SCIENTIFIC AMERICAN

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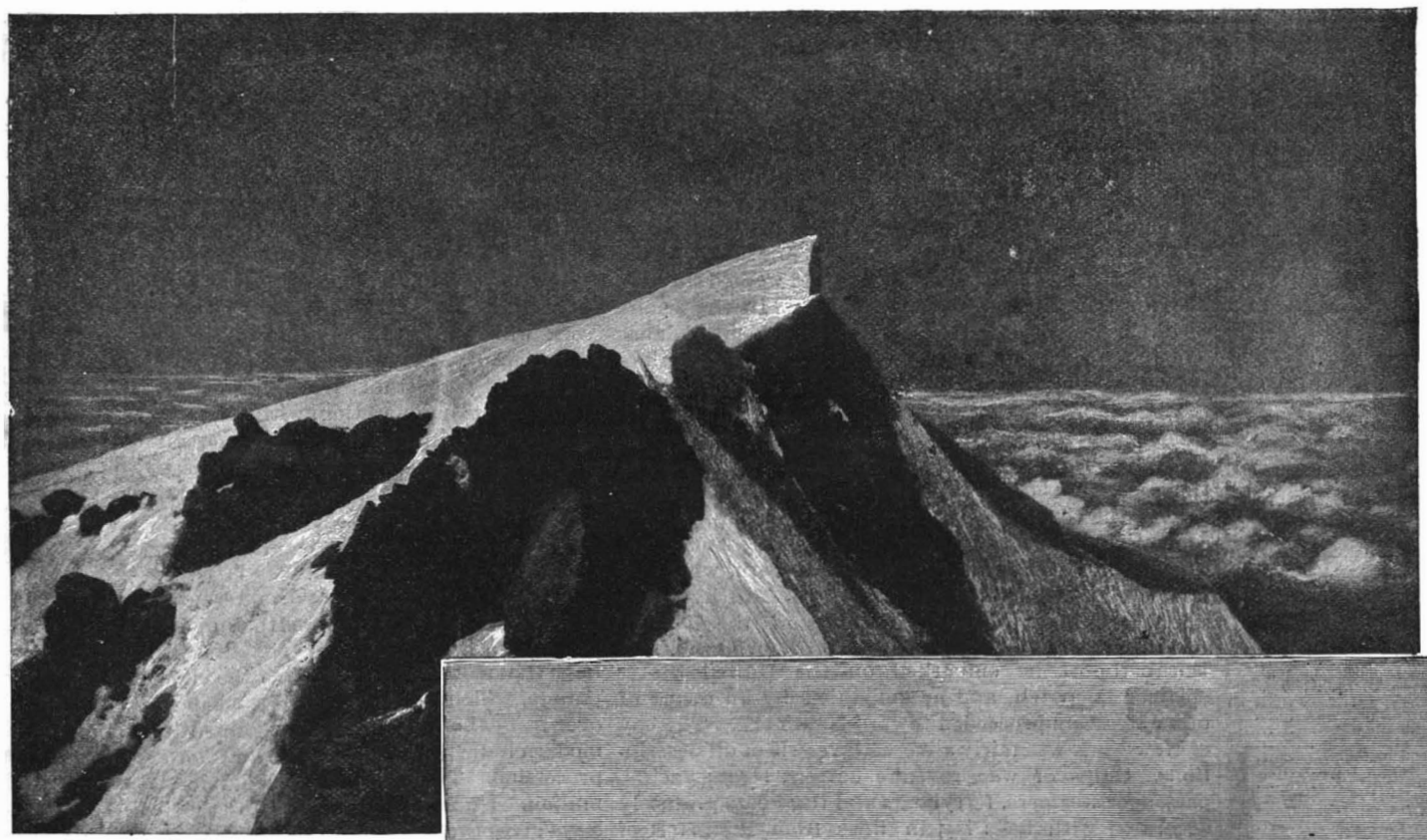
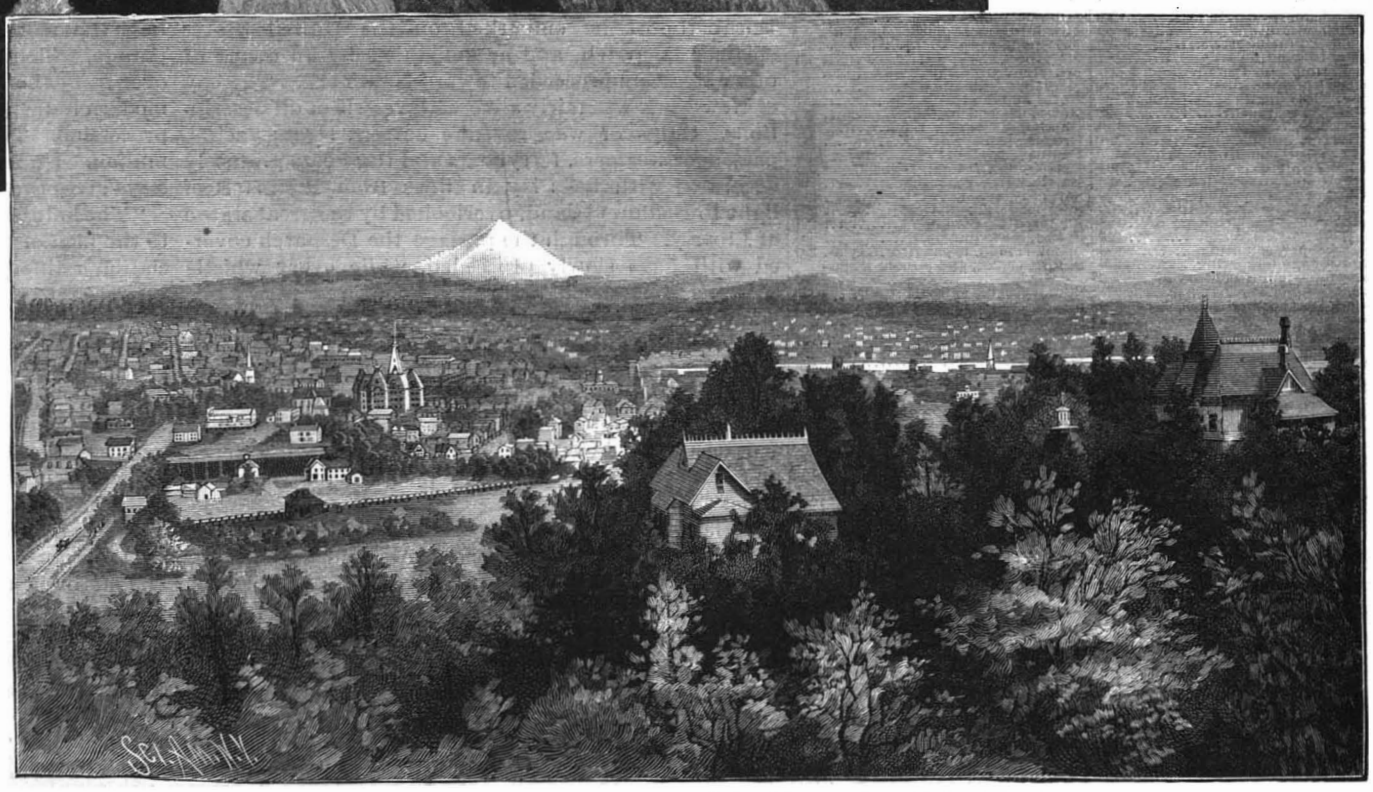
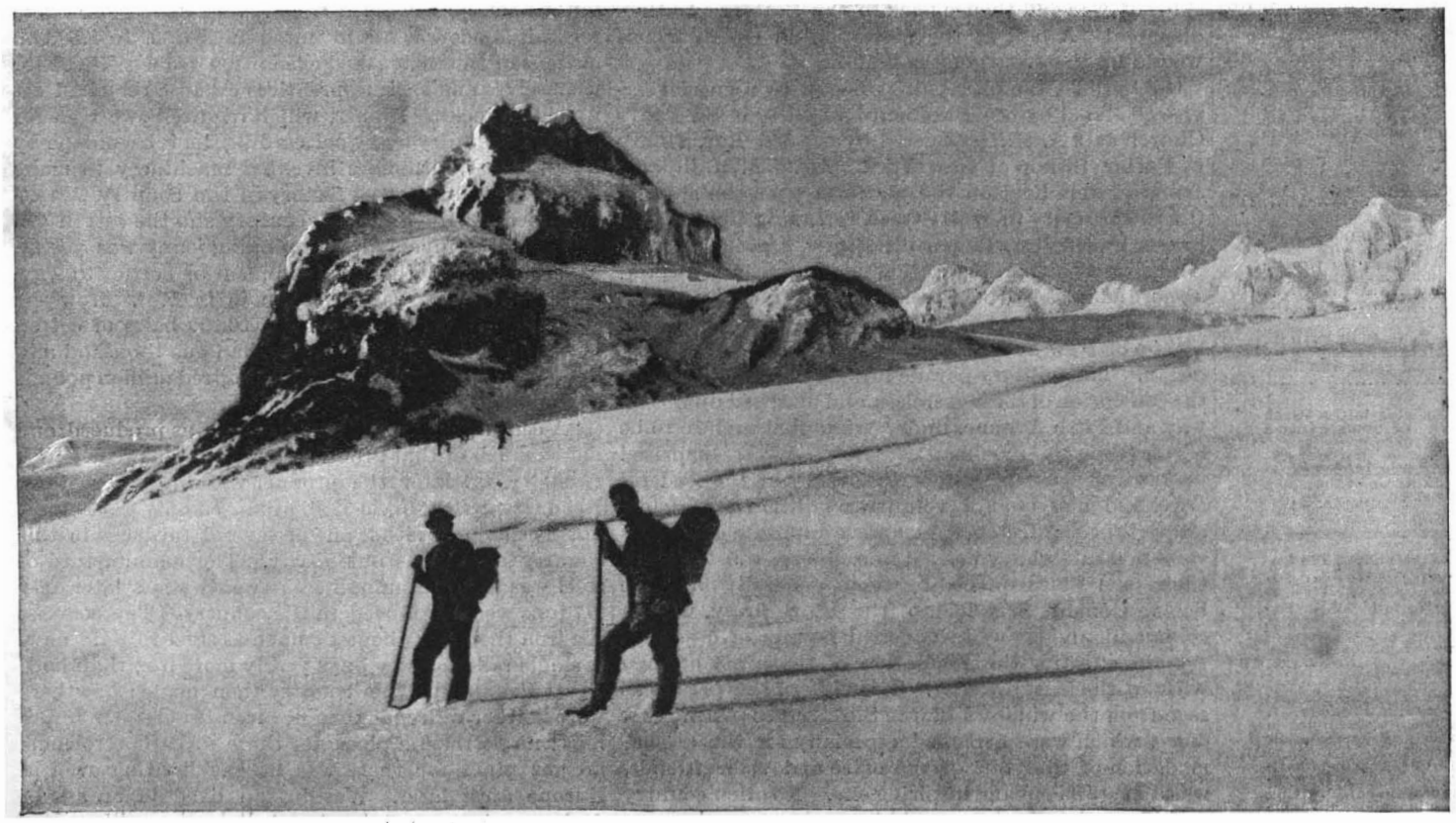




THE GRAND SCENERY OF OREGON.

By the completion of the Northern Pacific R.R., Oregon was provided with the veins and arteries necessary for full activity of life, and the State is now growing and extending and expanding its resources to a remarkable extent. Peculiar difficulties were offered to the construction of a railroad through this country, owing to the extraordinary freaks of nature in this volcanic district. The Snake River, which has cut its course through the vast plain of southeastern Washington Territory, has offered an almost impassable barrier. Its canon has a depth of 4,000 or 5,000 feet, and the cliffs are so precipitous as to baffle the efforts of the most intrepid mountaineer, while the stream itself is not navigable. Nature here was wanton and her work was on a gigantic scale. Nowhere on this continent do we find the marks of her finger more striking than here. Vast barren plains, broad navigable rivers, roaring torrents rushing through impassable canons, lofty mountains and fertile valleys on the western coast, are some of the characteristics which, from their size, appal the visitor.

East of the Cascade Mountains, Oregon is a sterile plain with no vegetation save the sage brush, the dwarf pine, and the juniper. There are a number of lakes in the southern portion, which, however, are mostly alkaline and marshy. The country is dreary and monotonous. In the region of the Columbia tributaries at the north, however, the country is more attractive, and the valleys are covered with a growth of forest trees. The woods abound in game, and the abundance of bear, deer, panthers, mountain sheep, and wolves make this region a paradise for hunters.



1. Summit of Mt. Hood. 2. View of Mt. Hood from Portland. 3. Ascent of Mt. Hood.

THE GRAND SCENERY OF OREGON.

The western coast is very different in physical characteristics, in climate, in fertility, and in every respect from the region described above. It possesses the traces of volcanic action found in the eastern plains, and there are evidences in the vast terraces which rise in successive levels toward the top of the lofty mountains that formerly the southern arm of Puget Sound extended as far as the lower valley of the Willamette. The climate of the coast is tempered by the warm currents of the Pacific from Japan, and the abundance of rain and the natural fertility of the soil have ren-

(*Continued on page 292.*)

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NEW YORK, SATURDAY, MAY 11, 1889.

Contents.

(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 697.

For the Week Ending May 11, 1889.

Price 10 cents. For sale by all newsdealers.

THE CENTENNIAL OF THE INAUGURATION OF GEORGE WASHINGTON AS PRESIDENT OF THE UNITED STATES.

On April 23, 1789, George Washington, duly elected President of the United States, reached Elizabethtown, N. J., on his way to New York, then the Federal capital, where he was to be inaugurated first president of the new nation. A splendid barge manned by thirteen masters of ships, commanded by Capt. James Nicholson, received him and brought him through the kills and across the harbor to the foot of Wall Street. Gov. George Clinton of New York received the President-elect and escorted him to the Franklin House in the square of that name. Six days elapsed, days of great excitement for the city, then of small proportions and giving no promise of its future growth. On April 30 all the churches in the city were opened at 9 o'clock in the morning, and prayers were offered up in all for the safety of the President. About midday the procession escorting him started from Franklin Square and proceeded to the Federal State House, on the corner of Wall and Broad Streets, occupying the site of the present sub-treasury. Washington was drawn in a coach by four horses. The procession as it neared its destination halted, and the military formed a line on both sides of the street. Washington alighted and walked through the lines and entered the building. In the senate chamber he was received by Vice-President Adams. The party went out upon the balcony, and the oath of office was administered by Chancellor Livingston.

The celebration of the hundredth anniversary of this event has been brought to a most successful end in this city. The ceremonies were arranged with reference to the occurrences of one hundred years ago. The President of the United States, Benjamin Harrison, was the central figure among the participators. He came from the city of Washington by rail to Elizabeth, where he was received on the morning of April 29th by a distinguished body of representatives of the literary and official circles of New York and New Jersey. At Elizabethport he embarked on the United States steamer Despatch, and accompanied by an escort of other steamers proceeded toward New York. The bay of New York was fairly alive with vessels of all descriptions. Ships of war, revenue cutters, steam yachts, passenger steamers, ferryboats and tug boats profusely decorated with flags lay in lines from Robins Reef light to Bedlows Island, overlooked by the great statue of Liberty. Through the passage the Despatch covered with flags slowly proceeded, while every whistle blew as she passed, and the ships of war with yards manned fired the presidential salute. Off the foot of Wall Street the Despatch anchored, and the President was rowed ashore in a barge manned by a crew of ship masters from the Marine Society of the City of New York, with Capt. Ambrose Snow as coxswain. The crew that rowed General Washington to the same spot one hundred years ago were members of the same society.

On landing, the President was received by Mr. William G. Hamilton, the grandson of Alexander Hamilton, and was introduced to the Governor of the State of New York and to the mayor of the city. The fleet of naval ships meanwhile proceeded up the Hudson River to an anchorage near 50th Street, and the other vessels formed in order for the naval parade. They steamed up the East River to a floating derrick near the southern end of Blackwell's Island, rounded it, and returning went up the Hudson River and around the ships of war and thence back to the Battery and then dispersed. A ball at the Metropolitan Opera House wound up the events of the first day.

On April 30, the proceedings began by a special service attended by the President and party in St. Paul's Church at 9 A. M., conducted by the Rt. Rev. Henry C. Potter, Bishop of New York. At 10 A. M. literary exercises were held on the platform over the steps of the sub-treasury in Wall Street, including an opening prayer by the Rev. Richard S. Storrs, a poem by John Greenleaf Whittier, an oration by Chauncey S. Depew, a short address by the President, and the benediction by the Most Reverend Michael A. Corrigan, Archbishop of New York. Then the great event of the day began. The military parade formed immediately after the conclusion of these exercises, and marched up Broadway and Fifth Avenue, under triumphal arches, to be reviewed by the President at 23d Street. It comprised upward of 46,000 men, representatives of the Federal army and navy and of volunteer militia from almost all parts of the Union. A number of State governors were present. They headed in each case the troops of their own State, preceding them, generally on horse back. General Schofield, of the U. S. army, was in command, and showed wonderful powers of organization in effecting the regulation of the army of men without the least disorder. The view of this parade as seen from the windows of the SCIENTIFIC AMERICAN office, which were arranged especially for the accommodation of the staff of the office and their friends, was a magnificent and inspiring one. No other country could now show, or ever could have shown, such an assemblage, consisting of the representatives of States thousands of miles distant from each other, in the guise of purely volunteer soldiery ready for the defense of their country in any possible emergency. Another feature of the day was the profuse decoration of the city. Not only the line of march, but every portion of New York, was decorated with flags and bunting. To the east and west, and for miles north of the line of procession, nearly every house displayed flags and other emblems and drapings. On the evening of April 30, a grand dinner took place at the Metropolitan Opera House. This was the great day of the celebration, as being the anniversary of Washington's inauguration.

On May 1, the civic and industrial parade took place. It comprised about 41,000 participants, representatives of the various trades of the city, leading societies, and a large array of public school children. This was also reviewed by the President, bringing the three days' pageant to a close.

Nothing was neglected by the great metropolis to enhance the meaning of the occasion. In the public schools special attention was given to instructing the scholars in the events commemorated. In selecting participants in the ceremonies, the descendants of the old time families of New York and of personages of historical fame were chosen. Grand stands were erected for the accommodation of spectators. Taken from all points of view, it may be questioned if New York will again see the equal of this display for another century. It is strange to read the printed account of the escort of Washington, taking up about 21 lines in its enumeration, with the list of participants in the centennial parades, that was enough to fill a book of many pages. The lessons of unity, patriotism, and peace taught by the three day's ceremonies cannot be without effect.

A Century of Industrial Growth.

Among the incidents of the recent celebration in New York of the one hundredth anniversary of the inauguration of Washington, the first President, perhaps the most remarkable was the civic or industrial parade, which took place May 1, when, it is estimated, over forty thousand persons, representing the various modern industries, fell into line and formed a gigantic procession. The spectators were numbered at over one million. Under the above heading the *New York Tribune* gives the following interesting article:

"The industrial parade, marvelous as it has seemed to the men of this generation, needs for a full appreciation a different point of view. How would it have appeared to George Washington and his Revolutionary associates? What incomprehensible and incredible marvels would they have seen in its machines and inventions, its arts and tools, its princely expenditure by voluntary societies of workingmen, its mighty array of well clad, well paid, and comfortable workers? If it were possible to contrast the industries of 1789, when the world had lived and learned at least fifty-eight centuries, with those of 1889, when only one century more has been added, what a startling contrast!

"It is not possible. A new world has been created. The methods, tools, products, and artisans of a century ago in many departments have vanished as completely as if they belonged to another planet. What has become of the spinning wheel or the wooden clock? The suit of woolen cloth worn by President Washington at his address to Congress in 1789 was presented by a woolen factory only established in the preceding year, and cloth then cost $5 a yard. The people were clothed in the homespun made in every family. The power loom for knit goods was not invented until 1830. In 1789 two citizens of Norwich asked exemption from poll tax for themselves and their apprentices because they had set up eight stocking frames, which required two men for each. A century ago wool carding had been done by hand, but Whittemore invented machinery to make cards. The first carpet factory in the country was established a little later. A century ago the cotton gin had not been invented, the spinning jenny was yet an experiment, and the first shipment of cotton to England, only eight bags, was made in 1784. Now the country has raised more than 7,000,000 bales of cotton in a year, and worked up more than one thousand million pounds of cotton and four hundred million pounds of wool.

"A century ago only charcoal iron was produced, and not as much of that probably as 30,000 tons yearly; for twenty years later the product was but 53,000 tons. Even Great Britain, in 1788, produced only 68,300 tons, not as much as either one of several furnaces in this country now turns out yearly. The manufacture of steel was just beginning here; twenty years later only 917 tons were produced in the country. The coarsest pig iron then cost about as much as steel rails do now. A single railroad now buys yearly more iron than both Great Britain and this country then made; but there were neither railroads then nor iron bridges nor buildings; no petroleum pipes, for there was no petroleum; no gas pipes, for there was no gas lighting even in Europe until later. Washington lived in an age of darkness; instead of the electric light the millions had candles, costing about two cents apiece. In all the departments and applications of chemistry the century

has simply created a new world. American pressed glass, which has completely revolutionized the supply of table and house ware, is an invention of the last sixty years. The silk manufacture has not existed in this country half a century; the paper made a hundred years ago would hardly be thought fit for use since modern methods have been invented; the only use discovered for India rubber then was to erase pencil marks; and while the town of Lynn made 100,000 pairs of boots and shoes in 1788, they were not the shoes of to-day, and the manufacture by machinery is wholly due to inventions since 1800. Sewing machines for any purpose were unknown, and salt was made by boiling sea water, though in 1787 it was first made from the springs near Syracuse at the rate of about ten bushels per day, and the cost soon fell to 50 cents per bushel.

"Farming in Washington's day knew nothing of machinery; even the first iron plow, patented in 1797, was a failure, for New Jersey farmers thought it poisoned the soil. Mowers, reapers, and harvesters began to be invented about the same time, and even the ordinary implements were such as it would not now be thought possible to use. The steamboat was practically unknown, and the railroad entirely until forty years later, and the cost of transportation by wagon confined the area of possible production with profit, as to most crops, to the margin of navigable waters. The whole nation could not produce in Washington's day as much wheat as single Territories not yet States now export each year, and when the accounts of a century ago tell of "vast quantities" exported, they really mean less in a year than the country has since moved in a single week.

"Volumes could be filled, and yet but a small part of the change in industry within the century could be mentioned. But the revolution in the condition of the laboring population has been the crowning result of all this progress. Of wages, it is enough to say that masons a century ago earned 67 cents a day in Massachusetts, carpenters 52 cents, blacksmiths 70 cents, and ordinary labor 30 cents. Food near the farms was cheap, but pork is quoted in Massachusetts at 16 cents per pound, flour at $8.16 per barrel, corn at 76 cents per bushel, and ham at 20 cents per pound. Calico cost 58 cents per yard, broadcloth $2.70, buckram 22 cents, cotton cloth 88 cents, and tow cloth 30 cents; hose cost $1.35 per pair, and "corded Nankeen breeches" $5.50; buttons from 1 to 5 shillings per dozen, shoes of lasting 84 cents per pair, and sugar from 15 to 22 cents per pound. One does not need to study such figures as these very long to discover that the world and the living of to-day were simply impossible for the working people a century ago. The whole world has changed, but nowhere has the marvelous advance been greater or for the working millions more beneficent than in these United States."

FLOATING WRECKS.

The International Maritime Conference, which will assemble at Washington in October next, among other important maatters pertaining to the saving of life on the ocean, will be called upon to consider the wisdom of dividing the Atlantic Ocean into districts and assigning them severally to the great naval powers, who will be expected to remove derelicts or wrecks which may be considered in any wise dangerous to commerce. For the past three years the Hydrographic Office of the Navy Department has been of great service to mariners by collecting information regarding derelicts, their movements, changes in character or position, by the action of the elements or other causes, and publishing the same on the first of each month in the form of a pilot chart, which also contains a large amount of other information of the greatest value to the navigator.

Subsidiary to the work of the Hydrographic Office in locating dangerous wrecks and reporting the movements of derelicts have been the operations of the naval vessels to which has been assigned the work of blowing up such of these obstructions to commerce as may be considered of a specially dangerous character. Most derelicts are lumber-laden and come from Southern ports of the United States. The Gulf Stream flowing strongly in a north-northeasterly direction, they are apt to be carried along with it until they strike the Labrador current flowing south, and then their course is reversed.

The American schooner W. L. White, abandoned off Cape Hatteras in the blizzard storm of March 13, 1888, is a case in point. She floated north with the Gulf Stream until she got into the Labrador current off the Grand Banks in the following May. Here she remained floating to and fro in the very track of many ocean steamers during the entire summer of 1888 and until October 30, when she took an easterly and then northeasterly course, and finally went ashore on the Hebrides January 25, 1889. During the cruise of this derelict, covering ten months and ten days, she must have covered a distance of at least five thousand miles.

Naval vessels frequently receive orders to look out for certain derelicts and to blow them up when found. The United States steamer Despatch, Lieutenant W. S. Cowles, though not specially adapted for this work, has done a considerable amount of it. After the great storm of March, 1888, a number of wrecks demanded immediate attention, and one of these was the bark Brimega, which had capsized off Cape May and lay bottom up inside the cape and grounded. The course pursued in blowing it up was as follows: Men from the Despatch, under command of Lieutenant McLean, got upon the hull, and with augers and axes penetrated through twenty inches of oak, and made four holes large enough to admit the torpedoes. These torpedoes consist of a cast iron shell cylindrical in form, three feet long and about a foot in diameter. There are handles on the sides, and from the head projects an iron tube, into which the electric wire passes. The tube is fitted with a plug to keep out the water, and the wire then passes through a papier-mache cylinder nearly to the nether end of the torpedo, where it is connected with a very thin platinum wire, and this again is surrounded with guncotton. Fine gunpowder is placed next to the guncotton, and above that the coarser grain, a hundred pounds of powder comprising the whole charge. When all was ready for the explosion, the men took to their boats and withdrew to a distance of from 150 to 200 feet. The officer in command of the operations paid out a wire from a reel which he held in his hand, and when the proper distance was reached he connected one end of it with a hand dynamo, which is known as the government torpedo station machine. The electric current is instantly sent into the torpedo, the platinum wire is heated to a white heat, the guncotton ignited, and the torpedoes, weighing about 325 pounds each, are instantly exploded. The wreck was broken in pieces, though subsequent explosions had to be made before the destruction was complete.

The masts of sunken vessels which extend above the surface of the water or terminate just below it are extremely dangerous to navigation, and the steamer Despatch has been frequently called upon to remove such obstructions. After proceeding to the locality indicated on the pilot chart issued by the Hydrographic Office or in special orders from the Navy Department, a survey is made and the position of the wreck determined upon as nearly as it can be from the deck of the steamer. Two boats then put out for the wreck. One carries the torpedo, with five men to handle it and six men at the oars. The other boat contains the officer in charge of the work, with a competent crew, and the apparatus for exploding the torpedoes. The steamship Eureka, which was wrecked off the Maryland capes, was found resting on the bottom. Two of her masts, which were of iron, extended above the water line, and two terminated just below it. To remove these obstructions a torpedo was let down by a guide rope to the deck of the vessel, placed against the masts, and exploded in the same manner as previously described. A conical column of water was thrown up to a distance of nearly 75 feet, and the masts were completely destroyed.

Sometimes wooden masts are found sticking out of the water and held in position by sunken wreckage. When the torpedo is set off, large pieces of the wood rise to a considerable distance in the air, seemingly whole, but as they descend they separate into a thousand pieces. On attaching the torpedo to the object to be destroyed, care has to be taken that it comes in direct contact with the object, for if any considerable amount of water is allowed to intervene, it acts as a cushion and a great deal of the force of the explosion will be lost. When sunken hulls are found, soundings are made, and if it appears that they are not covered with a sufficient depth of water to render them free from danger, torpedoes are let down with guide ropes and exploded in such a way as to destroy the hulls. This kind of work is slow and tedious, and can only be successfully carried on in a vessel like the Despatch, during fair weather and with a smooth sea. The area covered by the steamer Despatch in her cruises for derelicts is from seventy-five to a hundred miles and extends from Chesapeake Bay to Boston Harbor. The explosives used are not considered the most effective by the naval officers in charge of these operations, and they hope that guncotton or dynamite in time will be substituted for them.

Lieutenant Geo. P. Blow, now in charge of the New York branch of the Hydrographic Office, was in May, 1885, on board the United States man-of-war Pensacola, Captain Geo. Dewey. When six days out from Norfolk the floating derelict Bertha Balruhs was sighted. Upon examination she appeared to have been abandoned a long time. Her deck was level with the water, the sea was making clean breaches over her, and her sails were hanging in shreds and festoons from the yards. A guncotton torpedo was placed under the floor of the cabin, which blew off the deck house and did other damage. Another torpedo was exploded amidships, which shot the main mast up into the air like a rocket, but it settled back into its old place again, and the derelict continued to float along as before. Then the explosives were lashed to the keel of the vessel, and they shattered her so completely that in a short time she went to pieces.

The United States man-of-war Yantic has recently received orders to search out and destroy the derelict Vizenzo Perotta, which was wrecked off the capes of Virginia on September 18, 1887, and has been floating about the ocean ever since. She is loaded with lumber, has been reported eighteen times between the scene of the wreck and the coast of Cuba, and is considered a very dangerous derelict. There are nine derelicts now known to the Hydrographic Office, including the steamer Danmark, recently reported, and fifteen the names of which are not known.

Some derelicts are destroyed by collisions and others by the action of the elements, while others float a long time bottom upward, the air keeping the water from coming in and working their destruction. They are a constant menace to passing vessels, and there can be no doubt that some at least of the vessels which have gone out from port and have never been heard from were the victims of some derelict.

Information regarding the movements of derelicts and the position of various obstructions to navigation are reported to the several branch hydrographic offices which are now located at New York, Boston, Philadelphia, Baltimore, Norfolk, New Orleans, Portland, Oregon, and San Francisco, Cal. This information is sent to Washington, where the main hydrographic office is located, in charge of Lieutenant Geo. L. Dyer as hydrographer to the Bureau of Navigation. Here the information is classified and published on the first of every month in the form of a chart, upon which is also indicated the latest positions of derelicts, location of icebergs, course of ocean currents, fogs, probabilities of whirlwinds, waterspouts, and tornadoes, as well as other information. Every vessel, of whatever nationality, leaving the principal American ports is supplied with a set of charts, corrected to date, without charge.

Recently the co-operation of Captain Carbonell, the director of the newly established Marine Observatory at Havana, Cuba, has been secured, by which the Hydrographic Office will receive telegraphic information of tornadoes which may be approaching our coasts.

President Barnard, of Columbia College, N. Y.

On Saturday, April 27, at 4:15 P.M., President Barnard, of Columbia College, died. In his death a loss is inflicted not only on his college and city, but on the country at large. He ranked with the most advanced thinkers of the day, and did much to enhance the scientific standing of the United States.

Frederick Augustus Porter Barnard was born May 5, 1809, at Sheffield, Berkshire Co., Mass. He was of English ancestry. In 1828 he graduated at Yale and at once began his life work as an educator by accepting a position in the Hartford grammar school, and in 1830 became a tutor at Yale. It was soon proposed to make him professor of pure mathematics, but he was forced to decline on account of his health. In 1831 he taught in the Deaf and Dumb Asylum in Hartford, and 1832 in the corresponding institution in New York. From 1837 to 1848 he filled chairs of the natural sciences in the University of Alabama in Tuscaloosa, and after this in the University of Mississippi in Oxford. In 1856 he became president of this university. There he had as fellow professor Jefferson Davis, afterward President of the Southern Confederation. In 1854 Prof. Barnard had been admitted to the ministry of the Protestant Episcopal Church. During the war he did excellent service on the U. S. coast survey. He then became an applicant for the chair of physics in Columbia College, but was appointed president instead, succeeding Dr. Charles King. This position he accepted in May, 1864. About a year ago he resigned, but the trustees, anxious to have him complete a term of twenty-five years, delayed the acceptance of the resignation. It will be noticed that but a few days remained to complete a quarter century of devoted service to the college when he died.

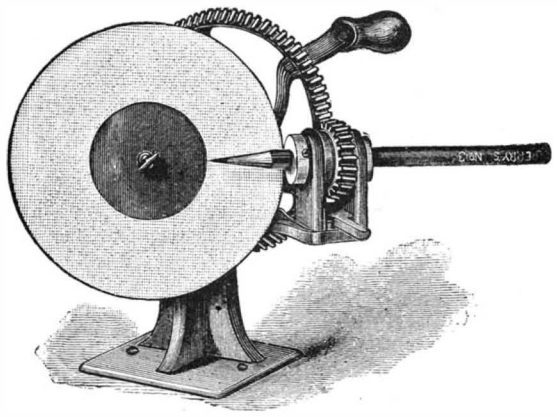
His mind, of strongly scientific bent, found many outlets. In microscopy and astronomy he did excellent work. He accompanied the U. S. coast survey expedition to Labrador to witness the total eclipse of the sun in 1860. Much of his work on the coast survey was in astronomical science. He was also president of the American Microscopical Society. He was one of the original incorporators of the National Academy of Sciences, has been president of the American Association for the Advancement of Science and of the Board of Experts of the American Bureau of Mines. He was one of the U. S. commissioners to the Paris exposition of 1867, and his elaborate report on Machinery, Processes, and Products of the Industrial Arts and Exact Sciences is, at the present day, excellent reading and a standard reference. He, with Professor Guyot, was a chief editor of Johnson's Cyclopedia. He was an ardent advocate of the metric system of weights and measures, and to the above cyclopedia, among other matter, contributed a most elaborate article on the weights and measures of all countries.

He was the recipient of honorary degrees from many universities, and his life work covered so extended a field that space will not permit even a full recapitulation of it here. In the great scientific development of Columbia College through the School of Mines the predominant bent of his mind found most congenial work. His funeral took place on May 2, and was attended by a numerous and representative assemblage.

GEM PENCIL SHARPENER.

This sharpener must be made stationary with screws to the desk, table, or counter on which it is used.

It will sharpen any pencil, large or small, and will

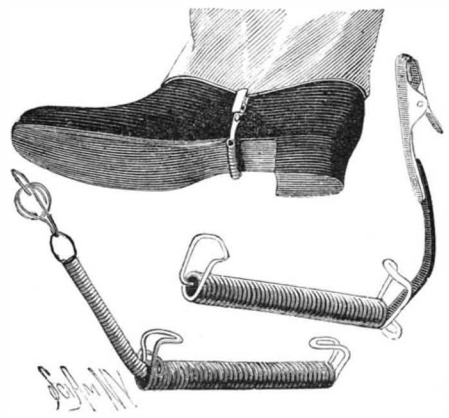


GEM PENCIL SHARPENER.

point a red or blue pencil perfectly, which all will appreciate who have tried to sharpen these pencils. To sharpen a pencil, push it through the chuck, press against the tail piece of the chuck holder, so as to bring the end of the pencil against the sand paper disk, and bring to a point by turning the crank. Any length of bevel on the end of a pencil desired can be obtained, and if a very fine point is desired, such as for artist's use, a piece of emery paper can be substituted for the sand paper, which answers for all ordinary purposes. This device is manufactured by Messrs. Gould & Cook, for Messrs. Goodnow & Wightman, of Boston, Mass.

AN IMPROVED TROUSERS STRAP.

The accompanying illustration represents a valuable device for the use of bicyclists and horseback riders,



CARTER'S IMPROVED TROUSERS STRAP.

to prevent the trousers from working up or from coming in contact with the wheel. It has been patented by Mr. George T. Carter, of Pittsburg, Pa. It is simple, durable, easily made and inexpensive, and both forms were thoroughly tested last summer by a large number of users, and pronounced a perfect success. The device clasps the sole just forward of the heel by two hooks connected by a spring, and is attached to the inside lower edge of the trousers leg by a light coil spring for bicycle riders, or by a band, elastic or not, as preferred for horseback riders. When in use the device is concealed from the view of passers-by, while it does not change the ordinary appearance of the trousers leg.

For further information relative to this invention address Mr. George T. Carter, Hamilton Building, Pittsburg, Pa., or Mr. Wendell M. Smith, Wilder Building, Rochester, N. Y.

Floating Industrial Exhibitions.

Floating exhibitions seem to be a success so far as Spain and Germany are concerned. A fine steamer loaded with the best specimens of all kinds of goods lately sailed from Spain for South America. The German Export Company has decided to apply the sum of $1,000,000 (5,000,000 marks) on the building, equipment, and working of a very large steamer which is to serve as a floating exhibition. The vessel in question will be called Kaiser Wilhelm, and the principal dimensions are as follows: Length, 564 ft.; breadth, 66 ft.; depth, 46 ft.; so the question is not of a small craft. The steamer is to have four engines, entirely independent of each other, and four propellers. She is to be fitted in exceptionally good style. The expenses for a two years' tour are calculated at $785,000, while the takings for hire of room and profits on sale are expected to reach $1,815,000, leaving the very handsome profit of more than $1,000,000. The steamer will, according to the present arrangements, be ready to start in the spring of next year. A previous undertaking of a similar nature, the steamer Gottorp, dispatched from Hamburg, is understood to have given a satisfactory result. Not only are Spanish and German goods being shown in many different parts of the world, but the staff accompanying steamer has ample opportunities for studying in each place the various local and special requirements, and to see to what extent and in what manner the different wants are being supplied, either by home or other foreign makers.

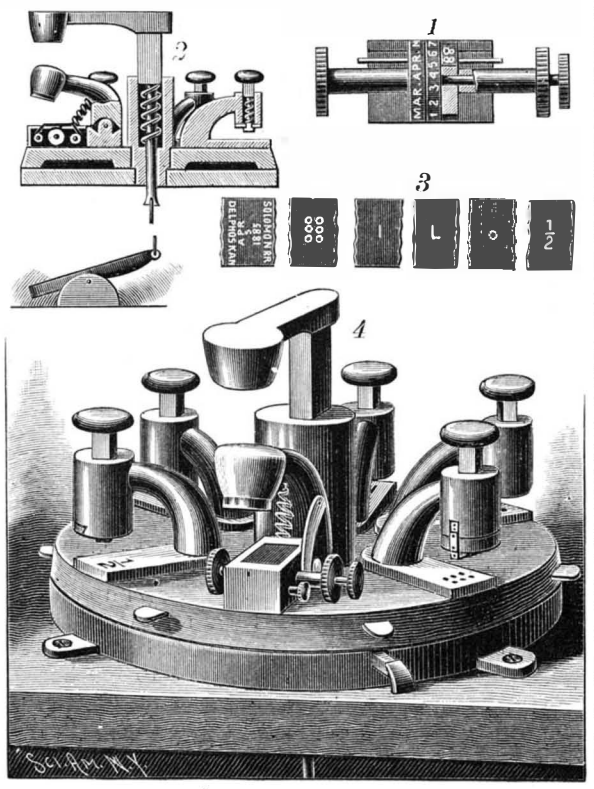
How many years longer must the American people wait and see the foreign trade carried off by other nations by simple devices such as the above and government subsidies? If laws were passed giving liberal payments to vessels of the highest speed for carrying the mails, we should soon have a greatly increased commerce.

Half a Century of Inventions.

Those of us not yet fifty years of age have probably lived in the most important and intellectually progressive period of human history. Within this half century the following inventions and discoveries have been among the number: Ocean steamships, street railways, telegraph lines, ocean cables, telephones, phonograph, photography and a score of new methods of picture making, aniline colors, kerosene oil, electric lights, steam fire engines, chemical fire extinguishers, anæsthetics and painless surgery; gun cotton, nitro-glycerine, dynamite, giant powder; aluminum, magnesium, and other new metals; electro-plating, spectrum analysis and spectroscope; audiphone, pneumatic tubes, electric motor, electric railway, electric bells, typewriter, cheap postal system, steam heating, steam and hydraulic elevators, vestibule cars, cantilever bridges. These are only a part. All positive knowledge of the physical constitution of planetary and stellar worlds has been attained within this period.—*Homiletic Review.*

A COUPON TICKET STAMP AND PUNCH.

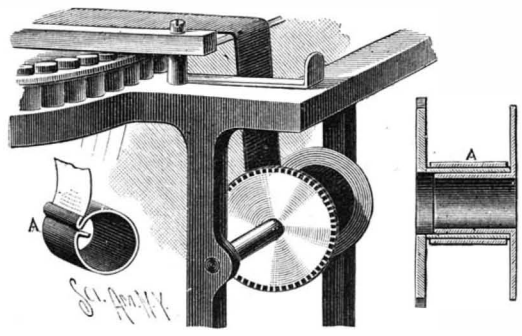
The accompanying illustration represents a stamp and punch designed mainly for the use of railroad ticket agents, for indicating on or in the ticket its date, the destination for which issued, and other particulars, the whole being mounted upon an adjustable revolving table controlled by a catch for bringing the stamp and punches under a hammer or striker common to them all, and operated by a foot treadle, leaving the hands free. It is a patented invention of Mr. Wilson M. Dunaway, of Hoxie, Sheridan County, Kansas. Fig. 1 represents a vertical transverse section through the ticket stamp, Fig. 2 a vertical section, Fig. 3 a face view of the tickets in part, and Fig. 4 a perspective view of the whole device. A revoluble table is mounted upon a stationary base, a ticket stamp and a series of punches, each having an independent bed piece, being detachably secured to the upper side of the revoluble table, the punches and stamp being arranged to allow of their being brought under a vertically reciprocating hammer or striker, this striker having an operating rod extending down through a central tubular bearing. A treadle is connected with the lower end of the rod to operate the striker, and a spring throws the rod upward after each stamp or punch has been made. An automatically operated inking ribbon is arranged in connection with the stamping arm, while the several punches, making different marks, are in ordinary but separate use for similar purposes. Thus, after the ticket is stamped, the first punch may be used to indicate the destination, the second the class of conveyance, the third whether the ticket is a limited one, the fourth the date, the fifth whether it is half or full fare, etc. Of course only such of the punches need be used as occasion requires, by simply turning the revoluble table to bring a particular punch under the hammer or striker.



DUNAWAY'S COUPON TICKET STAMP AND PUNCH.

IMPROVED INKING DEVICE FOR TYPE WRITERS.

The illustration herewith represents an inking ribbon spool for type writing machines, by means of which the ribbons can be quickly and easily adjusted, and ribbons of various colors can be readily interchanged with but a single set of ribbon spools fitted to the machine. This invention has been patented by Mr. Harvey Ray, of Mobile, Ala. One side of the spool has peripheral teeth to engage mechanism of the type writer as the machine is operated, and on this toothed side is fixed a hub, slotted to receive an inwardly bent tongue of the inking ribbon bobbin, as shown at A in the small figure and in the sectional view. This bobbin consists of a plate of metal bent around from

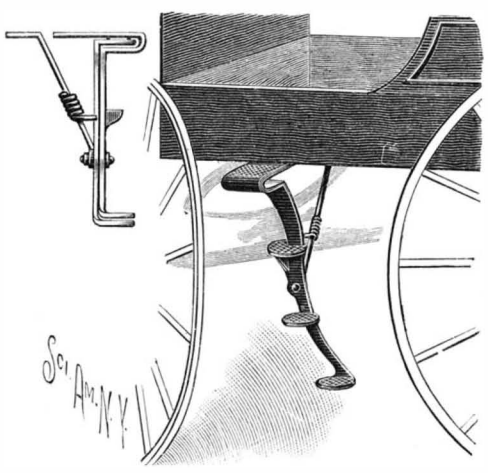


RAY'S INKING RIBBON SPOOL FOR TYPE WRITERS.

its tongue to fit loosely upon the fixed hub, and at the other end is bent upon itself to form a clamp into which the end of the inking ribbon is fastened. The other side part of the spool has a hub which fits snugly inside of the other fixed hub, and against the end of the bobbin, the side plates thus forming walls between which the inking ribbon is held truly edgewise. By removing the movable side portion, the bobbin with the ribbon wound on it may be readily slipped from the fixed hub, and replaced by another bobbin carrying a fresh ribbon, or one of a different color, without soiling the fingers.

AN IMPROVED FOLDING STEP FOR VEHICLES.

The accompanying illustration represents a folding carriage step having an upper section and lower section pivoted thereto, each section being provided with tread plates. This invention has been patented by Mrs. Mattie M. Marsh, of Moscow, Idaho Ter. The sections when folded one upon the other are parallel,



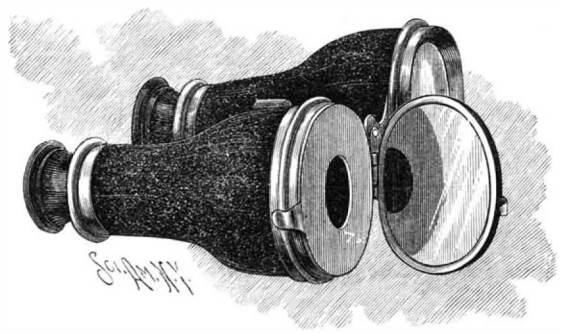
MARSH'S VEHICLE STEP.

and are pivotally connected by a bolt or pin, as shown in the small view. The sections may be either straight or curved, as desired. The upper end of the main section is bent to form a tread plate, and so that it can be secured to the vehicle body, while at its lower end is another tread plate. The extremities of the pivotal or drop section are bent outward to provide upper and lower tread plates, this section being so made that it will fold with the upper one. The step is braced by a rod secured to the inner end of the pivot pin and the under surface of the vehicle body, a spring coiled around this rod serving to hold the lower section in folded position when it is not necessary to use it, but the tension of the spring being so light that the section can be readily disengaged and brought to the drop position.

THE *Timberman* does not seem alarmed at the prospect of an early destruction of our timber supply. It asserts that Puget Sound has 1,800 miles of shore line, and all along this line, miles and miles farther than the eye can reach, is one vast and almost unbroken forest of enormous trees. The forests are so vast that, although the sawmills have been ripping 500,000,000 feet of lumber out of them every year for the past ten years, the spaces made by these inroads seem no more than garden patches. An official estimate places the amount of standing timber in that area at 500,000,000,000 feet, or a thousand years' supply, even at the enormous rate the timber is now being felled and sawed. The editor adds that the timber belt of Washington Territory covers an area equal to that of the States of Vermont, Massachusetts, Connecticut, and New Hampshire.

A MIRROR ATTACHMENT FOR OPERA GLASSES, ETC.

This device, readily applicable also to spy glasses or telescopes, consists in an adjustable reflector or mirror attachment, in front of the object lens, to provide means whereby the person using the glass can see objects at the side or in the rear without change of position. The invention has been patented by Mr. August Janzon, of 119 East Chicago Avenue, Chicago, Ill. The attachment consists of a circular metal or other plate, having a central contracted aperture fitting directly over the object lens, by means of a double jaw-like clamp or clip, and a hinged cover containing a mirror. This attachment is readily applied by springing the jaws, suitably shaped for that purpose, over or partly



JANZON'S MIRROR ATTACHMENT FOR OPERA GLASSES, ETC.

around the outer end portion of the tube containing the object lens, the mirror being then opened or adjusted to any desired angle. The opening in the plate resting against the object lens is made smaller than that lens to prevent disturbance of light rays emanating from the front. The device is readily detachable, and of a shape and size to be easily carried in a small pocket.

A MAGNET FOR EXPERIMENTATION.

BY GEO. M. HOPKINS.

The annexed engravings represent a large magnet which is well adapted for experimental work. With a current from six medium sized bichromate battery cells it is capable of sustaining about one thousand pounds. It is provided with a switch, so that it may readily be adapted to a light or a heavy current by combining the several coils in series or in parallel. It is made separable, to permit of using the coils detached from the core.

For the construction of the magnet 18 pounds of No. 14 double-covered magnet wire are required, also two well annealed cylindrical bars of soft iron, 8 inches long and 1½ in. in diameter for the core, a flat, soft iron bar 2½ inches wide, 8 inches long, and ¾ inch thick for the yoke, a bar of the same kind 7 inches long for the armature, two double wooden spools 4 inches in diameter and 7¾ inches long, with flanges 1 1/16 inch wide and 7/16 inch thick.

The walls of the spools are 1/16 inch thick. Each space in each spool is filled with the No. 14 magnet wire. There are two ways of winding the wire. According to one method a hole is drilled obliquely downward in the flange, and one end of the wire is passed from within

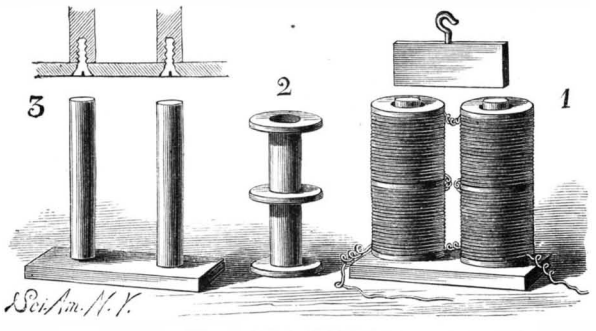


Fig. 1.—MAGNET FOR EXPERIMENTATION.

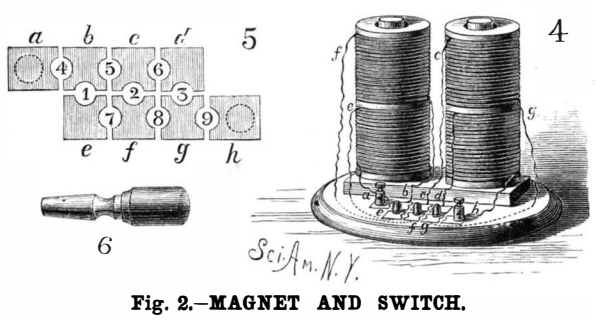


Fig. 2.—MAGNET AND SWITCH.

outward through the hole, and the spool is wound in the same manner as a spool of thread, the wires at the end of the coil being tied together with a stout thread to prevent unwinding. Each section of each spool is filled in the same manner.

Although this is the quickest way to wind the magnet, it is not the best way, as the inner end of the coil is liable to be broken off, when the entire coil must be rewound to secure a new connection with the inner end. The correct way to wind the wire is to take a sufficient length and wind it from opposite ends on two bobbins. Wind the wire once over the spool from one of the bobbins, then wind from the ends of the coil thus formed toward the middle, first with wire from one bobbin, then from the other bobbin, then wind from the middle back each way toward the ends in the same way, then again toward the center, and so on.

By this method both terminals of the coil are made to come out on the outer layer.

Fig. 1 of the illustration shows the completed magnet and its armature. Fig. 2 is a detail view of the spool. Fig. 3 shows the cores and yoke, both in perspective and section, the sectional view exhibiting the method of fastening the cores to the yoke by means of screws. Fig. 4 shows the magnet mounted on a wooden base provided with a plug switch for connecting the coils in parallel or in series. Fig. 5 is an enlarged view of the switch, and Fig. 6 shows one of the plugs by which the connections are made.

The switch is formed of brass blocks, *a*, *b*, *c*, *d*, *e*, *f* *g*, *h*, arranged in two series as shown in Fig. 5. The blocks, *a*, *h*, are provided with binding posts for receiving the battery wires. The blocks are provided with semicircular notches forming the plug holes, 1, 2, 3, 4, 5, 6, 7, 8, 9.

The block, *a*, is connected with the lower terminal of the lower left hand coil, and the block, *e*, is connected with the upper terminal of the same coil. The block, *b*, is connected with the lower terminal of the upper left hand coil, and the block, *f*, is connected with the upper terminal of the same coil. The block, *h*, is connected with the lower terminal of the lower right hand coil, and the block, *d*, is connected with the upper terminal of the same coil. The block, *g*, is connected with the lower terminal of the upper right hand coil, and the block, *c*, is connected with the upper terminal of the same coil. When the holes, 1, 2, and 3, are plugged, the current goes in series through all the coils. By plugging the holes, 4, 7, 2, 6, and 9, the current goes through the coils two in parallel and two in series, reducing the resistance to a quarter the original amount. By plugging the holes, 4, 5, 6 and 7, 8, 9, the current goes through all the coils in parallel, and the resistance is reduced to 1/16 the original amount.

The polar extremities of the magnet are drilled axially and tapped to receive screws by which are attached extension pieces for diamagnetic experiments.

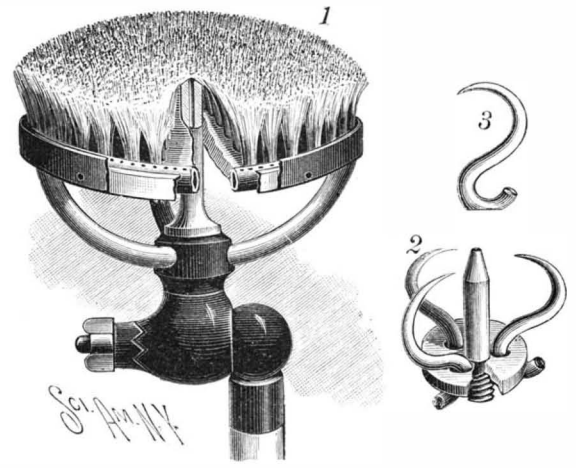
To retain the spools on the cores when the magnet is in an inverted position, a thin brass ring is screwed on the end of each core. The armature is provided with a hook for receiving a rope or chain, and the yoke has a threaded hole at the center for securing the eye for suspending the magnet.

AN IMPROVED CULTIVATOR.

The illustration herewith represents a roller cultivator specially adapted for use with listed corn or other plants growing in furrows, being designed to crush the clods in the furrows as well as upon the ridges, and leave the soil and trash in the same position as when left by the listing plow or any other furrow implement. The invention has been patented by Mr. Harrison Staggs, of Valencia, Kans. The frame is constructed with parallel spaced beams, extending longitudinally, and other shorter parallel beams outside of these, such beams carrying transversely-aligning standards, in which ridge rollers are centrally journaled, while an outer extensible furrow roller is journaled in the sliding standards. From the standards supporting the driver's seat two horizontal arms are rearwardly extended, between which a drum is journaled carrying a rope or chain attached by one end to a lever by the driver's seat, by means of which the drag plows, which may also be located at the front of the machine, may be elevated in turning corners. Downwardly and outwardly curved plates are adjustably secured to the inner faces of the plow beams, and to the lower end of these plates a vertical cultivator blade is pivoted which at one side is bent upon itself at the bottom, and carried inward in the form of a triangle, while above the triangular share is an essentially right-angled blade or scraper rigidly secured to the inner face of the cultivator blade. The furrow roller may be conveniently elevated as high as desirable, or the ridge roller may be entirely removed from the machine, which is designed to be used to cultivate listed corn when just appearing, or when five or six inches high, and is adapted to be adjusted to furrows of different width or depth.

A FOUNTAIN BRUSH AND SPONGE HOLDER.

The illustration herewith represents a device for holding a brush or sponge, and supplying the water for use therewith through the tubular handle, the device being especially adapted for use in cleaning windows and similar purposes. The wooden brush head is secured upon a central metal nozzle, a circular metal tube, with small apertures on its upper side, surrounding the brush head, and this tube being connected by side tubes to a thimble from which the central nozzle is extended. Surrounding the circular tube is a thin metal band holding in position an outer rubber band projecting beyond the edge of the holder, and designed to protect the object being washed from contact with the metal part of the head. When a sponge is to be used, the brush is removed with its central attached nozzle, and the sponge forced on the sponge holder nozzle, by connecting which with the central thimble the lower ends of the hooks are forced upward as shown in Fig. 2, forcing the upper points around the nozzle, and thus holding the sponge securely in position. Fig.



THOMPSON'S FOUNTAIN BRUSH AND SPONGE HOLDER.

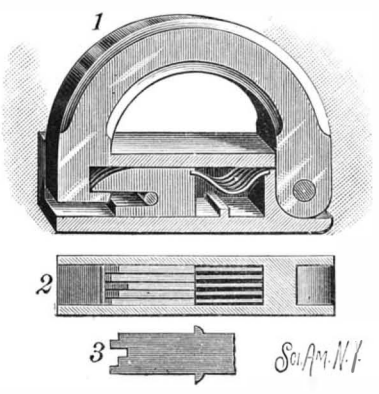
3 represents one of the sponge holder hooks. This invention has been patented by Mr. Samuel Thompson, of No. 47 River Street, Chicago, Ill.

Another Remarkable Gas Well.

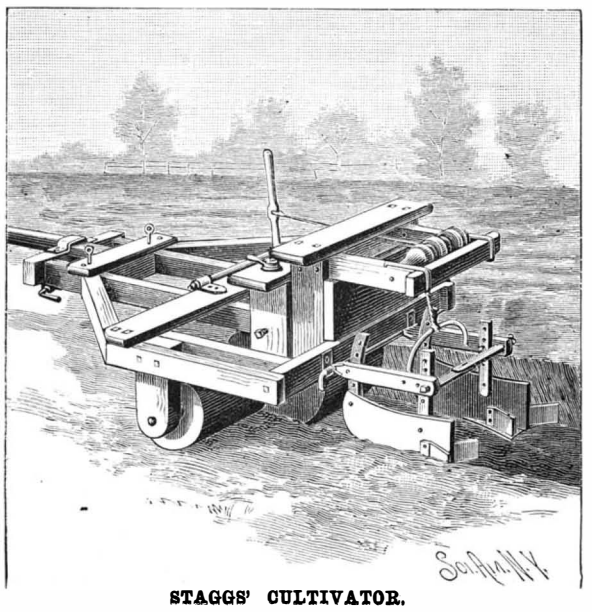
The largest natural gas well ever struck was bought in April 15, by the Philadelphia Company, near Belle Vernon, 26 miles from Pittsburg. It is running off 40,000,000 feet a day, the pressure being 800 pounds to the inch. It is one of the most significant wells ever struck, as it shows there are millions of new fields and that the supply is good for many years to come.

AN IMPROVED PADLOCK.

The padlock shown in the accompanying illustration forms the subject of a patent recently issued to Mr. Grant Brambel, of Detroit, Becker County, Minn. The bow or shackle is formed, at its outer end, with a recess, and an inclined bearing face upon a projection below the recess, the downward movement of the shackle being limited by a shoulder bearing against the upper plate of the case. Within the case are mounted any desired number of tumblers, formed with central slots and upper forward curved faces, partly shown in the sectional view, Fig. 1. The sections below the slots are of different lengths, as shown in Fig. 2. In the rear of each tumbler a spring is arranged, and there is also a stop to limit their rearward movement. In placing the tumblers in the case they are forced inward against the springs, after which a retaining pin is passed through apertures in the case and the slots in the tumblers, so that the springs will normally act to force the tumblers to the position shown in Fig. 1. The locking is effected by simply pushing the outer end of the bow or shackle into the case, when the tumblers are forced backward until the tongue on the lower end of the shackle has passed below the tumbler sections. The end of the key is stepped, as shown in Fig. 3, to coact with the tumblers employed in the construction of the lock.



BRAMBEL'S PADLOCK.



STAGGS' CULTIVATOR.

THE GRAND SCENERY OF OREGON.

(*Continued from first page.*)

dered this district very rich in vegetation. The valleys of the many streams and rivers which abound in this section are most of them very fertile. The Rogue River, which has cut its way to the coast through a deep canon, is very beautiful and is very heavily timbered. A number of placer mines have been established along its shores, and much gold has been taken from the sand and gravels of its bed.

Our illustration gives a general view of Portland, which is the principal city of Oregon. It is located on the Willamette about 12 miles above its junction with the Columbia River. Its population in 1880 was 17,577, but it has grown rapidly under the impulse given it by the Northern Pacific Railroad. From its streets may be seen the beautiful cone-shaped glitter of Mt. Hood, which is the wonder and admiration of all travelers, and which rises from the vast plain to a height of 11,225 feet, solitary in its grandeur and standing like a sentinel watching over the destinies of the city. Its summit extends into the region of perpetual snow, and some idea of its beauty may be had from the photographs which we here reproduce.

Oklahoma the New Eden.

That innate and inbred desire of the members of the human family to get something for nothing—or next to nothing—must account for the mad race for quarter sections of land in Oklahoma, of which so much has been printed lately in our daily newspapers.

All the neighboring States of the Southwest, bordering on the newly opened territory, share in the excitement, and even the older States, like conservative Tennessee, are sending their contingents. Yes! Even the lake regions of the North are sending settlers. Among the excited throng are farmers, lumbermen, miners, mechanics, printers, store keepers, gamblers, saloon keepers, whisky men, and adventurers of every sort.

Already cities have actually been plotted on paper, and for one of them a bank has been organized which began business at noon on the now celebrated 22d day of April, 1889. The *Southern Lumberman* thinks that for some time to come it is altogether probable that *faro* banks in fair Oklahoma will considerably outnumber the legitimate financial institutions.

At the present time only one railroad runs through the new country, but several others go very near its boundaries, and these convenient thoroughfares are all putting on extra rolling stock on account of the unprecedented demand for transportation.

The General Land Office has established two offices —the one at Kingfisher Station and the other at Guthrie; while the Post Office department is straining every nerve in maintaining an effective postal service. There are said to be no fewer than seventy thousand applicants for the eleven thousand quarter sections of land that are available for settlement, so it is very evident that many pilgrims will be disappointed. There is no evidence to hand that Oklahoma lands are one whit better or richer in any respect than those in the Indian Territory, Kansas, Missouri, Illinois, or Tennessee, and yet hundreds of farmers are leaving comfortable homesteads in old settled communities and are gladly taking all the chances of pioneer life. Were there any indications of auriferous deposits of rich silver ore; of lead mines; of inexhaustible coal measures; of vast forests of hard woods; or in fact of any evidence of mineral or vegetable wealth out of the ordinary run, one could understand this mad rush; such not being the case, all our readers can do is to patiently await developments and then judge of the real value of Oklahoma and its lands. Land agents and law firms are circulating maps of the new Eden, and on paper it certainly looks to be a beautiful country; and *The Lumberman* thinks if the garden of Eden had been as well shown up by land lawyers and agents of old, the descendants of Adam would have mobbed that lonely angel with a flaming sword who guarded its gate and kept them out. Oklahoma is evidently a more desirable country, as it has required several hundred of Uncle Sam's blue coated angels, armed with repeating rifles, to keep the people out of it. Still, we are not going there—this year the editor adds —and we are not advising any of our friends to go to stay. It may prove a good field for the tourist who represents a good lumber firm, a burial case factory, or a tombstone quarry.

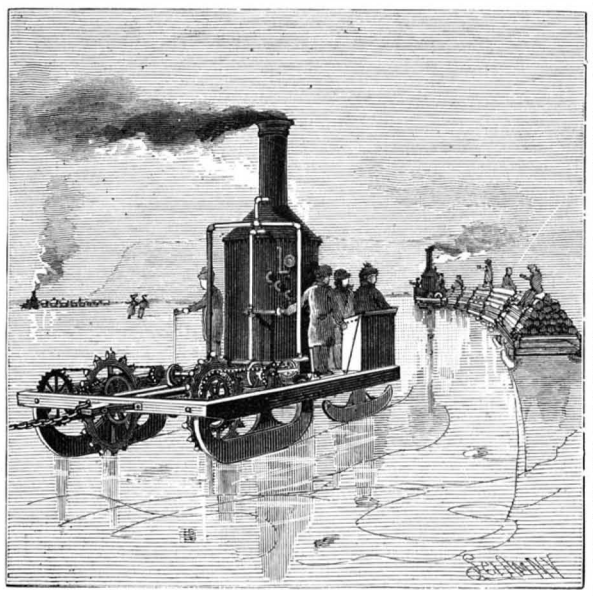
Rock Cuttings in the Proposed Nicaragua Canal.

The most serious feature of the Nicaragua canal project, in a contracting and financial sense, is the great rock cut at the eastern divide, 3 miles long and averaging 120 ft. deep by 80 ft. wide on the bottom, containing in all some 7,000,000 cubic yd. of material, or say 440 cubic yd. per lineal foot. There is no precedent, says *Engineering News*, for such an enormous cut, and it has been assumed that four years, at least, would be necessary to complete it, while many question the possibility of doing it in that time. The great rock cut at the Tilly Foster mine, Brewster's Station, N. Y., if it may be relied on as a precedent, would go far to relieve these doubts. From that cut 215,000 cubic yd. have been removed in 20 months within a lineal distance of 450 ft., or nearly 500 cubic yd. per lineal foot, and this by day work only, with a force of 150 men, or one man per yard of center line, by four cable hoisting plants only, or say one per 100 ft., and practically at the rate of about 4,000 cubic yd. per month per cable when working full time and with full force. Equal efficiency cannot be expected in tropical Nicaragua and temperate New York; but neglecting for the moment this very serious difference, a work conducted with equal efficiency, and with a cable hoisting plant for every 100 ft. of center line, would at the rate of 4,000 cubic yd. per month extract the necessary cube of 44,000 cubic yd. *in just* 11 *months* of solid work, and this without night work; while the force to accomplish this end, if the New York example were admissible as a precedent, would be about 5,300 men with 160 cable hoisting plants, or about 33 men per plant and per 100 ft.

This is not so large a number as to seem difficult of attainment, or to cause the men to be in each others' way, even if increased by a considerable percentage to allow for tropical inefficiency; and we fully believe that there are men in this country who can and will undertake to parallel this record if afforded the opportunity, and if the contracting wheat be winnowed from the chaff by some other and safer method than "lowest bid" and "influoence," so that those men who really understand from experience how to handle such work may have a fair chance.

A STEAM-PROPELLED SLED.

An invention by means of which a sled is designed to be propelled by steam power, and adapted to pull a



CONNIFF'S STEAM SLED.

train of sleds, has been patented by Mr. James F. Conniff, of Oconto, Wis., and is illustrated herewith. The main frame of the power sled is mounted on sets of runners, of which the rear set is pivotally connected to the under side of the frame. On the frame is a boiler supplying steam to an engine connected with driving shafts on either side, each of the shafts carrying a sprocket wheel communicating motion by a sprocket chain to a shaft mounted transversely at the rear end of the main frame.

From this shaft power is communicated to two propeller wheels, mounted in bearings in a frame that is free to swing up and down, whereby the wheels will be always in contact with the ice or snow. The periphery of each propeller wheel has projections with sharp cutting edges, to enable the wheel to take a firm hold on the ice or snow, whereby the power sled will be capable of drawing a train of sleds connected therewith.

A Recent Cat-astrophe.

An interesting exhibition of trained cats has been conducted for some time past by Leoni Clark, known on the variety stage as the "cat king." His troop of thirty cats has been a great attraction. Philadelphia has, of late, been the scene of many performances, and on the 24th ult. Mr. Clark thought that his troop of cats needed some medicine, and he went to a neighboring drug store and had a prescription, which was tried with good results many times, put up. He then assembled his troop of educated cats in a row and began to administer the medicine. After he had gone down the line giving dose after dose as far as the thirteenth cat, cat number one, with an unearthly shriek, leaped into the air and fell dead.

Cat number two followed suit. Cat number three did the same, and so it went on until thirteen cats that had taken the medicine lay dead before him. Mr. Clark is in a terrible state of mind over his loss, and will sue the druggist, who he claims put up the wrong prescription. The druggist declares that he put up exactly what Mr. Clark's prescription called for.

Correspondence.

A Suggestion for Introducing Wires in Electric Subways.

To the Editor of the Scientific American:

In the recent article on "The Electric Subways of New York City," I was struck with the extremely slow method of introducing the small line into the duct, preparatory to drawing the cable. It occurs to me the first line might be run through much quicker by air than with the jointed rod.

I should think a specially made large sized hand bellows would be sufficient to drive through a pasteboard cone with a light line attached. The line should be taken from a light, free-running reel.

Thimbles of different sizes could be made for the different sized ducts, so the nozzle of the bellows would fit any of them. One side of the thimble may be crimped sufficient to allow the line to enter the duct.

M. A. CURRIER.

Omaha, Neb.

Semi-solid Lubricants.

To the Editor of the Scientific American:

I note in your issue of April 27 that the well known mechanical engineer Joshua Rose speaks, in his Paris letter, of the use of a semi-solid lubricant on grinders forced by screw pressure upon the journals, and in speaking of it as a new idea "of much interest" he add: "I was informed that it was proposed to try a similar device upon the axle boxes of a locomotive. I should think it likely that such an axle box would, however, require a more continuous supply of lubricant than this would give." Concerning this it might be of interest to note that the idea is not new in this country, as at least over a year ago the Chicago and Northwestern Railway were using a solid lubricant, coming in the form of candles, upon their engines.

Just how successful it was I am unable to say. It was a white substance of about the size and hardness of an ordinary candle and some three or four inches in length, used in much the same manner described in his letter.

J. M. FARNSWORTH.

Vinton, Iowa, April 29, 1889.

Natural Gas in Kentucky and Indiana.

State Geologist Gorby, of Indiana, in relation to the natural gas development in Harrison County, Ind., and Meade County, Ky., says:

So far as it has been tested, the field stretches along the Ohio River about thirty miles, beginning at a point about twenty miles below Louisville and extending below Brandenburg. It has a width of seven or eight miles in each State, and contains about fifty wells, ten or fifteen of them on the Indiana side and the remainder of them in Kentucky. It is from the Kentucky wells that it is proposed to supply the city of Louisville. It will require a pipe line about thirty miles in length, and when I was there last, work upon it was being pushed vigorously. There were originally three companies that started out to supply the city, but they are merged into one organization now.

The Harrison County wells are shallower than those in Hamilton and Howard Counties, the gas being reached at a depth of 358′ in the river bottom. The bluffs along the river are about 200′ high, and the wells back from the stream require more boring, so that those sunk in different parts of the field range from 358′ to 550′ in depth. The Hamilton and Howard County wells, as I have observed them, run from 800′ to 1,000′. In some of those in Harrison County the supply is as abundant as in the average producing wells of Hamilton and Howard. Some of them are producing 4,000,000′ daily, and the output throughout the field is estimated at 50,000,000′ every twenty-four hours. The gas comes through a black shale, and is of about the same quality as that produced in other Indiana fields. There is more annoyance from salt water than there is in the Noblesville and Kokomo section, but this is obviated by the use of separators, which have been improved upon until some of them now work very satisfactorily.

I think there is a plentiful supply for Louisville, however, from the Kentucky portion of the field. It is astonishing what one moderately productive well will do when the gas is properly handled. In the State of Indiana the town of Portland, which has 2,000 inhabitants and several manufactories, is supplied by one well, with a capacity of 875,000′ daily, and one mill there with an engine of 20,000′ each day. Of course, where it is burned as an ornament or for advertisement in large flambeaus on the streets and in public places it is different. I am only speaking of cases where the gas is not wasted.

Preservation of Milk by Freezing.

It is said fresh milk may be preserved indefinitely by freezing it and maintaining it in the frozen state until wanted for use. Many of the steamers now sailing on distant voyages are provided with steam refrigerators, in which milk and other foods may readily be preserved for any length of time.

Explosion of a Lime Light Gas Cylinder.

A serious explosion of a gas cylinder, on the 28th of January, in Dublin, Ireland, occurred, by which one person was instantly killed. It appears to be the practice abroad of compressing the oxygen and hydrogen gases up to a pressure of 750 pounds to the square inch, while in the United States the usual working pressure is 250 pounds. The particular reason for the explosion was explained by experts to be the careless mixing of the oxygen and hydrogen gases in one cylinder, which, in escaping in a room in which there was a gas light, ignited and caused the explosion. A peculiar feature of the case is that the man who was killed was one of the proprietors of the works where the gas is compressed. Their rule was to store the oxygen gas in black cylinders and hydrogen in red. The proprietor had an urgent application for oxygen gas, and being short of oxygen cylinders, took a red hydrogen gas cylinder, which he supposed was nearly empty (no evidence was shown that it was tested by a gauge to see what pressure of hydrogen it had), and charged it with oxygen gas.

The party intending to use it was notified that it was oxygen gas instead of hydrogen, but did not use it. It was afterward returned to the gas works, and the proprietor, forgetting that it contained oxygen, sent it out a second time to fill another order for a cylinder of oxygen and hydrogen. When the operator of the lime light made his connections and undertook to light the hydrogen gas at the end of the lime light jet, he was startled by a small explosion there. The cold metal of the burner, it is supposed, prevented the flame from extending back to the cylinder, and thereby prevented a more serious explosion. He at once disconnected the cylinder, labeled it "mixed gases," and returned it to the works. He also notified the proprietor of the dangerous character of the gases. But he seemed to look upon it lightly, since he told his foreman that the quantity of hydrogen was so small that there was no danger, and that he would use it himself. The cylinder was placed by itself in a room used for making mechanical drawings, in which was one gas light. But the testimony as to whether it was lighted or not is not clear; some of the employes and assistants maintained that it was. He went into the room alone and experimented with small quantities of the gas, opening the valve at the top in the usual way. Suddenly his brother, in an adjoining room, heard a slight report and crash of glass. He rushed into the room and found the proprietor lying on his back on the floor dead.

It would seem that he died from his own carelessness, as he had been advised to let the gas escape in open air.

In the United States it has become the custom to compress the oxygen gas in red cylinders and hydrogen in black. An extensive user of these gases in England states that one company doing a large business in supplying these gases there does not always adhere to the rule adopted there of putting oxygen into black and hydrogen into red cylinders, for he has had sometimes as many as a dozen black cylinders containing hydrogen delivered for one of red. To avoid errors at the works, it is suggested that the spindles and coupling screws be made larger for the oxygen cylinder than the hydrogen, and that both the cylinders be painted in totally opposite colors.

When one of these cylinders bursts from defective construction and overpressure, it is generally in the form of a narrow seam, and no damage is done unless the person happens to be near the rupture; then the force of the escaping gas, acting like a gun, will send objects before it to great distances, precisely on the principle of the dynamite air gun.

A peculiar accident of this nature came to our attention, and is related as follows: Two cylinders of oxygen and hydrogen, placed on their long sides on the floor of a wagon, were being transported over a paved road. A boy was sitting on one of the cylinders. When they had nearly reached their destination, a peculiar report was heard and the driver noticed, on looking around, that the boy had disappeared. He was found unconscious, lying in the street, about fifty feet from the wagon. At first he was thought to be dead, but he subsequently recovered and escaped without a scratch. The mystery was never explained, except that the boy says he felt a tremendous breeze of wind pass upward in front of him and was instantly unconscious. One explanation given is that as he happened to be over the rupture in the cylinder, the escaping gas issuing with a tremendous velocity, at a pressure of 250 lb. to the square inch, lifted him into the air something on the principle of a rocket. On passing near his mouth it may have taken his breath away and made him unconscious. We are indebted to the account published in the *Br. Jour. of Photo.* for the facts regarding the Dublin explosion. It is perfectly safe to use gas in cylinders tested to three times the actual pressure usually employed, and it is very rare that the bursting of one is reported. A most useful adjunct is a gauge attached to the cylinder by a T joint between the cylinder and the lime jet, since it apprises the operator of the pressure he has on hand of either gas. Generally a trifle more of hydrogen is used than of oxygen. There are also pressure regulators made that can be attached to the cylinder for equalizing the pressure.

Natural History Notes.

Relation of Ants to the Seeds of Plants.—It is well known, says Prof. Trelease, in an address before the Cambridge Entomological Club, that in warm countries some ants carefully and systematically harvest the fruit of species of plants which are to their taste, and it would seem that they take some agricultural interest in the welfare of these plants. While this indicates a high grade of care for the food-producing species, the benefit to the plant is that which a cultivated crop receives from the self-interest of man in its preservation and propagation, without in any way approaching symbiosis.

The resemblance of some seeds or fruits to different kinds of insects or other arthropods has several times been commented on. Perhaps it is still an open question whether or not this is mimicry, but it has been so regarded by a number of naturalists, being held in some cases to secure dissemination by insectivorous birds, etc., and in others to render the detection of the seed by graminivorous birds difficult. Suggestions are not wanting that in some of these resemblances, and some other seminal peculiarities, adaptations exist for securing dissemination through the agency of ants. Mr. Charles Robertson states that the arils of *Sanguinaria* seeds possess an attraction for ants, which drag the seeds off for considerable distances. According to Lundstrom, *Melampyrum* seeds resemble ant pupæ in size and form, and, he believes, in odor also, to such an extent that ants are deceived into caring for them as if they were their own pupæ, until the mistake is discovered. Mimicry, such as he suggests, is a very difficult thing to prove to the satisfaction of unbiased biologists, but observations cited by him would seem to show that unusual attention is really paid to these seeds by ants which do not subsequently make use of them for food. The bracts of some species of this genus bear extranuptial nectar glands, which Rathay, who studied them carefully, could not explain by the protective theories of Delpino and Belt, or Kerner, though they are visited by ants. As the latter are thus attracted close to the fruit, Lundstrom suggests that the office of these nectar glands may stand in close relation with the supposed mimicry observed in the seeds; but this entire subject, while full of suggestion, is still in need of careful and comparative study.

Flowers altered by Mites.—Some experiments made by Prof. Plyritsch, at Innspruck, and recorded in the *Transactions* of the Imperial Academy of Vienna, show that double flowers may be produced by the agency of mites. He transferred some mites found on a wild double flower of *Valeriana tripteris* to other plants of the natural order Valerianaceæ, Cruciferæ, Scrophulariaceæ, Commelynaceæ, etc., with the result that various kinds of double flowers were obtained, as well as torsions and fasciations of the shoots. The doubling consisted in petalody of the stamens and pistils and prolification and duplication of the corolla. Even the leaves were affected by the mites, the margin showing comb-like teeth. In *Linaria cymbalaria* peloriate flowers and other changes were found. The results obtained would appear to depend upon how far the subject of the experiment is a good host plant for the mites, the plant in such case being quite crippled. In several cruciferous plants in which the flowers are normally ebracteate, bracts were developed by introducing the mite found on the hazel to the plants. In the daisy the disk florets became green, the leaves more hairy, and the involucral bracts elongated. It was also observed that after infection lateral bud development was accelerated, while growth in length was slow.

Preservation of the Colors of Flowers.—A writer in the *Revue de Botanique* states that he has succeeded in preserving the form, beauty, and freshness of flowers by dipping them in a varnish composed of 20 parts of powdered copal dissolved in 500 parts of ether, sand or powdered glass being used to make the resin dissolve more readily. The flowers are dipped in the liquor, carefully withdrawn, and allowed to dry for about ten minutes. This is repeated four or five times in succession. A second process given is to immerse the stem of the fresh plant in a solution of 31 grammes of alum, 4 of niter, and 186 of water, for two or three days, so that the liquid may be absorbed. The plants are then pressed in the ordinary way, except that dry sand is sifted over the flowers and the packets submitted to a gentle heat for about twenty-four hours. A third process consists in plunging the plant for an instant in a boiling solution of 1 part of salicylic acid in 600 of alcohol (too long an immersion will decolorize violet flowers), and then drying between bibulous paper. For restoring the color to red flowers which have turned violet or blue in drying, a piece of paper moistened with dilute nitric acid (1 part of acid to 10 or 12 parts of water) is placed under the plant, and then the whole submitted to moderate pressure for a few seconds between blotting paper. The amount of pressure and the strength of acid required will vary in different cases, but the green leaves should never be subjected to the acid, or they may lose their color.

Preservation of Animal Colors.—As alcohol has a tendency to alter or even wholly destroy the colors of animal specimens preserved in it, Mr. Fabre Domergue has been led to make some researches with a view to finding a substitute for it that does not possess this inconvenience. He recommends the following mixture:

Sirup of glucose, diluted	1,000 parts
Glycerine	100 "
Methylic alcohol	200 "
Camphor, to saturation.	

The glucose is dissolved in warm water, and, after it is cool, the glycerine, alcohol, and a few pinches of camphor are added. As this mixture is always acid, it should be neutralized by the addition of a small quantity of a solution of potash or soda. After filtering through paper, a few fragments of camphor are allowed to float upon the liquid.

This liquid is well adapted for the preservation of hard-shelled crustacea, of green, blue, or red color, and also of certain echinoderms. Most soft animals preserve their color in it, although they contract considerably.

Protective Secretions in Plants.—From some investigations made by Prof. Stahl on the use of secretions to plants, the conclusion is reached that these secretions in many plants serve to protect the latter against animals. Thus, tannin was found to be objectionable to slugs, slices of carrot dipped in its solution remaining untouched by them. On the other hand, plants containing acid oxalates of potash, such as sorrel, rhubarb, and begonias, were eaten with avidity by slugs when this salt was removed, although previously they would not touch the plants, nor would they attack carrot soaked in a solution of the salt. In the case of hellebore the vegetable poison present appears to act as a protective agent. M. Stahl also points out that the incrustations of carbonate of lime on saxifrages and the silicious coating on grasses and equisetums, and the raphides in plants, have a similar protective duty, since if these be removed, the leaves, etc., are speedily attacked by slugs. He found also that essential oils, such as those of rue, herb Robert and *Acorus calamus*, are also repulsive to slugs. This idea seems to receive confirmation from the well-known fact that cattle will not touch the common buttercup in its fresh state, although they eat it readily when dried, and that colchicum is always left untouched by them. Nevertheless the peppermint, and occasionally even the aconite (*A. Napellus*), is eaten in London gardens by the common cabbage moth (*Mamestra brassicæ*).

Epiphytic Plants of the Tropics.—Dr. A. F. W. Schimper has published a second installment of his magnificent work on this subject, this portion relating to the flowering plants and vascular cryptogams. The order by far the most largely represented is Orchideæ, of which 119 species are enumerated in tropical America alone. Next come Filices (American only) and Bromeliaceæ 18 each, Gesneraceæ 16, Rubriaceæ 14, Ericaceæ 13, and Melastomaceæ 10. The largest number of epiphytic plants are found on the arbored vegetation of mountain slopes in tropical and subtropical countries. Some species, but only those found on the lower branches of trees, grow also on rocks. The author describes the different ways in which the seeds of epiphytes are adapted from their peculiar habit. The most common contrivance is that they are provided with a succulent envelope which is devoured by animals, and the seeds themselves then voided on to the branches of trees; or they are so small as to be carried readily by the wind to fissures in the bark, as in the Orchideæ; or they are provided with a floating apparatus. Excluding true parasites, their nutrition is obtained in several ways. They may find their nutriment on the moist surface of the host, and are then usually protected against desiccation by the presence of receptacles for holding water. Others have aerial roots for absorbing moisture, like the orchids, or roots which reach the surface of the soil; while others again form for themselves a matrix of decaying animal and vegetable matter.

Effect of Minerals on Plant Growth.—From some recent experiments by Mr. Henri Jumelle in cultivating lupines in distilled water and in a mineral solution, it appears that the presence of mineral substances in the plant is accompanied with a greater production of parenchyma and a formation to a less degree of sustaining elements. Moreover, if the plants submitted to the experiment be dried, it is observed that, in a general way, the stalk and leaves of the plant provided with salts contain a larger proportion of water at this period than do these same organs in plants deprived of salts.

Upon the whole, the absence of salts notably modifies the structure of a plant, but the modifications seem to be due, in great part, less to the absence of salts than to the diminution of the constituent water that results therefrom.

A RACE between electrical launches lately took place in London. Five boats took part in the contest.

TRIPLE EXPANSION ENGINE.

We illustrate a novel construction of a triple expansion engine constructed by Cole, Marchant & Co., of Bradford, to the designs of Rhodes & Critchley, of Bradford, and given in a recent number of *Engineering*. The three cylinders are placed one above the other, and all the piston rods are connected to one and the same crosshead. This arrangement was adopted on account of the limited space at the disposal of the designers, the engine house being only 30 feet in length by 8 ft. 9 in. in width. The cylinders are 8¼ in., 13¼ in., and 21 in. in diameter respectively, with a stroke of 4 ft. The crosshead has been made very strong, of cast steel, and has slide blocks 2½ in. in thickness, and of a length equal to the distance from the center of the high pressure piston to the center of the low pressure piston.

The valves of the high pressure cylinder are of the Corliss type, the steam boxes being 10 in. long by 4½ in. in diameter, and the exhaust boxes 5 in. in diameter. The valves are made to draw out through the back bonnets. The disks on which are mounted the tripping arrangements are made of wrought iron forged plates. The pawl is of steel, and is fitted with a steel pin 1 in. in diameter; on the same axis is also fitted the cam and lever for tripping the pawl, which is of steel casehardened. The wrist plates are of cast iron bushed with steel liners and fitted with 1⅜ in. steel casehardened pins. The details of construction of this trip gear, which is the designers' special pattern, are clearly shown by the engravings.

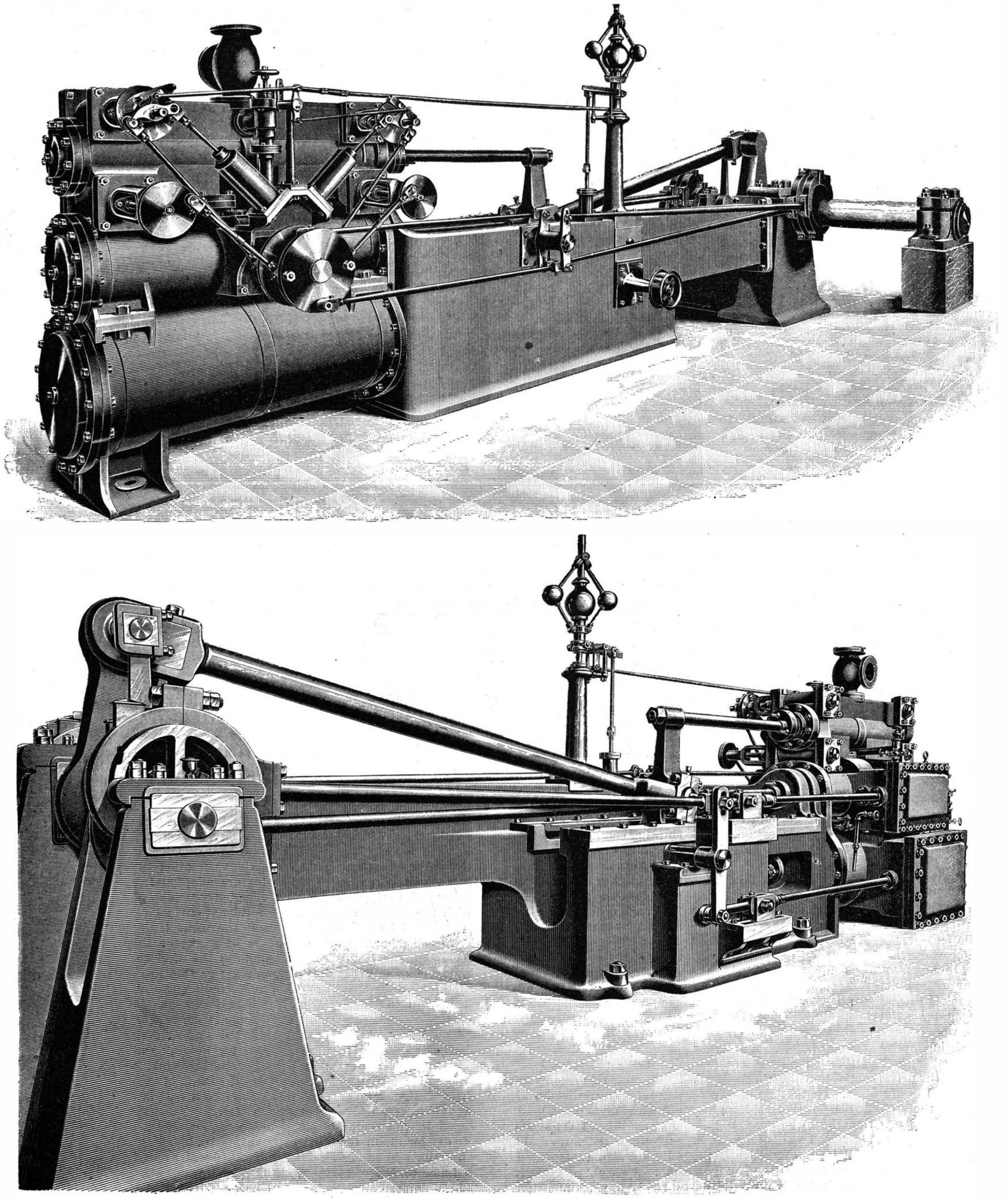
The intermediate cylinder is fitted with two slides and cut-off plates, worked directly by eccentrics 2½ in. wide on the drag shaft. These valves can be regulated to cut off earlier or later as required to equalize the amount of work done by the respective cylinders. In order to facilitate the adjustment of the valves the cut-off spindle has a screw index and wheel.

The low pressure cylinder is fitted with an ordinary slide valve worked also by an eccentric on the drag shaft. The pistons are all on Buckley's principle. The steel piston rods are 3 in. in diameter for the high pressure cylinder, 3¼ in. for the intermediate pressure cylinder, and 3½ in. for the low pressure cylinder.

The crosshead is fitted with a steel gudgeon 5½ in. in diameter in the body and 4¾ in. in diameter in the necks, with outer necks 2½ in. in diameter by 2½ in. long, for the air pump links. The connecting rod is 10 ft. long, 4½ in. in diameter at the crosshead end, 4¾ in. in diameter at butt end, and 5½ in. in diameter in the center, forked at the crosshead end and solid at the butt end. The fork end is fitted with a wrought iron cap and four 1¼ in. bolts and lock nuts. The butt end is fitted with a steel block, die, and brasses, with 1¼ in. steel adjustment screw.

The crank is 6 in. broad, turned and polished all over, and fitted with a steel pin 4¾ in. in diameter by 6 in. long, with an outer neck for the drag crank. The crankshaft is 9 in. in diameter in the body and 8½ in. in diameter by 14 in. long in the bearing for the crank pedestal, and 10 in. in diameter for flywheel.

The eccentric rod which drives the low pressure



IMPROVED TRIPLE EXPANSION ENGINES, WITH CORLISS VALVE GEAR.

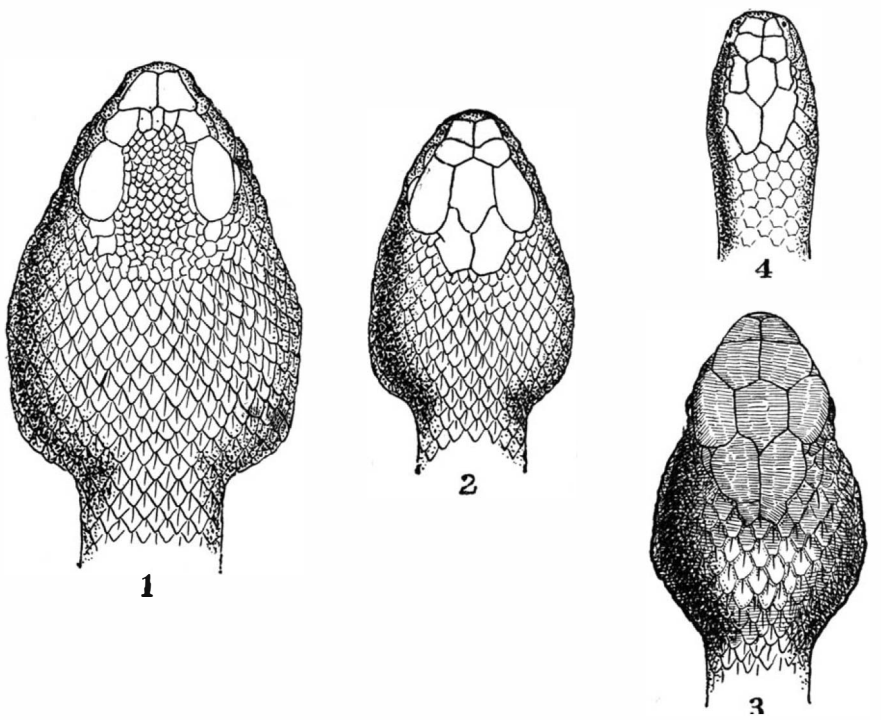
valve is coupled to a lever mounted on a rocking shaft fixed in adjustable phosphor bronze bearings. The eccentric rods for driving the Corliss wrist plates are hung on two two-armed rocking levers mounted on a 4 in. cast iron stud pin, which is bolted to the bed plate.

The air pump already in the engine house was used again. A cast iron liner was put in, 15½ in. in diameter. This pump is not shown in the engravings, but is of the vertical type, and is worked from links connected to the crosshead. The stroke is 18 in.

THE VENOMOUS SERPENTS OR TOXICOPHIDIA OF THE UNITED STATES.

The rattlesnakes, family *Crotalidæ:* In genus *Crotalus*, the true rattlesnakes, the head above is covered with small scales. (See Fig. 1.) The species are: 1. Eastern or mountain rattlesnake, *Crotalus horridus.* It is found from Maine to Arkansas and Texas. It varies greatly in color, being found dark brown, nearly black, to pale sulphur yellow with ashy gray bands. 2. The diamond or Southern swamp rattlesnake, *Crotalus adamanteus.* It inhabits North Carolina to Florida. There are several varieties of this repulsive serpent, which from time to time have been described as new species; variety *atrox* is found from Texas to California; variety *scutulatus* in Arizona. 3. Western rattlesnake, *Crotalus confluentus*, habitat Nebraska to Oregon, south to Texas and New Mexico. The red rattlesnake, *C. pyrrhus*, of Arizona, seems to be a local variety. 4. The bull-dog rattlesnake, *Crotalus molossus,* of which the U. S. Museum, at Washington, contains only three specimens, one each from Arizona, Texas, and Mexico, is nearly related to the harsh rattlesnake, *C. durissus*, of Mexico and South America, and may be a variety of the latter. 5. The horned rattlesnake, *Crotalus cerastes*, found from Colorado to California and south to Mexico. 6. The tiger rattlesnake, *Crotalus tigris,* found in New Mexico and Arizona. The St. Lucas rattlesnake, *C. enyo*, bears a close relationship to *molossus* and *durissus*, and it is doubtful if it may be called a distinct species. Four specimens from Lower California are in the United States Museum. 7. The lucifer rattlesnake, *Crotalus lucifer*, bears a near resemblance to the diamond rattlesnake variety *atrox.* It is possible that the Oregon rattlesnake, *C. Oregonus*, described by Dr. Holbrook, is the young of this species. His faded type specimen in the collection of Academy of Natural Sciences, Philadelphia, measures about a foot in length, and the tail has but one button, which proves it to be quite immature. *C. lucifer* has been found in Oregon, California, and Arizona. Mitchell's rattlesnake, *C. Mitchellii*, is founded on one individual from Lower California. It is a doubtful species, resembling *lucifer* and *atrox.* 8. Kennicott's asp or rattlesnake, *Aploaspis lepida*, from the Rio Grande, Texas, has been described from two alcoholic specimens of heads only, and requires further study.

The second group of rattlesnakes belongs to the genus *Crotalophorus* of Gray, 1825. Linnæus in 1735 first gave the name *Caudisona* to all the known rattlesnakes; but subsequently rejected it, and in 1749 adopted *Crotalophorus.* In 1754, and subsequently, he placed all the rattlesnakes in the genus *Crotalus.* Laurenti in 1768 adopted the genus *Caudisona* for the rattlesnakes. Gray in 1825 placed the rattlers with large plates on the head in the genus *Crotalophorus;* one year later, 1826, Fitzinger proposed *Caudisona* for the same group; therefore, Gray's genus *Crotalophorus* (a rattle bearer) should be retained. This family of rattlesnakes have the upper surface of the head covered with nine large plates, as seen in many non-venomous serpents. (See Fig. 2.) 9. Massasauga or prairie rattlesnake, *Crotalophorus tergeminus.* In 1854, Prof. Baird collected several specimens in a white cedar swamp at Byron, Genesee Co., N. Y. "Nessmuk," in *Forest and Stream*, says he observed it in a tamarack swamp, fourteen miles south of Brockport, N. Y. From New York its range extends westward to Utah and Montana, and from Ontario, Canada, south to Georgia. Edwards' rattlesnake, *C. Edwardsii*, although described as a native of Texas and Mexico, has lately been found in company with the massasauga in Bruce Co., Ontario. It seems to be only a variety between the prairie rattler and the following. 10. Southern ground rattlesnake, *Crotalophorus miliarius,* is found from North Carolina to New Mexico, and southward. *C. consors* is an accidental variety from Texas.



1. Eastern rattlesnake. 2. Massasauga. 3. Water moccasin. 4. Harlequin snake.

POISONOUS SERPENTS OF THE UNITED STATES.

To *Ancistrodon* belong the pit vipers without the rattle—the copperhead and moccasins. (See Fig. 3.)

11. The copperhead, *Ancistrodon contortrix*, has been found from Vermont to Florida, and westward to Kansas. 12. The water moccasin, *A. piscivorus,* is said to be found from North Carolina to the Gulf, and westward to Texas and Arkansas. Two years ago an ornithologist captured what he declared to be a true moccasin in a swamp in southern New Jersey. He sold the specimen to a dealer in objects of natural history. When I called to examine it, I found it had been bought by some unknown person, and all trace of it was lost. Mr. G. was a member of the Philadelphia Academy of Natural Sciences, and had ample opportunity to identify his specimen. I can find no records of it occurring north of the State of North Carolina. The mountain moccasin, variety *atrofuscus*, is found in the mountains of North Carolina and Tennessee. The Texan moccasin, variety *pugnax*, occurs in Texas only.

In the harlequin snakes, *Elaps*, the neck is not contracted as in the foregoing genera, but in most cases is continuous with the head and body. (See Fig. 4.) The upper jaw on each side is furnished with a small erect grooved fang. They are small snakes, not generally much over two feet in length, and are beautifully annulated with carmine red, black, and yellow rings. Although belonging to the same family as the dreaded cobra of India, they are generally considered harmless, and it is said they never attempt to bite, even though handled. Audubon says that formerly it was the fashion for Indian girls of Florida to decorate their hair with these brilliant little serpents; and in many places they are known as "bead snakes."

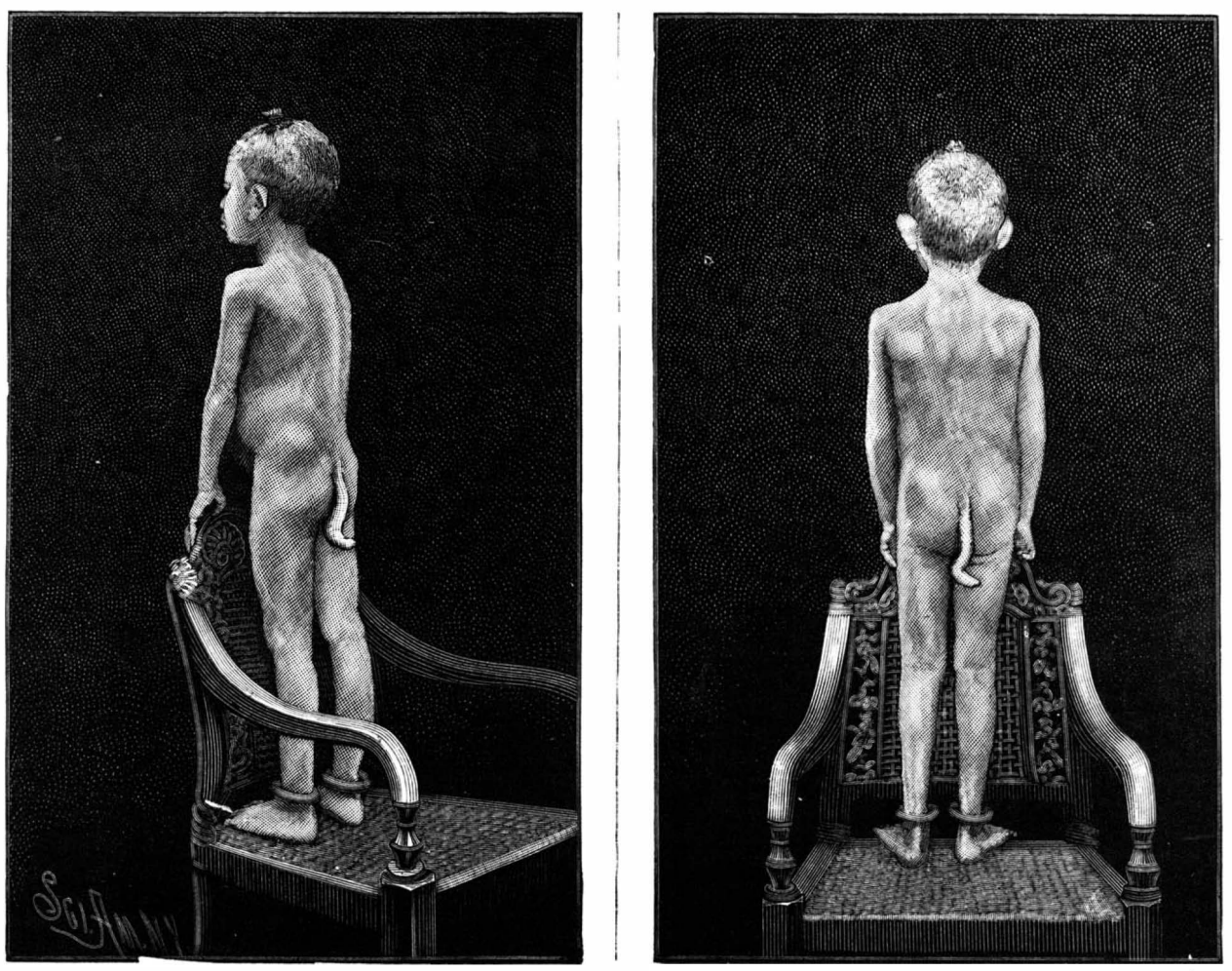
13. The common harlequin snake, *Elaps fulvius*, is found from South Carolina to Florida and Texas. Variety *tener*, of Baird and Girard, occurs in Texas, Mexico, and Florida. 14. Kennicott's harlequin snake, *Elaps euryxanthus*, inhabits Arizona and Mexico. *E. distans* has been found in Mexico and Florida; it appears to be merely a variety of *fulvius*, and not a distinct species.

The above list includes all the well-founded species of venomous serpents found in the United States; and it is not probable that many more names will be added in the future, as all the States and Territories have been well ransacked with the hope of finding "new species."

In nearly every section of country the natives will point out snakes which they "know for certain are awful poisonous," but which are, in reality, as harmless as a duckling. Take the hog-nosed snake or "blowing viper," *Heterodon platyrhinus*, for example; in one part of the country the rustic will declare to you that "that wiper am fearful wenomous," while in another section you will be informed that it is "a hog snake and ain't poisonous." By the way, this snake varies greatly in color, being found uniform black to pale yellowish brown with brown blotches. It can always be distinguished by its turned-up, hog-like snout and the manner in which it can flatten or spread itself and blow when approached. By some it is called "the spreading adder."

It is often a very repulsive and formidable-looking snake, and the additional fact that the posterior teeth in the upper jaw are long and fang-like has caused even educated persons to consider it venomous. Sometimes it has a curious habit of feigning death when pushed about with a stick or your foot—a habit which I have not observed in any other snake. At such times it throws itself over, assumes a *rigor mortis*, dislocates the lower jaw, becomes motionless, and to all outward appearances seeming as though the last spark of life had vanished. The unknowing person would imagine that a very tender spot had been touched which caused instant death. But when it sees the intruder at a safe distance—a snake always sleeps and dies with its eyes open—it quickly glides away to a place of safety. I know one instance where one of them permitted itself to be completely buried in sand without showing the least sign of life, but after a few minutes, when it supposed the unwelcome visitor had left, slowly pushed its head out of the sand, and not seeing the hidden yet observing enemy, slowly crawled out and began moving off.

The common garter or ribbon snake is rightly considered harmless, and yet the following clipping from a South-



A MOÏ BOY WITH TAIL NINE INCHES LONG.—(Engraved from a photograph.)

[FOR DESCRIPTION SEE PAGE 296.]

ern paper may be perfectly true: "A negro child on the plantation of Dr. B. R. Rieves, of this county, came to its death one day recently under peculiar circumstances. It seems that a cat had caught a garter snake and carried it into the house, where the child was sitting alone on the floor. The child in admiration for the snake took it up in its hands and was bitten by the reptile on the arm, and from the effects of the bite the child died."—*Dawson Journal.* This instance, however, does not prove that the garter snake possesses poison fangs and glands. Numerous cases are on record where the scratch of a pin, the puncture of a splinter, nail, or tack have caused death to man, yet we certainly do not consider a chip of wood or a tack articles of venom and death. I have seen many bites or scratches made by the teeth of garter and water snakes, and have been bitten myself, yet the scratches were less severe than the wounds we sometimes receive from thorns in plucking June roses. C. FEW SEISS.

CAUDAL APPENDAGE IN MAN.*

Naturalists have up to the present time given little attention to the study of tailed men. Such an organ has simply aroused the curiosity of any one who has seen a specimen, quite as a bearded woman arouses interest in a dime museum. The works on this subject are very incomplete, a few lines here and there scarcely throwing any light on the subject. There is one monograph † on this subject. There are few documents on the subject, the monstrosity is seldom found, and few of the well known cases could bear a close scrutiny.

It is not our intention to translate or give an abstract of this German production, but we have the good fortune to be able to reproduce an engraving from two very good photographs taken from life, and we shall accompany them with a few descriptive words.

A number of travelers in South Africa have testified to the existence of men of the Nyams-Nyams tribe who had tails. This may or may not be true. If such is the case, Mr. Quatrefages does not consider that the evidence to that end is very trustworthy, and rather comes to the conclusion that it has not been absolutely proved, although he believes the fact not improbable. Mr. Ecker, on the contrary, after examining this subject thinks that the testimony of explorers is credible.

Although there may not be a race of human monkeys, it must be admitted that there are some cases of individuals having a caudal appendage. When I say "some" cases, it should be understood that Pliny and Ptolemy, and after them Marco Polo, Strup Maillet, and others, speak of this anomaly, and their citations would comprise in all not 15 or 20 cases, but from 150 to 200. The well authenticated cases, however, are very few in number.

Bartels enumerates and describes twenty-one cases, which he classifies as: 1. Tail connected with body. 2. Tail with free movement. 3. Cutaneous prolongation. The first includes the triangular base bone unusually developed, and which extends to the anus and partially covers it. The second includes those tails that form a sort of projection at the back, and which separate from the body at the sacrum. The third will not be reviewed, as it does not seem necessary, as it could take either of the other forms mentioned and still be simply a cutaneous prolongation.

The specimens already observed enable us to give a general description, which will be done, however, with due caution. The tail is conical or spherical in shape, rarely cylindrical. The end nearly always curls slightly and sometimes is twisted like that of a pig. It is seldom more than 3 or 4 inches in length. It is sometimes covered, and sometimes it is quite smooth. In the former case the hair grows in places and resembles somewhat the tail of a cow. Bartels cites and has shown a case of this kind, while Quatrefages, who lived before his time, had considered this condition as a mere legend.

Whether these tails are soft or rigid, they possess in general no movement of their own. This physical peculiarity is usually accompanied with some other defect, with *atresia ani* in particular, and almost always with general constitutional weakness. Such are the general characteristics of this class of monstrosities. Can the cause of this be discovered? *Adhuc sub judice lis est.* Bartels considers that it is due to imperfect development, induced perhaps by inheritance from an ancestral type, while Quatrefages had not believed in this, but considered that it was caused by some abnormal development in the embryo. It is not for us to decide which theory is to be accepted. It is a curious circumstance, however, that this peculiarity is found principally among the male species. I do not think that the females of the lower orders are less favored in this respect than the males. It is also curious that the white races appear not to be privileged in this respect. If we admit that they are a superior race to the others, then perhaps atavism would explain it. In none of the cases that have been examined, however, could vertebræ be found in the tail; while the specimen that was dissected by Virchow simply consisted of fat and muscles. Atavism would explain alone the existence of an hereditary monstrosity.

The question of heredity was, at an early day, discussed by Mr. De Quatrefages. He came to the conclusion that such an organ, whatever its origin might be, could be transmitted from father to son. Such a conclusion is affirmed in the cases of other monstrosities in which this is found to be the case. The subject of the engraving, however, which we have not as yet described, is a very remarkable case. He is a young Moi, twelve years of age, who was taken to Saigon some time ago, where he was examined and photographed. Although so young, his tail was already nearly a foot in length. With the exception of its great length, this specimen resembled in almost every other respect those that had been examined by Bartels. From the information we have been able to procure, it appears that the organ is soft and smooth and has no bony frame. Bartels cites only four cases of this kind, while its cylindrical shape appears to be very rare. We stated above that, as a rule, this peculiarity was accompanied with other malformations, and such is found to be the case in the present instance. By examining the photograph it will be observed that a small mound or bunch is found upon each buttock. The shoulder blades seem to project abnormally, but it should be borne in mind that the subject is very thin.

The tail seems ordinary and possesses none of the peculiarities described by Mr. De Quatrefages. He describes tails two or three inches in length, while Bartels describes them as long as five inches, but this young Moi's tail is about ten inches in length. Therefore, up to the present time this is the best specimen on record. This matter ought not to be passed over carelessly, but it merits a thorough and complete investigation and study which should be no longer neglected.

* Etienne Rabaud in *La Naturaliste.*

† Max Bartels, Ueber Menschenschwanze, Archiv fur Anthropologie, 1880, p. 1 a 41, 1 pl.

Laws of Heat.

Heat is transmitted in three ways—by *conduction*, as when the end of a short rod of iron is placed in a fire and the opposite end becomes warmed—this is conducted heat; by *convection* (means of currents), such as the warming of a mass of water in a boiler, furnace, or saucepan; and by *radiation*, as that diffused from a piece of hot metal or an open fire. Radiant heat is transmitted like sound or light, in straight lines in every direction, and its intensity diminishes inversely as the square of the distance from its center or point of radiation. Suppose the distance from the center of radiation to be 1, 2, 3, and 4 yards, the surface covered by heat rays will increase 1, 4, 9, and 16 square feet; the intensity of heat will diminish 1, $\frac{1}{4}$, $\frac{1}{9}$, and $\frac{1}{16}$, and so on in like proportions until the heat becomes absorbed, or its source of supply stopped.

Whenever a difference in temperature exists either in solids or liquids that come in contact with or in close proximity to each other, there is a tendency for the temperature to become equalized; if water at 100° be poured into a vessel containing an equal quantity of water at 50°, the tendency will be for the whole to assume a temperature of 75°; and suppose the temperature of the surrounding air be 30°, the cooling process will continue until the water and the surrounding air become nearly equal, the temperature of the air being increased in proportion as that of the water is decreased.

The heat generated by the fire under a boiler is transmitted to the water inside the boiler, when the difference in the specific gravities, or, in other words, the cold water in the pipes, being heavier than that in the boiler, sinks and forces the lighter hot water upward. This heat is radiated from the pipes, which are good conductors of heat, to the air in the room, and raises it to the required temperature. That which absorbs heat rapidly parts with it rapidly, and is called a good conductor, and that which is slow to receive heat parts with it slowly, and is termed a bad conductor.

The following tables of conductivity, and of the radiating properties of various materials, may be of service:

CONDUCTING POWER OF VARIOUS SUBSTANCES.—DESPRITZ.

Material.	Conductivity.
Gold	100
Silver	97
Copper	89
Brass	75
Cast iron	56
Wrought iron	37
Zinc	36
Tin	30
Lead	18
Marble	2·4
Fire clay	1·1
Water	0·9

RADIATING POWER OF VARIOUS SUBSTANCES.—LESLIE.

Material.	Radiating Power.
Lampblack	100
Water	100
Writing paper	98
Glass	90
Tissue paper	88
Ice	85
Rough lead	45
Mercury	20
Polished lead	19
Polished iron	15
Gold, silver	12
Copper, tin	12

From the above tables it will be seen that water, being an excellent radiator and of great specific heat, and cast iron a good conductor, these qualities, together with the small cost of the materials, combine to render them efficient, economic, and convenient for the transmission and distribution of artificial heat.

Heat is a word freely used, yet difficult to define. With a temperature of 65° to 70° we frequently hear it remarked, "How hot this room is! It is insufferable." Water at the same temperature would be described as cold; a temperature of 90° in the shade we call "intensely hot." We should speak of water at this temperature as scarcely warm; a smith would rarely consider his iron hot if less than 800° (red heat), and would call it a good heat at 2,700° (welding). It would appear paradoxical to speak of heat and cold as synonymous terms, yet what we frequently call cold is only another term for a low degree of heat. The word "heat" is commonly used in two senses: (1) to express the sensation of warmth; (2) the state of things in bodies which causes that sensation. The expression herein must be taken in the latter sense. By adopting certain standards we are enabled to define, compare, and calculate so as to arrive at definite results, hence the adoption of a standard unit of heat, unit of power, unit of work, etc.

The standard unit of heat is the amount necessary to raise the temperature of 1 lb. of water at 32° Fahr. 1°, *i. e.*, from 32° to 33°.

Specific heat is the amount of heat necessary to raise the temperature of a solid or liquid body a certain number of degrees; water is adopted as the unit or standard of comparison. The heat necessary to raise 1 lb. of water 1° will raise 1 lb. of mercury about 30° and 1 lb. of lead about 32°.

Table of the Specific Heat of Equal Weights of Various Substances.

	Specific Heat.		Specific Heat.
SOLID BODIES.		LIQUIDS.	
Wood (fir and pine)	0·650	Water	1·000
" (oak)	0·570	Alcohol	0·598
Ice	0·504	Acid (pyroligneous)	0·590
Coal	0·280	Ether	0·520
Charcoal (animal)	0·260	Acid (acetic)	0·509
" (vegetable)	0·241	Oil (olive)	0·309
Iron (cast)	0·241	Mercury	0·033
Coke	0·201		
Limestone	0·200		
Glass	0·195		
Steel (hard)	0·117	GASES.	
" (soft)	0·116	Hydrogen	3·409
Iron (wrought)	0·111	Vapor of alcohol	0·547
Zinc	0·095	Steam	0·480
Copper (annealed)	0·094	Carbonic oxide	0·245
" (cold hammered)	0·093	Nitrogen	0·243
Tin	0·056	Oxygen	0·217
Lead	0·031	Atmospheric air	0·237
		Carbonic acid	0·202

—*Ironmonger.*

Acrophobia.

BY WINSLOW ANDERSON, M.D.

Among the many curious psychical experiments that are now attracting the attention of scientific minds, the one to which the term "acrophobia" has been applied has several points of interest. In referring to the term and phenomena, *Science* for January, 1889, defines it as an exaggerated condition of fear.

Dr. Verga has recently described the phenomena in his own case:

Though by nature not at all timid, all his courage leaves him when above ground. He complains of palpitations in mounting a step-ladder, for instance; finds it extremely unpleasant to ride on the top of a coach or even to look out of a first story window. This idiosyncrasy forbids him the use of an elevator, and the mere thought of those who have cast themselves down from high places causes tingling all over his person. His acrophobia even goes so far that the thought of the earth spinning through space is enough to cause discomfort.

Persons on a bridge high above the water, or on a cliff, or high up in a tower, are frequently overtaken by not only exaggerated fear, but by *abnormal* fear, producing at times dizziness and even faintness. Another class of individuals are seized with an intense and, at times, an uncontrollable desire to jump down from any height which they may have reached.

A greater or less degree of this fear seems quite common and perfectly compatible with normal mentality. —*Pacific Med. Jour.*

A Scientific Hotel Keeper.

Mr. E. S. Chapin, who died in Springfield, Mass., a few days ago, in his seventy-fourth year, not only made for his hotel, the Massasoit House, an almost national reputation, but was much interested in scientific subjects, and for forty years a reader of the SCIENTIFIC AMERICAN. In 1864 he published a pamphlet entitled "Gravity and Heat," and three years later, with the assistance of his daughter, Mrs. Haile, expanded his theory into a book of 120 pages, called "The Correlation and Conservation of Gravitation and Heat, and some of the Effects of these Forces on the Solar System." In 1887 he published "Gravitation the Determining Force." Williams College gave him an honorary degree of A.M. for his investigations.

CRUDE PETROLEUM FOR MANUFACTURING PURPOSES.

We illustrate herewith some of the many uses made of crude petroleum as fuel by the processes of the Aerated Fuel Company, of Springfield, Mass.

Fig. 1 shows the application of this system under a boiler, return flue pattern. Among the many advantages claimed by this system over coal are: Uniform heat, constant pressure of steam, no ashes, clinkers, soot or smoke, and consequently clean flues, one man attending from ten to fifteen 100 H. P. boilers burning this fuel easier and with less trouble than with one boiler burning coal.

Fig. 2 shows this system as applied to a forge suitable to a large variety of general work. One cylinder containing six burners is placed on one side, leaving one end open to receive the work. If desirable, both ends may be left open, especially when it is desired to heat long pieces of iron or steel in the center. By putting an adjustable or movable brick partition in the center, as many burners as are not wanted can be shut out, thus reducing the area of the fire box and using one or two burners, as required. At the repair shops of the Boston & Albany Railroad Company, at Springfield, Mass., where this system is generally employed, the superintendent states he regards the system as far superior to coal in every respect, particularly for work requiring a high degree of heat at short notice.

Fig. 3 illustrates the interior and end view of the burner cylinder and shows the proper position of float valve when cap is on end of cylinder.

The object of the float is to prevent the flowing of oil into the cylinder and rising above the mean level as established by the governing device in each cylinder. The float falls of its own weight, so as to open the valve and allow the oil to rise again to the mean level. The sectional cuts show that if, from any cause, the float should sink, it will also close the valve, thus preventing any possibility of flooding the furnace or overflow in tanks.

Referring to Fig. 3, it will be seen there is an air space maintained on an air pressure of from 10 to 25 lb. per square inch, according to the class of work being done. Although the nozzle of the burner is small, from 1-20 to 1-8 inch, and only a small quantity of air used, yet it must be under an equal pressure, that the oil may be finely atomized before igniting.

The Aerated Fuel Company have many forges, muffles, ovens, and similar fires, using over 1,500 burners, in successful operation, in which the fuel is crude Lima oil, burned by being atomized with a governed air pressure, very similar in quality to natural gas and free from danger. Its advantages are, no increased rates of insurance, for the best insurance companies approve of the system as shown in Fig. 2; no odor; no chimney connection needed; no sulphur or other impurities, as is the case with coal; perfect combustion and regulation; and cheaper than any fuel, not excepting natural gas, unless the consumer owns his own wells.

One pound of oil will do the work of from 3 to 6 lb. of the best hard coal in forges, and do it better, and there is less liability of overheating or burning stock.

The system can be adapted to nearly any forge now in use, but as it is necessary to use from 10 to 25 lb. air pressure per square inch, a compressor of some kind is necessary, as no fan blower will maintain this pressure. The oil ceases to flow through the burner when the air pressure is removed, consequently fire is impossible, and only one valve is necessary to control both oil and air. This process is already used for japanning, annealing, hardening, drop forging, shovel welding, heating blanks for bolts, riveting furnaces for boiler and bridge work, hoe, fork, and rake work, cutlery works, mowing, reaping, harvesting, binding, and hay pressing machinery, scale work, railroad repair and locomotive works, glass and copper works, etc.

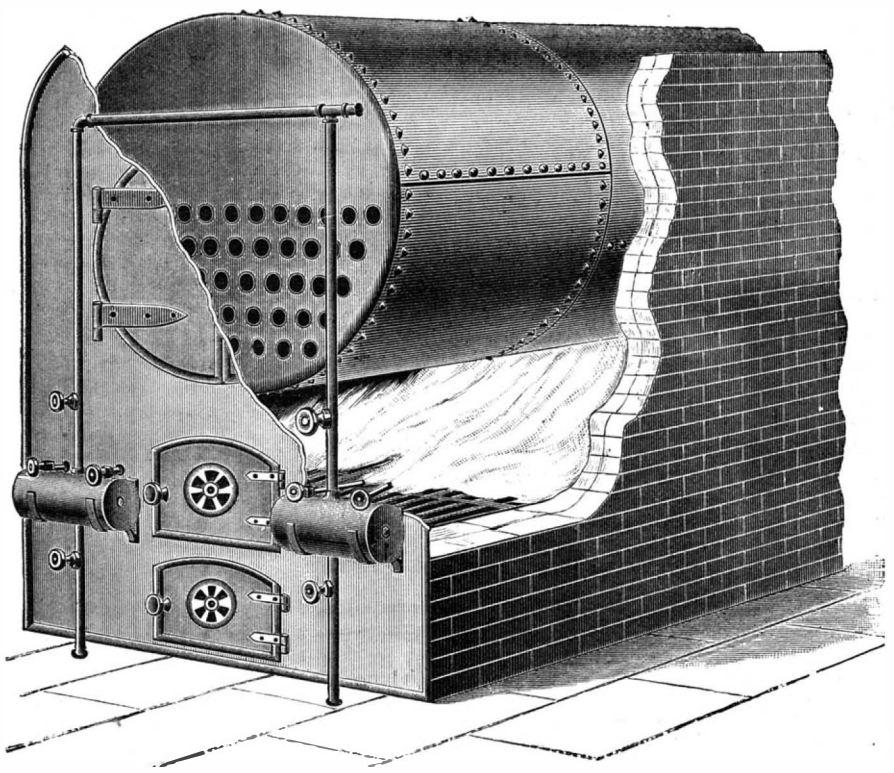


Fig. 1.—BURNING CRUDE OIL UNDER A BOILER RETURN FLUE PATTERN.

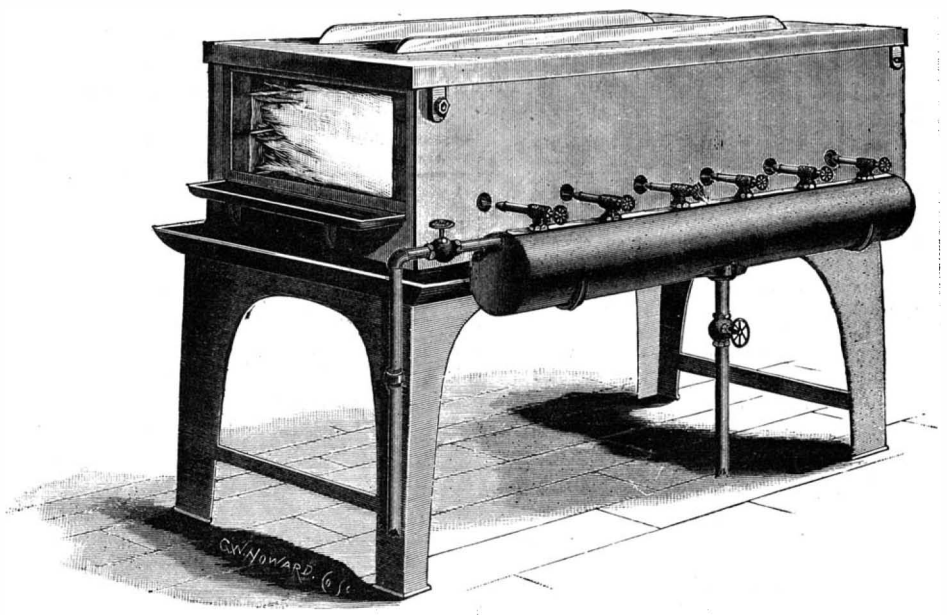


Fig. 2.—BURNING CRUDE OIL UNDER A FORGE FOR GENERAL WORK.

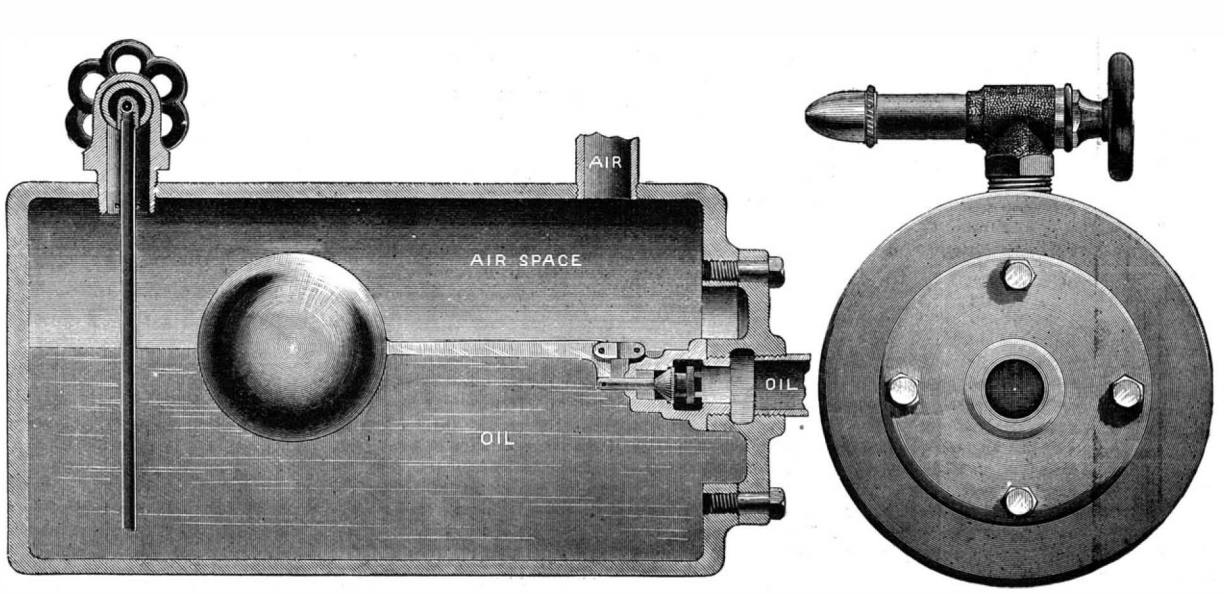


Fig. 3.—INTERIOR AND END VIEW OF BURNER CYLINDER.

On Artificial Organic Dyestuffs and Their Use.

In *calico printing* the dyestuff solutions are mixed with a thickening (starch paste, gum tragacanth) and if necessary a mordant, and applied to the fiber by means of printing blocks or rollers. Then usually follows steaming, whereby the dyestuff and mordant are caused to penetrate the fiber and combine with it. When albumen colors are employed, the albumen, which at the beginning is soluble, coagulates by the steaming process and in this state holds the dyestuff fixed upon the fiber.

Leather dyeing is on the whole based upon the employment of the same dyestuffs which are used for dyeing animal fibers, such as the eosines, fuchsines, methyl violet, malachite green, acid green, quinoline yellow, ponceaux, nigrosine; but also dyestuffs which are specially used in cotton dyeing, such as phosphine and methylene blue. It must be observed, however, that the colors obtained upon leather do not always match those which are produced with the same dyestuffs upon fibrous material. Prior to dyeing the leather must be very carefully cleaned. The dyeing operation consists either in immersion in a dyestuff solution or in the application of the baths by means of brushes. In the latter case aqueous as well as alcoholic or lake solutions are used.

The dyeing of feathers and hair is effected by first cleaning the feathers or hair, before dyeing, or bleaching if necessary, by lukewarm soda water (1:120). For dyeing, all neutral dyestuffs suitable for wool dyeing are employed in the same manner as for this fiber.

The dyeing of horn, bone, ivory, and ivory nuts is ordinarily effected, after cleaning, by laying them down in the suitable dyestuff solutions, or painting with them.

Straw is dyed in the same manner; before dyeing, however, it must be cleaned by laying it down in ammonia or soda solution. Usually it is previously bleached by sulphurous acid.

Wood, grasses, flowers, moss, etc., are stained by laying the objects to be colored down in the solutions, or painting them over, or pressing the coloring liquid into them. The most used colors are fuchsine, methyl violet, malachite green, and aniline blue.

The staining of paper with the artificial organic dyestuffs constitutes an extensive industry on account of the handsome and bright colors obtained and of the simplicity of the dyeing methods, of which two are distinguished, viz., staining in the sheet, when the paper is either immersed in the dyestuff solution or painted over with the same (or with colored lakes), and coloring in the pulp, when the dyestuff is already added to the paper stuff while in the rag engine. Paper can, besides, be printed with colors like tissues, as in the manufacture of wall paper.

For coloring soaps only dyestuffs are used which are soluble in alkaline liquids and are not altered thereby.

Colored varnishes or so-called brilliant lacquers are produced with aniline dyestuffs soluble in alcohol, such as fuchsine, methyl violet, azo and nitro dyestuffs soluble in alcohol, etc.

For colored inks many artificial organic dyestuffs are excellent to use on account of their great tinctorial value, and because the aqueous solutions do not become mouldy. For 3 pts. dyestuff generally 5 pts. gum arabic and 150 pts. water are used, and for copying inks some glycerine is added. Methyl violet is preferably used for violet (mauve) ink, eosine for red, and malachite green for green ink. For making marking ink (stamping) 3 pts. dyestuff are mixed with 144 pts. alcohol 50 per cent and 33 pts. glycerine.

Ink sticks were first, in 1878, produced by E. Jacobson, from aniline dyestuffs, graphite, and kaolin. These materials are mixed in four different proportions, according to the degree of hardness desired; the more kaolin and the less dyestuff and graphite, the harder the stick. The finely ground materials are carefully mixed, made into a paste with water, pressed through a perforated plate so as to form sticks, and dried.—*Textile Colorist.*

Turpentine Baths for Rheumatic Pains.

Make a concentrated emulsion of black soap, 200 grammes, add thereto 100 or 120 grammes of turpentine, and shake the whole vigorously until a beautiful creamy emulsion is obtained. For a bath take half of this mixture, which possesses an agreeable pine odor. At the end of five minutes there is a diminution of the pains, and a favorable warmth throughout the whole body. After remaining in the bath a quarter of an hour, the patient should get into bed, when a prickling sensation, not disagreeable, however, is felt over the entire body, then, after a nap, he awakens, with a marked diminution in the rheumatic pains.—*Prat. Med.*

RECENTLY PATENTED INVENTIONS.

Engineering.

ROTARY ENGINE. — Marcellus A. Buford, Thompson's Station, Tenn. The casing has steam inlet and exhaust chambers, a main driving shaft being mounted to rotate in the casing, while a wheel with central disks having inlet openings in their peripheries is secured on the shaft, exhaust disks being secured to the central disks, and the construction is adapted for the use of steam, air, water, or other suitable fluid.

Railway Appliances.

CAR COUPLING.—Josiah Poffenbarger, York, Neb. This device is designed to act automatically, the bumpers having transverse stationary rods combined with a locking hook with pivoted head and curved lower end, the locking lever having a spring bolt at its forward end, with other novel features, the construction being simple, strong, and cheap.

CAR COUPLING.—John J. Jeter, Campbellsville, Ky. This coupling acts automatically, and the improvement is applicable to the ordinary drawheads, the link being adjustable up or down as desired, while the drawhead is preferably secured to the car so that it may move longitudinally back against a spring when it strikes another drawhead.

Mechanical.

WRENCH.—Sidney Cook, Orlando, Fla. This improved wrench is of simple construction, and so made that one jaw will be removable and adjustable, while the movable jaw may be placed at various angles with respect to the fixed jaw and adjusted laterally while in any position.

COMBINATION TOOL. — Samuel L. Heinold, Anderson, Ind. This invention covers a tool comprising a hammer, crosscut-saw set, and gauge and is made also to hold a file for dressing and pointing saw teeth all to a uniform length.

NUT LOCK. — Isaac F. Leiby, Baird, Texas. Combined with a loop-formed nut-locking device, and the plate to which it is hinged, is a supplementary locking device, consisting of a wire or rod having one end bent at right angles and embracing the hinge of the main device, while its other end is provided with a hook to receive the side bar of the main device.

DOFFER CLEANER. — George Bebb, Indianapolis, Ind. This is a cleaner for carding machines working on woolen and cotton fibers, and the invention relates to that class of cleaners in which a cleaner bar having card clothing is supported so that it may be swung alternately in contact with the doffer and with the stripping bar, the mechanism being such that the cleaner need not be continuously operated, but only at such intervals as may be found desirable.

BARKING AND SPLITTING MACHINE.—Otis W. Stearns, Johnson, Vt. This machine has a vertically reciprocating barking knife and a vertically reciprocating splitter, both operated from one drive shaft at different speeds and arranged in proximity to each other, whereby as the log is barked it may be convenient to the splitter knife.

Miscellaneous.

SEWAGE PURIFIER.—James J. Powers, New York City. By this invention the sewage is supplied with lime at intervals and precipitated, the effluent flowing off at the end of the apparatus, while the sludge and solid matter remains to be removed at intervals, the sewage being held in a quiescent state while settling, the flow being intermittent to and from the settling tanks and automatically regulated at given quantities.

SHAFT SUPPORT.—Edward Clark, New York City. This is a device for taking off the weight and strain from the back of a horse hitched to a vehicle, a plate being hinged on the vehicle to engage the transverse beam of the shafts, the free end of such pivoted plate resting on a screw, which is adjustable to suit the height of the horse.

HYDROCARBON BURNER. — Graves Griffith and Theodore L. Miller, Blanchard, Iowa. This burner is especially adapted for furnaces, stoves, etc., although its principle may likewise be applied to a safety lamp, it being designed to secure safety against explosion of accumulated gas and complete control of the oil supply, while the amount of burning surface is regulated, and the requisite amount of air is fed to the burning oil or fuel.

CURRENT PROPELLER. — Ernst Lotze, Spokane Falls, Washington Ter. A chain anchored at one end up stream, where there is a current, is passed through the boat from stem to stern, in close engagement with a shaft on which are side wheels dipping into the water, the design being that the revolving of the paddle wheels by the current will operate to pull the boat, by means of the chain, up stream.

ELECTRIC LANTERN. — Charles W. Cox and Thomas E. Van Dyke, Philadelphia, Pa. Combined with a suitable casing containing a battery is an automatic switch arranged to close the circuit as the top of the casing is opened and open the circuit when the casing is closed, a lamp being placed in the circuit in convenient position for use, making a lamp adapted for use where a flame would be unsafe.

"PICKING" THIMBLE FOR STRINGED INSTRUMENTS.—Norman E. Barnes, Bay Shore, N. Y. This thimble is preferably made of metal, with a tubular split portion, whereby it may be readily slipped over a finger or thumb, and a rounded point which engages the strings of a stringed musical instrument in performing thereon.

DREDGING BUCKET. — Rezin Hosford, Lebanon, Ind. The frame of the implement consists of a head, upon each extremity of which two arms are pivoted, extending downward and outward in opposite directions, and carrying shovel blades, with other novel features, the object being to provide an implement of simple construction to dredge oysters, gravel, sand, etc., in which the jaws of the bucket may be closed prior to being lifted.

SCRAPER.—Etienne L. Lefebure, New York City. This is a tool for scraping wood and other surfaces, being specially designed for plasterers' use in cleaning mouldings, its blade having a central horizontal portion and edge portions inclined thereto, one of which edge portions has a beveled scraping edge and the other a scraping edge formed with short teeth, the blade being detachable for sharpening or repairing.

PRINTERS' KNIFE. — Louis J. Dus, Milwaukee, Wis. This is a knife with extensible blades arranged at opposite ends of its handle, presenting a series of sharp cutting edges, for the convenience of a pressman in cutting out "overlays" or "underlays" in making a form ready to work, and making a tool better suited to such work than the ordinary pocket knife.

TOBACCO PRESS.—Irving A. McKinley, Cicero, N. Y. This is a portable press especially adapted for packing leaf tobacco in boxes for shipment, the press being quickly applied to and detached from the box or case, the invention obviating the necessity of the lifting and handling of the boxes necessary under former methods of doing the work.

LOAD BINDER. — Thomas A. Rogers, Bloomdale, Ohio. This device is designed especially for tying or binding a load of logs, a curved arm being pivoted to a head having a handle, and a grab hook linked in the outer extremity of the arm, whereby each end of a chain will be carried in opposite directions and the body of the chain made to firmly bind upon the load.

VEHICLE BODY.—Lafayette A. Melburn, Denver, Col. The panels of this body have their meeting ends formed with dovetail grooves and ribs, pins being driven partially in each of the panels at their joints, while dovetail grooves are fitted to receive the seat posts, which are fitted in the grooves, and the sills secured to the inner sides of the panels.

TYPE WRITING MACHINE. — Lebbens G. Garrett, Bissell, Pa. This is a machine by which whole words or phrases may be printed at once on the same line across a page and at a reporting speed by depressing keys of a key board conveniently arranged at the front of the instrument, the machine having oscillating type carriers and connected keys operating upon them to bring the type into line.

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.

Needle slot screens and all kinds of mining screens. Robert Aitchison Perforated Metal Co., Chicago, Ill.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

Mech'l draughtsman wants situation. "E. C.," box 773, New York.

Engineers wanted to send their addresses and receive free a 25 cent book, "Hints and Suggestions for Steam Users." Lord & Co., 11 S. 9th St., Philadelphia, Pa.

Wanted—The latest novelty for a corner store awning. L. H. Daloz, 510 Tremont St., Boston, Mass.

For Sale—Patent No. 400,571, "mirror attachment to opera glasses." See illustration, page 291.

For Sale—To Wire Fence or Lightning Rod Manufacturers—License to manufacture "Lightning Conductors for Wire Fences." Patented. See Sci. Am., April 27. Address F. E. Wood, Kingman, Arizona.

Steel name stamps (1-16, 3-32, or ⅛ in. letters), 15c. per letter. F. A. Sackmann, 16 Huron St., Cleveland, O.

For the latest improved diamond prospecting drills, address the M. C. Bullock Mfg. Co., Chicago, Ill.

For best casehardening material, address The Rogers & Hubbard Co., Middletown, Conn. Send for circular.

Water purification for cities, manufacturers, and private users. The only successful legitimate system. Hyatt Pure Water Co., 16, 18 & 20 Cortlandt St., New York.

——Ball Engine.——

Automatic cut-off. Ball Engine Co., Erie, Pa.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J

The Holly Manufacturing Co., of Lockport, N. Y., will send their pamphlet, describing water works machinery, and containing reports of tests, on application.

Screw machines, milling machines, and drill presses. E. E. Garvin & Co., Laight and Canal Streets, New York.

Billings' Double-acting Ratchet Drills. Drop Forgings. Bronze Forgings. Billings & Spencer Co., Hartford, Conn.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Safety Elevators, steam and belt power; quick and smooth. The D. Frisbie Co., 112 Liberty St., New York.

"How to Keep Boilers Clean." Send your address for free 96 p. book. Jas. C. Hotchkiss, 120 Liberty St., N. Y.

The best *Coffee* roasters, coolers, stoners, separators, polishers, scourers, glossing apparatus, milling and peaberry machines: also rice and macaroni machinery, are built by The Hungerford Co., 69 Cortlandt St., N. Y.

Lathes for cutting irregular forms. Handle and spoke lathes. I. E. Merritt Co., Lockport, N. Y.

For steel castings of best quality, write the Buffalo Steel Foundry, Buffalo, N. Y.

Planing and Matching Machines. All kinds Wood Working Machinery. C. B. Rogers & Co., Norwich, Conn.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

NEW BOOKS AND PUBLICATIONS.

THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC AND PHOTOGRAPHER'S DAILY COMPANION. 1889. $1.00. Published by Henry Greenwood & Co., London, England.

This widely known annual, now in its twenty-ninth year, comes to us filled with a great variety and larger quantity of information more valuable to photographers than ever before. It has nearly four hundred pages of reading matter and one photographic illustration, and contains a very full explanation of the various formulas for printing with iron salts, such as making blue prints, printing blue or black lines direct on a white background, and directions for toning such prints. There are also a number of short illustrated articles, covering many subjects, together with reliable formulas and tables of great use to the photographer.

THE YEAR BOOK OF PHOTOGRAPHY. 1889. By Thomas Bolas. Piper & Carter, London. Pp. 216. Price $1.

This excellent annual, now in its thirtieth year, contains much practical information for the photographer. It has as a frontispiece a very fine specimen of a Woodbury type entitled "Group of Champion Great Danes," which are three handsome-looking dogs very artistically posed. The picture is reproduced from a negative by Thomas Fall. Among the useful articles is one "On the Preparation and Use of Gelatine Plates, for Transparencies," by W. K. Burton, which alone is worth the price of the book. There are illustrations of improved lamps for burning magnesium powder, descriptions of the carbon and photo-engraving processes, and under "Every-day Experiences and Processes" are several pages of formulas, illustrations of new devices, and other information of a very practical nature.

NATURALISTIC PHOTOGRAPHY FOR STUDENTS OF THE ART. By P. H. Emerson, B.A., M.A. E. & F. Spon, New York. Pp. 307, xii. Price $2.

This book contains a greater amount of information on the artistic elements to be considered in photography than any that we know of. The author, himself an artist, has elucidated very concisely, yet also very fully, the principles which should be kept in view in making artistic and attractive photographs. Accompanying the text are marginal notes of much convenience in attracting the eye to the special subjects considered on any one page. The work is divided into three books. The first treats of "Terminology and Argument," in three chapters. The second chapter relates to "Naturalism in Pictorial and Glyptic Art," explaining the various styles and schools of art. The third chapter is devoted to a full explanation of "Phenomena of Light, and Art Principles Deduced Therefrom." Book II. includes "Technique and Practice," covering a description of cameras and tripods, lenses, dark room and apparatus, studio and furniture, exposure, development, retouching, printing, enlarging, transparencies, mounting, preparing exhibits for exhibitions, and a very good explanation of the latest photogravure processes. Book III. is on Pictorial Art, and embraces such subjects as "Educated Sight," "Composition," "Out and Indoor Work," "Hints on Art," and "Decorative Art." Following this are some very good suggestions as to what photographic libraries should contain. In his introduction Mr. Emerson states that "to give the student a clear insight into the first principles of art is the chief aim of the book." In these days of amateur photography, when the mechanical and chemical manipulations necessary to obtain a good photograph are so easily acquired, a book like this, calling attention in simple language to the elementary conditions that should be observed in making artistic photographs, will be greatly appreciated. So far as the science of photography is described, enough is said to give the reader considerable general information, but we must take exception to the statement that lantern slides have no place in art. They are as truly useful in illustrating the composition of a picture as a sketch or painting; therefore we think they should be commended. The book as a whole is very well written, and will be an excellent guide to those desiring to learn the art principles of photography and its practice.

THE AMERICAN ANNUAL OF PHOTOGRAPHY AND PHOTOGRAPHIC TIMES ALMANAC. 1889. By C. W. Canfield. Scovill Manufacturing Co., New York. Pp. 328. Price $1.

A book full of the latest ideas, formulas, and descriptions of new apparatus, by American photographers. It contains thirteen full page illustrations by twelve different processes, also a complete record of American photographic societies, a list of books on photographic subjects published during the year, diagrams of shutters, dark rooms, and stereoscopic printing frames, articles on the "Making of Lantern Slides," by W. H. Raw, "Silver Printing on Plain Paper," by Charles L. Mitchell, M.D., the "Preparation of Specimens for Photo-micrography," by C. B. Longenecker, "Formulas for Various Kinds of Blacks," by C. C. Vevers, and a full description of "A Photo-Mechanical Printing Process for Amateurs," by Rev. W. H. Burbank. At the end of the book are very full tables, and formula of special value to either the professional or amateur photographer. A list of American patents on photographic subjects during the year 1888 is also given. The typography is of a superior character. There has seldom been issued a book so excellently printed and conveniently arranged as this appears to be.

☞ Any of the above books may be purchased through this office. Send for new book catalogue just published.

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Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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.

(776) F. M. D. writes: 1. Is there any way of preventing white holly in fretwork from turning yellow after it has been in use a short time? A. We cannot recommend any cure. Possibly sponging with javelle water might help it, but this would tend to destroy the glue. 2. Also do you publish or sell a small book called the French Polisher's Manual? I think I saw a reference to it in the Notes and Queries some time ago, but failed to find it again. A. We can supply the French Polisher's Manual. Price 25 cents. 3. Is there any preparation that can be applied to cotton covered wire, so that the insulation will remain good if placed in the ground? If not, what is the best kind of insulation for the purpose? A. We advise you to use gutta percha covered wire, or special underground cable. You will not be able to get any satisfaction out of cotton covered wire. 4. I have a number of jars of Grenet battery, zincs 1½ by 4 and carbons about the same size, made of light carbons. The jars hold about a quart. How many of these cells would be required and how should they be connected to run a three c. p. or five c. p. lamp? A. Use six couples for small lamp and ten couples for larger lamp, arranged in series.

(777) J. R. R. asks (1) why a telephone ear cup, made with same size and power magnet, wound with same size and amount of wire as the Bell, but in a wood case, does not work as well, or should it if properly made. A. It should make no difference. A wooden case works perfectly well. 2. Also give description of induction coil used with Blake transmitter. A. The primary is wound with No. 18 to 24 wire to ½ ohm resistance, the secondary with No. 36 wire to 80 ohms resistance. A core of fine iron wire in a cylindrical bundle is best.

(778) J. M. W. asks (1) for the cheapest artificial manner in which to freeze small quantities of water. A. Freezing apparatus are sold for this purpose. A simple method is to cool water by placing it in a tin vessel, surrounding the latter with cold water in which one-half its weight of nitrate of soda is dissolved. Then on repeating the operation with the cooled water as the solvent of more nitrate of ammonia, a second portion can be frozen. We fear that you will find little satisfaction in artificial ice making except with a regular machine. 2. Also if the water on melting will be as pure and wholesome as it was before freezing? A. Yes.

(779) W. R. asks how to make a spark coil. A. Make a ¾ inch bundle of iron wire 8 inches long, wrap it with five pounds No. 20 magnet wire. It will with battery and proper appliances light gas, but not an oil lamp.

(780) J. S. writes: Is beef a more digestible meat than veal? A. Beef is far more digestible. 2. In which time about is the former, and in which time the latter digested? A. Beef—boiled 2 hours 45 minutes, roasted 3 hours. Veal—roasted 4 hours, fried 4 hours 50 minutes.

(781) O. H. P. writes: 1. What is the meaning of the words ampere and ohm? A. See answer to queries 236 (Jan. 26) and 427 (March 9). 2. Give a good receipt for making a copying pad which will not spoil in warm weather. I desire to make from 20 to 50 copies from one copy. A. See SUPPLEMENT, No. 438, which we can send you for 10 cents. Mix a very little oil of cloves with it for hot weather.

(782) S. H. G. writes: Referring to the SCIENTIFIC AMERICAN of January 21, 1888, page 42, Prof. Mendelejef's "theory of the formation or origin of petroleum," where does he place the laboratory—as low down as "Cambrian," or not? A. Far below any geological horizon, in the incandescent regions of the earth's interior.

(783) M. S. asks: What is the usual treatment of apatite to extract the phosphoric acid, and also about what per cent it usually carries? A. It is treated with sulphuric acid to convert it into a superphosphate.

(784) J. W. D. writes: 1. Will vapor gas such as used by gasoline stoves answer for heating purposes, either by hot water or steam? A. Yes; but it is dangerous, as involving the storing and handling of large amounts of naphtha. 2. Would it be as cheap as bituminous coal at $3 per ton or anthracite at $6 per 2,000 lb.? A. Probably it would prove cheaper, because so easily extinguished and started, and because of there being no ashes to dispose of, etc. 3. From what is the gas made that H. Disston is using for fuel in his saw works, and is it the same with which Westchester, Pa., is to be supplied for fuel? A. We cannot answer this. Address the party named. 4. What is the probable comparative cost of kerosene, or crude oil, or fuel gas, or coal for generating steam? A. Allow 3½ barrels of oil to the ton of coal, and 55 to 65 lb. of coal to 1,000 cubic feet of gas for equal calorific powers. From these figures make your estimates according to relative prices in your vicinity.

(785) R. T. F. writes: 1. Can you give me a good simple recipe for making a nice liquid or solid shoe blacking, that will produce a quick shine? A. Various receipts have been published in our Notes and Queries. We also refer you to "Trade Secrets," which we can supply for 60 cents by mail. 2. Can you tell me what makes my hands perspire while playing the violin, and can you tell me of a harmless remedy to prevent it? A. It is constitutional. Try bathing the hands in alcohol and use powdered corn starch or soapstone on them before playing.

(786) T. L. R. asks: Will the receipt No. 653 in April 20, 1889, issue, for gumming labels, do to use in fastening papers, such as a bunch of note or letter heads? If not, will you please give a good receipt? Something that does not require heating when to be used, cheap and gummy. A. No. The regular composition used is made from best glue and glycerine and water colored with aniline. This needs heating. A solution of gum tragacanth with a little glycerine might answer your requirements, but we advise the first. For 5 lb. of dry glue allow 1 lb. of glycerine.

(787) H. C. asks: 1. Is there a paper published, anywhere in the world, which is devoted entirely to the subject of "Aerial Navigation"? A. Yes; in France. 2. What is the lifting power of 1,000 cubic feet of what is called "water gas," being made from steam, coal, and naphtha? A. About twenty pounds.

(788) W. H. M. asks: Can you give me the formula of a liniment of which sulphuric acid is a component part? A. No officinal liniment of this character is given. A mixture of the strong acid with saffron, forming a paste, is a strong caustic which has been used successfully. It is very powerful, and must be used with caution.

(789) O. V. writes: 1. Can you inform me what sort of cement is used in wooden boxes to make battery cells? A. Have boxes perfectly dry, smear them inside with a hot mixture of four parts resin, one part gutta percha, and a little boiled oil. The mixture must be thoroughly melted and stirred before use. A hot rod of iron may be used to melt it into the crevices. 2. Are they only good for Bunsen batteries or Grenet? A. They can be used for any ordinary type of battery. 3. What are dry batteries composed of, and are they any good for a medical coil? A. A good effect can be obtained from a paste of plaster of Paris one pound, oxide of zinc one-fourth pound, saturated solution of chloride of zinc enough to make a stiff paste. They are very good for medical coils.

(790) L. W. asks: 1. How to wash copper wire with mercury. I wish to use it for internal use. A. Dip in mercury covered with dilute sulphuric acid. 2. Also, is mercury poison? A. Yes. 3. Also how to silver copper wire and pan. A. Best by electroplating described in our SUPPLEMENT, Nos. 157, 158, and 159.

(791) O. B. asks how rubber cement is made, such as is used for repairing rubber boots. A. For solution of India rubber see SUPPLEMENT, Nos. 249, 251, and 252. Gutta percha dissolved in bisulphide of carbon may answer your purpose.

(792) A. J. P. writes: What effect has mercury on a man's system, and the way to extract it? A. It produces salivation and tends to disturb the entire gastric and intestinal system, and in sufficient quantity and form acts as a strong corrosive poison. Local blood letting, demulcent drinks, etc., are applied after cases of mercurial poison. Its effects vary according to the form in which it is administered. In many cases, the effects of a disease which has been treated by mercurial medicines are considered the effects of the mercury itself. A physician should be consulted in all such cases. It probably does not remain long in the system.

(793) Constant Reader asks: Some years ago I had some talk in regard to albumen, caseine, etc., with Prof. Chas. Joy, and he referred to the extraction of albumen by using ozone generated by passing air through spirits turpentine, if I remember correctly. What I want to ask is, Is ozone generated in that way by any one? A. Turpentine has a bleaching action formerly attributed to the presence of ozone. This is now not credited, the bleaching power being supposed due to an organic compound, $C_{10}H_{14}O_4$. We have no record of ozone being thus successfully generated.

(794) An Old Reader asks for a good receipt for making honey, if possible, without using honey as one of the ingredients? A. 5 lb. white sugar, 2 lb. water, gradually bring to a boil and skim well. When cool add 1 lb. bees' honey and 4 drops peppermint. To make of better quality add less water and more real honey. Other formulæ are given in Dick's Encyclopedia, which we can supply for $5. 2. Would also like to know what the chemical composition of honey is. A. Principally of saccharine matter and water, about as follows: Levulose 38½ to 40 per cent, dextrose 31¾ to 39 per cent, water 20 to 30 per cent, besides ash and other minor constituents.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

April 23, 1889,

AND EACH BEARING THAT DATE.

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

Acid, purifying acetic, Bang & Ruffin 401,992
Alarm. See Burglar alarm.
Animal releasing device, G. A. Waterhouse 401,914
Animal shears, A. A. White 401,806
Annunciator drop, J. M. Stuart 402,043
Auger, post hole, H. C. Cloyd 401,999
Axle making machine, A. Paterson 402,101
Axles, making, A. Paterson 402,102
Barrels, mechanism for the manufacture of, W. H. Cram 401,981
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Bearing, roller, R. W. Hent 401,884
Beehive, F. Dazenbaker 402,002
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Blast furnaces, flux feeder for, N. A. Pratt 402,103
Block. See Glass building block.
Block barking and splitting machine, combined, O. W. Stearns 401,866
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Press. See Printing press.
Pressure contact arm, universal upward, C. J. Van Depoele 402,117
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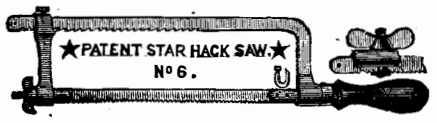

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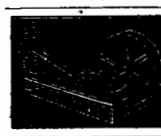

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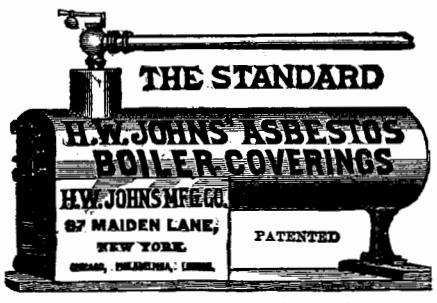

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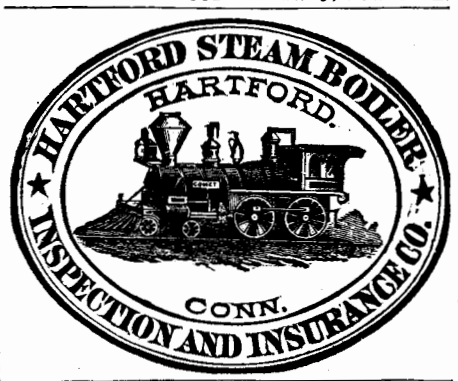

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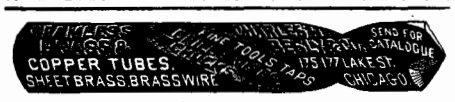

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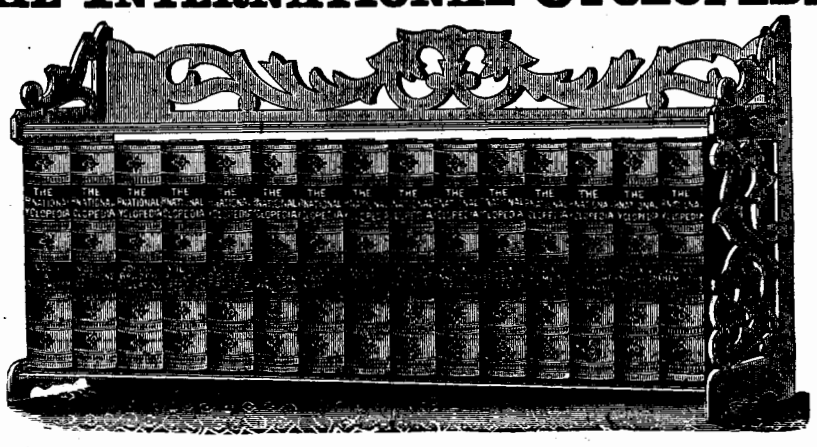

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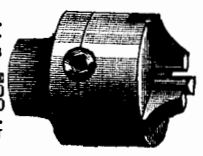

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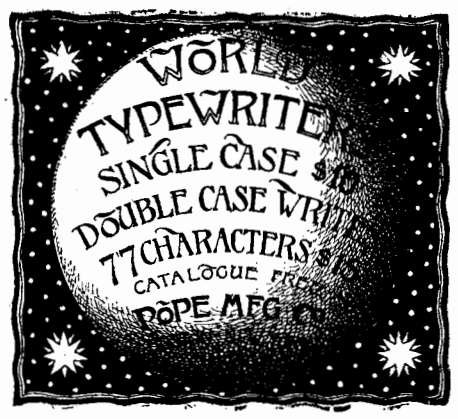

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