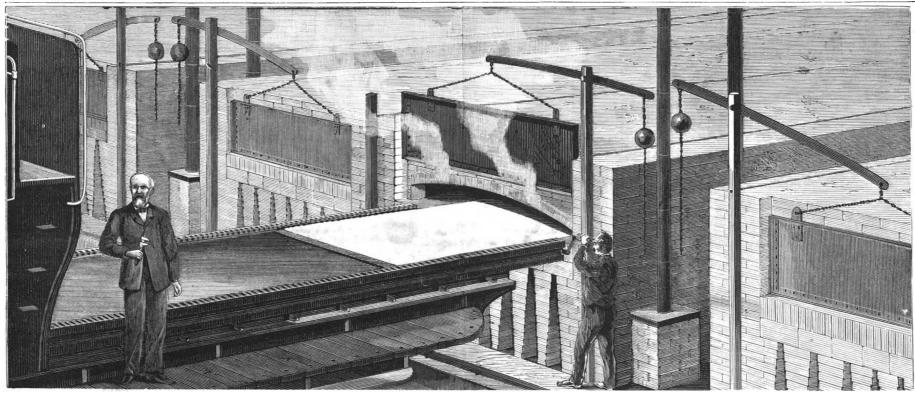
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

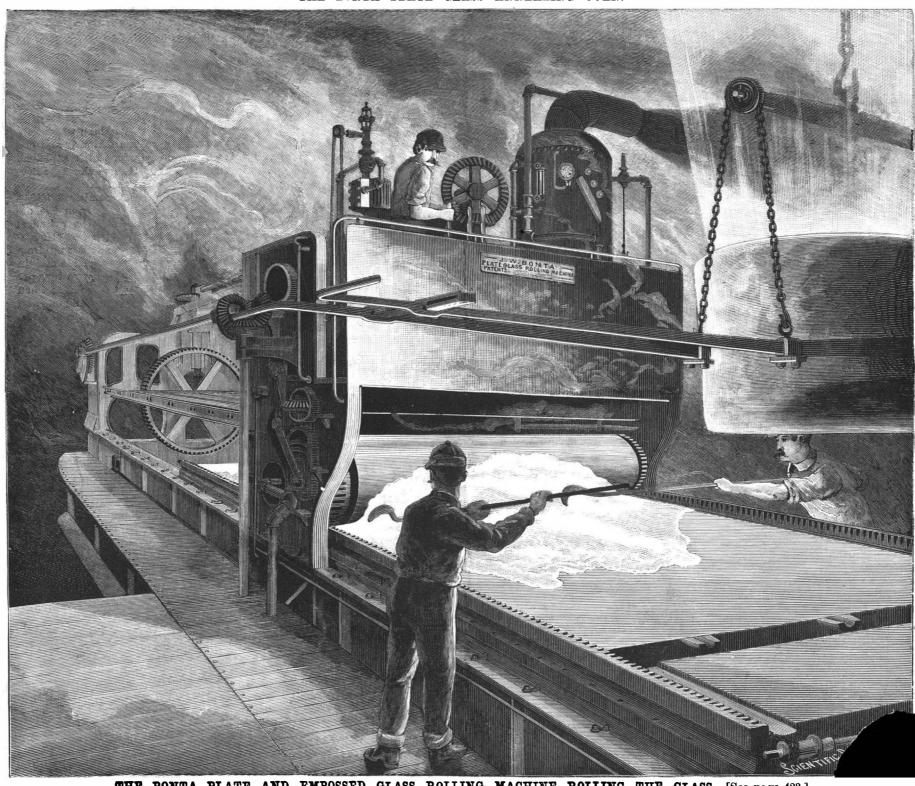
Vol. LXIX.—No. 27. Established 1845.

NEW YORK, DECEMBER 30, 1893.

\$3.00 A YEAR.



THE BONTA PLATE GLASS ANNEALING OVEN.



THE BONTA PLATE AND EMBOSSED GLASS ROLLING MACHINE-ROLLING THE GLASS.—[See page 423.]

# 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

is 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, 55.00 a year, for the U. S., Canada or Mexico. \$6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page. (Combined Ranes.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of seren dollars. To foreign countries within Postal Union, cight 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. 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, \$6.50 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.

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

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

NEW YORK, SATURDAY, DECEMBER 30, 1893.

### Contents.

(Illustrated articles are marked with an asterisk.)

Alkali metals, the $418$	Lathe attachment, taper turning*420
Babcock, George H 419	Meteors, November 419
Boiler pressure (5631) 427	Notes and queries, 427
Botter pressure (5051) 421	Notes and queries 421
Boring, a deep 422	Oil on water, distributing* 420
Canal boat propulsion (5629) 427	Old age—105 years 423
Celluloid plate vulcanizer* 421	Photochronography* 424
Coal consumed in cities 423	Planets for January 419
Crops of the United States 425	Plant, a New Jersey "pick up", 422
Cylinders, gas, explosion of high	Potassium and sodium 418
pressure 418	Printing office plate maker* 421
Electrically operated switch, an* 421	Railway switch, Falco's* 421
Engine, yacht, an* 421	Staff in the Albambra 419
Fish, frozen, Sandusky, Ohio 422	Trade marks
Gaseous fuel	Transportation 425
Gaseous theory of the earth 421	Typewriter, Anderson's short-
Glass grinding, polishing, etc. * 423	hand
Glass rolling machine, Bonta's*	Wagon, Cotes'*
417, 423	Wilcox, Stephen 419
Identification, difficulties of 420	Wood, artificial
Inventions, recently patented 426	
inventions, recently patented 420	Working men, social condition of 419

TABLE OF CONTENTS OF

### SCIENTIFIC AMERICAN SUPPLEMENT

No. 939.

For the Week Ending December 30, 1893.

Price 10 cents. For sale by all newsdealers

- I. ARCHÆOLOGY. Egyptian Chronology.-By SAMUEL BES-WICK .- How time was reckoned in ancient Egypt and recent discoveries in the epochs of old times.—The relations of obelisks and other hieroglyphic-bearing structures thereto.....
- II. ASTRONOMY.-The Moon's Face.-A study of the origin of its features.—By G. K. GILBERT.—Continuation of this interesting article, on the genesis of lunar geography.—The bombardment of the moon by meteors, the tidal, snow, meteoric, and moonlet theories of the formation of its surface.—Arched floors of craters. -4 illustrations.....
- III. EDUCATION.—The Equipment of Engineering Schools.—By ROBERT H. THURSTON.-A valuable contribution to technical education from the director of Sibley College.-Excellence of the outfits of American colleges as compared with foreign technical schools ...
- men in California.-Some curious and interesting deposits in California.-Their relations to hydrocarbons, natural gas, petroleum, and asphalt.-3 illustrations.....
- V. MISCELLANEOUS.-Gibraltar.-An interesting account of Gibraltar, England's great military station at the gates of the Mediterranean Sea, with characteristic views .- 6 illustrations .. The Churruk Poojah or Swinging Festival, in a Bengal Village.

  -A barbarous festival, of Bengal, to which the attention of the British House of Commons has recently been called, said to have en recently celebrated in a village near Calcutta.—1 illustra-

The Cody-Meyer Match.—The first of recent matches between horseman and bicyclist in Paris.-Won by the horseman.-1 illus-

ration.

The London Bird Catcher.—A curious business as carried out in the neighborhood of London.-The methods and apparatus em-

TGICS.—Phosphorescence and Luminous Paints.—By HENRY "he history of phosporescence.—The work already done and possible utilization of phosphorescence in the oal mines....

> -Almond Oil.—The preparation of almond oil. uses, and chemical tests for the same.—Its

### THE ALKALI METALS, POTASSIUM AND SODIUM.

Scientific American.

Sir Humphry Davy obtained in 1807 from potash. by the action of a voltaic battery of the greatest power which had then been constructed since its discovery in 1800, a brilliant, bluish metal, lighter than water and so soft that it could be welded between the fingers at ordinary temperature, as iron is at high heats by blows of a hammer. He extended his experiments to soda, and found a similar weldable metal, also lighter than water, silvery white in color. That potash and soda were oxides had been suspected by chemists, and this confirmation of the view created great excitement throughout the scientific world. Proof was soon obtained further that all the earthy or basic constituents of the rocks, lime, magnesia, baryta, alumina, etc., are also oxides of metals.

Other chemists, realizing that the electrolytic methods then known could not produce enough of these metals for any practical use, tried to separate the oxy gen from the alkalies by furnace operations. French chemists succeeded in decomposing potash by iron at high heat, but they obtained a liquid metal at first, which was subsequently discovered to be due to the presence of soda as an impurity in their potash—the two alkali metals forming together a permanently liquid alloy. With pure potash and iron Davy's solid potassium was obtained, and it was subsequently discovered that at very high heats carbon decomposes potash and soda and their carbonates, the metals distilling over—potassium as a vapor of a beautiful green color, the vapor of sodium being purplish in tint. These vapors are condensed in heavy hydrocarbon oil or melted paraffine wax.

In recent years, by reason of the belief, now general, that the clay-metal aluminum is destined to rank in usefulness with iron and steel, and of the fact that aluminum has been heretofore obtained by the action of sodium on aluminum compounds, an American chemist (Castner) made new efforts to obtain sodium cheaply. He combined iron and carbon, producing a peculiarly intimate mixture of the two. This operates on the carbonate of soda to great advantage, more rapidly and at a lower temperature. Finding but a small market for sodium in America, Castner went to England, and influenced capital to build large works for carrying out his new inventions, which were numerous. and extended to the manufacture of aluminum, as will be set forth in another article. As a result largely of the work of Castner, the following quotations for sodium, in this country, may be cited:

May 12, 1888	<b>\$4.50</b>	per	lb.
May 25, 1889	2.75		"
Oct. 26, 1889	2.50	"	44
May 30, 1891	2.50	"	"
Sept. 24, 1892 50 to 75	cts.	"	"
April 25, 189350 to 75	cts.	"	"
Aug. 19, 1893	1.75	"	• 6

The latter figure is quoted at the present date. The only reasonable explanation of the sudden rise in the valuation of sodium during 1893 is that it has passed out of use for the making of aluminum, which was its main channel of consumption. The electrolytic methods-such as Davy first introduced-have come back again; and with the potent aid of our magnificent dynamo-electric machinery, the clay-metal is produced much more cheaply by electrolysis. Hence the twenty sodium furnaces of Castner, at Oldbury, near Birmingham, which, according to an article before us. from Engineering, produced sodium in the latter part of 1888 at a cost of about 18 cents per lb., have doubtless gone out of use to a great extent. Nevertheless, the fact remains that sodium, which has such wonderful and exceptional chemical qualities and energies, was made for less than the cost of tin. With us, the cost would be a little higher, probably; for, as yet, most of our soda is imported from England. But this of sulphuric acid and coal. Of salt we have far more than England, and of pyrites for making sulphuric acid we have inexhaustible amounts of the highest grades, while she has to ship it from Spain. As to coal, that "goes without saying."

The object of this series of articles being to put before our practical men and inventors objects worthy of their ambition, and suggestions how to realize these, we will first give concisely the qualities of these alkali opposition company, and was not of suitable material. metals and their present uses, and then suggest new uses; also methods of obtaining them independent of existing methods. The latter, it is only safe to assume, are under the protection of existing patents. Sodium and potassium, and their liquid alloys, all take fire on contact with water, and burn with great violence and energy, and with enormous heat. They must all be preserved under the surface of hydrocarbon oils. A good article of common kerosene will answer. The solid metal ingots are easily divided under the oil with a knife, cutting like hard wax. The liquid alloys, of course, can be poured. Some density figures for solid sodium and potassium were given in Supplement, No. 938, December 23, 1893. The mean figure for sodium is about 0.97 (water = 1). The mean for potassium about 0.875. Sodium, when melted at about 208° F., is about 0.929, and at its boiling point (900° F.) cost, \$14,000,000.

0.744. The liquid alloy is about 0.891. The latter has about four times the coefficient of expansibility of mercury, and of late thermometers have been made with it in England, in an experimental way. These give indications far higher than mercurial thermometers, and the degrees are four times as long. Such thermometers will probably be unsafe for ordinary usage, but invaluable as instruments of scientific research. All these substances when placed suddenly under water explode with enormous energy. They amalgamate with mercury, but with violent explosion. Davy found that such amalgams would coat over iron, steel and platinum, which are in no way enfilmed by mercury alone.

The space for this article being exhausted, the suggestive portion is crowded over to the next issue.

### THE EXPLOSION OF HIGH PRESSURE GAS CYLINDERS.

One of the interesting developments of technical science is the commercial supply of gases under high pressure. Oxygen and hydrocarbon gases are now compressed into steel cylinders of very small size, relatively speaking. The gas is reduced to less than one one-hundredth of its normal volume. Another example of the same system is furnished by carbonic acid gas. This can be bought in the liquid state, contained in steel cylinders. Faraday's great achievement, one of the triumphs of a life of scientific experiment, is now a commercial process, and is applied to the supply of an everyday commodity.

Oxygen and hydrogen gases will stand unlimited pressures without liquefying. There is a special temptation to employ high pressures in their case, as the volume regularly diminishes as compression is applied. It is customary now to sell the cylinders filled at nearly 1,800 pounds pressure to the square inch. An innocent looking cylinder, less than five feet long and a few inches in diameter, may have locked up within it nearly a thousand tons of total pressure. If such a cylinder gives way, a dreadful explosion will ensue.

Two such accidents have recently occurred, one in Bradford, England, and one in Albany, N. Y. In the Bradford case a boy was transferring two cylinders, dragging one behind him and carrying the other. The dragged cylinder exploded, killing him on the spot and injuring a man. The Albany explosion occurred on December 6, on a dock. A number of cylinders of oxygen and of hydrocarbon gas, called in the trade 'hydrogen," were being shipped from New York to Albany. All but one had been taken from the dock where they had been placed. On attempting to remove this it exploded. It is believed that it was thrown down by the man carrying it. One man was fatally injured, two others were hurt, one seriously and one slightly. It was a hydrogen cylinder which exploded. In both cases the pressure of the gas was 120 atmospheres, or 1,800 pounds to the square inch.

In the London Engineering of December 8, 1893, a letter has been published emanating from the developer of the process used in making the cylinders originally used for high pressure oxygen gas. He describes his process of pressing the cylinders up from disks of sheet steel of approved quality. At a certain stage of the process a bursting strain of two tons per square inch is applied to detect hidden defects; when finished and annealed, a final test of one and one half tons is given them. The rationale of the two tests he does not explain. Such cylinders the writer in question, Mr. Howard Lane, says are worked by the German government up to 160 atmospheres or 2,400 pounds to the square inch. The regular pressure used here and in England is 120 atmospheres, or 1,800 pounds per square inch.

The governments of different countries take cognizance of steam boilers and see that they are tested at should not be so. Soda is made from salt, by the aid proper intervals. No boiler can be legally used without proper permit or license. It would be well both for the public and for the dealers in high pressure gases to subject these gas cylinders to proper tests and examination. It should include the fullest possible tests of the quality of the metal, even if it involved the cutting up of an occasional cylinder. Mr. Howard Lane in the communication referred to claims that the cylinder which exploded at Bradford was made by an Not only strength, but ductility of the steel is an important element of safety. If a boiler with perhaps only fifteen pounds pressure per square inch is an object of governmental regulation, a cylinder with one hundred times that pressure is still more so. It is nothing less than a shell charged with an explosive, whose power in destroying life has twice been proved within the last few weeks.

> Rough usage cannot be pleaded as an excuse. The shippers of goods always have employed rough treatment and will continue to do so. The cylinders should be of such quality as to stand anything that they may be subjected to.

> The Hoosac tunnel, Massachusetts, is the longest in the United States; length, four and three-fourths mile;

#### [FROM ASTRONOMY AND ASTRO-PHYSICS.] The Planets for January.

Mercury having been at greatest western elongation December 14, will in January be too close to the sun for observation. He will be at superior conjunction January 29, at 6 h. 36 m. A. M.

Venus, which has been such a brilliant object in the early evening sky during the past month, will be still in Brooklyn, N. Y., after a brief attack of pneumonia. more brilliant during the first part of January. This It was said of him that he had a simple, genial nature, planet will attain its maximum brilliancy on January 10, when the light will be 218, as compared with 145 on the interests involved, besides rare mechanical ability. December 1. The position of Venus is becoming a little more favorable for observation in northern latitudes, as the planet moves northward in declination. Venus and the crescent moon will be in conjunction on the morning of January 10, and the two will form a pretty pair on that evening and the preceding.

Mars will be morning planet during January, visible in the southeast after 5 o'clock. The low altitude will prevent good observations in our latitude, but south of the equator something may be done in the study of the surface markings of the planet. Mars and the waning moon will be in conjunction on the morning of January 3, the latter passing 4° south of the former.

Jupiter will be in excellent position for observation January 15, after which it will move slowly eastward. The "great red spot" was well seen by us with the 16 inch telescope on the night of October 31. Its center was on the central meridian of Jupiter at 11 h. 31 m., Central time, as near as we could estimate. This time agrees closely with that predicted by Mr. Marth. The spot was seen without difficulty, although the color was quite faint. The color was exactly the same as that of the belt just to the south of it, and the two objects merged into one another without the slightest change in intensity of color. The outline of the spot seems to be the same as in past years, except as stated above, that its southern edge is merged into the belt. There seemed to be two white clouds over the central draw from the tables in the report some inferences as portions of the spot, the following of the two being the larger. The seeing was excellent during this observation and much of very minute detail was seen in all the

Saturn is getting into better position for observation in the morning, but the majority of observers will prefer to wait two or three months until the planet is visible in the evening. Saturn will be at quadrature, 90° west from the sun, January 14. Saturn is in the constellation Virgo, a little northeast of Spica, and is moving very slowly eastward. The moon will be 4° south of Saturn at noon, January 27.

Uranus is in the constellation Libra, a little way east of the star  $\alpha$ . It is not yet in very good condition for observation in our latitude.

Neptune, having passed opposition in December, will be in excellent position for observation in January. It will move very slowly westward during the month, the position January 1 being a little more than one-third of the distance on a straight line from ι to ε Tauri. There is no star of equal brightness within a radius

November Meteors.—The November meteors were far more abundant this year than I have ever seen them before. Especially were they plentiful on the mornings of November 13, 14, and 15. Many very brilliant ones were seen. One on the morning of the 14th burst just below Coma Berenices It was nearly as large as the full moon. On November 15, at 14 h. 50 m., a splendid meteor from Leo shot across the sky and burst between Zeta and Eta Ursæ Majoris. This left a persistent train deficit of \$92.59 was traced to each of 453 families; 766 about 10° long, which remained bright and straight for about five minutes, like a slender comet; it then collected into a cloudy mass at the point of explosion. This elongated mass of luminosity remained distinctly visible for half an hour, drifting due east in the meantime about 7°. As I was photographing the comet at tions go, the three industries, in the order given, form this time I could not turn my telescope to it to see how long it remained visible after it had ceased to be seen with the naked eve. F. E. BARNARD.

Mt. Hamilton, November 19, 1893.

George A. Hill, United States Naval Observatory, of people in any calling throughout the country. Washington, D. C., has been appointed to the position of assistant astronomer in the observatory. He is now at work with the Prime vertical transit instrument. He takes the place of A. Hall, Jr., who resigned not long ago to accept the position of director of the Detroit Observatory at Ann Arbor, Michigan.

Professor S. W. Burnham.—At a recent meeting of the board of trustees of the University of Chicago, Mr. S. W. Burnham was unanimously elected professor of practical astronomy. The department of astronomy is to be congratulated on securing Professor Burnham's eminent services, and the honor which the university authorities have thus done to the cause of science will be fully appreciated by astronomers everywhere, who will rejoice to learn that Professor Burnham will again have adequate opportunities for continuing his splendid investigations in double star astronomy. It is un- ${\bf derstood\ that\ the\ micrometrical\ measurement\ of\ double}$ stars is one of the principal lines of research con-

Yerkes Observatory.

### Stephen Wilcox and George H, Babcock.

On November 27, Stephen Wilcox, one of the founders of the Babcock & Wilcox Company, the well-known engineers and boiler manufacturers, died at his home which would know nothing but the right, whatever He was born at Westerly, R. I., about sixty-three years

Within a few days following, on December 16, at Plainfield, N. J., occurred the death of the other of the principal members of this firm, Mr. George H. Babcock, in the 61st year of his age. He was among the first to invent a press for chromatic printing, and during the war invented a shrapnel shell.

Mr. Babcock had been married four times. Last summer he married Miss Eugenia Lewis, a teacher in the Plainfield public schools. He had been president of the Plainfield Board of Education since 1885. He was a lecturer in the mechanical engineering course at Cornell University, and a member of the New York during the first half of the night in January. The and Plainfield Camera clubs. Some of his lectures in planet will be stationary among the stars of Taurus on | the engineering course at Cornell have been published in the Scientific American Supplement. He was an art critic, and his home is filled with choice works. Several of his collections were exhibited at the World's Fair. He leaves one child, a boy eight years old.

### The Social Condition of Workingmen.\* BY RALPH D. ST. JOHN.

The "Seventh Annual Report of the Bureau of Labor," at Washington, has been recently published. The report relates to the cost of producing textiles and glass in the United States and in Europe; to the wages paid to the persons employed in these industries; and to the cost of living of the laborers. My object is to to the real condition of American laborers, and as to the relation existing between their condition and the cost of living. The following details are taken from the cotton, the woolen, and the glass industries.

families considered, 168 owned their house. The average size of the family was 5.7 persons. The average total yearly income for each individual was \$114.70, the expenditure \$106.48. Of the whole number of families, 765 came out at the end of the year with a deficit which amounted on an average for each to \$54.16. Averaging the total surplus among the 1.151 families who had accumulated, it gave as the share of each \$123.33. The average expenditure for food was \$287.06 a family, or \$50.06 an individual. The total cost of living, other than for food and rent, was \$258.79 a family, or \$45.13 an individual.

In the woolen industry, 911 families were considered, of whom 154 owned their house. Average size of family 4.9 persons. For each individual, the average total in come was \$136.49; the average expenditure \$122.28. A deficit was traced to 268 families, of the average amount of \$61.49; and a surplus of \$136.16 to each of 583 families. The cost of food was \$262.85 a family, \$54.10 an individual. Total expense, other than for food and rent, was \$256.32 a family, \$52.76 an individual.

In the glass industry, of the 1,276 families visited, 339 owned sheir home. Average number of persons in each family, 4.8. For each person the average income was \$177.81, the average expenditure \$159.07. An average families had each an average surplus of \$205.65. Cost of food was \$294.75 a family, \$60.97 an individual. Besides cost of food and rent, the expenditure was \$394.37 a family, \$81.57 an individual.

These figures show that, so far as financial consideraan ascending scale. They also show that, as far as actual financial results are concerned, they all compare favorably with the general estimate which any observing person would make of the condition of the majority which was finished and decorated about the year 1348.

1 will pass now to more specific cases, with the object of seeking out the causes of the sufferings of which some working people complain. I shall trace out some of the statements concerning certain individuals and compare and contrast them.

Of two families living in Alabama, and connected with the cotton industry, it is learned that both are of American birth. Of the one designated in the tables as No. 9, the husband, aged forty-seven years, is a section hand; the wife and three children are all at work. The husband's income is \$257.58, the wife's \$15.63, the children's \$333.56; total income, \$606.77. They do not own their house. For their food, the itemized bill amounts to \$261.60. For expenditure other than for food \$39 goes for rent; \$28 for fuel; \$6 for lighting; for clothing for the husband \$5, for the wife \$5, for the children \$45; furniture and utensils \$43. The total expenditure

\* Condensed for the Literary Digest from a paper in the Chautauquan, Meadville, Pa., December.

templated with the great 40 inch refractor of the is \$562.45. Under the table of notes, in which running comments on the condition of each family are made, it is said: "They live in squalor."

> In the other family, No. 35 in the tables, the husband, aged forty-six, is a carder, receiving \$257. The wife stays at home, but takes boarders and lodgers, earning thus \$236; the only child, a son, earns by work \$120. Their itemized expenditures for food reach the amount of \$279. The rent is \$24, fuel \$32, lighting \$15; clothing for husband \$12, for wife \$15, son \$5; furniture and utensils, \$1.50. The total expenditure is \$443; the surplus is \$170. Their cabin is described as neat but rowded, and they have a garden.

> The difference in the circumstances, under conditions quite similar, shows that the latter family have at least one of the secrets of the capitalist's success, while the other swells the list of the most miserable people in the land.

> In two families of Irish nationality, living in Illinois and working in the glass industry, greater differences still are found. In one case, the husband, aged fortytwo years, is a mixer; the wife remains at home; three children are at work, two at school, and two at home. The husband receives \$349, the children at work \$317 -total income \$666. Total expenditure for food, \$187.40; other than food, \$278.65. In the latter amount are comprised the following: Taxes, \$11.50; insurance on property, \$1.50, on life, \$14; for religion, \$1; for charity, \$1.50; books and newspapers, \$6.70; amusements and vacations, \$10; intoxicating liquor, \$26; tobacco, \$5.20. Their surplus is \$200, and they own their house and garden, a sewing machine, and a cow.

In the second family, the husband, aged thirty-three years, is a blower, and receives \$1,449.52. The wife and three children are not wage earners. The amount spent for food is \$352, other than for food, \$1,097.52. In the latter sum are included: Rent, \$120; labor organizations, \$34.18; religion, \$2; charity, \$15; books and newspapers, \$6.50; amusements and vacations, \$30; intoxicating liquors, \$400; tobacco, \$52; sickness and death, \$27; other expenses, \$60. Total expenditures reach \$1,449.52, just balancing income. One other item needs to be mentioned. In the former family the bill for clothing ran, for the husband \$20, the wife \$15, children \$50; in the latter family, husband \$125, wife \$40, chil-It is found that in the cotton industry, of the 2,132 dren \$65. The remarks in the report concerning the second family are: "Wretched people, miserable

> In this comparison the earmarks indicate a selfish, drunken husband, as the cause of the misery of the second family. It is a pity that any account of liquor entered into the first report, but it is the aim of this article to take in all particulars, average instead of extreme cases, which makes it necessary to note many things to be deplored.

> The tables in the seventh, as well as in the sixth report, show that the misery often to be found existing among the working people cannot be attributed to the cost of living, or rather to the disproportion between their earnings and the cost of living. The majority of those who are classed among the destitute are to be found, it is true, among those receiving the smallest wages: but that this does not necessarily follow is proved by the fact that some of the poorest paid laborers are recorded as living in good circumstances, and as having accumulated quite a property, while others receiving the best pay are in the most miserable con-

> Thus we come by this new route to the old lesson, that the cause for the misery or the happiness of men lies within themselves and not in outward circumstances.

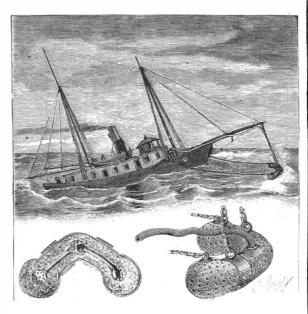
### Staff in the Alhambra.

There is a general impression that staff, the material so abundantly used for the rich-looking architectural works of the great Exposition, is of French origin. But it appears to have been introduced into Europe by the Arabian Moors, and much beautiful work composed of this or kindred material is still extant in Spain. Some of the finest examples are to be found in that grand historic old Moorish fortress the Alhambra, at Granada, Washington Irving, in a note in his delightful volume "The Alhambra," says:

"To an unpracticed eye the light relievos and fanciful arabesques which cover the walls of the Alhambra appear to have been sculptured by the hand, with a minute and patient labor, an inexhaustible variety of detail, yet a general uniformity and harmony of design truly astonishing; and this may especially be said of the vaults and cupolas, which are wrought like honeycombs or frost work, with stalactites and pendants, which confound the beholder with the seeming intricacy of their patterns. The astonishment ceases. however, when it is discovered that this is all stucco work; plates of plaster of Paris, cast in moulds and skillfully joined so as to form patterns of every size and form. This mode of diapering walls with arabesques and stuccoing the vaults with grotto work was invented in Damascus, but highly improved by the Moors in Morocco, to whom Saracenic architecture owes its most graceful and fanciful details."

### A NEW METHOD OF DISTRIBUTING OIL ON WATER.

Mr. P. Samohod, of Lima, Peru, sends us a sketch of a simple apparatus which he has devised for the distribution of oil from vessels on the surrounding sea surface in stormy weather, and suggests that possibly our government would be willing to give it a trial. The apparatus, as shown in the illustration, comprises a somewhat bow-shaped distributer, near the ends and center of which are globe-shaped, perforated, copper oil receivers connected with each other by metal tubing, and surrounded by sponge, the whole inclosed by a varnished leather cover with many perforations protected by metallic eyelets. The small figures represent the distributer in section and perspective. It has



two metal bands from which chains pass to the deck of the vessel, other chains being connected to facilitate its suspension from the bowsprit. An oil supply hose of good varnished leather or other preferred material suggests that if this enormous increase can be successextends from a pipe in communication with a pump and reservoir on the vessel to the central one of the tained for several days (it is often only a few hours) forced into and through the distributer as desired. It is also provided that the oil will pass through a secmay be placed when the weather is cold. It is designed that the length of the distributer shall be equal the application of gas for purposes other than those of to about one-third of the maximum width of the ves- lighting. The report then discusses the relative heat sel. The great efficiency of oil, when used even in small quantities, for the quieting of a pretty large area of the sea around a vessel, and thus materially mitigating the dangers to which vessels are sometimes exposed, has often been fully demonstrated, and its use for such purpose is now becoming quite frequent. The apparatus shown is designed to afford an inexpensive and effective means of so distributing the oil that the vessel will receive the greatest benefit.

### AN IMPROVED LATHE ATTACHMENT.

The illustration represents a recently patented appliance adapted for use on any lathe, and readily transferable from one lathe to another. It is attached by taking the nut off of cross feed, so that the tool block can be adjusted by screw in taper attachment, the device being easily operated from any of the four stoves follows, and the Lancet explains that no senti-means of a photograph as her husband, and it turned

V's on the lathe bed and set at front or back of tool block. It has two sliding jaws to be clamped to the cross slide of the lathe, and operated by a right and left hand screw, so that the attachment will always be in center of tool block. A clamp or strap is furnished to be attached to the tool block. in which a hole is drilled and tapped to receive a binding screw, and when the strap is in position the adjusting nuts on the cross feed screw are set so there will be no end play. The connecting rod is grooved in several places to receive the binding screw in clamp. The taper bar is graduated on one end, so that any desired taper can be easily obtained, and when straight and taper work are to be done on the same piece, the changes can be quickly and easily made. This ply Company, of No. 115 Liberty Street, New York City.

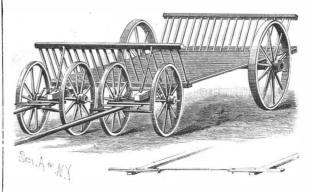
#### Gaseous Fuel.

The London Lancet publishes the result of an exhaustive inquiry, in which the practicability of employing gaseous fuel for heating and cooking appliances is fully discussed. The article contains a very considerable number of experimental data, upon which the deductions and conclusions contained therein are drawn up. At the outset the opinion is expressed that the universal adoption of gaseous fuel would unquestionably prevent the formation of unhealthy and smoke-laden fogs. With the view of determining whether the gas-producing centers of London would be equal to the increased production of gas necessarily involved, the Lancet quotes some facts and statistics of an important character-e. g., taking the Gas Light and Coke Company as a typical source of supply, it is shown that at present their production of gas is equal to twenty thousand million cubic feet per annum, representing some 6,000 tons of coal carbonized per diem; and in order to distribute this enormous volume of gas there are laid down in London streets nearly 2,000 miles of main, exclusive of services and other companies' supply. But the Lancet finds a striking and complete answer to the question as to whether the gas companies would be equal to the task of supplying an increased volume of gas were it demanded by its application for heating and cooking purposes in the following remarkable particulars: On Tuesday, December 1, 1891, with the thermometer at 46° F., the consumption of gas was 82,000,000 cubic feet from the Gas Light and Coke Company's works; on Thursday, the 17th, temperature 37°, the demand was 92,000,000. Then suddenly a fog set in, and on Friday, the 18th, temperature 26°, no less than 118,000,000 were required, while on the following Tuesday as much as 128,000,000, that is, some 50,000,000 cubic feet of gas above the normal daily winter demand, and an addition nearly equal to the daily average supply, was consumed. The Lancet fully grappled with at a single day's notice and mainthree oil receivers, by means of which the oil may be notice, for there are no means of ascertaining the precise moment when fog will appear or when the temperature will suddenly fall), it is probable that even the tion of coil in a simple form of heater where a lamp existing plant, both manufacturing and distributing, is equal to the increasing requirements necessitated by values of coal and gas, and it is shown that the gas produced from a ton of coal—that is 10,000 cubic feet is, as regards heat value, broadly one-fifth of the coal from which it is derived, supposing that the total energy of the mineral is utilized; but, as is pointed out, while a large proportion of the heat value of coal is lost in the shape of incomplete products, inflammable gases, soot, etc., gas admits of complete combustion under easy circumstances, and its total heat value is. therefore, utilized. That is, while gas does its duty fully, coal, as commonly consumed, fails largely in this respect. With gaseous fuel there is small possibility of undesirable products being formed, while an important economy as regards heating effect is at the same time secured. The probability of a cheaper gas supply is then discussed. The description of types of

attachment is furnished by the Prentiss Tool and Sup- mental objections on the score of cheerless appearance need obtain on the installation of gas firing, as in by far the majority of cases the stoves at hand are provided with a form of indestructible fuel or coal, which is maintained at a cheerful glow by the heat of the almost invisible atmospheric burner. A very considerable number of experiments with various stoves are then recorded and are embodied in a table occupying two pages of the journal. In dealing with the results comparisons are drawn, defects are pointed out and certain improvements are indicated. The provision of an adequate flue is absolutely essential to the working success of gas stoves; upon this point the Lancet is emphatic, as it seems to be a popular idea that because gas fires do not smoke they require no means of carrying off the products of combustion.

### AN IMPROVED WAGON.

A wagon having its hauling gear arranged in such a way that a large team of horses may be hitched close to the wagon, which may be easily hauled and the team readily controlled, is shown in the accompanying illustration, and has been patented by Mr. David W. Cotes, of Guthrie Center, Iowa. The wagon has a bed much wider than usual, and with sills projecting forward to be fastened by the ordinary king bolt to short axles, each of which carries a pair of wheels. The axles have forwardly extending tongues, with the customary whiffletrees, whereby four horses may be hitched abreast, the neck yokes of the tongues being coupled together by a detachable rod so that the horses will pull together effectively. When the wagon is used for hauling hay or other bulky material it may be provided with racks at the front and rear, or all around,



COTES' WAGON.

but, without such racks, the wagon presents a broad, firm bed, affording a firm foundation, and adapted to receive scraper loads of dirt or other material.

### Difficulties of Identification.

During the progress of a recent murder trial in New York medical witnesses testified it would be impossible to identify the remains of the deceased after burial for three months, without embalming. Also that it was impossible to determine whether poison found in a dead body had been ingested before or after death.

Dr. Herold testified that in one case occurring in his duty as a coroner's physician the body, lying in a police station, was claimed during the evening by three different women, each identifying the dead man by

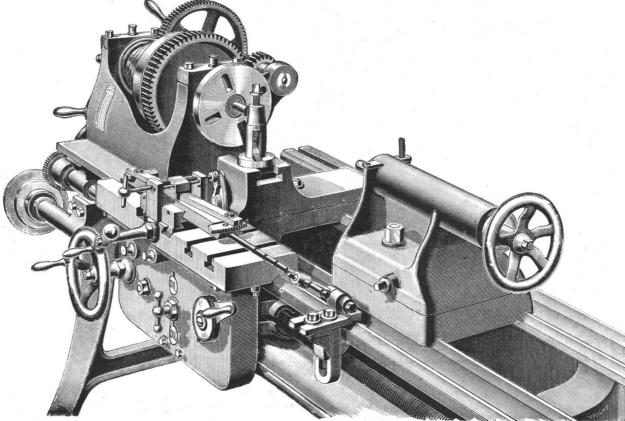
> out that neither of them was the wife of the dead man. He had been dead forty-five minutes.

> In another case a woman identified her dead husband in a station house, and then went home to find him safe and asleep in bed.

> In another case a widow buried the body of her husband; but ed up alive and well three months later.

> The witness said the first putrefaction changes were found in the face within two hours of death.

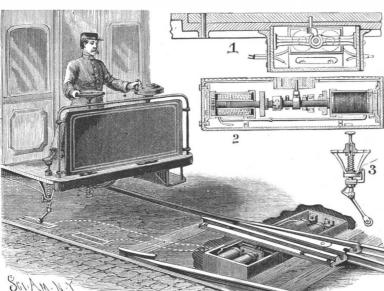
The senior class at Yale numbers 185 students; of these 54 wear glasses, the necessity for such aids to vision having, in 25 of the cases, arisen since the students entered the college. The average age of the members of the class is twenty-two.



THE HODGE-FRAZIER TAPER TURNING ATTACHMENT.

#### AN ELECTRICALLY OPERATED SWITCH.

The improvement shown in the illustration is designed principally for application to electric cars, although it admits of being applied to cars propelled by other power. It has been patented by Mr. Henry L. Falco, of No. 643 Carlton Avenue, Brooklyn, N. Y. The view in perspective shows the operation of the improved switch, Fig. 1 being a longitudinal and Fig. 2 a transverse section, while Fig. 3 shows the contact making device. The car may be supplied with the electrical current through a trolley, by storage batteries, or by a small dynamo taking power from the



FALCO'S ELECTRICALLY OPERATED RAILWAY SWITCH.

car axle, the wire carrying such current leading to the ring and a square ring. These rings are cut in three contact maker just under the car platform, and carrying at its upper end a foot piece to be pressed upon by the driver or motor man. The contact maker adapts the walls of the cylinder by means of round wire by these rollers, which are turned slightly rounding itself to any distance between the car and the contact plates. The switch tongue turns on a pivot, and is the rings. mounted in a casting in the usual way. A pin projects from the tongue through a slot in the casting, and en-

armatures which enter the coils of electro-magnets. These magnets have short cores and are inclosed in lead to prevent their being acted on by water entering the pit, and the mechanism is inclosed in an iron box with cross bars through which the rod slides, there being on the rod buffers to prevent shock when the armatures are drawn in either direction. There are two insulated contact plates in the roadbed near the track rail, a wire from one plate extending to one of the magnets, while the other plate is connected by a wire with the other magnet. When, therefore, a car approaches the switch, the driver can swing the switch tongue in either direction, to open or close the switch to the main or the side track, by simply pressing on the foot piece to bring the roller on the lower end of the contact maker down upon one of the contact plates in the roadbed, the current then being made to energize one or the other of the magnets to move the sliding rod connected with the switch tongue. The box containing the magnets is closed at the top by serrated covers in the usual way.

### Gaseous Theory of the Earth.

The idea of M. Rateau, as expressed the other day to the French Academy of Sciences, is that the phenomena of the earth's crust are well explained by considering that the planet's interior is molten, and that a layer of gaseous matter separates it from the portion of the crust forming the continents, whereas the seabeds rest directly upon the igneous globe. The continental masses tend generally to rise, being forced up by the accumulating gases, while the sea beds sink. The gradual escape of the gases, imprisoned under high pressure, will in time exceed the production of new supplies, when the pressure will diminish and the continents fall in, giving rise to more or less crateri-

form configurations. This is the state in which the passes through the center and enters the cylinder from moon now appears. Assuming the crust to be 181/2 miles thick, the pressure of the gases should be 650 atmospheres, their temperature 900° C., and their density nearly equal to that of water. This theory makes is of steel 31/4 inches in diameter and has bearing surit clear why volcanoes in the interior of continents give off gas instead of lava, and why lines of coast volcanoes have successively receded inland where the sea has encroached.

### A FINE YACHT ENGINE.

A fast steam yacht has been recently completed at

Bridgeport, Conn., for Mr. H. M. Hills, proprietor of the *Evening Post* of that city. It is 60 feet long, 12 feet beam, and 5 feet deep, drawing 20 inches forward and 3 feet 4 inches aft. The engine for this yacht, shown in our illustration, is a fore and aft compound, designed and built by the Coulter & McKenzie Machine Co., of 500 Water Street, Bridgeport. It is designed to The propeller furnish 75 horse power, turning a 3 foot screw 250 turns per minute with 100 pounds of steam, supplied by a Herreshoff water tube boiler. The high pressure cylinder is 6 inches in design. It condiameter, the low pressure 12 inches sists of a box and the stroke 9 inches. The exhaust from the high pressure cylinder passes around that cylinder and into the low ted two bearpressure valve, thus making a receiver and jacket in one and permitting the passage of steam to the low pressure trally between cylinder without piping.

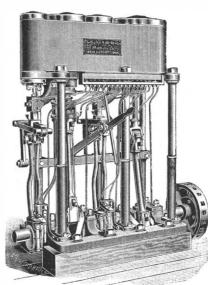
The pistons are fitted with a sectional Dunbar packing, consisting of lar clamped a solid center, or "bull" ring, and on each side of which is fitted an L-shaped

or four segments, as may be desired, and are adjusted so as to break joints. The rings are pressed against springs of a diameter equal to the inside diameter of

The valves are of the balanced piston type, made up of a center and two end pieces held together by the ters an arm on a sliding rod in the switch pit, there valve stem and fitted with a steam-tight ring on each taining this bearing is filled with oil, so that the parts

each end, the exhaust steam passing around the center. All the rods, connections and links have every means of adjustment for taking up wear. The shaft face of 18 inches on the bed. The crank pins are 23/4 inches in diameter by 3 inches long, and are set at an angle of 90 degrees. The shaft is fitted with a Pry wheel, which is also used to balance the two cranks and forms one-half of the coupling connecting the wheel shaft. The cylinders and their heads are neatly incased with German silver covers. On the front and bottom of the cylinders is a reservoir for oil, under which there is fitted a trough holding 18 separate pipes carrying oil

to the different bearings, separate oil holes being also provided for each bearing for use in case of need. shaft is fitted with a patented roller thrust bearing of new casting, in which are fitings, one on each end. Centhese bearings is a thrust colrigidly to the ENGINE OF STEAM YACHT DREAM shaft. On each



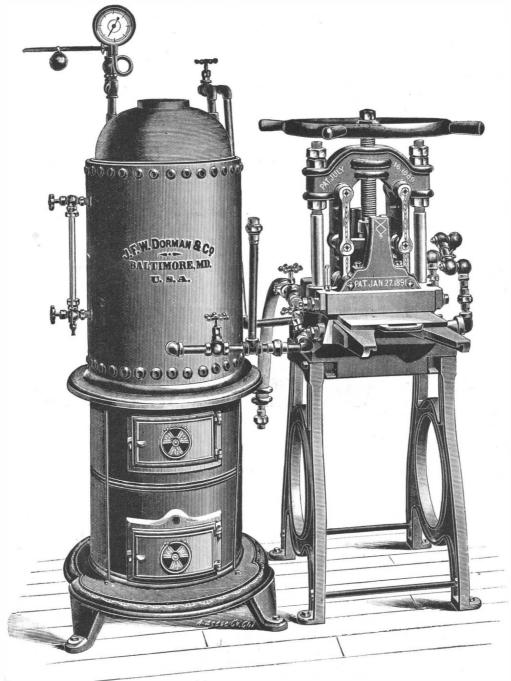
side of this thrust collar is a loose steel collar having four projecting arms or studs on which rollers are loosely mounted. The thrust of the shaft is received on the face, so as to overcome the sliding motion that would occur if they were flat.

One set of these rollers acts when in head motion and the other when in back motion. The box conbeing on opposite ends of the rod cross bars carrying end. The live steam enters on the top of the valve, are constantly lubricated and friction is reduced to a minimum.

### MAKING CELLULOID STEREOTYPES ETC.

The illustration shows a combi-

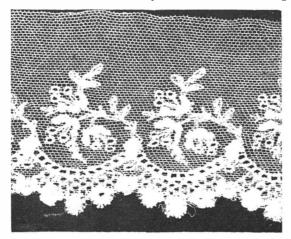
nation machine embodying recent improvements designed to facilitate stereotyping and moulding, wherein a regulated amount of heat is necessary, and especially for the making of cellutypes, or celluloid plates, to be used in place of electroplates or metal stereotypes. By means of this machine, and the improved methods now followed, it is claimed that celluloid plates are made equal to electrotypes as to sharpness of face, and superior for durability, the plates not being affected by any of the fancy colored inks, and the work being done in far less time than now required. Where one has the necessary steam supply, at a pressure of some sixty pounds, the boiler is not necessary, but where this is not available, as in most small printing offices, the combination machine includes an efficient and specially adapted construction of boiler, whereby the press may be quickly and economically heated, in both its platen and bed, to the required temperature, and then again as rapidly cooled, by the adjustment of valves regulating the circulation of water and steam. The mould is made of a specially prepared powder and gluten water, in which, when it has attained a proper consistency, the type form, engraving, or other representation to be reproduced is impressed in the press, and in this mould an impression is afterward made in a thin sheet of celluloid, the press, mould, and celluloid sheet being heated up to about 240 degrees. The machine is afterward cooled with the celluloid in it under pressure, and the cellutype thus made may be employed in printing as an ordinary electroplate. This process of making plates is well adapted for the representation of



THE "CLIMAX" STEREOTYPER AND MOULDING PRESS.

in the press, and being impressed directly upon the circumference, and some as much as 3 inches in diacelluloid, a pattern made in this way being shown herewith.

The convenience of such an outfit in a printing office will be at once apparent, as a cellutype can be made in a few minutes of any form from which a large



LACE SHOWN BY CELLUTYPE PLATE.

number of impressions are to be made, or one which will have to be used in the future, thus releasing type and saving time. The machine constitutes the most efficient of all appliances for making rubber stamps.

The "Climax" machine is made by Messrs. J. F. W. Dorman & Co., manufacturers of vulcanizers, stereotype machinery, and all stereotype supplies, No. 217 East German Street, Baltimore, Md.

### Trade Marks.

The law of the land respecting the use of trade marks has been summarized and announced to the bar of the Supreme Court of the United States by Justice Jackson. The opinion was read in the case of the appeal of the Columbia Mill Company, of Minnesota, against W. W. Alcorn & Company, from the circuit court for the eastern district of Pennsylvania. The mill company had brought suit to restrain Alcorn & Company from using the word "Columbia" apon a brand of flour sold by the defendant, but the court refused to entertain the proceeding and dismissed the bill. From that judgment the Columbia Company appealed to the Supreme Court. Justice Jackson said that by a long line of decisions in the Supreme Court the law of trade marks was well settled. Those decisions, he said, established the following propositions:

- 1. That to acquire the right to the exclusive use of a name, device, or symbol as a trade mark it must appear that it was adopted for the purpose of identifying the origin or ownership of the article to which it is attached, or that such trade mark must point distinctively, either by itself or by association, to the origin, manufacture, or ownership of the article on which it is stamped. It must be designed, as its primary object and purpose, to indicate the owner or producer of the commodity and to distinguish it from like articles manufactured by others.
- 2. That if the device, mark, or symbol was adopted and placed upon the article for the purpose of identifying its class, grade, style, or quality, or for any purpose other than a reference to or indication of its ownership, it cannot be sustained as a valid trade mark.
- 3. That the exclusive right to the use of the mark or device claimed as a trade mark is founded upon priority of appropriation.
- 4. Such trade mark cannot consist of words in common use as designating locality, section, or region of

In view of these propositions, the justice stated, the court were of the opinion that there was no valid trade mark in the word "Columbia," and the judgment of the court below was, therefore, affirmed.

### Remarkable Thunder and Hail Storms.

ciety, Mr. W. Marriott gave an account of the thunder valuable plant has cleared his land. Each of these and hail storms which occurred over England and the south of Scotland on July 8, 1893. Thunder storms were very numerous on that day, and in many instances were accompanied by terrific hail storms and squalls of wind. It was during one of these squalls that a pleasure boat was capsized off Skegness, twentynine persons being drowned. About noon a thunder storm. accompanied by heavy hail and a violent squall of wind, passed over Dumfries and along the valley of the Nith; many of the hailstones measured from 1 inch to 11/2 inches in length. At the same hour a similar storm occurred at Peterborough. From about 2 until 10 P. M. there was a succession of thunder storms over the northeast of England and southeast of Scotland, and at many places it was reported that the thunder storms were continuous for nine hours. Two storms were remarkable for the immense hailstones which fell

fine lace patterns, etc., the lace itself being placed in Yorkshire. The hailstones were 4 and 5 inches in held in reserve. Briefly stated, the principle of the meter. Great damage was done by these storms, all windows and glass facing the direction from which the storm came being broken. It is computed that within ity of 26 degrees. In this cylinder is a coil, heated by a radius of five miles of Harrogate not less than 100,000 panes of glass were broken, the extent of the damage being estimated at about £3,000. The thunder storms in the northern part of the country traveled generally in a north-northwesterly direction, at the rate of about twenty miles an hour. They appear to have taken the path of least resistance, and consequently passed over low ground and along river valleys and the sea coast. Several storms seem to have followed each other along the same track.

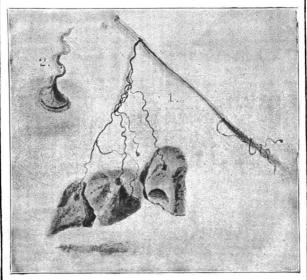
### A NEW JERSEY PICK UP PLANT.

For new features in fauna and vegetable life, we are largely indebted to New Jersey. It was but recently that we saw how the daisy crop of the country might, through her instructive example, be doubled. Again has a new lesson come to us from that fertile land, of the handiwork of Nature operating as the handmaid of man.

In the quiet back garden of a New Jersey residence, devoted to the propagation of innocent flowers with savage mosquitoes in juxtaposition, have grown up, to the astonishment of scientists, molecules of vegetation that, by natural attachment to and consequent "swinging to and fro, vehemently encountering other molecules, have moved stones. Our illustrations will show the mechanical and botanical means by which such results were accomplished. Fig. 1 shows the parent stem, from which are projected cord-like tendrils; our sketch, which is from nature, shows their final attachment to any mineral kingdom in the neighborhood; and Fig. 2 shows the way it is done, which seems, microscopically, to be similar to the way we boys used to take a round piece of boot of space, not an inch is lost. The pans are kept here leg, with a string in the center, and when it had been for twenty-four hours in a temperature at times as low surreptitiously soaked in the Monday's wash tub, attachment similar to Fig. 2 would permit a good sized a capacity of 2½ tons and there are sixteen of them, stone to be lifted.

Of the sized mineral at present utilized by this new agent of the industries, we are not concerned; it is its iuture that interests us. Here we have given us by a bountiful nature an embryo power that remains but for the Agricultural Department at Washington to develop to its full capacity. The mind dwells with pictured smile upon the development of those tendrils to ropelike proportions under fostering care. Chemical formulas of potash, nitrates, phosphates, silicas, etc., fed to this infant plant shall bring forth a power useful for man's domination, and not to be sneezed at. Tracts of land in Connecticut, now bountifully sown with bowlders, shall bless her sister New Jersey for this new salvation.

When the department shall have done its duty, a



right-minded citizen of Connecticut may casually sneak out at night and plant a few seeds in his neighmeeting of the Royal Meteorological So-| bor's hedge, and rightfully find, later on, that this rope-like tendrils (Fig. 1) has attached itself to a bowlder, and jerked them all off his land on to the next man's lot.

### The Frozen Fish Industry at Sandusky, Ohio.

A representative of The Register visited the warehouse of the Sandusky Fish Company the other day and there met Mr. Stoll, who showed him the plant and explained the method which he has perfected within the past few months of freezing and preserving both fresh and salt water fish.

The plant consists of two Hendrick Pontifex refrigerating machines, manufactured at Carbondale, Pa., of the absorption principle, their combined capacity being equal to a meltage of 50 tons of ice every 24 hours. If used for the purpose of making ice, these machines would produce twenty-five tons daily. At the present during their prevalence over Harrogate and Richmond time only one machine is operated, the second being and it is hoped that a depth of 8,200 ft. will be reached.

machine is as under:

A large cast iron cylindrical generator is charged with a quantity of aqua ammonia of the specific gravsteam, which starts the aqua ammonia to boil. Tho heated gases thus driven from the water are conveyed into condensers where they are cooled off and condensed into liquid anhydrous ammonia. Thence the anhydrous ammonia is conveyed into a chamber called the cooler. Underneath the floor is a cistern with a capacity of 4,000 gallons, containing liquid chloride of calcium. This liquid is sent through the cooler in a system of coils, and the anhydrous ammonia expanding, the chloride of calcium is cooled and then passes into the service pipes. The ammoniagas passes from the cooler into a vessel called the absorber, where there is a spray of weak aqua ammonia. Having a great affinity for water, it is combined with it and resolves itself into its original form of aqua ammonia, which issent back into the generator to be used again.

A large main pipe containing the cold liquid passes from the engine room into the warehouse, and from this lead smaller pipes which are carried into the sharp freezers and cold storage chambers. A constant circulation is maintained and the chloride of calcium returns to the tank, whence it is used over again with a very slight loss of temperature, in the space of five minutes.

When the fish are unloaded from the boats they are first sorted and graded as to size and quality. These are placed in galvanized iron pans, 22 inches long, 8 inches wide and 21/2 inches deep, covered with loosely fitting lids, and each containing about 12 pounds. The pans are then taken to the sharp freezers. These are solidly built vaults with heavy iron doors, resembling strong rooms, and filled with coils of pipes so arranged as to form shelves. On these shelves the pans are placed, and as one feature of the fixtures is economy as 16 degrees below zero. Each vault or chamber has giving a total capacity of 40 tons, which is the amount of fish that can be frozen daily if required.

On being taken out of the sharp freezers the pans are sent through a bath of cold water, and when the fish are removed they are frozen in a solid cake. These cakes are then taken to the cold storage warehouse, which is divided into chambers built in two stories, almost the same as the sharp freezers. The cakes of fish, as hard as stone, are packed in tiers and remain in good condition ready for sale. It is possible to preserve them for an indefinite time, but as a rule frozen fish are only kept for a season of from six to eight months. They are frozen in the spring and fall, when there is a surplus of fish, and sold generally in the winter or in the close season, when fresh fish cannot be obtained. The warehouse has a storage capacity of 1,500 tons.

Though the freezing plant has only been in full operation since the first of August, about 550 tons of various kinds of fish have been frozen. Some cisco or lake herring from Canada and some sturgeon were frozen last July and the following varieties were frozen during the fall: No. 1 pickerel, No. 1 blue pike, medium blue pike, yellow saugers, yellow perch, suckers and mullets, sheepheads, white bass, upper lake and Lake Erie white fish, ocean blue fish and weak fish.

It is an interesting sight to note the process of freezing. The interiors of the freezers and cold storage chambers are thickly coated with beautiful snow crystals that give them the appearance of some enchanted cave. The fish, though frozen together, keep their shape; they are very clean and their condition can be seen at a glance. When our reporter visited the place large stacks of sturgeon and other fish were being taken out of the cold storage warehouse for shipment, and they were all in excellent condition. It is expected that there will be a large demand for frozen fish in the next few months, as the fall catch was the smallest

The freezers and cold storage warehouse are of stone, with iron roof and iron doors and concreted attic floor. is well ventilated and fireproof, and the entire plant represents an investment of no less than \$45,000. Mr. Stoll is to be congratulated upon the successful realization of his plans, which are founded on scientific principles and should be the means of increasing the importance of Sandusky's fish industry and preserving for the use of man the valuable food products of Lake Erie.

### A Deep Boring.

The deepest boring of which we have any knowledge up to the present time, says Revue Scientifique, is at Parvschowitz, in the district of Ribnik, in Western Silesia. The depth attained is 6,568 ft., and the diameter of the hole is only 2.75 in. The work has been temporarily stopped in order to lower especial thermometers, which have been made with great accuracy, into the hole for the purpose of obtaining the temperature at different depths. The boring will then be resumed,

### THE BONTA GLASS ROLLING MACHINE, GLASS GRINDING and thence to be transferred to the leer or annealing AND POLISHING MACHINE AND ANNEALING OVEN.

The manufacture of plate glass has hitherto been conducted by a comparatively simple process. The melted glass is poured out upon a rolling table, is rolled out by a roller, and then is immediately transferred to the leer or annealing oven. When the glass is first introduced, the leer is very hot the temperature is gradually allowed to fall, and after a sufficient time, depending on the thickness of the plate, it is withdrawn and ground by mechanical processes on one side. It is then turned over by hand, an operation involving the greatest danger and the cause of numerous breakages. When successfully turned, the other side is ground. For the grinding operations the plate is bedded in plaster of Paris. Owing to irregularities incident to the rolling process and to upheavals or distortions of the floor of the leer, a great quantity of glass has sometimes to be ground away before the even surface is reached.

We illustrate an improved glass-rolling machine, one presenting most striking features of novelty and ingenuity, the invention of Mr. J. W. Bonta, of Wayne, Pa. The several cuts give a good idea of the machine, whose operations will now be described.

Its base, built up of plate girders, provides two parallel roller tracks on which the iron and steel bed for supporting the glass while being rolled traverses back and forth. The movement of this bed is effected by power. Over the center of the machine rises a roller housing surmounted by a bridge. On the bridge is established an eight horse power steam engine and boiler for actuating all the parts of the machine. Duplicate beds on which the glass is rolled are provided, flat tables of metal, one of which only is in the traversing position at a time, the second bed being supported in the rear of the machine in an inverted position, some distance above the traversing tracks. In the large cut one of the beds is seen in the front and has just received its charge of melted glass. It is resting on bearers, which in turn rest on the track. Racks gearing into pinions on both sides of the roller are provided, one at each side of the bed. In the rear of the roller housing is seen the second bed, inverted and held at some distance above the track or ways. The bed so raised can be lowered and drawn up again by power applied by the same steam engine. In its rear will be seen a gear wheel. The longitudinal axis of the bed ends at the center of this gear wheel. If the gear wheel were turned, the bed would turn with it.

The description of the operation of the machine will explain its construction further. Taking it in the position shown in the large cut on the front page, the the glass yields in the grinding process, and more engine, which is kept in continuous motion, is thrown into gear with the roller, set at the desired height according to the thickness of glass to be produced. The roller begins to turn, and the end pinions operating on the racks draw the bed and glass toward the rear of sectional cut, immediately beneath the chamber of the tons anthracite and 100,674 tons bituminous; Reading

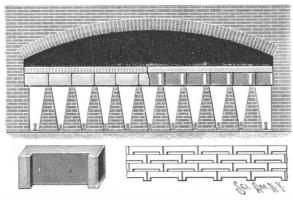
rolling out the molten mass into a plate. When the rear of the machine is reached, the roller is stopped; the upper bed, which, it will be remembered, is in an inverted position, is lowered on top of the hot glass, and the two beds are clamped together. They are then raised, the glass being held between them, and rotated. This phase of the operation is shown in the small cut on this page. As soon as the horizontal position is reached, the beds are lowered again on the bearers; the upper one, on which the glass was rolled, is lifted, the rollers is tarted in reverse motion and the plate is drawn back again beneath it, so that the glass is rolled upon the other side. Nearly everything about the machine is done by power, one engine actuating the whole mechanism, even to the clamping together of the beds. Throughout the most ingenious details of construction obtain, for

the machine under the roller, thus

much applies to the rolling of plate glass. The these come a range of fire bricks of the shape shown in feature of reversing the beds leads to the manufacture | the lower left hand figure of the cut, placed vertically. of embossed glass of the largest size. Thus, in place of the flat plate on which the glass is first rolled, may be substituted a mould of any desired design and of any size within the limits of the structure. Upon this sur face the melted glass is poured and the mould is drawn as described, under the roller, which forces the material, or "metal" as the glass workers call it, into the minutest detail of the design. Reaching the rear of the machine, the plate is clamped between the beds as described: they are raised and reversed, the mould is lifted, leaving the relief plate complete and resting on its back, design upward, ready to be run to the front of the machine, the roller being lifted out of the way, ter of Paris of the glass, together with the absolutely remarkable.

To effect these transfers the entire machine, which weighs some seventy tons, is mounted on traversing tracks, by which it can be brought in front of any one of the series of leers. By chains operated by hand windlasses in front of the machine, the plate of glass is drawn into the leer for annealing.

This system of rotating a great sheet of glass is so efficacious that its use in the grinding process was allowed to become perfectly cold. The plate is then almost a foregone conclusion. Accordingly, another of Mr. Bonta's inventions is for a glass-grinding machine, which is represented in principle by the rear section of his glass-rolling machine. The great sheet of glass taken from the cooled leer is covered with plaster of Paris, and one of the beds of the grinding machine is lowered on it. After setting, it is clamped between the



Ventilating bricks. Plan view of ventilating General section of oven. brick section.

### J. W. BONTA'S ANNEALING OVEN FOR PLATE GLASS.

beds and turned over by the machine and its other surface is ground and polished. Plaster of Paris is then poured over it and the second bed is lowered upon it.

When all is set, the mechanism rotates the two them, lowers them, and lifts off the upper bed. The plaster of Paris is then removed and the remaining Louis, 85,658 tons anthracite and 2,125,391 tons bitusurface of the glass is ground and polished. When it is remembered of what large size glass is now rolled, the immense advance in the grinding apparatus over the old system of turning the great plates by hand will tons anthracite and 375,012 tons bituminous; Cincinbe perceived. Another advantage is incident to this system. The plaster of Paris being deposited on the glass, and not on the bed, forms a more perfect union tons bituminous; Buffalo, 333,653 tons anthracite and with the glass, to the exclusion of air bubbles. These air bubbles are bad in their effects, as where they exist grinding is required to bring all to a level.

to prevent the floor from upheaving. Referring to the

safe method of reversing, will insure a great saving from loss by breakage. The rolling machine also, it will be seen, opens entirely new possibilities in the rolling of embossed glass. The saving of manual labor throughout will also be very great.

As a test object, a highly artistic mould of "Lincoln's Cabinet at the Reading of the Emancipation Proclamation," from the well known sculptor, E. A. Kretschman of Philadelphia was employed. From it an embossed relief plate of glass, 10 feet long by 8 feet wide, giving the minutest details of the subject, was successfully produced. By making relief panels in opal glass and roughing the surface with the sand blast the effect of Parian marble is attained.

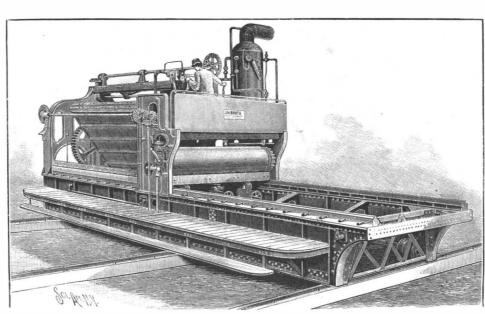
### Coal Consumed in Cities of the United States.

The following report compiled from the mineral industries in the United States shows some interesting comparative figures and the importance of the fuel question. The loss in wasteful handling, and genererally acknowledged imperfect combustion that represents millions of dollars, leave a profitable field, for invention, ingenuity and capital combined, to improve upon, if it is considered that only a fractional percentage of gain would figure up to enormous amounts. New York City received for consumption and shipment in the year of 1889, 10,253,706 tons anthracite and 4,353,436 tons of bituminous coal. Philadelphia, 4,751,175 tons anthracite and 2,620,562 tons bituminous. Boston, 1,660,001 tons anthracite and 984,409 tons bituminous coal. Buffalo, 2,480,035 tons anthracite and 1,126,765 tons bituminous coal. Chicago, 1,698,955 tons anthracite and 3,616,876 tons bituminous. The above figures include all coal used by railroad companies and delivered to steam vessels at the points named for their own fuel.

The actual quantities consumed in the various cities, excluding shipments, are as follows: New York City, 3,300,000 tons anthracite and 1,853,436 bituminous short tons; Chicago, 1,444,250 tons anthracite and 3,221,008 tons bituminous; Philadelphia, 3,188,094 tons anthrabeds with the plate clamped and secured between cite and 919,187 tons bituminous; Brooklyn, 1,800,000 tons anthracite and 200,000 tons bituminous; St. minous; Boston, 1,242,001 tons anthracite and 524,409 tons bituminous; Baltimore, 414,928 tons anthracite and 693,685 tons bituminous; San Francisco, 29,800 nati, 30,904 tons anthracite and 1,030,948 tons bituminous; Cleveland, 117,157 tons anthracite and 924,602 1,032,791 tons bituminous; New Orleans, 12,107 tons anthracite and 435,299 tons bituminous: Pittsburg. 2,294 tons anthracite and 334,035 tons bituminous; Washington, 481,088 tons anthracite and 45,050 tons In the leer devised by the same inventor, a system bituminous; Milwaukee, 402,774 tons anthracite and of ventilation beneath the floor is introduced in order | 262,089 tons bituminous; Scranton, 422,160 tons anthramous cite and 9,985 tons bituminous; Allegheny City, 1,591

> 331,944 tons anthracite and 59,902 tons bituminous; Syracuse, 179,891 tons anthracite and 84,327 tons bituminous; Rochester, 280,229 tons anthracite and 119,667 tons bituminous; Jersey City, 334,328 tonsanthracite and 132,602 tons bituminous; Newark, 410,918 tons anthracite and 133,158 tons bituminous; St. Paul, 83,675 tons anthracite and 171,367 tons bituminous; Providence, 349,641 tons anthracite and 155,985 tons bituminous; Atlanta, 1,269 tons anthracite and 208,554 tons bituminous; Denver, 10,118 tons anthracite and 300, 841 tons bituminous; Paterson, 202 290 tons anthracite and 24,259 tons bituminous; Nashville,231,300 tons bituminous; Wilmington, 158,614 tons anthracite and 128,515 tons bituminous; Memphis, 45 tons anthracite and 172,669 tons bituminous; Dayton, 4,802 tons anthracite and 178,314 tons bituminous; Louisville, 1,981 tons anthracite and 380,326 tons bituminous; Kansas

minous; Omaha, 41,279 tons anthracite and 244,357 tons bituminous ; Indianapolis, 11,390 tons anthracite and 277,278 tons bituminous; Trenton, 148,554 tons anthracite and 132,840 tons bituminous; Toledo, 93,583 tons anthracite and 153,968 tons bituminous; New Haven, 98,943 tons anthracite and 170,359 tons bituminous.



THE BONTA GLASS ROLLING MACHINE-ROTATING THE BEDS AND PLATES.

whose description we have not space here. This | leer is seen the floor of fire bricks laid close. Beneath | City, 59,353 tons anthracite and 306,607 tons bitu-The plan view of these bricks is shown in the lower right hand figure of the cut. These flues open only downward. The substructure is a series of brick piers or foundation walls. At the bases of the spaces between the piers are blast pipes; air being blown through them keeps the foundations cool and prevents any upheaval of the floor.

> It is anticipated that by rolling both surfaces of the glass and by annealing it on a leer with perfectly level floor, a saving of very large amount in the glass to be Millstone on December 15, aged 105 years 3 months and removed by grinding will be effected. By the improved grinding table, the superior embedding in plas-

### 105 Years Old,

Mrs. Sarah Farley Van Nostrand, probably the oldest person in New Jersey, died at her home in East 10 days. Mrs. Van Nostrand retained full possession of her faculties to the very last, and her memory was

### PHOTOCHRONOGRAPHY IN THE MEDICAL SCIENCES.

In a preceding article we gave a description of a new photochronographic apparatus designed more especially for medical studies. The numerous researches that we have had to make, the many experiments that and a distributer. we have performed, and finally, the financial question, it is very necessary to say, have retarded us. It is for these different reasons that our apparatus, begun nearly three years ago, has been but recently completed. This apparatus is designed to operate in the service of our regretted master, Professor Charcot, at the Salpetriere. We shall describe further along the annex of the laboratory of photography that has been created to utilize it.

do from a medical standpoint, we have had to get up an apparatus entirely different from those used at the present time in photochronography. It is not a question, in fact, of the physician obtaining in a very short time the largest number of photographs possible, but rather, in the study of any phenomenon whatever, of getting a sufficient number of them to seize on the one hand the attitudes that may escape direct observation, and, on the other, to know the general nature of the motion analyz-

It is necessary, moreover, that the photographs obtained shall have sufficient dimensions and a model complete enough to allow them to be easily studied.

We lay it down as a principle that a number of photographs amounting to twelve is practically sufficient in most cases to seize the different phases of a motion. Consequently our apparatus has been established for giving twelve successive photographs. The problem that we have proposed to ourself, then, consists in distributing these twelve photographs, in a uniform manner, over the duration of the motion observed, whatever be the duration of the latter, from a fraction of a second up to one or more seconds. There is nothing even to prevent operating at more distant intervals, at one or more minutes apart, although at first sight one scarcely feels the necessity of taking photographs at so distant intervals. Yet, from a medical standpoint, in order to observe certain slow-moving phenomena, such as the transfers of contractions or of attitudes during the period of catalepsy, this mode of operation of our apparatus will possess indisputable advantages for noting the position of the patient at accurately determined intervals.

We have consequently had to devise a special arrangement that should permit us to free the shutters one after the other and at variable intervals, according to the velocity of the motion observed. Lastly, it may be useful in the study of certain difficult cases (for seizing, for example, the so movable and varied

phases of an attack of hysteria or epilepsy), to take a of modifying the velocity of the different shutters. of time. Here it will no longer be a question of making of noting attitudes that appear unexpectedly and that the physician wishes to preserve.

With an ordinary apparatus one is powerless, since after each exposure it is necessary to remove the frame dozen photographs at any intervals whatever and according to the necessities of the experiment.

electric bulb. In the first case, the twelve photographs will be taken in an interval that has been fixed | On another hand, we know that the closer together | contacts is connected with one of the twelve terminals

beforehand; in the second, at every contact, we shall it is desired to have objects, the more it is necessary obtain a single photograph.

Let us now pass on to a description of our materiel, which consists of a camera, or receiver, a transmitter

(1) The Camera (Fig. 2).—This is provided with so as to give the twelve images upon a 9 x 12 various wires is effected at a single stroke by means of plate. Each objective is provided with a shutter of the piece, B, which is put in communication with the the Londe & Dessoudix system. We have adopted this distributer by means of a flexible 13-wire cable, twelve type of shuutter because it has always given us excellent results in practice and because it is of variable velocity. Here again is one of the characteristics of mon return wire. our apparatus, for it permits, independently of the

to increase the length of exposure. This still further shows the advantage that will accrue from the possibility of reducing the velocity of the shutters at will.

The freeing of the shutters is done electrically. Fig. 2 well shows the electro-magnets and their armatures twelve objectives arranged in three parallel rows placed near each objective. The connection of the of the wires being in communication with the twelve electro-magnets, and the thirteenth serving as a com-

The apparatus is mounted upon a laboratory stand In consequence of the special work that we have to variability of the intervals between each photograph, or a field stand, permitting of transporting it with

sufficient facility.

(2) The Transmitter.— Granting that the shutters are actuated electrically, it will suffice, in order to assure the operation of the apparatus, to send a current successively into each of the electromagnets, such emissions of current, moreover, being made at perfectly equal intervals. The realization of such synchronism is a delicate matter. Nevertheless, certain apparatus, such as a well constructed metronome or the Foucault regulator, are capable of giving excellent results, for the reason that the work to be effected, and which will consist in raising a light lever that establishes the desired contacts, could in no wise interfere with the regular operation of these apparatus.

Nevertheless, the metronome can be utilized only for a relatively slow succession of photographs. As for the Foucault regulator, that must be so modified as to give contacts at intervals variable within certain limits.

We have had the good fortune to meet in commerce an apparatus constructed upon such principles by Mr. Trouve and called an interrupter. This instrument, which is designed for medical uses, gives more or less frequent interruptions in a unit of time. By means of a very simple modification, it has been able to serve us for giving emissions of current at intervals regulated in advance.

A metallic cylinder is set in action by means of a clockwork movement provided with a regulator, so as to assure its uniform operation. Upon this cylinder are arranged, in parallel circles, pins whose number increases from one extremity of the cylinder to the other—one for the first, two for the second, and so on up to twenty-five for the last. The object of these pins is to lift a very light lever designed to close the electric circuit. Every time the lever is lifted an emission of the current occurs. The lever and its support are capable of moving parallel with the cylinder, so as to appear before such or such a concentric circle, thus permitting of a determinate number of contacts being easily obtained at will.

As regards our special studies, this apparatus, therefore, constitutes a very practical transmitter. Nevertheless, as the emissions of current always take place in the same direction, it is necessary to employ another apparatus in order to send the current by turns into each of the electro-magnets. This apparatus is the

(3) Distributer.—This apparatus, which was constructed according to our directions by Mr. L. Leroy, is represented in Fig. 3. A clockwork movement is inclosed between the pillar plates, A. Upon the last axle is mounted at right angles a rod, carrying at its extremity a platinum brush, B, which is capable of moving over a series of twelve platinum contacts regularly arranged upon an ivory disk, C. Each of these

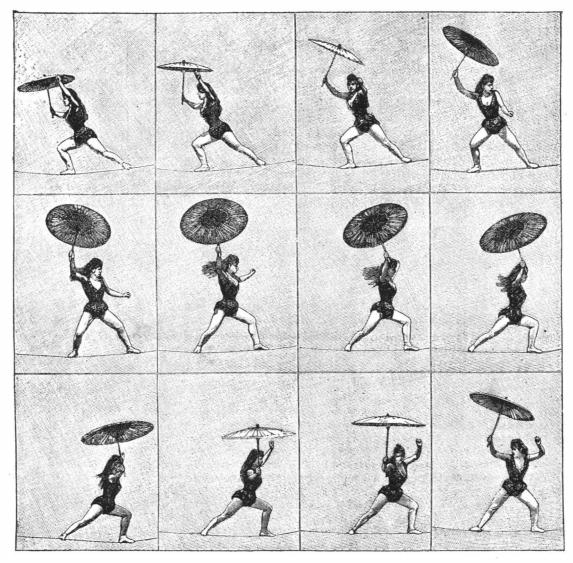
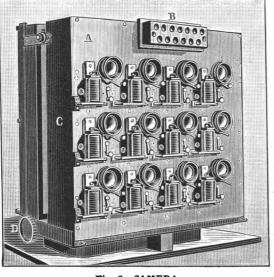


Fig. 1.-FACSIMILE OF A PHOTOGRAPH TAKEN BY MR. LONDE'S PHOTOCHRONOGRAPHIC METHOD.





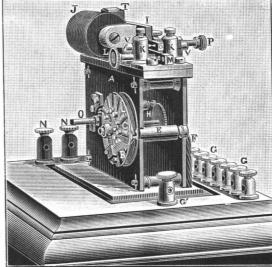


Fig. 3.-DISTRIBUTER.

-A, covering plate carrying the objectives, shutters and electric gearing; B, thirteen-wire contact; C, camera; D, focusing rack. Fig. 3.—A, clockwork case; B, brush; C, ivory disk; D, one of the twelve contacts; E, insulating tube; F, the twelve wires connected with the terminals G, G; G<sup>1</sup>, return wire; H, escapement; I, armature; J, electro-magnet; L, regulation of the counter spring; N, terminals for the current of the transmitter.

certain number of photographs in quite a short space This condition is most important as regards the quality of the images. We know, in fact, that the oba photochronographic analysis of a motion, but rather | taining of instantaneous photographs with great speed easily leads to a hardness of the image or its insufficiency as regards details and intensity. Despite the sensitiveness of the present gelatino-bromide of silver preparations, the very existence of the image becomes and to replace it. With ours, on causing each of the more and more problematical in measure as the time shutters to operate isolatedly, it is possible to take a of exposure is reduced. It therefore may be laid down as a principle that such time of exposure must be reduced only just the length desired to obtain sharp-In both cases the physician has only to maneuver an ness, under penalty of having insufficient and incomplete negatives.

represented at G G, these latter being put in communication with the twelve electro-magnets by means of the flexible cable of multiple conductors that we have already spoken of. In the interior, at H, may be seen an escapement wheel, which is controlled by the armature, I, which is attracted every time a current is sent by the transmitter into the bobbin, J. At every attraction, the brush advances by a twelfth of the circumference, and sends the current arriving through the terminal, G', into the corresponding shutter. On taking care, before any operation, to place the brush in the position that corresponds to zero, one will consequently free all the shutters in the order that has

upon the arrangement of the wires of the various electromagnets in such or such a terminal.

One can thus easily change the order of succession of the photographs according to the direction of the motion, and this is very advantageous for the reading of the results.

The apparatus employs the current of a battery of six bichromate piles, two to actuate the distributer, and four for freeing the shutters.

Operation of the Apparatus.-The focusing having been effected, the shutters are set and their velocity is regulated by means of the lower handle, which moves in five notches corresponding to five different velocities. The Trouve transmitter is so regulated as to have desired number of contacts for the reproduction of the motion that it is desired to photograph. The cylinder is then set in motion, and, after it has been ascertained whether the brush is really in its starting

position, the piles are lowered. The operator then benefit of our readers, is, in these photographs, exeholds in his hand an electric bulb, and, when the moment has arrived for operating, he has only to press the latter and maintain a contact during the time of extended. The series is complete in ten photographs. the experiment. The brush of the distributer frees the shutters one after the other, and the photochronographic series is obtained at the intervals that have been fixed in advance. In case it was desired to obtain a discontinuous series, that is to say, the twelve photographs at any intervals whatever, it would suffice to suppress the transmitter. Upon sending the current directly into the distributer, a photograph will be obtained every time the electric bulb is

In studies concerning locomotion, either in man or animals, a very simple arrangement will permit of making the apparatus operate automatically when the subject arrives in the field of the objectives. Across the path that the subject is to follow is placed a weak thread that keeps separated from each other two metallic plates at which end the conductors that previously led the current into the electric bulb. The current will not be able to pass until, the thread being broken by the passage of the subject, the plates have come close together.

apparatus will operate then at the velocity that has been fixed in advance by the operator, and in this way will be avoided many failures, and will be suppressed the lost time that is inevitable between the moment at which the subject is seen to arrive in the field of the apparatus and that in which the apparatus is set free.

Fig. 4 shows perfectly the arrangement as a whole at the moment at which the operator is about to catch the motion of a subject who is forging a piece of metal. This figure, moreover, represents the new open air laboratory that has just been installed at the Salpetriere, thanks to a subsidy generously granted by the Municipal Coun. cil of Paris. A large screen, 20 feet in length by 10 in width, permits the subject to stand out in relief from a plain background. Parallel with the latter there is a horizontal track for the study of motions

with the other permits of catching face or back motions. In the prolongation of this latter track are placed rails that carry the car upon which the appara- ton, hair or wool. The materials are first pulped with tus is mounted. In this way, the latter can be displaced with great facility.

upon a table. The box containing the transmitter is and moulded into any desired form. The articles are represented open in order to allow the latter to be seen. subsequently lixiviated, preferably in running water. There is also shown the flexible cable that connects Suitable coloring matter can be added to the materials the distributer with the photographic apparatus and at will.

the conductor terminating in an electric bulb that the operator holds in his hand. A finder situated above the camera permits of following the subject and of photographing him at the most favorable moment.

This installation will permit us to enter upon studies that it was impossible to pursue with the usual materiel and in a laboratory with a glass roof. On another hand, the apparatus is transportable, and this permits us to obtain a certain number of series, either in the country or at the seaside. On the present occasion, just as an example, we give in Fig. 1 a facsimile of one of our negatives representing an equilibrist upon a wire. Mlle. Barenco, of the New Circus, been fixed in advance. Such order will depend solely who was kind enough to come and pose for the special tion of its relations to the highest uses and objects of

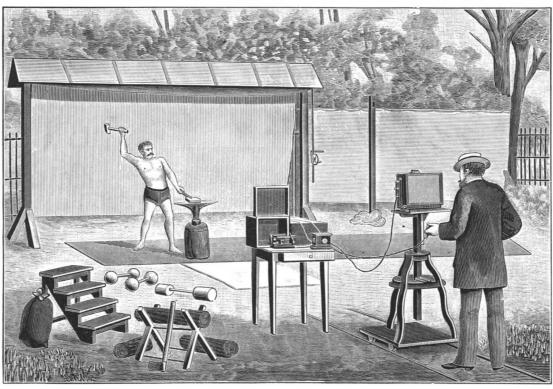
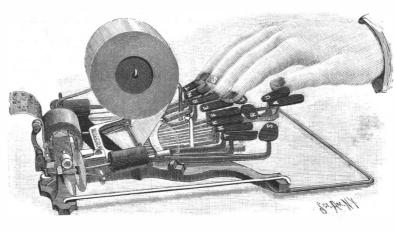


Fig. 4.-NEW OPEN AIR PHOTOCHRONOGRAPHIC LABORATORY.

cuting a volt from right to left—a motion that she re peats several times in succession, her limbs remaining the eleventh and twelfth representing the beginning of the same motion, but in an opposite direction. The twelve photographs were taken in  $1\frac{1}{5}$  second. Each of them measures 2\%4 by 2\%4 inches.

In conclusion, we believe it our duty to thank all those who have been our true fellow-laborers, and who have been instrumental in causing our ideas to pass from the domain of theory to that of practice: Messrs. Dessoudix and Bazin for the mechanical part, the Messrs. Mors Brothers for the electrical arrangement, and Mr. Lucien Leroy for his distributer. Nor can we forget our venerated master, Mr. Charcot, who has always encouraged our researches in the so interesting field of medical photography, and whom we saw for the last time when he did us the honor to come to witness the operation of the new laboratory installed under our direction in his service of the Salpetriere. A. Londe, in La Nature.

ARTIFICIAL wood suitable for making furniture,



ANDERSON'S SHORTHAND TYPEWRITER

together with waste vegetable or animal matter, such as wood, shavings and chips, sawdust, cellulose, cota solution of magnesium chloride in water, or a solution obtained by saturating hydrochloric acid with The piles, transmitter, and distributer are placed magnesite, with which mineral the pulp is then mixed

### Transportation.

The principal lesson suggested by the Fair, as it appears to me, is the importance of improving the means and methods of transportation between the different parts of our country, so that food products of all kinds and perishable goods and materials in general may be carried to market with the greatest possible celerity and in the best possible condition. The great mass of the American people need better food. It is an indispensable basis and condition for their attainment of permanent prosperity and of the fullest civilization of which they are capable. Most of them still think of their food without seriousness and with slight percep-

> human life. Though every dish prepared by unwilling hands is poisoned, yet cooking is mostly slave's service, without honor, respect or reward. The life of American working people needs reconstruction, from its basis in the character of their food to its apex, whatever that may be, and one of the most important means for improving the food of the mass of the people is the development of the better methods for the transportation of food products between the different regions of our country. The people who work with their hands for wages, and especially those who work in shops, mills and factories, need more fruit for food, fruit in better condition and at less cost. We should, as fast as possible, reduce the time for railway transit between the great fruit gardens of our Pacific coast region and the homes of the vast populations of our northeastern States. We shall soon

have a home market for all our food products; our system of railway management should be such as to secure the best possible markets for producers and the best products for consumers at reasonable prices.-J. B. Harrison in Chicago Tribune.

### A SHORTHAND TYPEWRITER.

This is a typewriter built especially for rapid work; simple enough to be very strong and small enough to be light, portable and noiseless. In fact, it is not much larger or heavier than a pair of opera glasses. Speed is gained by arranging the keys and type so that every letter on the keyboard can be printed at one time without shifting the hands, all the most frequently used letters being duplicated. Thus in writing the word "start," the "sta" would be struck with the left hand and the "rt" with the right hand simultaneously, the entire word being printed at one stroke, after which the machine automatically draws the paper forward and is ready for the next word to be printed, so that it really requires no more strokes of this kind to print a whole sentence on the Anderson Shorthand Typewriter than it would to merely strike the space key for making spaces between the The roof covering and insulating purposes can be made same words on an ordinary typewriter. This ar-

rangement of the keyboard restricts the number of keys and necessitates the omission of the less frequently used letters of the alphabet. These omitted letters are represented by combinations of those the machine prints, and as soon as this list or code of cipher letters is memorized, the learner has a complete alphabet at his service and can begin practicing for speed. Six weeks' practice will, it is said, give a speed of about 100 words a minute. No knowledge of stenography is required; there is nothing to learn except the list of cipher

The New York office of the Anderson Shorthand Typewriter is in the World building, rooms 149-151. Among the well known firms employing its operators may be mentioned the Forbes Lithograph Manufacturing Company, of Boston, the Journal of Commerce and Commercial Bulletin, of

seen from the side. A second track at right angles according to a patent process by burning magnesite New York, the Trust Company of North America, at Philadelphia, the Kellogg Newspaper Co., Memphis. Tenn., the American Public Health Association, with numerous lawyers, Congressmen and business houses.

### Crops of the United States.

The total value of the crops of the United States during 1892 is estimated at \$3,000,000,000, of which the largest item is \$750,000,000 worth of hay. The animal products, including meats, dairy products, poultry and eggs, and wool, are placed at \$965,000,000 more.

### RECENTLY PATENTED INVENTICITS. Railway Appliances.

CAR COUPLING.—Carman Frost, Hewlett's, N. Y. This is a device capable of coupling with a link and pin coupler as well as with another of its kind, and with which the coupling may be effected upon a curved as well as a straight track, there being a simple method of uncoupling, either from a platform or the sides of a car. Combined with a chambered drawbar is a slide having a forward forked end and downwardly projecting branch, there being a spring between the branch of the slide and the end of the chamber of the drawbar. A coupling dog is pivoted in the drawbar and pivotally connected with the slide, while connected with the projection are means for operat-

### Mechanical.

MANUFACTURING CHAINS.—Charles While, Barrow-in-Furness, England. This inventor has provided means for making chains with endless links formed from molten metal in a very simple and inexpensive manner. The mould consists of a divided casing or holder with recessed seats, and cores set in the seats having non-intersecting horizontal and vertical recesses registering with the recesses in the seats, the registering recesses of the holder and cores forming elliptical cavities for the reception of the molten metal to form the links of the chain. The recesses of the holder and core sections form non-intersecting elliptical cavities, the planes of which are at right angles to each

LUBRICATOR.—Lindley Fawcett, Eureka, Cal. This is a device especially adapted for oiling the bearing surfaces of commutators of electric motors, where only a little oil is necessary, but frequently applied, to prevent grooves being worn in the commutators by the friction of the brushes. The invention provides a swab which wipes the commutators in the same way this would be done by hand, so as to touch every portion of their bearing surfaces, there being a simple arrangement for operating the swabs from the  $\,$ armature shaft, the speed being reduced so that the swabs will be applied at only necessary intervals.

#### Agricultural.

STALK CUTTER.—James H. Herring, Murphy, Texas. This is a machine adapted to be drawn over a field and cut standing or prostrate corn or cotton stalks, etc., cutting off the stalks at their roots when standing, and reducing them to small pieces which can be plowed under and serve as a fertilizer. The field from which the ears of corn or the cotton have been gathered is thus rapidly cleaned up and strewed with small fragments of vegetable fiber, readily plowed into the soil in condition for quick decomposition and assimilation.

### Miscellaneous.

WAVE MOTOR. - James C. Walker, Waco, Texas. This inventor has devised an apparatus to be located in the sea near the shore, for utilizing the power of the waves. In a main supporting frame, properly anchored, a casing supports a vertically movable buoy, adapted to be lifted by a wave, and when the wave recedes the weight of the buoy depresses a pump piston, the rise of the piston and the power developed thereby depending upon the height of the wave and the size of the buoy, and the power developed by the descent depending on the weight of the buoy and its fall.

VESSEL PROPELLING MECHANISM.-Frank Taff, Whitestone, N. Y. Two elastic blades or fins are, according to this invention, arranged on opposite sides of the vessel, to be actuated by two transverse reciprocating rigidly attached shafts, having a sliding connection with each other at their inner ends. gear wheels and pitmen imparting a reversed reciprocating motion to the two shafts and blades. This mechanism may be used of itself alone or as an auxiliary to the usual screw propeller, the fins being designed to operate after the analogy of a fish's tail.

AERIAL CAMERA.—Cornele B. Adams, Augusta, Ga. A camera having an automatic shutter is suspended from a parachute detachably connected to a balloon proper, there being electro-mechanical means for reducing the lifting power of the balloon, and including a barometer in circuit, whereby an automatic exposure will be made when a predetermined height has the metal as fast as it is reduced, besides presenting been reached, and the descent of the camera with the parachute or balloon will then be made.

METHOD OF PHOTOGRAMMETRY.—The same inventor has obtained a further patent providing ment, provided with a number of collars, and the hub a method by means of which aerial photographs, taken as above, may be converted into topographical maps, to delineate not only the horizontal positions and distances of objects, but from which the altitude of the nally screw-threaded, the inner end being enlarged and objects may be quickly ascertained without the aid of having internal shoulders to fit upon the collars of the other field instruments. It consists in first taking photographs of the same object or tract from different being adapted to run a long time and keep the axle altitudes, and afterward determining the intersection of spindle well oiled, while also excluding dust. the vision lines of the different photographic exposures by geometrical and mathematical processes.

CARROUSEL.-Milton T. Weston, Kenton, Ohio. A merry-go-round that may be readily set up on a lawn, in a hall, or elsewhere, and conveniently taken apart and stored when not in use, has been designed by this inventor, for which he has been awarded two patents. The arms to which the carriages are to be secured are supported on a mast, and the driving mechanism may be operated on to stop the revolution of the arms at any time. Wherever possible the parts are put together with pins or hooks, to facilitate their being readily taken apart and put together. One of the patents especially provides for such construction of the machine that shafts and gearing may be dispensed with, there being a belt connection between the carriage shafts and a grooved drum on the mast. This construction is very simple, durable and inexpensive, besides being very light, reducing the friction to a minimum.

WORKMAN'S TIME RECORDER.—George

are oscillating rollers driven by clockwork, the rollers carrying a detachable ruled time sheet, and there being on the front of the casing hooks on which the workmen place checks in going to work, removing them on leaving. Both the placing and removing of the checks cause punctures to be made in the sheet in such manner that, at the end of the week, it will exhibit a complete record of the workman's time. The machine is not liable to get out of order, automatically adjusting itself daily, and being reset once a week.

BICYCLE. - George B. Robinson and William R. Roby, Colorado Springs, Col. This invention relates especially to the driving gear of safety bicycles, affording a convenient differential gear mechanism by which the speed and power may be changed at will without dismounting. The construction is simple and substantial, and also provides a positive and easily working arrangement for turning one of the sprocket wheels on the pedal shaft faster than the shaft itself. By the simple movement of a lever the gear may be shifted to or from either one of three positions, the first being the normal position, the second one in which the gear works slower and with greater power, and the third position giving greatly increased speed.

SPEED GEARING FOR CYCLES. George Glydon, Birmingham, England. This is an improved gearing which is also adapted for use on other machines, being simple, durable and dust proof. In a casing supported by a fixed frame are journaled two sets of pinions in mesh with one another, an internal gear wheel on the spindle meshing with one set of pinions, a spur wheel meshing with the second set of pinions, and a hub carrying the spur wheel forming a part of the wheel to be driven, the hub having a casing forming a cover for the casings supporting the pinions. The several casings also form a receptacle for the oil or other lubricant.

BICYCLE.—Murray Acklin, Angel Island, Cal. This improvement relates especially to the driving gear of bicycles, providing therefor a speed shifting apparatus which is simple, durable and extremely convenient. On the middle portion of the driving shaft is a clutch mechanism adapted to engage either of two sprocket wheels, the bicycle being driven with great power, for up-hill work or hard traveling, when one wheel is engaged, and at a high speed when the other wheel is engaged. The engagement with one or the other of the sprocket wheels is effected by the movement of a lever, and when this lever is placed in position so that neither of the sprocket wheels is engaged, the machine is adapted for coasting.

GRAIN CLEANING MACHINE. - Sylvester Bisbee, Madelia, Minn. This machine is especially adapted for the effective treatment of flax, as well as the cleaning of other grain. Groups of screens are employed in the machine, to which constant motion is given, the good grain falling through the meshes of the upper to the lower screens of each of the groups, and passing out of the rear of the machine into a blower, where it is cleared from all foreign matter. Brushes work against the screens constantly to thoroughly clean their meshes and promote their efficiency, rendering them capable of delivering material more quickly and in better condition than where such devices are not employed.

DISTILLING AND CONCENTRATING AP-PARATUS.—Albert F. Trageser, New York City. This glycerine and heavy oils, requiring no separate vacuum pan, whereby it may be employed by small manufacture ing establishments, permitting soap makers to make glycerine from their own soap lyes. The improvement comprises a shell provided with an evaporator, a receiver and a condenser located one above the other, the condenser being connected with the still and discharging the condensed vapors into the receiver, which serves as a storage reservoir for the accumulating liquid, and is adapted to charge the evaporator.

DECOMPOSING FUSED METALLIC CHLO-RIDES.—Farnham M. Lyte, 60 Finborough Road, London, S. W., England. This is an electrolytical process for the decomposition of the chlorides severally or in admixture while in a state of fusion, and consists essen tially in effecting the decomposition within an openmouthed, bell-like chamber, sealed by dipping into molten metal corresponding to the base of the chloride under treatment, and resulting for the most part from the decomposition of the chloride. This method prevents the escape of chlorine and permits of running off other highly valuable features.

AXLE BEARING.—Henry' N. Hamilton, Yonkers, N. Y. The axle is, according to this improve has a box with internally screw-threaded ends, the outer end being reduced. A tube leads from the box through the hub, and an apertured skein having its ends exter-

COMBINATION LOCK.—John A. Bexell and Victor O. Peterson, Rock Island, Ill. This is a simple, compact, and inexpensive lock, consisting of a cylinder inserted in the door, and provided with internal grooves parallel and at right angles to its axis, an enlarged knob spindle carrying spring-pressed followers adapted to work in the grooves of the cylinder, a key being made to act on the followers to force them to unlocking position. The bolt is operated by a lug on the hub of the knob spindle, while a spring-pressed latch pivoted to the bolt engages the bolt-operating lug.

EASEL. - Charles E. Fountain, Port Townsend, Washington. Opposite standards have at their upper ends notched posts between which a drawing board is held to swing, with fastening devices to support the board at any desired height, and means for fixing its inclination. It is also provided with swing- the inventors have designed a simple, inexpensive, ing tables adapted to hold water, paint brushes, etc., arranged on opposite ends of the easel, these tables being fastened beneath' the drawing board when the easel is W. McAninch, Davenport, Iowa. In a suitable casing to be packed away, it then taking up but small space.

KEY RING.—James M. Matthews, Graham, Va. This device consists of two open links, one split longitudinally to form a passageway for the other, and each of the links having at both ends inwardly extending arms, a pivot connecting two corresponding arms. It requires considerable skill to open and close the links to insert or remove a key, thus preventing their accidental displacement or removal by unauthorized per

FIREPLACE DAMPER.—Erick J. Johnson, Chicago, Ill. This is an improvement on a former patented invention of the same inventor, and provides for a cam adapted to engage the pivoted damper plate, to swing it up or down in the throat of the fireplace and to lock it in position. The damper is thus automatically supported in position, and the construction is simple and

FOLDING CHAIR. - Gutie H. Tuttle, Shorter's Depot, Ala. This improvement is especially applicable to dental chairs, the construction being very strong and inexpensive, and the chair, when not in use, being foldable in such manner as to occupy but little space. The chair has a back, seat, seat support, and foot rest, the back and the foot rest being independently adjustable, so that the chair may be placed in a position to suit the patient, or to place the patient in the best position to be operated upon.

POCKET KNIFE.—Gustaf F. Lundquist, Silverton, Col. All kinds and shapes of knives may, by this improvement, be made to serve the purpose of a magnetic needle or compass, so that one can at anytime, whether on land or sea, determine the north and south direction. The knife ends or terminals are made to have opposite magnetic polarity, and on the handle are means for supporting the knife horizontally, but free to rotate. The knife can also be made to indicate the time of day, by use as a sun dial. The application of this interesting feature to a knife is made at a very slight expense

JAR CLOSURE. - Frank. H. Palmer. Brooklyn, N. Y. The neck of the jar has an annular flange engaged by the ends of a spring wire bail which extends over the top of the cover, the bail holding in place a ball which closes an opening centrally through the cover into the jar. After the cover is locked in place and the contents of the jar steamed, a partial vacuum is formed, whereby the jar is tightly sealed. To remove the cover, the bail is sprung off, when it is easy to remove the ball valve, thus breaking the seal and loosening the cover.

Spoon.—William J. Osterman, Richmond, Va. This spoon has an attached scraping device by means of which the bowl of the spoon may be readily cleaned of any sticky material. The scraper has its lower edge conformed to the curvature of the bowl, and has a shank sliding in guides on the handle, and giving a spring pressure whereby the scraper will press the spoon throughout its stroke, and will be held in any position it may be set along the bowl.

ATTACHING ELASTIC BANDS TO BOXES. José Pou, Havana, Cuba. To quickly attach bands or other springs to match boxes, etc., for holding the cover in place, a machine has been devised by this inventor. A reciprocating needle is adapted to pass through the cover and bottom of the box, to form openings, and having a hook for supporting an elastic band and drawing it through the openings, in connection with wire-feeding is a simple and inexpensive apparatus for the treatment of devices to feed a wire on each side of the box through the elastic band.

> WASHING MACHINE. - Peter M. Thompson, Anaconda, Montana. This machine has a semi circular body in whose bottom rubbing rollers are semi-circularly arranged, the rollers being polygonal in cross A rubber provided with a series of ribs is adapted to be rocked or laterally reciprocated to rub the clothes placed between its ribbed surface and the bed of the rollers, in such manner that the position of the clothes will be constantly shifted, successfully removing the dirt without liability of injuring the clothes

> STEAM COOKER.-John A. Kendall, Maysville, Mo. This cooker is designed [to facilitate the preparing of food without the loss of nutriment or flavor by evaporation, and prevent the odors of cooking from being distributed through the house, the steam being re tained and condensed in the apparatus. A cooking vessel is fitted to a water-heating vessel, and has a cover extending down into the latter, while combined therewith is a steam chamber and one or more food recep-

> Box. - Joseph M. Baker, Louisville, Ky. This improvement relates to a former patented invention of the same inventor for boxes for holding plug tobacco, etc., forced into the box with considerable pres sure. The box requires no nails, is of increased strength and admits of the use of thin end pieces, while it can be quickly and readily opened and remain the neat-looking package it was before opening.

> TRUNK.-James L. Warren, Goshen, Texas. This trunk has a deep lid hinged at one side as usual, a tray jointed to the same side as the lid by bent hinges and folding against the top of the lid within, while a lower tray is hinged to the rear side of the trunk body and folds up against the other tray, there being hinged lids for both trays. The trunk provides novel adjunctive features better adapting it for the reception of clothing and small articles needed by travelers, and their convenient stowage and removal.

> WINDING KEY FOR GUITARS.-John Avuso, Brooklyn, N. Y. This is a supplementary key adapted for use in connection with screw keys, whereby the latter may be more quickly and conveniently turned than with the fingers. Instead of the half turn only, at one effort, the screw can, with this improvement, be given a complete turn with each twist.

SLED.—Franklin N. Wilde and Elmer F. Campbell, L'Anse, Mich. This improvement relates especially to lumber or bob sleighs, for which purpose and very strong sleigh, made entirely of metal, preferably steel, with the parts so formed that they may be conveniently put together. The runners have flat bottoms and upturned side flanges to which are secured

shoes, bearing blocks to which is secured a cross beam supported on the runners, knee braces being fastened to the beam and to the runners, and a bolster pivoted on the beam.

REFRIGERATOR.—Anton Larsen, New York City. This is an improvement in refrigerators having a siphon attachment for drawing off the water accumulated in the drip pan by melting ice. A trap is employed to prevent the escape of cold air from the box with the discharge water, the water siphoning out only when it has reached a certain height, and the water at all times constituting a seal against the escape of cold

VEGETABLE CUTTER.—Constantin Raible, Oskaloosa, Iowa. This is an improvement on a former patented invention of the same inventor, providing a cutter to cut or slice vegetables to any desired thickness. It has a cutting cylinder with its periphery formed of alternately arranged knives and hinged throat plates, there being adjustable stops for limiting the inward movement of the throat plates, which are adjustable relative to the edge of the knives to regulate the thickness of the

BOOMERANG.—Charles W. Renear, Stockton, Cal. This is a toy embodying the principle of the Australian boomerang, but adapted to be thrown by a gun or other suitable instrument instead of by hand. It has flat arms extending at an angle to each other and twisted slightly, with a safety edge flange extending around the edges and terminating near the elbow. It has an erratic path when projected, but is extremely light, so that it may be harmless

MEASURING TOOTH ROOTS.--Asher I. F. Buxbaum, Cincinnati, Ohio. The device designed by this inventor for the purpose named forms a wire loop for measuring the circumference of teeth or their roots, and consists of a tube or hollow body, and a portion through which the wire passes, and which is rotatable on the body to twist the wire to form the loop. The device is very efficient and measurements are thus quickly effected.

DESIGN FOR A SKATE.—Sylvenus D. Mosher, Storm King, N. Y. The blade of this skate is relatively long, its bed has concave sides, and on the bed are raised heel and ball surfaces of oval shape, with open panel-like figures.

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

### SCIENTIFIC AMERICAN BUILDING EDITION.

**DECEMBER**, 1893.-(No. 98.)

TABLE OF CONTENTS.

- 1. Elegant plate in colors showing a colonial residence at Stamford, Conn., recently erected for C. Cooper Clark, Esq., at a cost of \$9,500 complete. Floor plans and two perspective elevations. An excellent design. Mr. Augustus Howe, architect, New York.
- 2. Plate in colors showing the residence of Thomas C. Wordin, Esq., at Bridgeport, Conn. Two perspective views and floor plans. Cost \$5,000 complete. A very attractive Queen Anne design. Mr. Henry A. Lambert, architect, Bridgeport, Conn.
- dwelling erected for Edward W. Alling, Esq., at New Haven, Conn. Perspective and interior view and floor plans. An excellent design. Cost \$4,500 complete. Messrs. Stilson & Brown, architects, New Haven, Conn.
- 4. A very attractive residence recently erected for R. Burton, Esq., at Hartford, Conn., at a cost of \$7,800 complete. Floor plans, perspective view, etc. Mr. Henry D. Hooker, architect, New York. An excellent design.

  5. Engravings and floor plans of a suburban residence
- erected for H. McKay, Esq., at Boston, Mass., at cost of \$2,400 complete. Mr. Austin W. Pease, architect, Boston, Mass. A very attractive design.
- 6. A dwelling recently erected for P. H. Lucas, Esq., at Chester Hill, Mt. Vernon, N. Y., at a cost of \$7,000. Floor plans and perspective elevation, also an interior view. Mr. Louis H. Lucas, architect, Mt. Vernon, N. Y.
- 7. A cottage at Mystic, Conn., erected at a cost of \$3,000 complete. Elevation and floor plans and an interior view. Mr. John S. Rathbone, architect. New London, Conn.
- 8. A dwelling recently completed at Stamford, Conn., at a cost of \$3,500 complete. A picturesque design. Two perspective views and floor plans. Messrs. Munn & Co., architects, New York.
- 9. Miscellaneous Contents: The education of customers.—How to catch contracts.—Hints to readers.— The latest and best designs for houses.—Labor Day -Tests of paving materials.-The World's Columbian Exposition, a general view.—The builders' friend.—Adurable and ornamental roof, illustrated.-An improved woodworking machine, illustrated.—The Pasteur filter, illustrated. -The Rochester parlor heater and improved oil stove, illustrated.—A stovepipe radiator, illustrated.—An electric passenger elevator at the Exposition, illustrated. -Woodworking machinery at the Fair.-A new building material.—Torsion braided wire mattresses, pillows, cushions, etc., shown at the Exposition, 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 all newsdealers. MUNN & CO., PUBLISHERS,

361 Broadway, New York.

### Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Adver-tisements must be received at publication office as early as Thursday morning to appear in the following week's issu

"U. S." metal polish. Indianapolis Samples free. Wood pulp machinery. Trevor Mfg. Co., Lockport, N.Y. The exhibit of Wm. Jessop & Sons has received the highest award at Chicago Exhibition.

Steam pressure regulators, reducing valves, safety checks. Foster Engineering Co., Newark, N. J.

Light machinery, patterns, tools, models, and experi mental work. Waite Mfg. Co., Bridgeport, Conn.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Screw machines, milling machines, and drill pres 'The Garvin Mach. Co., Laight and Canal Sts., New York

Metal spinning, nickel plating, brass castings, experimental brass works. S. Newman, 64 Main St., Cin'ti, O. Centrifugal Pumps for paper and pulpmills. Irrigating and sand pumping plants. Irvin Van Wie, Syracuse, N. Y Magical Depot.

Send for free catalogue of tricks for parlor and stag 284 Asylum St., Room D, Hartford, Conn.

Emerson, Smith & Co., Ltd., Beaver Falls, Pa., will send Sawver's Hand Book on Circulars and Band Saws

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

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, N. Y.

Perforated Metals of all kinds and for all purposes, general or special. Address, stating requirements, The Harrington & King Perforating Co., Chicago

Send stamp for circular of castings and parts of the dynamo-motor advertised on page 3%. Scientific American. Elbridge Electrical Mfg. Co., Elbridge, N. Y. The best book for electricians and beginners in elec-

tricity is "Experimental Science," by Geo. M. Hopkins. By mail, \$4; Munn & Co., publishers, 361 Broadway, N. Y. Patent Electric Vise. What is claimed, is time saving.

No turning of handle to bring laws to the work, simply one sliding movement. Capital Mach. Tool Co., Auburn N.Y. 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.



HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our

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.

houses manufacturing or carrying the same.

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

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

Books referred to promptly supplied on receipt of price.

Winerals sent for examination should be distinctly marked or labeled.

(5624) G. A. M. asks (1) for a compound with which to coat wood and metals so that they will resist the action of the acids such as are used in batteries. A. Paraffine wax or thin sheet gutta percha. 2. Would it be practical to make a Gramme ring motor as few as is not advisable, and would not be better than a Siemens drum armature. 3. Is there any salt of mercury which simple way of finding the number of revolutions of a small motor or engine? A. Attach a sharp-pointed pencil near the axis of rotation. Move a piece of paper mounted on a board in front of the pencil. Keep it moving steadily for five or ten seconds. Then count the turns in the spiral. Some one may time you while you move the board.

(5625) E. R. W. asks: 1. Please tell mesilver varies in resistance according to its composition. If you use the factor 12 or 13, you will not go far wrong. 2. What is the rule to find the number of ampere turns required to get a given lifting power from a given magnet core, allowing for distance of the coils from core? There is no general rule. It all depends on the shape, material, and dimensions of the magnet core. The calculations must take leakage of lines of force into account. We refer you to Sloane's "Arithmetic of Electricity," \$1; Thompson's "Electro-magnet," \$1; Thompson's "Electro-magnetic Machinery," \$6. These we can supply by mail. 3. If I have a storage battery with ten  $6\frac{1}{2}$ × 41/4 inch plates, each plate punched full of 1/4 inch holes, which are filled with red lead, how fast can I discharge it without injury; that is, how many amperes can I pass through it. About how many ampere hours would it have? A. Allow six amperes per square foot of positive plate; about six amperes for the battery. It should have sixty ampere hours. 4. What would be its internal resistance, the plates being separated about threesixteenths inch? A. Almost negligible; perhaps one one-hundredth ohm. 5. In "Experimental Science," page 527, it says: "The Weston dynamo is also perfectly adapted to incandescent lighting. With a constant speed rise or the land to settle and cover the lower part of the

the regulation of the current is automatic." Just before this it describes the way in which shunt-wound dynamos regulate themselves in arc lighting where the lamps are connected up in series. Now, in arc lighting, as I understand it, as the resistance is lowered by turning out some lamps, the voltage falls; and in incandescent lighting, when the resistance is lowered by turning on some lamps, the voltage remains the same and the amperage increa Why does in the one case the voltage change and the amperage remain the same as the resistance of the external circuit falls? And in the other does the amperage change and the voltage remain the same, the resistance of the field magnets being the same, since the dynamo in both cases is self-regulating, according to "Experimental Science"? A. Supplying lamps in parallel, a shuntwound dynamo will regulate itself tolerably well, if the armature resistance is low. It is especially adapted for series lighting. It is more sensitive to irregularities of speed than is a series-wound dynamo. The action of shunt-wound dynamos is best studied from their characteristic curves. Examples are given in Thompson's "Dynamo-Electric Machinery." 6. If a dynamo had its field magnets always of the same strength (being excited from some different source), and was run at a perfectly uniform speed, would a change of the resistance of the external circuit change the voltage? A. The voltage would be constant. 7. Suppose we charge a storage battery thus: The whole resistance of circuit is 15 ohms. At its end is a storage cell with terminals M and H. By Ohm's law  $(\frac{3}{15} = \frac{1}{6})$  ampere would pass; but since C R = E. M. F., the potential between M and H is 2 volt  $(\frac{1}{5} \cdot 2 = \frac{7}{5})$ ; but  $\frac{1}{5}$  of a volt is not enough to overcome the voltage of the storage cell. Hence it would not charge. Please show me where the mistake is in the above conclusion. There must be one somewhere. A. In treating an electric circuit with opposed voltages, you subtract the less voltage from the greater and take the remainder as the net or actual voltage. The rule you cite applies only to actual resistance of a circuit through which a current is passing. Counter-electromotive force cannot be treated as if it were resistance.

(5626) J. P. G. writes: 1. In Supple MENT, No. 641, on page 10240, in second column, you give No. 18 wire for armature, and on next page, last column No. 16 for same. Which size is proper? A. It should read "No. 18" for armature coils. 2. Is wire to be single or double wound? A. Single wound is more compact. You may use either. 3. Could motor be connected to some power and give satisfaction, same as run with battery power? A. Yes; as a motor. It is not adapted for use as a dynamo, 4. How many revolutions is the armature required to make? A. As a motor, this regulates itself by the power, say 1,000 to 2,000 per minute. 5. How many 16 candle power incandescent lamps would the above motor run? A. None.

(5627) C. S. asks how to make a dry cell. A. See our Supplement. Nos. 157 and 767: also the Scientific American, vol. 61, No. 20, and vol. 67.

(5628) E. F. asks: 1. What must be the essential difference between an arclampdesigned to burn on a constant potential circuit and one designed to burn on a constant current circuit? A. The constant potential lamp must have a resistance coil in series to steady it. The constant current lamp must have an automatic cutout, so that if one lamp goes out it will not open the circuit. 2. With what is aluminum combined in its natural state, and how may I obtain some of the ore? A. With oxygen generally, in all clays, and earthy minerals in general: with fluorine in cryolite. 3. Has ammoniacal alum ever been obtained by the direct combination of ammonia, sulphuric acid, and aluminum? A. No; except possibly as a chemical experiment. 4. If it has, please tell how. If not, would the combination be of any value? A. Dissolve the aluminum in hydrochloric acid; evapo rate with sulphuric acid until all hydrochloric acid is expelled; add requisite amount of acid, if necessary, and of ammonia, and crystallize. There would be no object in carrying out such a process.

(5629) W. S. D. writes: The recent application of electricity to canal boats is regarded as a great invention. Now, it has always been stated that steam could never be used as a motive power on canals for the reason that the banks were undermined and ruined by the wash of the swiftly moving boat. Could you, four coils, and would it have any advantages over one through your paper, kindly explain to me and several with a Siemens armature? A. You can do this; but it others why the wash of an electric canal boat, moving at the rate of eight miles an hour, would be any less ruinous to the banks of the canal than the wash of a steam canal can be put into the battery solution to keep the zincs | boat moving at the same rate of speed? Both boats, of amalgamated? A. Mercury nitrate. 4. Is there any course, to have screw propellers. A. The mode of propulsion does not affect the wash on the banks of a canal. Stern and bow wheel propulsion was tried on the Erie Canal as early as 1833, and was then declared inadmissible on account of the wash. The Baxter system of screy propulsion began about 1870, in which speed was sacrificed to save the banks, four miles per hour being about the average, while six to seven miles could be made by the same boats between New York and Albany. B. T. exactly how the resistance of commercial German silver wire compares with that of pure copper. A. German silver wards in resistance according to its composition and discharging at the stern. It did not meet expectations, and the scheme was abandoned. No matter what kind of power is used, the speed of the boats, if made for carrying the greatest bulk, must conform to the hydraulic condition of the canal. Depth and width are the all-important exponents of speedy transit on our internal waters. We have seen the light draught, sharp-lined packets of the olden time drawn at the speed of a full trot with nine horses, or at seven miles per hour, with the waves curling over the tow path, but destructive to the canal. If ever an average speed of eight miles is ac complished on our canals on a commercial basis of profit. it will be when the canals are 10 feet deep and 150 feet

> (5630) W. J. R. asks: How is it that stumps of trees are found in the bogs of Ireland as far as twenty feet from the surface, which look as if they had been broken off? I have never found any one that could give me any explanation as to how they came to be so situated. A. The tree stumps found beneath the surface of bogs and swamps grew there in prehistoric times, be fore the water was raised above their roots. Geological changes in the level of the land have caused the water to

under water, which preserved them until the vegetable growth converted the pond or swamp into a peat bog. There are many such examples in Europe and America Sound cedar timber is now mined from ten to twenty feet below the surface in the swamps of Southern New

(5631) R. W. C. asks for a formula for computing the number of pounds pressure a boiler will stand, if you know the thickness of the iron and the size of the boiler. A. The bursting strength of a boiler is the thickness of the iron or steel in decimals of an inch, multiplied by its tensile strength, minus the per cent of loss of strength by the method of riveting. The product divided by one-half the internal diameter of the boiler. A single-riveted shell, with the best proportion of size and pitch of rivets, may be rated at 60 per cent of the value of the plate: a double-riveted shell at 70 per cent. For example, a double-riveted boiler, 48 inches diameter, fivesixteenths inch steel plate of assumed 60,000 pounds ten- $0.31 \times 60,000 \times 0.70$ 

sile strength, the figures will be 542 pounds, the ultimate strength of the boiler. The safe working pressure should be one-sixth, or 90 pounds.

(5632) C. W.—Catgut is made by scraping the entrails of sheep, twisting them while stretched, and holding them so until they are dry.

(5633) J. R. asks: 1. A test suitable to make before an audience to demonstrate the existence of opium in cigarettes. A. Try treatment with boiling alcohol and application of the ferric chloride test to the filtrate. This gives a dark blue color. 2. Is it probable that there would be enough arsenic to detect by Marsh's apparatus? A. It is doubtful. You can easily try it. Use chemically pure zinc and acid in making the test. 3. Is it injurious to health to sleep in a room with a coal fire burning in an open front stove? A. Not if the stove has a proper draught. 4. Is it true that the top portion of a nggy wheel turns faster than the lower portion? If so, why does it? A. See our Supplement, No. 706.

(5634) W. C. asks: 1. What determines which is the positive pole in a thermo-electric pair? A. The relations are determined by trial. There is no universal rule, and the thermo-electric relations of metals are different at different temperatures. 2. What two metals give the greatest current? A. Bismuth and crystallized antimony at ordinary temperatures. 3. Does the E. M. F. depend upon the number of pairs in series, or upon the intensity of the heat applied? A. On both. 4. Is there any varnish not affected by boiling water? A. We can give no reliable formula.

(5635) D. W. R. writes: We have a dynamo (5 K. W.), 105 volts. Could I connect it so that I could weld iron or "burn" sheet lead ? If so, how shall I proceed, or where can I obtain information regarding it? A. Your dynamo is of far too high resistance for incandescent welding. The usual way of operation is to employ an alternating current dynamo and to convert the current into one of higher intensity. We refer you for full information to our Supplement, Nos. 891, 892, 763. 682, 785, 778, which we can supply at 10 cents each by mail. Our Supplement, No. 840, describes the Ber nardos system of using the arc. This would operate with

(5636) G. A. G. asks: 1. Can I draw electricity from a storage battery and use it for heating in welding and smelting iron and minerals, and how shall I proceed? A. A storage battery may be used for welding, but is not to be recommended. A proper dynamo, with converter if necessary, is better. It can be used for smelting by using electric light carbons for terminals leading into a mixture of the ore with coke dust; but it will be expensive. 2. Is the storage battery patented and where offered for sale? A. There are patents affect ing different features. Address Queen & Co., whose address you will find in our advertising columns. 3. What kind of dynamo shall I use for storing this electricity A. Use a dynamo giving two and one-half volts potential for each cell that is to be stored. Charge at the rate specified by the manufacturer of the battery

(5637) C. H. McD. writes: 1. I have four storage batteries running a 4 candle power lamp of 6 volts. At times the lamp grows dim and then brightens up again: what is the cause of the batteries acting so? A. It is impossible for us to tell where the trouble is. If the battery is a good one, it should give ample current. 2. Can you give me approximate amperage of these cells, each cell having four plates, 6 ×8, covered with red lead paste? A. About four amperes, if the cells are in good condition. We imagine they are not, from your trouble with the lamp. Perhaps they are not fully formed. 3. I have a No. 3 Knapp motor, taking from four to ten volts. What is required to change motor into a dynamo? A. No change is necessary, if the field magnet core is of cast iron. But a small motor is apt not to give much return

### 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 all foreign countries may be had on application, and person contemplating the securing of patents, either at home or 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, 351 Broadway, New York.

### INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

December 19, 1893.

AND EACH BEARING THAT DATE

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

 Adding and registering machine, W. A. Neal.
 510,927

 Air brake, O. W. Dean.
 511,071

 Air compressor, G. De Laval
 511,086

Air drying apparatus, G. P. Schneider. 511,217 Air warming furnace, J. Schill et al. 511,164 Alarm. See Leak alarm.
Amusement apparatus. R. S. Hugnes
Awning, W. Bennett.         510,881           Bag. See Traveling bag.         511,242           Band cutter and feeder, J. W. Kinross.         511,242           Battery. See Blectric battery.         511,318           Bearing, adjustable spindle, C. H. Brown.         511,282           Bedstead, folding, T. Adams.         511,282           Bedstead, folding, D. M. Stevenson.         511,282           Bench. See Work bench.         511,282           Bicycle attachment, W. C. Moore.         510,924           Bicycle gearing, C. A. Snider.         511,169           Bicycle roller sprocket, R. J. Godbery.         511,012           Bicycles, etc., mechanism for automatically operating the adjustable saddles of, R. W. Riess.         510,993
Bedstead, folding, T. Adams. 511,230 Bedstead, folding, D. M. Stevenson. 511,282 Bench. See Work bench. 522
Bicycle attachment, W. C. Moore.   510.924     Bicycle gearing, C. A. Snider.   511,169     Bicycle roller sprocket, R. J. Godbery.   511,012
Bin. See Flour bin.
Binder, self, J. M. Lawrance. 511,243 Bit. See Bridle bit. Blind slat fastener, J. C. Stevens. 511,000 Block. See Paving block. Block shaving machine, Schraubstadter, Jr., & Schilling. 511,277 Blowing engine W. E. Good. 511,013
Board. See Chess and checker board. Drygoods beard. Ironing board. Bodkin, M. E. G. M. Ward. Bodkin, M. E. G. M. Ward. Boller, S. G. Brostus. Boiler cleaner, G. F. Schmid. Bookbinder, J. B. Johnston. Bookbinder, J. B. Johnston. Bookcase and washstand, combined, L. Hennes. 511,237 Boot, N. Herzog. Bottle making tool, R. S. Wiesenfeld.  Bottle making tool, R. S. Wiesenfeld.  Still, 643 Bottle packing device, Eggers & Mueller.  511,043 Bottles apparatus for injecting sirup to and filining with aerated waters internal-stoppered, T. Ferguson.  Box. See Folding box. Paper box. Resistance box. See Folding box. Paper box. Resistance
Boiler cleaner, G. F. Schmid. 511.064 Bookbinder J. B. Johnston. 511.082 Bookcase and washstand, combined, L. Hennes. 511.237
Bott N. Herzog. 511,141
Bottle stopper, J. Brooks. 511,014 Bottles, apparatus for injecting sirup to and filing with aerated waters internal-stoppered, T. Ferguson. 511,967
Box. See Folding box. Paper box. Resistance box. Brake. See Air brake. Car brake.
box.           Brake. See Air brake.         511.046           Brake piston indicator, W. J. Devers.         511.046           Brake shoe, J. T. Hall.         511.298           Brick kiln. J. Gaffney.         510.967           Brick mould, C. A. Shultz.         511.098           Bridde bit, E. R. Cahoone.         510.987           Brush holder, J. R. Coffman         510.892           Brush, metallic, E. E. Rice.         511.082           Brush mounting, P. Louchet         511.082           Buckle, W. F. Peet.         510.987           Buckle and snap. W. H. Pugh         511,310           Bung, seif-venting, H. W. Stone.         511,025           Burner. See Oil burner.         511,102
Brick mould, C. A. Snutz.       311,089         Bridle bit, E. R. Cahoone       510,890         Brush holder, J. R. Coffman       510,892         Brush metallic E. E. Rice       511,062
Brush mounting, P. Louchet. 511,152 Buckle, W. F. Peet. 510,387 Buckle and snap, W. H. Pugh 511,310
Butter worker, C. Owens. 511,274 Cabinet for holding money, coupons, etc., W. F. Beck. 511,231
Camera stand for bicycles, C. H. Campbell. 511,043 Can filling machine, Ball and & Stewart 510,963 Candle shade holder, W. E. P. French 510,907
Candy working machine, P. J. G. Firchau.   511,011   Car brake, J. Donovan   511,198   Car coupling, I. L. Brown   511,042
Car coupling, J. H. Brown 511,233 Car coupling, S. C. Brown 511,117 Car coupling, S. L. Denney 510,903 Car coupling, W. F. Donney 510,903
Car coupling, J. S. Scott
Car fender, street, W. B. Miles
Butter worker, C. Owens.   511,274
case. See Bookcase. Cash register and indicator, H. Cook. Cash register and indicator, Tyrrel & Aufuldish. 511.257 Casting apparatus, J. H. Cornelison.  511.265 Casting beads on spigot ends of iron pipes, method of and apparatus for, P. McArthur 511.247 Casting metals, centrifugal apparatus for, J. L. Sebenius.  510.995
method of and apparatus for, P. McArthur 511,247 Casting metals, centrifugal apparatus for, J. L. Sebenius 510,995
Catabult for propelling boomerangs, C. W. Renear
W. Mackey. 511,089 Chess and checker board, C. C. Moore. 511,308 Churn, A. W. Nanny. 511,056 Churn, C. Owens. 511,275 Cigar wrapper cutting machine, Storm & Warnken. 511,001
Ken
Chippers, shearing, E. A. Cochran
holz
Collar and process of manufacture, wood horse, B. A. J. Block
Colter clamp, J. Clayton
fibers for, Donisthorpe & Burrows. 511,129 Compasses, drawshting, B. H. Toquet. 511,177 Conveyer, Baxter & Mather. 511,315
Colter clamp, J. Clayton. 511,123 Combing fibrous materials, machine for, Donisthorne & Burrows. 511,128 Combing or spinning, machine for preparing fibers for, Donisthorne & Burrows. 511,129 Compasses, draughting, B. H. Toquet. 511,177 Conveyer, Baxter & Mather. 511,315 Cooler. See Wine cooler. 511,145 Copy holder, L. Hirt. 511,45 Copy holder, W. E. Younger. 511,032 Cornice, T. E. Denegar. 511,032 Cornice, T. E. Denegar. 511,197 Coupling. See Car coupling. Thill coupling. Cradle, automatic G. Denegri. 511,127 Cultivator, M. B. Gooing. 510,969
Cornice, T. E. Denegar
Cradle, automatic G. Denegri. 511,127 Cultivator, M. B. Gooing 510,969 Cultivator, corn, G. D. Houston 510,916 Cultivator, wheel, W. C. Moore 510,923 Curling iron, self-heating, E. Fontaine 511,297 Cutter. See Band cutter. Tobacco cutter. Dado head, G. W. De Grasse. 510,961 Dental forceps, H. Walter 511,067 Dental band piece, C. M. Spencer. 511,029 Dentist's device for saving gold filings, A. J. & F. F. Douds 510,963 Desk and cony holder, combined, Stuart, & Will-
Curling iron, self-heating, E. Fontaine
Dental forceps, H. Walter. 511,007 Dental hand piece, C. M. Spencer. 511,029 Dentist's device for saving gold filings, A. J. & F. F. Douds.
F. F. Douds 510,663  Desk and copy bolder, combined, Stuart & Willson. 511,631  Desk, school, G. A. Bobrick. 511,262  Dish handle and support, A. H. Bartbold. 511,682
Display cabinet for ribbons, laces, etc., C. P.
Doll pattern, L. M. Bowden
100
Draught equalizer, S. A. Holt.         510,971           Drill. See Rock drill.         510,880           Drilling machinery, M. Beal         510,880
Drilling machinery, M. Beal
Dumping platform scottening device, J. S. Kidd. 511,021 Eaves trough hanger, W. Baynes. 511,035 Ecraseur, Haussmann & Dunn. 511,202 Edging machine, double, C. B. Wessell. 511,212 Ejector, W. H. Hooker. 511,079 Electric battery, primary, E. Poppowitsch. 511,159 Electric elevator, F. A. Perret. 510,932 Electric machine brush holder, dynamo, F. E. Averill himself and the state of th
Ejector, W. H. Hooker. 511,079 Electric battery, primary, E. Poppowitsch. 511,159 Ejectric elevator, F. A. Perret. 510,932
Electric machine brush holder, dynamo, F. E.   Averill
Electric motor hand regulator, W. D. Packard 511,157 Electric regulating switch, E. A. Barber 511.187 Electric switch, J. L. Hinds
Electrode for voltaic cells, E. B. Cutten510,901, 510,902
Cutten 510.899 Elevator. Electric elevator. 510.913 to 510,915 Elevator belts, means for driving, D. A. Robinson. 511.212
Elevator rope drive, D. A. Robinson
Son. 511,212 Elevator rope drive, D. A. Robinson. 511,213 Emery wheels, tool for dressing, G. W. Kamerer. 511,083 Engine. See Blowing engine. Gas engine. Lo- comotive engine. Rotary engine. Engine attachment, gas, Barrett & Daly. 510,879 Engines, starting gear for compound, C. A. Ball. 511,186 Engines, trunning bearing for oscillating. C. E.
Healy 511,203 Engraving machine A. M. English 510,905
Exercising apparatus, C. K. Pickles. 511,251 Exhibiting apparatus, D. W. Tower. 511,104 Exhibiting device, Lunbeck & Cummings. 511,088
Exhibitor and depository, shade, J. Daehler
Expejlass guard, adjustable, Biegel & Phillips 511,261 Eyeglasses, S. Eastman 511,303 Fence, N. McAdams 511,303 Fence, Rosback & Band 511,063 Fence posts, device for applying wires to, E. F.
Pittman. 510,933 Fender. See Car fender. Filter, water, C. K. Lamb. 511,149 Fire escape, H. J. Schuldt 511,218

428	
Firing apparatus for use with coal dust, C. Wegener	I
ner 151,008  Flax cleaning and reducing machine, J. T. Smith. 511,221 Flour bin and sieve, G. C. Sherman. 510,268 Fly trap, Bender & Schoenecker. 511,108 Folding box, A. R. Hibson. 511,078 Fruit picker, J. R. Jones. 510,917 Furnace. See Air warming furnace. Puddling	
Fruit picker, J. R. Jones. Furnace. See Air warming furnace. Puddling furnace.  Furnace. Product.	20101010101
furnace.       511.194         Furnace, W. L. Braddock.       511.194         Furnace tap, E. P. Mathewson       511.690         Galley support, J. L. Dodd       511.256         Garbage receptacle, O. C. Newton       511.156         Gas engine, C. W. Pinkney       511.263         Gate, G. Adams       511.034	2010101
Gas engine, C. W. Plukney. 511,158 Gate, G. Adams. 510,058 Gate, T. A. Churchill 510,957 Gin sow filling machine, I. C. McCurry. 510,998	7   "
Gate, G. Adams       511,034         Gate, G. Adams       511,034         Gate, T. A. Churchill       510,936         Gin saw filling machine, J. C. McCurry       510,936         Girder and wall, hollow tile, C. P. Oudin       511,248         Grain binder, W. M. Piatt       510,988         Grain drill cultivating hoe, W. Anderson       511, 183         Guard       See Snow quard	
Guard. See Snow guard. Guns, ejector mechanism for breakdown, F. C. Stanley	
Meat hanger.	.   5
Harness, J. G. Garman.  Harnow and cultivator, combination, Boutwell & Magee.  Harrow disk, E. A. Ovenshire.  Harrow riding attachment, T. P. Navin.  Harrow riding attachment, T. P. Navin.  Harrow tooth socket, G. M. Bowen.  Harvester, corn, I. Hempy et al.  Harvester, corn, J. F. Winchell.  Hay loader, F. M. Bird.  House, temperature regulator for electric, A. M.  Butz.  Heating apparatus, E. R. Soleau.  Hinge, gate, J. P. Irwin.  Holisting apparatus, Smith & Morrill.  Horseshoe, J. Eckart.  Horseshoe, J. Eckart.  Horseshoe, J. Eckart.  Horseshoe, J. Eckart.  Horseshoe, A. E. Ogden.  Hose sleever, J. G. Hallas.  Hose supporter, E. L. Hanlon.  Hot air register, L. & H. G. Roberts.  Jil. 200  Hydraulic jack, A. E. Seaton.  Jil. 200  Hot and the standard of the standard of the graphic, L. Dorn.  Journal board, R. L. Armstrong.  Journal board, A. C. Pfohl.  Ironing board, A. C. Pfohl.  Ironing board, A. C. Pfohl.  Ironing board, A. C. Pfohl.  Jack. See Hydraulic jack. Wagon jack.  Jack. See Hydraulic jack. Wagon jack.  Journal box, self-oiling, H. W. Hill.  Kiln, We S. J. Oakes.  11.000	9
Harrow riding attachment, T. P. Naviii 311,039  Harrow tooth socket, G. M. Bowen 511,039  Harvester, corn, I. Hempy et al. 510,946  Harvester, corn, J. F. Winchell 510,945, 510,946	
Hay loader, F. M. Bird         511,109           Hay loader, S. Ferguson         510,965           Heaters, temperature regulator for electric, A. M. Birtz         510,860	
Heating apparatus, E. R. Soleau.       511,280         Hinge, gate, J. P. Irwin       511,080         Hinge, spring, W. S. Crane       510,890	9
Hoisting depice, H. Hagelstein 511,014 Horse rake, I. J. Borsum 511,014 Horse shoe, J. Eckart 511,017	
Horseshoe, J. W. Johnson	
Hose supporter, E. L. Hanlon         511.015           Hot air register, L. Ewald         511.298           Hydraulic Jack, A. E. Seaton         511.096	
lee cream treezer, L. & H. G. Roberts. 911,222 lee machine freezing can, E. Butler. 511,132 Incubator, H. J. Maxwell. 511,153 Inks. machine for grinding printing and litho-	
graphic, L. Dorn	
Ironing board or table attachment, F. N. Lewis 511,151 Jack. See Hydraulic jack. Wagon jack.  Jewelry holder, A. W. Turton	1 2
Journal box, self-oiling, H. W. Hill       511,144         Kiln. See Brick kiln       511,026         Kiln, W. & J. Oakes       511,026         Kitchen cabinet. G. Thompson       511,002	3
Kitchen cabinet, P. B. Thompson. 511,176 Knife polisher and sharpener, J. A. Ward. 511,181 Knitting, S. Conde. 510,955 Knitting, S. Conde. 510,955	
Journal box self-oiling, H. W. Hill	5
anism for automatic, J. G. Powell. 510,338 Knob attachi.ent, Anspach & Rebstock. 511,138 Knob attachment, W. H. Goune. 510,968 Knob, sheet metal W. A. Turner. 511,769	1 7
Label holder, Shaffer & Horovsky	2 7
Lamp draught regulator, J. W. Lawson	Ĺ
Lasting machine starting and stopping mechanism, S. W. Ladd	2
Lasting machine starting and stopping mechanism, S. W. Ladd. 510,975  Lead salts and caustic alkali, making basic, Lunge & Lyte. 511,975  Leaf turner, book, C. W. Clark 511,125  Leak alarm, C. H. Briggs 511,041  Letter, embossed sign, Maddin & Selman 510,987  Locomotive brake mechanism, T. H. Haberkorn, 510,981  Locomotive electric C. F. Winkler 510,981	(   (     (   (
Locomotive, electric, C. F. Winkler.  Locomotive engine, compound, W. H. Hansell 511,014  Locomotive link movement, S. L. Branton 510,84  Lung tester, coin-operated, Beckwith & McCol-	6 7
Machinery, rope or cable drive for, J. F.	5
Machirery, rope or cable drive for, J. F. O'Rourke   511,09	1 8 6
Meat hanger, A. H. Hieatzman 511.23 Metallic tie and fastener, T. M. Brintnall 511.33 Milking machine, cow. J. C. Fay 510,95	7
tacles, L. B. Parish	4
Motor. See Electric motor.  Music leaf turner, T. Douglas	8
Numbering head, C. A. Haney     510.91       Nut lock, J. Horner     511.27       Oil burner, H. Holland     511.24       Line of the control of the co	2   0   1   1   1
Pad inker, G. J. B. Rodwell. 511.21 Painting, hygroscopic, M. Bielefeldt. 511.21 Paper bag machine, C. B. Stilwell. 511.17	5 1 1
Paper box, Howe & Davidson	1 2 4
Pen, fountain, F. Gilbert.       511,38         Pen printing, H. R. Fuller       510,98         Photographic camera, J. Fretwell       511,33         Pignor capard, U. F. Rive       511,31         Figure capard, U. F. Rive       51,32	6
Pianos, stringing C. S. Weber. 510,34 Picker. See Kruit picker. 5pe cap, sewer and other, H. Bradley, Jr. 510,88	4
Pipe wrench, C. B. Merritt. 511,15 Pipes, floor and celling plate for, A. T. Bishop 511,03 Piperazin, Majert & Schmidt. 511,33 Piston. T. Goulding. 510,91	6 3 0
Plant setting machine, C. O. Moore et al.         510,92           Planter, corn, I. F. Yockey et al.         512,62           Pliers, F. C. Neuhaus         511,09           Plow, Graham & Griffin         511,00	25 0 1 15
Picker.         See Fruit picker.           Pipe cap, sewer and other, H. Bradley, Jr.         510,88           Pipe wrench, C. B. Merritt.         511,68           Pipes, floor and celling plate for, A. T. Bishop.         511,08           Piperazin, Majert & Schmidt.         511,28           Piston, T. Goulding.         510,91           Plant setting machine, C. O. Moore et al.         510,26           Planter, corn, I. F. Yockey et al.         511,26           Pilow, Graham & Griffin         511,38           Plow, Graham & Griffin         511,13           Plow, otary disk, L. D. Railsback         511,18           Powder and fuse warmer, A. Price         510,16           Power transmitting and speed regulating mechanism, Cooper & Hampton         511,28           Press.         See Clothes press.         Printing press.           Printing carpet yarns, apparatus for, W. Shaw         510,30	2 8 80
Power transmitting and speed regulating me- chanism, Cooper & Hampton	9
Press. See Clothes press.         Printing press.         510,93           Printing carpet yarns, apparatus for, W. Shaw.         510,93           Printing machine, W. Scott.         511,01           Printing press.         H. Breuer.         511,11           Printing press feed gauge, E. L. Megill.         511,15           Propeller, T. B. Heathorn.         510,97           Pr tector.         See Tree protector.           Puddling furnace, F. C. Roberts.         511,16           Pump, B. Mellor.         510,32           Pump, rotary reciprocating, Cooper & Hampton.         510,32           Pump, interpretable, check.         N. Williams.         511,31           Pump, interpretable, check.         N. Williams.         511,31	3
Pr tector, See Tree protector. Puddling furnace, F. C. Roberts. 511,16 Pump, B. Mellor. 510,88	233
Pump, B. Mellor	3
Radiator, J. W. Pertz. 511,02 Rail shoe and brace, Snider & Roberts. 511,17 Railway, closed conduit electric, W. S. Smith. 511,25 Railway, elevated, J. N. Valley. 511,25	7 0 4 9
Railway rail fastening, L. E. Whipple	6 3 31
Hendrix. 511,01 Railway switch, electrically operated, Stone & Webster 511,17	7
Railway switch, electrically operated, Stone & Webster	78 27 16
Railway tie. metal, H. A. De Raismes 511.07 Railway time signal, B. B. Morgan 511.30 Railway track, street, W. C. Wood 511.30	72 77 38
Railway trolley, electric, W. W. Hendrix511,018, 511,018 Rake. See Horse rake. Refrigerating apparatus, F. B. Hill	39 19
Kare. See Horse rare.  Refrigerating apparatus, F. B. Hill	- 1
Poods machine for making and renaising M. C.	
Bunnell. 510,88  Roadway, F. Melber. 511,09  Rock drill, Bullock & Douglass. 511,11  Rock drill support, S. W. Douglass. 511,10  Rock drill tripod, A. J. Sypher. 511,10  Roller See shade roller	19 14 03
Roller. See shade roller. Rolling iron bars, etc., method of and apparatus	

	Donah sanding and channeling machine Priggs	511,311
l	& Dancel	511,263 510,888 511,225
	Sad iron, H. J. Wattles Sand band, G. D. Cleveland	511,225 511,124 511,284
ı	Sand mould, S. J. Adams	511,030
	Saws, power mechanism for circular, W. W.	510,891
	Holmes Sawing machine, L. A. Deuther Scales, pendulum, C. L. & P. C. Woods	511,269 510,962 510,948 510,986
	Scraper, H. Molchior	510,986
Ì	don	<b>510,940</b>
	Separator. See Steam separator. Sewing machine, wax thread, G. R. Allen	510,951
İ	Shade holder, J. F. Grill	511,136 510,894
	Shade roller, spring, E. F. Hartshorn Shafts, centering device for revolving, E. Seger	511,076 510,938
	Shovel. See Steam shovel.	510,887
I	Scraper and cultivator, combined, Smith & Hendon. Screen. See Window screen. Separator. See Steam separator. Sewing machine, wax thread, G. R. Allen. Shade holder, J. F. Grill. Shade roller bracket, adjustable, G. Cook. Shade roller, spring, E. F. Hartshorn. Shafts, centering device for revolving, E. Seger. Shaper head, C. Bowman. Shovel. See Steam shovel. Sifter, ash, T. O. Payne. Signal. See Railway signal. Railway time signal. Signal wire support, J. Fisher.	511,132
	of, A. J. Chase	511,288 511,295
ĺ	producing, E. B. Cutten	510,900
ĺ	Soldering tin cans, H. Pennington	511,143 510,931
	Soldering tin cans. H. Pennington. Spike, G. W. Fisher. Spinning mechanism. D. P. German Spooler spindle, front, F. W. Easton. Spoon or analogous article, J. Staren.	511,143 510,931 511,236 510,909 511,266
1		511,100
{	Spring compressing apparatus, E. E. Chain Sprocket wheel and chain, Grueter & Jackson	510,956 511,137
	Stamp stem guide, T. Pilkington Stand. See Display stand. Map stand. Music	510,990
ij		£11 000
i	Staverrounding crozing, and chamfering ma- chine, Pleukharp & Liggett. Steam separator, Wolle & Treut. Steam shovel, Boudrie & McManus. Steamer for tempering wheat, F. Beall.	511,028 511,314 511,110
	Steamer for tempering wheat, F. Beall	510,954
i	Stopper. See Bottle stopper. Stove, Smith & Rose Stove, hot blast, F. C. Roberts	511,222 511,253
1	Strap. See Trousers strap. String instrument, E. Bocker	511,009
		511,204 511,092
1	Switch. See Electric switch. Electric regulating	511.003
i	Tack separating and feeding mechanism S. W.	510,978
ŀ	Tacking machine, S. W. Ladd	510.976
	Tanning hides, W. F. Lawley	511,300 511,301 511,007
	Telegraph relay, F. P. Medina	511,081
	Telegraph relay, F. P. Medina.  Telegraphic relay, E. Weston Telegraphic transmitter, H. F. Stinde.  Telegraphy, system of, Parker & Summers.  Telegraphy, experit two station F. A. Pickernell	511.005 511,172 510,929
	Telephone circuit, two station, F. A. Pickernell. Telephone, magneto, J. A. Brown. Temperature controlling device, H. B. Tatham, Jr.	511,276 511,118 511,283
	Temperature regulator, thermo-pheumatic, H. B.	
	Tatham, Jr.	511,066 511,245
	Thermo-eter, dial, E. Weston. Thermometer, dial, E. Weston. Thermometer, recording, A. Walther. Thill coupling, H. W. Lawrence. Thill coupling, J. B. Pouk Tie. See Metallic tie. Railway tie.	511,006 511,258 511,302
Ì	Thill coupling, J. B. Pouk	511,302 511,061
į	Tie. See Metallic tie. Railway tie. Time apparatus, automatic intermittent hydraulic. J. F. Franke	511 075
İ	Tire, pneumatic, E. J. Miles	511,207 510,895
	Tool, catching and holding, J. W. Jones Tool, combination, C. Becker	511,148 511,107
	Tool, combination, G. Massey	511,087
)	Top, Southwick & Mohr	511,057 510,998 511,084
	Toy, J. D. Latimer Toy bed or crib, M. E. Converse	510,919 510,893
	Toy machine gun, S. Brown	511,069 511,234
	Trap. See Fly trap. Traveling bag, E. Haskell	511,077
	Thill coupling, J. B. Pouk Tie. See Metallic tie. Railway tie. Time apparatus, automatic intermittent hydraulic. J. F. Franke. Tire, pneumatic, E. J. Miles. Tobacco cutter, A. B. Cosby. Tool, combination, C. Becker. Tool, combination, C. Becker. Tool, combination, G. Becker. Tool combination, G. Becker. Tool holder, F. Oblols. Top, Sou thwick & Mohr Toy, E. F. & L. B. Kellum. Toy, J. D. Latimer. Toy bed or crib, M. E. Converse. Toy machine gun, S. Brown. Transmitter, Morse, A. F. M. Cornand. Trap. See Fly trap. Traveling bag, E. Haskell. Trough. See Watering trough. Trough. See Watering trough. Trough. See Watering trough. Trunk, G. L. Walker. Type writing machine, M. G. Merritt. Tiplicycle, L. W. Harper. Unloading and stacking apparatus, J. J. Schrag. Valve, Boyne & Caldwell. Valve gear reversing, J. W. Phillips. Valve gear p. J. Langlais. Valve gear reversing, J. W. Phillips. Watchmaker's tool. W. G. Crook Wagon jack. Alleston & Chapman Washboard, G. W. Mickle Washing machine, J. S. Braden Watchmaker's tool. W. G. Crook Water closet connection, J. J. Ricketts Watchmaker's tool. W. G. Crook Water closet, W. Smith. Watchmaker's tool. W. G. Crook Water closet connection, J. J. Ricketts Wheel barrow, P. F. Dearstyne. Whipholder, A. Searlow, J. S. Braden Watchmaker's tool. W. G. Crook Water closet, W. Smith. Watchmaker's tool. W. G. Crook Water closet, W. Smith. Watchmaker's tool. W. G. Crook Water closet, W. Smith. Watchmaker's tool. W. G. Crook Water cl	510.975
;	Trunk, G. L. Walker	511,180 510,985
	Type writing machine, M. G. & H. W. Merritt Unicycle, L. W. Harper	511,305 511,139
. 1	Unloading and stacking apparatus, J. J. Schrag Valve, Boyne & Caldwell	510,937 510,883
	valve for air compressors, suction, F. Neukirch Valve gear, P. J. Langlais	511,248 511,085
)	Valve, quick action triple, A. P. Massey Velocipede, W. R. & E. G. Diehl	511,206 511,200
l L	Vending machine, coin-controlled, B. S. Dodge Ventilator. See Centrifugal ventilator,	511,291
3	Vessel hull, steam, E. W. Babcock Vulcanizer gas regulator, G. B. Snow	510,877 511,256
į	Wagon jack, Alleston & Chapman Washboard, G. W. Mickle	511,182 511,246
ĺ	Washing machine, J. S. Braden	511,040 511,055
į	Watchmaker's tool, W. G. Crook	510,897 510,997
ì	Water closet connection, J. J. Ricketts	511,161 511,142
3	Wheel driving mechanism, I. M. Bourke	510,882
1	Whipholder, A. Searls	511,045 511,165 511 10s
1	Window screen, C. C. Wheeler	511,106 511,209
5 6 8	Wire stretcher and holder, J. R. Brabston Wire stringer and stretcher, J. E. Brazee	511,112 511,232
30	Wood working machines, feed mechanism for, E. Judd.	511,205
5 0 1	Wood working machines, feed mechanism for, E. Judd. Wool grease, production of neutral, J. C. Lahu sen Work bench for saloons, C. E. Groves. Work rest, J. Grant. Wrench. See Pipe wrench. Wrench, A. L. Bedford. Wrist pin turner, R. L. Levin.	511,051 511,048
5	Wrench. See Pipe wrench. Wrench. A. L. Bedford	511.190
Š	Wrist pin turner, R. L. Levin	511,053
9	TRADE MARKS.	
9	I .	. 23.930
34	Rougies and suppositories, F. Wuersten	23,934
ð	China ware and faience, A. Hache & Co	. 23,935 . 23,938

	Bougies and suppositories, F. Wuersten	23,930
ı	a-brac, F. N. Osborne	93 93/
ı	China ware and faience, A. Hache & Co	23,036
i	Corsets, Bortree Manufacturing Company	23,036
ı	Dresses and dress goods, women's. C. E. Taylor	23 027
ĺ	Medicinal tablets, Fernine Tablet Co	22,026
i	Medicine for the cure of liver and kidney diseases.	20,50
	D D Drodt	92 024
	P. P. Bradt Oil, olive, Reiset & Waeber	23,936
i	Publications treating on orthopedic surgery,	20,940
	printed, H. R. Allen	92 020
	Remedies for diarrhea and gouty rheumatism,	40,95
	Chemische Fabrik.vormals Hofmann & Schoe-	
		02.00
	tensack	25,92
	Remedies for diseases of the stomach, spicen, liver	00 00
	lungs, heart, spine, and nerves, K. M. Tata	20,92
	Remedies for piles, Hamilton & Whittin	25,95
	Remedy for rheumatism, J. P. Greene	
	Tea, J. Butler	23,94
	Woolen dress goods, Botany Worsted Mills	23,93

### DESTONE

DESIGNS.	
Billiard cue handle, J. A. Rieper22,972 to Ceiling plate or panel. W. R. Kinnear	22,975 22,968
Dish, T. Haviland	
Game board, H. McDaniel Picture frame, etc., R. Golde	
Type writer finger guide, E. Terry	

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.

Rock drill support, S. W. Douglass. 511,1074
Rock drill tripod, A. J. Sypher. 511,108
Roller. See shade roller.
Rolling iron bars, etc., method of and apparatus
for, J. Hunter. 511,147
Roof, portable house, C. H. Leonard. 510,920

### 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 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.

# Patent Foot Power Machinery

Wood or Metal workers without steam power can successfully compete with the large shops, by using our New LABOR SAVING Minchinery, latest and most improved for practical Shop Use, also for Industrial Schools, Home Training, etc. Catalogue free.

Seneca Falls Mfg. Co. 695 Water Street, Seneca Falls N. Y.



IMPROVED LATHES MODERN DESIGNS Also Foot Lathes, Tools and Supplies. Catalogue Free Sebastian Lathe Co. 120-122 Culvert Street Cincinnati, oillo.

### PHONOGRAPHS

FOR SALE. ADDRESS

North American Phonograph Co. 30 Park Place, New York

Masonic Temple Bldg.,

### THE FISHER **Patent Steam Pump Governors**

FISHER PATENT GRAVITY GOVERNORS
For Steam Pumps filling elevated open tanks, are the most positive and durable devices made for the purpose.

REDUCING VALVES.
Send for circulars and testimonials.
FISHER GOVERNOR (O., Marshalltown, Iowa.

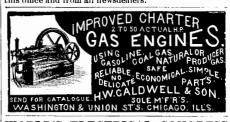
THE ATMOSPHERIC RAILWAY.-Description of a project for rapid transit dating back to the year 1848. A curiosity in the history of rallroading, With 6 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 922. Price D cents. To be had at this office and from all newsdealers.

# Inventions Practically Developed. D'AMOUR & LITTLEDALE, 204-206 East 43d Street, New York.



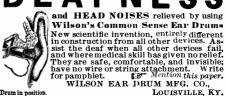
# OIL WELL SUPPLY GO. 91 & 92 WATER STREET, PITTSBURG, PA. Manufacturers of everything needed for ARTESIAN WELLS for either Gas, Oil, Water, or Mineral Tests Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. Illustrated catalogue, price lists, and discount sheets on request.

MUSIC AND LONGEVITY.—A PAPER MUSIC AND LONGEVITY.—A PAPER by Ephraim Cutter, M.D., in which the author endeavore 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 nerve force. That music is physiologically capable of enlarging the chest and the capillaries and of calming and regulating, if not increasing nerve force, 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 newsdeulers.



WORLD'S ELECTRICAL CONGRESS at Chicago.—Addresses of Prof. Elisha Gray. Prof. Thomson. Dr. Won Helmholtz, and Mr. W. H. Preece. Contained in Scientific AMERICAN SUPPLEMENT, No. 925. Price 10 cents. To be had at this office and from all newsdealers.

### EAFNESS





MAKE YOUR- MECHANICAL ENGINEER OR DRAUGHTSMAN; Or qualify to take charge of or to superintend the manufacture of machinery, by developing your idle hours to Home Study by the method of THE CORRESPOND-ENCE SCHOOL OF MECHANICS, Scranton, Pa. To begin, students need only know how to read and write. Moderate charges. Send for FREE Circular.

Family Ice Machine Ice, etc., in a few minutes, \$10 and up. Filters, \$1.25 and up. Cookers, \$1. Seltzateurs to prepare one's self soda water, \$4.50 and up. L. Dermigny, 126 W. 26th St., N. Y.



### Stereopticons Lantern Slides - -

This Season's Specialty. World's Fair Lantern Slides. Write for Catalogue M.

McINTOSH BATTERY & OPTICAL CO., Chicago

Perfect Newspaper File

The Koch Patent File, for preserving Newspapers, Magaziues, and Pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of \$1.50 by mail, or \$1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN" in gilt. Necessary for every one who wishes to preserve the paper. Address MILIN & CO., Publishers SCIENTIFIC AMERICAN MUNN & CO., Publishers SCIENTIFIC AMERICAN

### WORLD'S FAIR HIGHEST AWARDS

Medal & Diploma on our INCUBATOR and BROODER combined. Medal on Hot Water Brooder.

Old "Reliable" Leads Them All. If you are interested in Poultry, it will pay you to send 4c. in stamps for our 2-p. cat., giving valuable points on poultry culture.

Reliable Incubator & Brooder Co., Quincy, III.



THE PEARY EXPEDITION: AN INteresting narrative of.—With 8 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. No. 882. Price 10 cents. To be had at this office and from all newsdealers.



### **I**F YOU HAVE ANY SMALL ARTICLES

in Brass or Iron that you want manufactured in quantities, write to The Jones Bros. Elec-TRIC Co., 28-30-32 West Court St., Cin'ti, O.

### NOW READY!

Fourteenth Edition of Experimental Science

A GREAT BOOK FOR THE HOLIDAYS.



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

Just the thing for a boliday 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 illusions 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. Systemsof Electrical Distribution, Electrical Ore Finder, Electrical Rocker, Electric Chimes, How to Color Lantern Sides, 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.

CELLULOID LACQUERS

AND VARNISHES FOR METAL AND WOOD

### Advertisements.

### ORDINARY RATES.

de Page, each insertion. - 75 cents a line k Page, each insertion. - \$1.00 a line For some classes of Advertisements, Special and , er rates are required.

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

### OLD FORGED PRODUCT.

# Faged Wood Screw

Patented May 10, July 19, 1887; Oct. 29, 1889; Aug. 19, Oct. 21, 1890; April 7 May 12, 1891;

### Its Advantages are:

- 1. Stronger than a common screw.
- 2. Uniform and wide slot. 3. Requires the use of but one bit in hard wood.
- 4. Inserted easier.
- 5. Centralized point.6. Superior holding power.
- 7. The serew being ('old Forged, instead of Cut, leaves on its entire surface a metallic skin.

Send for samples to

### AMERICAN SCREW CO. PROVIDENCE, R. I.

SCIENTIFIC AMERICAN SUPPLE-MENT. Any desired back number of the SCIENTIFIC ANGRICAN SUPPLEMENT can be had at this office for 1 Ints. Also to be had of newsdealers in all parts of ountry.



Delivered free on receipt of price.
For Printing Presses, Lathes,
Grindstones, Coffee Mills, Ice
Grindstones, Coffee Mills, Ice
Grindstones, Coffee Mills, Ice
Grindstones, Churns, ChristS Gardens, Washing Machines, etc., No. 2, price \$10.
THE BOLCIANO WATER MOTOR CO.
414 Water Street, Baltimore, Md.



THE Motor of 19th Century Can be used any place, to do any nears, and by any one. No Boiler! No Steam! No. Ashes! No Gauges! No Engineer! A perfectly safe Moto for all places and purposes. Cos of operation about one cent as hour to each indicated horse power to exclusive the control of er. For circulars, etc., addres CHARTER GAS ENGINE CO P. O. Box 148. Sterling, III

### **GGINS'** TO MOUNTER.

e adhesive, scie "fically made the special requirements of ph, scrap book, textile and all ntings, yet low priced enough a general adhesive.



**Pipe Frame Truck Baskets** Wire Standard Truck Baskets STEEL and WOODEN TRUCKS PIPE FRAME SHOE RACKS WIRE LOOP SHOE RACKS L. MURRAY MOORE

Riggins' Pina 

### Rochester, N. Y. **ASTRONOMY**

ade easy and interesting with the help of our new Celestial Planisphere and Handbook.

POOLE BROS., Chicago, III. STEAM YACHTS USE



## COMPOUND ENGINES

'TO INCREASE POWER, and save one-third boiler capacity. The Coulter & McKenzie Mach. Co.

500 Water Street, BRIDGEPORT, CONN.



CAN DO IT! PATENTS Practically Developed. MODELS Made valuable Articles Manufactured. Address TOPEKA FOUNDRY, TOPEKA, KAN.



COPYRIGHTS.

CAN I OBTAIN A PATENT? For a prompt answer and an honest opinion, write and UNN & CO., who have had nearly fifty years' experience in the patent business. Communications strictly confidential. A Handbook of Information concerning Patents and how to obtain them sent free. Also a catalogue of mechanical and scientific books sent free.

Patents taken through Munn & Co. receive snecial notice in the Scientific American, and thus are brought widely before the public without cost to the inventor. This splendid paper, issued weekly, elegantly illustrated, has by far the largest circulation of any scientific work in the world. \$3 a year. Specimen copies sent free.

Building Edition, monthly, \$2.50 a year. Single copies, 25 cents. Every number contains beautiful plates, in colors, and photographs of new houses, with plans, enabling builders to show the latest designs and secure contracts. Address

M.NN & CO., New York, 361 Broadway.

### H. W. JOHNS M'F'G CO., ASEESTOS:

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

87 MAIDEN LANE, NEW YORK.

Chicago.

Philadelphia.

# ELECTRIC \* STREET \* RAILWAYS. THE MOST EFFICIENT MOTOR ON THE MARKET.

Highest Awards at the World's Fair. Railway Supplies of All Kinds.

Boston, Mass.
Philadelphia, Pa.
St. Paul, Minn.
Washington, D. C.
Denver, Col. All business outside the U.S. transacted by Thomson-Houston International Electric Co. 44 Broad St. New York

### ARMSTRONG'S \* PIPE \* THREADING **CUTTING-OFF MACHINES** Both Hand and Power. Sizes 1 to 6 inche

Sizes 1 to 6 inches.
Sizes 1 to 6 inches.
Water, Gas, and Steam Fitters' Tools. Hinged Pipe Vises,
Pipe Cutters. Stocks and Dies
universally acknowledged to be
THE BEST. IF Send for catalog.
Armstrane Armstrong Mfg. Co., Bridgeport, Conn.

AGENTS WANTED FOR FINE TOOLS IN EVERY SHOP CATALOGUE C.H.BESLY& CO.

\$6.00

Eastman Kodak Company,



\$100.00 ICE-BOATS-THEIR CONSTRUCTION and Management. With working drawings, details, and directions in full. Four engravings, showing mode oconstruction. Views of the two fastest ice-sailing boat used on the Hudson river in winter. By H. A. Horsfall M.E. Contained in SCIENTIFIC AMERICAN SUPPLE MENT, 1. The same number also contains the rules and regulations for the formation of ice-boat clubs, the sail ing and management of ice-boats. Price 10 cents.



### THE MOST POPULAR SCIENTIFIC PAPER IN THE WORLD

ESTABLISHED 1845.

Circulation Larger than all Papers of its Class Combined.

Only \$3.00 a Year, including Postage to United States, Canada and Mexico. \$4.00 a Year, including Postage to all countries in the Postal Union.

This is a Weekly Publication, and each number is splendidly illustrated. It contains sixteen pages of reading matter on new inventions and discoveries, and all the latest information on Engineering, Mechanics, Applied Science, Astronomy, Electricity, Naval Architecture, Chemistry, Manufactures, Photography, Telephony and Phonography, The success of this paper and its widespreadcirculation are the best guarantee of its value and its popularity.

One copy of The Scientific American Supplication on copy of states each week, giving the name of the inventor. The Notes and Queries department, with its full answers to rarious questions in mechanics and general science, will all one repay the reader for a full year's subscription.

The Scientific American Supplication or Copy of Seven deliars by the publishers.

The Scientific American Mexico, on receipt of seven deliars by the publishers.

The Scientific American Supplication or Postal Note. Money carefully placed inside of envelopes.

The Scientific American covers a broad field, and should satisfy all those who have any thirst for information or who have any desire to be familiar with the current scientific events and the industrial progress of the country. Each issue is embellished with the best class of wood engrav-

The asfest way to remit is by Post:: Order, Draft or Postal Note. Money carefully placed inside of envelopes, securely sealed and correctly addressed, selom goes astray, but it is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., 861 Broadway, New York.

## SCIENTIFIC AMERICAN SUPPLEMENT.

\$5.00 A YEAR, INCLUDING POSTAGE.

This is a distinct paper from The Scientific American, but it is uniform in size with it, every number containing 16 octavo pages. The Scientific American Supplement embraces a very wide range of contents, covering the most recent and valuable contributions in Science, Mechanics, Architecture, and Engineering, from every part of the world. Every number contains several illustrations, consisting in 1st of important engineering works in progress or completed, both at home and abroad. It presents the most recent papers by eminent writers in every department of science, and every number contains information useful to engineers in every department of science, and every number contains information useful to engineers in every department of industry, civil, mechanical, electrical, etc.

Therefore, The Scientific American, 361 Broadway, New York-

with illustrations of Grand Engineering Works; also of Naval and Mechanical constructions of magnitude, projected, progressing, and completed, at home and in all countries abroad.

The most important papers read at Scientific Conventions, by the best and most profound thinkers, will be found in The Scientific American Supplement. This paper, when preserved and bound, forms a most useful encyclopedia of information, and presents a complete history of the progress of the times in the Sciences, Arts, and Mechanical Engineering. This paper contains no advertisements. A catalogue of subjects published in The Scientific American and Supplement of subjects published in The Scientific American and Supplement of subjects published in The Scientific American and Supplement of subjects published in The Scientific American and Supplement of subjects published in The Scientific American and Supplement of subjects published in The Scientific American and Supplement of subjects published in The Scientific American and Supplement of subjects published in The Scientific American and Supplement of subjects published in The Scientific American and Supplement of subjects published in The Scientific American and Supplement of subjects published in The Scientific American and Supplement of subjects published in The Scientific American and Supplement of subjects published in The Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American and Supplement of Scientific American a

### THE SCIENTIFIC AMERICAN

## ARCHITECTS AND BUILDERS EDITION.

\$2.50 A YEAR. SINGLE COPIES, 25 CENTS.

This is a Special Edition of THE SCIENTIFIC AMERICAN, issued monthly—on the first day of the month. Each number contains about forty large quarto pages, equal to about two hundred ordinary book pages, forming, practically, a large and splendid Magnazine of Architecture, richly adorned with elegant plates in colors and with fine engravings; illustrating the most interesting examples of modern Architectural Construction and allied sublects. tion and allied subjects.

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, Specifications, Costs, and Details.

No other building paper contains so many new architectural plans regularly presented as the SCIENTIFIC AMERICAN. Thousands of dwellings and other buildings have been erected on the various plans we have issued during the past few years.

Architects, Builders, and Owners will find this work valuable in furnishing fresh and useful suggestions. All who contemplate building or improving homes, or erecting structure of any kind, have before them in this work an almost endless series of the latest and best examples from which to make selections, thus saving time and money.

Many other subjects, including Sewerage, Piping, Lighting, Warming, Ventilating, Decorating, Laying Out of Grounds, etc., are illustrated. An extensive Compendium of Manufacturers' announcements is also given, in which the most reliable and approved building Materials, Goods, Machines, Tools, and Appliances are described and illustrated, with addresses of the makers, etc.

The fullness, richness, cheapness, and convenience of this work have won for it the Largest Circulation of any Architectural publication in the world.

of any Architectural publication in the world.

Bound Volumes of the whole work, from beginning in 1886 to close of 1893, may now be obtained at this office, or from Booksellers and Newsdealers. Price, bound in paper, \$2.00 per volume. Two volumes per year. Forwarded to any address.

Including all the separate diagrams and engravings of construction details, each volume presents not far from one thousand illustrations. The reading matter covers a large variety of useful and excellent subjects, interesting to every one. No architect, builder, contractor, engineer, or householder can afford to be without this splendid work. It is full of useful information, and its silustrations have a permanent va ue for suggestion and reference. It never grows old or useless.

MUNN & CO., Publishers.

361 Broadway, New York.

ENGINES, BOILERS & MACHINI Complete outfits furnished. ces and Catalogue "B." W. P. DAVIS, Ro

INVENTORS! Don't order dustri H. H. Franklin Mfg. Co., Onondaga St., 🗸

### **Saskatchew** Buffalo Ro



They are the warmest, handsomest, and make Sleigh Robes made, practically unwear Not expensive, and insure solid comfort to perposed to cold weather. "Buffalo Bill" says the perfect substitute for the old, and now rare, I skins. Ask for the Saskatchewan Buffalo Royour dealer's, or if not in stock, send for illust book to AMERICAN BUFFALO ROBE.

3 Howell Street, Buffalo, N. Y.

OUTFIT FOR YOUR FRONT DOO! One Cell of Battery, One Bell, One Push, Fifth Insulated Wire and Staples, in wood box, by ex, One Dollar and Twenty-five cents. Also cate, Remit with order or send stamp for particulars.

LAW BATTERY COMPANY, 85 JOHN STREET, NEW YORK (

### The American Bell Telephone Comp 125 MILK ST., BOSTON. MASS

This Company owns the Letters Pat No. 186,787, granted to Alexander Gra) Bell, January 30, 1877, the scope of w has been defined by the Supreme Cor the United States in the following t

"The patent itself is for the m ical structure of an electric telep<sup>1</sup> be used to produce the electrical on which the first patent rests. T claim is for the use in such instr of a diaphragm, made of a plate or steel, or other material capable ductive action; the fifth, of a peri magnet constructed as described, coil upon the end or ends neares plate: the sixth, of a sounding box as described; the seventh, of a speaking or hearing tube as described for conveying the sounds; and the eighth, of a permanent magnet and plate combined. The claim is not for these several things in and of themselves, but for an electric telephone in the construction of which these things or any of them are used."

This Company also 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 cover fundamental inventions and embrace all forms of microphone transmitters and of carbon telephones.



The McCONNELL

BUFFALO, N. Y.

ENGINES.



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.



### PRINTING

OLAR ELECTRIC.

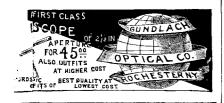
rows old or useless.

& CO., Publishers.

The SCIENTIFIC AMERICAN is ENEU JOHNSON & CO.'S INK.'
Sts., Philadelphis, and 47 Rose St., or

Founded by Mathew Carey, 1785.

NRY CAREY BAIRD & CO. al Publishers, Booksellers, and Importers, alnut St., Philadelphia, Pa., U. S. A. new and Revised Catalogue of Practical and Books, 88 pages, 8vo, and our other Catalogues bars, the whole covering every branch of Sci-ted to the Arts, sent free and free of postage in any part of the world who will furnish his



efortou Order and Subscribe to OREIGN PERIODICALS

for next year, please send for estimate to G. E.FECHERT, S10 Broadway, N. Y., Importer of Books and Periodicals. Branc.—Leipzig, London, Paris.

PHENIX ELECTRIC BELL OUTFIT.

All fut it in Circular from W. B. BEACH,

(5 Water St., Bridgeport, Conn.

ICES REASONABLE.

THBERING SEA FISHERIES. THIDERING SEA FISHERIES.—An isting paper on the habits of the fur seal, the localign the North Pacific inhabited by the animal and nethod of hunting and shaughtering it. With 5illuions and a man. Contained in SCIENTIFIC AMEN SUPPLEMENT, No. 919. Price 10 cents. To be haths office and from all newsdealers.

GAS ROCK & ORE BREAKER

Capacity upto 200 tons per hour.

Has produced more ballast, road metal, and broken more ore than all other Breake's combined. Builders of High Grade Mining Machinery. Send for Catalogues. Machinery. Send for Catalogues.

CATES IRON WORKS,

50 C So. Clinton St.. Chicago

136C, Liberty Street, New York.

237 C, Franklin St., Boston, Mass

NSECTS INJURIOUS TO DRUGS. NORULIS INJURIOUS TO DRUGS. By Prof. L. E. Sayre. A brief glance at the insects und in various drugs, with comments upon their life story and habits. With 32 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 926. rice 10 cents. To be had at this office and from all exwedulers.



# Rubber Rolls and Wheels.

Power Wringing Machines, Drying and Ventilating Fans. All styles of Trucks made to order. Catalogues free. GEORGE P. CLARK, BOX L. Windsor Locks. Conn.

### KNITTING MACHINERY.

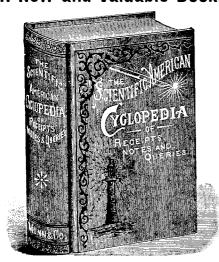
Knitted underwear is in vogue. The best machinery for its manufacture, such as

SHIRT MACHINES, SLEEVERS, BAR STITCH MACHINES, etc.,

are made by SCOTT & WILLIAMS, 2077 E. Cumberland Street. Established 1865. Philadelphia, Pa., U. S. A.

SCIENTIFIC EXPERIMENTS. - DE-SCHENTIFIC EAPERIMENTS. — DEscription of some simple and easily performed scientific experiments. Foucault's pendulum, exchange of water and wine, the bird in the cage, the five-pointed star, the sum of the angles of a triangle, surface of the sphere, with 6 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 875. Price 10 cents. To be had at this office and from all newsdealers.

### A New and Valuable Book.



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

Bound in Sheep, \$6. Half-Morocco, \$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.

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.

The who are in search of independent business or t, relating to the home manufacture of samwill find in it hundreds of most excellent

Send for Descriptive Circular. CO., Publishers, AMERICAN OFFICE <sup>2</sup>61 Broadway, New York.



### **※ 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, Ensily operated, with Universal Key Board.

INTERCHANGEABLE STEEL TYPE WHEEL

durable and easily kept in order. 30 keys, 90 characters. Weight, with carrycase, 16 pounds. Special wheels for different languages. Send for circular to THE MUNSON TYPEWRITER CO., 162 S. La Salle Street, Chicago, Ill., U.S. A.

SCIENTIFIC AMERICAN DYNAMO. SCIENTIFIC AMERICAN DYNAMO. Description of a plain shunt-wound dynamo of simple construction, capable of supplying a current of from 60 to 75 110-volt incandescent lamps, or of being used as a 5 h. p motor. This machine was constructed especially for the benefit of the readers of the Scientific American, by Mr. W. S. Bishop, of New Haven, Conn. It is designed to meet the wants of mechanics and amateurs who desire to construct a simple dynamo for their own use, but who do not care to enter into the subject scientifically. With 24 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. S65. Price 10 cents. To be had at this office and from all newsdealers.



### CASTINGS and PARTS for 641, 865, and other Dynamos and Motors described in Sci. Am. Sup-plements.

Engine Castings 1/6 to 6 h. p. **TELEPHONE** Materials. ELECTRICAL SUPPLIES. Send stamp for catalogue.

Mianus, Conn.

ELECTRO MOTOR, SIMPLE, HOW TO make. ByG.M. Hopkins.—Description of a small 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 SCENTIFIC AMERICAN SUPPLEMENT. No. 641. Piece 10 cents. To be had at this office and from all newsdealers.



VANDUZEN STEAM PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Clogs nor
freezes. Every Pump Guaranteed.
10 SIZES.
200 to 12000 Gallons per Hour.
Cost \$7 to \$75 each. Address
THE VANDITION 2.

THE VANDUZEN & TIFT CO.,

## Scientific Book Catalogue

RECENTLY PUBLISHED.

Our new catalogue containing over 100 pages, is ing works on more than fifty different subjects. Will be mailed free to any address on application.

MUNN & CO., Publishers Scientific American,

361 Broadway, New York.



### Parsons Horological Institute. earn the Watch Trade

Engraving and Jewelry Work. Circular free.

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



Machine Shop Work.

High Grade Tools;
elegant in design, superior in construction. The best foot power
lathes made, and quality considered, the
cheapest. Send for catalogue and prices.

W. F. & JOHN BARNES CO., 1999 Ruby St., Rockford, Ill.

THE GREAT POPULOUS CENTERS of the World.—By Gen. A. W. Greely. An enumeration of the largest cities of the world, with their population. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 924. Price 10 cents. To be had at this office and from all newsdealers.



ACENTS COIN

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 particulars address W. E. BEVERIDGE, Box 728.

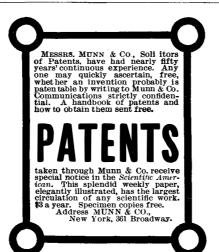
BALTIMORE, Md.

HARRISON CONVEYOR!

### Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, &c. Send for BORDEN, SELLECK & CO., { Sole (Manu' Pers, ) Chicago, III.

CHUCKS. Write "THE PRATT CHUCK CO.," Clayville, N. Y., U. S. A., for free illustrated catalogue of POSITIVE DRIVING DRILL, CHUCKS. showing the only perfect system ever devised for holding and driving drills.

Foreign Agencies: Ph. Roux et Cie., 54 Boulevard du Temple, Paris, France. E. Sonnenthal, Jr., Nueu Promenade No. 5. Berlin, Germany. Selig, Sonnenthal & Co., 85 Queen Victoria Street, London, E. C., England.



THE MODERN ICE YACHT. — BY Geo. W. Polls. A new and valuable paper, containing full, practical directions and specifications for the construction of the fastest and best kinds of Ice Yachts of the latest, most approved forms. Illustrated with engravings drawn to scale, showing the form, position, and arrangement of all the parts. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 624. Price 10 cents. To be had at this office and of all newsdealers.





J. STEVENS ARMS & TOOL CO., P. O. Box 280, Chicopee Falls, Mass.

HYPNOTISM: its Uses and Abuses. The science easily acquired. Illustrated book, just out. \$1.00. Address
PROF. ANDERSON, S. A. 12. 182 State St., CHICAGO.



IMPROVED TROLLEY SYSTEM.—DE-IMIT KUYED I KULLEI SYSTEM.—DEscription of an improved overhead system of electric traction recently adopted by the South Staffordshire Tramway Company. With 9 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 886. Price 10 cents. To be had at this office and from all newsdealers. The same number contains a description (with 2 illustrations) of a new electric tramway at Paris, and also a description of Siemens & Halske's electric railway conduit, with 3 illustrations.



For INCUBATORS and

Moisture Gauge SICK ROOMS.
or Weather Indicator. Mailed, \$1.00.
CHICAGO GAUGE MFG. Co., Chicago.

VOLNEY W. MASON & CO. FRICTION PULLEYS, CLUTCHES, and ELEVATORS PROVIDENCE, R. I.



to do as good work as any high priced machine. Special-ly adapted for use

INVENTORS Write us. We have perfect facilities for producing their Medels and man-chanical Specialties. Southern Electrical and Mechanical and Mechanical Engineers, Louisville, Ky.

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

WESTERN ELECTRICIAN

The Best Electrical Journal; \$3 per year, \$150 six months. Send for free sample copy. Electrician Publish

ELECTRICAL BOOKS MENTION SCIENTIFIC AMERICAN.

### PROPOSALS.

SEALED PROPOSALS FOR LIGHTING THE ( Try of Jackson, Mississippi, with Electricity. Mi Office, Jackson, Missis, Nov. 21, 1893. Notice is in given that sealed proposals will be received at the of the City Clerk until the 2d day of January, 1. and public buildings of the City of Jackson with electron of the years from March 1, 1894, in ord, ance with the plans and specifications on file said content of the cost price at which the plantit up according to said specifications may be purchaser, the city. The Board reserves the right to reject any dall bids. L. F. CHILES, Mayor,

### NOTICE.

Proposal for Lighting the Streets and Parkghe City of Schenectady for three years, beginning for 1.894, with Electric Arc Lamps of tuil 1000 cand for and of full 1200 candel power, and also of full 150 le power, and also of full 150 le quested by the Common Council of the City Ce. nectady, and turnish everything needed therefore a quested by the Common Council of the City Ce. nectady, abond, in the penalty of \$4000, with approved sureties, that the bidder will enter into a contract with said City, in accordance with his bid, and for the faithful performance of said contract when made must accom-

City, in accordance with his bid, and for the faithful performance of said contract when made, must accompany each bid.

The Common Council reserves the right to refuse to consider any bid not accompanied by such a bond, and to reject any or all bids made.

All bids must be addressed as follows: "Lamp Committee of the Common Council of the City of Schenectady, N. Y. Bids for lighting," and be in a sealed envelope.

tady, N. Y. Bids for iigning, and be in a construction velope.

They will be received and opened by the Council at a meeting to be held January 9, 1894, at 7.30 p. m.

Communications not including bids may be addressed to the members of the Committee by name.

PETFER B. HARBISON, Committee ALBERT SHEAR, On Lamps.

### NOTICE.

MINISTRY OF PUBLIC WORKS, CAIRO, EGY MINISTRY OF PUBLIC WORK
CARO, E.
The Egyptian Government puts up to a the construction and working of a tramway row gauge from Mansourah to Menzaleh ...
with its branch lines, on the conditions of the construction of the const Ti de

### JUST PUBLISHED.



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

A series of twelve elegantly printed Maps of t 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 in fixing in the mind the names and places of the various stars and constellations, by Alfred E. Beach. Altogether this is one of the most popular, and valuable works of the kind ever published.

One quarto volume, elegantly bound in cloth. Price \$2.50, postpaid.

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

### STEEL TYPE FOR TYPEWAITERS



Stencils, Steel Stamps, Rubber and Metal Type Wheels, Dies, etc.
Model and Experimental Work.
Small Machinery, Novelties, etc., manufactured by special contract.
New York Stencil Wks. 100 Na ss au St., N.Y.

Model & Experimental Work. Absolute secrety. Advice and ideas not charged for. Send for particular GARDAM & SON, 98 John Street, New York.

VELOCITY OF ICE BOATS. A COLlection of interesting letters to the editor of the SCIENTIFIC AMERICAN on the question of the speed of ice boats, demonstrating how and why it is that these craft sail faster than the wind which propels them. Illustrated with 10 explanatory diagrams. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 214. Price 10 cents. To be had at this office and from all newsdealers.

## The Scientific American PUBLICATIONS FOR 1894.

The prices of the different publications in the United States, Canada, and Mexico are as follows: RATES BY MAIL.

The Scientific American (weekly), one year \$3.00
The Scientific American Supplement (weekly), one year,
The Scientific American, Spanish Edition (monthly), one year,
The Scientific American Architects and Builders Edition (monthly), one year.

2.50

COMBINED RATES.

The Scientific American and Supplement The Scientific American and Architects and Builders Edition,

The Scientific American, Supplement, and Architects and Architects and Builders Edition, tects and Builders Edition, - - -

Proportionate Rates for Six Months. This includes postage, which we pay. Remit by postal rexpress money order, or draft to order of

MUNN & CO., 361 Broadway, New York



LUSTRATIONS.	E  East India building, Fair	Mat, wire, Horrock's	Steering gear, steam	Animals, large, mounting *234   Animals, mounted, at the Fair *41   Ant communities	Camera stand, Green's
<b>A</b>	Eclipse of April 16. 57 Egg of python 105 Electric Co., Western Fair 312 Electric To., Western Fair 312	Metroscope, Baillie's 20 Microscope, long range 151 Milk. condensed, at Fair 149 Milk color Morris 149	Stock, thoroughbred, exhibit 299 Stoves, burner for 356 Sun, eclipse of, April 16 57	Ant, parasol 282  Ants, African 389  Ants, edible qualities of 10  Ants 11 order	Canal boats, electric propulsion Canal, Bruges. Canal, Crimean, ancient.
7, Fonthill	Electricity, palace of	Mill engines	Switch, railway, electric	Ants, productive of sound. 71 Ants, pred, destruction of. 87	Canal, Corinth  Canal cutting on the Sacrament  Canal, Ganges  Canal, irrigation
ulture, Palace of	Elevator, Parmenter's	Mill, roller, Griffin	Taner turning attachment 420	Anthracite coal fields	Canal, Manchester*136 Canal, North, Fair Canal, ship, Manchester Canal, South, at Fair
ns, fire, French	Engine, mill 400 h. p. 345 Engine, rotary, Gould's 324 Engine, rotary, Morse's 340 Engine, vacht Dream 421	Monument, electric illum	Taxidermy 234 Telegraph, printing 72 Telegraph wire guide 196 Telephone Noriega's 330	Anti-smoke law	Candles, stearin, manuf. of Cannon, toy
and peristyle	Engines, compound, duplex 69 Eugines, gas. Otto 305 Engines, mill 120 Engines oil at Fair 244	Motor, rotary, Morse's 340 Motors, gas, Otto 305 Motor, stearine 75 Motor, water cheep 244	Tension of liquid films. 395 Tension, surface. 21 Testing machines, Olsen 216 Theoremeter Despects 375	Arch and Peristyle, Fair*161 Architect, American, honors to 43 Argentine	Car fenders wanted Car street, improved prize Car tickets, aluminum.
ue, Columbian, Fair 119	Expedition, arctic, Peary 43 Exposition, Columbian 193 Exposition, historic, Madrid 315	Mount Blanc Observatory 376 Music book or folio	Thill support. Meyerhoff's 356 Thrashing machine attach 5 Tiger, captive, in India 219 Time recorder 390	Arithmetic, mechanical*309 Arizona building at Fair*56 Arizonza ruin, remarkable204 Arit Nuchla besta all256	Cars, cable, lighting of
ls, cover for 197 , grand, at Fair 265	F	N Natural history exhibit, Kansas. 41	Steering gear, steam	Armor plate, Harveyized	ars, safety devices for
ry, storage, Edison	Fair, Arrivals at	New Mexico building at Fair 56 New York building at Fair 56 North. the, statue of 363	Train collisons, prevent	Armor trial, the latest	Cards, trick with
Phem Co 's exhibit	Ferris wheel, view from 169 Films, liquid, tension 395 Filters, McConnell 177 Fire algrms, French 341	Novelty for Midwinter Fair	Trick with cards         116           Trolley wire finder         184           Truck, electric motor         309           Trunk, mysterious         20	Association, American, meeting. 166 Association for Adv. Science	Castor oil
r end boring machine	Fireworks display at Fair	Observatory, Dudley, New 328 Observatory, Mont Blanc 376	Tubes, welded, German	Atmosphere, chemical history 281 Atmosphere, the high 43 Atmosphere, potential of 215 Auror: notable 106	Cattle guard, railway
case, Stimson's	Flue and chimney cleaner 37 Fonthill Abbey 75 Forgings, drop, at Fair 180 Furniture cockies 266	Optical goods at Fair 310 Objectives used as oculars 151 Ohio building at Fair 56 Oil burner Lorkin 103	v	Auchmuty, Colonel	Cautery, solar, as remedy Caves of the Black Hills Celluloid, homemade
ey. Mrs. Lydia 23 e, engine, Cleveland's. 388 e valve, Pelham's 180 e road Warburton 136	Fuel, oil and boilers at Fair 17	Oil burners, boiler 17 Oil fuel and boilers at Fair 17 Oil on water, distribut 420 Oklahoma building at Fair 56	Valve chest, Myer's 251 Valve chest, Myer's 293 Valve engine 164 Valve gafe Lunkon 148	B Rahenek Gao H	Cement for glass labels
Electric Co.'s exhibit 289, 295 for dynamos 244 ing, Arizona, etc 56	Ganges canal 89 Garbage burner, Chicago 408 Gas engine Sintz	Olympia. cruiser 401, 405 Optics, suggestions in 151 Ore concentrator 228	Time recorder. 389 Tinners. tools for 213 Top, aerial 331 Toppedo hoat, Nasmyth's 135 Towning, chain, magnetic. 73 Train collisons, prevent. 201 Tramway, wire rope 232 Trick of the training and the training and tr	Bacteria and colds	Centenarian still in practice Cevic, steamer, launch of Chair, folding. Moreland's
ing, East India	Cas engines, Ohto   305	Oven, annealing, glass	Vase, Peruvian 315 Vase, Peruvian 315 Vase, Peruvian 315	Ballooning military. 151 Bancroft, steamer, trial. 85 Barrels, inside cover for 197	Chapel, mysterious, Heron's Chapel, Ethan S Charcot, Jean Martin
ing, Japanese	Gas meter connection 346 Gate, water circulating 261 Gauge and valve, Crosby 225 Gearing, bevel, exhibit 148	Palace, cold storage, Fair 49, 52 Palace of Agriculture 129	Venicies, seir-ioaunig	Basin, grand, at Fair	Charleston harborimprovement Chemistry, early Chicken beheader, Denham's Chief Luther Jack
ng, Onio, at Fair	Gear, reversing, for engines 85 Generator, steam, Weed 202 Geometry, app. to teach 315 Gin, cotton roller 20	Palace of Electricity       121         Palace of Fisheries       35         Palace of Machinery       249         Palace of Manuf. and Arts       119	Ventilator, pneumatic	Battery, storage, Edison	Children, ignorance of Children, Japanese, rearing Children. treatment for Chinese immigration
belted, Dutch	Gold refining plant 132 Grain dump, portable 404 Guard, cattle, rail way 116 Guide block for wires 196	Pen and ink exhibit	Viking ship.         123           Vise, bench, Lurie's.         117           Voltmeter, recording.         245           Vulcanizer, rubber stamp.         373	Bear and wolf stories	Chinese in Oregon
ers, oil, for boilers	Guide for saws	Photochronograph, facsimile 423 Photography without tripod 99 Photoret 400 Pianos and organs at Fair 400	w	Bees, sense of vision	Chocolate tree, the
C , railway, accidents 150 railway Broadway 385, 392	Н	Piles, bearing power of 53 Pillows, wire braided 292 Pipes, frozen, thawing 117 Pitchfork and band cutter 101	Wagon, Cotes'	Bicycle and dog	Cholera well at Mecca
ra stand. Green's	Hammer, power, great 81 Hammers, exhibit at Fair 208 Harkness, William 201 Harkness, William 201	Planing machine monster 216 Plant, pick up, New Jersey 422 Pole, wagon, support for 356 Borton & Co. oxplinit at Foir 223	Wagons, heavy, at Fair. 187 Warship Columbia. 347, 361 Warship Columbia. 401, 405 Warship Victoria, sınking. 2 Watch, cheap. 180	Binding post, electric *181 Birds, intelligence of 186 Birds, our, leaving us 344 Black ing for sheet iron 101	Cleanliness first law of health Cliff dwellers, homes of Clock face, 24 hour
, Ganges	Heating, new burner for 356 Heating process, new 246 Helmholtz, Prof. Von 247	Post fence, new 72 Post office box, new 404 Pottery, art, at Fair. 200 Pottery bill Lawton's 200	Watch rings	Blindness, color, at Miller School 138 Blindness, color, remedy for 260 Blocks, erratic 357 Boots, erratic 357	Cloves. vanillin from
les, stearin, manufacture 360 on, toy 214 oupling, Ervin's 37	Hammer, power, great   81   Hammers, exhibit at Fair   208   Harkness, William   201   Heater and condenser   309   Heating, new burner for   356   Heating process, new   246   Helmholtz, Prof. Von   247   Hog wart   27   Hoo-den, at Fair   121   Horological Institute   23   Horse power, exhibit of   187   Hot air engine   196   Hut, South Sea Island   121	Power station, cable 385 Press, copper plate 197 Press, printing, register for 180 Protection for the protection of the protection for	Water wheel, Frame's	Bicycle fire engine	Coal conveyor, Weehawken Coal dust engine Coal fields, Pennsylvania Coal vein, new Mexican
o, marine 121 e guard, railway 116 e, handsome team of 85	Hut, South Sea Island. 121	Propeller, Davie's 346   Propeller, Davie's 346   Propeller, Hyling 331   Pump, rotary, Nasi's 277   Python, egg of 105	Wheel, water, Frame's. 4 White, O. C., exhibit, Fair 260 Window larder, Penisi's 5 Window larder, Penisi's 5	Boats, canal. electric propulsion. 376 Boats, submarine, proposed. 2 Boats, torpedo, swift	Coaling vessels at sea Cocoanut. desiccated Codfish. eggs of
to marine 122 e guard, railway 116 e, handsome team of 85 e, prize, at Fair 281 e stall Aeberly's 181 r, folding, Moreland 244 el, mysterious He ron's 267 ever Levy Morrian 200	India irrigation in	R	Wheel, Ferris, view from   169	Boat, torpedo, Nasmyth's. *135 Boat, war, submarine. 22 Boats, canal. electric propulsion. 376 Boats, submarine, proposed. 22 Boats, torpedo, swift 354 Bodies, preserving. 204 Boiler end boring machine. *337 Boiler plant. Babcock & Wilcox. *97 Boiler covering, influence of. 11 Boiler steam, Weed. *202 Boilers, oil-fired, at Fair. *37 Boilers, steam, at Fair. 323 Book, oldest in world. 42 Bookcase, Stimson's. *342 Borling and turning machine. *357 Boring, deep. 422	Coffee, glazing of Coin holder, Berrini's Colds and bacteria Collisions, train, prevention
Luther Jack	Institute, Imperial, London 117 Iron works, Trenton 232 Imigation in India	Race of market porters	Work guide for saws 72 Wrench, Jones 404	207   207	Color blindness at Miller School Color blindness, remedy for Colors. dyed, action of light Colors of ancient Egypt
n, friction, Wern's	л	Railroad exhibit, Fair 375 Railway, cable, accidents 150 Railway, cable, Broadway 385, 392 Railway, electric, Sperry 285 Railway, intramural, Fair 88	Yacht Valkyrie	Boring and turning machine *357 Boring, deep 422 Boring machine, cylinder *308	Colorado State building Columbia, cruiser, new Columbia, warship*347, Columbus, silver statue
anut desiccated	Jack straws, magnetic	Razor and strop, Fox		Boring and turning machine. **357 Boring, deep. 422 Boring machine, cylinder. **308 Boring machine, improved. **138 Bottles in China. 42 Bowlders, erratic. 357 Bradley, Mrs. Lydia. **23 Brake, engine, Cleveland's. **388 Brake, street car, wanted. 1183 Brake valve, Pelham's. **180 Brazil, new navy of. 355	Columbus, statue of
nbia, warship	Jowett Benjamin	Recording instruments	MISCELLANY.	Brake, engine, Cleveland's	
mbia, warship	Kansas exhibit at Fair	Respiration, artificial 288 Resuscitator: Desant 280 Retardation, magnetic 134 Roadbed, Platton's 293 Roller, mill, Griffin 165 Rubber stamp vulcanizer 375	Abbey. Fonthill	Bread made with soap	Commutator brush Composing stick, Hill's, Compressor, air Rand Comptometer, Felt's. Concentrator, ore. Conduits, water, wooden.
oressor, air, Rand     325       otometer, Felt's     309       entrator, ore     228       er, automatic     24       ing, new burner for     356	Kansas exhibit at Fair. 41 Kiln, pottery, Lawton's 260 K neading machine 233 Knitting machines, electric 213 Krupp exhibit at Fair 33	Rule, slide, dublex lul	5 Acid, carbonic, and compressed  air		Congress, engineers'. Congress, engineering, Fair Congressmen choosing seats Contagion spread by doctors
er, muk, merz's 197	i	Saddle velocinede 10	Acid, prussic, from sugar 281 Acid, salicylic, preservative 198 Accumulator plate, chloride *380 Adding machine new *388	Brush Electric Co. exhibit. *295 Bubble, soap, solution. 138 Buenos Ayres, new port. 229 Building Arizona etc. *56	Cooking by gas
ling, car, Ervin's 37 t of honor at Fair 313 e, traveling, Krupp 33	Lagoon, view in 121 Lamp, night, movable 328 Lamp, safety, evolution 164 Lamp see 18 18 18 18 18 18 18 18 18 18 18 18 18	Santa Maria, ship 137 Saw, cross-cutting, new 340 Saw setting device 164	7 Æpyornis, egg of	Brusia Electric Co. eximint. 229 Bubble, soap, solution. 138 Buenos Ayres, new port. 229 Building, Arizona, etc. *56 Building, British, at Fair. *56 Building, East India. *379 Building, Eectricity, at Fair. *229 Puilding, Invanese.	Cooler, milk, Merz's
ble Co., Dixon	Lantern, prejection, paragon 324 Larder, window, Ponisi's 5 Lathe for crank shafts 100 Lathe screw autting	Saws, work guide for. 73 Scout, Indian, at Fair 323 Screw-cutting lathe 295 Scripture of the Feir 365	Agriculture, genius wanted 374 Agriculture in France 167 Agriculture Palace of *138 Agriculture Palace of *138	Building, Japanese. *121 Building, Krupp, at Fair. *40 Building, Montana, at Fair. *56 Building, New York, at Fair. *56 Building, Ohlo, or Fair. *56	Copper use among Indians
boxes, educational 315 off for engines 295 er Leni Lenepe 45 or whole	Lathe side rest	Search lights, German 15 Sewers of Paris 37 Shaper, Morton 34 Ship Feldon 15	2 Air, compressed, and carbonic 2 acid	Building, rapid	Corintn Canal Corn bread no go in Germany Cosmetics, ancient Cotton gin, roller Cotton injured by ginning
nder boring machine 30	Light, flesh, photo 101 Light reflecting apparatus 148 Lights, search, German 152	Ship of war Columbia	1 Air, cooling	Buildings, tall, vibrations of. 340 Bulbs lamp, blackening. 395 Bull, belted, Dutch. *281 Bullet regulation por	Coupling, car. Ervin's. Court of Honor at Fair. Crawfish, fighting stratagem
y apparatus at Fair	Locomotive, burt 8	Ship Viking 12 Sign, luminous at Fair 31 Silver refining plant 13	Acid. salicylic, preservative   198	Building, New York, at Fair. *56 Building, New York, at Fair. *56 Building, New York, at Fair. *56 Building, Soman's, Fair. *171 Buildings, State, at Fair. *171 Buildings, State, at Fair. *121 Buildings, State, at Fair. *122 Buildings, State, at Fair. *133 Buildings, State, at Fair. *133 Buildings, State, at Fair. *135 Buildings, tall, vibrations of *340 Buildings, tall, vibrations of *340 Buildings, tall, vibrations of *340 Buildings, tall, vibrations of *340 Buildings, tall, vibrations of *340 Buildings, tall, vibrations of *340 Buildings, tall, vibrations of *340 Buildings, tall, vibrations of *340 Buildings, tall, vibrations of *340 Buildings, tall, vibrations of *340 Buildings, New *340 Build	Creamery apparatus
40 doi: 40 doi	5 Locomotives, light. 23; 5 Locomotive, steam vs. electric, 21; 3 Log, maynetic, showing. 13; 3 Lubricator, improved. 5; 5 Lubricators at the Fair. 22; 4 Luther Jack, chief. 115;	Side rest, lathe 27 Snakes, brooding 10 Speed indicator, Paragon 30	** Algoriquin Fark 140 6 Alloys, aluminum. 105 6 Alopeda, treatment. 199 8 Aluminum alloys. 105	Burners, oil, for boilers. *17 Burnbam, Prof. S. W. 419 Busk-Ivanhoe Tunn el 118	Crucible Co., Dixon
saurs, primitve	Undergators at the Fair	Spelling, device to teach 133 Square, carpenter's 5 Squeezing machine, metal 27 Stall, cattle. Aeberly's 183	Aluminum car tickets	Butter, preserving. 118 Buttonhole machine. *241	uruiser. tastest afloat. Cruiser New York, trial Cruiser Olympia
er, northern	4   M 6   9   Machine, glass rolling	Stallion, Clydesdale 29   Stamp rubber, vulcanizer 37,8   Statue of Columbus 37, 26   Statue of "The North" 36	9 Aluminum, solder. 121 3 Aluminum, soldering. 404 1 America, impressions of 247 3 Ampere, towboat. *73	Cable railway accidents*150	Crystal, watch, breaking Cube boxes, educational Cut-off for engines Cutter Leni Lenepe
I, twist, Morse 19 Monceau, Duhamel 29 amo, Desroziers 8 amos, brush for 24	3   Maine State building       15         6   Manchester ship canal       134         4   Match sufe, Sci. Amer       32         4   Mattresses, wire braided       39	Steam appliances 22 Steamer Detroit 15 Stearine, motor 7 Steel, Sheffield, at Fair 23	5       Anemones. sea, senses of	Cable railway, Broadway. *392 Cactus furniture. *266 Calculator, lightning. 42 Camera eye piece. *151	Cycle wheel  Cylinder boring machine.  Cylinder, compressed gas, explos  Cylinders, gas, explosion

D  Dairy apparatus, Fair*165	Furnace, blast, an ancient	Leather, dyeing	Oregon, battle ship, launch 327 Organs and pianos at Fair*277	Robbers, train, protection vs 226 Robbers, train, scald them 39	Thrashing machine attachment *5 Tibetans, life among
Daisy, twin*139 Dain, Austin, failure of	G.	Lemonade, good	Oxygen, atmospheric, origin 212 Oxygen, new use for 394	Rocks, flying, Mt. St. Helens. 355 Rodent, a fish eating. 10	Ties. metal in Mexico 27 Tiger, captive, in India. *219 Time, geological
Dam, Colorado River         42           Dam, La Grange         346           Dam, State         600           *405         *405	Ganges canal*89 Garbage burner, Chicago*408	Leni Lenepe, cutter *43 Lens. antiquity of 104	Oxygen, none in the sun	Roller mill, Griffin*165 Roofs, tropical 60 Root grubber electric 23	Time, egological 146 Time recorder, Bundy *389 Time recorder, employe's *101 Tin mines of Maliwun 149 Tinners tools for \$212
Dam, La Grange.         346           Dam, State. (choes.         *405           Dandruff, pomade for.         23           Death rate of large cities.         371           Description register.         322	Garden, botanical, New York 50 Gardening by electricity. 4, 6 Garnet rock, rose. 371 Gas asphyxiation. 522 Gas, cooking by 274, 306 Gas engine, Sitz. 2, 306 Gas engines, Otto. 303 Gas lamps, street, lighting. 384 Gas lighted cable cars. 394 Gas lighter, Geissler's. 101 Gas meter connection. 346 Gas motors for street cars. 330 Gas, natural, supply, l'ittsburg. 391 Gasses, densities of, determining. 342 Gases, polsonous. 302 Gasocution. 306 Gagette, Patent Office. 82 Gazette, Patent Office. 83 Gear, reversing, for engines. *55 Gearing, bevel, exhibit of. 148 Generator, steam, wed. 202 Generator, steam, wed. 202 Generators, electric, for Niagara 371 Geometry, app. to teach. *315 Gin, cotton, roller. *20 Glaciers, action of. 36 Glass, fire resisting. 342	Library building, Congressional. 98 Librar es in Chicago. 66 Light electric column		Rose g owing, Saxony 266 Roses, otto of, German 298	Tinners of Mainwin 149 Tinners, tools for. *213 Tire, rubber, requisites. 199 Toadstool poisoning. 210 Toadstool poisoning remedy 246 Toning and fiving both
Decimals, how written. 162 Detroit, cruiser. *155	Gas asphyxiation	Light, electric, Edison, suits 82 Light, electric, support*340	Packing sings aboute 341	Ruin, Arizona, remarkable 204 Ruins of Ang-Kor 82	Toadstool poisoning
Diamond, a monster	Gas engine, Sintz*212 Gas engines, Otto*305 Gas lamps street lighting *388	Light, flash, aluminum168, 394 Light, flash, photo. *101 Light most cost wknown 11	Paint for iron and steel. 7 Painting, seaside 183	Rule, slide, duplex*101 Rule, topographic*298	Toning and fixing bath 323 Top, aerial 7831 Torpedo boat, capsizing of 387 Torpedo boat, Ericsson 137 Torpedo boat, Nasmyth's 135 Torpedo boats for men of war 361
Diamonds from coal gas 299 Digestion, chloralamid for. 357	Gas lighted cable cars 194 Gas lighter, Geissler's *101	light, range, the largest	Paintings, preservation of,. 218 Palace of Agriculture*138 Palace cold storage burned *52	Russia exhibits at Fair291, 311	Torpedo boat, Ericsson
Digging machine, improved*373 Diphtheria, cause of	Gas meter connection	Light, search in warfare 390 Light, water power into 114 Lights search German *159	Palace of Fisheries *35 Palace of Machinery *249	$\mathbf{s}$	
Dinosaurs, primit ve 59 Directum, race horse 363	Gases, densities of, determining. 342 Gases, poisonous 362	Lighthouse, wonderful 247 Lighthouses and their keepers. 387	Palace of Manut, and Arts*119 Paleontology, mammalian 146 Palm oil	Sabine Pass, port. 35.5 Saddle, velocipede. *100	Torpedo net tests 331 Torpedo net testing 402 Torpedoes, naval 66
Diseases, infectious, incubation, 147 Diseases, zymotic 219 Disinfectant, electric, for water, *91	Gauge and valve, steam, Crosby.*225 Gauge work, electroplated 98	Lighting of Cable cars	Paper, metal surfaced	Salt in reclaimed land 258 Santa Maria ship at Fair 41-77	Towels, Chinese use of
Disinfectant, new, pixol	Gazette, Patent Office. 82 Gazette, Patent Office. delay 50	Lines, red, on blue prints. 133 Litchfield mill	Paper, silver	Santander, disaster at	Trade mark appeals
Diver, Northern	Gearing, bevel, exhibit of*148 Generations, third and fourth 331	Living, American standard 218 Locomotive and car. Burt *409	Pasteur Institute. New York 263 Patent, Cary's, decision 203	Saw mill, pioneermachine	Trade marks
Dixon Crucible (•. exhibit*149 Docks of Southampton	Generators, electric, for Niagara 371	Locomotive, electric, at Fair *88 Locomotive exhibit at Fair *87	Pastett Institute. New 1 ork	Saws, finishing*132 Saws, work guide for*72	Train collisions, prevention *201 Train fast Chicago 228
Dogs as draught animals. 171 Dough kneader 327	Gin, cotton roller*20 Glaciers, action of	Locomotives, light, at Fair*233 Lobster eggs, hatching	Patent Office building, new 194 Patent Office examiners wanted 146 Patent Office examiners wanted 146	Sawing, a large day's	Train robbers, protection vs 226 Tramway, wire rope, at Fair *232 Tramways wire
Drawings, preservation of 218 Dredger, improved 4373	Glass, fire resisting. 342 Glass, focusing, blue 134	Locust year 120 Lubricant, plumbago as 183 Lubricator, improved. *5	Patent Office Gazette, delay 50 Patent, telephone, Berliner 137	Schools, trade. New York	Transmission plant, Pomona 38 Transportation 425
Du Monceau, Duhamel*296 Dye, kamela	Glycerine for a cough	Lubricator scapsuds as 39 Lubricators at the Fair *226 Lucania, steamer 210, 244	Patents, Congress on	Science, training in	Traveling, fast
Dyes, action of light on 358 Dyeing leather, etc 403 Oyumnita experiments with 150	Gold extracted from its ores 329 Gold in ocean water 267 Gold refining plant *129	Lucania, steamer	Peach fever 199 Peach yellows. 140	Scout, Indian, at Fair *329 Screw cutting lathe. *292	Trick with cards *116 Tricycle, new use for 18
Dynamite rain making 200 Dynamite, terrible effects of 354	Gold, soluble	Lumber, uses of.       210         Lupulin fire caused by.       379         Luther Jack, Chief.       *115         Lysol.       152	Pen and ink exhibit, Caw's*181 Pen, steel, exhibit at Fair*181 Penner 387	Screws, cold forged 278 Sculpture at the Fair *261	Trolley wire finder*184 Truck, electric motor*309
Dynamos, brush for *244 Dynamo, Desroziers' *84	Grain dump, portable 404	M	Pepper in Siam. 248 Perfume of flowers. 71	Search lights, German*152 Search very hird hebits of	Trunk, mysterious *20 Tuberculosis and its prevention 344
E	Guard, cattle, railway *116 Guide block for wires. *196	Macassar oil	Petroleum as fuel 358 Perfumes, distributor of *388	Sewage of a large city, treating. 391 Sewers of Paris, work on *372	Tunnel. Busk-Ivanhoe
Earth gaseous theory of 421 Earth in space 314	Guide, work, for saws. *72 Gum arabic, artificial 67	Machine shops to light 362 Machinery Hall day in 227	Patent Office, exped. of work in   82   Patent Office Gazette, delay   50   Patent, telephone, Berliner.   137   Patents, Congress on   242   Patents, history of   39   Pavements, London   374   Peach fever   191   Peach yellows   140   Pen and ink exhibit, Caw's   181   Pen, steel, exhibit at Fair   181   Penper   387   Pepper   387   Pepper in Siam   248   Perfume of flowers   71   Peristyle and arch, Fair   161   Petroleum as fuel   358   Petroleum, early use of   392   Petroleum, early use of   392   Petroleum, solidfied   410   Photochronography in med   801   424   Photochronography in me	Shaper, Morton*344 Shed fires, watching	Torpedo, Howell 37 Torpedo net testing 402 Torpedo net testing 402 Torpedo net testing 402 Torpedo net testing 402 Torpedo net testing 402 Torpedoes naval. 60 Towles Chinese use of 88 Towers of Silence, Parsee. 205 Town ng. chain, mag netic 77 Trade mark appeals 410 Trade mark appeals 410 Trade mark registration 55 Trade schools, New York 66 Trades union folly 7 Train collisions, prevention 701 Train, fast, Chicago 7 Train, fast, Ch
East India building. *379 Ebonite packing rings. 341 Falings of April 16 *57	Gun, ancient and modern 116 Gun carriage, disappearing .*296 Gun Krupn at Fair .*40	Machinery Hall, Fair	Photochronography in med sci.*424 Photographs, stereoscopic 358	Ship canal Manchester	Turbine, steam, new*263 Tyndall, John 386
Eclipses of sun, ancient 107 Egg of the fabled roc 339	Gun machine, Maxim	Magnetism and the human body. 58 Magnetization of rails	Photographic notes	Ship Falcon, Peary's. *43 Ship Oregon, luunch of. 827 Ship Santa Maria. *137 Ship the Viking. *123 Ship of war Columbia. *347, *361	
Egg natenings 188 Egg of python 105 Egg, to stand on end. 297	Guns for navy, large 119 Gunboat Castine, trial 251	Mail clerk mnemotechny	Photography, color. 130 Photography in colors, screen 386	Ship of war Columbia *347, *361 Ship of war Olympia *405 Ship of war Victoria 344	U United States ahead 187
Eggs of codfish 135 Eggs, lobster, hatching 58 Eggs notes on	EP	Mainsprings, tempering	Photography, legal uses of	Ship of war Victoria	
Eggs, shapes of 39 Ei Cld, steamer 231	Grate, water Circuianin, 214 Guard, cattle, raliway 116 Guard cattle, raliway 116 Guide block for wires. *196 Guide block for wires. *196 Guide, stamp mill. *5 Guide, work, for saws. *72 Gum arable, artificial for Gun, ancient and modern 116 Gun Carriage, disappearing 236 Gun, Krupp, at Fair *40 Gun machine, Maxim 104 Gun, whe, Brown. 187 Guns, 13 inch, new 131 Guns, 13 inch, new 131 Gun for navy, large. 119 Gunboat Castine, trial 251  Hair oil, Macassar 258 Haff-tone blocks 239 Hands, to whiten 233 Hands, to whiten 234 Harkness, William 201 Harvard at the top 367 Harvey, Hayward A 178 Harvey, Hayward A 178 Harvey, Hayward A 178 Harvey, Hayward A 178 Harvey, Hayward A 178 Harvey, Hayward A 178 Harvey, royalties of 39 Havock, torpedo boat 354 Health rules in six words. 354 Health rules in six words. 354 Health rules in six words. 354 Heather and condenser 399 Heat ng, new burner for 356 Heating process, new 326 Hebrew invasion, records of 198 Holm, bull, Proc. 198 Holm, out at Fair 121 Hogeo. 4 419 Hog, wart 27 Hoo-den at Fair 121 Horolokical Institute 222	Man, enemies of 148 Man, glacial, in America 147	Photography upon wood	Ships of war, wonderful	Valiant, yacht
Electric machine, simple *960	Hammers, exhibit, at Fair. *203 Hands, to whiten 2002	man in South America 139 Manchester ship canal *136, 291, 403 Manufacturing depression in 167	Physician, the true	Shot, Holtzer, test of 214 Shoulders, round cured	Valkyrie, yacht*51 Valve chest, Myer's*298 Valve, engine steem
Electricity, agricultural 248 Electricity and art of war 90 Electricity Publications 248	Hardness, testing 244 Harkness William *201	Marble, photographing upon 346 Marine exhibits at Fair 211	Pianos and organs at Fair. *277 Pigments of old Egypt 395	Siderosthen	Valve, gate, Lunken *148 Valve, graduating *180
Electricity, fishing by 140 Electricity, gardening by 407	Harvey, Hayward A 178 Harvey, royalties of 90	Match safe, Sci. Amer *326 Mattresses, whe, braider *292	rues, bearing power of. *53 Pillows, wire, braided. *292 Pineapple, ferment, of	Sign, luminous, at Fair	Valve, siteam, Crosby *225 Valves, steam, at Fair. *247
Electricity, water power. 106 Electricity, what is it? 331 Electrolier. Rivenburgh's *340	Havock, torpedo boat	Maturity, age of	Pineapples, American. 357 Pipes, electric, injuries to. 266	Silverware, Chinese	Vanadiferous oil
Electroplating ships' bottoms 22 Electrop ating with copper 168	Heater and condenser *309 Heating, new burner for *356 Heating process new *346	Medals and awards, Exposition 323 Memory, assisting the 315	Pipes, steam butt welded 266 Pipes, water, natural 120	Sleigh. propeller, Schaefer's *324 Slide rest, lathe *276	Vase, red cedar, Fair
Elevator, Parmenter's *324 Elevators, Otis, at Fair *273	Hebrew invasion, records of 198 Helmholtz, Prof. Von*247	Man, ingredients of	Pitchfork and band cutter*101 Pixol, disinfectant	Smoke, Lancashire 363 Smoke prevention 120	Velocipede saddle *100 Velocipede, snow and ice *213
Enameling, new process. 323 Engine, coal dust	Hul, Geo. A. 419 Hog, wart 27 Hoo,-den, at Fair *121 Horological Institute *23 Horological Institute *23	Metal, carbonizing	Placer fields, Playa de Oro	Smoke prevention in Mass 394 Snake bite, cure for 231 Snake bite, remedy 202	Velocipede wheel *228 Ventilator, pneumatic *372 Ventilation tunnel 101
Engine cylinders, boring*309 Engine, hot air, Rider *196 Engine mill 400 b p  *345	Horological Institute *23 Horse, intelligence of	Metals cut by steam. 213 Metals, volatility of	Planets, position in September. 170 Planets for January. 419	Snakes, brooding*105 Snow sheds of Union Pacific 346 Soon bubble solution	Venus, reappearance of
Engine, rotary, Gould's *324 Engine, rotary, Morse's *340	Horses of London.	Meter, gas, connection*346 Meters, water, value of104	Planets for December 327 Planing machine, monster *216 Plant, pick up New Jersey *422	Soap cakes. marking 105 Soap powders 299	Vibrations of buildings340 Victoria House at Fair36
Engines, compound, duplex. *69 Engines, gas, Otto *305	Household, royal	Meteor, fall of a	Plant species, variations in 10 Plastomenite 387	Soapsuds as lubricator 39 Soda from kainit 70 Solder aluminum 191	Victoria, ship, loss of
Engines, mill .*120 Engines, oil, at the Fair .*24 Engines, oil, at the Fair .*24	Hydrogen, perox., disinfectant 339 Hydrogen, perox., water purifier 258	Metric equivalents 185 Metroscope, Baillie's 20	Platinum, exhibit, Fair	Sorghum Juice. clarification 410 Sorghum sugarindustry 228	Vigilant yacht *214, *250 Viking ship *123
Eng neer, electric, to become 274, 359 Engineers, Congress of	Hoo-den, at Fair   121     Horological Institute   223     Horse, intelligence of   130     Horse power, exhibit of   187     Horse, race, Directum   363     Horses of London   148     Household, royal   215     Housekeepers, hints for   70     Hydrogen   342     Hydrogen   perox., disinfectant   339     Hydrogen, perox., disinfectant   339     Hydrogen, perox., water purifier   258     I   I     Identification, difficulties of   420     Inmigration, Chinese and other   323     India nubber tree, new   278     Indian Scout at Fair   329     Indian State building   853     Indian State building   853     Indian State building   853     Insane, simulation in   330     Insect simulation in   330     Insect, sprouting, new   329     Insects, local names of   10     Institute, Armour   130     Institute, Haperial, London   117     Institute, Imperial, London   128     Invasion Hebrew, records of   55     Invention wanted   19     Inventions, contrariety in   246	Microbes on post cards 277 Microscope, long range *151	Plumbago as lubricant	Speeds, high, physical strain	Vinegar genuine
Engineers needed for the navy. 338 English the world speech 314 Englishmen increased height 393	Identification, difficulties of 420	Milk, adulteration of	Poison, ivy, remedy for. 22 Pole, wagon, support for *356	Spider, natural enemy of	Vise. bench, Lurie's *117 Volcano of Kilauea 329 Volcano of Krakatoa 329
Enterprises, enormous 24 Epilepsy, remedy for 327	India, irrigation in *89 India rubber tree, new 278	Milk, preservation of 72 Mill engine, 400 h. p. *345	Pork pie poisoning 136 Port, new, for Buenos Ayres 229	Spiders and their foes 139 Spike holes, plugs for 3 79	Voltmeter, recording*245 Vulcanizer, rubber stamp*373
Europe reached in four days 11 Excursions, scientific 18	Indian State building *153 Indians Biloxi 166	Mill, grinding, Quaker City *167 Mill, Litchfield 7	Port, new, Sabine Pass	Squeezing machine*277 Staff in Alhambra419	w
Expedition, arctic, Peary *43 Expedition, polar Nansen's87, 139 Expedition, scientific, lost 394	Insane, simulation in	Mill, roller, Griffin*165 Mind, physical power	Post cards, microbes on. 277 Post, fence, new	Stall, cattle. Aeberly's*181 Stallion, Clydesdale*299 Stamp, rubber, vulcanizer *273	Wagon, Cotes' *420
Exposition awards 182 Exposition, Chicago, closing 290	Insect, sprouting, new 329 Insects, local names of 10	Mine, sienite	Potash from kainit	Statue of Columbus*37, *261 Statue of "The North"*363	Wagons, dump *4 Wagons, heavy, at Fair *187
28, *35, *51, 67, 83, *99, *115, 131, 154, 163, 179, 195, *199, *211, 220.	Institute, Armour. 130 Institute, Brooklyn 226 Institute, Imperial, London *117	Minerals, exhibits of	Potassium permanganate 347 Pottery, art, at Fair * 00 Pottery kilp Lawton's **960	Steam cuts meta's	War boats, submarine, proposed. 2 War art of and electricity 90
227, *243, 259, 275, 291, 307 Exposition, historic, Madrid. *315 Exposition items 371	Institute, Pasteur, New York 263 Invasion Hebrew, records of 55 Invention Wanted 119	Mining and milling, cost	Powder, smokeless, new	Steam, temperature of	Warship (olumbia*347, *361 Warship Minneapolis
Exposition medals and awards. 323 Exposition, midwinter 180	Invasion. Hebrew, records of 55   Invention wanted	Modeling, compound for	Powerful warships	Steamer Cevic, launch of 261 Steamer Detroit	Warship Victoria, sinking of *2, 344 Warship Yoshino
Eye, action of the	28, 44, 76, 92, 168, 124, 140, 156, 172, 89, 205, 236, 252, 268, 284, 300, 316,	Money, "god," in China	Press, copper plate	Steamer La Navarre	Warships, wonderful
Fobrico photographing upon 946	332, 348, 364, 380, 396, 411, 426 Inventor a royal	Money of the world	Projectiles, forming	Steamer, modern	Watch Company, Waterbury 356 Watch crystal breaking 234 Watch rings *51
Fair, the great 2 Fair, impressions of 259 Fair items	Inventors, swindlers of 274 Iron industry 136 Iron magnetizing effects 276	Mont Blanc Observatory*376 Monument, electric illum*248 Moon the face of	Promethium. 167 Propeller, Davies. *346	Steamers, ocean, fast	Watch tools and machines *212 Water mains, wooden 391
Fair, midwinter 180 Fair, World's, awards 182	Inventors, swindlers of 274	Minneapolis, warship Mirrors, beveling and silvering, *283 Modeling, compound for. *788 Modeling attent damage to 199 Molecules, weight of 200 Molecules, weight of 370 Money, paper, compulsory. *266 Money of the world 182 Monsters, anted litvian 759 Montana building at Fair 758 Mont Bianc Observatory 376 Monument, electric fillom 248 Moon, the face of 251 Moonshiner, plant of a. *330 Motor, starpe aliber 388 Moth, gypsy, fighting, 38 Motor, carbonic acid 335 Motor, rotary, Morre's. *340 Motor, rotary, Morre's. *340 Motor, starine 375	Problems, unsolved, Edison's         25           1'roctor, Richard A.         246           Projectiles, forming         *404           Projectiles, relocity of.         7, 118           Promethium.         167           Propeller, Davies.         *336           Propeller, flying.         *831           Propeller, inventor of.         213           Pump, rotary, Nasi's.         *277           1'umps, wave power.         98           Pythou, erg of.         *16	Stearine, motor	Wagon, Cotes'. *420 Wagon pole support. *256 Vagon s, dump *256 Vagon s, dump *187 War boat, submarine *187 War boats, submarine, proposed. 2 War, art of, and electricity. 90 Warship olumbia. *347, *861 Warship folumbia. *347, *861 Warship Minneapolis. 204 Warship yolympia. *405 Warship Yoshino. 149 Warship Yoshino. 149 Warships, Woshino. 149 Warships, wonderful. 250 Watch, cheap *180 Watch, cheap *180 Watch crystal. breaking. 234 Watch rings. *51 Watch tools and machines. *212 Vater mains, wooden. 391 Water meters, value of. 104 Water, purification of. 27, 162 Water, purification of. 27, 162 Water purification of. 27, 162 Water purification of. 27, 162 Water purification of electric. *91 Water purification of electric. *91 Water purification of. 27, 162 Water purification of electric. *91 Water purification of electric. *91 Water purification of electric. *91 Water purification of electric. *91 Water purification of electric. *91 Water steam and heat *407
	Irrigation, canal, cemented	Motor, carbonic acid *395 Motor rotary, More's*340	Pumps, wave power. 98 Python, egg of ,*105	Steel, Sheffield, at Fair*331 Steering gear, steam*379	Water, purification of
Fair, World's, notes from .3. 19, *35, *51, 67, 83, *99, *115, 131, 154, 163, 179, 195, *211, 227, *243, 259	Irrigation, prehist. Arizona 136 Irrigation project, gigantic 24 Italy, exhibit of Fair **17	Motor, stearine *75  Motor, water cheap *244  Motors, gas. Otto *205	· <b>O</b>	Stephenson, John 294 Stephenson, John 98 Stereos copic pictures enlarged 296	Water purifier, perox. hydrogen. 258 Water, steam and heat 407 Watermelon rind, pickled 114
Fair, World's, notes fr. m. 3. 19.  *35, *51. 67. 83. *99, *15. 131, 154.  163, 179, 195, *211, 227, *243, 259.  Fair, World's, seeing at home.  *375, 291, 307  Fair, World's, seeing at home.  *347  Falcon, ship, Pearry's.  *343  Farming, does it pay?.  *362  Farming for a living.  149  Feathers, dyeing.  403  Feet, tired.  404  Fence post, Gowdy's.  *72  Ferris wheel, view from.  *109  Fertilizer, a new.  *305  Fever, peach.  *395  Filters, Mc onnell.  *177  Fir- alarms, French.  *341  Fire engine, bicycle.  *306  Fire extinguishment, school.  *226  Fires, mysterious.  Fires, shed, watching for.  407  Kireworks, display of, Fair.  *359  Fireworks, display of, Fair.  *359  Fireworks, whistling.  *277  Fish, freezing.  *343  Fish, frozen, industry.  *422  Fish oils  Fishes, color assimilation.  *399  Fishes, sense of smell im.  *399  Fisheries, Palace of.  *35  Fishing by electricity.  *101  Fisheshight, aluminum.  *168, 394  Filashight, aluminum.  *168, 394  Filer, Chicago, on the.  *228  Filer, Sudden death to.  *37	Iron, malleability of   133   133   130	Motors, gas, for street cars 330 Mount St. Helens, flying rocks . 355 Mountain ranges or 350	Quebracho for sleepers	steering gear, seani. 379  Stenography 294  Stephenson, John 38  Stereoscopic rictures, enlarged 386  Stereotyper, celluloid 421  Stilk walkers, race of. 4107  Stock, electric, fall in 82  Stock, thoroughbred, exhibit 499  Stock, instead 951	Watermelon to test
Farming, does it pay?	27 рокон, гешену 22	Mountaineering	Queen, household of	Stock, thoroughbred, exhibit*299 Stockings, silk, plated	Water tanks 219 Waterways, need of 204
Feathers, dyeing	J Jack straws, magnetic *396	Music book or folio	R	Stone, wood	Water wheel, Frame's
F'erris wheel, view from*169 Fertilizer, a new	Jacquard, interview with. 60 Jarecki Mfg. Co., exhibit of *356 Johns H W Mfg Co.	347	Race of market porters	Storms, thunder and hail. 422 Stoves, hydrocarbon burner for *356 Street car broke monted	Well water, purification
Films, liquid, tension	Joints, ball and socket. *260 Journalism in China. 103	Natural history exhibit, Kansas *41	Rail, railroad, Keenan's *298 Rail tests 343	Street cleaning inventions 98 Sucrol 164	West, great, growth of 85 Whale, horse power of 279
#341  Fire engine, bicycle	Jowett, Benjamin*247 Justice, mammoth figure*390	Natural history notes. 10, 71, 282, 339 Naval operations, amateur 306 Navigation, aerial	Rails and joints, exhibit of*375 Rails, magnetization	Sugar, 1,000,000 lb. a week 363 Sugar industry, progress 203 Sugar, Manila	w nate, stranded
Fire, origin, curious 292 Fires mysterious 298 Fires shed watching for	к .	Navigation steam, early 2 Navy, Brazilian, new 355	Railroad, costliest mile	Sugar, sorghum, industry 228 Sun, eclipse of, April 16. *57 Sun eclipses argint	Wheel Ferris *8 Wheel Ferris, view from *169 Wheel velocited ***
Fireworks, display of, Fair. *359 Fireworks, whistling 277	Kainit, potash and soda from 70 Kamela dye 309	Navy, yo th's prospects. 122 Nebraska State building. *153	Rail rad speed, modern 322 Railroad, street, protect. dev 50	Sun devoid of oxygen 342 Sun motion in space 122	Wheel, water, Frame's *4 White, O. C., exhibit. Fair. *260
Fish, freezing. 343 Fish, frozen, industry 422 Fish oils 170	Kansas exhibit at Fair *41  Kiln, pottery, Lawton's *260  Kneading machine *902	New York building at Fair *56 New York building at Fair *56 New York cruiser	Railroads, Y. M. C. A	Sunshine, crystallized	wintewashing by machine
Fishes, color assimilation	Knitting machines, electric*213 Krakatoa, eruption of	New York to Boston, five hours. 23 Nitro-glycerine precautions. 23 Noise loudest ever board.	Railroads, steam and electric 54 Railway accidents 362 Railway American first	Swimming, teaching*276 Swindlers of inventors	Willow, Mississippi 249 Willow trees, growth of 106 Windmills horse rewered
Fishes, preservation of 71 Fishes, sense of smell in. 339	Kyphosis bicyclistarum	North, statue of	Railway, cable, accidents. *150 Railway, cable, Broadway. *392	Swordfish exploits*297	Windom revenue cutter 148
risneries, Palace of	L	Nutrition, science of	Railway, electric, early plan. 5 Railway, electric, franchises 248 Railway, electric, Sperry *295	T	Wine Co., Lake Keuka. *226 Wine making at Fair *177 Wire finder, trolley. *184
Flashfight apparatus *101 Fler, Chicago, on the. 228 Flies, sudden death to 122	Labels, glass, cement for	0	Railway exhibit at Fair	Tablets, Tell-el-Amarna55. 198 Tank water as fertilizer395 Tanks, tar and asphalt for	Woman's building, Fair *171 Wood, artificial 425 Wood stone 124
Floor and ceiling arches *312 Flower seeds for July 71	Labor day 267 Lag, magnetic showing *134	Obelisk, cap for	Railway speeds, high 153 Railway, wooden, Burt *409	Tanks, water. 219 Tanks, water, painting of 298	Work guide for saws
Flowers, anomalous position of. 339 Flowers, cut, to preserve	Labels, glass, cement for 277 Jaboratory and the workshop 402 Labor, cheap, Chinese 43 Labor day 267 Lag, magnetic, showing 134 Lakes and Mississippi 394 Lakes extinct 122 Lamberton, Dr. R. A 203 Lamp bulbs, blackening 385 Lamp bulbs, blackening 385 Lamp bulbs, blackening 6 38 Lamp, safety, evolution of 164 Lamps, gas, street, lighting 188 Lamp, safety, evolution of 164 Lamps, gas, street, lighting 188 Landaahire smoke 363 Landeaping as tine art 55 Language of human races 84 Languages, rapid acquisition 379 Lantern, projection, Paragon 524 Lantern, stereoscopic 345 Lantern, stereoscopic 345 Lanter, window 152 Lathe for crankshafts 100 Lathe, screw cutting 292 Lathe slide rest 287 Lawn dramage 55 Lead as iron coating 123	Objectives used as oculars*151 Observatory, Dudley, new*328	Railways in Unina 212 Railways of U. S., progress 130 Rain making, dynamite 200	Tar and asphalt for tanks 9 Taste, how to obscure the	Wreck, blowing up a
Flue and chimney cleaner *37 Flu d, preservative 204 Fluorine	Lamp bulbs, blackening 395 Lamp bulbs, blackening of 38 Lamp night moveble ***	Observatory, Mt. Blanc 261, *876 Ohio building at Fair *56 Oil burners botter	Rattlesnakes, experiments with. 18 Razor and strop, Fox*116 Reading stand	Taxidermy	Wrench, Jones'*404
Fly, oxbot 118 Flying machines, Edison on 326	Lamp, safety, evolution of*164 Lamps, gas, street, lighting*38	Oil burner, Larkin	Recording instruments *245 Recreat on for middle age	Telegraph wire guide block *196 Telegraphy, dynamo 379	X Walith
Forging coppers	Lancashire smoke 363 Landscaping as fine art 55	Oil, Macassar	Register, printing press *180 Reptiles of Philippine Islands 313	Telephone, Noriega's *330 Telephone patent, Berliner 137	
Forgings, drop, at Fair *180 Fonthill Abbey *73 Foods, farinaceous 400	J. Language of human races 84 Languages, rapid acquisition 359 Lantern, projection, Paragon **294	Oil, palm 72 Oil, vanadiferous	Respiration, artificial*290 Resuscitator, Desant*280 Retardation magnetic *124	Telephonemeter. 149 Telephone, long distance. 299 Telescope, French great	Yacht Valiant
Foundation laying, novel 42 Foundations, new method 218	Lantern in stage effects. 178 Lantern, stereoscopic. 345	Oils, fish	Revenue cutter Windom 148 Rhodolite, Mexican 371	Tell-el-Amarna tablets 198 Tension of liquid films *895	Yacht Valkyrie
Freezing machinery, snip 186 Frost on windows 407	Lathe for crankshafts*100 Lathe. screw cutting*292	Olympia, cruiser 179, *405 Optical goods at Fair 310	Richardson, Benj. Ward 181 Rifle, navy, new 283	Terrible, warship 250 Testing machines, Olsen *216	Yoshino, warship. 149
Fuel, gaseous 420 Fuel of steamers 200 Fuel, oil, and boilers, at Fair *17	Launches, electric, at Fair *377 Lawn drainage 55	Oranges and lemons	Roaches, Brazilian, habits 71 Roadbed, Platten's *293	nermometer, record., Draper's.*373 Thermometers, improved 244 Thill support, Meyerhoff's*356	z
Fuel, petroleum as	3 ' Lead as iron coating 123 '	Ure concentrator, new*228	Road building55	Thiocami	zinc, German production of 194