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

Vol. LXX.-No. 25. Established 1845.

NEW YORK, JUNE 23, 1894.

\$3.00 A YEAR.

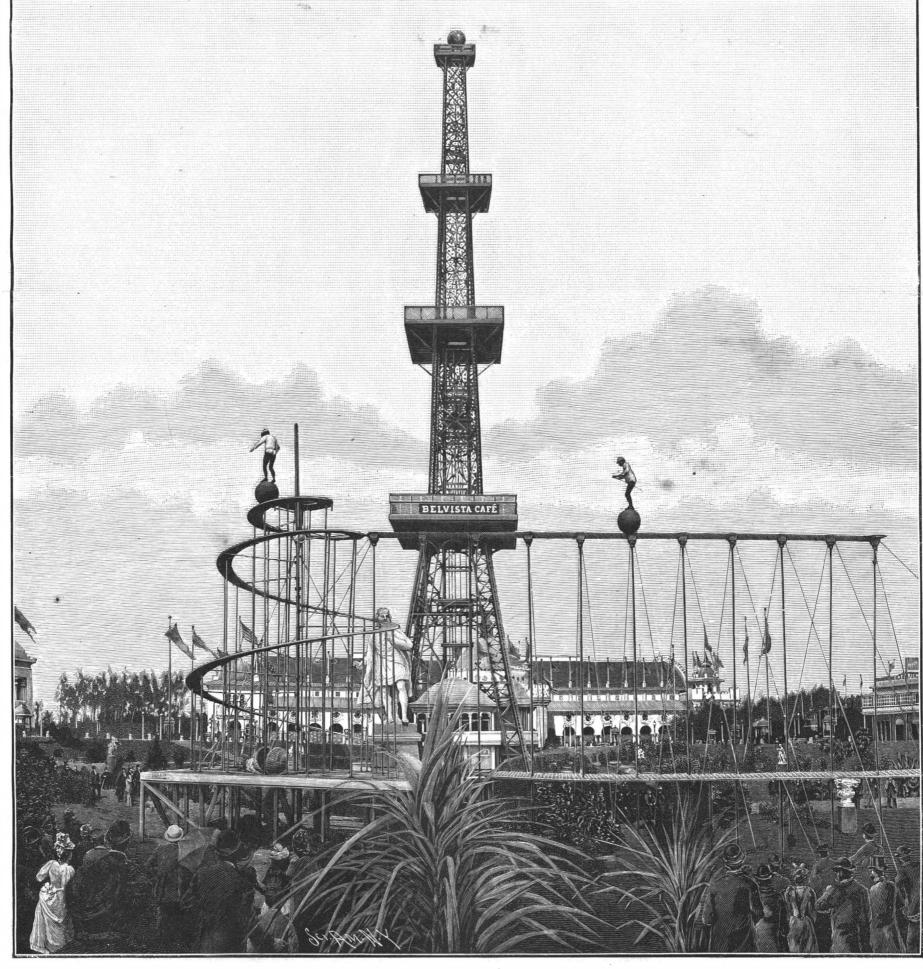
THE CALIFORNIA MIDWINTER EXHIBITION.

The rapid creation of the White City at Chicago was a remarkable achievement, but even this wonderful feat of the skill of the architect and the engineer is transcended by the rapidity of transformation that | tention that its merit deserved or that it would have took place at the San Francisco Midwinter Fair. Last August the western portion of Golden Gate Park was financial depression has also prevented great numalmost a wilderness made up of sand dunes and scattered trees. Under the hand of the landscape gardener, the park has been transformed into a veritable cisco. We have from time to time published views Garden of Eden and a dream city was created in five of the buildings and grounds, so that a good opmonths. A city has grown up in the midst of many portunity has been afforded the readers of the Scienpalms and broad-leaved tropical plants and almost TIFIC AMERICAN of judging of the extent and merit

within sound of the breakers which dash against the cliffs that guard the Golden Gate.

Following so closely upon the great Columbian Exposition, the Midwinter Fair has not attracted the atreceived had it been held at any other time. The bers from visiting it, who, at a more propitious season, would have made a pilgrimage to San Fran-

of this great achievement. Many of the exhibitors at Chicago sent their wares directly to the California Fair, and a visitor there would easily recognize many familiar scenes from the Midway Plaisance. He could attend, if he pleased, the fantastic nuptial ceremonies that took place each noontide in the Cairo Street. He could, if it gave him pleasure, watch the contortions and so-called dances of the Oriental houris from the civilized East or the barbarous but less offensive war dances and songs of the Samoan warriors. Then there are many scenes of interest illustrative of early California life, the camp of the Forty-niners, with full (Continued on page 393.)



THE CALIFORNIA MIDWINTER EXHIBITION-THE GREAT BONET ELECTRIC TOWER,

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

The Scientific American Supplement

ta a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, for the U. S., Canada or Mexico. \$6.00 a year, for the U. S., Canada or Mexico. \$6.00 a year for the U. S., Canada or Mexico. \$6.00 a year for foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page. (ombined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of seven dollars. To foreign countries within Postal Union, eight dollars and fifty cents a year.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.50 a year. To foreign Postal Union countries, \$3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, \$5.00 a year. To foreign Postal Union countries, \$6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, \$3.00 a year. To foreign Postal Union countries, \$11.00 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of La America is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language, It circulates throughout Cuba, the West Indies, Mexico Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. \$3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

pies 25 cents. See P. MUNN & CO., Publishers, 361 Broadway, New York.

The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO. Readers are specially requested to notify the publishers in case of any failure delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, JUNE 23, 1894.

Contents

(Illustrated articles are marked with an asterisk.)

(Indicated at the are	marked with an asterisk.)
Advertisements, earth, sea and sky 394	Gas companies swindling the public
Ambergris, big money in 394	Gold production, the 38
Armor, naval, recent trials of 386	Ice, kow to make 38
Armor plates, the nickel 395	Incandescent lamp, how to mend 39
Atlantis, the island of 386	Inventions recently patented 39
Bronzing, simple process of 394	Japanese tea house, California
Cars driven by compressed air 394	Fair* 39
Chinese language, the 390	Matter, solid and liquid 39
Citric acid, artificial production 390	Metals affected by low tempera-
Combustion, spontaneous, of	tures 38
colored paper 389	Notes and queries 39
Campo-board, a new building ma-	Patents granted, weekly record. 33
terial	Patrol wagon, Broadway R.R.* 38
Cottons, foreign competition on 387	Pavings, different, merits of 38
Cotton gins electrically driven 391	Penn, William, a letter from 39
Death, the origin of 394	Perfumes, artificial 39
Electrical equipments, decline in	Photo-etching on copper 39
price of 395	Photography, electric 38
Electrical supplies, Fibrone-Ter-	Pulleys, paper covered (6100) 39
raloid* 388	Railway, India and Ceylon, pro-
Electric photography 387	posed
Electric tower, the great Bonet, San Francisco*385	Sound waves shown by lantern
San Francisco*	slides* 39
Exhibition, California Midwin-	Telegraph, the, and its inventor, 39
ter* 385	Telephone, an efficient magneto. *38
Filter, the Berkefeld* 388	Tuck marker, the perfection* 38
Fire hose carried over street	University building, the old N.Y. 38
cars* 389	Wagon, steam, the Simonds* 38
Flower and feather manufac.* 392	Water, sterilizing 38

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 964.

For the Week Ending June 23, 1894.

Price 10 cents. For sale by all newsdealers

 AGRICULTURE.—Winthrop Gardens.—A farm in Massachuset successfully conducted by a woman.—The crops and methods. 	tts 1541
II. ARBORICULTURE.—The Sassafras.—The history of this tre—Its habits and uses	ee. 1541
III. ARCHÆOLOGY.—The Latest Egyptian Discoveries.—Rece work in Egypt under the auspices of the British Museum.—5 illu- trations.	us-
IV. ASTRONOMY.—What is a Comet's Tail?—By A. C. RANYARD Different theories as to the matter of a comet's tail.—I illustration	ra-
V. CIVIL ENGINEERING.—Opening of the Manchester Ship Can —The ceremonies at the opening of the great canal.—1 illustr	ra-
tion The Manchester Ship Canal.—The story of this great work no virtually completed.—A trip up the canal described.—3 illustr	ow.
VI. ELECTRIC ENGINEERING—The Brott Electric Elevat	15399

VII.—ENGINEERING.—The Relation of Mathematics and Engineering.—The importance of mathematics to the modern engineer in all departments of bis work.—4 illustrations.

IX. MEDICINE AND HYGIENE.—How to Live and Retain Health and Vigor in Old Age.—By NICOLAS PIKE.—A very popular treatment of this subject of universal interest....

The Adulteration of Food.—By H. W. WILEY.—Authoritative paper by the U. S. Government Chemist on this subject.......

XIII. PHOTOGRAPHY.—An Amateur's Photographic Laboratory.—Gaston Tissandier's notes of the model laboratory.—2 illustra-

PROPOSED RAILWAY FROM INDIA TO CEYLON.

The island of Ceylon is one of the most valuable possessions of the British Empire. It has an area of over twenty-five thousand square miles, and a population of over three millions. Great progress has been made within the past few years. Railways and telegraph lines have been extended. The people are industrious and education is making progress

Ceylon is situated off the southeast side of the extremity of India, and the island is supposed in past geological ages to have formed a part of the mainland, between which and Ceylon there are now some islands and some reefs. The depth of water on the latter is small. A railway is now projected to connect Ceylon with India. It is estimated that the waterway requiring to be bridged is about thirty miles in extent. The whole work, it is supposed, will cost not more than \$5,000,000.

THE ISLAND OF ATLANTIS.

Among newly projected enterprises is one for the formation of an island, ten or eleven miles out at sea, off the coast of Long Island, with the object of establishing there a summer hotel, for the benefit of citizens who wish to keep cool and avoid mosquitoes during hot weather. The projector of this enterprise, Mr. Charles Coen, and a party of coadjutors went out recently in a steamer and selected the spot, planting thereon a buoy with an attached white flag with a single red star. The water at the selected place has a depth of about 70 feet. It is proposed to sink a group of sixty iron caissons each 15 feet in diameter and to erect the hotel building upon them. The spot selected is claimed to be outside the jurisdiction of the United States or any other nation; hence the corporation will be subject to no taxes and will be subject to no laws except its own legislation. Atlantis is to be the name of the new territory.

There is nothing impracticable in the formation of an island in the manner proposed, and no great engineering difficulty stands in the way. Its accomplishment is chiefly a financial question. If the money is forthcoming—one million dollars is the estimated cost -the island can soon be created. The parties claim they can command the funds.

As defenses for the harbor of New York the building of such islands has heretofore been suggested in the SCIENTIFIC AMERICAN, and illustrations thereof show ing the method of construction have been presented.

RECENT TRIALS OF NAVAL ARMOR.

Not long since there was chronicled in our columns, and in those of the daily press, the failure of an 18 inch Harveyized plate, which was tested by the government as a sample of the armor plate for the cruiser Indiana. This plate was 7 feet 6 inches wide, 16 feet long and varied in thickness from 18 inches to 8 inches, the latter thickness being only at the bottom edge, which, as the plates go on the ship, was to be under the water. The plate was the representative of six hundred tons of armor. The attack was to have been made by a 13 inch rifle, but operations were commenced with a 12 inch rifle. The projectile from the latter penetrated the plate to a depth of 8 inches, breaking it into three pieces, while the projectile suffered hardly any injury. Although this proved the plate unable to stand the test, another shot was taken at what was left of the plate, the 13 inch rifle being employed.

This completely destroyed the plate, while the projectile itself was shattered to pieces. The test cost the Bethlehem Steel Works \$20,000, and, naturally, im-14 paired confidence in the product of the manufacturers, 13 so that when the time came to test sample plates to represent 650 tons of curved armor for the protection of the battle ship Massachusetts, a reduction of the velocity of the projectile was pleaded for. But when the Carnegie Company, of Pittsburg, offered to submit one of their own plates to the trial, the Bethlehem Company faced the encounter and submitted a 17 inch plate. The results obtained in the trial, which took the highest possible qualities. The same 12 inch rifle whose projectile had demolished the large Harveyized plate in the preceding trial was used. The first shot struck the plate almost normally to its surface, penetrated it a distance of six inches without developing any cracks in the plate or bulging it in the rear. The Carpenter projectile was broken to pieces, small fragments flying 200 yards. A second projectile, fired at a higher velocity and caused to strike in another place, penetrated about ten inches, producing only one very fine crack, and the plate was left in condition for further service. Authorities in England have been much exercised over Harveyized plates, as it has ap-

cooling process, which are liable to produce a plate under very high and irregular stresses. Such thick and enormous masses of metal, especially where they vary in thickness, inevitably cool irregularly, and then the use of subsequent hardening processes subjects them to still further strain. It is conceded that the system used by our government of testing sample plates selected from the lot by their own officers enables us to arrive at a much better judgment of the value of our armor than do any tests which have hitherto been applied abroad.

It causes a shock to the rational mind to see the amount of metallurgical skill which is devoted to the manufacture of armor plates and projectiles designed for offensive and defensive purposes only. The modern projectile of the finest steel turned to accurate shape is almost a work of art, yet its sole uses are to destroy an armor plate as fine a piece of work as the shell in its own way, or worse yet, to destroy life. The above may sound like platitudes, but it is a strange spectacle to see the talents of the engineer devoted to destruc-

How Metals are Affected by Very Low Temperatures.

Before the Royal Institution Professor James Dewar recently delivered a lecture, in which he dealt with the properties of solid bodies, especially of metals, as affected by very low temperatures. He began with experiments on the effect of breaking strains and of pressure upon metals; small metal wires or bars were used, and magnified by projection upon the screen, so that those present could see, for instance, the elongation of a small copper bar under strain, and its extra contraction in diameter near the point at which it finally broke. By applying pressure to small blocks of tin and of lead, the metals were forced through a small hole in the receptacle in which each was placed, as if they were viscous liquids.

To show how metals behave under extremely low temperatures, he applied strain, by means of a commercial cement-testing machine, with the jaws modified so that they dipped into a small vessel containing liquid oxygen or air, at temperatures of from -180° to --200° C., and he could gradually apply a strain of about two tons by means of a double lever, upon which pressure was brought to bear by water gradually permitted to run into a suitable receptacle. The tensile strength of non-crystalline metals was greatly increased by low temperatures. He said that at -180° C. the breaking strain of tin was increased from 200 to 400 pounds, that of lead from 77 pounds to 170 pounds, and of fusible metal from 140 pounds to 450 pounds. These experiments involved a great waste of material, as the liquids boiled off vigorously while cooling down the containing vessel and the jaws of the machine, so that, he said, "some people think that it is a very large waste to obtain so small a result; but such is the way of the world." Tin has small extension at low temperatures, and lead a great deal. He produced a few small rods of mercury, and they had a great tendency to weld and stick together wherever they came into contact. One of these circular rods, of slightly less than one-tenth of an inch in area in the cross section, broke at a temperature of -180° C. in the testing machine; its breaking strain was 31. pounds. It first elongated a great deal near its place of fracture, like lead, to which class of metals it belongs. By experiment he showed that the rigidity, as regards flexure, also the torsional rigidity of metals, is increased by cold. He took two tuning forks, which were synchronous at the same temperature, but on intensely cooling one of them, they gave musical beats which sounded at the same time; the rigidity and the torsional rigidity run parallel to each other. The magnetic powers of metals are enormously increased at low temperatures, and magnetism seems to be in some remarkable way directly related to tensile strength.

BREAKING STRESS.

Tons per s	—180° C. square inch.	Elongatio	—180° C. on per cent.
Copper 22:3	30.0	6.8	13.4
Iron 34·0	62.7	8.2	4.7
Brass 25·1	31.4	35.5	32.2
G. silver 38·3	47.0	10.7	20.4
Steel 35·4	60.0	29.4	19.5

Merits of Different Pavings.

The comparative merits of different paving materials for Chicago have been classified as follows by Mr. D. W. Mead:

•	Asphalt.	Brick.	Cedar block.	Cobble stone.	Granit block.	Mac- adam.
First cost	5	4	2	1	6	3
Cost of maintenance	4	1	5	3	2	6
Facility of repair	6	2	5	4	3	1
Durability under traffic	4	1	5	3	2	6
Freedom from noise	3	4	2	6	5	1
Freedom from dust	1	2	4	5	3	6
Freedom from decay	5	1	6	3	2	4
Freedom from absorption	1	2	6	4	3	5
Foothold for horses	6	4	5	1	2	3
Ease of traction	1	2	3	6	5	4

Foreign Competition on Cottons,

According to an article in the Boston Commercial Bulletin, the cotton cloth industry prospects in the United States are far from rosy. Increasing pressure of foreign competition on our markets, foreign and domestic, seems to be the destiny of our cotton manu-

The industry in Europe is particularly depressed.

At the international meeting of textile workers at Roubaix, France, last November, the official reports told a terrible tale of foreign wages in the cotton industry. The weavers of Manchester, England, according to this report, earn on the average \$6.63 for a week of 56 hours. The spinners average \$8.53, the girls from eighteen to twenty years earning \$4.30 to \$4.50. Piecers earn on an average \$4.38 a week, and bobbin boys

In France the daily wage for fourteen hours' work, in Cambresis and the Department de l'Aisne, is 13% c to 19%c. for weavers.

The representatives of a large German factory employing 1.500 hands and running 90.000 spindles reported the average earnings of girls and women at \$1.45 for

operatives who required no clothing worth mentioning, and no food but oil and rice, could work more cheaply large factories at Bombay for the manufacture of the coarser cotton yarns.

suffering from the competition of Bombay, not only in India, but also in China.

More recently Japan has come to the front, and is taking the China trade away, not only from Manchesspindles in operation in Japan, and by the end of this year 750,000 will be turning.

The factories in Japan are at Osaka. They have the advantages of cheap coal, cheap skilled as well as unskilled labor, and a fixed rate of exchange, both Japan are 16.2 cents per day for male operatives and 8 cents | lived for many years and died." per day for females. The prices on Japanese cotton varns at Shanghai and Hong-Kong are cut sharply below both Manchester and Bombay rates, but the then experimenting with photography or the effect of Mikado's country is doubling its machinery yearly and already has nearly as many spindles as the State of Maine.

The Old University Building-Its Once Distinguished Occupants.

The old gray granite building on University Place, facing Washington Square, which until a few weeks ago was the home of the University of the City of Draper had studied the effect of light upon organic New York, is now in process of demolition. For a long time, as time is measured in this quick-moving knowledge so conveyed to him, and he was the first to new world of ours, the building has added character to a very picturesque part of the city; but new times and new needs have come, and now the University is to be removed to a new site beyond the Harlem River, Her face was powdered and the lines upon it drawn, and the familiar old building itself is to be replaced by a tall and stately business building. For nearly sixty years, or since its completion in 1835, the building has not only sheltered the schools of the University, but it has been the home of many men who have achieved fame in literature or art, and within its highceilinged rooms some of the most important inventions of the nineteenth century—inventions of great The faculty were in difficulty until one of the number influence upon the advance of civilization or the betterment of mankind—have been made or perfected.

wing of the building Morse made his perfected apparatus for the transmission and recording of messages by electricity. Samuel Finley Breese Morse was born in year caused an abandonment of the project for the Charlestown, Mass., on April 27, 1791. He was graduated at Yale in 1810, where, while an undergaduate, he received his first instruction in electricity. Upon | tinuing his lectures until 1881. He died at Hastingsleaving college he studied art under Washington Allston, whom he accompanied to Europe. He was admitted into the Royal Academy in 1812, but he continued his studies uuder Allston and under Benjamin model of the "Dving Hercules" turned to America, and he practiced his profession messages over long distances. with varying fortunes for many years. In 1818 he wrote to a friend from Charleston, S. C., that he was his home in the old building. Colt was born in Hart-"painting night and day." In 1823 he returned to ford, Conn., on July 19, 1814. He began work in his New York, thereafter, except for a few occasional ab- father's factory, but he early ran away from home and sences, to make this city his home. He was one of the shipped as a sailor before the mast. In 1829, when founders of the National Academy of Design, and be-only fifteen and while upon an East Indian voyage, he came its first president, serving in that capacity for a made the first model of his revolver. Returning home, number of years. He again visited Europe for purposes of study, his wife having died meanwhile. On ing and bleaching acquired an accurate and extensive October 1, 1832, he sailed from Havre for home on knowledge of chemistry, and this knowledge he put to board the packet ship Sully.

fellow passenger, learned something more of the power money he made in this way he devoted to the perfecof electricity and the possibility of its almost instantation and manufacture of his models. In 1835 he neous transmission through wire or other suitable con- patented his invention, and. with some New York ductors, and with his quick intelligence and foresight capitalists, formed a company, under the name of the proper chemical reactions, and an electric machine he perceived that human intelligence might control Patent Arms Company, with a capital of \$300,000, for this power. It was so that the idea of the electric tele- the manufacture of his revolvers. The government the photographer

graph first came to him, and with characteristic energy he began at once to develop it, and before the ship had arrived at New York he had conceived and formulated the dot and dash system of transmission. In New York Morse then lived for two or three years in one room provided for him by his brothers, in a building on the corner of Nassau and Beekman Streets. He endured many hardships, but he worked constantly upon his models and plans. In 1835, however, he was appointed professor of the literature of the arts of design in the University, and in the same year he was able to show to his friends a working model of his invention, and also the relay magnet which he had designed to re-enforce the electric current upon a long circuit. In September, 1837, the instruments were shown to visitors in the cabinet of the University and messages were then sent from instrument to instrument over 1,700 feet of wire arranged about the room. On May 24, 1844. Morse, stationed in the chamber of the Supreme Court in Washington, received a message sent to him from his assistant Mr. Vail, in the Mount Hope depot in Baltimore. The message was dictated by a daughter of H. L. Ellsworth, the then Commissioner of Patents, and was "What hath God wrought!" The capitalists of England conceived the idea that Numbers xxiii. 23. The telegraph was offered to the government for \$100,000, but this offer was declined, although Congress at length appropriated \$8,000 for even than these unhappy toilers. So they established the cost and maintenance of the line then in exist ence. For a while Morse had other hardships to endure, and his title to his invention was disputed; but The experiment was successful, and Manchester is his rights were finally settled by a decision of the Supreme Court of the United States. There are now said to be 2,000,000 miles of telegraph wires in operation in the world, in addition to 150,000 miles of submarine cables, and in 90 per cent of the connected offices the ter, but from Bombay. Last year there were 360,000 | Morse instruments are in use. For many years after the demonstration that his invention was practicable Morse lived, secure in the esteem and admiration of his countrymen. He died in this city on the 2d of April, 1872. Upon the front wall of a house on the north side of 22d Street, a little west of Fifth Avenue, a taband India being on a silver basis. The average wages let recounts simply, "In this house, S. F. B. Morse

> While in Paris, during one of his later trips, Prof. Morse made the acquaintance of Daguerre, who was sunlight upon sensitized silver plates. Morse had previously experimented unsuccessfully in the same direction; but he learned the process of Daguerre, and working to improve his own knowledge as he could at intervals, he was, at length, able to take a sun picture. He was the first to do so in this country. Morse told of his discovery to John William Draper, who was then a fellow professor of his in the University. Prof. and inorganic matter, and he improved upon the take a photograph portrait from life, Daguerre having confined his attempts to landscape. Prof. Draper's sitter was his sister, Miss Dorothy Catherine Draper. and the sitting was long and arduous.

John W. Draper was born at St. Helens, near Liverpool, on the 5th of May, 1811. In 1832 he came to America. When the University was organized the faculty asked the authorities of Yale and other colleges to suggest a man able to become the professor of chemistry in the new University, but they could not recalled some papers upon chemistry he had then recently read, of which Draper was the author. It was In the front room on the third floor of the north then that he was elected to the chair. In 1837 he was long to be seen by the eye, if some other substances are elected professor of proposed medical department of the University; but the financial troubles of that time; but in 1839 he was elected president of the Medi cal College, retaining that position until 1872, but conon-Hudson, January 4, 1882.

Prof. Draper was associated with Morse in the development of the magnetic telegraph, and the series of experiments conducted by him in the laboratory of the coin will at once be seen, and that it is really en-West, and in 1813 he gained a gold medal for a plaster the University was the first to establish with certainty graved on the glass surface is evident, for it will not Soon after he re-the practicability of utilizing electricity for sending

Samuel Colt was another inventor who once made he again entered his father's factory, and in the dye use and profit immediately when he delivered lectures While on board ship Morse, in conversation with a throughout the United States and Canada. The

objected to the arm at first, because of its supposed tendency to explode several chambers at once and for other reasons, but Colt was able to modify and improve his invention, and in 1837, when Lieut.-Col. Harvey was at war with the Florida Indians, a few of the troops armed with this weapon were able to drive the Indians from the Everglades. The conclusion of the Seminole war stopped the sales of the revolvers, and the Patent Arms Company was forced to suspend In 1847 Gen. Taylor sent to Colt for a supply for use in the Mexican war. Colt had in the meantime partec with his last one to a Texan ranger, and had to make a new model, after advertising in vain for an old one. In this model several new improvements were made, and the government duly adopted the arm. Other improvements were made after the Crimean and other Indian wars until the weapon assumed its almost perfect shape. Col. Colt died on January 10, 1862.

Prof. Martyn Paine, who also lived in the University, although not an inventor, should be remembered for his services to humanity. He was born in Williamstown, Vt., July 8, 1794. After graduation he practiced medicine, at first in Montreal but later in this city. In 1841 he united with other physicians in establishing the University Medical College, now the medical department of the University. Dr. Paine was the author of many books upon medical subjects, and was mainly responsible for the passage of the law permitting the practical study of anatomy. Until 1954 a very stringent law was in existence forbidding the dissection of the human body. A bill was introduced in the State legislature repealing this law, but its passage was doubtful. At the earnest solicitation of his colleagues. Dr. Paine went to Albany and for three months labored with the members of the legislature, removing their prejudices and explaining the benefits which would follow its passage. He was at last successful. Dr. Paine's long and useful life ended in New York on No bember 10, 1877.

Electric Photography.

In the May number of the Cosmonolitan Magazine. Prof. A. E. Dolbear makes the following suggestive remarks on the above subject:

For a long time it was believed there were three different kinds of ether waves, known as heat, light and actinic rays. The latter were supposed to be the ones that produced the chemical action on photographic plates, while light consisted of rays of a different kind. capable of affecting the eye. It was discovered, however, that the same rays that can produce vision can also heat a body, and also do photographic work, and what any ray can do depends upon the kind of matter it falls upon, so that all rays have similar characteristic properties. This discovery makes it plain that there is no peculiar kind of ether waves which can be called light, as distinguished from other kinds of ether waves. What is called light is a physiological phenomenon, and has no existence apart from eyes. So well assured is this, that the serious proposal is made to banish the word "light" from physics.

The sensitive coating upon a photographic plate is an unstable chemical compound, which may be broken up by mechanical pressure, by heat, or by ether waves. The proper wave length for a given plate depends upon the nature of its surface. The tanning of the skin, the darkening of newly laid shingles, the coloring upon apples and other fruits, is a photographic process, as can be shown by shielding them from the sun's rays. It has long been known by photographers that pictures may be taken with ether waves much too used in place of the simple silver salts in common use.

Since it has been shown that ether waves of all lengths have an electromagnetic origin, it has been apparent that all the effects of light can be duplicated with suitable electric apparatus. Lay a coin, like a half dollar, on a plate of glass and let a few sparks from an electric machine fall on it. Remove the coin, and the glass surface will not appear to have been affected: but if it be breathed on, the image of easily rub off. If a piece of photographic paper takes the place of the glass, it must have the imprint of the coin made upon it. It is not needful to have the sparks fall upon the coin, for, if it be inclosed in a dark box. brought near to an electric machine having short sparks passing between its knobs, the ether waves set up by the latter will be sufficiently short to affect the photographic surface, which may be developed afterward in the ordinary way. So it is actually possible to take a photograph of an object in absolute darkness, with the ether waves set up by working an electric machine. Not much has yet been done in this direction, but it is a new clew to chemical possibilities, and one may confidently look forward to the time when the qualities and colors of surfaces of many things will be changed to suit the taste by an application of electric waves of suitable length to bring about the may become a necessary adjunct to the apparatus of

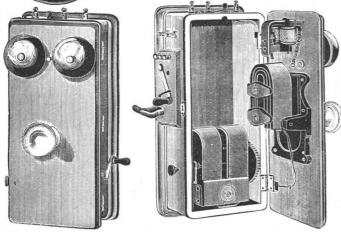
AN EFFICIENT MAGNETO TELEPHONE.

Until lately, it has been generally believed that a magneto telephone could not be used to advantage except in connection with a microphone transmitter. This may be true of magneto telephones heretofore in use. Lately, however, a new telephone has been introduced by the Viaduct Manufacturing Co., of Baltimore, Md., which is adapted for use in manufacturing establishments, hotels, asylums and public and private buildings and small exchanges.

A number of exchanges in which these magneto telephones are used have been established in several small towns, among which are West Winsted, Conn., Great Barrington, Mass., Emporium and Laceyville, Pa., Reidville, N. C., Liberty, N. Y., Vineland, N. J., Clin-

ton, Tenn., Gaffney, S. C., Suffolk, Va., and Newport, Pa. The number of subscribers varies in the different exchanges from ten to one

Our engravings show the combi-



AN EFFICIENT MAGNETO TELEPHONE.

call both closed and open. In the open view is shown of the United States Army, etc. the powerful magnet of the transmitter which is depended on for superior results. The small cut shows one of the switches used at the Central Office.

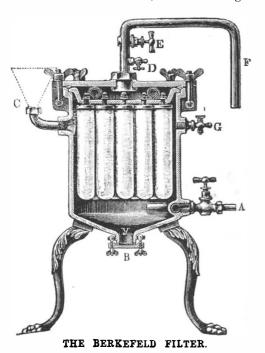
Purchasers of the Viaduct instruments, magneto bells, transmitters, receivers and switch board, it is said, run no risk of litigation, as the company claims not to make anything which infringes existing patents.

THE BERKEFELD FILTER.

A filter which will mechanically perform its work so well as to thoroughly sterilize water, necessarily at the same time removing all minor impurities, and which will operate so rapidly as to be practically applicable to the ordinary household supply faucet, without greatly delaying the flow, presents the first elements of merit, the further most essential practical matter being that such filter may be readily cleaned and kept in its state of original efficiency. Such a filter the Berkefeld Filter Co. claim to offer, Mr. August Geise,



proprietor, No. 4 Cedar Street, New York City. The small figure shows a filter of this kind attached to an ordinary water faucet, and the larger figure represents a group of such cylinders combined in one, as might be necessary in hotels and large manufacturing establishments, with added appliances to facilitate the frequent and ready cleaning out of the filters. The filtering cylinder, or the filter proper, is made in several different sizes, with inclosing metal



ply service, the filter cylinder in the small illustration will be found perfectly sterile when tested in suitable being 3½ inches high and of 2 inches outside diameter. | culture media. The amount of active chlorine present The prime merit of this filter lies in the peculiar quality is reduced within the two hours by about 9.1 per cent, of the filtering cylinder, which is made of infusorial and the remainder may be neutralized by the addition of earth from the kieselguhr mines of Hanover. Germany, composed of minute skeletons of diatomaceæ, and having an enormous number of exceedingly small soon converted into sulphate by the oxygen dissolved pores, designed to intercept the flow of the minutest in the water. After treatment in this manner, water suspended organic or inorganic matter, while their has a pure taste and a perfectly neutral reaction. hard silicious nature affords a firm and practically indestructible material. The pores are so minute as by such treatment has not been exactly ascertained. to be practically impassable by the minute germs Zeitschr. Hygiene; Pharm. Jour. which develop into the organisms causing putrefaction, fermentations, and the various zymotic diseases, and yet the filter may be easily cleaned, ordinarily by simply brushing off the surface of the filtering cylinder, or it may be thoroughly sterilized by being boiled in water, being gradually brought to the boiling point. recent period, and made from "fibrone" by hydraulic The capacity of a single cylinder small filter is a gallon of filtered water in three minutes at a pressure of forty Oliver Street, Newark, N. J. The goods have a polish nation magneto transmitter and pounds, equal to about ninety feet head, and at other equal to the finish of the dies, and are designed to

pressures in proportion. The larger illustration represents a large supply filter, especially adapted for hotels or manufacturing purposes, mineral water makers, brewers, etc., and provided with special facilities for easy cleaning. A is the inlet pipe, the filtered water passing out through F, and C represents a funnel through which a silicious wash may be introduced. An air pump is connected at D, and G and E are air cocks to be operated in connection with it, whereby suspended silica is made to do the internal scouring of the cylinders without removing them from the casing. Among the high testimonials commending this filter are the indorsements of Professors Koch, of Berlin, and Flugge, of Breslau, Surgeon-General Sternberg,

AN IMPROVED TUCK MARKER.

In no class of sewing machine attachments has there been less improvement made in past years than in the tuck marker, and manufacturers will find in the "Perfection" all the elements required to make it what its name implies. This attachment is manufactured by the Perfection Tucker Company, of No. 2 River Street, Rochester, N. Y. It throws absolutely no extra wear on the machine to which it is attached, nor does it affect the operation of machine in any particular, a defect so prevalent in other markers. It enables the operator with a glance and turn of screw to instantly change from one width of tuck to another and back again, or to throw any desired space in or out. The marker is made of the best material, and is tested before leaving the works. The marker is fastened to the machine base with a single screw, and not to the presser-foot, as in most others, thereby avoiding unnecessary jar and wear on the attachment or machine on which it is used. The attachment itself is held in fixed position, it being unnecessary to tighten or loosen this screw for any purpose other than its application to or removal from machine.

The "Perfection" has the largest range of any in the market, as it will make tucks from 1/8 inch in width up to those of 2 inch, including a 1 inch space. The adjustment is accomplished by means of two screws on the "tuck and space" scale, located on the upper part of attachment, and in plain view of the opera-

tucks and that on the right when space is desired between tucks, and they are manipulated as follows: Let it be assumed that we are to make a combination of tucks and spaces as the following—1/4, 1/4, 1/4 "tucks," 3%, 1% space tuck; then the operation would be, first set cloth guide, which is part of attachment, to mark on its scale corresponding to width of first tuck desired, viz., 1/4 inch: next. loosen left hand screw of "tuck and space" scale, and push scale out until it arrives at a point marked 1/4, which is the one desired; tighten screw with thumb and finger, and attachment is set for 1/4 inch tucks. Make first two, then loosen screw on right hand end of scale, push marker out until it arrives at a point marked 3/8, fasten screw; stitch third tuck, and we have now made three 1/4 inch tucks and one 3/8 space;

all that is required on part of the operator to make any combination of tucks and spaces.

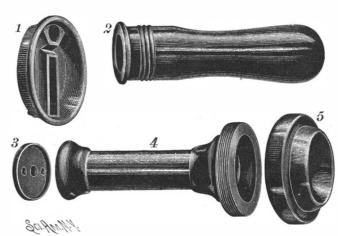
Simple Method of Sterilizing Water.

M. Traube states that by mixing water with chloride of lime in the proportion of half a milligramme to 100 cutic centimeters, all micro-organisms present are destroyed within the space of two hours. Water room was at 70° F. in half an hour. - Chem. News.

case and connections for attachment to the house sup-abounding in bacteria, after having been thus treated sodium sulphite in sufficient amount—the addition of an excess would not be detrimental, as it would be Whether pathogenic bacteria are completely destroyed

A NEW ARTICLE OF MANUFACTURE.

The illustration represents a few of many samples of goods put on the market within a comparatively pressure by the Fibrone-Terraloid Co., of No. 97



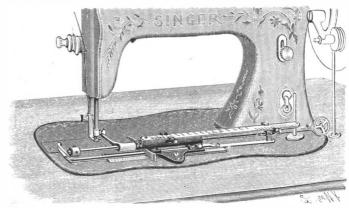
FIBRONE-TERRALOID ELECTRICAL SUPPLIES.

take the place of hard rubber in nearly all articles for which the latter is employed. They are made in all colors, and in marble and wood imitations, and are not affected by damp walls. In our illustration Fig. 1 shows a battery jar cover, Fig. 2 a switch handle, and Fig. 4 a telephone handle, Fig. 3 being an insulating disk, and Fig. 5 a mouth piece. The material is adapted to fill a most useful place in the making of a wide variety of articles.

How to Make Ice.

BY H. N. WARREN, RESEARCH ANALYST.

To procure ice in the laboratory, even when intended to illustrate the same as an experiment, is generally brought about either by the clumsy method of mixing large quantities of the original compound with sodium or calcium chloride, and exposing to its influence the substance under examination; or when in larger quantity, by employing one of the costly refrigerators now upon the market. With a practical chemist all such apparatus is ridiculed. Take for the expensive refrigerator a fractional distillation flask; place the flask in the desired quantity of water which is intended to freeze, contained in a suitable receptacle. Through the neck of the flask is now inserted a rubber tube terminating in a glass point, which should all but touch the surface of the liquid contained in the flask, which consists of about 20 c. c. of an equal mixture of ether and carbon disulphide. The further end of the rubber is now connected to a pair of tor. The screw on the left is used when marking constant bellows, and a brisk current of air continued



AN IMPROVED TUCK MARKER.

now proceed as above for remainder. This is absolutely for about three minutes; almost immediately the thermometer will sink to zero, the vapor of the mixture introduced escaping through the small tubular of the flask, while the outside vessel, containing the water, will be found to have become inseparable, owing to the thickness of the ice formed. This constitutes a beautiful experiment for a lecture table, where the ${\bf gradual}$ development of the ice can be readily observed. By this means I have frozen a liter of water when the

THE SIMONDS STEAM WAGON.

On account of electric and cable traction, not to mention the more humble bicycle, the tendency of the present day is that the horse must go, must go metaphorically, for his days of labor seem nearly passed. In the furtherance of this view, we illustrate a steam road wagon, in which steam is to do his work on country roads and city streets, something which has been for many years one of the foremost aims of the in-

The wagon was invented and patented by Mr. C. L. wagon carries eight pair of shearlegs, 20 feet high, was perceptible in the house. This smell had been

Simonds, of Lynn, Mass., and on four bicycle wheels with rubber tires is placed the body and machinery of the wagon. The machinery consists of a steam boiler of the porcupine type, built to carry 100 pounds of steam to the square inch. Small as it is, it has 28 feet of heating surface. A two-cylinder vertical engine works the main shaft, the two cranks of which are set at an angle of 90° with each other, so that there shall be no dead

The main shaft carries a sprocket wheel which is connected by chain with a sprocket wheel on the left hand rear wheel of the wagon. As the engine runs at a high speed, the sprocket on the wheel is of much larger size than the other, so as to reduce the speed. The total weight of the vehicle is 437 pounds. The front wheels are 36 inches in diameter, the rear ones 48 inches. They are rubber-tired. Two pumps are employed; one feeds the boiler, the other drives the air blast through the naphtha. Under the boiler are five burners, arranged so that they can be used singly if desired. Five gallons of naphtha, enough to run the wagon 100 miles, are carried. Steam can be made in five minutes. A steering wheel is provided in front of the seat. The exhaust steam is passed through a feed water heater, and is then delivered to the naphtha flame, where its presence

of the wagon, and it can make ten miles an hour, and climb hills with two passengers.

THE PATROL WAGONS OF THE METROPOLITAN TRACTION COMPANY.

The Metropolitan Traction Company, owning the Broadway cable road in this city, has provided two patrol wagons for use in keeping its road clear of obstacles and for helping wrecked cars out of trouble, the operations of which are illustrated in this issue. The wagons, of which there are two, are stationed one at the corner of Broadway and Houston Street, the ment for the guys can be found. other at Broadway and 50th Street, where they are kept standing with the horses harnessed, ready for inthe horses are taken out and put in the stable, but the lalong the line, close to the track, is a trap covering a from the previous year. The returns published in wagon is still ready for

call at any hour. The wagon has several lockers, in which are stored a varied assortment of tools, pinch bars, crowbars, cold chisels, slot bars, hammers, wrenches, and the like, really suggestive of a very complete burglar's kit. Besides these, several power jacks are stored away in the lockers, with one hydraulic jack. Underneath the wagon is suspended a sort of shoe like a small sledge runner made of heavy angle iron. This is used to place under the axle of a broken down wagon or cart which may impede the track, in order to enable it to be pulled away. Blocks and falls, several lengths of heavy wire rope, and

The patrol wagon is subject to call for any of the numerous accidents which may happen on the line. Wagons or trucks may break down on the track, so as to prevent the cars from moving. A car itself may become dis-

similar apparatus com-

plete the equipment.

abled and have to be drawn off the track, and the grip may have to be removed. The patrol wagon is provided for all of these emergencies. Two or three men working with the jacks can in a very few minutes throw a car completely off the track, leaving the way clear for others. A broken grip can be taken out, a truck with broken axle can be removed to one side, and any similar work can be quickly performed.

The most characteristic service of the patrol wagons, however, is that which they perform at fires. Each of my children complained that a smell of burnt paper



LIGHT STEAM ROAD WAGON.

ing the scene of a fire, the shear legs are set up on each side of the street, and guyed so as to lean slightly forward or toward the center of the street. Straps are put around the lines of hose which have to be carried across the street, the falls are attached, and the hose is hoisted as shown, leaving the way clear for the cars. It is obvious that owing to the grips no system of bridging the tracks is applicable to a cable road. The guys are fastened to any convenient place; the wagon carrying as part of its equipment steel pins to be driven into the ground, when no other efficient point of attach-

It yet remains to be explained how the wagon is summoned to the scene of trouble. The cable road is more than 1892. The silver product for 1893 is estimatstant use at any moment of the day. During the night patrolled by a force of inspectors. Every few blocks ed at a little over \$78,000,000—a decrease of \$6.000,000

signal station. From this station the inspector signals for the wagon in case it is required, calling it either up or down town. On receipt of the signal, the wagon proceeds up or down the line as ordered, the driver watching as he goes until he reaches the place where his services are needed.

Spontaneous Combustion of Colored Paper.

A correspondent of the London Times says: "One

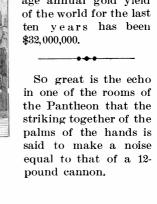
noticed some hours previously, but was not then traced to its source. A careful search led to the discovery that a paper lamp shade in one of the rooms had been entirely consumed by fire. For two days prior to the accident, the lamp, a duplex, had not been lighted, and there had been no fire in the room. Since the morning of that day, when the room was dusted and the shade apparently in its usual condition, no one had entered the room. The shade was made about a year ago from so-called crinkled tissue paper, one white and one vellow sheet, gathered together on the upper part where it was fixed to the wire frame, where it formed a considerable bunch, and spreading thence over the frame below. On examination the yellow paper was found to be colored by chromate of lead, and this no doubt was the cause of the accident. There can, I think, be no doubt that this was a genuine case of spontaneous ignition, though I have not as yet been able experimentally to reproduce the necessary conditions leading to such a result. Fortunately there were no readily inflammable articles near, or a serious fire might have resulted, the origin of which would probably never even have been suspected. The dangerous paper is readily recognized by setting fire to a piece of it and blowing out the flame. In the case of ordinary paper it will be found

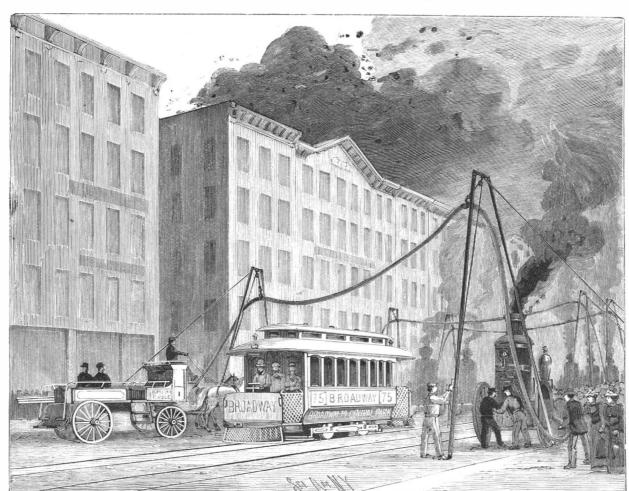
destroys noise. No skill is needed in the management with corresponding tackle, straps, and guys. On reach- that the glow along the burnt edge is very soon extinguished, whereas in the case of these chromate papers, it continues until the whole is consumed, as is the case with ordinary touch paper. I find that besides the yellow paper, pale green paper also contains chromate of lead, and would, no doubt, be equally dangerous. and possibly there are papers of other colors containing the same material. It would be interesting to learn whether any similar case has been observed before."

Gold Production.

Current statistics of the country's gold product in 1893 estimate it approximating \$36,000,000—\$3,000,000

> various papers lately show the yield of gold in Australasia for 1893 to be 1,876,561 ounces. Giving this a value of \$20 an ounce would make that worth \$37,-531,240. It will be observed that Australasia produced more gold last year than the United States. For the first three months of 1894 the Witwatersrand district in South Africa has produced 467,056 ounces, an increase of nearly 50 per cent over last year. The South African gold, so reputed, is about 0.82 fine. If the African output is kept up during the year, the total will be about that of the United States for the same period. The average annual gold yield





THE PATROL WAGON OF THE METROPOLITAN TRACTION COMPANY AT A FIRE HOW THE HOSE IS CARRIED ACROSS THE STREET.

The Telegraph and its Inventor.

the sending of that famous message, "What hath God score years, closing in 1872, was full of activity. wrought!" by the electric telegraph. A line had been constructed by government aid from Washington to Baltimore, and over this line that message was trans- Mr. S. F. B. Morse, of Chicago, who is identified with mitted on May 24, 1844. This was considered the first practical demonstration of the invention. To estimate the value of this invention would be most difficult. It has bound the world together, made possible the daily press and the modern systems of business. Electricity in the industrial and commercial world dates from the above event. Since that day invention has followed invention, until it seems to the practical man of to-day that the summit has been reached; and yet possibly the same thought came to those who witnessed the sending of the first message.

Samuel F. B. Morse, the inventor of the telegraph, whose name is famous the world over, had the advantage of educated and wise parents, who directed his studies and whose counsels guided his conduct through life. He was educated at Yale College, graduating at 19 in 1810. His chosen profession was that of a painter. Under the best masters he studied in England, France and Italy. In 1813 his painting, "Dying Hercules," exhibit of the Royal Academy, London, and for a bust of Hercules he received a gold medal. This was his first many important commissions. A great disappoint ment, and one which even his later successes did not efface, was his failure to receive one of the commissions for the paintings for the capitol.

Inventors have come from nearly every walk of life, vet it is seldom that a person forsakes a calling in which he has attained prominence to enter upon the laborious duties of an inventor. Such, however, was the case with Morse. The field he entered was not unfamiliar to him. While at college he attended the lectures of inches in width. Profs. Silliman and Day on electricity, and took great interest in the subject. In his studies and following the duties of his profession he added to his fund of general knowledge. He was a personal friend of Profs. Dana, Henry and others, who were experimenting with electricity. His inventive talent had previously manifested itself in many ways. Morse dates the invention of the telegraph from his voyage on the ship Sully, from Havre to New York, on his return in 1832 from Europe, where he had spent three years in executing numerous commissions and in study. It was suggested by conversation on the ship on the discoveries recently made in electricity. He spent almost the entire time during the voyage with his pencil, developing by means of drawings his system of telegraphy. The systems of telegraphy previously devised were limited to the distances the sight or hearing could cov er, but his system was not limited by distances. Immediately upon his landing in New York he commenced the work of constructing his instruments. The history of the next ten years is similar to that of other inventors. Without the means to perfect and to place before the public in a desirable way his apparatus, he was obliged to make his own instruments and at the same time mation about this tongue, concerning which very earn his expenses until he secured, in 1837, the aid of little is generally known, and that little very inaccu-Mr. Alfred Vail, who became his partner and valuable assistant.

After having exhibited his instrument before various scientific societies and prominent citizens, he determined to place it before Congress. He set up his instruments in a room of the capitol and exhibited them to the President and members of Congress, but it was not until February, 1843, that he succeeded in securing an the keyboard of the human voice is limited, and as it appropriation of \$30,000 to test the capacity and usefulness of the system. The line from Washington to Baltimore was determined upon as likely to prove the have identically the same sound, that is to say, that most beneficial. The wires were to be placed underground, incased in lead tube, but after seven miles had been laid it was found that in the process of manufac- ity of homophonous terms, this language cannot be of multiplication is by conids, but they occasionally ture the insulation of the wire had in many places been destroyed. This plan was then abandoned and the character absolute monosyllabism. The spoken lan-asci; and a yeast-like budding also occurs. The prowires were placed on poles. The work was prosecuted from both ends, and in May, 1844, the two parts were joined and the line completed. On the 24th the public or more sounds, to each of which, in the written lan-presence of oxygen. The most favorable nutrient trial took place. Two days later the national Democratic convention assembled in Baltimore, and the dis-but not written. This statement is worthy of medi-centrated solution of sugar. The change is probably patches transmitted during the convention greatly in- tation, and may be recommended to the consideration due to a process of oxidation represented by the folcreased the interest in the telegraph. All these dispatches were recorded on strips of paper, which was then considered an important part of the system.

For the operation of this line Congress appropriated \$8,000 and placed it in charge of the Postmaster-General. Commencing April 1, 1845, a tariff of one cent for four characters was laid. For the first four days the revenue amounted to one cent; on the eighth day the revenue increased to \$1.30. It was the intention of Morse and his associates to sell the patents to the government, and that the government would establish lines in connection with its postal system. In this he was not successful. In May, 1845, the Magnetic New York to Washington, which was the first step in

from the different nations than were paid to any On May 24 last occurred the fiftieth anniversary of American citizen. His life, which covered over four-

> Many interesting souvenirs of the telegraph and its inventor are preserved by his grandson and namesake, the electrical industry. For a number of years he was connected with the telegraph, and at present is a member of a well known firm handling, in the West, insulated wires. Mr. Morse was a favorite of his grandfather, and retains a vivid recollection of many incidents and interviews with him.—Electrical Industries

Compo-board, a New Building Material.

One of the factories that form the new nuge plant of the C. A. Smith Lumber Company, at Forty-fourth Avenue North and Lyndale Avenue, Chicago, is a factory for the manufacture of what they call "compoboard." This material is designed to serve instead of lath and plaster, and is described as follows by the Northwestern Lumberman: It is made of 1/2 inch strips of wood, from 3/4 to 11/4 inches wide, placed between two sheets of heavy straw board and united under heavy pressure with a strong cement. The process of manufacture is peculiar. Into the machine that was placed among the twelve selected from those in the moulds the board are run two sheets of the straw board from rolls, one from above and one from below a table onto which are fed from a feeding device the success. His reputation grew rapidly and he executed strips of wood. A roller running in a tank of the liquid cement rolls upon the inner surface of the sheets of straw board, and the three layers of material run together between rolls and into a hydraulic pres capable of exerting a pressure of 120 tons to the square inch. Ten feet of the board is stopped automatically for a few seconds in the press, then run out upon a table fitted with cut-off saws, where it is sawed to the desired length. It is then run upon trucks, placed in the dry kiln, and when taken out is trimmed to 48

The strength of the board as compared with its weight is marvelous. The ends of an 18 foot board can be brought together without breaking or warping it. No conditions can warp it. The new office building of the C. A. Smith Lumber Company is sheeted within with this material. Wall paper is put upon the board, and the finish is as fine as upon any plastered wall. The strong points claimed for the board are: It is not more expensive than first-class plastering. It forms an absolutely air-tight wall. It stiffens a build-those that have a proper signification, such as nouns, ing much more than any coat of mortar and lath can. It is quickly put on, and produces no dampness, thus causing no swelling and shrinking of floors and casings. It is light, thus avoiding the dragging down of the house frame, the consequent cracking of walls, and the warping of door frames. It forms a solider, cleaner, warmer, drier wall at no more expense than is involved in the old way.

The Chinese Language.

Mr. C. Imbault Huart, in a manual for the acquisition of the spoken Chinese language, analyzed by the Revue Scientifique, gives some very interesting infor-

Mr. Huart lays it down as a principle that there are two distinct languages in China, or, more accurately speaking, two forms of the same language, the one written, the other spoken. The first consists of signs or characters of one or more strokes of the brush to each of which is conventionally attached a sound. As was impossible for the cycle of Chinese knowledge to be so, it results that we find a host of characters that are pronounced alike, while at the same time having a particular sense. In consequence of this multiplicspoken; it is only to be written. It has as its principal produce other structures, which may be sclerotes or guage, on the contrary, is polysyllabic. Most of the duction of citric acid is in the first place due to oxidawords therein are formed of the aggregation of two tion of the carbohydrate, and is dependent on the guage, corresponds a single character. It is spoken, substratum for its formation is a moderately conof those philologists who still insist upon classing the Chinese language as monosyllabic, and who perpetually confound the written with the spoken language—the signs with the words that they represent.

The principal character of every primitive language has been monosyllabism; there is no longer any doubt about that. Every language, monosyllabic in its infancy, has afterward developed by means of various processes, which, in the Indo-European languages, have been juxtaposition, attraction, composition, etc., and, in the Semitic languages, deflection: and thus polysyllabism has been reached. The same has been the case with Chinese. The spoken language, says Telegraph Company was organized to build a line from Mr. Huart, had necessarily to originate before the written, and the Chinese characters were devised for the establishment of the vast system that covers the figuring the idea that the sounds of the spoken lan-

ly exhausted and it soon happened that such or such a sound was found to answer to several characters. The sounds were limited, but the figurative signs could not be. The Chinese then conceived of tones and aspirations, and this produced a certain number of new sounds; but this did not yet suffice, and they had to have recourse to another system. The sound fou, which, in the spoken language, expressed the idea of "father," "happiness," "housewife," "ax," "to hide," "to lift," etc., could indeed be varied by the aid of tones, but not by means of aspirations. The Chinese then invented a simple, regular and ingenious lexicological system. They formed words by the method of composition, that is to say, they combined the simple terms or the elementary roots of the language according to fixed rules.

Mr. Huart gives an example that clearly shows how the spoken language passed from monosyllabism to polysyllabism. The sound fou, above mentioned, having several meanings, would have inevitably led to confusion. Upon this sound being heard isolatedly, it could not have been known what fou it was a question of: whether it concerned fou, "father," fou, "wife," or fou, "to hide," etc. In order to avoid such ambiguity, the Chinese added to fou, "father," the word ts'inn, "relative," and fou-ts'inn, "father-relative," then signified "father;" to fou, "wife," was added jenn, "human being," and fou-jenn then signified "woman," "wife;" before fou, "to hide," was placed mai, "to inter," and mai-fou took the meaning of "to place one's self in ambush," etc.

Mr. Huart states that the Chinese language is easy to learn. Its grammar is simple, and free from all those stumbling blocks that arrest the progress of students of the European languages. In Chinese there is no article, no gender, no declension and no conjugation. The relations of substantives, tenses and moods are marked by particles, which are very few in number. In itself, the syntax is quite simple, and has the logical order for its basis. The rules are few and easy to remember.

The Chinese themselves, even the most highly educated, have no knowledge of the grammar of their language. They do not know what a noun in the genitive, dative, instrumental or ablative is, nor what a substantive, adjective or verb is. They divide the words of their language into two great classes—the "full" and the "empty" words. The former are and the latter are particles that serve merely for modifying the meaning of the former or for marking the relations that connect them. Their language once created, the Chinese have not known how to derive rules therefrom. The idiom has become fixed by usage—a word under the protection of which everything is placed in China. The most learned member of the "Forest of Pencils" (Institute of China) would be incapable of analyzing the first sentence presented to him or of explaining it grammatically. If he were asked why the sentence was constructed in such a manner rather than in another, or why such a word was found at the beginning and not at the end, he would never be able to tell. He would answer that he knew that it should be so, but that he did not know why. The Europeans and Americans are the only ones capable of analyzing a sentence, and they alone have been able to deduce rules of grammar and syntax in order to guide students and teach them to learn how to construct correct Chinese sentences.

Artificial Production of Citric Acid.

Mr. C. Wehmer, in carrying on experiments upon the production of oxalic acid by fungi, has found a genus (to which he gives the name of Citromyces) that has the remarkable power of converting carbohydrates into citric acid. Of the genus, he describes two species, C. Pfefferianus and C. glaber. Their ordinary mode lowing equation:

 $C_6H_{12}O_6 + 3O = C_6H_8O_7 + 2H_2O.$

A full description of the conditions under which it takes place is given in a paper that was communicated to the Berlin Academy of Sciences last June. This mode of producing citric acid is now being worked at Thann and Mulhausen, and there is a prospect that, in addition to its scientific interest, it will be of industrial importance.

In connection with this subject, the Kew Bulletin calls attention to the interesting coincidence that citric acid has been found in sugar cane juice, and that it sometimes makes its appearance during the process of sugar manufacture.

There are 10,000 copyrighted volumes of American civilized world. Prof. Morse received greater honors guage represented. But the list of sounds was quick-poetry in the Congressional Library at Washington.

Correspondence.

How to Mend an Incandescent Lamp.

To the Editor of the Scientific American:

T. R. E., in query 5978, date April 28, 1894, asks how to mend an incandescent lamp when the wires are blown off close to the glass. I mended a small lamp of the Swan type by filing off the glass (with an ordinary steel file) close to the broken wire, making a rightangled cut, then carefully bending the projecting piece of platinum wire into a small hook; round this I lashed some thin platinum wire, so as to form a loop to take the place of the broken one. These loops can be easily fitted in the two bent wires in the holder, taking the precaution of pressing back the spring wire when inserting the lamp. I advise T. R. E. to buy lamps in which the glass neck is surrounded by a metallic ring, the space filled with some insulating material, out of which two strong copper wires, soldered to the platinum wire, project. These wires are twisted several times into a loop. This kind of lamp, as I know from experience, can stand almost any kind of rought treat-F. HAUSHAHN.

Propaganda, Rome, Italy.

Artificial Perfumes.

Almost all the natural perfumes are of vegetable origin, and are derived from the treatment of flowers and fruits. In this way are obtained the aromatic essential oils of rose, mint, anise, santal, thyme, cloves, etc., and the perfumes of the violet, iris, and jasmin. Musk is the only important perfume that is of animal

For a long time now, the odor of fruits has been imitated with the aldehydes and ethers of fatty acids, such as the acetates, valerianates, benzoates, salicylates and butyrates of methyl, ethyl and amyl, which, mixed in definite proportions, recall the odor of strawberries, raspberries, apples, pears, etc. The following are two examples of such mixtures:

PERFUME OF THE PINEAPPLE.

Chiorottom	10	grammes.
Aldehyde	10	"
Butyrate of ethyl	50	44
" of amyl	100	46
Glycerine	30	"
Alcohol, 100°	1	liter.
PERFUME OF THE APPLE.		

Chiorotoriu	10	grammes.
Nitric ether	10	**
Aldehyde	20	-6
Acetate of ethyl	10	46
Valerianate of amyl	100	46 1
Glycerine		
Alcohol, 100°		liter.

The aroma of rum and cognac and the bouquet of wines have also been reproduced artificially. We shall not dwell upon the danger that accompanies the use of these products in a large quantity when they are mixed with beverages and alimentary substances. We shall occupy ourselves here more particularly either with products like those that we find in nature, such as vanilline, or with perfumes such as musk and the odor of violet, which are designed not for alimentation, but for perfumery properly so called.

Among the aromatic products employed as perfumes we may first mention methylsalicylic ether, which reproduces the oil of wintergreen (Gaultheria procumbens). The oil of bitter almonds, too, has been frequently replaced by nitrobenzine, which is prepared in large quantities by manufactories of coloring materials. Nitrobenzine, as regards composition, is absolutely different from the oil of bitter almonds, but it resembles it in odor. Benzaldehyde, likewise, has replaced the oil of bitter almonds in certain cases.

Such substances possess but a secondary importance but vanilline, on the contrary, which reproduces the odoriferous principle of the vanilla bean, is the object of an extensive and very prosperous manufacture. The first process that gave rise to it was elaborated in 1874 by Messrs. Tiemann and Haarmaan. In studying conifering, these scientists found that it was formed of a glucoside which, under the influence of a special ferment (emulsine), split up into glucose and coniferic acid. This latter, through oxidation, gives vanilline. The coniferine itself, oxidized with a mixture of sulphuric acid and bichromate, furnishes vanilline. It was by this process that it was first manufactured. The method of purification was very simple. Like aldehyde, vanilla possesses the property of forming an insoluble bisulphite combination, which was separated from the mass and afterward decomposed.

Chemically, vanilline is methylprotocatechic alde hyde:

The figures to the right of the atomic groupings represent the relative positions in the benzenic nucleus. They are of considerable importance, since isovanilline, which is constituted by exactly the same groupings, but differently placed, has no odor. After the formula

that were wanting, and to properly place them with respect to each other. A host of methods was proposed to this effect, in making use of eugenol (De Laire and Tiemann), which was oxidized by permanganate; of eugenol and bromide of methylene (De Boissieu); and of guaicol and pyrocatechine (Tiemann and Reimer). Vanilline is even found in certain natural products, such as the benzoin of Siam, crude beet sugar, asafætida, and opium. A certain number of these processes is employed industrially.

Piperonal or heliotropine is closely connected with vanilline. It is, in fact, the methylenic ether of protocatechic aldehyde. In order to prepare it, piperic acid is oxidized by permanganate, but it can also be obtained by means of safrol. It is found in the oils of sassafras and shikimal, and can also be obtained from the oil of camphor. Coumarine is the anhydride of ortho-oxycinnamic acid. It has been obtained synthetically by Perkin by causing acetic anhydride to react upon the sodium salt of salicylic aldehyde. It is especially extracted from natural products, such as the Tonka bean and the "vanilla plant" (Liatris odoratissima) of the United States.

Spirit of turpentine has likewise yielded a perfume, the terpineol of De Laire. To this effect, one can either dehydrate terpine or treat spirit of turpentine directly. This perfume is known under the name of lily of the valley or lilac.

We now come to the two most recent discoveries, viz. the perfume of musk and that of the violet. Natural musk is the product of a secretion of the musk deer, a ruminant mammal that inhabits certain regions of Asia. The perfume is found in a sac which usually contains from 14 to 20 grammes of it. It is also found, but in much smaller or even minimum quantity, in other animals, such as the civet, the musk rat, the badger, and the marten. Certain plants, too, often possess the odor of musk. This product is of the highest importance, since it is the base of all artificial perfumes, which sometimes contain considerable quanti-

The first process of preparation of a product having the odor of musk was discovered by Messrs. Schaafer and Haffeld, who heated a mixture of dimethyl-ben zine, isobutylic alcohol, and chloride of zinc, which they afterward broke up and nitrated. The truly industrial discovery of an artificial musk dates back to 1889, and was made by Mr. Baur, on the occasion of some researches upon the oil of resin.

In order to prepare the Baur musk, chloride of isobutyl is made to react upon toluene (methyl-benzine) in the presence of chloride of aluminum. We thus obtain isobutyl-toluene, which, under the influence of nitric acid, is converted into trinitroisobutyltoluene, which is the somewhat cumbersome chemical name of commercial musk.

There exists, theoretically, a host of analogues and homologues of this musk. A certain number of them have been prepared from xylene, cymene, and the diphenyl and xylyl methanes. A large number of such products possess the characteristic odor of musk.

A no less important discovery is that made a year ago by Mr. Tiemann, who reproduced synthetically the perfume of the violet (called ionone), after a series of researches of the greatest interest, from a scientific standpoint.

In order to prepare this perfume, we start from citral which is itself derived from the oil of lemon, or from the oxidation of the alcohols of the formula $C_{10}H_{18}O$ that we find in certain essential oils: geraniol, linaleol, aurantiol, and lavendol. The citral is shaken with acetone and barytes, and pseudo-ionone is thus formed. This body is odorless, and in order to render it odorous it is necessary to convert it into ionone, a product which is very closely related, but which is cyclic, while the pseudo-derivative is of the open chain series. A long series of similar products can be made with other acetones, and these have been studied with the greatest care by Messrs. De Laire and Tiemann.

Messrs. Tiemann and Kruger, on treating orris root with appropriate solutions, have separated various products, and, among others, irone, which is the odorous Returns for England is what we want, and either we principle of this root, and it was in the wake of these must have less from thence or better ways of making experiments that the synthesis of ionone was these two bodies being, in fact, isomerous, and consequently very closely related.—Le Genie Civil.

Electrically Driven Cotton Mills.

The Ponemah mills are located at Taftville, Conn., not far from Norwich. An electrical apparatus has lately been installed by the General Electric Company for driving Ponemah machinery. The motive power is furnished by water wheels located at Baltic, on the Shetucket River, which is 4½ miles from Taftville. At this point a dam 625 feet long has been thrown across the river, which furnishes motive power with a head of 32 feet for turbines that yield 1,500 horse power. Here the dynamo machines are located. The wires leading from Baltic to Taftville are No. 0 bare copper, four in number, supported on standard oil insulators. The efficiency of the complete transmisof vanilline became known, an endeavor was made to sion at full load from the power applied to the dynamo employ the neighboring bodies, to add the groupings pulley to that delivered to the motor pulley is 80 per

cent. There are 1,700 looms in the new mill, which is lighted by electricity.

How Gas Companies Swindle the Public.

Among the papers read before the Western Gas Association at its recent meeting in Cleveland was one by Mr. Wilkiemyer upon "The Best Method of Introducing Gas Stoves." In the discussion which followed Mr. Evans told how his company worked the subject

We adopted rather a novel method of introducing gas stoves, by distributing circulars to every family on the line of our street mains, offering to give them a gas range free. Of course the object of this circular was to bring possible consumers to the office, where we could explain what we meant by it. Of course we had a 'string" to the offer. Our explanation was simply this: If the consumer would pay for \$20 worth of gas in advance we would give him a \$25 gas range, or, rather, a gas range he could not purchase for less than \$25 at retail. Of course they could not understand such an offer. Our explanation was that by the use of \$20 worth of gas, having acquired the knowledge of how to use gas properly, they would become permanent consumers. Of course the facts were simply these: They paid for the gas in advance; we had the money to buy the stoves with; we made a profit on that \$20 worth of gas sold which was nearly enough to pay for the stove (laughter); and we got a permanent consumer. Perhaps I will modify that a little by saying that it does not cost any more to distribute 200,000 feet of gas than it does to distribute 100,000 cubic feet. In figuring on the cost of gas, in that deal especially, we figured on the cost of the gas in the holder; and our profits accrued on the margin beyond that. As a matter of fact it did bring us in immediate business. On that plan we put out 1,500 gas ranges within three months; and those gas ranges brought us in a consumption of 150. 000 feet per day; and as a matter of fact we made \$9.40 per thousand profit (laughter)—I mean \$9.40 profit on each \$20 worth of gas sold; and between that and what the gas ranges cost us was certainly an advertisement that paid us to adopt that system.

The President—The idea is a good one, and I think it has been tried by some others, though not perhaps in exactly the same way.

A Letter from William Penn.

The Leisure Hour says: The spade of Mr. J. J. Cartwright, F.S.A., has been busy among Lord Lonsdale's muniments at Lowther Castle, and has dug up some literary treasures of decided historic value. One is a letter in which William Penn describes Pennsylvania. It is written to Sir John Lowther at Whitehaven, and dated in the orthodox Quaker fashion:

"16.6m, 1701, Pennsberry.

"Honored Friend, I would not but have thought my selfe lost in thy country entertainments but I finde that Whitehaven is much kinder than Whitehall to Pennsylvania, for the one sends its good wishes and the other suffers itselfe to be mislead to crush such prosperous beginings. I return my most hearty acknowledgements for thy obligeing remembrance and beg the continuance of thy good word and wishes for our prosperity; for whatever interested men suggest, we are an approved experiment what sobriety and industry can do in a wilderness against heats, colds. wants and dangers. The Crown gets best by us, but its officers less than by other Governments, and that's our crime; but time will sett truth in a better light, to which I adjourn my resentments. We thrive, our town, I think, too much for the country, not keeping a ballance in all things in Government is (perhaps) the hidden but sure cause of visible obstructions and entanglements in administration. I finde the country 70 miles back, the best land, Sasquehanah a glorious river boatable upon freshes. We are planted 170 miles upon Delawar, and in some places 16 miles back into the woods. Our staple corn and tobacco; we are trying for rice, converted timber for shipping and hemp. them. Barbado's and those Islands are our market and we are too hard for our neighbours for our flowr and bread, being the whitest and preferred; we spare much of both to our neighbour colonys also, as New England, Maryland, Virginia, and Carolina, where wheat will hardly grow, but rice to perfection, and silk is got to a good pitch, and will certainly be a commodity. We have had a good share of health since our arrival and my family increast by a little son, and if ill treatment call us not home are like, if God please to prolong life, to pass away a year or two at least. Only my privat affairs could make me leave it any more, but they will compel it once again, and then it would not displease me to lay my bones where I have layd my labour, mony, and solicitation, in Pennsyl-

"I shall close with this assurance that I am with great esteem and affection

"thy very faithfull Friend

"WM. PENN."

FLOWER AND FEATHER MANUFACTURING.

The great number of artificial flowers used in trimming ladies' hats and for other ornamentation are made mostly of muslin, linen, velvet, satin, and silk. The material if for white flowers is first fastened on to stretchers in sheets and their backs coated with a solution composed of dextrine and starch. This solution stiffens the material so that it can be worked and formed into shape. After drying it is ready for cutting. For colored flowers the material is dyed. About five gallons of aniline dyeing solution is mixed up into copper boilers and heated by steam: the material is then placed into it and dyed in a few minutes. They are trimming purposes, come from all parts of the world. then run through a wringer and placed upon stretchers to dry and have their backs sized. The sheets when dry are then taken to the cutter. About a dozen at a | blowpipes. The entrails are taken out by them, and time are placed over an oval-topped leaden block, the the skin and feathers stuffed with wild cotton. The

gummed to the wire stem. The stamens, which are of the feather causes them to straighten out and bemade of jute, are then placed around the center piece and stem and the whole carefully wrapped around with tissue paper. The stem is then run through the bottom of the flower and into the muslin tubing, the parts being thoroughly gummed together. The daisy centers are made mostly of wool dyed.

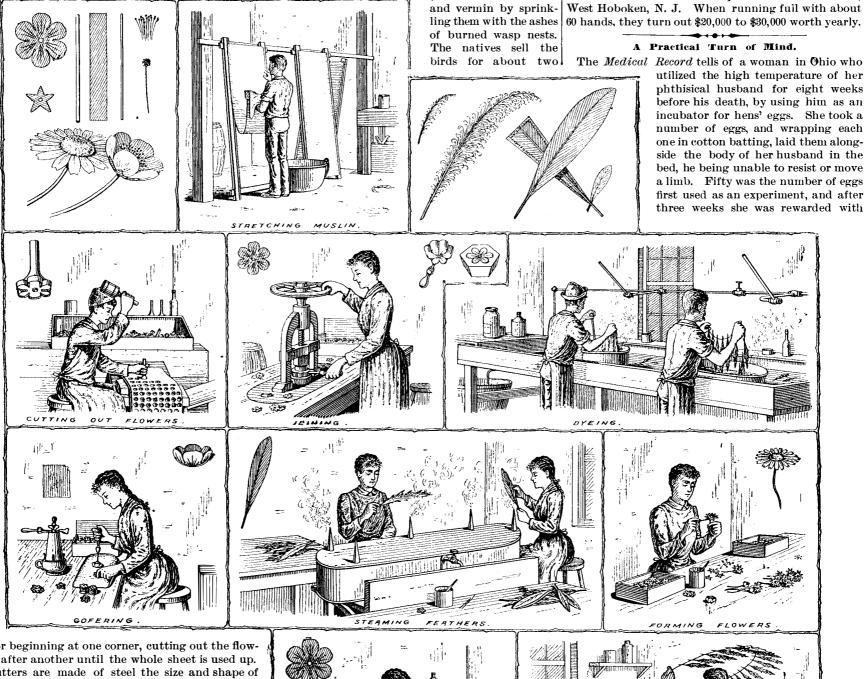
By moistening a quantity of white flowers in alcohol and water and placing them separately on to wooden frames they can be colored by the point of a brush, the alcohol solution making them take the aniline color. The feathers and birds, which are also used for There are over four or five hundred different varieties. The natives shoot them with guns or kill them with

> birds and feathers are preserved from moths and vermin by sprinkling them with the ashes of burned wasp nests. The natives sell the

come smooth. The edges are then trimmed and either frosted or covered with jet. A great many of the colored frostings are made of gelatine. Gold metallié, copper, and silver are also used, the material being fastened on by means of rubber gum. Ostrich feathers are dyed and beaten dry in the same manner as the common feathers. After beating they are pared or scraped down to give greater flexibility.

The barbs are curled by drawing them singly over the face of a blunt knife or the cautious application of a heated iron. The best feathers come from the male bird, those coming from the wings and rump being white, and the short feathers jet black. In the female the feathers are tinged with a dull gray. Dull-colored feathers are usually dyed black with logwood and sulphate or acetate of iron. There are as many as 1,000,000 birds imported into this country yearly. The sketches were taken from the plant of L. R. Alexander, West Hoboken, N. J. When running full with about 60 hands, they turn out \$20,000 to \$30,000 worth yearly.

> utilized the high temperature of her phthisical husband for eight weeks before his death, by using him as an incubator for hens' eggs. She took a number of eggs, and wrapping each one in cotton batting, laid them alongside the body of her husband in the bed, he being unable to resist or move a limb. Fifty was the number of eggs first used as an experiment, and after three weeks she was rewarded with



operator beginning at one corner, cutting out the flowers one after another until the whole sheet is used up. The cutters are made of steel the size and shape of flowers, among which are the buttercup, daisy, rose, etc. The cutters are about one-half inch in depth, so that when the operator strikes with the hammer, the tool passes down through the material, cutting out about one dozen flowers at once. An operator can cut out about 2,000 flowers per day.

The flowers are then taken and veined. The veiner consists of two dies the shape and size of flower, one being made to fit inside of the other. The bottom of each die is veined, one being raised and the other sunk. The flower is first placed into the bottom die; the attendant then places the top veiner, which fits exactly into the other, over the flower, and places both under The attendant, by turning the wheel of the press, forces the top veiner down into the other, the pressure of which forms the veins into the flower. A cents each. Great numbers of turkey, goose, and forty-six lively young chickens. The happy result of good hand can vein about three gross of flowers per hour. Flowers that are more or less cup-shaped go through what is called the gofering process. The flowers after being veined are placed on a cushion or pad. The operator heats the gofer, which is a circular steel ball attached to the end of an iron rod, over a lamp; hands and striking them down on a paper-covered when it is properly heated, the gofer is waxed and the table. This operation causes them to dry in about operator presses and works it round the center of the ten to fifteen minutes. After drying they are taken flower, the pressure and heat of which causes the flower to the steaming apparatus. to curl up into a circular or cup-shaped form.

The flower is then put together, the parts of which are composed of muslin, velvet, etc., wire, jute, tissue paper, muslin tubing, wool and corn meal. The first operation, if forming a buttercup, is fastening the center piece and the stamens to the wire stem; the cen- attendants hold the dried feathers into the steam for a thread by means of rubber gum. This in turn is by running the fingers along the barbs toward the top sia, 5,736 feet deep—a little over one mile.

chicken feathers are used. The feathers that are to be dyed are first fastened at the quill end to a string and put into a dyeing boiler. After dyeing they are put through a wringer. From the wringer they are beaten dry by an operator holding the ends of the string in his

The steamer is oval-shaped and made of copper: it is about three and one-half feet in length, about fourteen inches in height, and about twelve inches in width. Projecting from the top are a number of conical shaped tubes through which the dry steam issues. The ter piece is made of corn meal fastened to a coarse few moments, which moistens them slightly, and then

the first trial prompted her to try it again, and this time she doubled the quantity, and was again rewarded for her ingenuity with another brood of chickens. Another hundred eggs were placed in the bed, but this time her husband was so near the end that the necessary heat was lacking, and he passed away, leaving behind one hundred half-hatched chicks. The scheming wife, not to be outdone in her plans by grim death, placed the eggs in the oven, thinking to finish the work her husband had failed to complete. During the bustle and excitement of the funeral, however, she allowed the fire to get too hot, and the eggs were all cooked.

The editor says he hopes there is no incubator awaiting this woman in this world, at least!

THE deepest boring is that of Schadebach, in Prus

incongruous sur-

roundings. At

the Columbian

Exposition, the Tea Garden and

the Hoo-den or

the Japanese phe-

nix palace were

objects of great interest, and were

enjoyed by many

visitors, but when

the Midwinter Fair was propos-

ed. it was soon

seen that many

Oriental effects

could be obtained

without the ne-

cessity of a mira-

cle of the land-

scape gardener's art. The sur-

roundings of the

Tea Garden at

the Midwinter

Fair are most ap-

propriate. Gorge-

ous flowers, fine

trees and shrubs,

and a miniature

lake furnished un-

bounded possibili-

ties to the pro-

moters of the en-

terprise. In this

ideal garden were

erected a number

of grass-thatched

buildings. In the

foreground will be

noticed the dwarf

trees, the raising

wonder that

THE CALIFORNIA MIDWINTER EXHIBITION.

(Continued from first page.) equipment of stage coach, "road agents," keno layout, etc. All these could be found and many more, but of these diversions we have no concern.

In the middle of the Great Court of Honor of the oped is demonstrated by the performance which is still the true Oriental effect was lost on account of

Midwinter Fair stands the Bonet electric tower. Owing to its height of 272 feet. and its central position, it will readily be seen that the tower is one of the main features of the Exposition. The tower is built throughout of steel and was erected by Leo Bonet & Company, architects. To make the foundations, piles were driven in 17 feet and over 30 $tons\ of\ cement$ were used. The Belvista Café is situated on the first platform, at an elevation of 80 feet above the level of the ground. It forms a delightful feature of the Fair for visitors to be able to lunch and dine at such a height apparently suspended in midair, and a delightful view of the grounds and surrounding country may be obtained

from it. The sec-

largest searchlights ever constructed.

Access to the various platforms is gained by the use of an electric elevator constructed by the Otis Company. This elevator was removed from the Manufactures building at the Chicago Fair, and was illustrated in the issue of the Scientific American for October 28, 1893. The elevator runs up to the third

platform, which is ten feet wide, and affords an excellent opportunity to study the arrangement of the Fair grounds At night the Exposition is superb, and some idea of the brillian. cy of the scene may be obtained when it is stated that on the tower there are 3,213 inc and e scent lamps, which by an interrupter are constantly"blinking" orforming patterns of various colors. The grounds are brilliantly illuminatedand the outlines of the buildings are picked out in lines of light by the use of in-

candescent

lamps. It is somewhat difficult to appreciate the in Japan from time immemorial always suggests someheight of the cafe, owing to the structure that appears thing mysterious, and hints at heathen rites even in front of it. This represents an elevated path when the buildings are transplanted to our more rigorending in a spiral inclined plane. The wonderful ex | ous country. Although Japanese villages have been tent to which the sense of equilibrium can be devel-from time to time exhibited in the United States,



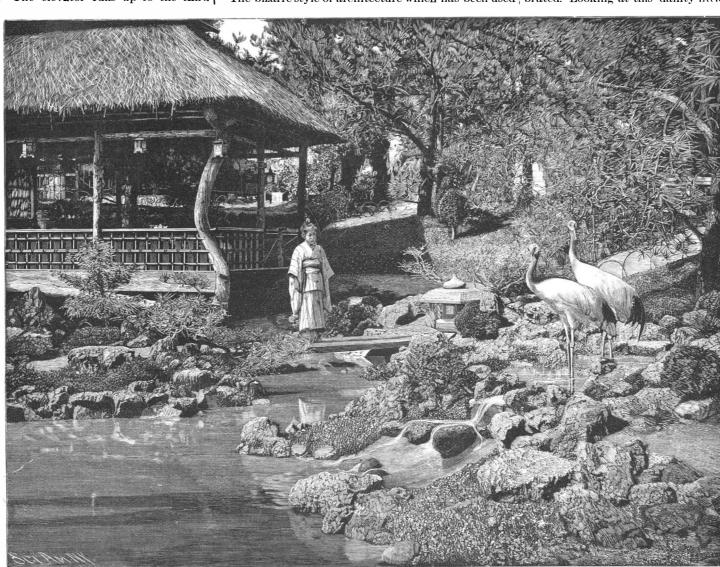
THE CALIFORNIA MIDWINTER EXHIBITION-INTERIOR OF THE JAPANESE TEA HOUSE.

spiral, and finally brings it and himself in safety to the platform below by the mere effort of balance.

The colossal statue of Columbus, one of the special features of the Fair, appears quite near the tower. Our engraving was prepared from a photograph kindly furnished us by Mr. A. W. Cornwall.

The bizarre style of architecture which has been used brated. Looking at this dainty little creature, it is no

of which is quite ond platform is 146 feet high, and the third is 220 feet | represented in progress. The performer causes the | an industry in Japan, and one in which the Japanese high. On the fourth platform is placed one of the ball to travel along the path, ascend and descend the excel. The storks are tame, and they have acquired bad habits in America, as they are very prone to loot the pocket of the visitor. The Japanese regard the birds as sacred, and hold them in veneration. Our other illustration shows the orchestra in the tea house. A Japanese female dancer is just ready to perform one of the graceful little dances which are so cele-



THE CALIFORNIA MIDWINTER EXHIBITION-JAPANESE TEA HOUSE AND GARDEN,

Pierre Loti says: "The mysterious little cabinet curiosity, the Japanese woman." The minute scale on which every thing is constructed makes the visitor feel truly Brobd i ngnagian. The household utensils are like children's toys. Even the pipes which the animated figurines are perpetually smoking are infantile, being no larger than an acorn cup. They look with surprise at a foreigner with his large-bowled pipe, and they have a saying, "At the bottom of a pipe there lives poison."

Some of

must be simple to harmonize and there are wonderful artistic possibilities. The tea is presented in the tiny cups with a politeness which casts a shade upon the Frenchman.

The Japanese Tea Garden is an interesting feature of the Midwinter Fair, and rarely have both nature and art been blended with such satisfactory results. Our illustrations are made from photographs taken by Mr. A. A. Martin.

Earth, Sea and Sky Advertisements.

Lord Rosebery made a speech at the Royal Academy dinner lately, and the Lancet says the most amusing portion of it was on the various advertisements now occupying earth, air, and water, which have become common also on this side of the Atlantic. It is not altogether that the landscape is affected by hideous boards, which, by spoiling its beauty, influence injuriously the good taste of the traveler; it is the effect of the reading of those boards on the health both of mind and body against which we too would raise a protest. When a person leaves his home to travel through the country, whether on business or pleasure, there is always, in properly conducted journeys, some benefit derivable from the charm and picturesque character of the landscape that comes before him. He forgets himself, his worries, his troubles, his pains, in the diverting objects he sees. There is the church forming the center of the pretty village, calling up memories and suggestions which fill the mind with thoughts of the past and hopes of the future. There are the distant blue hill, the green meadow, the copse, the wood, the cottage, the castle, the park, the mansion; and connected with these there is always some bit of romance gathered from past readings and meditations which comes as a relief, a dream outside the busy world, change ing the monotony of life, and by the very forgetfulness of past troubles giving a repose in variety which has the effect of cure in some instances, of relief in all. But what shall be said when from place to place the mind of the traveling sufferer is, nolens volens, forced to dwell on his own ailments, real or imaginary? Why is he obliged to learn that he has a liver that is not in working order; or that his digestion is, day by day, failing; or that he is getting every hour weaker and weaker; or that his heart is palpitating; or that his kidneys are involved in the universal break-up of his frame; or that his brain is altogether losing its balance; or that he is becoming prematurely old; or that, in short, he must soon die if he neglects to treat himself plaster, to say nothing of two or three ointments which have the facility of going direct to the bone? Lord is many a true word spoken in jest, and, emphatically, his words were true. We hope he will not stop here, but that, holding the reins of power, he will go beyond the misfortunes of the Royal Academy and, pitying the misfortunes of the public generally, will suggest sky of these irritating abominations.

Matter-Solid and Liquid.

In the course of the last of his lectures on this subject at the Royal Institution, Professor Dewar dealt with what he said might be called the elastic problem -the relations of force or stress to the corresponding alterations produced by them in matter. At the outset he remarked that the determination of the constants of solids was more difficult than it was in the case of liquids, on account of the smaller changes in while the alteration which occurred simultaneously in sole factors. "Young's modulus." Some eross section was given by ordinary temperatures had a breaking strain of 200 The individual needs no greater capacity of persistpounds to the square inch. Some other experiments task. were also made to show the changes in the physical | It is not our intention here to follow Weismann into constants of metals at low temperatures. Two equal all the details of his argument; but his line of thought ing days.

such a distinctive feature in Japanese houses are shown and one of them was cooled to -180 degrees, the other of physiology—the cause of death. Death, in the last in our engraving. It is strange that some one has not being at the temperature of the room. A weight analysis, is an adaptation. "I do not believe," says reproduced a Japanese house for a summer villa, for which at once bent the warmer one had no effect Weismann, "that the duration of life is prescribed the construction would not be costly, the furniture on the other. Two tuning forks which sounded in because its nature is inconsistent with unlimited duraunsion became decidedly dissonant when one of them tion, but because an unlimited duration of the (no was cooled to -180 degrees, a fact which shows that longer procreative) individual would be a purposethe period of vibration had been altered by the change less luxury for the species." Death, that is, the in rigidity. Professor Dewar concluded from his experiments generally that the resistance of metals to an attribute of all organisms. There are numerous strain increased as the temperature was lowered, and lower life types, amœbæ, unicellular algæ, infusohe supposed that at -273 degrees, the zero of absolute ria, etc., which are not necessarily subject to it. They temperature, all metals would be infinitely resistant.

Simple Process of Bronzing,

The very pretty artistic effects that are obtained from galvanic bronzing cause this process to be highly esteemed by manufacturers; but it requires apparatus that one does not always have at hand. Mr. Mandit, of Caen, says Le Genie Civil, has recently made known a very simple formula, which is capable of giving every tone, from that of Barbedian bronze to antique green, from unicellular, the question arises, How has this caaccording to the length of time that the copper is allowed to remain in contact with the liquid. Its very simplicity will cause it to be appreciated by those interested.

After the piece has been well scoured it is covered with the following mixture by means of a brush:

Castor oil	20 p	arts.
Alcohol	80	"
Soft soap	40	44
Water	40	44

The piece, left to itself for twenty-four hours, becomes bronzed, and if the duration of the contact be prolonged, the tone changes. An infinite number of tones, pleasing to the eye, may thus be obtained. The drying is finally effected with hot sawdust, and it then only remains to coat the piece with a colorless varnish, greatly diluted with alcohol, in order to obtain an eminently satisfactory result.

On the Origin of Death.

The most remarkable phenomenon of life is death. To the superficial observer it may appear a matter of course that every living thing, the smallest speck of protoplasm as well as the most complicated organism. should bear the germ of death within itself, but to the more penetrating vision death presents itself as an insoluble mystery. From time immemorial the subject has been made the battle ground of metaphysical discussion; but the question of its origin, of its biological significance, of its physiological explanation, has only in quite recent years become the subject of rigorous scientific discussion.

Investigation into the duration of life constitutes the with some particular life-giving pill, potion, lotion or first link in the chain of Weismann's achievements in this direction of research. "Organic bodies are perishable; while life, with a show of immortality, passes Rosebery's humor ought not to be misapplied. There from one individual to another, the individual himself dies." So said Johannes Muller, and Weismann characterized the expression as significant, and exhaustive of all that can be said on the subject.

Be that as it may, so much at least is beyond doubt, that the life of the individual, in so far as consuch legal measures as shall clear earth, water, and cerns the experience of non-scientific observers, has its natural limitations. It is equally beyond question that these limitations vary with different species of plants and animals. The physiological constitution of the plant or animal has been supposed to determine the duration of life, but however much it may condition that duration, it is certainly not the only factor. In the last analysis the determining cause must be sought in the organism itself. The moment we endeavor to base the duration of life upon size or complexity or physiological constitution we realize that the theory is irreconcilable with the very divergent facts. The elephant volume that took place. In the case of a solid there lives to 200 years, but so also do the carp and pike; the were three constants to be found—its extensibility, its horse may live to 40 years, but so also do the toad, the torsional variation at different temperatures and pres- cat, and the sea anemone. How indeed could we resures, and its general compressibility. The extensi-concile with this theory the fact that working ants live bility of a metal was expressed by Hooke's law that for years, while the males live only a few weeks? The elongation was proportional to the force producing it, physiological conditions are most assuredly not the

This brings us to the fundamental idea of Weisidea might be gained of the resistance of any material mann's theory. According to him, external conditions framework on the beach, began to search for amberto compression or tensional strain by investigating the operating by natural selection are the prime factors force necessary to break it at various temperatures, in determining the duration of life. It will be evi-Non-crystalline metals at low temperatures would dent to every one familiar with the operation of bear a much greater strain than at ordinary ones. It natural selection that the aim to be achieved is the was experimentally shown that a rod of tin which at perpetuation of the species and not of the individual. pounds required at 180 degrees below zero a strain of ence than is necessary to the propagation of the speabout 380 pounds to break it. In the same way iron and cies, and this being provided for, we might reasonably lead at low temperatures would bear twice as much assume that the individual, having performed its chief strain without breaking as they would at ordinary life labor, would immediately die, unless the care of temperatures. The determination of the breaking the young is necessary to the maintenance of the spestrain of mercury was also shown. The mercury was cies. And this indeed is the fact. All mammals and men having already received several thousand pounds first frozen in a tube. The resulting solid rod was then birds survive the completion of their reproductive immersed in liquid oxygen and tested in the usual functions, while insects, with the exception of those way, when it was found to break with a force of 31 which care for their young, die on completion of their

the mysterious little cupboards and closets which form rods of the same material were supported at their ends takes us directly to one of the most difficult problems limitation of the continuance of life, is not really are not, of course, indestructible; heat or corrosive agencies will decompose their tissues, but as long as the necessary conditions of life persist they do not die; they have within themselves the capacity of indefinite life. They multiply by fission, and if the amœbæ were endowed with self-consciousness, there can be no doubt that after the fission each new cell would regard itself as the parent of the other. But since, according to the Darwinian theory, multicellular organisms spring pacity for eternal life been lost?

This is probably the result of the specialization of function of the several cells in a multicellular organism. We may divide the cells in such an organism into two opposing groups, the somatic and the propagating -the individual and the reproductive cells. The latter could not lose their capacity for unlimited multiplication without danger to the species; but that the somatic cells should gradually lose their power of unlimited multiplication, that they should be limited to a prescribed if even to a great number of cell generations, is explained by the impossibility of the individual cell guarding itself absolutely against accidents, and by its consequent perishableness. Unicellular organisms were exempted from death by the fact that the individual and reproductive cell were one and the same; in higher organisms the individual and reproductive cells were differentiated, death became possible, and the unlimited duration of the life of the individual superfluous; and the inexorable laws of natural selection left it, like every other superfluity, to disappear.—Die Nation (Berlin); Public Opinion.

Cars Driven by Compressed Air.

In a recent paper by M. Victor Popp, of Paris, the author described the compressed air system used for propulsion on the Nantes tramways and on the line from Paris to Nogent-sur-Marne. On the latter line each car is fitted with nine steel storage reservoirs fixed underneath the car body, containing air at a pressure of 100 lb. to 176 lb. per square inch. Three of the reservoirs form a reserve in cases of emergency. The air is heated on its passage to the motor by hot water, which at starting has a temperature of 300 deg. Fah. The cars seat 50 passengers, and weigh upward of 14 tons. They will run 12 miles with a single charge on the level, but owing to the heavy grades one charge suffices for but 8\% miles, the consumption of air being 35 lb. per mile on the grades and about 24 lb. on the level. One objection to this system of traction is the great weight of the reservoirs. By providing for the automatic recharging of these reservoirs at feeding points distributed along the line, M. Conti has succeeded in reducing the weight required very materially. The feeding points are placed at intervals of about 1½ miles, and the car as it runs over the points automatically makes connection with mains supplied from a central station, a stop of a few seconds only being required to fill the reservoirs.

Big Money in Ambergris.

The Sydney Bulletin is responsible for the following ambergris story: Two years ago one of Macgregor's (Tasmania) whaling captains, having cut the blubber from a whale, was about to cast the rest of it adrift, when there came alongside two Hobart fishermen-"Portuguese Joe" and his mate, an African negro. The Portuguese begged to be given the carcass, so that they might tow it ashore and make what they could out of it. "All right," said the skipper, with the generosity of a satisfied exploiter who knew the blubber Joe, having got the leviatha gris, which drug was quoted at that time in the current price lists at somewhere about \$65 per ounce. He found 174 pounds. Many people interviewed him, and wanted to give him \$25,000 to \$45,000 for the lot; but the man understood the luck of his find.

Meanwhile the ambergris was lodged in a bank which was presently served with an injunction on behalf of the Macgregor firm to restrain the sale of the precious prize pending a discussion on the ownership. But these legal fireworks fizzled out, and the ambergris is still being realized in London, the two fisher-

The Austrian poor law gives every man 60 years old the right to a pension equal to one-third of the amount per day which he had earned during his work-

LANTERN SLIDE ILLUSTRATING SOUND WAVES. BY GEC. M. HOPKINS.

In demonstrating the theory of sound, it is usual to illustrate the condensations and rarefactions of air which produce sound waves by light and dark bands, which give an idea of the condition of the air at any instant in which it is transmitting sonorous vibrations. But these bands do not represent the progression of the sound waves. For an illustration of this, reference is often made to the concentric undulations produced on the surface of a mill pond by a pebble dropped in the water. This depends for its value upon the student having noticed the mill pond phenomenon and upon his ability to realize that these spreading rings relate only to the feature of progression as it would present

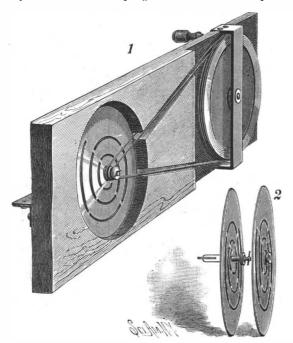


Fig. 1.-SLIDE FOR ILLUSTRATING CONCENTRIC WAVES.

itself in a section taken through a sound sphere in any plane that would intersect the center of the sphere at which is located the source of sound.

The mechanical slide shown in Fig. 1, when projected, is capable of producing on the screen a series of concentric rings of light and shade, representing the condensations and rarefactions of a succession of sound waves, and these waves, beginning at the center, constantly enlarge in circumference until they disappear at the periphery of the disk. This effect is produced by means of two thin metal disks arranged to revolve on the same axis, and each provided with a spiral slot extending from center to periphery, the slot of one disk being oppositely arranged with respect to that of the other disk. One disk is secured to a sleeve which fits on a stud supported by a fixed bar extending across the opening of the slide. The other disk turns on the sleeve. The sleeve and the disk which turns upon it are each provided with a small pulley. One of these pulleys is slightly larger in diameter than the other, so that when the two disks are projected and revolved rapidly in the same direction, one turning at a very slightly increased speed causes the points of intersection of the spiral slots to move outwardly and thus produce on the screen a series of light rings, which increase in diameter like mill pond waves. To cause the light rings and intervening dark rings to blend into each other, the slide is thrown a little out of focus.

To show interference of sound waves two images of

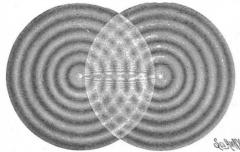


Fig. 2.—INTERFERENCE.

the slide may be projected. one being superposed on the other as shown in Fig. 2. This is easily done by arranging at a suitable angle in front of the lantern objective a series of glass plates, such as are employed in a glass plate polarizer, as in Fig. 3. A portion of the beam is transmitted, forming one image on the screen, and a portion is reflected upward and intercepted by a mirror which throws it upon the screen, forming a second, which may be made to coincide with the first, or it may be made to overlap the first image so as to produce the interference effect shown in Fig. 2. In this case the centers or wave sources are separated more than the semi-diameters of the disks, and the interfering waves approach each other from opposite directions. In Fig. 4 are shown, diagrammatically, superposed wave disks with centers one wave length apart. The waves' "crests" coincide, and re-enforce-

ment along a line joining the two centers is the result. If the centers were a half wave length apart, the 'crests" would alternate and one set of waves would neutralize the other.

In Fig. 5 are shown diagrammatically two disks of different size produced by dividing the beam before it passes through the objective, projecting the two parts of the beam with objectives of slightly different power. In this case, owing to the difference in the size of the disks, the relative velocities of the wave rings differ, so that the waves of one series over- States authorities have instituted a system of inspectake the waves of the other series at a, thus illustrat- i tion and tests of armor which aims at a completeness ing the phenomenon of beats.

The Decline in Price of Electrical Equipments.

In commenting on the business situation and the decline in prices of electrical apparatus, the *Electrical* Review says: "Six years ago the price for a complete plates which defied all comers. Then our own Sheffield equipment for a trolley car, including two motors, was about \$4,500. This price held for a year and a half and then dropped to \$3,850, \$3,500 and \$3,300, until pushed on without hinderance, employing Harvey's two years ago it was about \$2,850. One year ago

improved in quality and efficiency, while to-day the average price is between \$1,000 and \$1,200. We have been told of an electric railway manager who desired quite recently to purchase an equipment for a single car. He wrote to seven manufacturing companies, and immediately was called upon by seven salesmen, all of whom had paid traveling expenses to try for the order. The prices quoted ranged from \$1,500 to \$640. The manager

crease in actual selling prices from \$4,500 in 1888 to \$640 in 1894, a period of six years. In 1888 there were seven electric railways in the United States. In January, 1890, there were 162 electric railways in operation and in process of construction. In January, 1891, this number had grown to 281, while to-day there are probably over 500 cities in the United States equipped with electric roads, many of them of great mileage, as in Boston, Brooklyn, St. Paul, Minneapolis and Cincinnati.

"This marked reduction in the price of railway apparatus during the short period of six years is due largely to competition between manufacturing companies, but chiefly to a reduction in the cost of manufacture, accompanied by an increase in the quality of the product. The margin of profit on the equipment mentioned at \$4,500, in 1888, was not as large as it was on a better equipment at \$2,850, in 1892, owing to the reduction in the cost of manufacture. While prices have been fearfully cut during the last year by all the manufacturing companies, partly due to intense competition and partly to the business depression, we do not believe that any company can make and sell a satisfactory car equipment for \$640 and clear a profit on it."

The Nickel Armor Plates.

Speaking of the recent failure of a Harveyized plate, the Engineer, London, says:

"There is nothing surprising in this result. With very thick plates terrible disappointments have taken place in our own country. We have known a case where visitors were specially invited to witness a trial ing solution where the light has not acted. It will be and when the disappointment was most crushing, but observed that no rolling up with printing ink is neceswe did not telegraph the result to America. This was sary, as in the case of a zinc plate etched in acid. The

many years ago, and we have since that had further experience with very thick plates, much more than has been acquired in the United States. There has been one remarkable success reported in America with 14 inch Harveyed nickel steel. We expressed our surprise and admiration at it. Our own makers have not as yet obtained so successful a result with thick armor, and having thus expressed ourselves, it is not to be expected that we should be surprised when thick Harvey armor talls short of such a standard.

"The actual measure of the failure, as shown by calculation, is as follows:

The first blow represented a perforation of 18.7 plate is next strongly heated until the coating assumes inches of iron only. The second blow represents on the English system 251/2 inches of iron, or 201/4 inches of steel, and on Krupp's system 271/2 inches of iron, or 22 inches of steel. It was sanguine, indeed, to expect this 18 inch plate to stand the second blow, but it undoubtedly should have borne the first if its quality had been anything approaching to that of the thinner plates. In the light of past experience with thick armor, however, we think very little of the matter, and are inclined to believe that the United States authorities will have to lower their standard, or else that the Indiana and her sisters will wait a long time for their armor. We have before noticed the admirable behavior of Carpenter projectiles, which are perhaps the best we have seen of large caliber.

"We are not taking a popular view in speaking as as forty different meanings.

we do. But are our readers aware that in testing samples systematically for acceptance of the supply of 18 inch plates, the United States authorities are doing what has not been done in this country, and we doubt if it has been done in any country? Individual 18 inch plates we have undoubtedly tested at Shoeburyness, but the regular selection of samples for the acceptance test of 18 inch armor has, we think, not been attempted as it has been with the thinner kinds, for which only, provision exists on board the Nettle. The United and at a standard not attempted elsewhere. They have been hoodwinked and met with disappointment, but let us make no mistake in the measure to which the disappointment extends.

"Until recently, the United States had produced makers were literally "put on their metal." Mr. White took steps and made such arrangements that we process in combination with the much more complete \$2,000 was the price of the same equipment, greatly system of water chilling which had been patented by

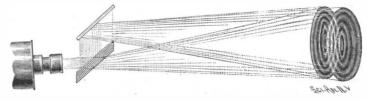


Fig. 3.-ARRANGEMENT FOR PROJECTING TWO IMAGES OF THE SLIDE.

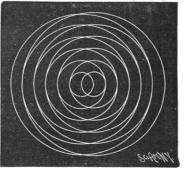
bought the \$640 apparatus. Here we have a de-|Tresidder, whose patents, we understand, have held good on the Continent, where Harvey's have failed. We hold that what was then done in England can hardly be too highly praised. We have since that time obtained results with treated steel armor of medium thickness that will compare with anything. It was the successful Vickers treated plate that finally led us on our present path. Cammell and Brown have since produced the first-class armor to which we refer. 'Mr. White decided-and, we were inclined to believe, rightly decided—to discard nickel, and recent events. as far as they go, bear this out. We hope that at the present moment we have taken the lead again in armor, but we cannot say more than 'hope' until we have had a fair competitive trial with America."

Photo Etching on Copper.

As explained by Mr. Calmels, the polished copper plate is sensitized with the following solution:

Fish glue	2 oz.
Albumen	2 oz.
Water	4 oz.
Ammonium bichromate	60 grains

The plate is then placed on a whirler so as to produce evenness of coating, and remove the superfluous solution. After drying, the plate is ready for exposure under the negative, which, of course, has been associated in the camera with a lined screen. In this case it may be mentioned the screen used had 135 lines to the inch. The exposure necessary for a copper plate prepared in the way described is about two minutes to direct sunlight. Development is brought about by simple washing in water, which dissolves out the coat-





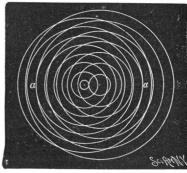


Fig. 5.—BEATS.

a brown color. The lecturer used an iron plate for this purpose which was heated from below with a powerful Bunsen burner. After cooling, the plate was put into an ordinary porcelain developing dish and covered with an etching solution of perchloride of iron (strength 30° Baume). The coating was evidently of a very tough nature, for the lecturer rubbed its surface with a pledget of cotton wool while in the bath. At the end of about a quarter of an hour the etching operation was complete, when the plate was washed, dried, and a proof in printing ink of a very satisfactory nature, considering that hand pressure only was applied to it, was quickly obtained.—Photographic News.

Some words in the Chinese language have as many

RECENTLY PATENTED INVENTIONS.

Engineering.

SMOKE ARRESTER.—William P. Shank Cairo, Ill. This invention comprises a water tank and collecting chamber, with nozzles leading from the chamber to the tank, and blast devices discharging into the tank for the separation of the soot, the nozzles opening below the surface of the water and having contracted dis charge openings. The invention is designed to effectu ally stop the emission of heavy products usually dis charged in smoke from furnaces

COAL CHUTE.—John Scully, South Amboy, N. J. This invention relates to chutes for discharg ing coal from cars into vessels, coal bins, etc., and provided with screens over which the coal passes. The chute is supported on the usual framework, with tracks and openings between the rails for dumping the coal into pockets, in connection with which is an adjustable sliding gate, arranged below which is a screen bottom, while a lower or swinging chute is hinged to the fixed chute. The pitch of the swinging chute may be arranged as desired, and the stream of coal is somewhat retarded, so that while an even and not too large quantity of coal will be run steadily over the screen, the coal will be kept and delivered in good condition.

Railway Appliances.

CAR BRAKE.—John Mayer, Amsterdam, N. Y. According to this improvement peculiarly constructed frictional contact blocks are supported above the track rails near the car wheels, and means are provided to rock the blocks to cause them to have more or less bearing on the top faces of the rails, the faces $\,$ of $\,$ the blocks acting in a measure as cams to lift the car body from the track, and, in cases of extreme urgency, thus lifting the entire weight of the car upon the brakes

FREIGHT CAR. - John J. McClimont and Peter Marron, Aspen, Col. A simple device applicable to the roof of a box car has been provided by these inventors, so that openings in the roof may be easily made when necessary to facilitate loading and unloading, but such openings may not be made from the exterior of the car. The covers of these openings are so arranged that in connection with an ordinary chute they will form a hopper through which grain, ore or other freight may be loaded on the car, and a simple lock is provided for fastening the covers to the openings on the inside of the

RAILROAD RAIL OR TIE DISTRIBUTER. -Caleb C. Gates, Forsyth, Montana. This is an attachment for a car adapted to carry rails or ties, consisting of a series of roller sections and supports adjustably and removably connected, whereby the distributer may be made in any desired number of sections, readily coupled together and rigidly held at the desired angle. The speed of the material passed over the distributer may also be regulated, and the rails be directed either to the right or the left in discharging them.

Mechanical.

WRENCH.—Archibald McCallum, Conrad, Pa. This is a quickly adjusted and convenient tool in which the handle and head are adjustably connected to enable the handle to be placed at the desired angle to the head. This adjustment of the handle may be easily effected, and provision is made for working the wrench as a ratchet wrench in either direction, the head being locked at any angle in fixed relation to the handle, against movement in either direction.

CLEAT.-John C. Steelman, Linwood, N. J. 'This inventor has provided a clamp consisting of a body with a recess or mouth in one of its ends and inclined lower roughened wall, a jaw eccentrically pivoted in the mouth having a concaved ribbed lower face. The improvement forms a simple, strong and inexpensive device adapted for use wherever the clamping of a rope is required, the cleat biting the rope or cable forced in con-

LEATHER STRIPPING MACHINE. Michael J. Ryan, New Orleans, La. This machine is adapted to cut an entire side of leather into a series of strins of a desired width at one time, the leather being properly fed and guided and the strips smoothly and rapidly cut. The machine has a pair of feed rollers, the upper one with projecting bearing faces, and mounted above it is a swinging bar, to which is secured a number of downwardly projecting and laterally adjustable knives. The leather as cut is delivered in parallel strips at the rear end of the table.

MATCH MAKING MACHINE.—Henry A. La Chicotte and Walter B. La Chicotte, New York City. The veneers of wood fed to this machine are cut into splints of the desired cross section, and the splints are fed to an apparatus which cuts them of a uniform length. the splints before being cut being engaged by gripping devices which carry the splints after being cut to an oil or paraffine bath, and next to a bath of an ignitable compound, finally removing them to be dried and delivered to a suitable receptacle, the operation being continuous and automatic after the veneers, have been once fed into the machine.

Agricultural.

POTATO DIGGER.—Nathan Sturdy, Chicago, Ill. In this machine an elevator frame and a draught frame are pivoted on the axle on which the two supporting wheels are loosely mounted. An adjustable shovel removes the potatoes from the ground, to be received, together with the vines or roots that may cling to them, by the elevator, which has a vibratory motion de signed to free the potatoes from dirt, etc., and deliver them to a hopper, whence they are directed to receptacles on platform at the rear of the machine

TRANSPLANTING MACHINE. - August Willner, Germantown, Ohio. This is an improvement in of this paper.

machines having furrow openers and liquid discharging tanks, with means for closing and smoothing the furrow whereby the furrow is opened to place a plant therein the soil is moistened, and the loose earth carried around the roots of the plant and pressed down by a covering or pressure wheel. This machine is adapted to rise and fall according to the inequalities of the ground or to pass an obstruction, being fitted for work on a hill side or on rough ground as well as upon a level.

Miscellaneous.

PHOTOGRAPHIC LENS, ETC.—Henry Vander Weyde, London, England. This invention re lates to portrait photography and consists essentially in interposing in the pencil of rays lens-like media of peculiar form, convex or concave, whereby the rays of light will be so refracted as to produce the effect desired, and yet the parts modified will flow into and merge with the surroundings. The media may be interposed either within or without the camera, the curvature and form of the lens-like medium varying according to the desired effect, whereby different portions of a picture may be made larger or smaller, or otherwise artistically modi-

TRIGGER FOR DOUBLE-BARRELED Guns.—William Fleming, Newberry, Pa. In this firearm a single trigger is combined with two sears, the trigger carrying an adjustable shoulder, adjustable laterally. in connection with a spring for throwing it to a middle position, and locking devices for holding it to either side. The invention is designed to dispense with the necessity for more than one trigger for double-barreled guns, and provide a trigger by which either barrel may be fired independently or both barrels together, or either one in sequence after the other.

SAFETY MATCH.—William Barnhurst. New York City. According to this invention the match splint is detachably connected with a sleeve or envelope, the sleeve having a rubbing compound and the splint an igniting compound, each held normally out of engagement with the other, and yet located one in the path of the other, ignition being effected when the splint is separated and drawn from the sleeve. The two parts are combined in one article forming the match. which is ignited as the splint is withdrawn from the casing.

GATE LATCH.—Gabriel Rohrbach, Del Rio, Texas. This improvement relates especially to latch attachments for swinging gates which move the lock latch vertically as they are swung. The gate has a pivoted latch arranged to engage a catch consisting of oppositely arranged pairs of converging flanges separated to receive the latch, swinging detents being pivoted inside the entrance slots, and a keeper being placed below the lower flanges. The device is very simple, durable, and easily applied.

STOPPER.—Max Rubin, New York City. -This device comprises a shell having an inlet in its bottom and a spout leading from one side near the bottom while a plug valve fitted to travel up and down in the shell has at its upper end a lip closing over the outer end of the spout when the valve is seated in the shell. The improvement is adapted for use with bottles of any de scription, cans, or other receptacles, the stopper auto matically and perfectly sealing the outlet when seated in

DISPLAY BOX.—Nicholas Schroder, New York City. A box to conveniently hold scarfs and similar articles in position for shipment and display in stores has been provided by this inventor, the box being strong, simply made, and inexpensive. A flanged holder is secured to the bottom of the box, while triangular projections between the flanges form notches for the recep tion of the article, tongues extending from one flange nearly to the other.

PENDULUM ESCAPEMENT.—Charles E. Buckbee, Flushing, Mich. The escapement wheel, according to this invention, has on one surface a series of inclined planes extending from near the center to the periphery, the planes being located at stated intervals, and friction rollers on the ends of a crosshead secured on the pendulum rod are adapted for alternate engagement with the inclined planes on the wheel. The construction is durable and simple, and the escape wheel has no re coil.

ICE CREAM FREEZER.—Joseph B. Butler, Brooklyn, N. Y. This is an inexpensive and easily operated machine for readily and quickly freezing individual creams in numerous compartments, creams of dissimilar flavors being thus simultaneously frozen. The several compartments or cups are so arranged that they may be readily removed, and each is hermetically sealed by a cover which prevents contact with the brine or water of the freezer.

CHECKREIN SUPPORT.—Joseph Carter, Blyth, Canada. This is a combined checkrein support and winker stay, the support for the overdraw check effectually preventing the checkrein from wearing upon or rubbing against the head of the horse, while the winker stay is adapted for attachment to the winkers or blinds, which may be held at any desired angle to the animal's head, and be quickly and conveniently adjusted in the required position.

CIGARETTE WRAPPER HOLDER.—José R. Hernandez, Havana, Cuba. This is an improvement on a formerly patented invention of the same inventor for a device for holding and smoothing the wrappers be fore they are rolled around the filler. A lever is pivotally connected with uprights in a table on which the wrappers are laid, a pedal being connected with the rear arm of the lever and a plunger with its front arm, with which also is pivotally connected a ring, in connection with a guide secured to the table, and a spring bearing on the

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

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 I hursday morning to appear in the following week's issue

"U.S." metal polish. Indianapolis. Samples free.

For pile driving engines. J. S. Mundy, Newark, N. J. Microbe Killer Water Filter, McConnell Filter Co Buffalo, N. Y.

Bookbinding.—All classes of work. Magazines specialty. Haddon & Co., 139 Center St., New York.

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

Screwmachines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Centrifugal Pumps. Capacity, 100 to 40,000 gals. per minute. All sizes in stock. IrvinVan Wie, Syracuse, N.Y.

Emerson, Smith & Co., Ltd., Beaver Falls, Pa., will end Sawyer's Hand Book on Circulars and Band Saws free to any address.

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

'The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, \$4; Munn & Co., publishers, 361 Broadway, N. Y.

For the original Bogardus Universal Eccentric Mill, Foot and Power Presses, Drills, Shears, etc., address J. S. & G. F. Simpson, 26 to 36 Rodney St., Brooklyn, N. Y.

Patent Electric Vise. What is claimed, is time saving. No turning of handle to bring jaws to the work, simply one sliding movement. Capital Mach. Tool Co., Auburn,

Competent persons who desire agencies for a new popular book, of ready sale, with handsome profit, may apply to Munn & Co., Scientific American office, 361 Broadway, New York.

Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

SCIENTIFIC AMERICAN

BUILDING EDITION.

JUNE, 1894. -(No. 104.)

TABLE OF CONTENTS.

1. Elegant plate in colors showing a cottage at Rochelle Park, recently completed for Dr. N. M. Beckwith. Floor plans and two perspective elevations. Cost complete \$11,000. Mr. G. K. Thompson, architect, New York. A very unique design in the old Dutch style of architecture.

Plate in colors showing a handsome residence at Evanston, Ill., recently completed for H. D. Cable, Esq. Two perspective views and floor plans. Messrs. Raeder, Coffin & Crocker, architects, Chicago, Ill. An elegant design.

An attractive residence at Hartford, Conn., recently completed for Albert S. Cook, Esq. Cost \$7,500 complete. Mr. A. U. Scoville, architect, Hartford, Conn. A pleasing and attractive design, two perspective views and floor plans.

Perspective elevations and floor plans of a residence *at Portchester, N. Y., recently erected for William Mertz, Esq. The design is severely classic in its treatment and illustrates the American progress in architecture. Mr. Carl Volz, architect, New York.

5. A residence in the colonial style recently erected at Ashbourne, Pa., for Addison Foster, Esq. Perspective elevation and floor plans. Estimated cost \$5,500. Mr. Samuel Milligan, architect, Philadelphia, Pa.

6. A residence at Freeport, L. I., recently completed for J. E. Brown, Esq. Perspective elevations and floor plans. Cost complete \$6,950. An attractive

7. The dwelling of J. S. Benner, Esq., at Reading, Pa. Three perspective views and floor plans. Mr. Geo. P. Barber, architect, Knoxville, Tenn.

8. A colonial cottage recently completed for Howell E. Beane, Esq., at Ashbourne, Pa. Cost \$4,000. Perspective elevation and floor plans. Mr. Horace Trumbbauer, architect, Philadelphia, Pa.

9. Perspective elevations and floor plans of a cottage recently erected for A. P. Dunn, Esq., at Lowere, N. Y. An elegant and attractive design. Cost complete \$3,800. Mr. R. H. Duryea, architect, New York.

10. California Midwinter Fair. Half page engraving. showing a bird's eye view, the Mechanic Arts Building; also a view of the Fine Arts Building.

11. Miscellaneous Contents: Damage to water pipes by electrolytic action.—Red slate.—Treating stones for construction.—Metal plated lumber.—Damage by lightning.—Gas from wood.—The steel-clad bathtub, illustrated.-An attractive greenhouse, illustrated.—The band resaw.—The "Grand" fireplace heater, illustrated.-Fly screens, illustrated.-The Norris patent sash pulley, illustrated.—Glu tol.—The Ives sash lock, illustrated.—Interior finish of the home.—The Peerless steam and hot water heater, illustrated.-Reproducing architects' drawings.—Cortright metal roofing shingles, illustrated.-A fine metalwork arch, illustrated.

The Scientific American Architects and Builders Edition is issued monthly. \$2.50 a year. Single copies. 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITEC-TURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural Publication in the world. Sold by MUNN & CO., PUBLISHERS,

361 Broadway, New York.



HINTS TO CORRESPONDENTS.

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.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Infermation 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.

Winerals sent for examination should be distinctly

Minerals sent for examination should be distinctly marked or labeled.

(6098) R. B. asks: 1. What is the specific gravity of the vapor of benzine? Is it heavier than air. A. The vapor of benzine or naphtha is heavier than air. Its specific gravity being from 2.0 to 2.5. 2. Mercury boils at 662° Fah. How high a temperature will it record reliably? A. Mercurial thermometers are made for temperatures up to 600° Fah. 3. What are the temperatures required for distilling of benzine,gasoline, kerosene, lubricating oils, and paraffine, and what is the greatestheat required in any process of distilling crude American oil? A. Light benzine boils and distills at from 189° to 200° Fah. Naphtha and gasoline at 250° to 300° Fah. Kerosene, 300° to 350°. Paraffine is separated after the last distillate. About 400° Fah. is the highest heat. 4. What is the difference between paraffine and vaseline? A. Vaseline is the residue from the oil stills purified by filtration, See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 439, 485, for details of the process, $10\,\mathrm{cents}$ mailed. It is virtually a soft paraffine. 5In distilling crude oil there is a very poisonous gas comes out of the tail pipes. What is it chemically? When there is sulphur and arsenic in the crude oil, do they make the escaping gas any more deleterious? A. There are lighter hydrocarbon gases distilling under 170° Fah. that may carry off vapors of sulphur and other poisonous substances constituting the first gases from the tail pipes. 6. About what proportion of air and benzine vapor is explosive? A. Any proportion of air and benzine or gasoline vapor between equal parts and 1 of vapor to 12 of air is explosive.

(6099) R. M. G. asks: What is the longest distance a cannon has been known to throw a shot? What is the greatest range attained by modern guns / What is the greatest range of the guns (heaviest) of H.M.S. Blake? For what distance are the guns of the Blake sighted? Is there any truth in the statement that a gun is, or has been, chained to the rocks at Dover, England, which threw a shot across the English Channel to Calais? A. Seven or eight miles is probably the greatest range actually made. Twelve to thirteen miles is the computed range of the most powerful guns now made. To obtain this range an elevation of nearly 45° is required. The mounting of the guns of the Blake and other ships carrying heavy ordnance is not intended for the greatest possible range. They can be sighted for ranges up to 7 or 8 miles. Shooting across the English Channel has been commented upon in journals and military circles.

(6100) M. W. asks what kind of paper to put on pulleys to keep them from slipping. Also a recipe for making cement for putting it on. A. Use the toughest wrapping paper that can be obtained. If the pulley has been used and is polished, scratch the face with a coarsefile and remove all grease or oil with a solution of sal soda. For the cement use the best glue, soaked and cooked quite thick. When ready to apply the paper, add a half gill of hot strong decoction of oak or hemlock bark to each pint of glue. Have the pulley warm and apply the glue to the paper in strips and wrap tightly on the pulley as many thicknesses as may be desired. Six to eight thicknesses make a good working pulley, durable, according to the severity of the work, from 6 months to 3 years.

(6102) M. L. R. asks: 1. Which is the better for use on a short telephone line, No. 16 hard drawn copper wire or No. 12 galvanized iron wire? A. The copper wire. 2. How many cells of the diamond carbon and how many cells of the Samson battery would it require to ring one bell through a line 1,000 feet length with earth return? A. Allow four to six cells. 3. How much does No. 12 galvanized iron wire weigh per mile? A. 327 pounds. 4. Can a common telephone receiver, such as was fully described in the Scientific American of February 3, 1894, be used successfully as both receiver and transmitter? A. Yes. 5. Will the receiver with the compound magnet give any more volume of sound over a given amount of wire than a re ceiver with a round bar magnet? A. The compound magnet telephone is the best. 6. What is the charging fluid of the Samson battery? A. Solution of chloride of ammonium. 7. Which is the better for open circuit work and which has the longer life, the Samson or the Diamond carbon battery? A. We cannot undertake to pronounce as to relative merit in such cases. 8. Will you please give me the address of some reliable company where I can get a good receiver at a low price? A. Consult our advertising columns.

(6103) W. A. asks how to determine the amount of current and number of volts necessary to run an electric motor, the size and number of feet of wire being known. I have a small motor; the armature is wound with twelve coils of No. 22 wire, twelve feet in each coil, 144 feet in all, and the fields are wound with 350 feet of No. 18 wire, and I wish to know the amount of current and number of volts it will require to run it to its full capacity. A. The current and voltage required depend on whether the motor is shunt or series wound If shunt wound, allow all the current the field wire will stand, and calculate by Ohm's law the voltage for this current based on the resistance of the field. If series

wound, then give twice the current the armature wire would stand and apply Ohm's law as above. For electrical calculations we refer you to Sloane's "Arithmetic of Electricity," \$1 by mail.

(6104) W. S. E. asks: 1. Introducing a resistance into the field of the dynamo, are the E. M. F. alone reduced or is the E. M. F. and C. both reduced? A. If shunt wound, both are reduced. 2. Has aluminum ever been reduced directly from common clay? A. Not to any great extent. 3. Give chemical formula for the hydrated oxide of aluminum. A. Al2(OH)6. 4. In the electrolysis of a compound body, what disadvantage, if any, is there in employing an electromotive force greatly in excess of the E.M.F. necessary to effect the decomposition'? A. None except perhaps wastefulness of energy. 5. What is the present market price of aluminum? A About \$1 a pound.

(6105) H. G. K. asks: Kindly inform me of the method of obtaining the amount that a safety relating to steam engines. A. The electric horse power and high wheel is geared to. And supposing it is 60, what is the denomination of 60? A. For a safety count the teeth on the sprocket wheels, divide the number on the crank axle sprocket by the number on the driving wheel axle, and multiply the diameter of the driving wheel by the quotient. We do not understand what you mean by the other query about the high wheel. If you refer to a geared ordinary or front driver, try how many times the front wheel revolves for one revolution of the pedal and multiply the diameter thereby.

(6106) B. asks (1) how to construct a simple, long-lived, effective battery for bell work. A. Make a sal-ammoniac zinc carbon couple with large area of carbon. 2. How many cells and what number copper wire will be required to operate one bell, 50 foot circuit? A. Wind with No. 22 or 24 wire, using two or three oances. 3. Where can I purchase shell, diaphragm, etc., for telephone described in Scientific American of February 3, current year? A. Address some of our advertisers who sell telephones.

(6107) R. W. R. asks: 1. What should be the voltage and amperage of a current to run 641 motor to best advantage, the armature being wound with No. 16 wire, having 4 layers of 7 convolutions each to each coil? A. Eight or ten amperes and seven volts. 2. What would be the resistance of water in a glass tube of half inch inside diameter for each inch between electrodes? A. It depends on size of electrodes and on the purity of water. 3. Would the armature core of 641 motor answer as well, made of No. 14 iron wire instead of No. 18, also would it make any difference if the wire was not all one piece, or must there be perfect connection through its entire length? A. Any wire will answer. It need not be continuous. 4. I notice in making the mixture of 4 parts resin, 1 part gutta percha, and a little boiled oil, for coating wooden battery cells, that unless the amount of boiled oil is extremely small, the solution will not harden; is this due to a bad sample oil, would not paraffine answer instead of oil? A. Use oil. Be sure it is boiled oil. You might add some liquid drier.

(6108) G. F. D. asks: 1. Which has re latively the most conductivity, viz., a No. 16 galvanized iron wire or a common fuse wire of exactly the same size as iron wire? A. If of lead, the fuse wire has least conductivity. 2. In building a metallic circuit telephone line with No. 16 galvanized iron wire, what size fuse wire should be used for safety cut-outs? A. Use fuse wire of the diameter of the copper house wire

(6109) L. P. asks: 1. In what number of the Scientific American was the induction coil for alternating currents described? A. Vol. 68, No. 10. 2. Can the coil give an alternating induced current without stoppage while the primary circuit is closed? A. Yes. 3. What firm makes a transformer to change a low voltage to a high voltage? A. Address any of our advertisers of electrical goods, such as J. H. Bunnell & Co., 76 Cortlandt Street, New York. 4. Does the amperage of a transformed current rise with the voltage of not? A. Yes, if a circuit of low impedance is open for it.

(6110) R. W. S. asks: 1. Will you please inform me how to find the amperes of an incandescent lamp or an arc lamp, only knowing the candle power? A. You cannot unless you have also the voltage. Allowing 3 watts to the candle power, you can calculate the amperage if you have the candle power and voltage. 2. Will six cells sal-ammoniac battery charge a storage battery, 4 plates, 3×31/2? A. No. 3. What kind of acid would you use in a storage battery? A. Sulphuric acid. 4. Is there any kind of closed circuit batteries not using strong acids? A. The Daniell and similar combinations use copper sulphate and no acid

(6111) E. F. B. asks: In your issue of May 26 I find an article on "Hard Water," from The Asclepiad. To soften hard water, the addition of lime water is recommended. The water of this section is already surcharged with lime, and it would seem like "carrying coals to Newcastle," to add more. Does not the article refer specifically to Great Britain, with its chalk deposits? A. The softening process alluded to is designed for water charged with calcium bicarbonate For gypsum-charged water it is ineffectual. We pre sume that your region has water of the latter type. See next query.

(6112) W. A. C. writes: In your issue of May 26 is an article by Sir B.W. Richardson, "How to soft en Hard Water by the Use of Lime." I always supposed hard water was caused by its being already impregnated with lime. In one of your issues will you kindly explain how this can be? A. Hard water may be charged with calcium sulphate (from gypsum rocks) or with calcium bicarbonate. If the latter is present, the addition of calcium hydrate or lime will produce calcium carbonate. The latter is insoluble and will be precipitated. The reaction is $CaH_2(CO_3)_2 + Ca(OH)_2 = 2CaCO_3 + 2H_2O$. The CaCO₃ is precipitated.

(6113) W. P. C. writes: What difference does it make if a receiver is wound to 75 ohms? Will it work as well on a short line as it does on a long line, and what does the resistance have to do with the working of the telephone? A. Resistance does not help, but injures the working of a telephone. The statement of "resistance 75 ohms" is merely a convenient way of prescribing how much wire shall be wound on it. The

working is due to the turns of wire; if the resistance could be zero, it would be all the better. The turns of the telephone coil are needed for short or long line connections

(6114) W. A. H. writes: If two electromagnets are mounted on a base, each provided with an armature, connected to the same lever, the lever pivoted between the two magnets (walking beam style), and one pair of magnets excited by a battery to an attractive strength of 2, which will hold the seesaw lever against it, or as close as an ordinary telegraph sounder armature is held? Now, if the other pair of magnets be excited to an attractive strength of 3, can it overcome the attractive force of the first pair, and draw the lever in the opposite direction? A. It is a question of relative distance. If the lever has any amount of play, it will stay attracted by the magnet whose poles it nearly touches.

(6115) E. S. asks what difference there between an electric horse power and the horse power is equal to 746 watts or volt-amperes, the steam horse power to 33,000 foot pounds per minute; one is convertible into the other.

(6116) H. R. E. asks: In purifying a mineral (clay) I am using hydrochloric acid. What will entirely remove the acid or neutralize its effect? A. Washing with water or neutralization with dilute caustic soda solution.

(6117) F. P. R. asks: By whom and when was the first piano made on this continent? A Jonas Chickering was the pioneer maker, beginning in 1822, and exposing his first piano for sale in Boston April 15, 1823. Previous to this some unimportant at tempts at piano making, it is said, were made.

(6118) J. W. B. asks how to obtain the gold from a solution of its alloys in nitro-hydrochloric acid. A. Ferrous sulphate, oxalic acid, and many other reducing agents will precipitate metallic gold from the solution of its chloride.

(6119) C. A. C. writes: I have just finish ed an 8 light dynamo described in Supplement 600 and i works to perfection. 1. How can I make a nickel plat ing tank, and what is it painted with inside? A. Smear wooden cell, when perfectly dry, with a cement of 4 parts resin, 1 part gutta percha, and a little boiled oil, melted together. 2. What amperage should dynamo give for general plating? A. One tenth ampere per square inch of electrode at starting, dropping to one-fifth this amoun after starting. 3. I have a sparking coil made with one inch core of fine wire wound with six or eight layers of No. 14 D. C. magnet wire and is 8 inches long. run it with four large bichromate potash cells, but it doe not give enough spark to run my gasoline engine. A Your coil needs more turns of wire; simply add ten to twenty layers of No. 20 wire. The length of spark is duto number of turns of wire; a small wire is not as good as a coarser one. It might pay better to remove the large wire, and rewind with thirty or forty layers o No. 20. The latter is coarse enough

(6120) J. C. P. and S. write: We have built the 8 light dynamo as described in Supplement No. 600, winding field magnets each leg with four layer No. 12 magnet wire. One leg of the magnet seems very soft iron and the other appears harder, as though they were not both cast at the same time. It runs very nicely as motor, but as a dynamo will run one 52 volt lamp at only about half its candle power, and when more lamps ar connected it will not light them at all. Running at 2,60 per minute, one lamp and volt meter in circuit, meter shows 35 volts. Can you give us information that wil help us out of our difficulty? A. You may have either to weak a field or too few turns on your armature. The relation between armature and field resistances depends on external resistance and on whether the connections ar in shunt or series. The difference of hardness of the two arms may affect the working of the dynamo.

(6121) W. L. B. asks: Which would be the most economical to use as power, compressed at 'dry" or a vacuum power? In producing vacuums, i there a loss corresponding to the heat generated in com pressing dry air ? A. Compressed air is more economica than a vacuum for power purposes. A larger range of pressure can be used with compressed air and with les loss from engine friction than with a vacuum. There i loss in heat by expansion and consequent shrinkage o pressure, alike in both systems; with the additional dis advantage of limited pressure practically below 1 pounds in the vacuum system.

TO INVENTORS.

An experience of forty-tour years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and alforeign countries may be had on application, and person contemplating the securing of patents, either at homeon abroad, are invited to write to this office for prices which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office Scientific American, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

June 12, 1894,

AND EACH REARING THAT DATE

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

Adding machine, J. P. Royall	
Advertising match box, J. J. Harrison	521,212
Alarm. See Boiler water alarm. Burglar	
Ammonia, process of and apparatus for ma	nufac-
turing aqua, Charlton & Mitchell	
Animal trap, Loomis & Harris	
Axle box lid, N. H. Davis	521.207
Axle box lid, ear, N. H. Davis	.521.231, 521.232
Badge, B. S. Whitehead	521.198
Bait bucket, O. M. Muncaster	521.244
Baling press feed attachment J. S. Tuttle.	521,193
Band cutter and feeder, E. J. Vraalstad	
Barrel, knockdown, G. R. Lund	
Barrel making machine, P. Little	521,319
Battery. See Electric battery. Thermo-e	
battery.	
Bearing, ball, M. Wogan	521.399
Bench pin, guide, and knife, combined of	arpen-
Bench pin, guide, and knife, combined of ter's, J. H. Fredericks	521,234

	Smerican.	
ı	Bevel, J. T. Langlais	Mea r Mec
	Bit. See Boring bit. Block. See Detaching block. Boat hallasting device. J. P. Pool. 521.388	Met
1	Boiler feed, automatic, H. J. Weisser	Mot Mus Mus Mus Mus
e t	Boring bit, A. A. Bourgeous. 521,430 Box. See Advertising match box. Knockdown box. Whist box. Box, T. Drummond 521,156 Box machine, C. B. Southard 521,224	Nail Nut
e	BOX, T. Drummond 22,139 BOX machine, C. B. Southard 521,224 Brace drill, E. E. Anthony 521,327 Brake, See Vehicle brake 521,252 Brick machine, H. Stuckey 521,349 Bricks truck, Warner & Hammond 521,196 Bricks, tiles, etc., facing, A. L. R. Van den Serghen Broom head, J. R. Gilhert 521,161	Oil a
- 1	Brick truck, Warner & Hammond. 521,195 Bricks, tiles, etc., facing, A. L. R. Van den 521,226 Berghen. 521,226 Broom head, J. R. Gilbert. 521,161 Buggy top support, T. MacGlashan 521,415	Pap Pav Pen Pict Pile
•	Bercks, tiles, etc., facing, A. L. K. van den 521,226 Broom head, J. R. Gilbert. 521,141 Burggy top support, T. MacGlashan 521,415 Burglar alarm, L. S. Buffington 521,415 Burglar alarm, C. R. Hoopes 521,239 Burner for the combustion of gas or vapor for heating purposes, H. A. & H. A. House, Jr. 521,438 Button, J. V. Pilcher 521,407 Candles, apparatus for manufacturing bollow. L. J. B. Fournier 521,432 Car coupling, H. Deitz 521,433 Car coupling, H. Deitz 521,432 Car coupling, J. D. Gooley 521,262 Car coupling, A. L. Rue 521,376 Sunday 5	Pile Pipe Pipe
r	heating purposes, H. A. & H. A. House, Jr 521,165 Button, J. V. Pilcher 521,418 Candles, apparatus for manufacturing bollow. L. J. B. Fournier 521,407	Pipe Pipe
e -	Car coupling, H. Deitz. 521,362 Car coupling, J. D. Gooley 521,262 Car coupling, A. La Rue 521,376 Car coupling safety attachment, J. A. Markley 521,243 Car coupling safety attachment, J. A. Markley 521,243	Plan Plum Prem Prin
ı l	Car coupling, A. La Rue 221,376 Car coupling, A. La Rue 221,376 Car coupling safety attachment, J. A. Markley 521,338 Car door, P. T. Mooney 521,383 Car door, W. L. Ransome 521,296 Car pilot or guard. R. A. Crawford 521,307 Car safety guard. street, Norton & Rice 521,307 Car whoels making W. A Pearson 521,324	Prii Prii Pro
c	Car wheels, making, W. A. Pearson. 521,331 Cash register, T. Carroll. 521,332 Cash register and indicator, T. Carroll. 521,332 Cash register total adding, T. Carroll. 521,233 Casket lining, F. S. Pinkham. 521,214 Castet pedestal, E. E. Fisher. 521,211 Centering tool, F. B. Covel. 521,226 Chair. See Dental chair. Knockdown chair. 521,242 Churn, E. E. Van Court. 521,282 Cleaner. See Spring jack cleaner. Clock winding mechanism, electric, Vidal & Hervieu 521,396 521,396	Pul Pul Pul Pul
l	Casket Ining, F. S. Pinkham. 521,419 Casket pedestal, E. E. Fisher. 521,211 Centering tool, F. B. Covel. 521,206 Chair. See Dental chair. Knockdown chair.	Pul Pul Pur Pur
1 1	Churn, R. E. van Court. 521,194 Churn motor, F. Elliott. 521,282 Cleaner. See Spring jack cleaner. Clock winding mechanism, electric, Vidal & Her-	Pur Rai Rai
;- -	Clothes drier, E. B. Gildersleeve	Rai Rai Rai
e c r	Coal cutting machine, A. Greenwood 521,253 Column, N. Poulson 521,320 Composition of matter, J. Matthews 521,332 Composition of matter, W. M. Pope 521,177 Condenser, S. W. Johnson 521,373 Coop and hawk trap, combined chicken, W. S. 1rwin Irwin 521,262	Ras Rec Rec
е	Coop and nawk trap, combined chicken, W. S. Irwin	Reg Rul Sasi
t t	Irwin 521,266 Core attracting solenoid, W. R. Michl 521,269 Cotton elevating apparatus, seed, F. Garraux 521,59 Coupling, See Car coupling. Pipe coupling. 521,54 Crate, shipping, G. W. Worden 521,340 Cultivator, N. W. Falor 521,340 Cultivator, J. Schauman 521,200 Curtain stretcher, R. J. Bartley 521,200 Cut-out, automatic electro-magnetic, L. T. Stanley 521,423	Saw Sca Scr
r	Cut-out, automatic electro-magnetic, L. T. Stanley. Cut-out, automatic electro-magnetic, L. T. Stanley. Solver. Band cutter. Vegetable cutter. Dental chair, A. W. Browne	Sea Sep Sep
d r h	Detaching block, G. W. Browne	Sew Sew Sew
t e	Detacming block, G. W. Moore	Sha
f I		Sha Sift Sin Ska
0	Duster, E. Nation 521,174 Ear jewels, attachment for holding, Tilford & Bennett 521,192 Eaves trough hanger, F. E. Albro 521,357 Educational appliance, A. Bechmann 521,330	Ska Sna Spo Spo
e d e	Educational appliance, A. Bechmann. 321,360 Electric battery, Dubero & Mohrdieck 521,260 Electrical conductor bond, J. Herr 521,238 Electrical distribution, system of, T. J. Fay 521,436 Elevated carrier, G. B. Davis. 521,309 Elevated carrier, G. B. Davis. 521,309	Spr Sta Sta Sta
f	Elevator. See Water elevator. Elevator driving mechanism, electric, C. E. Geiger . 521,160 Embroidering machine, R. Weiss	Ste Ste Sto
e r,	Engine. See Gas engine. Locomotive engine. Pulip engine. Engine, E. J. Woolf. 521,278 Envelope, C. M. Carnahan. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,432 Envelope, machine, L. J. & M. J. Church. 521,432 Envelope, machine, L. J. & M. J. Church. 521,432 Envelope, machine, L. J. & M. J. Church. 521,432 Envelope, machine, L. J. & M. J. Church. 521,432 Envelope, machine, L. J. & M. J. Church. 521,432 Envelope, machine, L. J. & M. J. Church. 521,432 Envelope, machine, L. J. & M. J. Church. 521,433 Envelope, machine, L. J. & M. J. Church. 521,433 Envelope, machine, L. J. & M. J. Church. 521,433 Envelope, machine, L. J. & M. J. Church. 521,433 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. Church. 521,431 Envelope, machine, L. J. & M. J. & M	Sto Sto Stu
y	Envelope, machine, L. J. & M. J. Church. 521,153 Eraser, blackboard, A. J. Creamer. 521,258 Evaporating liquids in vacuo and apparatus therefor, process of, S. M. Lillie. 521,215 Explosive and making same, H. Kolf. 521,345 Extractor. See Stump extractor.	Stu Sur Sus Swi
a y e	reedwater and gas supply regulator, H. A. & H.	Swi Swi Tai
00 r	A. House, Jr. 521,168 Feedwater heater and purifier, F. Diehl. 521,337 Felly, bicycle wheel, A. P. Squires. 521,187 Felly wheel, J. T. Mosely. 521,328 Fence, G. C. Snyder. 521,275 Fence, wire, M. Berdan 521,328	Tel Tel Tel
ll 10 10 10	Fence, wire, S. S. Young	Tel Tel Tel
n e ie	Fire escape, C. A. Noack	The
e	Europe of F. Coddr 591 909	Tol
ir is	Garment fastening, M. C. Moran. 521,359 Garment supporter, F. G. Davis. 521,259	To
n- al of	dear rolling, making tree for, it. I. I offer	Tra
is	Generator. See Steam generator. Glass furnace breast wall, W. H. Barr	Tru Tru Tru
of 8- 12	Hewitt Governor for fluids, pressure, W. Hoffman 521,311 Gun, folding, A. Burgess. 521,202 Guns, automatically operated breech mechanism	Ту
=	for. J. B. G. A. Canet 521,400 Handle, P. Oswald 521,217 Hanger. See Picture hanger Harrow, N. O. Starks 521,392	Un
n a-	Hay rake, tedder, and loader, combined, J. H.	Ve
A A	Ridings. 521,247 Heater. See Feedwater heater. Water heater. Heater, D. S. Richardson. 521,420 Heating apparatus, E. R. Soleau. 521,348	Wa
ns or s	Heating apparatus, Et. Soleau	Wa
88 1-	Hook. See Snap nook. 521,391 Hook and eye, J. F. Schoeppl. 521,391 Ice cream freezer, W. R. Thatcher 521,426 Index, J. E. Spears 521,324 Indicator. See Station indicator.	We
3	or liquid, apparatus used in making, Childs &	WC
	Jalousies, band or cord self-acting uproller on, S. Stahl. 521,276 Kiln. See Lime kiln. Knitting machine, L. E. Salisbury. 521,248	
	Knitting machine, L. E. Salisbury. 521,387 Knitting machine cam, G. H. Gilbert. 521,367 Knitting machine, circular, E. W. Gourd. 521,284 Knitting machine, of protion, E. Tiffany. 521,180 Knitting machines, fashioning device for circular for the control of the c	Wr Wr Wr
c.	Knitting machines, fashloning device for circular, Paxkot & O'Neill, Knitting machines, quarter saver for flat rib, Tiffany & Parker, Knitting machines, stop motion for straight, E. 521,191	
] 21 12	Tiffany 521,277 Knockdown box, B. L. Gale 521,310 Knockdown chair, A. R. Van Norman 521,381 Ladder, F. B. Mallory 521,382	Bo
	Lamp, W. A. Phillips	Bu
01 78 07 32 98	Lantern holder for wagons, etc., G. J. Beehler 521,361 Lantern, signal, P. Gray	r ii
19	Lanterns, electric arc light for magic, C. Beseler. 521,395 Last, S. Appleton. — 252,305 Lathing, metallic, G. Hayes. 521,287 Leg, artificial, J. McGuire. 521,446 Lime kiln, O'Connell & Sniffin. 521,295 Lock, W. W. Davis. 521,396 Locomotive attachment, F. J. Smith. 521,295 Locomotive engine, compound. C. A. Ball. 521,286 Locomotive shifting link motion, W. B. Warren. 521,386 Loom warp stop motion, O. Smith. 521,289	Mo Pit Pu Ra
34	Locomotive shifting link motion, W. B. Warren 521,398	Sho

	Measuring and recording electric currents, apparatus for, W. Themson
	Metals, making resinates of, F. Pirschl. 521,270 Moistener for stamps, envelopes, etc., J. G. Willius 521,250
	Mop wringer, Noble & Ward
	Music box damping device, H. Langfelder
	Nails, machine for preparing and finishing, J. M. Laughlin. 521,242 Nut finishing machine, G. Dunbam 521,233 Nut wrench and lubricator, combined, J. S. Scarboroush
	Oil and maken an anaton Til Anatim 501 100
	Oil and Water separator, E. Austin. 321,139 Oiling bearings, mechanism for, D. Gessner. 521,235 Paper boxes, machine for covering, E. H. Taylor. 521,236 Pavement, road, G. R. Bowen. 521,364 Pencil sharpener, J. L. Hall. 521,313 Picture banger, P. H. Lynch. 521,291 Pile shee, A. Harris. 531,285
	Fencti snarpenet, J. I. Hall
	Pipe bending machine, J. C. Orr
	Pipe dies, screw dummy for sewer, A. F. Foster. 521,445 Pipe hanger, R. Boyd. 521,149 Pipe wrench, W. King 521,267
	Paper boxes, machine for covering, E. H. Taylor. 521,299 Pavement, road, G. R. Bowen. Pencil sharpener, J. I. Hall. 521,313 Picture hanger, P. H. Lynch. 521,291 Pile shoe, A. Harris. 521,292 Pipe. See Tobacco pipe. 521,285 Pipe bending machine, J. C. Orr. 521,417 Pipe coupling, combination soft and hard metal. 521,437 Pipe dies, screw dummy for sewer, A. F. Foster. 521,437 Pipe hanger, R. Boyd. 521,237 Pipe wrench, W. King. 521,237 Planer feed roil, J. D. Sigler. 521,237 Plume fastener for helmets, L. A. Hayes. 521,237 Press. See Printing press. 522,237
	Printing machine, ticket, Gray & Bowen 521,458
	Printing press, rotary, J. P. Lunn
	Pulley, clutch, H. Bunker. 521,281 Pulley, friction clutch, Kirkbride & Ouram. 521,240 Pulley turning machine, A. Wood. 521,353 Pulp engine, L. A. Thomas. 521,300
3	Pump regulator, hydraulic steam, T. J. Davis 521,409
ļ	Pump, vacuum, E. D. Chaplin
;	Railway cross tie, F. P. Feuerbacher 521,158 Railways, conduit supply system for electric, H.
3	Alexander 521,326 Rake. See Hay rake. Rams, machine for maintaining air pressure in chambers of bydraulic, H. Ingham 521,167 Rasp making machine, J. H. Stokes 521,424 Recorder. See Telephone call recorder. Reel, C. C. Partridge 521,245 Reel, M. E. Knight 521,246 Resister. See Cash register. 521,246 Rubber article, hollow, E. L. Perry 521,246 Saw, D. Hazard 521,343 Saw, D. Hazard 521,343 Sawing machine, J. Jilek 521,347 Scale, S. S. Crompton 521,230
Ź	Rasp making machine, J. H. Stokes. 521,424 Recorder. See Telephone call recorder. Reel. M. E. Knight. 521,413
;	Reel, C. C. Partridge 521,245 Register See Cash register. 521,246 Rubber article, hollow, E. L. Perry 521,246
1	Sash fastener, G. C. Gardner 521341 Saw, D. Hazard 521,343 Sawing machine, J. Jilek 521,317
)	Screen. See Pulp screen. Stone screen.
3	Songrator Son Oil and water congrator
3	Separator and grader, D. J. Davidson. 521,402 Sewing machine, C. A. Dahl 521,303 Sewing machine, C. F. Littlejohn 521,372 Sewing machine, C. F. Littlejohn 521,372 Sewing machine, R. W. Thomson 521,301 Shades, etc., device for adjusting window, P. Coldmann
1	Sewing machine, R. W. Thomson 521,301 Shades, etc., device for adjusting window, P. Goldmann 521,408 Shades, fixture for vertically adjusting window,
5	N. Bosmann
1	N. Bosmann 521,280 Shaft setting device, H. B. Campbell 521,304 Sifter, cinder, A. J. Henderson 521,344 Sink, B. F. Ford 521,304 Skate, L. W. Kenney 521,375 Skates, self-acting brake for roller, J. Riedel 521,811
7	Snap hook, J. Pickett
0 8 6	Spool and support thereof, A. Kreidler. 521.241 Spring jack cleaner, M. Seter. 521.232 Stapling machine, W. S. Hamm 521.339 Stamping device, hand, H. S. Ingersoll 521.237
9	Station indicator, A. Baker. 521,359 Steam boiler, J. A. Caldwell 521,204 Steam boiler, tubulous, H. A. & H. A. House, Jr. 521,164
7	Stamping device, hand, H. S. Ingersoll. 521,257 Station indicator, A. Baker. 521,259 Steam boiler, J. A. Caldwell. 521,254 Steam boiler, tubulous, H. A. & H. A. House, Jr. 521,164 521,249 Stone, artificial, L. Grote. 521,264 Stone screen, J. J. Donovan. 521,264 Store service apparatus, J. S. Goodnow. 521,233 Store, cooking, R. H. Hayes. 521,419 Stump extractor, W. R. Wilkinson. 521,352 Stump puller or load lifter, M. Allmon. 521,249 Supporter, D. L. Smith. 521,249
8	Store service apparatus, J. S. Goodnow. 521,283 Stove, cooking, R. H. Hayes. 521,410 Stump extractor, W. R. Wilkinson. 521,352
8	Stump puller or load litter, M. Allmon 521,250 Supporter, D. L. Smith 521,249 Suspensory, A. H. Parker 521,176 3000 521,249
5	Supporter, D. L. Smith 521,249 Suspensory, A. H. Parker 521,176 Swing, Crandall & Smith 521,385 Switch. See Telephone switch. Switchboards, busy test for multiple, J. A. Wotton
6 7 7	ton Tanks, automatic shut-off for roof, C. F. De Arden. Talks, automatic shut-off for roof, C. F. De Arden. S21,303 Telegraph, printing, O. L. Kleber. S21,170 Telegraph system, police signal, C. A. Rolfe. S21,181 Telephone call recorder, W. F. Smith. S21,422 Telephone, electric, W. L. Richards. S21,225 Telephone, magneto, Stromberg & Carlson. S21,188 Telephone switch, J. B. Smith. S21,188 Telephone transmitter, J. B. Smith. S21,235 Testing machine, L. Schopper. S21,333 Telephone transmitter, J. B. Smith. S21,235 Thermo-clectric battery, E. W. Jungner. S21,136 Thermometer, A. K. Keepe. S21,237 Thermometer, A. K. Schopper. Thread cutter tool holder, C. R. Behnke. S21,233 Thermocolopie, N. Demuth. S21,233 Tobacco pipe, W. Demuth. S21,333 Tobacco pipe, W. Demuth. S21,430 Top, J. U. Barr, Jr. S21,438 Top, J. U. Barr, Jr. S21,482 Top, J. U. Barr, Jr. Track circuit, L. F. Johnson. S21,412 Track circuit, L. F. Johnson. S21,412 Track circuit, L. F. Johnson. S21,412 Trolley, contact, R. W. Hawkesworth. S21,631 Trolley wire finder. T. E. Gressle. S21,331
5 5 8	Telegraph system, police signal, C. A. Rolfe 521,183 Telephone call recorder, W. F. Smith 521,422 Telephone electric, W. L. Richards 521,220
$\frac{4}{2}$	Telephone, magneto, Stromberg & Carlson. 521,388 Telephone switch, J. B. Smith. 521,274 Telephone transmitter, J. B. Smith. 522,325
9 6 	Testing machine, L. Schopper 521,323 Thermo-electric battery, E. W. Jungner 521,168 Thermometer, A. A. Keene 521,374
7 5 9 0	Thread cutter tool holder, C. R. Behnke 521,255 Tire, bicycle, R. P. Scott 521,273 Tire, pneumatic, A. J. Burns 521,330 521,330
374	Tobacco pipe, W. Demuth 521,380 Tobacco pipe bowls, cover for, T. Morton 521,173 Tobacco tyler median 8 Tolly 571,50
93	Top, J. U. Barr, Jr. 521,148 Toy holder, F. D. Arthur 521,253 Track front I. F. Lohnson 521,419
4 9	Trap. See Animal trap. Fly trap. Trolley, H. Scheele et al. 521,184 Trolley contact R W Hawkesworth 521,163
8	Trolley wire finder, T. E. Gressle. 521,311 Truck, car, E. Cliff. 521,205 Trunk stran fastener, W. J. Webb. 521,227
1 5	Trap. See Animal trap. Fly trap. 521.184 Trolley, H. Scheele et al. 521.184 Trolley wire finder, T. E. Gressle 521.311 Truck, car, E. Cliffer, W. J. Webb 521.262 Trunk strap fastener W. J. Webb 521.262 Tubular boiler, J. J. Brown 521.502 Tubular boiler, J. P. Serve 521.452 Type leveling and aligning device, L. P. Diss 521.383 Typewriting machines, ribbon reversing mechanism for, C. E. Johnson 521.288 Umbrella, self-opening, H. W. Schoff et al. 521.252 Umbrellas, etc., flexible support for, W. J. Yapp. 521.353 Underwaist, C. R. De Bevoise 521.438 Upholstery pendant or ornament, G. F. Hensel 521.370
2	Typewriting machines, ribbon reversing mechan- ism for, C. E. Johnson
7	Umbrellas, etc., flexible support for, W. J. Yapp. 521,355 Underwaist, C. R. De Bevoise
1	Underwaist, C. R. De Bevoise. 521,435 Upholstery pendant or ornament, G. F. Hensel. 521,370 Valve, ball cock, W. A. Turner. 521,530 Valve, engineer's, W. A. Thacher. 521,425 Vehicle brake, C. Sample. 521,389 Vegetable cutter, D. M. Wright. 521,279 Watchease, J. Durrstein Watchease, J. Durrstein Watchease, J. Stelkau & Winkelmann. 521,441
7	Vehicle brake, C. Sample. 521,389 Vegetable cutter, D. M. Wright. 521,279 Watchease, J. Durrstein 521,210 Water elevator, steam vacuum, Sattelkau & 501,411
8.0	Water elevators, storage reservoir for steam
19	Water wheel, turbine, J. M. Parker
164	Well digger, Odewahn & Reichart 521,175
	Whist box, duplicate, A. H. Woodward. 521,302 Window, C. Ajello. 521,356 Woodworking machine, C. Seymour 521,185
9 6	Woodworking machinery, antivibratory pressure bar for A. Premo
8	Wrench and pipe and thread cutter, combined, R. Haberthur
7 4 0 8	Writing machine, W B. Wait
1	DEGLONG
7005	Badge, W. C. Finck 23,542 Bathtub leg, W. C. Peet 23 251
9	Buttle, W. L. Juhring 23 352 Buckle, G. M. Aylesworth 23 362 Carpet, G. Marchetti 23 362 23 362 23 362
2	Carpet button, stair. Warren & Walker 23,347 Clothes pounder, Potteiger & Kohman 23,557 Ewer, etc. H. Brunt 23,354
1 2 2	rerruie, H. A. Curtiss. 23,344 Finishing plate, E. A. Langenbach. 23,558 Fire kindler holder, P. J. Harrah. 23,355
15 17	Grame Board, G. H. Wildsmith 23,330 Hammock hook, I. E. Palmer 23,349 Knife or fork cap, H. A. Curtiss 23,345 Monument C. Clearer 23,345
6 6 6	Monument, W. H. Perry 23,365 Pitcher, etc., Barlow & Pope 23,353 Puzzle body, F. H. Vost.
14 18 18	Radiator, C. F. Walther

 Toy cap exploder, C. A. Hotchkiss
 23,356

 Type border, E. B. Fox
 23,341

 Vault light lens, P. Schwickart
 23,348

TRADE MARKS.

TRADE MARKS.

Antipyretic and anodyne powders for headache and neuralgia, F. A. Wheeler. 24,867
Baking powder, Pasquier & Stankard. 24,855
Baking powder, Scudder-Gale Grocer Company. 24,856
Baking powder, F. W. Young. 24,857
Beer, I ager, J. Conrad. 24,855
Beyeles, E. K. Tryon, Jr. & Company. 24,850
Bicycles, E. K. Tryon, Jr. & Company. 24,850
Boilers, compound for removing scale from. W. M. Plantz & Company. 24,849
Boilers, compound for removing scale from. W. M. Plantz & Company. 24,849
Bondons and chewing gum, Royal Remedy and Extract Company. 24,862
China, including plumbers' and toilet ware, vitrecus, Maryland Pottery Company of Baltimore China, including plumbers' and toilet ware, vitrecus, Maryland Pottery Company of Baltimore China, including plumbers' and Friend Company 24,853
Coal saver, chemical, Household Friend Company 24,853
Cotton plaids and stripes, Eagle and Phenix Manufacturing Company. 24,853
Cotton plaids and stripes, Eagle and Phenix Manufacturing Company. 24,853
Dental preparations, J. A. Bermudez. 24,846
Fiber, leather board, leatheroid, and trunks and other articles made therefrom, J. Cummings, Son & Company. 24,853
Flour, F. E. Smith. 24,853
Flour, wheat. Kunbardt & Company. 24,853
Harness snaps, J. C. Covert. 24,853
Matches. wooden and paper, American Safety Head Match Company Medicinal and chemical compounds, certain named, C. F. Boehringer & Sohne. 24,868
Medicine and tonic, nerve, Magic Medicine Company. 24,868
Olis for external use for veterinary purposes, compound of lubricating, W. A. Lowe. 24,864

Soap bar, J. Biechele Suap Company	24.863
Starch, made of potatoes, burned, B. P. Ducas	24.863
Suits, children's, Bowlby & Company	24.863
Tobacco pipes, L. Nax	24.875
Vessels for physicians' and surgeons' use, L. A.	
Dessar	24.878

PRINTS.

"Dr. Kilmer Swamp Root," J. Ottomann Lithographing Company.....

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple at a cost of \$40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Mdvertisements.

ORDINARY RATES.

Inside Page, each insertion - - 75 cents a line Back Page. each insertion - - - \$1.00 a line

Back Page. each insertion - - - - 51.00 a line

18 For some classes of Advertisements, Special and
Higher rates are required.

The above are charges per agate line—about eight
words per line. This notice shows the width of the line,
and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be
received at Publication Office as early as Thursday
morning to appear in the following week's issue.



LATHES, Shapers, Planers, Drills, Machine Shop Outfits, Foot Lathes, Tools and Supplies. Catalogue Free. SEBASTIAN LATHE CO., 120 CULVERT ST., CINCINNATI, O.



AIGHT & CLARK, ALBANY, IRON AND BRASS FOUNDERS, IRON CASTINGS

of Every Description. Also BRASS, COM-POSITION, ALUMINUM and ALUMINUM BRONZE CASTINGS, PURE COPPER CAST-INGS free from blow holes.

Japanning and Nickel Plating. Light Machine Work.

◆ALL WORK STRICTLY FIRST CLASS.◆

Stave Mill Machinery



Improved Gauge Lathe.

FIREPROOF FLOORING.—DESCRIP tion of the various systems of fireproof flooring employed in Europe and the United States. With 73 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 947. Price 10 cents. To be had at this office and from all newsdealers.

Lockport, N. Y.



"LICHTNING" SCREW PLATES WITH Birmingham (Stubs) Wire Gauge Sizes



For Bicycle Repairers, Electricians and others. Adjustable Dies with case-hardened guides.

For Send for Supplement No. 1.

Wiley & Russell Mrg. Co., Greenfield, Mass.
U. S. A.

Unless they contain sufficient Potash.
Complete fertilizers should contain at least 6 per cent.
of Potash.
Fertilizers for Potatoes, Tobacco, Fruits and Vegetables should contain from 10 to 15 per cent. of Potash.
To obtain best results use fertilizers containing enough Potash or apply Potash salts, such as Muriate of Potash, Sulphate of Potash and Kainit. Instructive pamphlets and information free. Address,
German Kali Works, Bennett Bldg., N. Y. City.



Before You Buy a Wheel, Send stamp for our Bargain List of -hands. Good wheels, \$10 to \$75. High Grade Second-hands. Good wheels, \$10 to \$75.

EISENBRANET CYCLE CO.,

315 E. Baltimore St.. Baltimore, Md.

STARRETT'S Adjustable Jaw Cut-Nipper. Jaws are detachable, so they can be removed, ground, and adjusted when worn, all parts case-hardened except jaws. Flat spring below cutting edges obviates danger of breaking jaws.

Price, 6 inch M (for music wire) ... \$2.00

Tillustrated Catalogue Free.

If a Connect Manufact'r of Fine Tools. L. S. Starrett, Manufact'r of Fine Tools, P.O. Box 13, ATHOL, MASS.

ICE-HOUSE AND COLD ROOM.-BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUP-PLEMENT, NO. 59. Price 10 cents. To be had at this office and from all newsdealers.



Experimental & Model Work

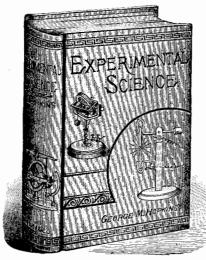
Electrical Instruments, Fine Machinery, Special Apparatus, Telephones, Photograph Machines, Repairs, etc. E. V. BAILLARD, 106 Liberty Street, N. Y.

AMMONIA MOTORS.—A DETAILED description of the apparatus devised by Mr. MacMahon for the recovery of the ammonia employed for the propulsion of cars in a motor of his invention. With 13 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 944. Price 10 cents. To be had at this office and from all newsdealers.



NOW READY!

Fourteenth Edition of Experimental Science



REVISED AND ENLARGED. 120 Pages and 110 Superb Cuts added.

Just the thing for a present for any man, woman, student, teacher, or any one interested in science. In the new matter contained in the last edition will be found the Scientific Use of the Phonograph, the curious optical illusion known as the Anorthoscope, together with other new and interesting Optical Illusions, the Optical Projection of Opaque Objects, new experiments in Projection, Iridescent Glass, some points in Photography, including Hand Cameras, Cane Cameras, etc. Systems of Electrical Obstribution, Electrical Ope Finder, Electrical Rocker, Electric Chimes, How to Color Lantern Slides, Study of the Stars, and a great deal of other new matter which will prove of interest to scientific readers.

840 pages, 782 fine cuts, substantially and beautifully bound. Price in cloth, by mail, \$4. Half morocco, \$5.

Send for illustrated circular.

MUNN & CO., Publishers,
Office of the SCIENTIFIC AMERICAN, 361 BROADWAY, NEW YORK.

INSTRUCTION & MAIL

Architecture. chitectural Drawing. ımbing, Heating and Ventilation, Filmonia, Heating and Bridge Engimeering, Railroad Engineering, Surveying and Mapping, Mechanics, Mechanical Drawing, Mining, English Branches, and

ELECTRICITY. Diplomas awarded. To begin studen

4000 STUDENTS.

Study Electricity at Home

by our correspondence method, with FREE APPARATUS. Terms low. Cat. free. Scientific Machinist, Clevel'd, O.



Parsons Horological Institute. earn the Watch Trade

Engraving and Jewelry Work. Circular free.

PARSONS, IDE & CO. 302 Bradley Ave., PEORIA, ILL.

BULL'S-EYE THE NEW KIND OF CAMERA.

Illustrated in SCIENTIFIC AMERICAN, March 31st, p. 197
LIGHT PROOF FILM CARTRIDGES.

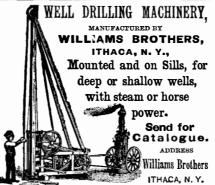
NO DARK ROOM REQUIRED.
Best and Most Practical Camera in the World regardless of price. Prices, \$8 to \$15.

To Send for Description, with Sample of Work.

Rooton Camera Mfc (b. 382 Treamont St. Roston Mass. Boston Camera Mfg. Co., 382 Tremont St., Boston, Mass

BARNES New Friction Disk Drill. FOR LIGHT WORK. Has these Great Advantages: The speed can be instantly changed from 0 to 1600 without stopping or shifting belts. Power applied can be graduated to drive, with equal safety, the analiest or largest drills within its range—a wonderful economy in time and great saving in drill breakage. Send for catalogue.

derful economy in time and green on in-breakage. Send for catalogue. W. F. & JNO. BARNES CO., 1999 Ruby St., - Rockford, III. WELL DRILLING MACHINERY.



ARTESIAN WELLS.—BY PROF. E. G. Smith. A paper on artesian wells as a source of water supply. Essential geological conditions of artesian wells. Some chemical features of artesian well supply. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 943. Price 10 cents. To be had at this office and from all newsdealers.



${f MATCH} * {f MACHINERY}.$

Latest improved. Complete plants furnished. JOS. C. DONNELLY, 1209 Buttonwood Street, Philadelphia, Pa.

GATES ROCK & ORE BREAKER

Capacity up to 200 tons per hour.

CATES IRON WORKS, 50 CSo. Clinton St.. Chicage 136 C, Liberty St. N.Y. 237 C, Franklin St., Boston, Mass

HYPNOTISM: My original method, \$1. Suggest-tical, \$3.50. Dr. Anderson, Masonic Tem., S.A.6, Chicago

WIFE CANNOT SEE HOW YOU DO IT AND PAY FREIGHT. SMEASURE THE BOYS OF 2 drawer walnut or oak Improved High Arm Singersewing machine they finished, nickel plated, adapted to light and many work; guaranteed for 10 Years; with automatic Bobbin Winder, Self-Threading Cylinder Skutile, Self-Stetling Needleand a complete set of Steel Attachments; shipped any where on 30 Day's Trial. Nomoney required in advance. To,000 now inuse. World's Fair Medalawarded machine and attachments. Buy from factory and save dealer's and argent's profits.

FREE Cat logres, testimon his an office possess of the World's Fair.

OXFORD MFG. CO. 342 Wabash Ave. CHICAGO,ILL ADJUSTABLE HOLDERS INCANDESCENT LAMPS. OCWHITECO. WORCESTER, MASS.

Fine Experimental Machine Work. D'Amour & Littledale, 204 E. 43d St., New York

OLDS CASOLINE ENGINES. MOST RELIABLE, SMALL COST, GREAT MERITS.

Send for 1894 Catalogue. P. F. OLDS & SON, Box 218, Lausing, Mich., U.S A.

Learn the Watch Trade HOME



If you want the best Lathe and Drill



Westcott Chuck Co., Oneida, N. Y., U. S. A. Ask for catalogue in English, French, Spanish or German. FIRST PRIZE AT COLUMBIAN EXPOSITION, 1893.



CONSULTATION INVENTORS.
AND ADVICE TO INVENTORS.
Experimental work of every description. Automatic machinery designed and built. [37] Send for circular.
MALTBY MFG. CO., Brooklyn, N. Y.

THE Scheniunio A merican

ESTABLISHED 1845. The Most Popular Scientific Paper in the World Only \$3.00 a Year. Including Postage.

Weekly—52 Numbers a Year.

This widely circulated and spiendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of teen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity Telegraphy, Photography, Archi-tecture, Agriculture, Horticulture, Natural History, etc. Complete list of patents each week.

Terms of Subscription .- One copy of the SCIEN-TIFIC AMERICAN will be sent for one year—52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of three dollars by the publishers; six months, \$1.50: three months, \$1.00.

Clubs .- Special rates for several names, and to Post

Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed seldom goes astray, but is at the sender's risk. Address

all letters and make all orders, drafts, etc., payable to MUNN & CO., 361 Broadway, New York.

Scientific American Supplement

This is a separate and distinct publication from 'I'HE SCIENTIFIC AMERICAN, but is uniform therewith in size. every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. The SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy Chemis-try, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information

Obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated

and described in the SUPPLEMENT.
Price for the SUPPLEMENT for the United States, Has produced more ballast, road metal, and broken more ore than all other Breake's combined.

Builders of High Grade Mining Machinery. King-Darragh Concentrator. Connersville Blowers. Send for Catalogues.

Send for Catalogues.

CATES IRON WORKS.

Price for the SUPPLEMENT for the United Science, \$5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year to one address for \$7.00, Single copies, 10 cents. Address and remit by postal order, express money order, or check.

MUNN & CO... 361 Broadway, New York.

MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. \$2.50 a year, Single copies, 25 cents. Thirty-two large quarto pages, forming a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors, and with other fine engravings; illustrating the most interesting examples of modern architectural construction and

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with Plans, Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work have won for it the Largest Circulation of any Architectural publication in the world. Sold by all newsdealers. \$2.50 a year. Remit to

MUNN & CO., Publishers, 361 Broadway, New York, Founded by Mathew Carey, 1785.

HENRY CAREY BAIRD & CO., INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTED S10 Walnut St., Philadelphia, Pa., U. S. A.

EF Our new and Revised Catalogue of Practical and Scientific Books. 88 pages. 8vo, and our other Catalogues and Circulars, the whole covering every branch of Sci-ence applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his



VANDUZEN STEAM PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Glogs nor
freezes. Every Pump Guaranteed.

10 SIZES. 200 to 12000 Gallons per Hour. Cost \$7 to \$75 each. Address ` THE VANDUZEN & TIFT CO.,

BUY TELEPHONES

That are good—not "cheap things." The difference in cost is little. We guarantee our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are BOTH GOOD. WESTERN TELEPHONE CONSTRUCTION CO.,

440 Monadnock Block, CHICAGO Largest Manufacturers of Telephones in the United States.



SINTZ GAS ENGINE CO. GRAND RAPIDS, MICH., U. S. A.

Manufacturers of the Sintz Stationary and Marine Gas and Gasoline Engines. Especially adapted for Boats and Blectric Lighting. Runs with manufactured or natural gas—Boats and launches. Prices within the reach of all. Found for Catalogue.

Mention this paper.

YPEWRITERS.

l makes half-price. Rebuilt to equal new. Shipped out deposit to responsible parties in all parts of the d. Unprejudiced advice given. Illust'd cata. free. TYPEWRITER 45 Liberty Street, HEADQUARTERS, New York, U.S. A.



MUSIC AND LONGEVITY.—A PAPER MUSIC AND LONGEVITY.—A PAPER by Ephraim Cutter, M.D., in which the author endeavors to show that music prolongs or is thought to prolong life; that diseases peculiar to and preventive of long-evity are those that impede the circulation of air, blood and nerveforce. That music is physiologically capable of enlarging the chest and the capillaries and of calming and regulating, if not increasing nerveforce, and that, other things being equal, longevity should belong to musical people. Contained in Scientific American Supplement, No. 924. Price 10 cents. To be had at this office and from all newsdealers.

THE FISHER **Patent Steam Pump Governors** FISHER PATENT GRAVITY GOVERNORS

FISHER GOVERNOR (O.).
201 S. 1st Avenue. - Marshalltown, Iowal.

A Primer on Inventing,

Or rather on mechanical helps to invention, experiments, investigation, etc., sent free, to advertise our machine shop.

THE JONES BROTHERS ELECTRIC CO. CIN'TI. O.



graphic Register. It gives you a record of the days' sales that can be sworn by. Enforces accuracy and honesty. Three duplicate tickets, one for customer, one for cashier and one for you. It makes no mistakes and for you. It makes no mistakes and rest. Day Book? On meet its continued by the form of the fo

VEGETABLE PARCHMENT.—A VALuable paper on the properties, uses and manufacture of this product. Contained in SCIENTIFIC AMERICAN SUP-PLEMENT, No. 945. Price 10 cents. To be had at this office and from all newsdealers.

JUST PUBLISHED.



- Mang A Mual

By Richard A. Proctor, F.R.A.S.

* *

A series of twelve elegantly printed Maps of the Heavens, one for every month in the year. Specially prepared for use in North America. With descriptions accompanying each map, giving the names of the principal stars and constellations, showing their relative

positions at given hours and days of the month.

A most beautiful and convenient work, specially adapted for the use of those who desire to acquire a general knowledge of the starry realms.

To which is added a description of the method of

preparing and using artificial luminous stars as an aid fixing in the mind the names and places various stars and constellations, by Alfred E. Beach. Altogether this is one of the most popular, useful and valuable works of the kind ever published.

One quarto volume, elegantly bound in cloth. Price

MUNN & CO., Publishers, 361 Broadway, New York.

NEPERA PAPER.

A New Printing-Out Ready Sensitized Paper.

PERMANENT PRINTS, Better Results. Easier Obtained. No Ice. No Hot Water Treatment. No Lend Salts. No Alum or other hardeners endangering the durability of the image. Extreme simplicity of all operations. Printed, foned and mounted in less time and with less trouble than any other paper. Does not bronze and does not fix out. A paper for all climates and all seasons. Will stand a hot water test of 100° F. and will behave just as well in ice cold water. Has none of the defects of its rivals. Write for free sample sheets. Ask for prices of our Special Bromide Paper.

For sale by All Dealers.

Nepera Chemical Co., Nepera Park, N.Y.

ELECTRO MOTOR, SIMPLE, HOW TO make. By G. M. Hopkins.—Description of asmall electro motor devised and constructed with a view to assisting amateurs to make a motor wnich might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power, with 11 figures Contained in SCIENTIFIC AMERICAN SUPPLEMENT. No. 641. Price 10 cents. To be had at this office and from all newsdealers.



WANTED.—Financial assistance to take out foreign patents on float-controlled Valve Operating Device for automatically opening and closing the throttle valve of pumps by which water is pumped to elevator and other tanks. The U. S. patent allowed. Invention is practical and fully tested. For further particulars address CHAS OTIS, 62 First Street, New York City.



SANITARY SOAP VASE PREVENTS disease, waste, pilfering of soap, clogging of waste pipes, stain of marble, uncleanly soap dish. AFFORDS each user fresh, dry pure soap.

The Only Clean, Sanitary, and Safe vay to use soap. W. R. RANNIE,

Rochester, N. Y., U. S. A.





THE "CLIMAX" Stereotyper and Moulding Press

combined, for making perfect Cellu-loid Stereotypes to be used in place of metal stereotypes. Also for making Rubber Stamps. Should be in use in every printing office. See SCI. AM., Dec. 30, 1893. Send for circular to

circular to

THE J. F. W. DORMAN CO.

217 E. German St.,

Baltimore, Md.

Manufacturers of

Rubber Stamps, Vulcanizers, Stereotype Machinery and Supplies.

VALUABLE PATENTS FOR SALE.

New improved Nickel Soap Vase for Powdered Soap Business successful. Will be generally used. Patented in United States and five foreign countries. Tools already made. Price moderate. Address T. P. STOWELL, P. O. Box No. 14, ROCHESTER, N. Y.



Wire Bending and Forming

Estimates furnished for machines and forms, either simple or automatic. Send sample of article required. Light machinery and models built to order.

L. I. DARBY, Mulberry and Chestnut Sts., Newark, N. J.

HIGH GRADE ONLY. Warranted. Contractors desiring a trustworthy Jack Screw. address RUMSEY & Co., Ltd., Seneca Falls, N.Y.

EGGS Best and cheapest food known. Warranted to double egg production. Get circulars. Webster & Hannom, Cazenovia, N. Y.

PERFORATORS OF ALL METALS





※ THE "MUNSON" TYPEWRITER. ※

This machine is an "evolution," the outgrowth of years of experience and the best results of scientific work. Its principles appeal at once to the educated mechanic. It is Light, small, Compact, Easily operated, with Universal Key Board.

INTERCHANGEABLE STEEL TYPE WHEEL,

durable and easily kept in order. 30 keys, 90 characters. Weight, with carry-case, 16 pounds. Special wheels for different languages.

Highest Medal Awarded, World's Fair, Chicago, 1893. Send for circular to The Munson Typewriter Co., 171 E. Division Street, Chlcago, III., U. S. A.

MANUFACTURERS

and others seeking a desirable LOCATION FOR FACTORIES.

One of the most beautiful towns in Southern Illinois is situated at

PELLONIA, ILL.

This thriving town is located on the north bank of the Ohio River, two and a half miles below Paducah, Ky.; three miles below the mouth of the Tennessee river; and twelve miles below the mouth of the Tennessee river; and twelve miles below the mouth of the Dunberland river, and forty-eight miles above the junction of Ohio and Missis sippi rivers. It has a population of about 700 inhabitants, and at present has one saw mill and flour mill. Excellent church and school advantages and healthful climate. In addition to two daily packet lines, the Paducab branch of the Cairo Short Line R.R. enters the town from the north, giving direct communication with St. Louis, Mo., which is distant only 159 miles. The town is surrounded by an almost unbroken forest of timber, presenting an inviting and very desirable location for all kinds of woodworking establishments, especially box, barrel and hardwood factories. Manufacturers contemplating a change of location, or those starting new industries, would do well to investigate the unsurpassed advantages of this location. Correspondence invited. Further particulars may be obtained by addressing DR. J. D. YOUNG, Mayor, Pellonia, Ill.; ORRIS STEELE, Clerk; or WM. PELL, Councilman.



Engineers and Architects should specify GRAPHITE PAINT

for Bridges, Roofs, Structural Iron, and all exposed metal or wood surfaces. Warranted not affected by heat, cold, smoke, or chemicals. DETROIT GRAPHITE MFG. Co., Detroit, Mich.



ACENTS MAKE

Money selling Beveridge's Automatic Cooker. Latest and best cooking utensil ever invented. Sells at sight. One Agent sold over 1700 in one town.

One sample Cooker free to good agents. Advertising matter furnished. For full particular saddress W. E. BEVERIDGE, Box 728. BALTIMORE, Md.



These cuts represent two wonderful American Products, Waterbury is outdone, as these Watches keep perfect time, will last as long as any Watch, are easily repaired, wind quickly and are the Cheapest in the WORLD. Not French, German or Swiss, but AMERICAN. Signed GUARANTEE OF Accuracy etc. with each, covering ONE YEAR. We are responsible, and our Watches are backed by \$\$\frac{2}{2}\$,000,000 Watches soid to date; Present sales over 1,000 daily. DESCRIPTION-American Lever Movement, Quick Train, 34 Plate, Regular 18 size, Plain or Engraved Case, Solid Gilt or Nickel, Koman or Arabic Dial. Regular Stem Wind, \$2.00 post-paid; 3 for \$4.00. Inside Stem Wind \$1.50 post-paid; 3 for \$4.00. Entire Satisaction Guaranteed. Handsome Chain included flyou mention paper. INGERSOLL & BRO., 65 CORTLANDT ST., N. Y. CITY



STEREOPTICONS. MAGIC LANTERNS AND ACCESSORIES, SEND FOR CATALOGUE TO CHAS BESELERMAKER 218 CENTRE ST. NEW YORK.

THE "OLIN"

GAS AND GASOLINE ENGINES,

FROM 1 TO 10 HORSE POWER, FOR ALL POWER PURPOSES.

THE OLIN GAS ENGINE Co., 222 CHICAGO STREET, BUFFALO, NEW YORK. Ruggles-Coles Engineering Co., 39-41 Cortlandt Street, New York, Agents.

937 RIDGE AVENUE PHILADELPHIA, PA.

THE CARBOPHONE

is invisible and absolutely the best of anything yet invented, is strictly scientific, working on the principle of the telephone and microphone, which reports the steps of a fly a great distance. This instrument will overcome any kind of deafness unless the ear is stopped by catarrh, if such is the case, our vaporator cures it permanently.



No Rider

can afford to be without this brake—Comfort, Economy, Safety—all demand it. It is automatic and as quick in action as thought itself. Send for Descriptive Catalogue.

BAILEY MFG. CO., 207 S. Canal St., CHICAGO.

LIGHTNING CONDUCTORS. - A valuable and exhaustive paper giving Reynold's instructions for erecting and testing lightning rods. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 906.

Price 10 cents. To be had at this office and from all payedecles.



Deer Park

Oakland

On the Crest of the Alleghanies.

(MAIN LINE B. & O. R.R.)

SEASON OPENS JUNE 23, 1894

Rates, \$60, \$75 and \$90 a month, according to location. Address

GEORGE D. DESHIELDS, Manager Cumberland, Md., up to June 10: after that date, either Deer Park or Oakland, Garrett County, Md.

KEEP THE HEAD COOL.

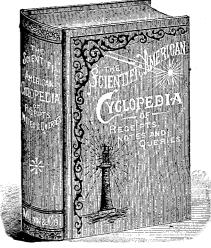


The Braided Wire Spring
Pillow is Cool and
Cleanly, Comfoable as down or
feathers, Practi-



A New and Valuable Book

2d Floor, Wilshire, Cleveland, O.



12,500 Receipts. 708 Pages. Price \$5.

Bound in Sheep, \$6. Half-Moroco, \$6.50.

This splendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the Scientific American during the past fifty years; together with many valuable and important additions.

Over Twelve Thousand selected Receipts are here collected; nearly every branch of the useful arts being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

volume of the kind ever placed before the public.

The work may be regarded as the product of the studies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form convenient for ready use.

Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered.

Instructions for working many different processes in the arts are given.

Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings.

Those who are in search of independent business or employ ment, relating to the home manufacture of sample articles, will find in it hundreds of most excellent suggestions.

Send for Descriptive Circular.

MUNN & CO., Publishers, SCIENTIFIC AMERICAN OFFICE, 361 Broadway, New York.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line Back Page, each insertion. - \$1.00 a line For some classes of Advertisements, Special and Higher rates are required.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head edvertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

COLD FORGED PRODUCT.

Fluted Tire Bolt



Is stiffer and stronger than a common bolt. The fluted shank prevents the bolt from turning in the rim and tire.

COLD FORGED

MACHINE SCREWS MACHINE SCREWS
STOVE BOLTS
LOCK CAP SCREWS
SIDE KNOB SCREWS
THREADED WIRES

AMERICAN SCREW COMPANY, PROVIDENCE, R. I.



KODAKS *6.00 ro sinn.ni

Eastman Kodak Company,

Rochester, N. Y.



MADE. Only perfect substitute for Hard Rubber.

Samples, 45 cents each. Large discount for quantities.

FIBRONE - TERRALOID CO.

97 Oliver Street, Newark. N. J.

"THE STANDARD" DRIPLESS STRAINER in the world.

No drip to soil table linen. No wires to clog spout. No falling off. Beautif'y nickel plated.

Standard Strainer Co. 36 Maiden Lane, New York City.



office Headache, Office Headache, and mistakes in carrying forward don't occur where the Comptometer is used. It saves half the time in doing the work and all time looking for errors. Solves with greatrapidity and absolute accuracy all arithmetical problems. Why don't you get one!

Write for Pamphlet.

FELT & TARRANT MFG CO

The American Bell Telephone Company,

125 Milk Street, Boston, Mass.

This Company owns Letters-Patent No. 463,569, granted to Emile Berliner November 17, 1891, for a combined Telegraph and Telephone, and controls Letters-Patent No. 474,231, granted to Thomas A. Edison May 3, 1892, for a Speaking Telegraph, which Patents cover fundamental inventions and embrace all forms of microphone transmitters and of carbon telephones.

Victor **Bicycles**

All about the best bicycles ever built since the world began is contained in the Victor catalog which will be sent you on request, or it can be obtained of any Victor agent.

The Victor Resiliometer, the only tire testing machine in existence, has proved conclusively that

Bicycles

2 So. Howard St., Baltimore, Md., Ú.S.A.

MANUFACTURE
the very best Telephone, Transmitter, and Magneto Bell in the World and guarantee them, Twenty-two years' experience in electrical appliances. Send for Circulars.



Bicycles

Bicycles

the Victor Pneumatic Tire is the most resilient of

any. Victor Tires, like Victor Bicycles, are un-

Why not ride the best?

OVERMAN WHEEL CO.

PHILADELPHIA CHICAGO

SAN FRANCISCO LOS ANGELES PORTLAND

equaled, unapproached.

AGENTS WANTED FOR FINE TOOLS IN EVERY SHOP, CATALOGUE C.H.BESLY&CO. CHICAGO, ILL.U.S.A. SEND 40 CENTS and receive, by mail, to any address in the U. S., one Improved patent Roller Blotter. Stamps taken. Address E. E. JOHNSON, Collins, N. Y.



For Men or Women 🚄 —Boys or Girls.

HIGHEST GRADE. FULLY WARRANTED.

JOHN P. LOVELL ARMS CO. BOSTON, MASS.

Light Roadster, Weight 25 lbs., Price \$115. Popular Prices.

Agents Wanted.

H. W. JOHNS M'F'G CO., ASEES FOS

ROOFING, LIQUID PAINTS, ASBESTOS MANUFACTURES, NON-CONDUCTING AND INSULATING MATERIALS,

87 MAIDEN LANE, NEW YORK.

Jersey City.

Philadelphia.

JESSOP'S STEELTHE VERY FOR TOOLS, SAWS ETC. WM JESSOP & SONS LE 91 JOHN ST. NEW YORK

SCIENTIFIC AMERICAN SUPPLE-MENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents, Also to be had of newsdealers in all parts of the country.



The distribution of your power is as important as its application. I know a good deal about the economical distribution of power. Perhaps I could give you a few pointers. Inquiries answered free, catalogues sent free, Catalogues: A, woodworking mach'y: B, mach'y for brass, ivory, horn, etc.; C, shaft'g, pulleys, hangers, etc. P. PRYIBIL, 488-500 W. 41st St.. NEW YORK.

Columbia Popularity Is

Proverbial, and the Columbia models for 1894 are achieving a popularity never before accorded even to Columbias. Seven new peerless wheels which need



only to be seen to be appreciated. Their only to be seen to be appreciated. Their beauty appeals to the eye, and their construction good sense of every wheelman in the

land, while their standard price of \$125 proves particularly attractive to purchasers of high grade bicycles.

POPE MFG. CO.,

Boston, New York, Chicago, Hartford. All Columbia agents furnish our catalogue free, or we mail it for two two-cent stamps.



THE ELECTRIC STORAGE BATTERY CO. 🕬

THE CHLORIDE ACCUMULATOR.

Elements of all sizes, from 100 up to 10,000 watt-hours capacity each CENTRAL STATION INSTALLATIONS. Electric Launch Equipments; Telegraph, Phonograph, Surgical, and all special cells. DREXEL BUILDING. PHILADELPHIA, PA.



PAID for all kinds of good Second-hand Iron and Wood-Working Machinery. Address W. P. DAVIS. ROCHESTER, N. Y.

ALUMINUM goods made in quantity at low price. H. H. H. Franklin Mfg. Co., Syracuse, N.Y AGENTS WANTED for Grinders' Supplies, Liberal Commission, The Tanite Co., Stroudsburg, Pa

THE BEST & MOST DURABLE ROOF IN INUSE ROOF PRICES & SAMPLES FURNISHED ON APPLICATION THE PHILLIP CAREY MAN FOR 137°01476 ILBERT AVE. CINCINNATI. OH

The Berkefeld House Filter.

Thebestand most reliable filter in the market, tested and indorsed by many leading authorities in Europe and America. It gives a continuous flow of filtered water, absolutely free from germs. It is easily cleaned, as all impurities remain on the surface of the filtering cylinder. Cylinders can be sterilized by boiling in water for one hour, Send for circulars and prices to one hour. Send for circulars and prices to the BERKEFELD FILTER CO... 4 Cedar Street, New York.



Ride a Tribune! THAT'S THE WHEEL!



Write for Catalogue and Agency. THE BLACK MFG. CO., - ERIE, PA.

MANUFACTURE OF BICYCLES.-A MANUFACTURE OF BICILIES.—A very comprehensive article giving the details of construction of every part of these vehicles. With 15 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 90S. Price 10 cents. To be had at this office and from all newsdealers.

Towers, Tanks and Tubs

PATENT SECTIONAL ALL IRON TOWERS. PLAIN

ALL WOOD TOWERS

ELEVATED TANKS for Automatic Fire Sprinkler Plants.

Louisiana Red Cypress Tanks a Specialty.

W. E. CALDWELL CO. 219 E. Main Street,

LOUISVILLE, KY., U. S. A.

The "Missing Link" Found at Last! THE "KEYSTONE"

OPEN LINK It is the Best, Strongest, Quickest to Adjust, and Only Open Link Drop Forged from bar steel on the market.

Requires no tools to adjust, and cannot work loose, open or fall out in use

Drop forged from Bar Steel. Superior in Strength, Quality, and Finish. Drop Forgings of every description, in Iron, Steel, Copper, and Aluminum. Hoist Hooks, Wrenches, Machine Handles, Shafting Colessia. lars, Ring or Eye Bolts, Thumb Screws, and Nuts. PHILADELPHIA DROP FORGE CO. No. 2350 American St., Philadelphia, Pa.



ICE HOUSES. — DESCRIPTION OF ice houses as they were built a century ago. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 933. Price 10 cents. To be had at this office and from all newsdealers.

''Pacific''& ''Union'' Gas and Gasoline Engines,



Marine and Stationary. 1 h. p. to 75 h. p. Safe, Simple, Economica THE GLOBE GAS ENGINE COMPANY, 53 N. 7th Street, Philadelphia, Pa.

Printing inks. The SCIENTIFIC AMERICAN is printed with CHAS, ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York.