell chemical plant is a profitable adjunct. A careful estimation by Mr. George W. Sharp, based upon the work done by the Newberry plant, shows that from a 30 kiln chemical plant (50 cords per kiln) 20 per cent net annual profit can be made on an investment of $250,000.

ONE or more belts running independently on the top of another will add much to the transmission of power.

Artesian Wells for Irrigation.

Census Bulletin, No. 193, the ninth of the series devoted to irrigation in the arid and sub-humid States and Territories, has been prepared by Mr. F. H. Newell, special agent of the Census Office for the collection of statistics of irrigation, under the direction of Mr. John Hyde, special agent in charge of statistics of all branches of agriculture, and relates to artesian wells on farms, especially as used for irrigation. The total number of artesian wells on farms in June, 1890, in the States and Territories forming the western half of the United States, was 8,097, representing an estimated aggregate investment of $1,988,461.26. Complete statistics, concerning the depth, cost, discharge, and other features of 2,971 of such wells, fairly distributed through the various States and counties from which they are reported, have been obtained from the owners, and from the averages derived from such statistics the number of artesian wells used for the purposes of irrigation is computed at 3,930, the average depth per well 210·41 feet, the average cost per well $245.58, the total discharge of water per minute 440,719·71 gallons, or 54·43 gallons per well per minute, the average area irrigated per well 13·21 acres, and the average cost of water per acre irrigated $18.55. Over one-half of these wells are in the State of California, where 38,378 acres of agricultural land were irrigated by artesian water. Utah stands second in the number of artesian wells used for irrigation purposes and Colorado in the area of land thus irrigated, followed, at a long distance, by Texas and other States, as set forth in the bulletin.

Destruction of Field Mice by Typhus Bacillus.

Professor Loeffler, the originator of the system of destroying field mice by typhus bacillus infection, has returned to Germany, from Greece, where he had gone to put his system to a practical test. The professor reports that his mission has been a complete success, and that within eight or nine days the swarms of field mice which infested the parts of the country visited by him, and destroyed the crops, were absolutely annihilated. The remedy was applied in the following manner:

The peasants in the district to be operated upon were asked to meet at a given point with baskets of odd pieces of bread broken small. This bread was soaked in the solution containing typhus bacilli, and returned to the owners with instructions to spread it in the fields. In this manner large areas could be treated every day. Pieces of bread saturated with the bacillus were eaten by Dr. Loeffler and his assistants to demonstrate its harmlessness upon the human system. Horses and other large animals were also experimentally fed with it, and experienced no ill effects whatever.

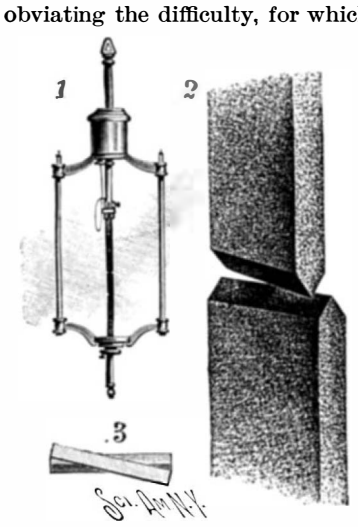
Cloth from Ramie.

In a recent issue of this journal we gave an account of the first experiment in the manufacture of cloth from ramie in the United States. We have since learned that the ramie fiber used by the San Jose Woolen mill at that time was degummed, cleansed, bleached, and supplied by Mr. Walter T. Forbes, of Atlanta, Georgia.

Mr. E. W. Wilgard, of the Agricultural Experiment Station, College of Agriculture, University of California, speaks in highly favorable terms of Mr. Forbes' method of treating the fiber.

PROF. THURSTON'S ARC LAMP IMPROVEMENT.

Some trouble having been caused by the irregular working of the arc lamps on the campus at Cornell University, from the carbons occasionally shaking past each other and jamming together in windy weather, Prof. Thurston has made an improvement obviating the difficulty, for which a patent has recently been issued. The invention consists in arranging the carbons in planes intersecting at a small angle, as shown in an exaggerated form in Figs. 2 and 3. In practice it is designed that the angle shall be just sufficient to prevent the carbons from passing each other, and not so large as to make any material difference in the length of the arc formed between the center and the ends of the carbons. It is said that experience with this improvement has shown it to be very satisfactory and useful.



AN IMPROVED ARC LAMP.

A NOVEL TOP.

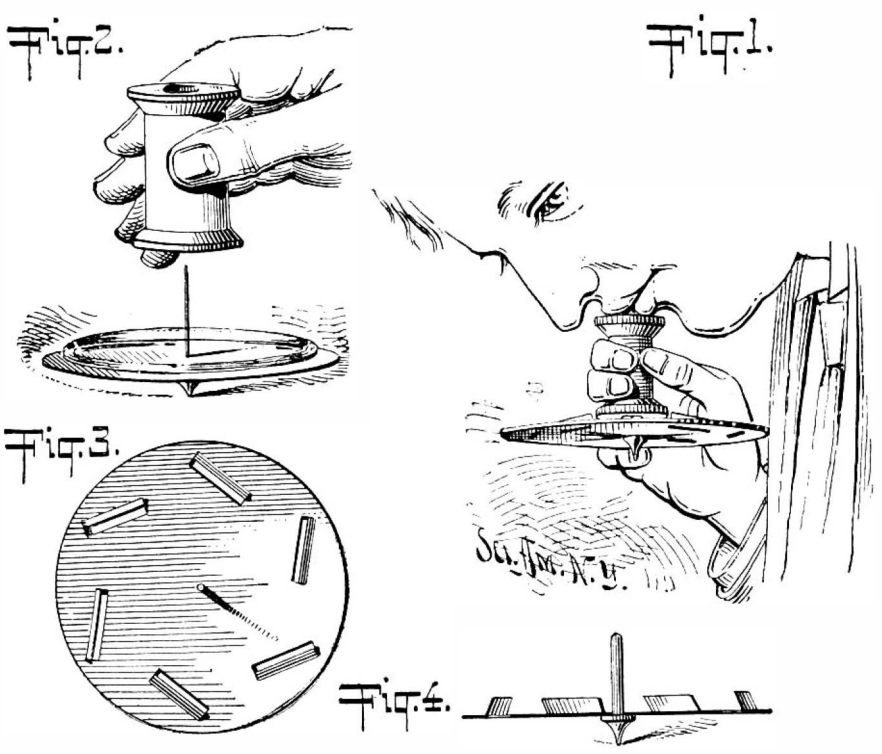
Although the top has been modified in many different ways as to form, material and methods of spinning, the one shown in the engraving appears to have novel features which distinguish it from any of its predecessors.

It consists of a cardboard disk, having a series of oblique slots symmetrically arranged; the cardboard being cut entirely through on one of the longer and two of the shorter sides of the parallelogram, the cardboard thus detached being turned up at right angles to the plane of the card, to form oblique wings or vanes. In the center of the disk a large common pin is secured by means of sealing wax, the head of the pin being allowed to project about a quarter of an inch to form the pivot of the top.

A common spool is used as a mouthpiece for setting the top whirling. The spool is held to the mouth, the pointed end of the pin is inserted loosely in the bore of the spool and the disk is held up by very light pressure of the finger on the pivot. As soon as the disk is blown upon, the finger may be removed from the pivot, when the disk will be revolved rapidly by the impingement of the blast of air on the vanes, at the same time the lateral streams of air issuing between the spool and the disk create a partial vacuum between the disk and spool, and atmospheric pressure exerted on the under side of the disk sustains it, so that the top really revolves in air and with very little friction.

As soon as the blowing ceases the top drops, but it continues to revolve on its pivot. It is perhaps needless to say that, to secure good results, the surface on which the top spins after it drops should be a piece of glass, a glazed plate or some other hard, smooth, surface suited to this purpose.

Fig. 1 shows the method of spinning, Fig. 2 the top after it is dropped, Fig. 3 is a plan view and Fig. 4 is a diametrical section of a metal top having a wooden spindle of the form shown. G. M. H.



AN AIR-PROPELLED TOP.

Photography and Astronomy.

There are good reasons for expecting hot summers this year and the next two years, and this presents pleasing expectations to photographers, especially as we have had no summers worth mentioning for a few years past. Every eleven years there is a maximum of sun spots, indicating great disturbances in the solar orb, and in looking back over old meteorological records, it has been noticed that such periods are almost invariably accompanied by hot summers. Although this point does not rank as an established fact, accurate records not extending over a sufficient time, it is one considered to deserve attention by those competent to judge. These remarks are our own; nothing was said recently, at Greenwich, on this somewhat speculative matter, when the annual visitation of the Royal Observatory took place, and some two or three hundred persons inspected the work which is being carried on, and the many instruments employed for the various observations.

The report, which was presented by the Astronomer Royal, shows that, owing to various structural alterations, some interruption has been occasioned to the astronomical observations. During the year ending May 10, 1892, photographs have been taken of the sun on 219 days, and the gaps which have necessarily occurred, owing to the presence of cloud, have been filled by photographs from India and Mauritius. The solar activity has increased in a remarkable manner during the past year. While there were 175 days without spots in the year 1890, there were only 21 such days in 1891, and since 1891 (March 28) the sun has not been free from spots on a single day on which it has been observed. The number of groups visible on the disk at the same time, and their average size and complexity, have all greatly increased during the last twelve months, the group of February 5 to 18 being the largest ever photographed at Greenwich. This group has had an unusally long life, appearing first on November 15, 1891, and persisting till 1892 (March 17). In the year 1891 there were five days of great magnetic disturbance, but there were also twenty other days of lesser disturbance. A very large magnetic disturbance occurred on February 13–14, commencing about a day after the large sun spot was on the central meridian, and there are numerous other instances of magnetic disturbances at times of sun spot activity, clearly establishing a very intimate connection between the two phenomena.—*Photography* (*London*).

Simple Diet in Obesity.

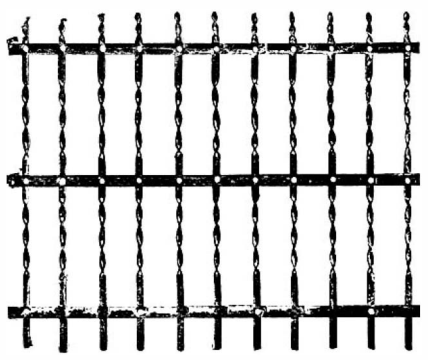
The *Journal de la Sante* attributes to a medical officer of the French army the latest "cure" for obesity, which is strangely simple in its carrying out. The form of diet was simply a restriction to one dish at each meal, irrespective of what that dish might be, and no matter whether the quantity consumed was greater or smaller, it was made to satisfy the desire for food to the full at each meal. No supplementary dishes, such as soups, desserts, or condiments, were allowed; one single dish, and that taken plain, was found to satisfy the appetite much sooner than a variety of dishes, even if the quantity was apparently smaller and on almost an abstemious scale. This regimen was employed also in the case of a lady whose *embonpoint* threatened too rapid increase with good results, and without any discomfort in the observance of the restrictions. In fact, in one or two instances the reduction of corpulence has seemed to go on too rapidly, and it has been deemed best to take means for restoration, in a measure, of that which has been lost. Under this system, as under most others, adds *Popular Science News*, the excessive imbibition of liquids has to be forbidden, care being taken not to enforce the abstinence from water, especially to the point where symptoms of circulatory depression arise from insufficiency of volume of blood in the vessels.

New Lead Alloy.

A new alloy of lead, very malleable and almost unattacked by acid, has been proposed by M. Worms for the manufacture of accumulator plates. He takes 945 parts of lead, 22 of antimony, and 13 of mercury. The lead is first smelted, the antimony is added, and the mercury is introduced at the moment of pouring into the ingot mould. A species of amalgamated lead is thus obtained which can be rolled in sufficiently thin sheets.

A LIGHT AND DURABLE FENCE.

The fence shown in the illustration is designed to be constructed of metal, in an expeditious, convenient, and inexpensive manner. It forms the subject of a patent issued to Mr. Julius Baker, of No. 8 New Grant Street, Pittsburg, Pa. The top and bottom rails are preferably L-shaped in cross section, and they have aligning longitudinal slots in their horizontal portion through which the pickets are passed, each picket having an offset or projection near its upper end resting against the lower face of the upper rail. The offset is made by indenting one side of the picket with a suitable instrument, to produce a projection on the other side, and a central tie rail is adapted to be attached to the series of pickets by rivets. In making the fence the pickets are first passed through the slots of the lower rail and then twisted, some of the pickets being bolted to the lower rail, and, after riveting the central rail in place, another twist is made in the pickets before they are passed through the top rail, which rests on the offsets, the pickets being then bolted to the upper rail and their upper ends twisted.



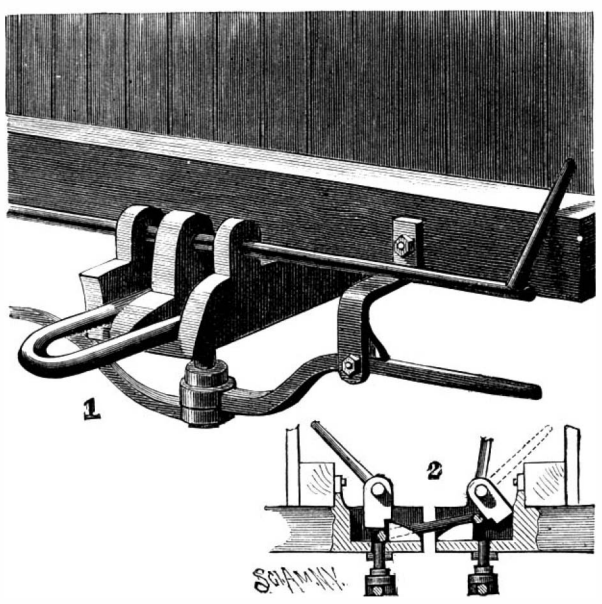
BAKER'S IMPROVED FENCE.

Ants, Black and Red.

We presume editors of newspapers have more inquiries for some remedy for the expulsion of ants than for almost anything else. The New York *Observer* has a correspondent who solves the problem as follows; "Having had years of torment with ants, both black and red, we lighted upon the following remedy, which with us has worked like magic: One spoonful tartar emetic, one spoonful of sugar, mixed into a thin sirup. As it evaporates or is carried off, add ingredients as needed. A sicker lot of pests would be hard to find. Whether they impart the results to the home firm or whether all are killed, I trow not. Certain it is they do not pay us a second visit. For ants on the lawn, a spoonful of Paris green cut with alcohol and made into sirup with sugar and water can be placed on pieces of glass or crockery—cover from domestic pets—and the slaughter will be satisfactory."

AN IMPROVEMENT IN CAR COUPLERS.

The illustration represents an automatic link coupling in which the link engages a lug on the floor of the drawhead, simple means being provided for holding the link in position and for disengaging it for uncoupling. The improvement has been patented by Mr. William Greenlees, of Brookland, District of Columbia. When the cars are coupled the link is held, as shown in Fig. 1, by a swinging block or weighted arm attached to and operated by a transverse rod, with a lever arm at each end near the side of the car. In coupling, the link, held in horizontal position in the drawhead of an approaching car, rides up on the lug, pushing back the swinging block and dropping behind the lug, as shown in Fig. 2. The uncoupling is effected by operating the transverse rod, by which the block is swung back out of the way, and then pushing down upon a link lifter, pivoted in a bracket or hanger beneath, when a vertically-moving push rod raises the end of the link.



GREENLEES' CAR COUPLING.

PHOTOGRAPHIC NOTES.

An Improved Film.—One of the troubles with thin rollable films has been to keep them flat in the developing dish and in the printing frame. Usually they are soaked in a solution of glycerine and water, after fixing, to help make them dry flat.

A company at Rochester, New York, has just introduced a new film which has the property of keeping flat through all the manipulations, and when dry, also, in the printing frame. It consists in coating the back of the celluloid support with a film of insoluble gelatine having the same expansive and contractive qualities as the sensitive gelatine film. Thus the two forces, so to speak, of expansion and contraction counteract each other equally.

A Double Film Dry Plate.—According to the *Br. Jour. of Photography*, a new dry plate has lately been introduced, coated first with a film of a slow emulsion and second, after the first is dry, with another film of a rapid emulsion. It is said to give very excellent results, as the first film in contact with the glass counteracts any effect of overexposure on the first film and also prevents what is known as halation around images of bright objects.

Formulæ for Preparing Gelatino-Chloride Paper.—A correspondent in *Photography* thus describes his method of making this paper, which is becoming very popular.

I can recommend the following formulæ for gelatino-chloride emulsion paper as giving similar tones to albumenized paper. Make three solutions as follows:

A.

Gelatine	35 grains.
Hot water	1 ounce.

B.

Sodium chloride	25 grains.
Calcium chloride	20 grains.
Water	1 ounce.

C.

Nitrate silver (tri-crystal)	135 grains.
Water (distilled)	2 ounces.
Citric acid	25 grains.

Place the solutions in a water bath heated to 100° F., and leave here until all the gelatine has melted. Now mix solutions A and B, and then add two drops of a 20 per cent solution of hydrochloric acid. Keep the two solutions at a heat of 90° for half an hour, and then, by aid of either yellow or red light, pour solution C into A and B combined, drop by drop, stirring well all the time. Now put two drachms of rectified alcohol into the vessel which contained the silver solution, and add to the emulsion. The pot containing it must now be placed in the water bath at a heat of 120° F. for one hour, and then taken out and left to set for two or three days. You can now filter out any dust or insoluble precipitates not wanted in the emulsion. First warm gently until it has perfectly liquefied, and then strain three or four times through a linen bag, and all will be ready for coating. Pour the emulsion into a dish, and take hold of a sheet of paper by the ends and lower gently into the dish, allowing the middle to touch the surface first, and gradually lower the edges until it floats on the emulsion. Leave it here for three minutes, and hang up by clips to dry.

World's Fair Notes.

On the inland waterways which traverse the world's fair grounds from one end to another, there will be plying three kinds of boats for public use. These will be the omnibus, express and cab boats or launches. The omnibus boats will make regular trips around the waterways, stopping at each building. The express boats will make round trips without stopping, while the cab boats, with carrying capacity of four persons, may be hailed at any point and engaged for the trip or by the hour, as is a hansom cab.

A dispatch from Singapore says that the Sultan of Johore, one of the most prosperous states in the East, situated in the western part of the Malay Peninsula, is causing to be prepared for the World's Columbian Exposition a model Malay village, in which the trades and industries peculiar to the Malays will be carried on by natives. It is highly probable, the dispatch adds, that the sultan himself will visit Chicago during the exposition.

One of the most interesting exhibits in the government building at the world's fair will be a display of arms, uniforms, tents, and flags in use in the United States army at various times since 1776. This display is being prepared in one of the Gray's Ferry arsenal buildings. A space of 6,000 square feet has been set aside for this exhibit. The uniforms will be draped upon lay figures and arranged in realistic attitudes. The one particular group in which especial pride is taken is to consist of seven figures on horseback, representing a general of the present army and staff. The central figure will be as nearly as possible an exact likeness of Major-General Schofield. All the articles were made entirely by Americans and of American materials. There is a collection of at least twenty-five flags, and these alone are valued at $8,000.

The United States Patent Office will exhibit at the world's fair as complete a collection as possible of the models of all the important American patented inventions, with a view of showing the great advance in the several arts, which is due in no small degree to the encouragement and protection afforded by the patent system. Many of the desired models are not now in the possession of the Patent Office, owing to loss by fire and the fact that in recent years models have not generally been required. The available appropriation is not sufficient to enable the office to make the missing models, and, therefore, the Commissioner of Patents has issued an invitation to inventors and manufacturers to loan such models to the office with the understanding that they will be returned, and that due credit will be given in labels and catalogues. This invitation is being met with hearty response.

Bleaching of Woolen Fabrics.

In decolorizing woolen fabrics two agents are commonly employed. These are sulphurous acid and hydrogen peroxide. The use of these two substances is by no means a modern innovation. Indeed, the first goes back as far as the Christian era, and the second almost as far, certainly to the time that the cloth was laid out in the air and bleached with natural agents.

In the natural method of bleaching it is commonly supposed that the element which accomplishes the decolorizing of the fabric resides in the sun's rays. But chemical research has shown that this is erroneous. A substance called ozone has been separated from the atmosphere, and it has been demonstrated that this is the element which has to do mainly with the bleaching process. This substance is always present to some extent in country air at all times, and it is a fact that cloth exposed to the bleaching action of country air is always more perfectly whitened than when it is exposed in the closer, more confined atmosphere of cities or towns. To facilitate matters, then, it has been the aim of chemists to obtain this element in quantities sufficiently large to enable manufacturers to do their bleaching in less time and at less expense. As yet the use of peroxide of hydrogen cannot be said to be as common as it might be, but it is steadily growing in favor. This is but natural, since it gives a purer white upon wool than sulphurous acid, and one which is more permanent and clear. The great obstacle to its more extended use as a bleaching agent is the fact that it has not yet been produced on such a scale as to bring its price within the range of economy.

In using hydrogen peroxide, it is necessary to apply a little ammonia, and this has the effect of neutralizing the acid which is always present. This acid is employed in the manufacture of the agent and is left with it in order to keep it from spoiling, which it is sure to do when left in its natural condition. The goods to be bleached are passed through the solution of peroxide, slightly wrung and gradually dried. This is sufficient in many cases, but where the condition of the wool requires it, it may be necessary to repeat the process two or three times before the desired whiteness is attained.

The second method employed in bleaching woolens is that in which sulphurous acid is the agent, and it is probably the most common of all. The operation is undergone in a compartment constructed for the purpose called a stove or oven. The material used is brick or stone, lined with wood, and in the lining all nail heads, hooks, etc., are carefully concealed. The reason for this is that, by the action of the gases disengaged during the process upon the iron, sulphate of iron is formed, which drops upon the cloth and makes a spot that cannot be removed.

The woolens to be bleached by this process must first be thoroughly scoured, after which they are soaped with a neutral white soap. The whizzing must be as complete and perfect as possible, so that no loose water shall remain in the folds or creases of the cloth to prevent the uniform action of the gases upon all parts of the cloth alike. When thus prepared the cloth is hung in the bleach house or oven and there an amount of roll sulphur equal to about one-tenth of the weight of the goods is placed in an iron vessel and set on fire by means of a red hot iron. The doors are closed, and over this the cloth is allowed to hang for several hours. The goods quickly absorb the gases, and the coloring matter is gradually neutralized. After the time necessary, which will vary, of course, with the nature of the goods, has elapsed, the cloth is removed, washed, and dried. There is usually an odor present in goods thus treated, which arises from the fact that all traces of the acid have not been thoroughly removed. It is difficult to do away with this altogether, yet, where bleached yarns are to be woven with colored, unless they are removed there is sure to be an evil effect upon all colors which come in contact with the white. The acid may be removed by first washing as clean as possible in pure water, and then running the cloth through a dilute solution of hydrogen peroxide. The sulphurous acid is thus connected with sulphuric acid and easily passes off.

The third method adopted in woolen bleaching is known as liquid bleaching, but as a process is confined more especially to loose wools than to the woolen fabric. It is valuable as a process for bleaching loose wools, because it is less difficult to manipulate loose wools in liquid than in the other way, but it is not so powerful a bleaching agent as the gas, nor is the process altogether satisfactory in other ways.

The actual bleaching process is due in every case to the destruction of the yellow coloring matter naturally inherent in the wool. This destruction is brought about by means of the chemical action of the agent employed. But it has to be admitted that in no case is the reduction of this matter complete or permanent; since frequent washing in an alkaline solution has the effect of counteracting the influence of the bleaching agent, and restoring again the original yellow of the wool. This effect is noticeable in flannel underwear or blankets, which, though pure and white when they are taken from the store, soon begin to color up as they are exposed to the alkaline action of the soap used in washing.—*Textile Record.*

Machines and Men.

A writer in one of our exchanges, says the *Manufacturers' Gazette*, bewails the decay of mechanical skill in the following words:

"The decrease of manual skill and of artistic sense among mechanical workmen results not merely from want of such all-around practice as they got half a century ago, but from a want of that sort of loving interest in their work the old-timers used to feel, when they could put something of their individuality into everything that they made. Nowadays the workman has simply to work out a design—or rather to run a machine to work out some part of a design—prepared by some artist whom he does not know and never has seen. The general result may be beautiful when the different parts are assembled, but the workman feels that he has no personal share in the production of its beauty. He has become a regulator of a machine; he simply sharpens tools, adjusts them, keeps his machine oiled, and puts into it the material to be worked upon. All the precision, the nicety of operation are due to the inanimate rather than the living tool. What interest can such work beget? What lofty ambition can it stimulate? What workman when the bell rings the time to quit work feels reluctant to leave his task, or lingers over it to bring out some beautiful effect or interesting combination that he feels he must see before he can depart contentedly? If machines were invented to play billiards, and only by their use could this king of games be played, how long would the game be a favorite? If violins could be performed upon only by automatic mechanism, or pictures painted only by machine-actuated self-charging brushes, who would be charmed any longer by art? Neither the artist nor the dilettante; the artist and the dilettante would cease to exist. So, while we have gained much from the enormous increase in labor-saving machinery that has characterized the latter half of the present century, we have lost what probably will not soon be restored, the love of work and pride in work for its own sake, the love and pride that were the parents of mechanical skill, skill which, now they are dead, is itself decaying. The loss appears inevitable to those who scan the social horizon philosophically; it is, however, no less to be regretted because unavoidable.

"This tendency of labor-saving machines was many years ago pointed out by Ruskin, who, in the light of the fulfillment of his prediction, proved only too true a prophet. It is this effect upon the masses, more than unequal distribution of wealth, that is separating society in America into distinct classes."

Mica and Its Uses.

There is a greater range of use for ground mica than for the mineral in sheets, and, though the value of that part of the product made use of in this form is small, the many peculiar properties which ground mica possesses render it quite probable that its use will be widely extended. The difficulties to be overcome in grinding mica are considerable, and there are only two or three firms, says one of our London exchanges, engaged in the business at present. Eight standard grades of ground mica are made. The coarsest of these are used to give frosted and spangled effects to the fancy grades of wall paper. The medium grades are employed in the manufacture of a lubricant for the journals of railway carriages, for heavy bearings generally, and for the axles of road vehicles. The finest grades are used in producing a uniform metallic white surface on wall paper. Scrap mica for grinding must be white and as free from specks or colored matter as possible, since any impurities in the scrap will affect the color and luster of the product. There is considerable consumption of mica on the part of the manufacturers of electrical machinery and likewise for stove purposes. The higher grade micas are used for the latter purpose. The lower grade micas are used by the electrical manufacturers.

A New Use for Caffeine.

Caffeine, the active principle of coffee, has recently been recommended as an excellent local anæsthetic, and is said may, for many purposes at least, advantageously replace cocaine, the use of which is not altogether liked by many medical men.

Correspondence.

How to Polish Photo Prints.

To the Editor of the Scientific American:

As burnishing oftentimes adds much value to a photographic print and increases its detail, a burnishing device of some sort is a useful adjunct to any photographic outfit. But a good burnisher is expensive, and it scarcely pays an amateur to invest in one, especially since such excellent paper can now be purchased, which needs but little additional polish after it is dried. I have obtained very good results on omega and albumen papers by employing a polishing iron, such as is used for laundry work. This should be brightly nickeled and have one end rounded. It should be used quite hot, but if too hot it is likely to scorch the print. Before polishing, the print must be lubricated by rubbing it with a cloth moistened with a strong alcoholic solution of castile soap. The iron must be kept constantly in motion and be firmly pressed down on the print. By a little patient use of the iron a fine polish can be given, even to an albumen print.

I have found such an iron especially useful in straightening out dry mounts so they would lie flat. This can readily be done by applying the iron to the reverse side of the mount. Place the mount, print side down, on a piece of clean blotting paper. With one hand press the iron firmly on the card, and with the other hand grasp the end of the mount and draw it out from beneath the iron, pulling it upward at the same time, so as to bend it back over the rounded end of the iron. If the bend is too sharp, there is some danger of injuring the print. I have found this method especially useful in straightening out mounts for albums. W. M. STINE.

Athens, Ohio, June 4, 1892.

Cyclones and Cities.

To the Editor of the Scientific American:

Scarcely a day passes in these spring and summer months but the wires bring us news of dreadful cyclones, tornadoes, or hurricanes, devastation following in their wake; villages are wiped out, with great loss of life and property. At present there seems no remedy, but may there not be at least a partial one? Occasionally the larger cities are visited, and the dread is of some tremendous catastrophe of this kind. Several years ago Louisville and Philadelphia, and a few days ago Chicago, were visited, but it is to be noticed that these storms seldom reached the center of these large cities, confining their fury to the outskirts.

Why is this so? And why is it that larger cities are always likely to be safer from great wind storms than small towns and villages? In the opinion of the writer there are several causes:

First, large cities have better built and stronger houses; second, the outskirts act as a brake for the mass of the city; but the great cause of safety is the large volumes of gases generated from the manufacturing establishments located in and around large cities, as well as the multitude of chimneys of dwellings pouring forth their quantum. The general volume of all this gas acts as a buffer if the storm is very severe, or deflects it if simply a "twister," or may entirely neutralize the effect of any storm prevailing on the outskirts. This city, surrounded by high hills, with three rivers as conductors or channels for storms, with its enormous volumes of gases, far greater than produced in any other American city, is, I think, pre-eminently safe from great storms. Other large cities—New York, Boston, Philadelphia, Baltimore, Chicago, St. Louis—should be safe in proportion to their size.

As a theory—I do not present it as a scientific fact—is it not worthy of investigation by our weather bureau?

Comparisons could be easily made of velocities within and at points surrounding cities, probabilities calculated, and possibly safeguards suggested. Oil on troubled waters has saved vessels. Might not oil or gas tanks fired at approach of cyclones save our Western towns from unnecessary destruction? THOS. N. MILLER.

Pittsburg, Pa., June 14, 1892.

[The range of intensity of our great cyclones or tornadoes seems to occupy a district bordering the Mississippi Valley and its tributaries. There is probably a meteorological condition of influence that intensifies it there, and no matter how great a city might be, if it should happen to lie centrally in the path of an intensely active tornado, such as swept through a section of Louisville, or the later ones in the Western States, it would cut a swath through it as clean as the forest examples in some of those States. A large city netted with telegraph wires and covered with metallic roofs connected with the sewerage and underground water system may largely influence the electric conditions of tornadoes, but would have little resistance beyond the weight and strength of its buildings to a direct onset of a genuine cyclone. The remedies suggested by our correspondent would always be found too late in practice. The warnings leave no time for such remedies. —ED.]

Electricity vs. Steam.

The inadequacy of all electric locomotives proposed for heavy and frequent passenger trains—for service such as must be handled on the prominent suburban railroads—has several times been referred to in these columns. We have pointed out what seems to be a lack of appreciation on the part of the electric companies and designers of the problem to be solved. We now present some definite information on this subject, to show clearly what is needed in an electric motor if it is to do the work now performed by steam locomotives in the service referred to. The data are based on the present operation of the suburban section of the Illinois Central road in Chicago, one of the largest suburban traffic fields in this country.

The lengths of the stops average about 15 seconds when the trains are not too crowded and the trainmen are alert. The trains are composed of from four to sixteen cars, according to the traffic, and the average number of cars per train is six.

The data are based on actual speed and indicator-diagrams taken from the suburban engines on the road, and are as accurate as necessary to give a perfectly safe basis for estimating the power needed to run the road by electricity. From diagrams we have calculated the average and maximum horse power between stations required to pull a train, and the average and maximum horse power required to run all the trains. The results are given in what follows, together with the amount of coal consumed per useful horse power absorbed in hauling the cars and their lading per hour.

Average number of cars per train	6
Maximum number of trains on line at any one time	14
Maximum number of cars on line at any one time	84
Average horse power required between stations to overcome the inertia and the friction of the trains, as shown from the acceleration diagrams	390
Maximum horse power required between stations to overcome the inertia and the friction of the trains, as shown from the acceleration diagrams	510
Average pull on the forward drawbar of the train in pounds, taken as an average of the pull between stations	7,750
Maximum pull on drawbar at starting, pounds	14,000

If all the trains are running exactly according to the large diagram, which accords with the time table, then the following averages and maximums may be deduced:

Average aggregate horse power for all trains on the line	2,600
Maximum horse power for all trains	4,500
Aggregate pull on forward drawbars, average pounds	51,700
Aggregate pull on all forward drawbars, maximum pounds	108,750

If it happens that all trains are running at once, but not necessarily all starting at once, then the following is obtained:

Average horse power for all trains	6,270
Maximum horse power for all trains	7,140
Average pull for all forward drawbars, pounds	172,200
Maximum pull for all forward drawbars, pounds	196,000

The following are the averages between the hours of 5 and 6:20 P. M.:

Average number of trains on line	12·3
Average number of trains accelerating at one time	6·6
Maximum number of trains accelerating at one time	10·0
Average number of horse power hours of work done by each steam locomotive per day	2,145
Average amount of coal used by a steam locomotive in doing 2,145 hours of work, pounds	14,000
Average amount of Illinois coal used per horse power hour, pounds	6·52

The diagrams and tables give exactly what an electric locomotive will have to do in order to duplicate the work now done by steam locomotives. This is outside of all problems of switching, signaling and distribution of power. Of course, all those matters are readily settled. Where a railroad company owns its right of way, it is comparatively a simple matter to lay conductors for the electric current, and the switching of the current can be readily done. The whole question about the substitution of electricity for steam is centered around the possibility of getting a motor sufficiently powerful to do the work, and the handling of such powerful currents as would be necessary on a line like the Illinois Central, where a total of 7,000 or 8,000 horse power is needed. The business of the Illinois Central is constantly growing. The number of trains will be doubled within the next few years, and the suburban business will be extended further from the terminus. But, of course, more than one electric station could be used to supply the line, and distribution, in itself, is probably not an insurmountable obstacle. The problem that remains to be settled before much enthusiasm can be aroused among steam railroad men is that relating to the possibility of making an electric motor with power equal to that of the steam locomotive. It will be noticed that the average horse power between stations is about 390, while the maximum is 510.

The problem then is to construct and maintain an electric locomotive of sufficient weight to haul a train, one capable of evolving from 500 to 800 horse power. More than one motor to a train is practically out of the question. The exigences of excursion days, when heavier and more numerous trains are run, we will ignore for the present. It now remains for those engineers who make electricity a special study to bring forward their plans and show what they propose to do. As yet they have shown no evidence of ability to meet the serious problem we have here outlined. Many railroad men have a feeling of confidence that electric motors will some day supplant our steam locomotives, but it is in most cases decidedly indefinite, not to say superficial. This sentiment encourages the electrical inventors, and it is right that it should, but they will need something more tangible if they are to make the desired progress.—*Abstract from the Railroad Gazette.*

New Experiment in Steam Propulsion.

An interesting experiment is soon to be tried in England with a vessel provided with two screws which are arranged amidships under the bottom of the boat on plans invented by F. W. Richardson. A successful trial has been made in an old vessel, and now the company have intrusted Messrs. Cochrane, Cooper & Schofield with the order to build a new vessel specially adapted for the purpose. The vessel will have the following dimensions: Length between perpendiculars, 94 feet; breadth, 18 feet 6 inches; depth of hold, 8 feet. She is to be fitted with two pairs of compound surface condensing engines. The tube in which the propeller works is a complete tube for about five or six feet, and then it tapers down to the keel, the forward end at eleven and the after end at eight degrees. The advantages claimed by the patentee for this system of propulsion over the present stern propeller are as under:

1. Economy of power, and consequently saving of fuel.
2. Direct action between the steam and the work.
3. Enormous reduction of weight in all moving parts, together with general lightness and compactness.
4. Variable immersion, so objectionable in the present system of propulsion, will not affect the principle.
5. Immunity from rocking and straining of engines.
6. Risk of fracture of crank or propeller shaft minimized.
7. Less noise and vibration, consequently a much more comfortable passenger boat.
8. When reversed the vessel will move straight astern without divergence.
9. No swell or side-work to destroy canal banks, owing to the currents moving straight astern.
10. By altering the relative speed of the engines, the vessel can be safely navigated in the event of rudder being carried away, or steering gear disabled.
11. Safety and steadiness in the event of the ship being hove to, with perfect command under all situations.
12. War vessels can be built double ended, with power for ramming increased.
13. Greater facility for handling the ship, with full engine power for maneuvering.
14. Safety of the propeller power from harm.
15. Avoidance of risk of detention from accident and adjustment of the machinery for both screws at the same time.

Ink for Marking Bales.

Best gum arabic	10 lb.
Logwood liquor, sp. gr. 1·09	3 gals.
Fustic extract	1 lb.
Nitrate of iron solution, sp. gr. 1·37	20 fluid ounces.
Bichromate of potassium	2½ ounces.
Water	q. s.

Dissolve the gum arabic in 1 gallon of water, strain and add the logwood liquor, mix thoroughly, and let it stand twenty-four hours. Then stir in rapidly the bichromate, dissolving in 3 quarts of boiling water. Then add the nitrate of iron and fustic extract. If too thick for use, add lukewarm water until reduced to the proper consistency.

The above directions will make, if carefully followed, a jet black ink that will leave an indelible mark and will dry quickly.

If a blue black is desired, omit the fustic extract, and substitute 4 ounces of indigo extract.

When no appliance is at hand for determining the specific gravity of the logwood and the iron liquids, a sufficiently near approximation of the strength and proportions required may be ascertained by a few colorimetric trials. The logwood liquor may be conveniently made by dissolving the extract in water, and the strength can then be easily regulated.—*Druggists' Circular.*

Completion of a Cable Survey.

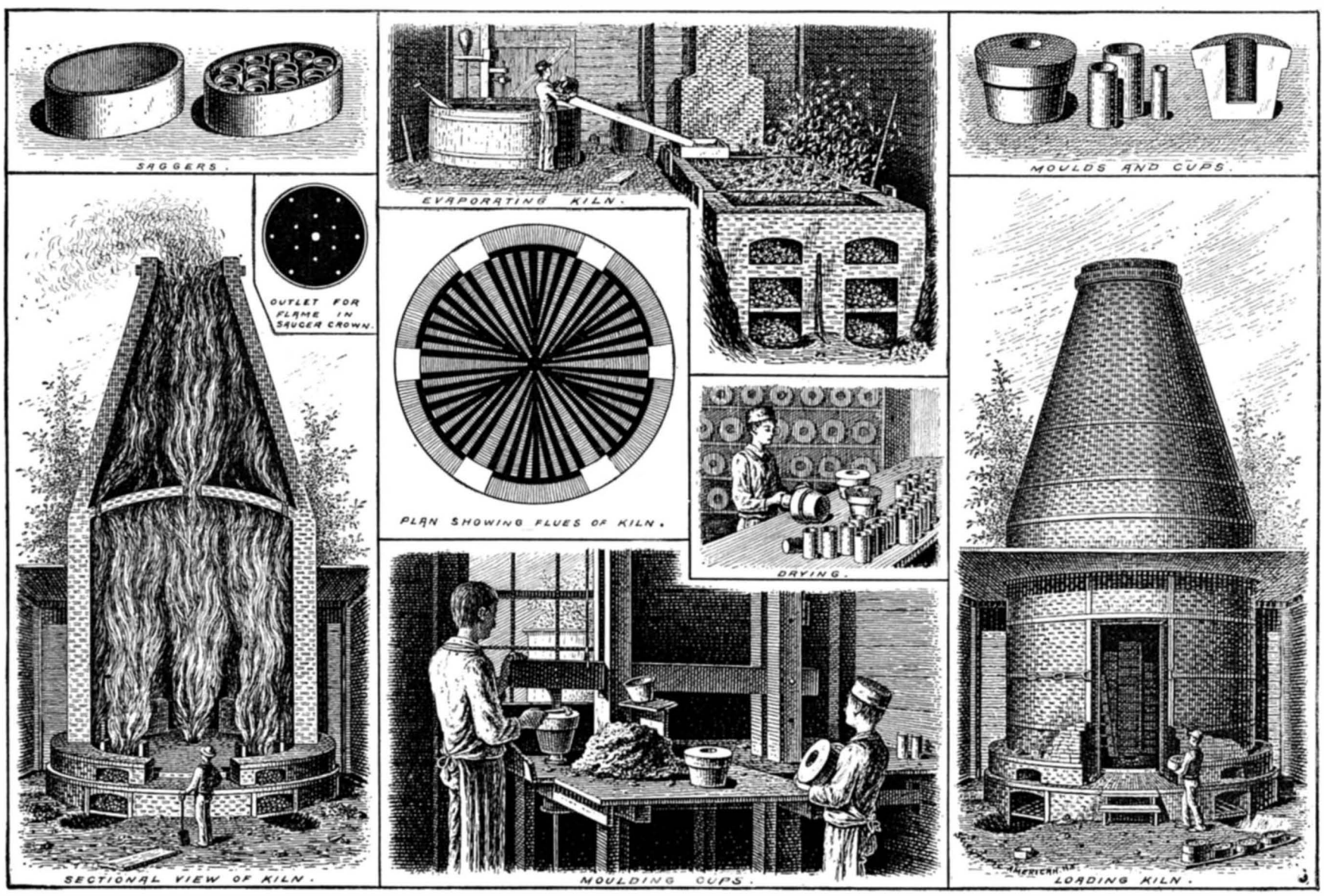
The United States survey steamer Thetis arrived at Honolulu on May 20 from Hilo, where she ended the survey for the cable to be put in between San Francisco and the Hawaiian Islands. The course to Hilo comprised 2,060 miles as surveyed by the Thetis, with 300 soundings, against the survey of the Albatross of 2,150 miles and 250 soundings.

The soundings were made at intervals of two, ten, and sometimes one mile apart. The deepest was 3,228 fathoms, about 245 miles northeast of Hilo, and the shoalest was 976 fathoms, at a point about 350 miles from Point Conception. Were it not for this abrupt rise, the course would have been almost level.

The route traversed by the Thetis is considered by the officers as the most practicable yet surveyed.

MANUFACTURE OF POROUS CUPS FOR ELECTRIC BATTERIES.

The standard porous cups which hold the carbon of galvanic batteries were first introduced by a Frenchman named Leclanche. They are made of a mixture of feldspar, kaolin, white quartz, and ball clay. Feldspar is a mineral pulverized, found in Vermont and New Hampshire. Kaolin is a china clay imported from England. The white quartz which gives body and strength comes generally from Illinois. These ingredients are first put into a large circular tub as follows: 1,440 lb. of kaolin, 1,320 lb. of feldspar, 280 lb. of quartz, and 960 lb. of ball clay, making in all about 4,000 lb. Water is then poured on and the whole mass is thoroughly mixed together and thinned down to about the consistency of paint. It is then run through a 120-mesh lawn or sieve into the evaporating kiln. This kiln is about 5 feet in height, 12 feet in length, 5 feet in width, and about 1 foot in depth. The flooring is made of flanged tiling cemented together. These tiles are 12 inches square and 2½ inches in thickness. A coal fire is built in the ovens at the end of kiln, the flames of which pass through a number of flues underneath the tiling, heating up the liquid mass above. It is then allowed to boil and simmer for 25 hours, causping. The improvements over the old kilns are in the number of flues and size of mouths of kiln, also the shape of crown and the doing away with the old double wall inside of kiln. The old mouths of kiln used to be about 32 inches in width, and fewer than the new, which is about 23 inches. This new kiln has six mouths, each an equal distance apart. There are new flues introduced between each mouth, running from the circular flue around the kiln, called the mid and semi-mid feather flues. These flues all lead into the 10 inch well hole into the center of floor of kiln. The old crown of kiln used to be 3 feet 8 inches higher and ran straight across. The new saucer-shaped crown tends to make it burn more evenly. Over each mouth on the inside of kiln are bags built of brick. The old bags used to be from 4 to 5 feet in height; they have been cut down to about 2 feet square and 10 inches in width. They tend to keep the heat and flame from going to the center of kiln. The well holes on the floor of kiln and crown are directly over each other. The heat required for burning is about 1,800 degrees. The illustrations were taken from the plant of Thomas Loughran, Marion, N. J. The cost of outfit, with 1,000 moulds and 5 H. P. engine, was about $3,500. There are several establishments in this country for the manufacture of porous cups, and their aggregate production is about 1,000 cups a day.



MANUFACTURE OF POROUS CUPS FOR ELECTRIC BATTERIES

Quarter-Sawed Oak.

Two years ago the demand for quarter-sawed oak reached such proportions that it could hardly be supplied in the quantities called for. Fashion dictated that this wood be used extensively, both in the manufacture of furniture and for interior work, and for once the requirements of fashion were in the line of common sense. Price, quality and available supply considered, quarter-sawed oak ranks well with any of the other hard woods for the purposes mentioned, and is superior to most of them. But it is not necessary to enlarge upon the excellence of this wood. Its claims for recognition are already established, and are not disputed. Suppose, however, the tide of public favor turns toward some other wood, what then?

The *Lumberman* does not believe that quartered oak will ever cease to be an important factor of the hard wood trade. Governed by the inexorable laws of supply and demand, its monetary value will fluctuate, but the wood itself will continue to be used so long as a sufficient supply of oak trees can be found to furnish material for the saw mills. Some there are who believe now that the erratic something called fashion has issued a decree that quarter-sawed oak is no longer "the thing." But, if so, what has come forward to take its place? Plain-sawed oak may have done so to a certain extent, but none will claim that plain stock is as desirable as quartered, the one point of superiority in the former being its lower price.

Whenever the price of any commodity, because of its scarcity or for other reasons, becomes excessive, users of such commodity will look for something to take its place. On the other hand, when the price is high, manufacturers will use every endeavor to increase their output of the high-priced article, and if their resources are ample enough, will eventually produce more than the market calls for. It is one of the axioms of the hard wood business that a season of scarcity is always followed by one of overproduction, and overproduction by scarcity. The trade in quarter-sawed oak has proved this up to the present point, and such will be its history in the future.

The Decoration of St. Paul's.

The decoration of the interior of St. Paul's, London, with mosaics instead of the paintings (which proved impracticable owing to the bad atmosphere) is proceeding slowly. Mr. W. B. Richmond has to fill with mosaics twelve spandrels about the arch tops in the choir, twelve window spaces about the windows in the clerestory of the choir above the spandrels, three sections of the vault over the apse, and twelve "pendentives" or spaces on the vaulted ceiling about the base of three domes which light the choir. In the three domes the acts of creation are to be shown, namely, the creation of birds, fishes, and beasts. The fall of man and the redemption provide subjects for spandrels and window walls. In the vault of the apse a leading design shows Christ seated in judgment with recording angels by his side. The kite-shaped pendentives narrowing down from the bases of the domes will contain each an angel with many wings, the arms raised upward and outward, so as to fill the space. There are twelve, or four to each dome. Mr. Richmond has already placed the mosaics in two spandrels and drawn the designs for the other ten and for the east end figures. At this rate of progress the dull interior of St. Paul's will in a few years glow and glitter with gold and bright glass mosaics, as it was meant to when the cathedral was first erected.—*N. Y. Times.*

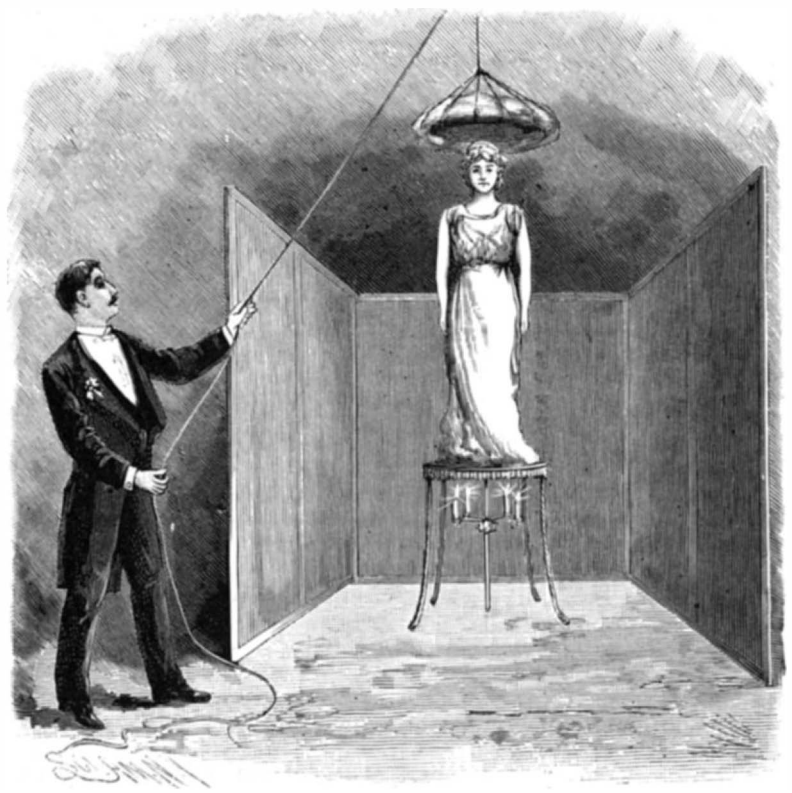
Cocaine Fatalities.

At a recent meeting of the Societe de Chirurgie, of Paris, a letter from Professor Germain See was read, in which he stated that he had collected particulars of two hundred and sixty accidents with hypodermic injections of cocaine, of which twenty-one terminated fatally. The professor considers the drug to be dangerous, and pronounces himself opposed to its employment.

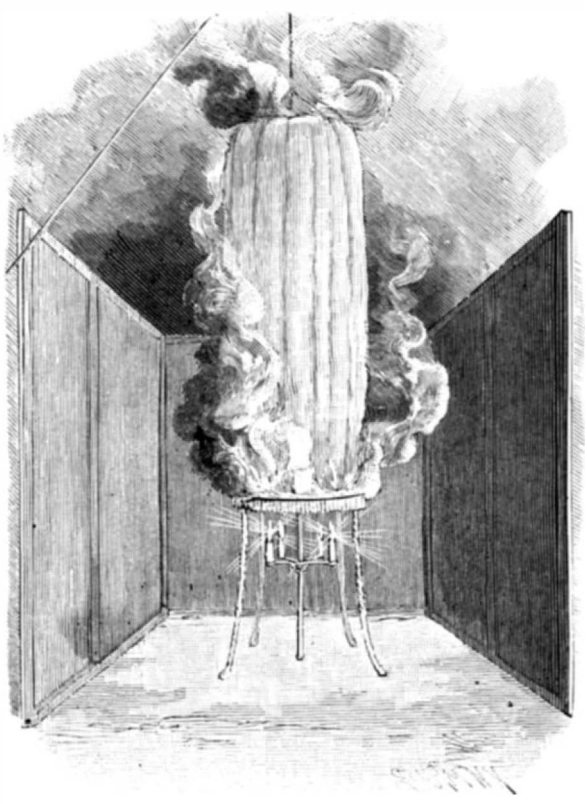
A WEIRD SPECTACLE.

During the season just closing, among various interesting things to be seen at the Eden Musee, perhaps the most interesting, and at the same time the most scientific, is the weird spectacle entitled "She," exhibited by Powell, the well known illusionist, and suggested by the Cave scene in Rider Haggard's celebrated novel "She."

In this scene a beautiful young lady mounts a table arranged in an alcove formed of a folding screen. Above the victim is suspended a cylindrical cloth screen. The screen is lowered to the level of the table, completely inclosing the subject. The table apparently has four legs, and four candles shown beneath it indicate that the space underneath the table is open and clear. The cylindrical screen is shown to be entire, with openings only at the upper and lower ends, and no openings are seen in the folding screen which partly surrounds the table. Upon the firing of a pistol the occupant of the table is ignited, and smoke and flame bursting from the screen indicate that the work of destruction is going on within. When the fire is burned out the screen is lifted, and nothing remains upon the table but a few smouldering embers and a pile of bones surmounted by a skull. Close observation does not reveal any way of escape for the young woman. It is, however, obvious that the magician cannot afford to sacrifice such a subject every evening, and the spectators are forced to conclude that the whole affair is a very clever trick. In fact, it is simply a modification of the beheaded lady and numerous other tricks based upon the use of plane mirrors. The table has but two legs, the other two which appear being simply reflections. The central standard supports but two candles, the other two being reflections. Underneath the table, and converging at the central standard, are arranged two plane mirrors at an angle of 90° with each other and 45° with the side panels of the screen. By means of this arrangement the side panels, which are of the same color as the central or back panel, are reflected in the mirror and appear as a continuation of the back panel. The triangular box, of which the mirrors form two sides, has a top composed in part of the table top and in part of mirror sections for reflecting the back panel, or with a covering of the same color as the back panel.



PREPARED FOR CREMATION.



THE BURNING.

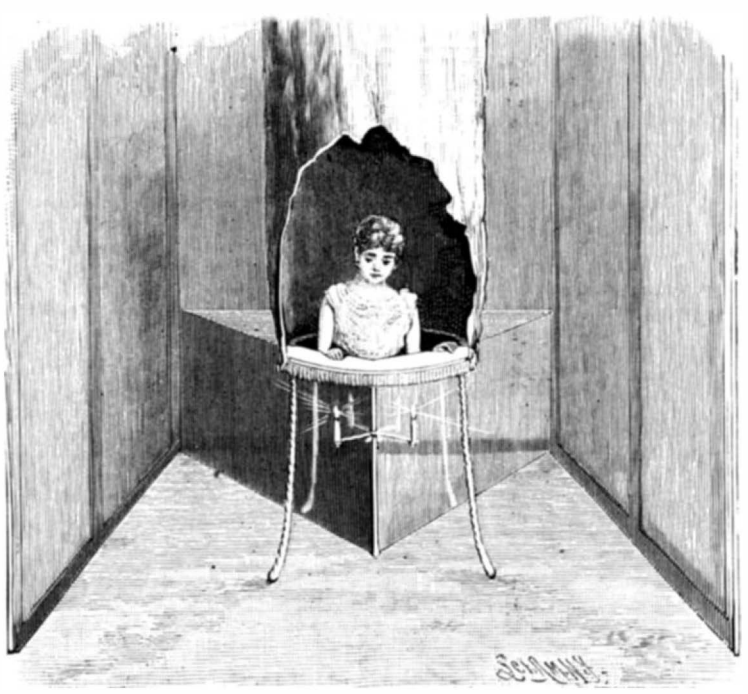
The operation of the apparatus is now obvious. When the victim is inclosed by the cylindrical screen, she immediately escapes through a trap door in the table top, places the bones and the fireworks upon the table, and at the firing of the pistol ignites the latter and retires, closing the trap door after her.

Injection of Brain Substance.

At a recent meeting of the Academie de Medecine, at Paris, Dr. Constantin Paul related his observations (*Sem. Méd.*) on eleven cases which he had treated by means of injections of brain substance into the subcutaneous cellular tissue. Three of the patients suffered from chlorotic neurasthenia, three from classic neurasthenia, one from permanently slow pulse, and four from locomotor ataxia. The liquid used was a ten per cent solution of the gray substance of the brain of the sheep, sterilized by carbonic acid in Arsonval's apparatus; the injections were made into the lumbar or gluteal region, the dose being five cubic centimeters [80 minims] at most.

This treatment is reported to have been well borne, as a rule producing no reaction, either local or general. In the two hundred odd injections made in the eleven patients, abscess or acneic pustules resulted in no instance; occasionally, however, slight lymphatic engorgement was observed, which disappeared in three or four or, at the most, seven days. The first effect noticed by the patient was a sensation of increased strength and comfort, the previous muscular weakness diminishing rapidly. The vertebral pains and spinal hyperæsthesia disappeared after a few injections; the lightning pains of the tabetic subjects, the neurasthenic headaches, the insomnia, and the cerebral impotence all vanished in their turn. The appetite returned, and those patients who were previously dyspeptic now assimilated their food so well that they began to increase in weight. In the tabetics sexual power returned with the general improvement. The author, therefore, considers the injections of gray brain substance a nerve tonic of no mean value.

Dr. Paul compares a neurasthenic patient with an accumulator which it is impossible to charge. While the morbid condition lasts, he is unable to transform his food into force; after the least effort his muscular and intellectual forces are exhausted. But, it is maintained, the injection of cerebral matter in the manner described promotes the utilization of food and its due assimilation; so that the nervous system now becomes a chargeable condenser by means of which the subject acquires force which he can dispose of at will. It should be noted that it is the nervous force which first returns in all these cases; subsequent to and consequent upon this, the power to do intellectual and muscular labor comes back, the improvement in the condition of the blood following later on.



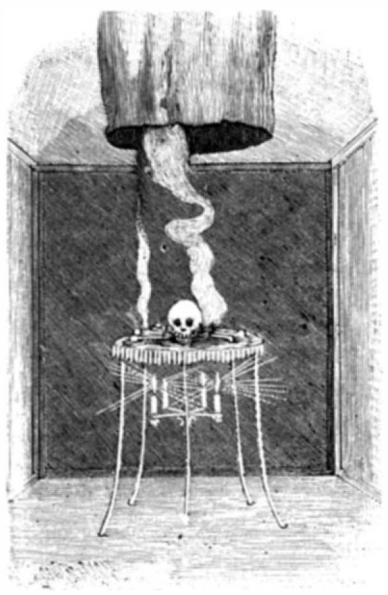
THE ESCAPE.

In conclusion, the doctor claims that the subcutaneous injection of brain substance alleviates and cures neurasthenia much more rapidly than the ordinary therapeutic measures, iron, arsenic, phosphates, opium, alcohol, etc.; and its action is more prompt and certain that that of hygiene alone, or that of suggestion, ovariotomy, or even electricity.—*Merck's Bulletin.*

The New Paris Labor Exchange.

The new Paris labor exchange has just been completed at a cost $1,600,000 and turned over to the trades unions. It is a bright and shining light in the solution of the problem of the unemployed that may show the way to the establishment of similar enterprises in other countries. Commerce, banking and trade have their business exchanges. Labor is very rapidly acquiring the intelligence to imitate the example set by business interests. Paris has 230 trades unions. The problem has been working itself out for the past three years of completing a labor center which shall stand in labor matters for exactly what the great Paris Bourse does in financial and commercial affairs. In fact, the magnificent building just completed is called the Bourse de Travail. While the new home of labor has been building, the new exchange enterprise has been actively in practice with such means as it had in hand. The labor exchange has nineteen bureaus, or offices, each headed by a paid delegate, and it publishes a monthly journal. Within the past twelve months it has obtained situations for about 300,000 persons.

According to the Boston *Globe*, the new Bourse de Travail has 150 rooms, a grand hall, a library, and a reading and amusement room in the basement, which will accommodate 1,000 unemployed men. In this great labor edifice contractors may consult and arbitrate with the heads of bureaus. Just as the current prices of stocks and produce are posted in the business exchanges, so on a great bulletin here are posted the daily prices of labor, the offerings of contractors and all that appertains to wages and industry, just as though an ordinary commodity were being dealt with. The city government of Paris has virtually given this magnificent institution to the trades unions, believing that it will soon pay for itself in the saving of strikes and bread riots. Many rich men have contributed generously to it and expressed the intention of heartily co-operating with its bureaus in the adjustment of industrial differences.



THE FINISH.

The chief guarantee of success in this enterprise is that the labor organizations have already demonstrated their ability to conduct the exchange with dignity, intelligence and sound business prudence. There is nothing of charity in the undertaking. It is an active, effective, and well organized fountain head, from which unemployed labor is distributed where it can occupy itself most successfully and remuneratively. The attainment of peace, arbitration and the meeting of the directors of labor and capital on equal terms is its central purpose. The Paris labor exchange has set an example which can hardly fail to be imitated in many great commercial and industrial nations.

Sweet Castor Oil.

In the progress of chemistry that nauseous but most useful medicine castor oil has been robbed of its disgusting qualities and converted into an agreeable sirup. It has in fact been born again and baptized with a new name, Palma Christi, or Oleum Ricini Aromaticum. All the cathartic qualities of the drug are retained, but the revolting oily taste is removed, and a sweet spicy flavor substituted, something like a combination of cinnamon and vanilla.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

SLEEPING CAR. — William Sneckner, Winthrop Hotel, 125th Street and Seventh Avenue, New York City. The upper berth, according to this invention, has a vertical movement, and the lower berth is independent of the upper one, there being locking devices to unite the two berths, and an elevating mechanism connected with one of the berths. The upper berth is virtually suspended from the car roof, and may be readily raised and concealed close to the roof when not in use, or lowered to any desired point, the lower berth being locked thereto, and both berths elevated and held near the roof, giving a maximum of head room over the seats, which need not be employed as receptacles for clothing. The seats are also foldable, to present a table surface for the lower berth, or the latter may be held in such position that the seats may be used in dressing and undressing, the sections being separated also by partitions with sliding panels.

CAR COUPLING—William P. Clark, Elberton, Ga. A horizontally swinging hook is pivoted in and projects from the drawhead, in the side of which a spring-pressed dog swings horizontally in the side of the drawhead opposite the hook, to engage the hook of an opposing coupling, while a lever mechanism moves the dog against the spring. The device automatically couples with an opposing coupling, and it may be operated from the sides of the car or from a platform, while its construction is such that, if the coupling hook of one coupling breaks, the other coupling hook will hold the cars together.

CAR BRAKE.—James W. Fisher, Palouse, Washington. The brake shoes of this device are adapted to engage the rails instead of the car wheels, a shaft carrying arms pivotally connected with the brake shoes, while a chain is connected with the free end of an arm projecting from the shaft, the chain being connected with an arm on a second shaft, which may be turned by hand or power. The device is of strong and simple construction, and designed to facilitate the quick stoppage of trains on which it is used.

RAIL JOINT.—Richard Roxby, Dartmouth, Canada. Overlapping sheaths are by this invention adapted to be secured to the meeting ends of the rails, the sheaths being disconnected at their overlapping ends from each other to form a sliding joint, and shaped to fit the lower portions of the rails, one of the sheaths having thinned ends and the opposite sheath having an enlarged portion to fit over the adjacent sheath. The meeting ends of the rails are thus held together, so that they cannot move laterally or vertically, although having the proper play to allow for expansion and contraction, and the device may be used whether or not the joint comes above a supporting tie.

Mechanical.

CLUTCH.—John S. Adams, New Orleans, La. According to this improvement, a lever mechanism is connected with two sliding blocks and a sliding sleeve for alternately operating the blocks by a continuous movement of the sleeve, a brake sleeve held on one of the blocks engaging the pulley to be driven. The device is so arranged as to permit of gradually applying the friction lock, and when the speed of the driving and driven parts is nearly equal, the friction lock is broken and the positive lock is actuated to connect the two parts, thus forming a direct or positive coupling.

STAPLE DRIVING MACHINE.—Gilbert Hay, Madison, Neb. This is a simple and rapid-working machine for forcing metallic staples through a seam, the invention more especially improving the feeding mechanism, so that the staples may be fed one by one and held in a suitable position for driving, the machine being also especially intended for setting staples in leather goods, for the purpose of securing seams, instead of using rivet fastenings.

NUT LOCK.—Waters B. Parrot, Elizabeth, N. J. The washer used with this improvement has one face formed as a series of inclined planes, a locking box or shell screwed on the bolt having a lug engaging the planes of the washer, while an elastic washer, carried by the bolt, engages the inner surface of the shell, and a jam nut screwed on the bolt enters the shell and engages the washer. The device is of simple, durable, and inexpensive construction.

GLASS POLISHING MACHINE.—Ferdinand K. Maximilian, New York City. This is a machine designed especially for polishing the beveled edges of plate glass, the improvement increasing the capacity of the machine and reducing the cost of labor. It has two beds, with a passageway between, longitudinal guide rods at each side of each bed, connected with a transverse rod at one end, standards on the guide rods supporting a rubber frame consisting of cross bars and adjustable longitudinal rubber-carrying bars, in combination with means for reciprocating the frame on the beds.

VENEERING MACHINE. — Charles Sprewitz, New York City. A simple and durable machine is provided by this invention, whereby veneers may be effectively and expeditiously flattened, heated, and set in large quantities. A series of tables, some of them adjustable, is located one above the other, each table having an inlet and outlet opening, and a body section with a marginal rib upon one face, and also a series of spurs, while a cover plate conceals the spurs and is attached to the ribs, weights and links being connected with the movable tables, whereby they move together, while pressure devices exert tension upon the tables.

Agricultural.

CORN HARVESTING MACHINE.—James Clements, John Clements, and Fred. H. Rollins, Lake City, Iowa. This is a machine to be drawn lengthwise over a row of corn, picking the ears from the stalks, husking the corn, and delivering the husked ears into an adjacent wagon or other receptacle. The machine comprises a portable frame, in which is a central passageway, with compressor shoes on its opposite sides, a flanged vertical beater being on one side of the passageway, and a guard board opposite the beater, while an elevator adjacent to the guard board delivers into a husker, and another elevator receives the husked corn. The machine is designed to operate rapidly, and do the work as nicely as it could be done by hand.

HAY RACK.—William T. Wallace, Beloit, Kansas. This invention is designed to simplify the construction of racks, and provides one capable of being built in a durable and economic manner. This improved rack is made in one or more adjustable sections, to readily increase or diminish its area, the sections being quickly and conveniently united, and the arrangement being such that any of the sections may be made to fold downward to expose more or less of the contents of the rack.

HARVESTER BRAKE.—Daniel E. Mentzel, Spangle, Washington. The "steer wheels" of harvesters or headers are, by this invention, provided with a device by which the operator may quickly and conveniently apply the brake in such a way as to retard the speed of the implement or fully stop it, the brake being held without the aid of the operator, in more or less close engagement with the wheel. The handle of the brake lever is immediately back of the operator, who draws the handle toward him in applying the brake, carrying the lever outward in removing the brake.

POISON DISTRIBUTER.—Harry J. Hill, Perry's Mills, N. Y. This is a machine to be moved forward between rows of plants, in wheelbarrow style, a powder-distributing cylinder projecting from each side, so that two rows of plants will be sprinkled at the same time. The distributing cylinders are revolved by means of connections with the front wheel, as the device is moved along, the height of the cylinders being adjustable as desired, and being protected by hoods from wind and rain.

Miscellaneous.

EVAPORATING PAN.—Harrison F. Thurston, Centre Bartlett, N. H. A receptacle having depending hollow flanges rests on a flat ash box, a series of curved hollow flanges extending centrally from the receptacle to the box, and terminating adjacent to the outlet, to form flues, there being a tank on the rear end of the ash box, connected by a siphon pipe with the receptacle, while a supplemental pan within has flanges resting on the edges of the evaporating receptacle. This evaporator has very large heating surface, and is designed to rapidly reduce sap to sirup and boil the sirup to sugar.

DAM.—Otte Van Oostrum, Portland, Oregon. This dam, to be made either of cast or sheet metal, or partly of wood and partly of metal, is designed to stop the flow of water in small ditches, such as are used for purposes of irrigation. It has side wings with vertical grooves, in which slides a gate with an opening, and an auxillagy gate sliding therein. The dam is put into position by forcing the side plates down into the dirt at opposite sides of the ditch, and then introducing the central plate with its door.

WELL BORING AND PROSPECTING.—George A. Miller, Colfax, Washington. This invention provides an improved method of drilling and excavating for making a well or prospecting for minerals. A heavy drill is operated in a reciprocatory manner by mechanical means, falling by gravity; after a seat for the explosive has been formed within the earth, the explosive is dropped to position and fired by allowing the drill shaft and cap to drop on it, thus thoroughly breaking up the rock through which the well is being bored.

COFFEE POT. — William H. Wrigley, New Orleans, La. Depending from the cover opening of this coffee pot is a perforated cylindrical coffee holder, in which the coffee is placed, and within the coffee holder is placed a smaller perforated cylinder depending from the cover, through which hot water is supplied to percolate through the coffee to the main portion of the pot below.

GLOVE FASTENING.—August V. Demange and Jules M. R. Hervieu, Paris, France. This is a simple, neat, and ornamental device for affording a hooked connection between the vent edges of the glove, providing a convenient hook and loop fastening, of which the hook piece may be concealed when the glove is not in use. Each of the fasteners is composed of a hook section and a loop section that may be quickly interlocked when the glove is closed on the wrist of the wearer, any desired number of the fasteners being readily attached to the glove.

POCKET ATTACHMENT.—Sally Salinger, New York City. This is a safety attachment for use in the ordinary garment pockets, and is readily applied to or removed from the pocket. It is composed of hinged jaws, one of which has slots with perforated lugs on opposite sides of each slot, pins sliding in each pair of lugs to attach the frame to a garment pocket. In fastening a bag to a garment pocket the pins are made to pass through a portion of the bag.

BASE BALL GAME.—Morris Ullman, Washington, D. C. This is a game for use at summer resorts, excursion grounds, etc., affording amusement and serving to test the accuracy and strength of the throwing arm of the player. A pivoted pendulum at the rear of a rigid target frame is moved by the impact of the ball through different distances or arcs, making an electrical connection which moves an indicator according to the force and accuracy of the blow, the several figures representing the different players in the field, being electrically connected, if desired, with the main electrical circuit, and arranged to be moved about by the closing of the circuit.

PESSARY.—Horace H. Taylor, Fresno, Cal. This is an elastic, hollow, longitudinally extensible device, with its upper and lower extremities of greater thickness than its side walls, and with a specially constructed support for the device when in place.

TYPE-WRITING MACHINE.—William J. Borden, Hico, and Jahu W. Johnson, Houston, Texas. This is a machine especially designed for writing upon blank books, facilitating the making of official records in improved style, while it is also capable of use for the ordinary work of type-writers. Spring-pressed type are carried by the type wheel, which is supported by an oscillating frame connected with an actuating mechanism, a shifting and driving mechanism being also connected with the wheel, while a trip mechanism in the path of its rotation acts successively upon the type. The frame is journaled in a vertically movable carriage, upon which a sleeve slides laterally, arms projecting from the sleeve engaging the type wheel at opposite sides. Owing to the manner in which the line spacing and letter spacing is effected, type of different sizes may be employed.

LAND AND WATER VELOCIPEDE. — Theodore G. P. Vogt, Passaic, N. J. This is a light, strong vehicle, adapted for manual propulsion on land or water, without change of adjustment or parts, and carrying several persons. It has two long, end-tapered, air-tight hulls, spaced apart by a yoke bar at each end, and with a water wheel between them, near the center, while upon a transverse axle are two hollow main tricycle wheels, with air chambers and radial paddles and a peripheral elastic tire. There is a forward hollow air-tight steering wheel, swiveling and rotating between the hulls; two saddles on the wheel case, with treadle gears below for each saddle, sprocket gearing and chains connecting with the axle of the main wheels, with other novel features, the principal parts being made to contain air, so that in water the vehicle becomes a floating raft, with means for propulsion and steering.

TRICYCLE. — Archie McDougall, Salt Lake City, Utah Ter. The driver may use his hands and his feet in propelling this vehicle, which is thus designed to be driven with great speed. It has parallel driving wheels connected by the driving axle, a steering wheel in advance being connected by a reach with a frame on the driving axle, while a sprocket wheel pivoted on the axle frame is connected by a chain with a sprocket wheel on the axle, and an oscillating and revoluble lever pivoted on the reach is connected by a rod and crank with the driving sprocket wheel, there being also a sprocket wheel and chain connection between the oscillating lever and the steering fork.

BLANK BOOK.—James W. Burris, Uvalde, Texas. According to this improvement, blank sheets are secured to a binding forming the back of the book, so that the attachment and detachment of the sheets may be conveniently effected, the book being thus particularly adapted for the use of typewriters and other copyists. The backing piece or binder for the sheets is flat, and has a series of parallel rows of perforations through which cord loops are drawn, the several perforations of adjacent rows being out of alignment. In securing a pack of sheets to the backing, the several loops are drawn through perforations in the sheets and also interlocked on their inner side.

LAWN SPRINKLER.—Charles H. Baker, Bay City, Mich. A rotary deflecting cone, provided with a series of distributing wings, is arranged above the discharge end of the nozzle of the sprinkler, the lower part of the nozzle having a screw-threaded inlet for connection with a hose, while below this is a downwardly projecting leg adapted to stick into the ground to hold the whole device in upright position. By the novel means of attachment of the tilting frame having the rotating cone within it, the issuing water may be sprayed through the area of an entire circle, or through only three-fourths, a half, or a quarter of a circle, as desired.

OVEN THERMOMETER.—Harvey Murdock, Brooklyn, N. Y. A simple thermostat is provided by this invention to operate by its own expansion directly upon an indicator, without the use of levers of any kind. An expansible and revoluble rod is suspended by one end in a hanger within the oven, the rod and the hanger having a screw-thread connection, and the outer end of the rod having an external indicating hand passing over a dial on the outside of the oven door. As the rod expands with the rising temperature, the screw-thread of the hanger, acting on that of the rod, gives the latter a rotary motion, which is indicated by the hand on the dial, the latter being properly marked to indicate the corresponding temperature.

WASHING MACHINE. — Frederick M. Webster, Somerville, Mass. This device is designed to be conveniently applied to either a set or a portable washtub, and operates to keep the clothes well covered with suds while rapidly washing them. In a frame designed to set well down in the tub are journaled three spring-pressed corrugated rollers, two below and one immediately above a crank arm extending from the latter, by revolving which the clothing is drawn between the rollers. By oscillating the crank the rollers are worked backward and forward to give the clothing the necessary amount of rubbing and squeezing.

BALL BEARING.—Friedrich A. Gruneberg, New York City. This improvement is especially applicable to the fifth wheels of vehicles, providing therefor ball or roller bearings in a simple and economic manner, the attachment being readily made to any fifth wheel. A pocket plate is located between the upper and lower fifth wheel sections, and held to operate jointly with them by the king bolt, the pocket plate holding the balls in position while leaving them free to turn in their pockets.

MUSICAL INSTRUMENT.—William Carter, Albion, N. Y. A "nasalette" is the name given this instrument, which has a nose cap, or hood, forming a receiver for air blown from the nostrils, a duct directing the air downward from the receiver, and a tubular mouth-piece connected with the duct below, and provided with a sounding strip, for the air expelled from the hood-shaped receiver and through the mouth-piece. By the player working or changing the position of his tongue it is designed to vary the sound and obtain any desired tone.

PANTALOONS HANGER.—Charles T. N. Engels, Middlesborough, Ky. This device consists of parallel connected rocking strands or wires, each having an outward projecting arm, or jaw, movable toward and from each other, according to the direction in which the wires are rocked, the latter being bowed or bent outward to form means for rocking them. The improvement forms a ready attachment to opposite sides of a waistband, to be suspended from a convenient support, whereby both legs and both sides of the body will receive equal tension.

TOWEL BRACKET.—Wm. A. Neidhardt, New York City. Supplemental end brackets are secured to the wall plate, one of the brackets having an outer shell and a removable inner portion, and one of them having its shell slotted at the top, and a lock to hold the two parts of the slotted bracket together. The device holds the towel upon a roller in convenient position for use, but so that it may be locked in place and cannot be removed without unlocking it.

ANIMAL TRAP. — Joseph Klar and Frank H. Hall, Anna, Ill. This is a trap for catching rats and mice, in which, as the animal enters and takes the bait, a pivoted chute or runway is carried down to close the inlet opening. When the animal seeks to escape, in traveling over this runway it sets the trap for another victim. There is in conjunction with the trap a cell, into which the animal is likely to enter to escape from the trap, but from which it is impossible for the animal to return to the trap.

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Notes & Queries

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

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

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

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

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

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(4439) R. E. H. asks: Can you through the Notes and Queries column of your paper tell me of any equitable rules for time allowance based on load water line for steam yacht races? A. The American Yacht Club uses the following rule for the larger class of steam yachts. The time allowance is the difference between the time actually made over the course and the computed time by the formula of: Speed in knots per hour=

$$2.7\times\sqrt[3]{\text{length in feet on the water line}}.$$

If the computed time is less than the actual time, the least difference is the winner. If it is greater than the actual time, the greatest difference is the winner. For the small steam launches, the speed in knots per hour divided by the cube root of the length in feet on the water line $\left(\frac{\text{speed}}{\sqrt[3]{\text{length}}}\right)$ equals the merit of the race.

(4440) A. P. H. writes: Can you tell me what volume 100 cubic feet of carbon dioxide (CO_2) at atmospheric pressure and 60° Fah. temperature will occupy when compressed to a liquid? In other words, how do the volumes of gaseous CO_2 compare with the liquid CO_2? A. The specific gravity of liquid carbondioxideis at −10° C. 0·9951; at 0° C. 0·9470; at 20° C. 0·8266. The latter temperature corresponds to 68° Fah., at which the amount named would occupy the volume of 98,755 grains of water or about 390 inches; at 60° Fah. the volume would be approximately that of 95,609 grains of water or about 379 cubic inches.

(4441) K. N. asks: How many cubic feet or hundredweights of ice is needed to cool a space of 1,000 cubic feet of an ice box (lined throughout with 4 inches sawdust) to about 40° Fah.? A. The melting of 100 pounds of ice should be enough to cool the ice box to 40° from our summer temperature, if it is perfectly tight; but as ice boxes are generally made and used, a constant storage of from 300 to 400 pounds of ice is not too much.

(4442) F. B. W. asks: 1. What causes the so-called heat lightning? A. So-called heat lightning is simply the ordinary discharge of lightning at a great distance. What is seen is merely the reflection of the light from the lightning and the storm on account of its great distance. 2. Why is it not accompanied by thunder? 3. Is it considered dangerous? If not, why? A. No, for the reason just given.

(4443) H. M. R. asks for the components used for the production of the lead tree in a bottle. I may mention that there are men in London that peddle the powder in the streets at 1 penny per packet with the wire. A. The powder is lead acetate or sugar of lead; the wire is zinc.

(4444) F. W., Chicago, writes: Will you please suggest some way to me through the SCIENTIFIC AMERICAN of removing or lessening the dampness in my basement? It rusts my tools, spoils everything I put down there, and the unpleasant odor makes it very annoying. A. The only approved way of removing the nuisance of damp cellars in Chicago soil is to make a concrete floor with Portland cement, using gravel or sand with the cement at least 2 inches thick, and plaster the walls 2 to 3 feet high all around with Portland cement. Then cover floor and sides with a thin coat of asphalt put on hot. Then lay a floor so as to have a clear space underneath and arranged to connect with outer air through ventilators. Sides of basement to be furred off, lathed and plastered. You have parties in Chicago that do this work.

(4445) N. E. C. asks: What language contains the largest number of words? A. The Chinese anguage is supposed to have the largest number of words. The English language contains about 120,000 words, including technical words; the German language about 80,000 words.

NEW BOOKS AND PUBLICATIONS.

SEA SIDE AND WAY SIDE. By Julia McNair Wright. Boston: D. C. Heath & Co. 1892. Pp. viii, 361. Price 70 cents. No index.

This charming book is the fourth of the series of nature readers, of which we have already reviewed several in this paper. It begins with the formation of the earth, goes through the different geological eras, and then treats of modern natural history. The whole is comprised in 50 reading lessons, is excellently printed and with creditable illustrations as required. We believe a good work is done in providing for the young this class of reader, in order to direct their thoughts to the marvels of nature.

SAFE BUILDING. By Louis De Coppet Berg, F.A.I.A. Vol. II. Boston: Ticknor & Company. 1892. Pp. xv, 279, with additional tables. Price $5.

The first volume of this book has received already such encomiums and such wide circulation among the profession that the present work will meet of course with the same circulation, as it is essential to complete the book. It starts with chapter 8, and is devoted to iron structure, and in it the manufacture of iron and its quality receive very full consideration. Iron is departed from under a section devoted to trusses, where something is said of wooden trusses also, but the metal is pre-eminently the subject of this second volume. A very exhaustive general index, filling nearly 20 pages, is a most commendable feature.

JOHNSON'S TABLES. By J. B. Johnson. New York: John Wiley & Son. 1892. Pp. vii, 99. Price $1.25.

Stadia and earthwork tables, four-place logarithms, logarithmic traverse table, natural functions, map projections, etc., reprinted from Professor Johnson's work on the theory and practice of surveying, are the matter of the present volume, preceded by chapter 13 of the original work, upon the measurement of volumes. It is believed that the great use made by engineers of these tables and formulas justifies their separate reproduction, and we have no doubt the work will be found justified by the acceptance it will receive from the profession.

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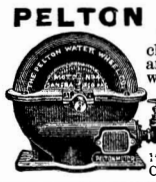

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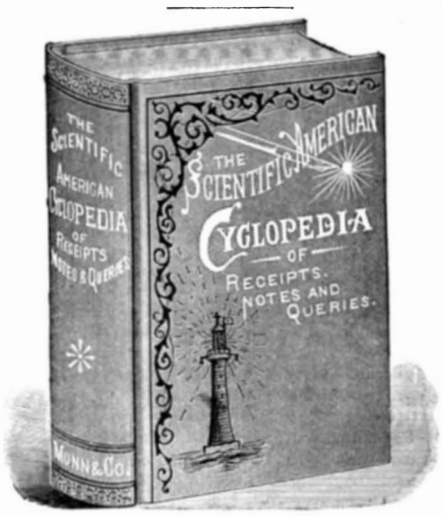

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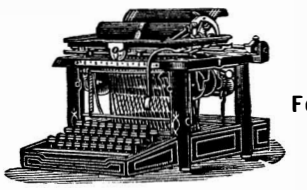

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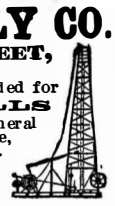

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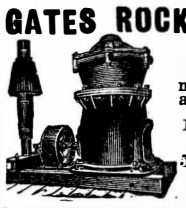

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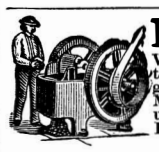

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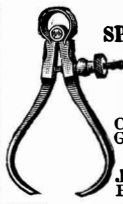

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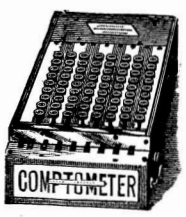

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PROPOSALS.

NOTICE TO ARCHITECTS.

THE Honorable the Chief Commissioner of Lands and Works hereby invites Architects to submit, on or before the 30th September next, (competitive) plans and estimates of cost for the construction of certain Provincial Government Buildings.

Particulars of competition and further information can be obtained from the undersigned.

W. S. GORE,
Deputy Commissioner of Lands & Works.
Lands and Works Department,
Victoria, B. C., 16th June, 1892. je16

PROPOSALS FOR DREDGING PLANT, UNITED States Engineer Office, Improving Mississippi River, 4th District, No. 1 Prytania Street, New Orleans, La., June 1, 1892.—Sealed proposals, in duplicate, will be received at this office until 11 o'clock a. m. Monday, August 1, 1892, for building or leasing a dredging plant for use at the works of improvement at the junction of the Mississippi, Red and Atchafalaya Rivers, near Turnbull Island, Louisiana, U. S. A. Specifications, maps, blank forms of proposal and detailed information will be furnished on application to this office. The attention of bidders is invited to the Acts of Congress approved February 27, 1885, and February 23, 1887, vol. 23, page 332, and vol. 24, page 414, Statutes at Large, prohibiting the employment of convict labor or the labor of "assisted" foreign immigrants brought into this country for the purpose under contract or agreement. Preference will be given to articles of domestic manufacture. The right is reserved to reject any or all proposals. JOHN MILLIS, 1st Lieut. Corps of Engineers, U. S. Army.

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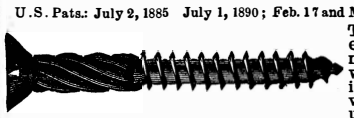
U.S. Pats.: July 2, 1885 July 1, 1890; Feb. 17 and Mar. 15, 1892.



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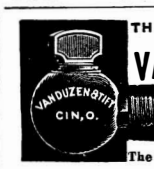

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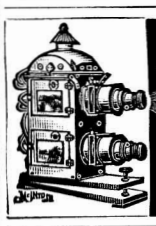

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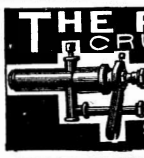

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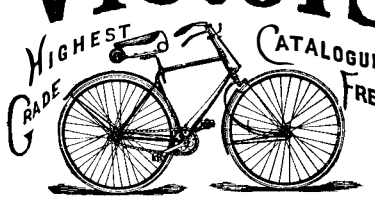

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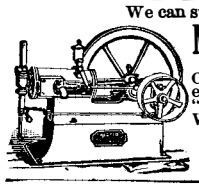

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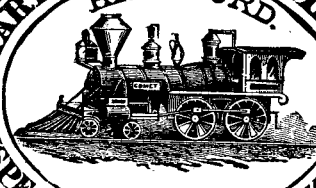

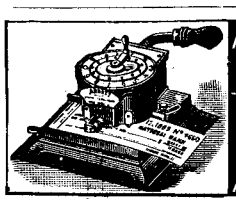

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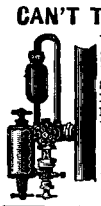

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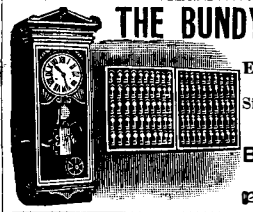

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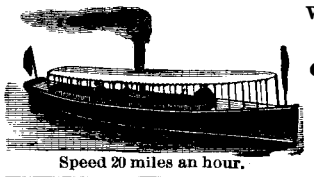

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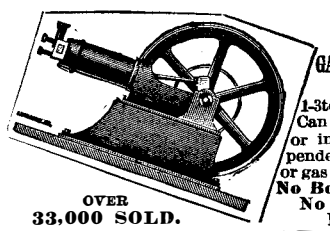

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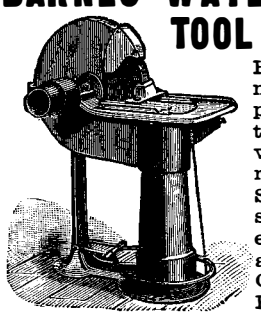

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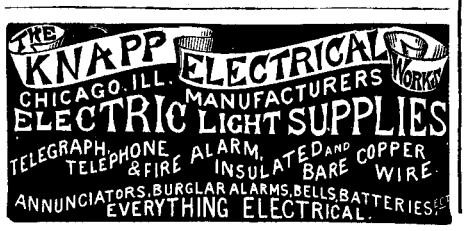

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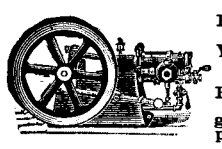

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