SCIENTIFIC AMERICAN

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THE NEW FRENCH ATLANTIC STEAMSHIP LA BOURGOGNE.

This magnificent vessel, of which we give an illustration, is one of the four recently constructed for the Compagnie Generale Transatlantique by the Societe des Forges, at La Seyne, on the Mediterranean. The three other boats are the La Champagne, La Bretagne, and La Gascogne. To all these have been added improvements on the La Normandie, which is considered one of the finest types of the European commercial marine. These vessels have been built expressly for the postal service between Havre and New York, under a contract with the French Government, and their minimum speed will be fifteen knots an hour.

The length of this ship, La Bourgogne, is 480 feet, with a beam of 48 feet. The hull is constructed of steel, and subdivided into several compartments, which will (with the steam pump) prevent the sinking of the ship in case of accident of any kind. She carries 800 tons of water ballast, and as the coal (of which there is a daily consumption of 150 tons) is consumed, its room is filled by water, so that the screw is always submerged. The engines of the La Bourgogne are of 8,000 horse power, and the main shaft of the propeller, which has four blades, is 21 feet in diameter, and divided into three cranks, weighing about fifty tons. The Bourgogne has eight steel boilers, and the average duration of the voyage will be eight days in summer and nine in winter. But it is not alone to the acceleration of the voyage that attention has been directed; special regard has been given to the safety and to the comfort of the passengers. As for safety, all chance of collision during the night, or fire arising from the carelessness of the crew or passengers, is guarded against. The electric light is employed, not only on the masts and bows, but is used in the cabins and passenger saloons, which latter are very capacious and well ventilated. Berths are provided with comfortable beds and bedding; the table is well kept; the provisions are always fresh, abundant, and of the best quality, and the arrangements of the cuisine excellent. Wine is provided *ad libitum* at table, and there is an unlimited supply of drinking water and ice; and a distilling apparatus is also in use. The ship is commanded by Captain Frangeul, one of the oldest and most distinguished officers of the company; his maritime career has been signalized by acts of courage for which he has been awarded the "Croix de la Legion d'Honneur."

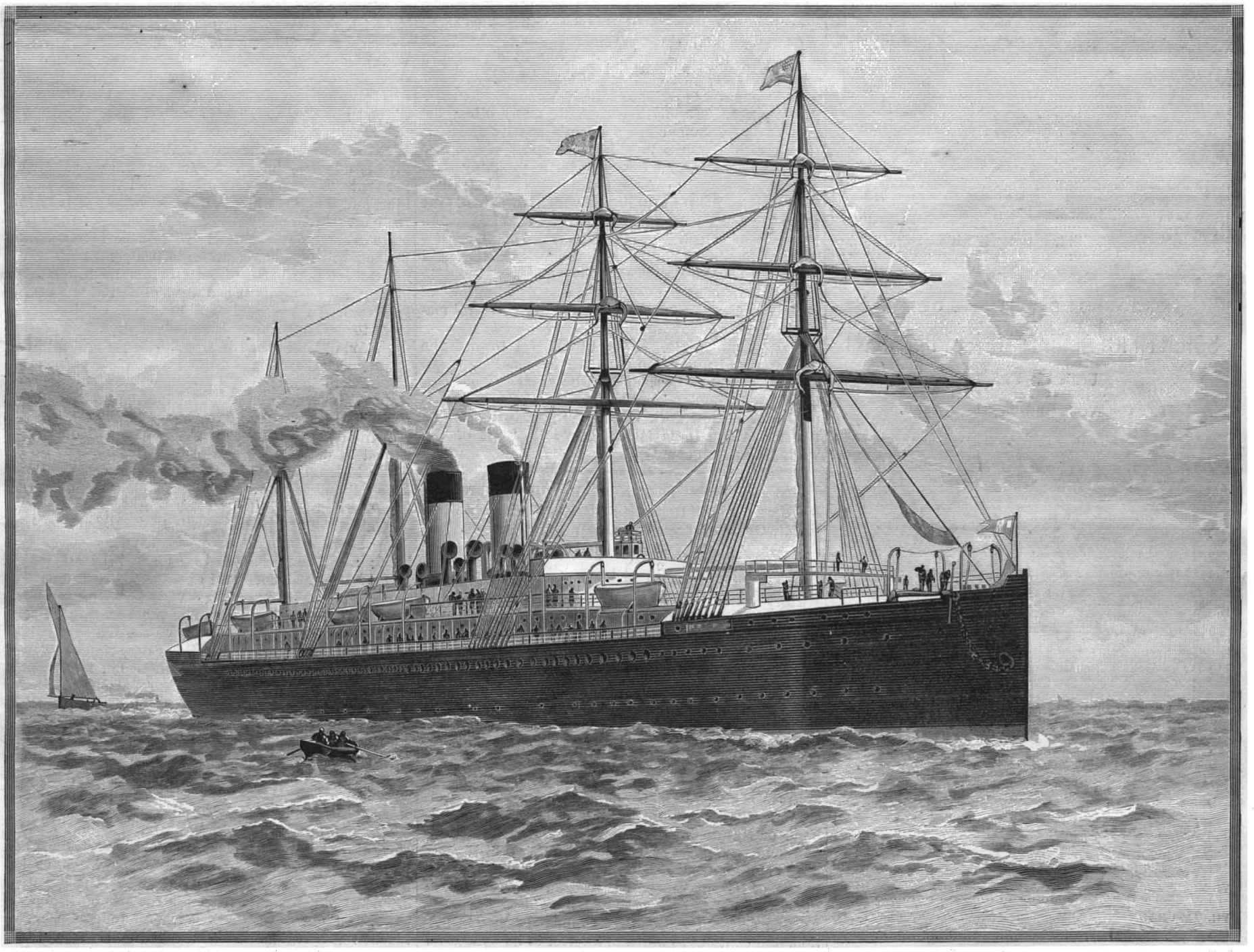
M. Eugene Pereire, who has succeeded his relatives, the celebrated Emile and Isaac Pereire, in the office of President of the Compagnie Transatlantique, has profited by the errors of some other companies, and has directed his operations in a spirit of progress with considerable energy, and with a success worthy of emulation.—*Illustrated London News.*

The Extinction of Kilauea.

On March 6 the active volcano of Kilauea, in the Sandwich Islands, composed of the old Lake Halemaumau and the New Lake, sank from the bed of the crater, leaving a bottomless abyss about four miles in circumference. The volcanic eruption which has been so active in the past was utterly extinguished.

During the latter part of 1885, both lakes were very active, and boiled and surged from side to side with unusual violence. In the middle of December the New Lake commenced building a wall for itself, which by the first of March had covered its surface. On the evening of the 6th, both lakes were full of boiling and surging lava, and were particularly brilliant up to half past nine o'clock. At that time a series of earthquake shocks began, forty-three in number, which lasted until half past seven the next morning. After the fourth shock, the fires of the New Lake had entirely disappeared, and only a slight reflection from Halemaumau was visible. During several days following, cracks and rents were made in the surrounding wall, and immense quantities of steam and vapor rose above the crater. Several upheavals occurred to change the entire configuration of the immediate surroundings. Large portions of the edge of the crater fell into the gulf with a sound like thunder. The cone in the New Lake disappeared entirely, while the bottom of the lake can still be seen 500 to 600 feet below its former level; but of Halemaumau nothing is visible but a gaping abyss, four miles in circumference.

It is possible that the volcanic fires will never be renewed, and that Kilauea will be classed with that large list of extinct volcanoes which tell of past energy and fire. The islanders, it is reported, do not admit this probability, as it would rob them of one of their greatest attractions for tourists. They hold that the lava has found some temporary subterranean outlet, where it may be expected soon to solidify, and being thus cut off from other escape will again fill the crater of Kilauea and recall its dispersed students.



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NEW YORK, SATURDAY, MAY 1, 1886.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 589

For the Week Ending May 1, 1886.

Price 10 cents. For sale by all newsdealers.

INVENTIONS WANTED IN INDIA.

The present industrial requirements of India is the subject of a very interesting communication received from an esteemed correspondent in Calcutta, whose position as proprietor of a large tea estate has given him an excellent opportunity for observation. His suggestions will be of interest to American inventors, as they point out new fields for the application of that ingenuity which has already given to American inventions such an enviable pre-eminence in the markets of both hemispheres. After a long period of apparent mechanical inertia, India is now evincing a progressiveness which will make her a country whose acquaintance it will be very desirable to cultivate. As her resources are still largely agricultural, one of the first demands is for improved farming tools and appliances. In tea culture, improved machines for rolling the leaf after withering, for firing, sorting, and sifting, are in demand, and would be heartily welcomed by many planters. In handling silk, a great disadvantage is at present experienced from the difficulty of producing an even thread. The fiber of the native silk is excellent, but the manipulations which it subsequently undergoes are so imperfectly performed that the product comes out an inferior article. India, it will be remembered, is the old home of the sugar cane, and improved crushing machinery finds ready market. One firm alone makes over a hundred thousand dollars annually in royalties from its patent mill. The indigo industry has been brought to considerable perfection, though there is still room for improvement in the chemical and mechanical manipulations. In addition, there are large amounts of crude products, such as oil seeds, jute, and cotton, which are exported, but which could be worked up at home to good advantage were suitable manufacturing processes available.

As all of these industries require large quantities of worked timber for boxes, buildings, carts, tool mountings, etc., there is an excellent market, our correspondent adds, for woodworking machinery. In many parts of the empire there are valuable forests, but the lack of sawmills prevents them from being utilized. The demand is particularly for portable machines which can be conveniently moved from place to place as demand and timber supply require. The mining implements of India are still very primitive, though the development of the petroleum industry has created a demand for improved boring tools. Steam launches and barges are coming into more general use, and considerable progress is shown in this direction. The railways have effected a marked mechanical advance. They now manufacture their own locomotives and most other appliances for railway service. We might enumerate many other departments from our correspondent's lengthy and carefully compiled notes in which this spirit of progressiveness is manifest, but we have probably said enough to convince American inventors that there is already a field in India in which to extend the success achieved at home, and it is a field the importance of which is annually increasing. Our correspondent thinks our manufacturers, exporters, and inventors will be unwise if they overlook India in their pursuit of new avenues for the distribution of their merchandise and the introduction of useful machinery and patent appliances.

The patent laws of India are liberal toward the inventor, and protection is as readily accorded there as in other countries; and with steam communication between England and India as regular as the boats ply between New York and Fall River, to which add the telegraph, India is no longer an "out of the world, barbarian country."

THE AMERICAN MUSEUM OF NATURAL HISTORY.

We want to call the special attention of our readers to Mr. Gratacap's very interesting description in the SCIENTIFIC AMERICAN of April 17 of the more prominent specimens to be found in the paleontological department of the American Museum of Natural History at Central Park, New York. We believe that the institution is not as fully appreciated and used as it should be, because it is not very well known to the public.

We are sure that a great many more people would avail themselves of its treasures if they only knew how much there is there to claim their interest. And a word in regard to our illustrations. We have, it is true, built up an ideal picture in order to present more vividly those extinct organisms which once inhabited the land and sea, but our artist has not drawn upon his imagination for even the slightest detail. Both fauna and flora are exact reproductions of the actual specimens, just as the hand of Nature inclosed them between the limestone and sandstone pages of her great geological history.

The Museum is located on Eighth Avenue, at the corner of Seventy-seventh Street, on the west side of the Park, and is easily reached by way of the Sixth Avenue elevated railroad. It is open for free inspection, and contains so much of interest in its collections of minerals, fossils, natural history specimens, native woods, etc., that we are confident any and all of our readers, whether particularly scientific or not, must feel well repaid for the trouble of a visit by the pleasure of a careful examination. We hope that the educational importance of the collection will in the future be better understood and appreciated.

NATIONAL ACADEMY OF SCIENCES.—ANNUAL MEETING AT WASHINGTON.

The regular annual meeting of the National Academy of Sciences was held at the Smithsonian Institution, April 20 and for several subsequent days, President O. C. Marsh in the chair. (See portrait on another page.)

The attendance of members was the largest ever known in the history of the Academy, including the following: Cleveland Abbe, Spencer F. Baird, George F. Barker, A. Graham Bell, John S. Billings, W. K. Brooks, John H. C. Coffin, Edward D. Cope, Clarence E. Dutton, William Ferril, Grove K. Gilbert, Theodore N. Gill, Arnold Hague, Asaph Hall, Julius E. Hilgard, George W. Hill, T. Sterry Hunt, Samuel P. Langley, Alfred M. Mayer, Montgomery C. Meigs, Henry Mitchell, S. Weir Mitchell, Edward S. Morse, Simon Newcomb, H. A. Newton, A. S. Packard, John W. Powell, Raphael Pumpelly, Ira Remsen, Ogden N. Rood, Henry A. Rowland, Charles A. Schott, Samuel H. Scudder, William Sellers, Sidney I. Smith, Arthur W. Wright, and Charles A. Young.

The session was especially signalized by the conferring of the first medal ever awarded by the Academy—the Henry Draper gold medal, of the value of $200, placed at the disposal of the Academy by the widow of the late Henry Draper, and awarded by a committee of the Academy for the best original researches in astronomical physics.

The award was not restricted to the limits of the Academy, but was to go to the most successful discoverer in all the world. After careful consideration, the committee reported that it was best deserved by a fellow member, Prof. Samuel P. Langley, of the Allegheny Observatory, for his researches into the wave lengths of light in the infra-red and ultra-violet portions of the spectrum.

In presenting the medal, President Marsh gave a synopsis of Prof. Langley's scientific researches, extending over the last fifteen years. In 1869 he observed the solar eclipse, and again in 1870, going to Spain the latter year. In 1875 he demonstrated the absorption of violet rays by the sun's atmosphere. In 1876 he studied the distribution of heat on the sun, and the limits within which sun spots affect climate, proving that they cannot make a difference of 1° Fah., and continued investigations of solar heat and its effect upon the earth for several years following. In 1878 he investigated the solar spectrum from Pike's Peak, and showed that the rays of the "great group A" were double. In 1881 he carried out the expedition to Mount Whitney, and ascertained that the amount of the sun's heat had previously been greatly underestimated. He increased the estimate 50 per cent. He also determined the fact that the sun is blue, and that the white light which we see is only the remnant sifted out by the selective action of the sun's and the earth's atmosphere. In 1882 he invented the bolometer, which enabled him to study with a degree of precision not theretofore attainable the undulations of long wave lengths below the visible red end of the spectrum. In 1884 and 1885 he applied this instrument to the study of terrestrial absorption and of the radiation of heat from the moon.

In 1885 and 1886 he prosecuted researches far into the infra-red region of the spectrum, discovering in terrestrial and lunar radiations undulations much slower than have been detected in the spectrum of light direct from the sun. Sir Isaac Newton had only succeeded in detecting waves of 0·00004 to 0·00007 millimeter in length, and in the two centuries since his time subsequent observers were able to extend the investigation only to 0·00010 m.; whereas, since the invention of the bolometer in 1882, Langley has demonstrated undulations of the length of 0·004 m., being a range forty times as great as all other investigators had covered in the two centuries preceding.

Two other medals of the same value are to be hereafter awarded by the Academy—the Watson medal, for original research in another department of astronomy, and the Lawrence Smith medal, for original discovery in meteoric bodies. The Watson medal has been awarded to Professor B. A. Gould, and will be conferred next year. The brilliant and instructive studies of Professor Hubert A. Newton, of Yale College, point to him as evidently the most conspicuous candidate for the honor of the latter medal.

The papers read at this meeting have been of high value, both scientific and utilitarian. Professor Langley presented results of his studies on invisible spectra. He said that most of the region of the spectrum from which energy comes to us is unknown. We have in the ultra-violet rays one hundredth part the amount of energy which comes from all the rest of the spectrum, and our investigations therefore have merely touched this region. This is due to the fact that these rays will not pass through glass, and rock salt, the most available medium, is difficult to work.

He has succeeded, however, in obtaining prisms of this material whereby to investigate the subject of the molecular vibrations associated with wave lengths.

Sir Isaac Newton determined wave lengths of 0·00003 to 0·00007 millimeter. In 1882, all that was certain was wave lengths of 0·00010 m.; within two years we went down to 0·00027 m. There we found that the sun's effect ceased.

Much greater results were subsequently obtained by the use of Rowland's gratings, being made of extraordinary size for this purpose. The apparatus was described in detail. It was of such delicacy that readings could be made down to 0·1 m. when there was one vibration in 40 seconds. The sodium lines were taken as fixed points of comparison.

The difficulty of manipulation was indicated by the statement that the spectrum to be examined must be identified and distinguished from among twenty or more other visible and an almost infinite number of invisible spectra.

The delicacy of the apparatus employed was such that the presence of a current of only 0 000000001 ampere was distinguishable.

Two years of work were required to overcome difficulties. The extrapolation formulæ employed led to cubic equations difficult to solve.

By means of numerous experiments, however, it was ascertained that the relation of the index of refraction to the molecular wave length of vibration throughout the entire spectrum is nearly represented by a hyperbola.

As a result, the shortest wave length measured was about 53,000 on Angstrom's scale. The longest wave length of the visible spectrum is about 0·01 m. The extremes found by Langley were 0·1 m. and 0·0025 m.

The shortest wave length of sound determined by Helmholtz is about 5 m., being only fifty times the length of Langley's longest wave length of the spectrum, thus vastly reducing the hitherto immeasurable gulf between light and heat on one hand and sound on the other.

Professor H. A. Newton read an important paper on Biela's comet, which is connected with the November meteoric shower. This shower was mostly over before sunset in this country, but in Europe it was notably brilliant, exceeding the display of 1872, though not equal to that of 1833.

In many places, up to a hundred a minute were counted by a single person, the maximum display continuing not more than three hours. Experiments show that no single observer can detect more than one-eighth of the entire number that fall; so that the shower probably amounted to 75,000 per hour.

To compute the density of their distribution in space, we must take into account the fact that we do not see them near the horizon as we should if we saw all that fall. One in fifty of all that are visible come within 10° of the zenith.

Computing the path of the earth through its orbit for three hours, it appears that the dense shower only occupies a space 87,000 miles in width, hence each meter corresponds to an area 20½ miles square.

Applying proper correction for the effect of the earth's attraction, the dispersion of meteors covered about 10°; although, as seen from the sun, the apparent thickness of the shower belt is only 4′, and its actual thickness therefore is only 8′.

If these meteors come to us though a range of 10°, they represent, not a group, but a wide dispersion through space. The only possible explanation of the wide divergence, therefore, is that they glance when they strike the earth's atmosphere.

This explanation, it is true, has been previously suggested, but it has seemed to be untenable, for the reason that the meteors as we see them always move in straight lines. An ingenious explanation of this was now given. The meteors are small irregular bodies, which, when they strike the atmosphere, are cold and dark, and compress the air before them to such an extent as to compel them to change their course to a path of less resistance; but as soon as the pressure and friction heat them to incandescence, the side which is forward fuses, and is wiped off by the impact of the air, leaving the glowing particles behind, which constitute the trail, and at the same time rounding off the front of the meteor, so that it will thereafter proceed in a straightforward course, like a round bullet, having no longer the sharp angles which at first compelled it to glance. Thus it is that the meteors are dispersed while dark and invisible; but as soon as they become visible, they have assumed the rounded form, which gives them a straight path from the time when we are first able to discern them. Were it not for this dispersion, we might fix the direction of the radiant within an angular distance only one-quarter the apparent diameter of the full moon, and the shower would be seen pouring down in this narrow stream. The radiant last November was in zenith nearly over the Black Sea.

In 1841, Biela's comet came near to Jupiter, and its course was changed. It was at the same time broken into two large and innumerable small fragments.

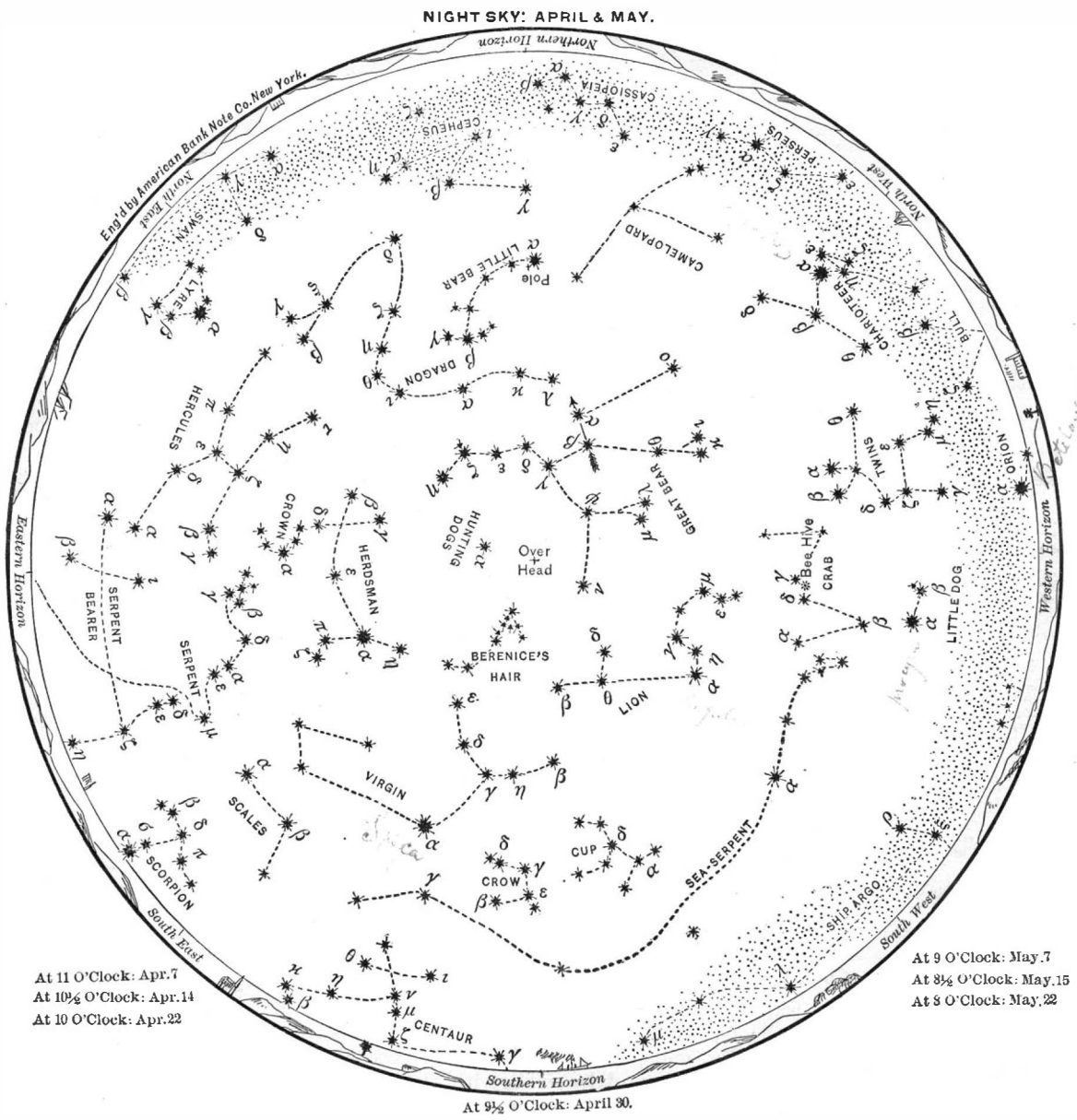
Comparing the longitude of the meteoric showers before this disruption with that of Biela's comet, a substantial conformity is seen. Afterward, both comet and meteors underwent a radical change of longitude, and still the new position in longitude was the same for both comet and meteors. Comparison of right ascension also gives the same results.

This proves conclusively that the meteors were not separated from the comet until after its disruption, and it follows as a corollary that the disintegration of the comet is in progress, and that it will be ultimately dissipated; which is further apparent from the fact that the comet was not visible at the computed periods of the return in 1859 and 1866. We are now one hundred million miles distant from where the comet ought to be.

The meteoric showers will also gradually become less conspicuous, on the whole, although the earth may occasionally, as last November, pass through a denser portion.

The prominence given at this meeting to astronomy and astronomical physics by the award of the Draper medal seemed to entitle these papers to precedence, leaving till next week the report of Hunt's paper on the Cowles electrical furnace, and its immense practical value in the metallurgy of aluminum and other metals.

Prof. Wolcott Gibbs was elected Foreign Secretary in place of Alexander Agassiz, resigned. W. H. H.



In the map, stars of the first magnitude are eight-pointed; second magnitude, six-pointed; third magnitude, five-pointed; fourth magnitude (a few), four-pointed; fifth magnitude (very few), three-pointed; counting the points only as shown in the solid outline, without the intermediate lines signifying star rays.

NIGHT SKY—APRIL AND MAY.

BY RICHARD A. PROCTOR.

The Great Bear, *Ursa Major*, is now at its highest and nearly overhead, the pointers aiming downward from high up, slightly west of due north. A line from the Pole Star, α of the Little Bear, *Ursa Minor*, to the Guardians of the Pole, β and γ, is now in the position of the minute hand of a clock eight minutes after an hour.

Below the Little Bear we find Cepheus low down to the east of north, and *Cassiopeia* low down to the west of north. *Perseus*, the Rescuer, is setting in the northwest; the Camelopard is above, trying to get on his feet.

The Charioteer, *Auriga*, with the bright Capella is nearing the northwestern horizon, followed by the Twins, *Gemini*, in the west. Further west and higher we find the Crab, *Cancer*, below which is the Little Dog, *Canis Minor*.

The southwestern sky is very barren of bright stars, *Alfard*, the heart of the Sea Serpent, *Hydra*, shining alone in a great blank space. Above the Sea Serpent's head we see the Sickle in the Lion, *Leo*, himself stretching his tail to due south, very high up. *Coma Berenices* is close by, and the Hunting Dogs, *Canes Venatici*, between Coma and the Great Bear.

In the south, lower down, we find the Crow, *Corvus*, and the Cup, *Crater*, on the Serpent's back; the Virgin, *Virgo*, extending in the mid-heavens from southeast to south, between the Lion's tail and the Crow. In the same direction, but low down, we find the head and body of the Centaur, *Centaurus*, supposed to have typified the patriarchal Noah.

In the southeast the Scorpion's Heart has just risen, and between the head of *Scorpio* and the Virgin's robes we see the stars of the Scales, *Libra*.

Due east, low down, is the Serpent Holder, *Ophiuchus*, on his back—'tis the customary attitude of heavenly bodies when rising. The Serpent, *Serpens*, held by him is seen curving upward toward the Crown, *Corona Borealis*. The Serpent's head is due west, and above it we see the bright Arcturus, chief brilliant of the Herdsman, *Bootes*.

In the northeast is *Hercules*, his head close to the head of the Serpent Holder. Beneath his feet is the Lyre, *Lyra*, with the brilliant Vega; and the Swan, *Cygnus*, has already half risen above the northeastern horizon.

Lastly, the Dragon, *Draco*, curves from between the pointers and the pole, round the Guardians toward Cepheus, and then retorts its head, with gleaming eyes (β and γ), toward the heel of Hercules.

Magnetic Qualities of Iron.

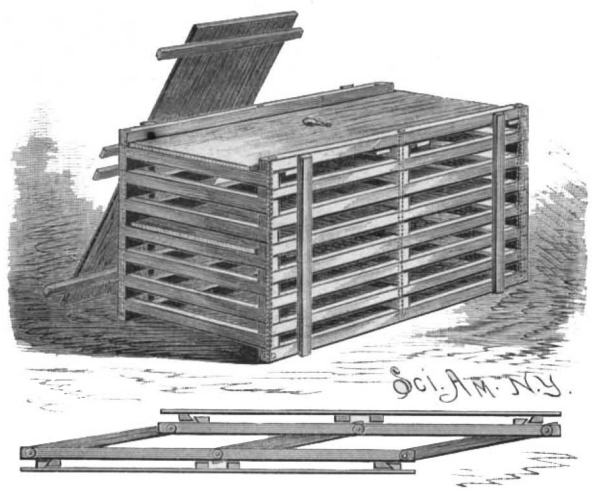
It is well known what an influence the quality of the iron in the field magnets has upon the ultimate output in a dynamo, and a case in point is mentioned by Mr. Gisbert Kapp, showing how impossible it is to foretell accurately the performance of a dynamo unless the quality of the iron be exactly the same in the manufactured machine as the sample submitted. In the case of two machines manufactured for him, there was a difference of electro-motive force of 20 per cent between the two, although the machines were of exactly the same dimensions and treated in the same manner. It was imagined that in the first machine the iron magnets had not been sufficiently annealed, in consequence of the shortness of time allowed for the work. A second pair of field magnets were ordered and an extra time allowed for the work, the consequence being that 20 per cent. more electro-motive force was obtained.

Erratum.

In Abernethy's keying clamp, illustrated on page 242, April 17, 1886, the slots shown in the cut should not extend entirely through the jaws, as represented. They should be about half the depth of the jaws.

A CRATE FOR SHIPPING FRUITS, VEGETABLES, ETC.

The illustration herewith shows a method of making a crate for the transportation of fruit, vegetables, etc., in such manner that, after use for the purpose for which it is designed, it may be taken down and folded up to occupy the least possible space, to be returned to the original shipper. The crate is composed of side and end bars, which meet at the four angles, where they are overlapped, and held in place by a long rod, which passes through the ends of the bars, being formed at one end with a head, and passing through a plate at the other, above which plate the rod is flattened out by riveting, so that displacement will be prevented. Upon either



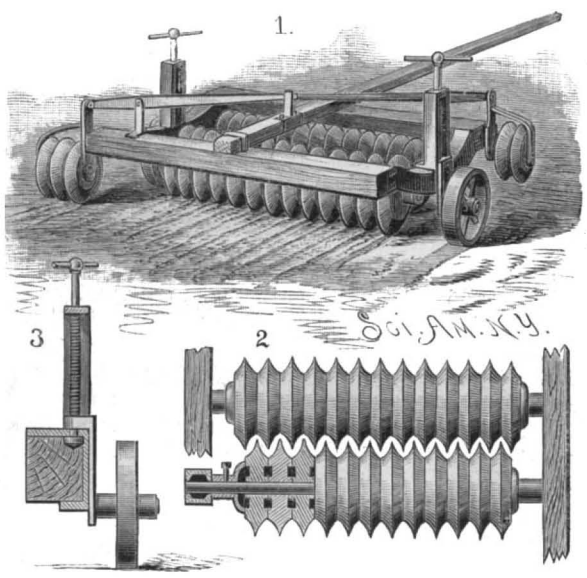
COLVILLE'S RETURN CRATE.

end of each set of side bars there are cleats which serve as braces and as retaining cleats for the bottom and cover of the crate. In the longitudinal center of the crate there is also a partition formed by bars inserted and held in place by rods after the same manner as the crate is otherwise held together by the rods at the corners. In the illustration, one of the views is in perspective, showing the crate set up, while beneath is a representation of one of the sections as it appears when unpacked, to be folded for return to the shipper.

This invention has been patented by Mr. John Colville, of Brunswick, Ga.

TWICK'S COMBINED LAND ROLLER AND CLOD CRUSHER.

An improved land roller for breaking the lumps and clods of earth in a newly plowed field has recently been patented by Mr. Friedrich Twick, of Sheboygan, Wis. A rectangular frame, as shown in the perspective view of the machine, is attached to an ordinary draught pole, and has two parallel shafts journaled in its side pieces. A series of cutter disks, or colters, having sharp cutting edges separated by curved annular grooves, is mounted on each transverse shaft in such a manner that the cutting disks on one shaft pass into the grooves on the other, as shown in Fig. 2. Suitable washers are interposed between the end disks and the sides of the frame. Screw spindles with cross pieces or handles on their upper ends are mounted in standards projecting upward from the central portion of the side pieces of the frame, one on each side of the machine. These



TWICK'S COMBINED LAND ROLLER AND CLOD CRUSHER.

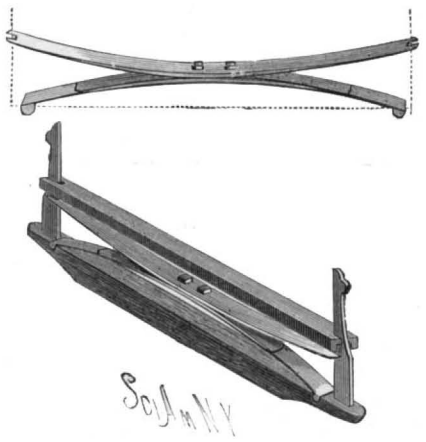
spindles pass through nuts formed as arms on the upper ends of side plates carrying the road wheels. Fig. 3 represents the details of this construction. Consequently, by turning the spindles, the frame can be raised or lowered in relation to the wheels, and the cutter disks lifted entirely above the ground, when going to and from the field, or adjusted to penetrate more or less deeply when the machine is in operation. The disks may, if desired, be placed at unequal distances above the ground on the two sides of the frame. Additional disks in sets of two or three are shown at the front and rear of the machine. These are mounted on small shafts journaled in sliding frames which are connected with the main frame at diagonally opposite corners. These sliding frames are raised or depressed by means of levers capable of being locked in place by a spring catch on the draught pole. The action of the machine is to crush the lumps and clods, and at the same time cut them in pieces and pulverize the earth.

Cattle Bones.

The four feet of an ordinary ox will make a pint of neat's foot oil. Not a bone of any animal is thrown away. Many cattle's shin bones are shipped to England for the making of knife handles, where they bring $40 per ton. The thigh bones are the most valuable, being worth $80 per ton for cutting into tooth-brush handles. The fore-leg bones are worth $30 per ton and are made into collar buttons, parasol handles, and jewelry, though sheeps' legs are the staple parasol handles. The water in which the bones are boiled is reduced to glue, and the dust which comes from sawing the bones is fed to cattle and poultry.

A SPRING FOR LUMBER WAGONS.

A spring which is designed to have an easy movement with either light or heavy loads, and which can be readily placed on or removed from the vehicle, is shown in the accompanying illustration. It is composed of two convex members centrally united at their backs, each member being re-enforced with one, two, or more additional plates, as may be desired. The ends of the upper member of the spring have recesses which fit over the stakes of the bolster, thereby preventing any sidewise movement of the spring, but allowing a lengthwise expansion, while the ends of the lower member of the spring have downwardly extending lugs, which ride on the upper edge of the bolster, and thus hold the spring in place. As the spring is not permanently fastened to the bolster, it can be easily and quickly removed from the vehicle.



EDELMANN'S VEHICLE SPRING.

This invention has been patented by Mr. Adam Edelmann, of Germantown, N. Y., and application for further particulars in reference thereto should be addressed to Mr. A. Weck, East Camp, Columbia County, N. Y.

Gold and Silver in the Arts.

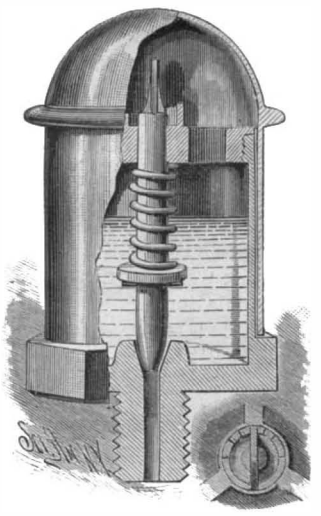
From a table recently prepared by the Director of the Mint, it appears that during the calendar year 1883 a total of $14,459,464 worth of gold was utilized in the arts and manufactures of the United States. Of this amount, $7,905,163 was used in jewelry and watches; $3,598,308 for watch cases; $1,084,824 in gold leaf; $827,000 for watch chains; and the remainder in smaller sums for dental supplies, pens, instruments, plate, spectacles, chemicals, and jewelers' supplies. During the same period, a total of $5,556,530 worth of silver was utilized for similar purposes. Of this amount, $2,066,294 was used for plate; $1,815,599 for watch cases; $1,098,220 for jewelry and watches; and the remainder was divided among the other uses specified for gold. The table is of considerable importance, for by giving the amount of gold and silver annually utilized in the arts, it permits an approximate estimate of the available metallic currency of the country.

The English "Parcels Post."

The *Railway News* gives the new arrangements for the parcels post, which are to take effect May 1. The present maximum weight is seven pounds, which is to be increased to eleven pounds. The charges will be 3d. for the first pound and 1½d. for each pound or portion of a pound after the first, so that the charge for eleven pounds would be 18d., or 36 cents. There is also a provision for insurance up to a value of £10, at an additional charge of 2d. Postal arrangements of this kind here would tend to diminish the value of express stocks.

AN ADJUSTABLE AUTOMATIC OIL CUP.

The discharge aperture in the bottom of the oil cup shown in the accompanying illustration is fitted with an adjustable valve and novel means for holding the valve in any position in which it may be placed. The cup has a threaded nipple for attachment to the guides of a locomotive or other mechanism with which it is to be used, and at the top of the opening of the nipple is formed a valve seat, the valve stem extending upward through a spider in the top of the cup. On this spider, and concentric with the stem of the valve, is formed an annular rim, on the upper edge of which



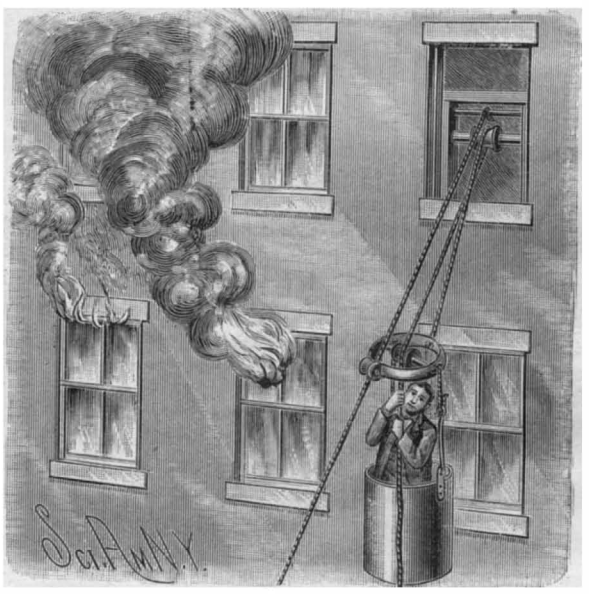
MAHAN & ROSSETTER'S OIL CUP.

are two inclined surfaces or cams, shown more in detail in the smaller view. The top of the valve spindle has a crossbar whose lower edge is V-shaped and rests upon the inclined cams; when the crossbar is above the lower ends of the inclined cams, the valve will be on its seat, and when the crossbar is turned to cause it to ride upward, the valve will be raised, allowing the escape of oil. Notches are formed in one of the cams to hold the crossbar in such position as it may be desired to set the valve, and a spiral spring on the valve spindle holds it in place.

This invention has been patented by Messrs. William A. Mahan and Charles Rossetter, of Marquette, Mich.

A SIMPLE FIRE ESCAPE.

The device herewith illustrated, besides being a simple one for use by individual householders, is intended also as a convenient appliance for the service of fire departments, in connection with hook and ladder companies, to facilitate the releasing of occupants from the upper floors of burning buildings. The fire escape proper consists of a car or basket, suspended from a ring which has a rope attached to it, by which the basket is raised and lowered, the rope passing over a roller or pulley on a shaft held in the window frame; or, otherwise, the pulley over which the rope passes may be suspended by a suitable hook made fast within a window frame or other opening of an upper story. There is, in addition, a guide rope, made fast at the window, and passing through lugs at the outer edge of the ring from which the basket is suspended, to be anchored at the other end at a suitable distance from the



ILSE'S FIRE ESCAPE.

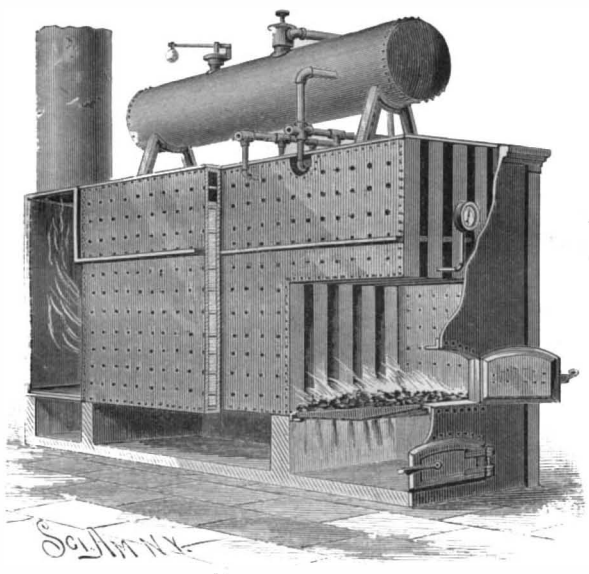
building. This escape can be operated by a person in the basket to reach or lower away from an upper story, or by one on the ground, the basket being raised and lowered as slowly or as quickly as desired.

This invention has been patented by Mr. Augustus Ilse, of Evanston, Wyoming Territory.

To remove candle grease from furniture without injuring the varnish, rub it off with a little warm water and a rag.

IMPROVED STEAM BOILER.

The boiler shown in the accompanying engraving has an extensive heating surface, and is capable of standing high pressure. The water boxes or sections are formed of sheets of iron or steel, connected by short bolts and retained apart a short distance by strips at the edges, so as to form boxes of flat form, the space between the sides being about an inch. Any suitable number of these boxes are placed side by side with narrow spaces between, and are connected by braces so as



COOPER'S IMPROVED STEAM BOILER.

to form flues that terminate in a smokebox at the rear end of the boiler. Between the sections, a short distance below the water line, are placed bars which extend from the front plate to the smokebox, and are bent at the inner ends and extended upward to the top of the sections; these bars prevent the flame from rising too high between the sections. The interior boxes are cut out at the front end to form a firebox, the sides of which are formed by the outside boxes. Pipes connect the boxes with the steam dome; the feed water pipe is connected with the rear lower ends of the boxes. It will be seen that this boiler has extensive heating surface compared with the body of water, and can be made to stand a high pressure.

This invention has been patented by Mr. George H. Cooper, of New Westminster, British Columbia, Canada.

A DOUBLE-LINK, AUTOMATIC CAR COUPLING.

The top of the drawhead of the coupling herewith shown has a slot of sufficient size to allow the coupling hook to be readily inserted and removed through it, the hook having a short slot in its rear to receive a pin, by which it is secured in place, the pin being kept in position by a key or other suitable means, and so arranged as to allow the coupling hook the necessary play. Fig. 1 is a perspective and Fig. 2 a sectional view of the couplings linked together. The coupler has two hooks upon its lower side, for which there are corresponding slots in the lower side of the drawhead, the rear hook being made so long that it will never be raised out of its slot when the coupler is in use. The forward side of the forward hook is inclined or rounded so that it will be raised by the contact of the coupling link of the opposite car when the cars are run together, to allow the link to pass this forward hook, which then drops back into place and the cars are coupled. The coupling hook has three bearing points besides the pin on which it works—an inclined seat at the forward end of the slot in the top of the drawhead and two inclined seats at the forward end of the two slots in the bottom of the drawhead. With this construction, each drawhead is permanently provided with a coupling link, the inner end of which is held by the rear hook; and when two cars are run together, the draught strain will be sustained by two independent links, either of which is intended to be sufficiently strong for use should the other be broken, while, should both be broken, the cars can be coupled by an ordinary coupling link, and the coupling still be automatic.

This invention has been patented by Messrs. William H. Adams, James D. Felthousen, and Albert Lawtenslager, of Albany, N. Y., and is an improvement on a former patented invention of the same inventors. For further particulars in reference thereto address Mr. Albert Lawtenslager, 71 North Pearl Street, Albany, N. Y.

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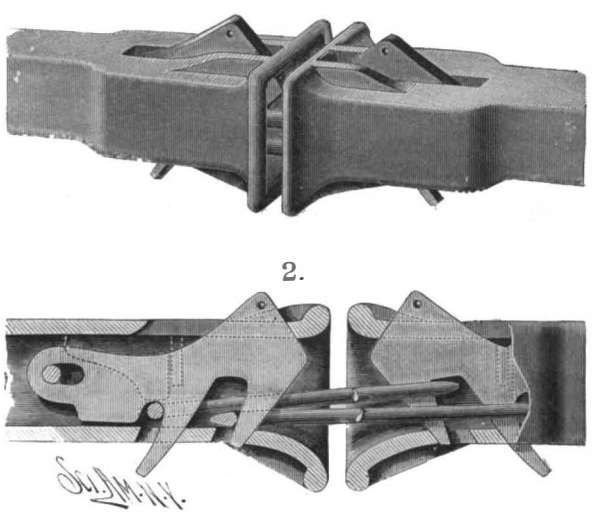


AN IMPROVED CAR COUPLING.

CONSTRUCTION OF TORPEDO BOATS.

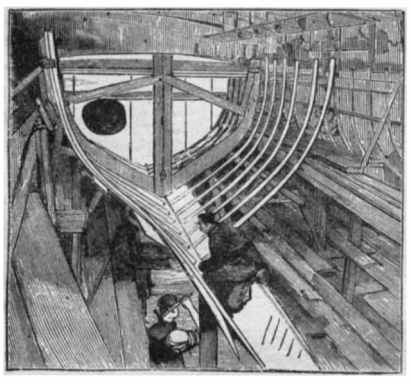
The construction of torpedo boats is an industry of very recent growth. It is one, however, which has of late attracted much attention, in consequence of the rapid increase in the number of such vessels in foreign navies, and the very few in our own. We are glad this deficiency is being fast put an end to; the British Government having in the course of construction at the present time no less than fifty thoroughly serviceable first-class, sea-going torpedo boats, all of which will be completed in the course of this year.

Among the most celebrated constructors are Messrs. Yarrow & Co., who, during the last few years, have supplied nearly every country in the world with boats of this type; and the British Government at the time of the Russian scare last spring contracted with them for the supply of twenty-four, which are now fast approaching completion. In addition to these, Messrs. Yarrow & Co. are building similar vessels for the Spanish, Austrian, Dutch, Italian, Japanese, Portuguese, and Chilian Governments; and at the present moment their works represent a scene of the greatest possible activity —a very pleasant contrast with the general depression of trade in other parts of the country.

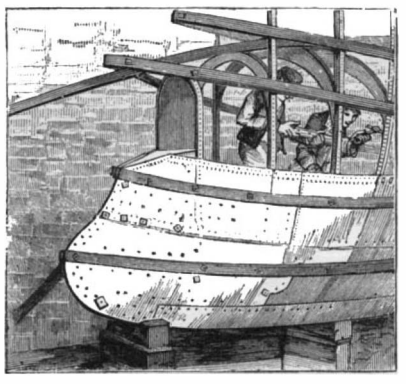
In these works, not only are the vessels themselves constructed from the very commencement, but also the machinery for propelling them, giving employment to over 1,200 men.

To give some idea of the amount of material which enters into the construction of a torpedo boat, it may be mentioned that the bars forming the skeleton work of the hull, if laid out in a continuous line, would extend for a length of over two miles, all of which has to be bent into shape, punched, and fitted up in its place, to which framework the outside skin plating of the hull is attached.

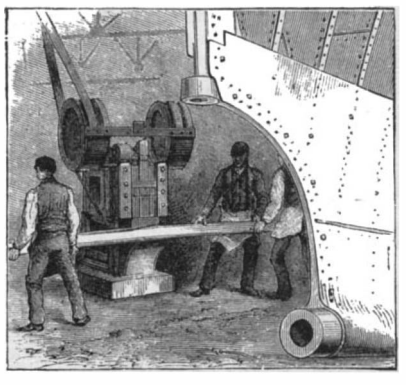
The longitudinal section represents probably the most interesting torpedo boat ever constructed, and shows very clearly what the internal arrangements of such a



TRAINING THE HULL.

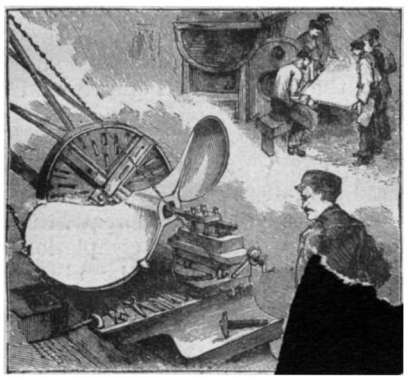


PUTTING A SKIN PLATING AT THE BOW.

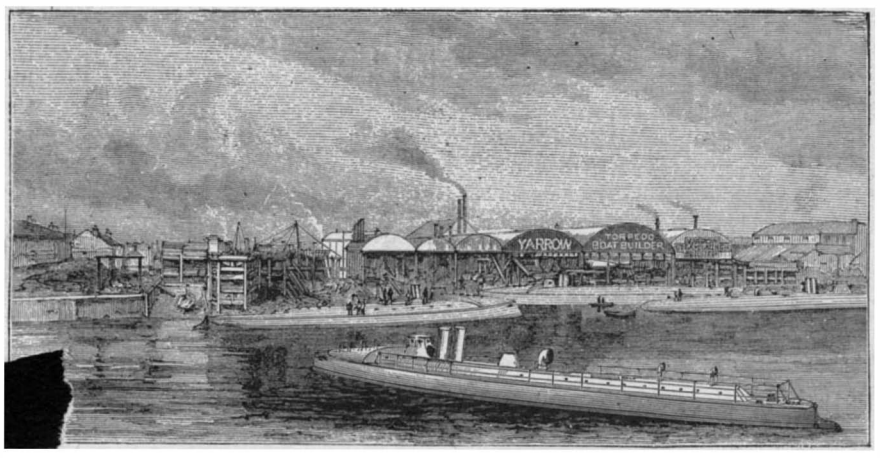


SHEARING A SKIN PLATING.

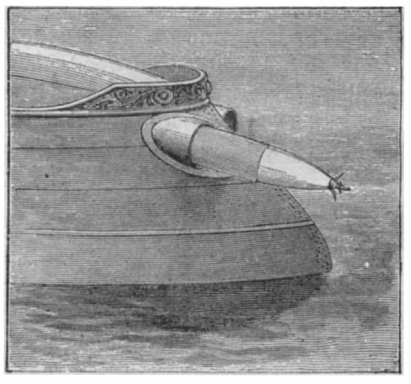
FORGING STEEL SCREW PROPELLER.



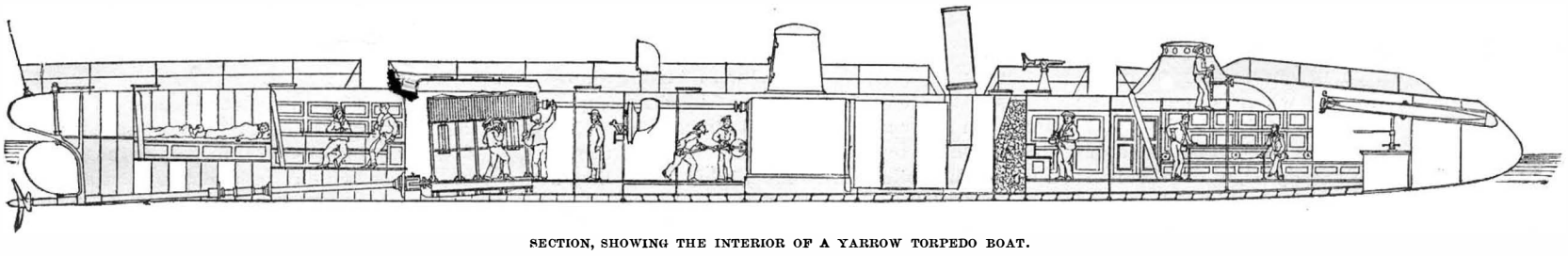
BORING OUT SCREW PROPELLER.



VIEW OF MESSRS. YARROW & CO.'S WORKS FROM THE RIVER THAMES.



VIEW OF BOW, SHOWING WHITEHEAD TORPEDO BEING DISCHARGED.



SECTION, SHOWING THE INTERIOR OF A YARROW TORPEDO BOAT.

CONSTRUCTION OF TORPEDO BOATS AT YARROW & CO.'S WORKS LONDON.

craft are like. In the bow are two tubes, into which, it will be seen, the Whitehead torpedoes are placed. They are ejected from these tubes at the required moment by the officer in charge, which is done by means of either compressed air or gunpowder. Aft of the torpedo compartment are the commander's and officers' cabins, next to which come the boiler and engines. We may here remark that the stokehole is sealed down air tight, no ingress or egress being permitted, and air is pumped into it by means of a steam ventilator, so that the men who are firing the boiler are actually at work under a pressure of air. Aft of the machinery compartment there is the crew space and petty officers' cabin. On deck will be seen two conning towers—one forward of the funnels, which is for use in time of war; the other, on deck amidships, being in a more suitable position for navigating when cruising about. The special interest that attaches itself to the torpedo boat represented by the sectional view is due to its unprecedented speed, which, on recent trials, was shown to be 27½ miles an hour. It may here be mentioned that when going full speed the boiler consumes no less than 1½ tons of coal per hour, evaporating water at the rate of one ton every four to five minutes, the engines developing over 1,200 horse power. —*Illustrated London News.*

Concrete as a Fireproof Material.

The engine works of the Barrow Shipbuilding Company, only lately restarted, are largely constructed of stone, and except in connection with the roof, pattern makers' floor, brass finishers' department, stores, and the gates, there is little or no wood, and yet stone it appears is not a good fire-resisting material and the best of it cracks, while iron exposed to a fierce flame buckles and twists and is soon practically destroyed. Properly made concrete, however, successfully resists fire, and when iron beams or joists are embedded in it, they are well protected. It is now possible to construct large buildings entirely of concrete, although for roofing it is not perhaps always successful; but for walls and floors it is eminently suitable, while its use for foundations is widely known—for this latter purpose six parts of ballast, one of sand, and one of Portland cement makes a concrete good enough for any kind of foundation. When great care is taken in making concrete for walls, these can be one-fifth less in thickness than brickwork. For flooring, concrete has successfully stood the test, especially in the North of England, and there is a large warehouse in Sunderland which has no less than 1,800 tons of cement concrete in its floors. These were made of slabs, some being as large as 21 ft. by 12 ft. 6 in. and 13 in. thick—four parts of hard broken brick to one of Portland cement being used; and the iron girders were thoroughly embedded on all sides, except under the bottom flange. After six years these floors stand quite unshaken, and although there have been two or three serious fires, no damage has yet been done to the building itself. Care was taken to see that the cement used was not below 700 lb. tensile strength per square inch.

A Cheap Camera.

A good substitute for a more expensive camera lucida for the microscope can be made as follows: Cut a piece of thin metal, brass or copper (or even tin will do), into the form of a letter L. After smoothing the edges, bend one limb into an inclosed band, to clasp the end of the eyepiece after the cap is removed. Clasp the other limb, near its juncture with the ring, with a pair of pliers, and twist it on its own axis through an angle of 90°. On the outer end bend a cockeye to hold a piece of wood, in the end of which make a slight split and insert the edge of a cover glass to serve as a mirror. Of course, both the image and the pencil point are seen by looking through the glass—the former by reflected, and the latter by transmitted light. The light reflected is sufficient to give good definition when ordinary powers are used. In this way, each member of a class can easily make a camera for himself.—*Botanical Gazette.*

Venice.

A. S. VON ROCHAN.

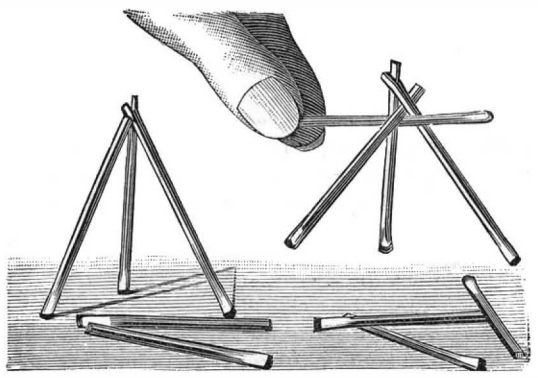
There are two things in Venice that I have never been able to make out: How do they build a house, and how do they put out a fire? Building materials, of course, can be procured, and there is certainly no want of water. But where is the ground on which firemen or builders can take their stand? Even for the commonest repairs of houses three or four stories high, in streets only five or six feet wide, some plan must be adopted of which I have no conception. Two or three beams, half a hundred building stones, and a hod of mortar would block up the street, and interrupt the traffic of a whole quarter.—*Architect.*

SIMPLE MATCH TRICK.

To lift three matches by means of one, it is necessary to make an incision in the end of a match and insert the pointed end of a second match into this incision. Place them on the table with a third match resting against them for a support, as shown at the left of the figure. Then present a match to any one who may be looking on, and ask them to raise the three together by means of the match in the hand.

The solution is given at the right of the figure. Bear lightly against the two matches that are joined until the third falls against the one held in the hand. Then raise it, and all three will be lifted together.

Although this trick, which we find described in a



A SIMPLE MATCH TRICK.

French paper, *Le Chercheur*, is probably as ancient as the art of making matches, our juvenile readers may find it of interest, and possibly it may afford them a half hour's amusement at recess time.

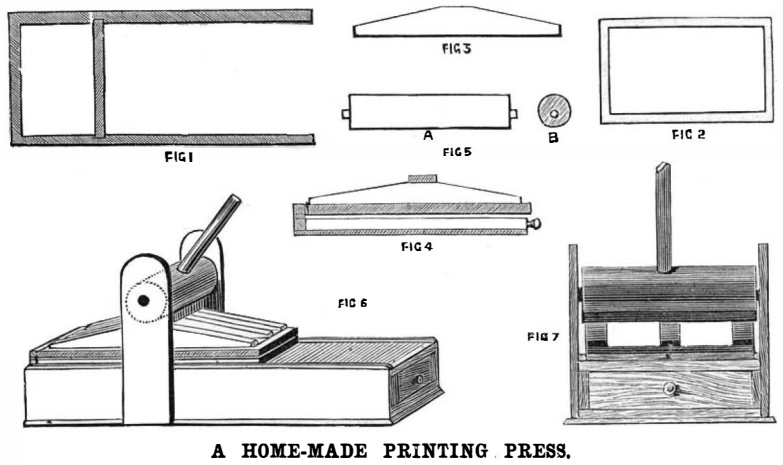
Heat Developed by Various Systems of Lighting.

In the *Zeitschrift fur Elektrotechnik*, Mr. Wilhelm Penkert gives the following as the results of his experiments on the amount of heat emitted by various kinds of lights during one hour:

INCANDESCENT LAMPS.	
Siemens & Halske	427 units.
Edison	355 "
Swan	430 "
GAS BURNERS.	
Siemens recuperator	1,500 units.
Argand burner	4,860 "
Two-light burner	12,150 "
KEROSENE.	
Round wick	3,360 units.
Flat wick	7,200 "
MISCELLANEOUS.	
Carcel lamp	4,200 units.
Paraffine candle	9,200 "
Spermaceti candle	7,960 "
Wax candle	7,960 "
Stearine candle	8,940 "
Tallow candle	9,700 "

A HOME-MADE PRINTING PRESS.

"Faust," in the *Amateur*, of London, gives the drawings and details for building a press capable of printing a sheet 8 x 10 in., and which is of a strength and solidity sufficient to give a good impression. Figs. 1 and 2 show sections of frame; Fig. 3, pieces for giving strength to top of platen; Fig. 4, carriage with its hinging; Fig. 5, front and end elevation (A and B) of impression roller, so made as to form with its handle an eccentric lever; Figs. 6 and 7, perspective and end views of press. The pieces for frame, drawer, guides, etc., are of clean yellow deal, well seasoned and free from knots, while the platen, bed, and sides and ends of carriage are made of mahogany. The manner of making a platen here shown insures its being almost as rigid as if it were made of cast iron. The turning of the impression roller must be looked after with care, to be sure that the two pins just off the center at the ends, on which the roller turns, are absolutely in line with each other. The press will be greatly improved in appearance and its durability will be increased by a thorough coating with a spirit varnish. It is estimated that the cost of the materials for such a press will not exceed from $2.50 to $3.



A HOME-MADE PRINTING PRESS.

Council of Engineering Societies on National Public Works.

The organization now includes twenty-one engineering societies, representing a total membership of about 2,600. It was resolved at the last meeting that the organization should be called the Council of Engineering Societies on National Public Works, and that its object should be to promote an improved system of national public works. In making the Council permanent, a president, vice-president, and executive board of seven members were chosen, and it was decided that its membership should consist of the committees on public work of the various engineering societies throughout the United States, and as associates, with all the privileges except that of voting, any engineers interested in the development of a national policy. The organization has already enlisted the interest of many of the most prominent American engineers, and promises to make itself felt in influencing the future engineering work of the Government. Sub-committees of one member were appointed to gather information in regard to the organization and conduct of the public works of the United States, France, Italy, Austria, Great Britain, and Canada. These results will be published from time to time, and a strong effort made to secure public co-operation. A committee was also appointed upon legislative information. It is believed that the best informed members of Congress appreciate the fact that the time has come for a radical change in the administration of the internal improvements made by the Government, and that instead of the highly diversified schemes now brought before Congress and the River and Harbor Committee of the House, through influences eminently local, there should be a board of public works, under, probably, the Treasury Department, which should discuss and thoroughly digest all these proposed plans before they are submitted to Congress. Such a board would operate in very much the same manner as the present Lighthouse Board, whose suggestions are always received with respect and are usually carried out. Some of the members of the Council do not feel that the time has quite come when it would be advisable to approach the members of Congress with such a proposition, but they all agree that the necessary information should be collected with as little delay as possible, and that the proper time for presenting the results of this investigation in a bill before Congress cannot be far distant. There is at present a manifest disposition on the part of the people to enlarge the functions of Government, and to give it the power to do for the nation many things which were formerly left to individual enterprise. So long as the conduct of public affairs can be kept in the hands of honest and disinterested representatives of the best element of the people, this tendency is to be warmly encouraged. If the Council of Engineers succeed in framing a wiser policy for the national works, we shall hope that these same advisers will be tempted to improve, through legislative enactment, the administration of some of those larger enterprises, such as transportation and communication, upon which the interests of the people are so greatly dependent.

Tonnage of the Tehuantepec Ship Railway.

The wise man who is about to build, first sits down and counts the cost, and, if he is an engineer, he adds to this calculation what the returns of the investment will probably be, that is, what there is to justify the cost. In the transisthmian ship railway, the cost has been very carefully estimated, and the other side of the equation, the returns, has received not less thoughtful consideration. During the year 1879, the total tonnage of the vessels which were entered and cleared from the Isthmus of Panama, and from such Atlantic and Pacific ports as indicated the doubling of Cape Horn, amounted to 2,938,386 tons. In 1885, this had increased to 4,518,934 tons, a gain of 54 per cent. At the same rate of increase, the tonnage for 1890, the date of the completion of the ship railway, would be about [illegible] is calculated that the tonnage which would be [illegible] the two oceans by a [illegible] and at least amount to [illegible]000 tons. This would give a total tonnage for the first year of the railway of over 7,000,000 tons, provided that the vessels engaged in this trade chose a short land carriage in preference to the entire or partial circumnavigation of a continent or to the reshipment of their cargoes at the Isthmus, which is not an unnatural supposition. It is difficult to estimate the increased growth of commerce which would result from such stimulus. The tonnage on the Suez Canal increased nearly 400 per cent from 1872 to 1883, and at Tehuantepec the increase would be scarcely less, as the indications all point to a marked development of the commerce of the tributary countries.

Correspondence.

A Correction.

To the Editor of the Scientific American:

Will you permit me to make a correction of an erroneous statement in my short notice of our Geological Hall in your last issue? It has arisen through an elision of the MS., and leaves an impression quite the reverse of the meaning intended.

Trilobite is a name applied to this class of crustacea, *not* from their sectional division into glabella, thoracic segments, and pygidium, but from the presence of a trilobed character extended through all these parts, from the tail to the head—a longitudinal or lengthwise, not a transverse, feature. L. P. GRATACAP.

American Museum of Natural History.

Frozen Petroleum for Steamers.

To the Editor of the Scientific American:

It seems to me the question of fuel for steamers—I mean the substitution of petroleum for coal—can easily be solved. The drawback to petroleum is its liquid nature and consequent danger of listing. If petroleum be turned from a liquid into frozen bricks of any desired size, the objection disappears. It can then be packed as safely as coal, even more so. Small tanks heated by steam can be provided to feed the furnace burners, and into these tanks may also run pipes from the bunkers to carry away all leakage from thawing. In this manner, frozen petroleum can be carried by a steamer that will furnish considerably more fuel for the space occupied than the same bulk of coal. I think that the cost of petroleum in this form would also be a great saving on the present fuel.

E. F. DE CELIS, *Editor La Cronica.*

Los Angeles, Cal., April 10, 1886.

A DETACHABLE BILLIARD CUE TIP.

This tip for a billiard cue is composed of layers of leather or other suitable material, in which is secured a bushing which serves as a means of uniting the layers, and which may be used with or without glue or cement. The tip is united to the cue by a fixed screw, which remains in the end of the cue when the tip is removed, the bushing remaining in the tip. By this arrangement an injured or worn tip may be readily replaced by a new one, and tips may be changed from one cue to another to suit different players, who may thus easily detach and keep separately the tips of private cues.

This invention has been patented by Mr. John A. Tracy, of Weston, W. Va.

The Tornado at St. Cloud.

BY H. C. HOVEY.

Minnesota has had more gratuitous advertising lately than was desirable; and the evil has been increased by the habit of styling tornadoes by the larger name of cyclones. There are points of resemblance, such as the fact that both move vertically around an advancing center, the motion being from right to left, or in a direction opposite to that of the hands of a watch, and both are violent agents of destruction and objects of dread. But there is also a marked difference between the phenomena. The true cyclone starts with a diameter of from 50 to 300 miles, spreading as it advances to one of from 500 to 3,000 miles. Its usual birthplace is amid the tropics, and its fury is exhausted before it reaches this more northern realm. Moving over a large body of water, it piles up mighty tidal waves that finally inundate the land. The tornado, on the other hand, is purely a local affair, originating in some collision of opposing storm currents, assuming a funnel-shaped form, its tail now touching and then rebounding from the earth, and again sweeping along over it like a huge wet blanket, but its greatest diameter rarely exceeding 500 yards. Thus it proceeds in a serpentine way for from a few rods to 25 or 30 miles, when it bursts in some sort of local storm of rain or hail. Should it strike the water, it then becomes a waterspout, as was demonstrated in the case of a tornado in 1883, that swept out of Wisconsin upon Lake Michigan, causing a great commotion there and lifting a column of water some 300 feet high.

Several notable tornadoes have ravaged the Northwest during the last ten years, among which may be mentioned those at Hazel Green, Wis., in June, 1877; at Mankato, Minn., in June, 1880; at Faribault, Minn., in June, 1881; at New Ulm, Minn., at Grinnell, Iowa, at Racine, Wis., in 1883; at Rochester, Minn., in the same year; and at several other localities. But it should be remembered that there have likewise been many storms and tornadoes in other parts of the United States, as appears from the researches made by Lieut. Finley, whose unique book, bearing the title of "Six Hundred Tornadoes," will give the needed information, together with the supplementary observations made by the same authority.

The universal opinion, however, seems to be that none of the long list exceeds in its destructive energy or terrible manifestations the tornado of St. Cloud and Sauk Rapids, Minn., that took place on April 14, 1886, and of which the writer had the opportunity to make special observations, at least so far as the effects were concerned. Being on the outskirts of the storm, I only saw the massing of black clouds, followed by a spiteful hail, many of the stones measuring more than an inch in diameter; but on a subsequent day I visited the locality, making inquiries of eye-witnesses, and following the tornado's track myself for several miles, and noting its varied effects.

During the day a remarkably high temperature had prevailed for the season, the mercury rising as high as 80 deg., and the air was sultry and oppressive. At 3 P. M. observers saw dark banks of struggling clouds overhanging the ridge that in ancient times used to be the river limit, and there were apprehensions of impending danger. Suddenly the clouds began to revolve, while sharp points shot downward, until a whirling funnel-shaped mass was formed above a basin amid the hills, that seems to have furnished the cradle for the ensuing tornado. Its first condition was undoubtedly that of a simple whirlwind, having a diameter of about 1,000 feet, which uprooted or twisted off nearly every tree in its circle, overturned the monuments in the adjoining Masonic cemetery, and tore up the bowlders from the ground. Thence it moved slowly and majestically along, at the rate of about 12 or 15 miles an hour, but with an inconceivably rapid rotary motion upon its vertical axis, confining itself for some distance to a path hardly more than 150 feet wide. The pyrotechnic display of flaming colors against a background of sooty blackness was very impressive and wonderful. Hundreds of people took timely warning and got out of the road of the moving column of cloud, whose general trend was toward the northeast. Having wrecked the Catholic church on Calvary Hill, and also several farmhouses, it entered a portion of the city of St. Cloud mainly occupied by foreigners, whose frame cottages were strewn over the plain indiscriminately, leaving nothing but the cellars to mark the site of the houses.

I noticed but one exception to this general work of complete demolition, and that was of a house that had been whirled about end for end and left on its foundation as a wreck. Reaching the freight depot of the Manitoba R.R., the wind tore that to pieces, overturned the long lines of freight cars, carried the trucks away, and even in places wrenched the iron rails from the ties. In one instance the trucks were blown from underneath a car, dropping the latter on the track where it was left. By a merciful exemption, the hospital of St. Benedict was spared, although the houses in its vicinity were taken. The tornado left the city limits near the residence of Lieut.-Gov. Gilman, tearing away his fences and killing his horses. The total loss of life in St. Cloud was 22 individuals, mostly women and children, besides 40 or 50 more or less injured; and the total loss of property was $87,395, of which amount $50,000 fell to the share of the Manitoba R.R., while the remainder was divided among 64 sufferers and their families, thus rendered homeless. From these figures it will be seen that the dwellings were not of an expensive sort, and will readily be rebuilt by the generosity of contributors.

The tornado struck the Mississippi River at a point opposite the village of Sauk Rapids, and fishermen who were in full view of the crossing aver that for a few moments the bed of the river was swept dry; and in corroboration of this remarkable statement they showed me a wide marshy spot where no water had been before this event took place! Two spans were torn away from the substantial wagon bridge below the rapids, one span being hurled up stream and the other down it by the rotary motion of the blast; and great blocks of granite being also torn bodily out from the piers. The large flour mill near the bridge was leveled. The depot of the Northern Pacific R.R. was demolished, and the central portion of the village itself was then attacked with the greatest violence. Being the county seat, the court-house was located here, a substantial structure, of which only the vault, six iron safes, and the calaboose were left—the latter turned upside down. A fine new schoolhouse, costing $15,000, was completely swept away. The Episcopal church was so utterly removed that the sole relic thus far found is a battered communion plate. The floor of the large skating-rink is all that remains of that structure. Stores, hotels, a brewery, and four-fifths of the residences in the village were scattered as rubbish along the hillsides, or borne away for miles through the air. The caprice of the storm was shown here and there. The lower story of one house was removed to parts unknown, while the upper story was left on the foundation below. A large barn containing twenty mules was demolished, but the mules escaped without a scatch. A woman was lifted from her chair, carried over the walls of her roofless dwelling, and deposited in a thicket of scrub oaks several rods distant. A man told me that, after getting his family into the cellar, he thought he would watch the storm for a moment; but being caught by it, he seized hold of the roots of a tree, and was flopped up and down, as a carpet that is being shaken, but escaped without serious injury. An iron safe was carried by the wind completely across the street, and left there as a monument of aerial energy!

The number of the killed at Sauk Rapids was 39, and about 100 were injured more or less. The fatal blows seemed to be of two kinds, either contusion about the head or stabbing by the lance-like splinters of boards whirled through the air. Many had their limbs broken by falling timbers and other heavy objects. Of sufferers still living, several are in a critical condition and may not survive. It is an instructive fact that, of those who had the presence of mind to take refuge in cellars, on hearing the roar of the approaching tornado, only one, so far as I could learn, fell a victim to its fury—a boy who was crushed by falling masonry in a part of the cellar farthest from the storm. I examined nearly every cellar in the village over which the storm had passed, and found that the portion *nearest* its direction of approach was free from rubbish, and would no doubt have proved to be a safe refuge.

An appraisement committee say that the total number of houses destroyed at Sauk Rapids, not including sheds and barns, was 109, and the total value of property destroyed was more than $290,000.

One of the saddest of the many tragedies marking this wide disaster took place at a farmhouse in the country, about sixteen miles north of Sauk Rapids, where a wedding party of thirty were assembled. The ceremony was just concluded, and the officiating clergyman was offering prayer, when the building was struck by the tornado. The bridegroom was killed outright, as were also fifteen others; seven more victims have since died, and only one of the company escaped severe injury of some kind.

Following the tornado's track through the forest, I was interested in observing that the scrub oaks had in so many instances resisted successfully the onslaught that had leveled larger and nobler trees. Their branches were grotesquely laden with torn garments, scraps of roofing, fragments of boards, articles of furniture, and other objects. This display was observable for miles. The depot sign "Sauk Rapids" was carried to a locality nine miles distant. A plank 14 inches wide and 12 feet long was transported 18 miles. A hunter 28 miles north of the village told me that he saw a black cloud approaching, from which he took refuge. But it did no further harm than to shower down bits of boards, lathing, torn books, etc. He picked up a ledger which was identified as belonging to the clerk of the county court.

I had excellent opportunity of noting, in a large open field, the proofs that the tornado traveled in a serpentine path, and with rapid rotation on its axis. Along the right hand of the general track, the boards and other fragments of houses, and the overturned trees, were all disposed so as to point forward and inward toward the line of march. Those along the left-hand side were invariably pointed backward and away from that line. Many large splinters were driven into the ground so firmly that, using all my strength, I could not pull them out again. A farmhouse standing near the left-hand margin of the track had its right side intact, while on the left or outward side the windows were all broken in, and the walls and roof were pierced by numerous plinters. Estimates have been made as to the rate of the rotary motion that could drive timbers deep into the soil and that could send a splintered joist, like a huge javelin, completely through the roof of a dwelling, but I know of no satisfactory mode of calculation.

Putting together the testimony of various observers stationed at different points, the width of the tornado's track must have varied from 100 to 1,000 feet; ts entire duration must have been rather less than one hour, lingering but a few moments in any one locality; and the entire distance traversed by it, from the starting point southeast of St. Cloud to the point where it burst in a heavy rainfall, considerably northeast of Rice's Station, was about thirty-five or forty miles. The total loss of life thus far reported from all points was about ninety individuals, and about twice that number injured. The sum total of property destroyed could not have been less than $400,000.

Trees in the Valley of Mexico.

A contract was lately concluded by the Mexican Government with Mr. Oscar Droege, to plant 2,000,000 trees in the Valley of Mexico, within four years. The trees specified are chiefly ash, poplar, acacia, and mountain cedar, with a sufficient margin for miscellaneous kinds, according to special conditions of site and climate; and the arrangements contemplate the formation of national nurseries in which the study of scientific forestry may be pursued on a footing in some degree commensurate with its importance. The valley was densely wooded in the time of Montezuma, when Cortez and the Spaniards entered the country. But the Spaniards burnt off and destroyed the timber.

AN article on the usefulness of patents, taken from the Boston *Advertiser*, will be found on another page. It is well worth reading by every one, and we especially commend it to the attention of our legislators when considering the various bills pertaining to patents now before Congress.

Barbados.

The island of Barbados is the most densely populated part of the earth. This island, with an area of 106,600 acres, contains a population of over 175,000 souls, that is to say, an average of no less than 1,054 people to each of its 166 square miles of territory. The Chinese province of Keang-su, which was at one time ignorantly imagined to be the most uncomfortably crowded district under the sun, contains but 850 moon-eyed Celestials to the square mile, while East Flanders, in Belgium, the most thickly populated neighborhood in Europe, can boast of only 705 inhabitants to the square mile. Coming nearer home, Westchester Co., New York, with a territory three times as large, has only four-sevenths as many people as are packed upon this thronged, man-ridden Caribbee island. If the Empire State were as thickly settled as Barbados, it would boast a population of 60,000,000. Of the 175,000 souls in this island, 9 per cent are whites and 91 per cent are blacks or of mixed blood.

Mistakes of Life.

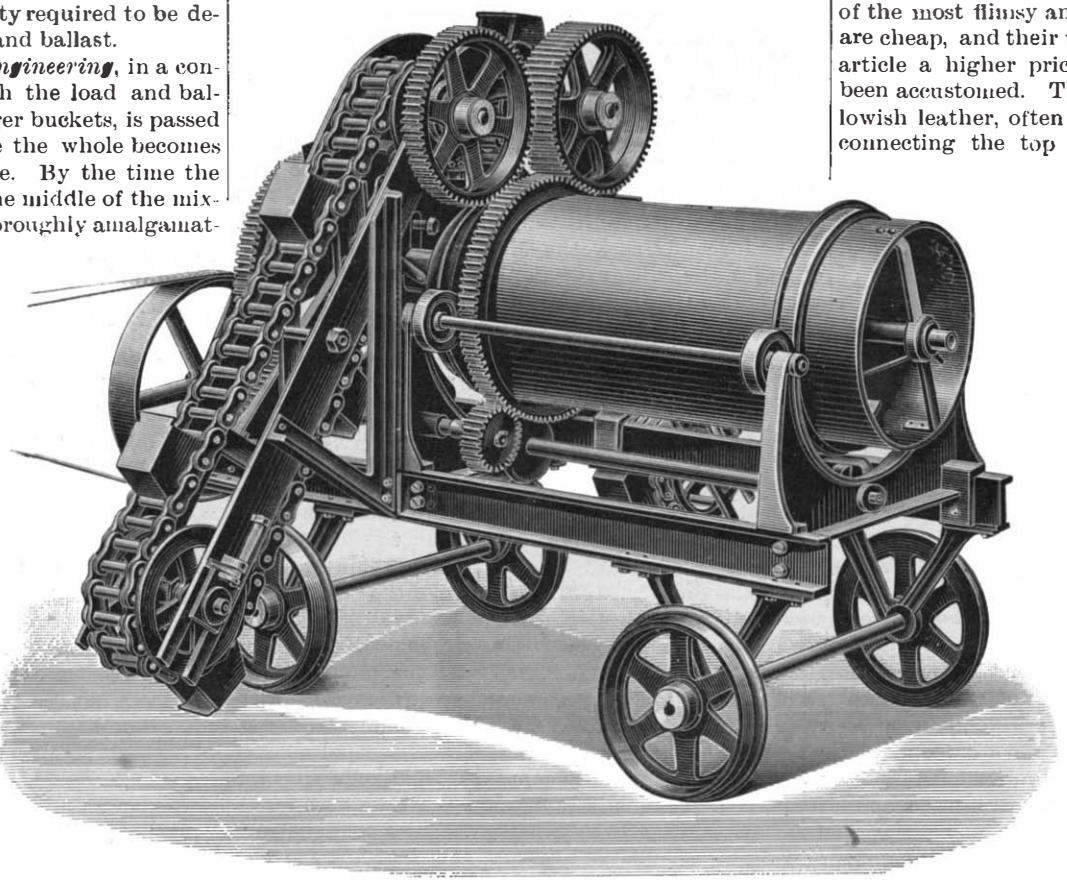
Somebody has condensed the mistakes of life, and arrived at the conclusion that there are fourteen of them. Most people would say, if they told the truth, that there was no limit to the mistakes of life; that they were like the drops in the ocean or the sands of the shore in number, but it is well to be accurate. Here, then, are fourteen great mistakes: "It is a great mistake to set up our own standard of right and wrong, and judge people accordingly; to measure the enjoyment of others by our own; to expect uniformity of opinion in this world: to look for judgment and experience in youth; to endeavor to mould all dispositions alike; to yield to immaterial trifles; to look for perfection in our own actions; to worry ourselves and others with what cannot be remedied; not to alleviate all that needs alleviation as far as lies in our power; not to make allowances for the infirmities of others; to consider everything impossible that we cannot perform; to believe only what our finite minds can grasp; to expect to be able to understand everything.

IMPROVED CONCRETE MAKING MACHINE.

The Carey-Latham machine consists essentially of an arrangement of elevator or dredger buckets, a cement hopper, and a mixing cylinder. The sand and ballast are gathered by the buckets and delivered to the mixing cylinder—the proportion of sand to ballast being regulated by the number or capacity of the buckets employed. The cement or lime is fed from the hopper by an archimedean screw, the pitch or speed of which can be adjusted to suit the quantity required to be delivered in proportion to the sand and ballast.

The cement is delivered, says *Engineering*, in a continuous stream, and together with the load and ballast, which are fed in by the dredger buckets, is passed to the revolving cylinders, where the whole becomes intimately mixed in the dry state. By the time the materials have arrived at about the middle of the mixing cylinder they have become thoroughly amalgamated, and water is then admitted in the requisite quantity by means of a perforated hollow shaft, around which the cylinder revolves. The operation of wet mixing is then performed, and the complete concrete is delivered continuously from the open end of the cylinder. An important feature of the machine is the arrangement of mixing blades, which revolve in the same direction as the cylinder, but at a slightly different speed; this has the effect of increasing the stirring or mixing action, and overcomes a difficulty which was found to exist by the setting of the cement when fixed blades were employed. The blades in moving at a quicker speed constantly change their position with respect to the inside of the cylinder, so that no cement can accumulate and set upon them. The cylinder is horizontal, but as the blades are of a curved or screw-like form, the materials are lifted and tumbled over and over, and at the same time forced toward the open end of the cylinder.

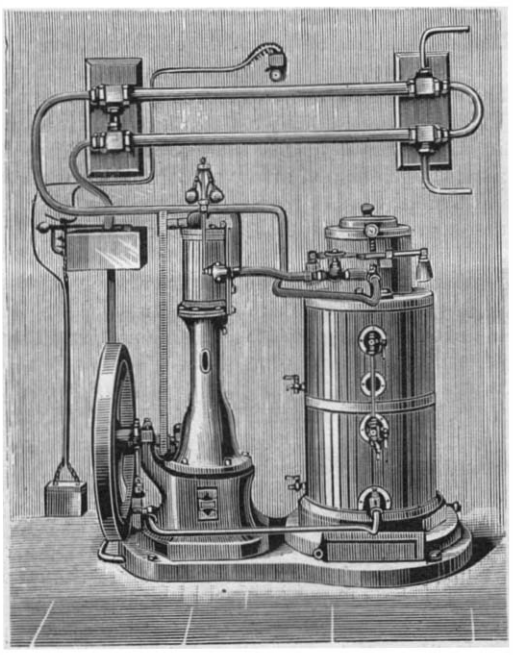
At the Newhaven Harbor Works, two of Carey & Latham's machines have been employed in making over one million tons of concrete; but numerous improvements have since been effected in them, and the machine we illustrate differs in several material points from the former pattern. It is now constructed in various sizes suitable for making five to seventy cubic yards per hour, and we understand Messrs. Ingrey, Poore & Latham, London, have supplied several of 20 yards and 70 yards capacity to some of our large contractors.



IMPROVED CONCRETE MAKING MACHINE.

A SMALL CONDENSING ENGINE AND BOILER.

The engine and boiler, illustrated herewith are designed for use in small workshops, rural residences, etc. Mr. Pifre, the maker, has designed the boiler so that it only requires an occasional supply of fuel, and the steam is condensed to return the water to the boiler. The principle adopted for firing the boiler is that of a cupola or a slow combustion stove, having a column of fuel which burns away at the bottom and allows the remainder gradually to descend. The boiler is placed



A SMALL CONDENSING ENGINE AND BOILER.

on the same baseplate as the engine, and is composed of an outer shell with an internal cylindrical firebox, standing upon an ashpit cast with the foundation plate, which is provided with slides for regulating the air supply. The lower part of the firebox contains a number of vertical water tubes ranged round the circumference and jointed with bends to the firebox shell. For the small sizes, from ¼ to 1 horse power, the firebox has the same diameter from top to bottom of the outer shell, leaving an annular steam and water space in which the circulation of the water is promoted by the water tubes. Into the upper part of the firebox a cylindrical filling chute is inserted, which reaches to about the middle of the firebox. Above the firebox and round the upper part of the filling cylinder there is a smokebox with a lateral pipe to the chimney. Coke or charcoal is used as fuel, and the entire lower part of the firebox and the chute are filled with the same. The coke burns in the fire box and the combustion gases pass through the annular space between the firebox and the filling chute. In proportion as the fuel on the grate is consumed, the column of coke sinks down, and at sufficiently long intervals the chute is filled again to the top. This does not interfere with the combustion, which can be regulated by the slides on the ashpit and a damper in the chimney pipe, and the evaporation when once adjusted proceeds very regularly. For powers above one horse, the firebox reaches only to about the middle of the height of the boiler, and the filling chute is riveted to its top, a number of tubes being inserted between the annular firebox top and the top of the boiler.

The engine is of the steam-hammer type, and possesses no peculiar features, except that the cylinder, piston, and slide valve are made of bronze, so as to require no lubricant besides the steam. It is fitted with a governor and a feed pump driven by an eccentric. The steam, on escaping from the cylinder, is passed through a condenser, which is placed out of the way against a wall, and consists of two concentric pipes. The steam passes through the inner pipe, while in the annular space water circulates in the opposite direction to the flow of steam, a reservoir in which the water can cool itself again being, of course, required for this purpose where there is no available cheap supply which can be allowed to run to waste. The condensed water flows into a cistern, from which the feed pump draws. The safety valve on the boiler also discharges into the condensing pipe.

These small motors are very cleanly, according to the *Mechanical World*, of London, there being no continual firing with a shovel, and they are intended to be especially useful for those who desire small powers intermittently.

French Shoes.

The following is from special reports which have just been made to the Government at Washington by the consuls and commercial agents of the United States:

The French have peculiar tastes, and believe that their shoes are inimitable in material, workmanship, and, above all, in style. Take, for instance, their ladies' dress slipper, the distinguishing features of which are the pointed toe and a high heel, sloping from the place where the heel belongs to the center of the foot. This peculiar structure is extended to their walking shoes, and it is a sad fact that they have been sent in countless numbers to America and other countries, and have been readily sold, when to the casual observer they would simply appear to be refined instruments of torture. Wooden shoes and wooden soles, cardboard and straw soles, with prunella and cloth uppers, are cheaply manufactured, and find favor among the working classes. The French have possessed themselves of the secret of cheap manufacturing, so that, while maintaining a fair exterior, they can deteriorate the quality to such an extent that it is more than an offset to any foreign competition.

The duties are not excessive, but the great obstacles to the importation of boots and shoes in this district (Marseilles) are of another character. These are the willingness of the people to purchase and wear shoes of the most flimsy and inferior quality, provided they are cheap, and their unwillingness to pay for a better article a higher price than that to which they have been accustomed. The soles are of soft, spongy, yellowish leather, often underlaid with paper; the seam connecting the top with the vamp soon gives way, and in wet weather the "counter" breaks down, and permits the heel to bulge beyond the soles. These goods are the product of hand labor in hundreds of small shops and factories throughout this district, and they form the staple footwear of the people, who, conservative and severely frugal in all things, cannot see why they should pay from 26f. to 30f. for one pair of good shoes when the same sum will purchase three pairs of new ones. In this, as in other articles of dress and luxury among the French working people, it is the new thing which counts.

Boots and shoes for men's wear have been imported here (Lyons) to some extent from Vienna, in Austria, and are meeting with some success. They are quite perfect in elegance and shape, but objection is made to the quality of the soles, which are said to be inferior. Germany is also supplying the French markets with felt slippers to a considerable extent, the sole either of felt or leather, as the case may be. England is exporting so very small a quantity to this country that it is scarcely worth mentioning. Boots and shoes manufactured in the United States are quite unknown in this consulate district. Large quantities of caoutchouc come from there, but the fabrication into boots and shoes is perfected here in France.

A CALCULATION made by Mr. Corthell of the figures of the mile-long railroad train drawn by a single locomotive establishes that there were 3,253 tons weight on this train, which was drawn by a single 55 ton engine. This would be more than the weight of many steamships with their cargoes.

OTHNIEL CHARLES MARSH.

BY A YALE CLASSMATE.

To write the record of a successful life, always a pleasant task, is doubly so when, as in this instance, the history is that of a life-long friend.

Othniel Charles Marsh, Professor of Paleontology in Yale College and President of the National Academy of Sciences, was born in Lockport, N. Y., October 29, 1831. His parents were Caleb and Mary Gaines (Peabody) Marsh, whose eldest and only surviving child he is. Both his parents were of New England descent, and he was connected with the Pope, Dodge, Spofford, and other prominent families. His maternal uncle was the eminent banker, George Peabody. From early youth he was addicted to athletic exercise, especially to hunting. He was a sportsman before he became a scientist; but this out of door life and contact with nature soon turned his attention to the study of the natural sciences, at the same time that it contributed robustness and vigor to his frame, which has enabled him in after life to perform without weariness an amount of thorough and efficient work under which a mere book-worm would have collapsed, and rendered him on subsequent expeditions to the Rocky Mountains the best shot of the party.

In 1852 Marsh went to the Philips Exeter Academy, at Andover, Mass., a celebrated training school, where he studied for four years and graduated as valedictorian of his class. Entering Yale College in the fall of 1856, together with most of his Andover classmates, he graduated there in the class of 1860 with high honor.

It was as a classmate at Yale that I first knew him. He was already a savant before he had attained his first scholastic degree. Without neglecting the studies of the curriculum, he found time to care for an aquarium which he kept in his room, and in which he cultivated aquatic life, both animal and vegetable, as material for his biological studies. Vacations were often, perhaps generally, spent in Nova Scotia in the study of the geology and paleontology of that then little known country, and it was on that soil that his first great discovery was made, the two celebrated vertebræ of the *Eosaurus acadianus*, the earliest vestiges of reptilian life yet known. At the end of his collegiate course, Marsh stood eighth in rank of scholarship in a class of 108 or, as it now stands on the triennial catalogue of Yale, 109 members, the largest and one of the ablest classes that had ever graduated there. As a rule in that class, a high stand in scholarship was not incompatible with excellence in other directions, and among the men of whom the world has since heard may be mentioned William Walter Phelps, whose rank on the appointment list was even higher than that of Marsh.

Although Marsh had always rightly regarded linguistic studies as a means rather than an end, yet his proficiency in classics was such as to entitle him on graduation to the Berkeley Scholarship, which was founded by the eminent English metaphysician, Bishop George Berkeley; and in accordance with the terms on which the income of that foundation is granted, Marsh, rather for the honor than the income, since his private fortune was ample, remained two years longer at Yale as a scholar of the house. Already he began to contribute articles to scientific journals, and his name became known in both hemispheres, so that when in 1862 he went abroad to continue his studies, he was recognized by the scientists of Europe as a brother.

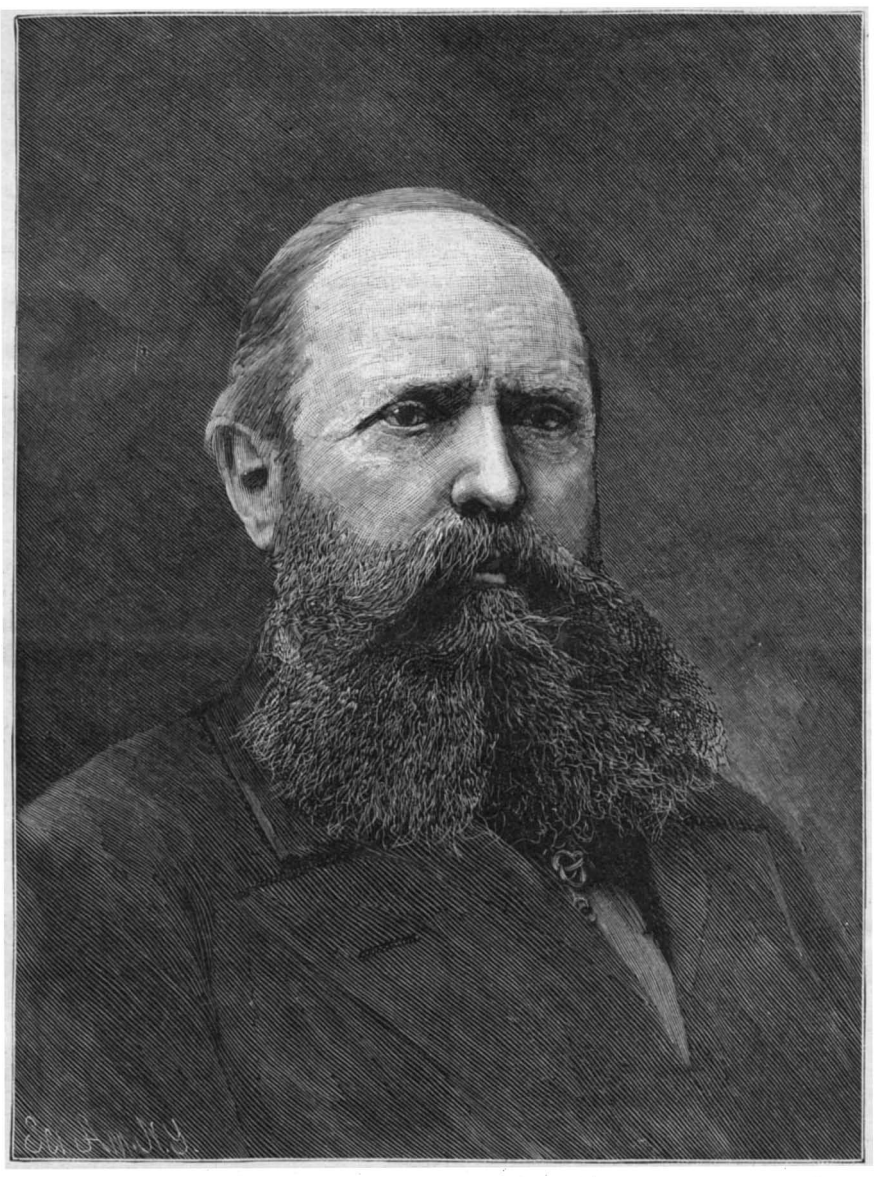
He remained for three years in the universities of Heidelberg, Breslau, and Berlin, and studied under the direction of Ehrenberg, Frose, Bunsen, Peters, Beyrich, and Roemer. His vacations, as usual, were employed in the field, much of the time among the Alps, and as usual he found something that others had overlooked.

In 1866 he was appointed Professor of Paleontology at Yale College, and still retains that professorship, the only person who has ever filled that chair at Yale. The fund which endows it comes from the estate of his uncle, George Peabody, as also does the endowment of the Peabody Museum of Natural History at New Haven, the Peabody Museum of Archeology and Ethnology at Cambridge, and the Peabody Academy of Science at Salem, Mass., to the success of all which he has contributed by his advice and plans.

Prof. Marsh began the work of his professorship by examinations of the Cretaceous and Tertiary fauna of New Jersey; but in 1868 he made the first journey to the region with which his name is most fully identified. He may well be said to have written his name across the Rocky Mountains, so numerous and valuable have been his discoveries there. On this first trip he obtained specimens of larval *Siredons*, and discovered that they underwent a metamorphosis into the *Amblystoma*, thus illustrating the evolution of one living species out of another. He was encouraged also by a rich find of fossils in Nebraska to prepare the Yale exploring party which left New Haven June 30, 1870, reached San Francisco October 19, and returned to New Haven December 19 the same year. Over one hundred new species of extinct vertebrates, most of them from two newly discovered Tertiary basins, were the results of this expedition.

The following abstracts are from a daily paper published within a week after the return of the party:

The Professor of Paleontology, or the science of fossils, in Yale College is O. C. Marsh, a young, fresh-looking gentleman of possibly five and-thirty years of age, who appears to the casual observer anything else than a devoted student of the petrified bones of past ages. But if one could obtain a glance at the Professor's cabinets, in College Street, he would everywhere see not only the evidences of great scientific acquirements, but valuable specimens of scientific treasures. As Professor of Paleontology in Yale College he is also Curator of the Yale Geological Museum, and as soon as he can perform the thousand offices of duty and of friendship which awaited him on his return from his summer's explorations in the Rocky Mountain regions last Saturday, he will busy himself arranging and describing the treasures he brought back with him. The discoveries made by Professor Marsh are of the greatest importance.



PROF. MARSH, PRESIDENT OF THE NATIONAL ACADEMY OF SCIENCES.

About a dozen subsequent expeditions were undertaken from year to year, but he finally preferred to send out trained explorers.

In 1874 he came in contact with the Sioux Indians, who at first drove him back, supposing he was prospecting for gold. On better acquaintance, however, Red Cloud spoke of him as being the only white man he ever met who kept his promises. He was led to attempt redress of the Indian grievances, and thus brought into conflict with the policy of Secretary Delano. The quindecennial history of the Yale class of 1860, published in 1875, says: "Secretary Delano began by calling our classmate 'a Mr. Marsh,' and ended by retiring to private life and political death in Ohio, where he is now known as 'a Mr. Delano.' This is the first instance in which a private citizen has successfully fought a department of the Government in his efforts to expose corruption, and *of course* the victor was a '60 man."

Prof. Marsh is a connoisseur in art as well as a leader in science. His beautiful mansion in New Haven is a well-stocked museum of painting and sculpture.

He is still a bachelor, though older than most of his classmates, who already boast the paternity of several hundred sons and daughters of Yale. His fine physique, robust health, and florid complexion still give him a youthful appearance, as the engraving, accurately reproduced from a life-like photograph, well shows.

He was Vice-President of the American Association for the Advancement of Science at the Nashville meeting in 1877, and President of the same at the St. Louis meeting in 1878.

As Vice-President, he delivered an address "On the Introduction and Succession of Vertebrate Life in America," and as retiring President at Saratoga, in 1879, an address "On the History and Methods of Paleontological Discovery," both which were milestones in the progress of science.

His larger published works are the elaborate monographs, published in the Geological Survey series, on "Odontornithes" and "Dinocerata."

He has also published over one hundred and fifty papers on scientific subjects, all favoring the evolutionary theory.

In April, 1878, he was elected Vice-President of the National Academy of Sciences, and on the death of Joseph Henry, later in the year, he succeeded Henry as President, which office he has ever since held, and is expected to preside at the annual meeting of the Academy in Washington, commencing April 20.

W. H. H.

Industrial Notes.

Damaskeening Metals by Electrolysis.—At one of the last sessions of the Societe Industrielle d'Aix-la-Chapelle a note was presented in which was described a method of damaskeening metal plates by electrolysis. The process is based upon the following principle: If we put two copper plates into a sulphate of copper bath, and connect one of them with the positive and the other with the negative pole of a battery, a transfer of metal from one to the other will occur. This granted, the process is as follows: A thin layer of an insulating substance (wax, for example) is spread over a plate of copper, and on this is drawn with an etching needle the design that it is desired to reproduce. The plate thus prepared is suspended in a sulphate of copper bath and connected with the positive pole of a battery. In a short time the plate will have been attacked everywhere where the copper was laid bare by the needle, that is to say, upon the lines of the drawing.

It requires a battery of two elements to bite in the lines of the drawing to the depth of a millimeter. After sufficient biting in, the plate is taken from the bath and treated with a few drops of hydrochloric acid, in order to remove all traces of oxide of copper in the lines of the drawing. After this, the plate is washed with water and suspended in a bath of silver or nickel and connected with the negative pole of a battery. The positive pole now consists of a plate of platinum. The silver or nickel deposits wherever the copper has been attacked, and, at the end of a certain time, the depressions will be entirely filled with the new metal.

After this it only remains to polish the plate, when it will be impossible to distinguish it from one that has been damaskeened by hand.—*La Lumiere Electrique.*

Artificial Stone.—Messrs. Thompson and Bryant form a good artificial stone by mixing in proper proportions Portland cement, powdered granite, blast furnace slag, and water containing silicate of soda. The mixture may be colored to suit the taste.

Iron Paint.—For painting walls or other objects exposed to dampness a composition is much used in Germany formed of very fine iron filings and linseed oil varnish. When the object to be painted is to undergo frequent changes of temperature, linseed oil and amber varnish are added to the first two coats.

This paint may be applied to wood, stone, or iron. In the case of the latter, it is not necessary to first free it from rust or oily matters.

Fireproof Composition.—Mr. S. J. Blanc, by treating furnace slag with boiling acid, obtains a jelly-like substance, of which he mixes 16 parts with 8 parts of silica, 23 of oxide of zinc, 23 of silicate of soda, and 30 of lime water. The product thus obtained he mixes with colors and varnishes, in order to render them incombustible, and, at the same time, impermeable to moisture.

Bleaching without the Use of Chlorine.—Mr. Thomas, of Elberfeld, describes the following process of bleaching without the use of chlorine: The materials to be bleached are submitted to a preparatory treatment, either a cold one in a stone or wooden back, or a hot one in an iron boiler, according to the degree of decoloration that it is desired to obtain. This treatment is

performed with a solution of caustic soda in the proportion of 3½ pounds to 100 pounds of the materials to be treated. The duration of this operation is about twelve hours.

The materials are next immersed in a hot bath of permanganate of potash for twenty or thirty minutes, and after this in a solution of one pound of borax in ten gallons of water, which has previously been saturated with sulphurous acid. In this latter bath they are allowed to remain from twenty to thirty minutes, after which they are thoroughly washed, and finally dried. —*Moniteur Industrielle.*

Preparation of Metals for Nickelizing.—Surfaces to be nickelized are usually polished before being submitted to the action of the bath. After this operation is finished they remain covered with a slight greasiness, which is often still further increased by contact with the hands. This is one of the principal causes of failure to obtain a perfect nickelization, and it is therefore essential to have the surfaces as clean as possible. The *Elektrotechnische Rundschau* says that the following process will always yield good results:

Prepare a hot solution of one part by weight of potash in ten of water, and place the object in this and allow it to remain therein for one or two minutes, and then wash with plenty of water. Next put it into a bath made by slaking quicklime in water and adding enough water to make the mixture look like milk. Then wash again with fresh water. Finally, place the object in a solution of one drachm of hydrochloric acid to a quart of water, and wash a third time with pure water. The surfaces will now be well adapted for receiving a nickel coating, and the only precaution to take is to prevent them from coming into contact with the hands or other greasy bodies.

What is Thought of It.

The encomiums passed upon the SCIENTIFIC AMERICAN by the press throughout the country are numerous and very gratifying to the conductors of this paper. It is but seldom that we occupy space for the reproduction of these kindly expressions, but occasionally we take occasion to recognize the courtesy of our contemporaries by copying from some of those papers published in diverse portions of the country. The papers named in the annexed list, and scores of others who have seen fit to say good words for the SCIENTIFIC AMERICAN, have the publishers' thanks.

The SCIENTIFIC AMERICAN is the very best publication in this country for those interested in science, engineering, mechanics, etc.—*Fulton Co. (N. Y.) Republican.*

The SCIENTIFIC AMERICAN certainly needs no one to "sing its praises," but notwithstanding this fact we feel it an absolute duty to the general public, at least that portion of it which has never seen or heard of the paper, to tell them that such a one is published, and that its true value cannot be overestimated. It stands at the head.—*The Practical Poultryman, Warsaw, Ind.*

That well known and most useful journal, the SCIENTIFIC AMERICAN, a paper that is alike interesting to the common reader, the artisan, and the student. Its columns are always practical and entertaining.—*San Antonio (Tex.) Light.*

SCIENTIFIC AMERICAN.—Every week this most valuable periodical presents whatever is new in the world of science, art, and manufactures. Full of practical information, it discloses to the thoughtful not only what has been ascertained, but also suggests the possibilities still to be revealed. With the growing attention to education in the industrial arts this periodical must attain a larger usefulness, and the reading world may realize that "Truth is stranger than fiction."—*Truth and Works, Phila.*

The SCIENTIFIC AMERICAN presents weekly to its readers the best and most reliable record of various improvements in machinery, while the scientific progress of the country can in no way be gleaned so well as by the regular perusal of its pages.—*The Fountain, York, Pa.*

A father can give his young son no better present than a year's reading of the SCIENTIFIC AMERICAN. Its good influence will undoubtedly show in the brain of his son, which will make him feel proud of him. Its contents will lead the young mind in the path of thought, and if he treads there a while, he'll forget frivolities and be of some account.

After the moral and religious instruction of the family is secured, we know of nothing more interesting and instructive than a record of the progress of modern science and its marvelous achievements. And we know no medium which presents such a record in so full and readable a manner as that well known weekly, the SCIENTIFIC AMERICAN, $3.20 a year, established over forty years. It will promote industry, progress, thrift, and intelligence wherever it is read. It is of special value to every machinist, mechanic, or engineer, but is also of use to the farming and mercantile community, on account of its illustrated notes on farming, fencing, farm buildings, implements, etc.

The SCIENTIFIC AMERICAN SUPPLEMENT is the same size, and of a somewhat higher and more technical grade. Price $5, or the two together for $7. Munn & Co., 361 Broadway, New York, are the publishers.—*Home and School, Toronto, Canada.*

Among the publications devoted to practical information, art, science, mechanics, chemistry, manufactures, and kindred subjects, none fulfills its aim more thoroughly than the SCIENTIFIC AMERICAN. Its copious letterpress is supplemented by admirable illustrations, and is the product of the best minds in the peculiar domain which it cultivates. The SCIENTIFIC AMERICAN is considered an authority by both specialists and the general public.—*The Standard, Boston.*

The SCIENTIFIC AMERICAN is the most practically useful publication of its kind in the country. Indeed, it occupies a field distinctively its own. Not alone for the machinist, manufacturer, or scientist, but it is a journal for popular perusal and study.—*The Tonica (Ill.) News.*

The SCIENTIFIC AMERICAN is the standard of all scientific and art questions throughout the civilized world. It is placed at a very low rate of subscription, $3.20 per annum, which places it within the reach of all.—*The Weiser (Idaho) Leader.*

The SCIENTIFIC AMERICAN is, beyond all competition, the leading scientific paper of America. It presents the latest scientific topics in an interesting as well as a reliable manner.—*Sunday Gazette, Akron, O.*

The SCIENTIFIC AMERICAN and the SCIENTIFIC AMERICAN SUPPLEMENT are publications of incalculable worth to every mechanic, artisan, and inventor. By reading these beautifully printed publications, with their pages filled with pictures and illustrations of new appliances and inventions, men gain ideas and knowledge that often prove fortunes to them.—"*Brick*" *Pomeroy's Democrat.*

The SCIENTIFIC AMERICAN, says the *Wolsey (Dakota) Journal*, is without a peer in its line, and is invaluable to mechanics and inventors.

The SCIENTIFIC AMERICAN remains without a rival in its special field. One will always find it full of valuable information that it would be difficult to get elsewhere.—*Christian S. S. Teacher.*

The SCIENTIFIC AMERICAN is the greatest journal of its class in the world.—*The Dakota Record and Advocate.*

The SCIENTIFIC AMERICAN is, without a doubt, the best scientific paper published in America and is interesting and instructive to all classes.—*Latrobe (Pa.) Advance.*

Our Patent System.

If some philosopher should propose a scheme by which, without any expense to the state, a small army of ingenious men might constantly be employed in devising means for adding to the wealth of the country and to the comfort of its inhabitants, he would be regarded as a person of almost superhuman wisdom. And yet the patent system of the United States is such a scheme, producing such results. Last year the patents granted for inventions reached the enormous number of 23,329, and most of these were for really useful devices that will effect a saving in time, money, and labor. It would be speaking within bounds to say that every year 10,000 men employ a considerable part of their working hours in making inventions, and to this class our wonderful industrial and agricultural progress is largely due. It is the genius of the inventor that has developed our manufactures, planted and reaped the prairies, and even fenced in the cattle ranges of the West. In his recent work on "Popular Government," Sir Henry Maine remarks that the power to grant patents by federal authority is one of those provisions of the Constitution which, though commonly overlooked by superficial critics, "have most influenced the destinies of the American people," and that it has made them "the first in the world for the number and ingenuity of the inventions by which they have promoted the useful arts." Practical men who study our industrial achievements come to the same conclusion. A few years ago a commission of Swiss manufacturers who visited this country returned home almost in despair of competing with us even in the manufacture of watches; and in their report they recommend, as of the utmost necessity, the creation of a patent system in Switzerland similar to our own. Sir William Thomson, President of the Mathematical and Physical Section of the British Association, has declared that "if Europe does not amend its patent laws, America will speedily become the nursery of useful inventions for the world."

The Boston *Weekly Advertiser*, from which the above is taken, expresses the opinion that the costs of a patent in this country seldom prevent an inventor from obtaining a patent, in consequence of his inability to pay the fees, although circumstances may require him to wait some time longer than he likes to, for lack of the necessary means.

Referring to the Patent Office, the editor adds: Small as the fees are, however, the income arising from them is sufficient not only to defray the whole expense of the Patent Office, but to leave a large surplus besides; and, therefore, there can be no excuse for the niggardly appropriations made by Congress for this department. The force is too small, so that inventors are kept waiting an unreasonable time for action upon their applications, and the salaries of the examiners are insufficient to attract such men as the duties of their office demand. If, therefore, any new legislation is to be had in respect to patents, it should be such as will increase the efficiency of the present system, already a source of revenue to the state and of immense benefit to the country. But the changes most often proposed, and embodied in five or six bills recently introduced in Congress, are of a directly opposite character, and calculated to impair, in some cases to destroy, the efficiency of the present law. They are indications of a feeling which crops out continually, here and there, especially in the West, that patents are instruments of oppression, and that the country would be so much the richer if they could be done away with.

It is true that the protection of a patent sometimes involves a certain hardship to innocent purchasers of an infringing article, but the hardship in this case is no greater than in other cases where innocent purchasers are victimized by thieves. The man who buys a stolen horse is obliged to surrender him to the rightful owner, and although this is a hardship, it is a necessary one. And a similar hardship is equally necessary in the case of a patent, for if innocent purchasers were not liable to suits for infringement, the infringing manufacturer and seller would stand as well in the market as the owner of the patent; and when the article invented was, as it very often, perhaps most often, is of such a character as to be made and disposed of easily, the value of the patent would practically be gone. In reality, it very seldom happens that an innocent purchaser is sued; but if his liability to suit were taken away, capitalists would not buy patents, and the prospective reward of the inventor would disappear. The capitalist is as indispensable to the inventor as he is to the workman; and it is impossible to destroy the property of the capitalist in patents without striking a fatal blow at the inventor behind him. The capitalist benefits incidentally by the patent law, but if this be a misfortune, it is an unavoidable one.

Those who wish to curtail the privilege of patent owners, or to abolish the system altogether, should bear in mind not only soulless corporations and rich capitalists, but the real object of the patent laws—the inventor. Commonly he is a poor mechanic, toiling late at night; often and often, as the law books record, struggling with poverty, illness, and discouragement, but buoyed up for years, may be, by the certainty of obtaining, if he succeeds, a patent that will have a market value. It is for the purpose of keeping this man to his task that our patent system exists. Without the hope of pecuniary reward, great in proportion to the value of his invention, he will either make no attempt to invent, or succumb to the first difficulty. In the establishment of M. Schneider, the famous ironworker of Creuzot, France, about 12,000 workmen are employed, but they are forbidden to take out patents for themselves, and the result is that they have never produced a single invention of sufficient value to be worth patenting by the proprietors.

A patent system, to be of any avail, must touch every workman in the country, and to this end the patent must, first, be obtained cheaply, and, second, be protected efficiently. If not cheaply obtainable, it will be beyond the reach of the workman; and unless fully protected, it will not be for the interest of the capitalist to buy the patent; consequently, there being no reward for the inventor, he will cease to invent. At present, our patent system combines both of these essential characteristics; to abolish either of them would be an act not only of injustice, but of folly.

Repairs of Railroad Cars by Contract.

At a meeting of the Master Car Builders' Club, at their rooms in New York city, on April 15, there was an informal discussion of the question of the advisability of introducing some system whereby car repairing of all kinds, including painting and varnishing, might be done by contract. There has been some slight attempt made in this direction by one or two companies, in special kinds of work, but the idea of thus covering the whole field of car repairs is now being entertained by a sufficient number of railroad men to insure a thorough discussion of the subject. One of the reasons especially put forward in its favor is that, once having a scale of prices adopted covering all the details of the work, the companies will not be likely to have as much difficulty with the men on account of strikes, as, under the proposed new contract system, the work would naturally be so divided as to come under the control of "teams," as it were, in the several departments, these teams contracting to do so much work, the company furnishing the material, and the men settling their own affairs as to the division of the pay among themselves.

Red Ink in Printing.

In ornate typography, red is growing in favor, and the tendency is to work in heavy masses of it. To produce a striking effect, more red is required than black. A recent number of the *Art Age*, in an elaborate review of the use of red ink, says, among other pertinent things, that the mistake most frequently made is in introducing red inappropriately in masses where it is neither ornamental nor part of the general composition.

To put it plainer, there is an increasing disposition on the part of printers who have a laudable desire to be progressive to use great masses of red merely for the sake of obtaining a glaring effect. A single line of red in a page of gothic produces a highly attractive effect. One heavy initial letter or line of red in a page is pleasing to the eye; any further addition of red in mass becomes a positive blemish, which repels.

Natural History Notes.

The Age of Fish.—Many statements have been made as to the great age that fish may attain. Some persons think that there are carp at Fontainebleau that date back to the time of Francis I., but the majority is skeptical in regard to this, and for good reasons. Professor Spencer F. Baird thinks that we may allow an age of 200 years for certain carp. There is nothing, says he, to prevent fish from living almost indefinitely, since they have no period of maturity, and grow every year of their life. In Washington there are goldfish that have belonged to the same family for fifty years, and they appear to be scarcely any larger than they were when purchased. In the royal aquaria at St. Petersburg, there are fish that are really 140 years old. Some of these are fully five times larger than they were when introduced, while others have gained but a fraction of an inch in length. It appears that in China there are sacred fish of still greater age.

A Gigantic Sea Weed.—Captain John Stone, commander of the ship Clever, recently carried to Montevideo some remains of a gigantic sea weed that he picked up near the equator. While overtaken by a dead calm in these regions, the sailors perceived an object floating on the surface at some distance from the ship. Manning a boat, they rowed out to it and found to their surprise that it was an alga of the extraordinary length of over fifteen hundred feet. From an examination of the specimens collected, botanists identified the plant as *Macrocystis pyrifera.*

Deep Water Fauna of the North Atlantic.—In a recent paper by Professor S. I. Smith on the decapod crustaceans dredged by the Albatross in the North Atlantic, the author remarks that at least a third of all the species taken came from depths greater than a thousand fathoms, and a number were remarkable for their large size. One Brachyuran had a carapace five inches long and six broad, and some specimens of an Anomuran measured, with outstretched legs, over three feet. Some of the species were nearly colorless, but most were of some shade of red or orange. As regards eyes, eight out of twenty-one had normal black ones, two had abnormally small ones, three had eyes with light colored pigment, and of the rest the function was doubtful. Of five species from below two thousand fathoms, one had normal, well developed eyes, while the eyes of the rest were small, imperfect, or doubtful. From these and other facts, Professor Smith draws the conclusion that, notwithstanding the objections made by physicists, some light penetrates to a depth of over two thousand fathoms, and, in view of the purity of the water in mid-ocean, he sees no reason why light should not reach that depth as easily as it does five hundred or two hundred fathoms nearer shore. However this may be, he finds that there is a tendency toward a radical modification or an obliteration of the normal visual organs in deep water species.

The Enemies of the Oyster.—In a recent number of *Science*, Mr. R. S. Tarr gives some interesting details in regard to the habits of two enemies of the oyster, studied by him—*Asterias Forbesii* and *Eurosalpinx Cinerea.* The former of these approaches the oyster, which naturally is powerless to move, and lies upon its shell. It then proceeds to attack its victim's stomach, and in so doing secretes a peculiar liquid that seems to weaken or kill the oyster, so that the latter remains with its shell partly open. After a while, the Asterias has absorbed sufficient of the oyster, and takes its departure, leaving its victim to perish. Getting hungry again, the Asterias begins upon another oyster, eating a small portion as before, and leaving the rest without ever returning to it. It appears that at times an oyster bed will be entirely taken possession of by these animals and be wholly destroyed in one night. Mr. Tarr thinks the only remedy is to find whether there is not some mollusk that the Asterias might like better than the oyster, and, if there is, to rear this in the vicinity of oyster beds in order to satisfy the starfish's voracity.

The Eurosalpinx, by means of its odontophore, bores a hole into the oyster's shell with amazing rapidity, and then scrapes out the flesh and feeds upon it. After a short period of rest it passes to another oyster, and so on. In both cases the victim is fatally injured, and soon dies. According to Mr. Tarr, these two enemies are the cause of very great mortality among oysters.

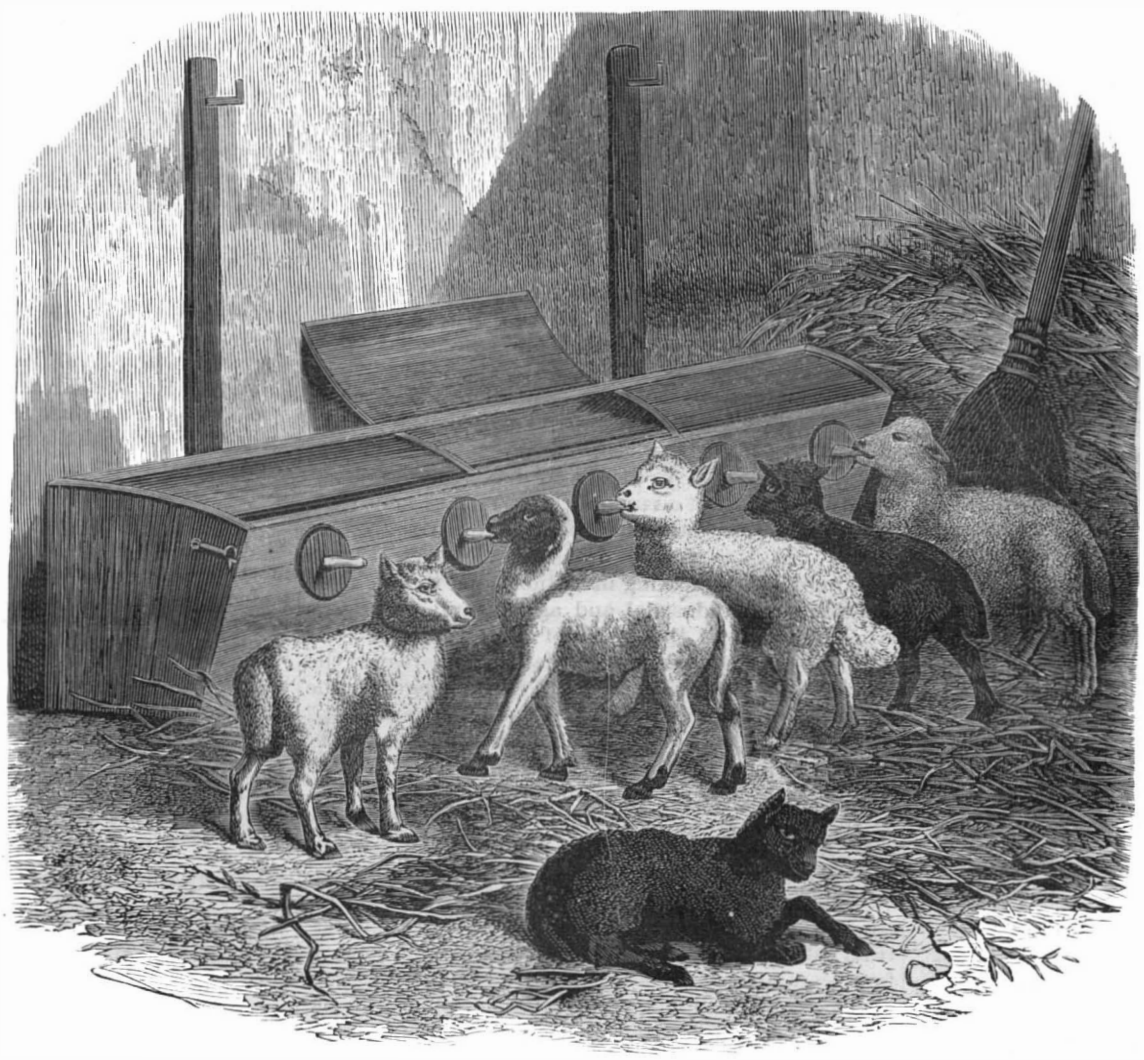
Influence of Electricity on Plant Roots.—It is a fact generally known to botanists that the roots of aquatic plants incline to one side or the other when an electric current is passed through the water in which they grow. Mr. Elfring was the first to observe this fact, as long ago as 1882. He found that the majority of the roots examined by him curved positively, that is, toward the anode; others, on the contrary, curved toward the cathode; and, finally, some exhibited an inclination whose direction it was difficult to determine. Mr. Elfring endeavored to explain this phenomenon by saying that the current, acting upon the protoplasm, produces a diminution in the turgidness of the cellules, and consequently a retardation in the growth; and this retardation being different at various points of the root, there results a curvature of the latter.

A little later, Mr. Brunchorst thought that he had discovered that the curvature depended solely upon the intensity of the current, that is to say, that a current of feeble intensity produced a negative curvature, and one of strong intensity a positive one.

More recently some researches on this subject have been made by Mr. Rischewi. According to the theory which he espouses, the curvatures are attributable to cataphoric action. This scientist bases his theory upon the well known experiment of Dr. Du Bois Reymond, in which two cylinders of coagulated albumen, placed between the electrodes, show an inflation at the negative electrode and a contraction at the positive. This phenomenon is due to the fact that the water in the cylinder moves, under the influence of the current, in the direction of the latter. Roots afford another example of such action. As the turgidness of the cellules increases on the side next the cathode, this side elongates, and a positive curvature is produced. The negative curvature is explained by the diffusion of the external liquid in the porous roots, this occurring on the side next the anode, when a current of feeble intensity is made to pass.

The Velocity of Meteors.

About six weeks ago, we referred to the fact of an extraordinarily brilliant meteor having flashed across the sky in this neighborhood, and we invited communications upon it from any who might have observed it. It seems that upon the same night a similar meteor was observed in England. Now, under ordinary circumstances, there was nothing notable in this, for meteors are known to be continually falling, it having been calculated that many millions of them fall annually upon the earth. But that one should fall of exceeding brilliance, and described in almost identical language by correspondents in the *Times* and by ourselves, is worthy of note and of further inquiry. We recorded that such a meteor appeared at 27 minutes past 12 in the direction east-southeast from Cumballa Hill, from which place it was seen. It was subsequently reported from Rutnagherry that a meteor was seen there, but to the north. A correspondent wrote us from Mahableshwur, who reported that he saw a very bright meteor at half past 1 (local time), but the great difference in time pointed to some error in recording the exact appearance, or else proved that it was some other meteor that was seen. In England there was a meteor which seems to have passed over London about 5:5 P.M. Greenwich time, or 9:55 P.M. Bombay time; and it appears to have been traveling eastward. It does not seem beyond the bounds of possibility that the meteors seen here and in England were the same. The absolute difference in time would thus be 2 hours 32 minutes, which is equal to the time taken to travel the distance between these two points. Assuming this distance to be about 5,500 miles, the rate at which the meteor was traveling was about 35½ miles a minute in the earth's atmosphere. The rate at which meteors travel in interstellar space is about 40 to 50 miles per second. So that the difference between these two rates of speed shows the retardation due to the earth's atmosphere, always going upon the assumption that the meteor seen in England was the same as that seen here. To settle this point, it will be of interest to know if any one between Bombay and London noticed the brilliant meteor of the 16th of January, and it would also be interesting to know if any one saw it on the other side of India and further east. Though meteors or meteorites fall in such great numbers, it is very rarely that their history can be traced, and it appears that a service may be done to science by tracing out the path of this particular one, if so be that two points in its journey have been fixed.—*Times of India, March* 6, 1886.



A NOVEL MODE OF FEEDING LAMBS.

NOVEL MODE OF FEEDING LAMBS.

The device for feeding lambs is so simple and so well delineated in our excellent engraving as to require but very little description.

It may be well to state that the reservoir containing the milk should be kept clean and sweet, and fed to the lambs at about the normal temperature of the animal.

The sooner after birth the lambs are introduced to this mode of artificial feeding, the less trouble will be experienced in the weaning process. The lambs should be fed regularly, not less than three times a day. In France, where the invention has been introduced quite extensively, it is said to have proved very satisfactory.

The Paris Metropolitan Railway.

The capital of the company for the promotion of the Metropolitan Railway for Paris is to be 50,000,000 francs. The plan comprises (1) an inner circle line along which the rails will pass, according to the nature of the ground traversed, underground through cuttings or over viaducts; (2) two great arteries destined to connect the stations of the great companies and intersecting Paris. One underground will connect the Gare de l'Est, pass through the district of the General Post Office and Halles, and terminate at Mont Parnasse Station; the other, which will be above the surface level, will connect with each other (1) the Saint Lazare and the Nord stations by a line which will pass through the Carrefour Drouot; (2) the two stations so united of the West and North with the Vincennes and Lyons stations by means of a line passing from the Carrefour Drouot and leading toward the Avenue Daumesnil by crossing the district of the Halles, which, serving as a point of intersection of the above-ground artery and the underground artery, will thus have exceptional advantages. The contemplated stations number 64, of which 28 are to be on the viaduct, 15 over open cuttings, and 21 over the underground way.

ENGINEERING INVENTIONS.

A boiler covering composition has been patented by Mr. William M. Suhr, of New York city. It is a fireproof and at the same time non-conducting boiler and tube covering, consisting of a solution of alum and soda, a mixture of hair or felt, asbestos fibers, mineral wool, cork and sawdust, and plaster of Paris, or other similar substance, mingled in certain proportions.

A rotary engine has been patented by Mr. William L. Tuck, of Bay View, Wis. It has a circular cylinder combined with a non-concentric block having recesses and steam ports, a piston having wings and radially slotted plates, within which the ends of the wings move, a slide valve, exhaust valves, manipulating lever, etc., the engine being designed to utilize the full force of the steam throughout the greater part of the revolution of the piston.

MISCELLANEOUS INVENTIONS.

A head rest has been patented by Mr. George Phillips, of Tilford, Ill. It is a wire frame provided with a cushion for the head, with cords attached which are held by the feet to support the head rest at the desired inclination, the device being simple, light, and portable, for the use of tourists and others.

A cyclometer has been patented by Mr. Gabriel P. B. Hoyt, of Jamaica, N. Y. It is constructed to receive positive, intermittent, or stop motion, from a point, projection, or cogwheel arranged to revolve with the crank, and does not depend upon the force of gravity for its operation.

A duplex brick has been patented by Mr. James A. McAllister, of Fredericton, N. B., Canada. It consists of two ordinary sized brick united by a connecting neck or web, the surfaces of the brick being indented on the upper and lower faces and ends to enable the mortar to obtain a firmer grip.

A brick burner has been patented by Mr. Bernhard Albers, of Conception, Mo. This invention consists in furnaces having interchangeable grates, the furnaces being arranged in pairs, each pair being connected by an arch in which there is a flue, said flue being centrally divided by a solid abutment or partition.

An edge trimmer for walks and beds has been patented by Mr. Thomas Akins, of Camden, N. J. Its construction is such that as the machine is moved along the edge of a walk the cutter trims the edge of the sod to the desired slope, and the plow or scraper loosens the sod and soil cut off and throws them into the middle part of the walk.

A coffee huller has been patented by Mr. Jose Guardiola, of Chocola, Guatemala. In connection with the hopper and its casing are disks which revolve about two hundred times a minute, the berries being rubbed between projections of the casing and the disks and plates, whereby the hulls are broken and removed

A wrench has been patented by Messrs. John and Patrick Ryan, of New York city. Its handle is in two parallel parts, one being a prolongation of the shank and having mortises, and the other part of the handle having lugs adapted to enter the mortises, the outer end of the adjusting screw being journaled in this part.

A cement for roofing has been patented by Mr. Eldridge J. Burchell, of La Fargeville, N. Y. It is made of coal tar, water lime, coal ashes, plaster of Paris, an oil solution, and a soda solution, mixed in specified proportions, which are variable somewhat, according to the uses to which it is to be put, and adding coloring matter as desired.

An anti-insect fabric has been patented by Mr. John P. Regan, of New York city. It is made by first steeping the fabric in a solution of tobacco and cascarilla bark macerated in benzine, then drying and steeping in tobacco, cascarilla bark, and hot water, the fabric to be used in trunk linings, etc., as a protection from moths or other insects.

A mode of re-enforcing tubular or hollow structures has been patented by Mr. Ebenezer Hill, of South Norwalk, Conn. In vessels exposed to high internal fluid pressures, this method consists in inclosing the vessels in a series of casings, each succeeding outer one charged with fluid, air, or gas of a less pressure than the one next within it.

A stencil has been patented by Mr. Geo. F. Gunther, of Louisville, Ky. It has a metal head piece with wire or rod extension on which letters or numbers may be slipped to form the print to be made, with other novel features, to facilitate the marking of packages with ink and brush by a readily changeable device.

A street lamp has been patented by Mr. Albert F. B. Hennig, of Denver, Col. The construction is such that the gas is automatically turned on by swinging up the bottom gate or door to introduce the torch or other light used for igniting the gas, and the improvement is one that can be applied on any gas lamp and on any burner.

A fire escape has been patented by Mr. Patrick Fogarty, of Milwaukee, Wis. It consists essentially of an elevator car supported by wires that pass over pulleys carried by arms that project from an adjustable bar that is secured within the window casing, with certain novel details of construction, to facilitate the escape of occupants from burning buildings.

A band cutter and feeding attachment for thrashing machines has been patented by Mr. James H. Sheldon, of Warren, Minn. It is designed to carry the bundles forward, cut the bands, spread the grain, and feed it evenly, and when the machine is not in use, and passing from place to place, the carrier can be swung over the chute.

A rosette for harness has been patented by Mr. Ernest F. Pflueger, of Akron, O. This invention consists in means for securing the holding loop to the rosette frame more strongly, and is an improvement on a former patented invention of the same inventor, the ends of the loop being, according to the present invention, embedded in a solid filling of solder.

A gate latch has been patented by Mr. Louis S. Stoll, of Arcadia, Iowa. It consists of a bar or lever, two slotted and tongued plates, a spring and a catch plate with attaching screws and bolts, making a simple and inexpensive latch, which may be readily applied to new or old gates, and one which will effectively and automatically latch the gate when it is swung shut from either side of the fence.

A machine for printing samples on textile fabrics has been patented by Mr. William Mather, of Manchester, Lancaster Co., Eng. Its construction is such that thereby samples can be printed of designs from the engraved copper rollers without the necessity of first mounting the rollers on solid mandrels, thereby saving the great trouble and cost of readjustment for separate trials involved in present methods.

A hoe sharpener has been patented by Mr. Park D. Folkes, of Hays' Landing, Miss. It consists of a pair of jaws pivoted together, a whetstone or sharpening device secured along the inner edge of one jaw, and an anti-friction roller journaled on the other jaw, making a device which can be used on a large variety of tools, or to sharpen mowing machine knives without removing them from the machine.

A machine for hardening seamless felt boots and other hollow felt articles has been patented by Messrs. Walter P. and Nelson F. Hyatt, of Matteawan, N. Y. It has a solid mould with a recess of about the shape of the desired article, with a core which can be placed in the recess and vibrated therein, so that no subsequent stitching, finishing, or felting is required for firmly uniting the bats to complete the article.

A bridle has been patented by Mr. Robert Richardson, of Detroit, Mich. It has two bits, so arranged in connection with straps and rings of the head gear that in driving only one bit will ordinarily be used, but if this is not sufficient to check the horse, an extra tension on the reins will bring the other and smaller bit into the horse's mouth with a force sufficient to curb even the most restive and vicious animal.

A combined breast collar and saddle has been patented by Mr. Christopher G. Calo, of New York city. The saddle tree is made with end loops to receive the top strap, with upwardly projecting flanges to keep it in place, and with other novel features, whereby the use of the ordinary back saddles is avoided, and the harness is made lighter and less expensive to manufacture.

A process of ornamenting wall and other papers has been patented by Mr. William V. Wilson, of Jubilee St., Mile End, Middlesex Co., Eng. It is for producing a finish on previously printed papers, in imitation of silk, satin, or other fabrics, and consists in first coating the fabric with a varnish or compound of nitro-cellulose, and then embossing or frictioning the varnished surface.

An apparatus for electrotyping has been patented by Mr. William J. Ladd, of New York city. This invention relates to devices for suspending the moulds and forming the electric connection therewith in the decomposing trough, the currents being easily disconnected without removing the mould from the bath, there being an indicator to mark the time of deposit, and provision for preventing the deposit of metal on the back of the mould.

A garment lock has been patented by Mr. Anders Ponten, of New York city. It is a small device for conveniently securing coats, hats, umbrellas, and like articles, to supports in dining rooms, cars, and other places, to prevent their being taken by mistake, the lock having hooks to close upon the article, and cap plates for adjustment, so the lock cannot be opened until they are placed at the point at which the lock was set.

A jersey waist forms the subject of two patents issued to Mr. David F. Halsted, of Brooklyn, N. Y. This invention provides for such a construction of ladies' jersey waists that they will have the appearance of being worn over a jacket, and so that the fronts can be readily removed, washed, and replaced, the knitted garment having a space between its front edges and a separate woven fabric front having approximately the contour of the space, and detachably connected at its side edges to the front edges of the jersey.

A process of producing sulphite or bisulphite of sodium forms the subject of a patent issued to Messrs. William O. and William P. Crocker, of Turner's Falls, Mass. It consists in mixing sulphate of sodium with carbonaceous matter, roasting the mixture, leaching out the soluble part, evaporating to dryness, granulating the product, then heating it, and agitating it in contact with air or oxygen until incandescence ceases, and making it into a solution, with other details, by which sulphur and sodium are sufficiently oxidized to produce a practical wood reducing solution.

A process of making bisulphites has also been patented by the same inventors. It consists in suspending by agitation neutral sulphite of calcium in neutral sulphate of sodium solution, and then charging the mixture with sulphurous acid until decomposition has taken place, with other special details.

NEW BOOKS AND PUBLICATIONS.

"The Present Condition of Electric Lighting" is the title of a report made for the Gaslighting Company of Munich, September 26, 1885, by Dr. N. H. Schilling, and republished in this country by Cupples, Upham & Co., of Boston. It gives a brief review of the experience of Munich and other German cities in electric lighting, and in less detail that of several American and British cities, making out a case decidedly unfavorable to electricity. A contract was made with the gas company in 1863, for lighting the public squares and streets of Munich for 36 years. A strong disposition to repudiate the contract has called forth this report, in which the author maintains that both justice and self-interest should support the continuance and extension of the present system of gas illumination.

Special.

LOTTA—PHILADELPHIA'S FAVORITE.

It was always a marvel to the amusement-loving public how Lotta could be so sick that the Chestnut Street Opera House, Philadelphia, was compelled to be closed for one week, about two years ago, and that at the end of that time she was well enough to resume her play of "Nitouche." More than this, it was noticed that her voice had acquired fresh volume, and in "Nitouche," which is a singing play, she could be heard in ensemble as well as in solo. Among all the gifted ladies who adorn the stage, Lotta is decidedly the pet and favorite. Her intense vitality, her beauty, and the versatility of her talents draw all classes to see her. She has been on the stage since her eighth year, and in all that time the breath of scandal has never once assailed her. She is a phenomenally devoted child to her mother, in whose society she is found at all times. Can it be wondered at that this little lady returned so soon to her labor at the Opera House, when we remember that this speedy restoration was due to the inhalation of Compound Oxygen? A press correspondent writes: "It was at the residence of Mrs. James H. Heverin, of Delancy Place (wife of the eminent counselor), that I obtained a brief interview with Lotta in reference to the treatment of Drs. Starkey & Palen, which prevented her a great pecuniary loss. The little comedienne was spending the day there, and as she answered my card she came bounding into the parlor, throwing herself into a luxurious armchair, and as soon as the formalities of a visit were complied with, I at once broached my subject.

"I hear you have tried Compound Oxygen treatment, Lotta?"

"Oh, yes! You remember the terrible sore throat I had two years ago—that it baffled the skill of my New York physicians? After burning my throat and positively prohibiting my appearance before an audience for an unlimited time, I was promised great things if I would try the 'Oxygen,' so I immediately came to Philadelphia and put myself under the care of Drs. Starkey & Palen."

"Did you experience relief immediately?"

"It was evident from the first inhalation that I had done the right thing, for it seemed to bring the whole trouble under immediate control."

"Then you do not favor burning the throat or any of the methods usually resorted to?"

"No. I think it a harsh and cruel treatment, and it cannot be long before Compound Oxygen will come to the rescue of all the profession."

"Drs. Starkey & Palen claim that the health obtained by the Compound Oxygen treatment is as genuine and permanent as one's original health. Does your experience confirm that opinion?"

"Yes, it most certainly does. I have not been sick an hour since I used the oxygen. My mother has also been greatly benefited by the use of the Oxygen, and is as great an enthusiast as I. It seems to invigorate the whole constitution, and imparts fresh life to every part of the body. In my profession I am always studying from nature. I observe the expressions, gestures, and ways of the various people with whom I meet, and find that my power of observation has grown more acute and discriminating since my treatment with the Oxygen. In the voice alone there is a most perceptible gain. Long and sustained notes have become easy; and whether talking or singing, I find it now no labor. Persons who sing or talk much on stage or platform feel a certain amount of exhaustion at the end of the season, and to them the use of the Compound Oxgen would be of great value. I wonder these gentlemen have not brought it to the notice of the acting profession before. It is just what we all need."

"Do you think it would have the same effect on the system as change of climate?"

"Yes, and without the disadvantages of long journeys in pursuit of health, such as the loss of home comforts and the interference with regular business pursuits."

"Did you have any unpleasant sensations while taking the Oxygen?"

"No; on the contrary, the sensations were pleasant."

"Do you give your full consent to make this interview public?"

"I certainly do. You are at liberty to say I said so."

Miss Lotta is one of the busiest little ladies in the world. Her engagements are continuously requiring her presence in the cities each season. She owns theaters and real estate in America and Europe and large tracts of wooded land in the Northwest; indeed, she is one of the wealthiest ladies of the stage. Lotta is modest about her own merits. She believes the test of talent is public appreciation. Surely no one has passed this test with greater *eclat* than this gifted lady, who is still young and fresh. Now, if the Compound Oxygen can bring back to the stage each year this favorite and pet, in prime health, the public can but thank Drs. Starkey & Palen. Any who may desire to know more of the treatment of which so kindly words are spoken should write to the office of the physicians, 1529 Arch Street, for the literature on the subject, which is mailed free to all applicants.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) J. P. W., Jr., asks the cheapest mode of obtaining a solution with which to charge an electric battery calculated to operate a 6 candle power Edison light. A. There are many solutions used, the particular kind depending on the battery. For zinc carbon battery (Grenet), mix 5 fluid ounces of sulphuric acid (oil of vitriol) with three pints of cold water; after it has cooled, add 6 ounces or as much as it will take up of powdered bichromate of potash. Follow above proportions for any desired amount.

(2) F. G. Z. asks why one can't use covered wire instead of naked for a certain part of the induction coil mentioned in SUPPLEMENT, No. 160. A. You can do so. Economy of construction prompts the use of uncovered wire.

(3) F. P. L. asks how to remove the copper from the electric light carbon. A. The copper can be dissolved in nitric acid. 2. If I should use coppered ones, and the solution be weakened, could I charge it again and get as good current? A. The copper ones would answer. It is a simple matter to add a little more sal ammoniac to strengthen the solution as it becomes exhausted. 3. Which plate does the current come from—the carbon or the zinc? A. The current is assumed to pass from carbon to zinc on the outer circuit of a battery. The electric current is a conventional term only; we know nothing of the actual action.

(4) G. E. C. asks the best kind of soft iron and size of copper wire to make electro-magnets. A. Norway iron is very good. After it has been forged and finished, heat it to a red heat and bury it in forge cinders or in powdered quicklime. The size of wire depends on the available current and other circumstances of the case. No general rule can be given.

(5) H. B. P. asks for a method of drilling holes in glass, and if they can be drilled as large as ¼ inch without enlarging or running out. A. A hard drill or a file with end broken off may be used in a brace. Apply spirits of turpentine with camphor in solution to the glass, and keep the cavity supplied. A copper tube held in a lathe chuck and supplied with emery and oil cuts a very neat hole. The glass may be held steady by a core cemented to it to fit inside of the tube. Hold a cork pressed against the glass opposite the tube end while drilling

(6) J. B. McG. writes: Two engines are as near alike as can be made, except size of driving wheels—fired alike, steam pressure alike. Why is it that the one with 3 ft. 2 in. driving wheels will start and haul a heavier train of cars than the one with 4 ft. 2 in. wheels? A. The piston of the engine with 3 ft. 2 in. drivers will act with more advantageous leverage than will the other, as far as hauling power is concerned, but it loses the exact equivalent in rate of running at equal piston speed.

(7) J. T. S. W. writes: I have read that if you make a piece of steel red hot, and touch it with a stick of brimstone, the steel will melt and run like water. Is this a fact? I have tried the experiment, but with no success. A. Your heat may have been insufficient, and you may not have held the brimstone long enough in contact with it. A chemical reaction takes place; the sulphur combines with the iron, forming a sulphide of iron, fusible at a red heat. This it is that melts, not the steel as such. Use a stick of sulphur, and keep it in contact with the steel until the result is obtained. The sulphur will probably catch fire, so be careful when you try the experiment, and have water at hand with which to extinguish the sulphur if necessary. The odor of the burning sulphur will be very disagreeable.

(8) A. F. M. asks how to make a cement for carbon to make a box for a battery. A. Try Burgundy pitch or melted shellac. We would not advise you to trust to cement alone. Fasten your plates by metal straps or screws, and make water tight by either of above cements.

(9) C. H. M. asks: 1. How much cold will the fire extinguishing liquid stand, a recipe of which you have given? A. It is supposed to stand the coldest temperature of this region. It is possible that the extreme cold of Dakota might affect it. 2. Is it equal to that used in the hand grenades? A. It is used in them. 3. Is there any objection to running a lightning rod through a barn, following a post, instead of carrying it down on outside? A. It is considered better practice to carry it outside of the building. 4. I have a geared windwheel on one end of my barn; its upright shaft (1½ inches) extends about 8 feet above the roof, and comes within about 8 feet of the floor. The horizontal shaft runs 24 feet toward the center of barn, the two shafts connecting with pinions. Can I keep the electric current from following the horizontal shaft, in case it was struck, and run it direct to the ground? A. Connect lower end of vertical shaft by a lightning rod or other conductor to a plate of iron buried in charcoal, damp earth, or immersed in a cistern or well. The electricity will not follow the shaft. 5. In rodding the barn, would you connect a point to upright shaft? The barn is 62 feet long, and should have three rods or points. There is a cupola in center of roof, 9 or 10 feet higher than peak of barn. A. If above connection is made, it will be well to have several points connected to shaft. If the shaft is in contact with the wooden frame only, and has no metallic connection with the ground, no points are needed. The connection described in No. 4 under latter conditions is unnecessary also.

(10) W. A. P. writes: In making my dynamo, described in SUPPLEMENT, No. 161, I have wound the magnet with No. 16 wire, cotton-covered, and covered each layer with shellac and red lead; and when I connect one of the terminals with a battery, and touch the other battery wire to either pole of the magnet, I get a spark; what is the trouble? A. Your wire is in direct communication with the core of the magnet. The coating is broken, or the binding screw or terminal may not be insulated.

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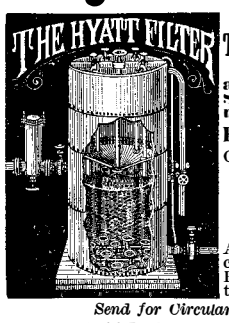

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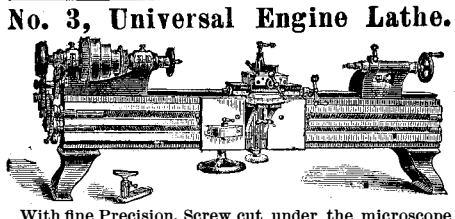

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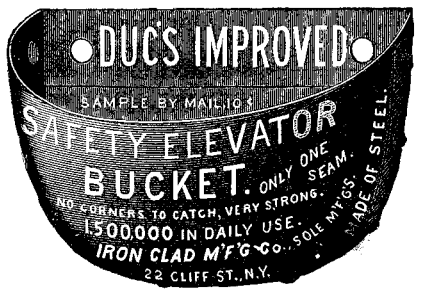

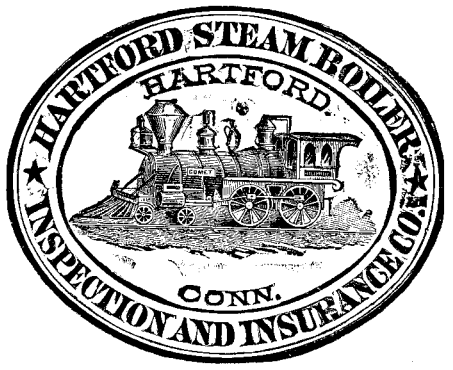

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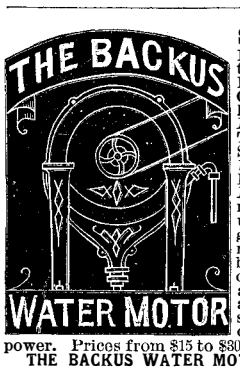

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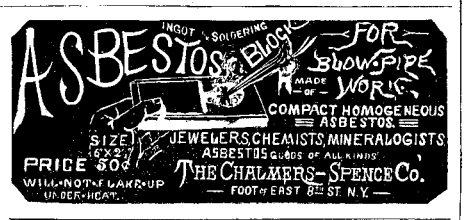

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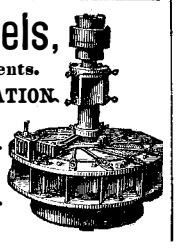

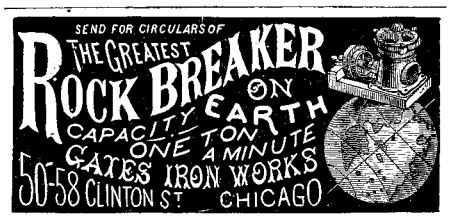

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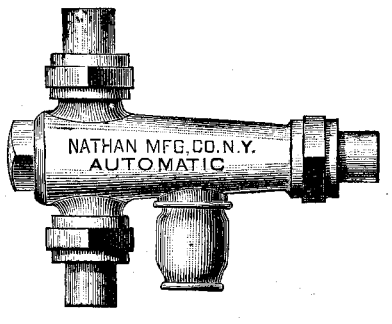

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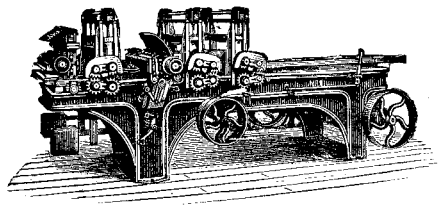

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