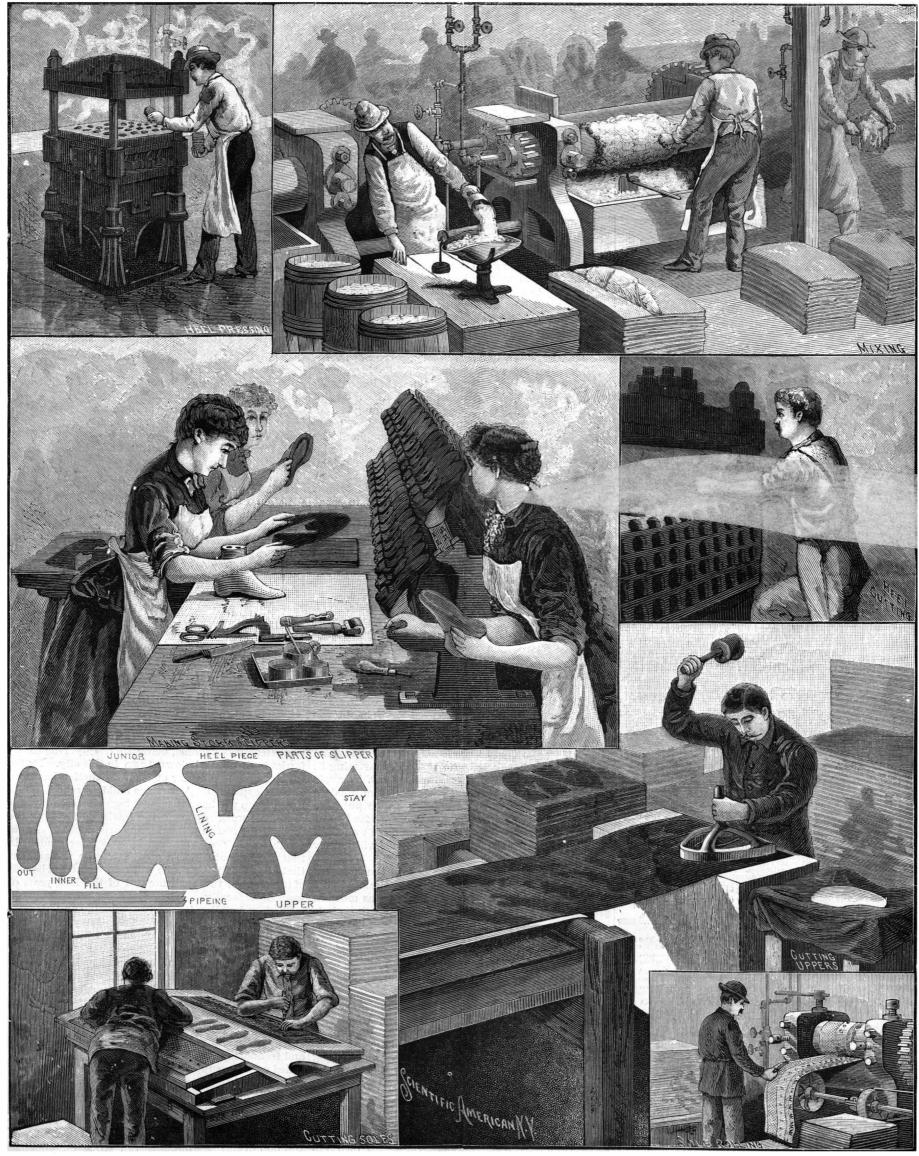
[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyrighted, 1892, by Munn & Co.

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

Vol. LXVII.—No. 24. ESTABLISHED 1845.

NEW YORK, DECEMBER 10, 1892.

\$3.00 A YEAR.
WEEKLY.



MANUFACTURE OF RUBBER SHOES-INTERIOR VIEWS OF FACTORY OF BOSTON RUBBER SHOE CO., MALDEN, MASS.-[See p. 374.]

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.

One copy one year to any foreign country belonging to Postal Union. 4 00 y postal or express money order, or by bank draft or chec MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

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 is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, for the U. S., Canada or Mexico. \$6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page. Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S., Canada or Mexico, on receipt of seven dollars. To foreign countries within Postal Union, nine dollars 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 contemplatebuilding this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.50 a year. To foreign Postal Union countries, \$3.00 a year. Combined rate for Building Edition with Scientific American, \$5.00 a year. combined rate for Building Edition, Scientific American and Supplement, \$9.00 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of La America 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, draft 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 10, 1892.

(Illustrated articles are marked with an asterisk.)

Almonds, sweet, oil of 3
Armor plate machines*
Books and publications, new 3
Business, stick to legitimate 3
Canary birds from Germany 3
Carriage builders' school, a 3
Cement, waterproof and fireproof 3
Check box, Williams'*
Cholera bacillus, the
Cod liver oil, manufacture of 3
Columbus drinking fountain,
Drake's 3
Comet, another Brooks 3
Cotton harvester, a new*
Danforth case, the 3
Dish washer, the Wood-Gordon* 3
Earthquakes, American 3
Fire escape, McCollom's* 3
Fog lighting in London 3
Fire escape, McCollom's*
Gum árabic, artificial 3
Hemorrhage, hot water for 3
Hydraulic ram, a large 3
Inventions, recently patented 3
Lemon, essence of 3
Lysol 3

marked with an asterism.

Menthol. 369
Mosquitoes, capturing. 369
Nicaragua Canal convention, the 369
Nose and throat. 379
Notes and queries. 379
Oak, to darken. 369
Patents granted, weekly record. 379
Paint, iron cinder. 376
Planers and slotters, large* 371
Potato blight, specific for. 370
Railroads of the world. 373
Railway appliances, some new. 378
Railway speed, fast. 377
Roads, good. 368

ing.... Schuylkill Valley industries.... Trees in French cities 376
Trip to a fixed star, a. 375
Varnish, rubber 373
Watch, statistics of running a. 373
Wooden bucket, Reese's 370
World's Fair buildings, painting 370
Well, a 3,000 foot. 376

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 884.

For the Week Ending December 10, 1892.

Price 10 cents. For sale by all newsdealers

- I. ARCHÆOLOGY.—The Old Stone Mill at Newport.—By J. P. MACLEAN.—The origin of the old stone mill.—A probable solution of the problem of its origin.
- II. ASTRONOMY.—Some Additional Points Relating to Comets.—
 By George W. Coakley.—An interesting paper by Prof. Coakley, giving his conclusions concerning the nature of comets.....
 'The Mount Joy Meteorite.—By EDWIN E. HOWELL.—The third largest meteorite found in the United States.—Its analysis and dimensions.—I illustration.
- III. BACTERIOLOGY.—Recent Contributions to the Chemistry and Bacteriology of the Fermentation Industries.—By PERCY F. Frankland.—A second lecture on this most interesting subject, treating of the culture of microbes.—Their examination and identification and recognition.—10 libustrations...

 The Pasteur Institute in Australia.—The inoculation of sheep in Australia to prevent them from getting hydrophobia, due to the bites of wild dogs.—8 illustrations.
- IV. BOTANY.-Cycads at Kew.-An unrivaled collection of cycads now cultivated in England.-1 illustration.....

- VII. ENTOMOLOGY Reliable Remedies Against Insect Pests.—A valuable paper on economic entomology.—The destruction of in-sects injurious to plants and trees.
- VIII. HYGIENE.—Safe and Perilous Occupations.—Popular resums of the chances of life in different occupations......
- XI. NAVAL ENGINEERING.—Life Saving Appliances.—The text of the decision awarding the £200 prize in the London Graphic competition, recently reproduced in these columns, with illustration of the successful device.—3 illustrations.
- XII. TECHNOLOGY.—The Manufacture of Liquors and Preserves.
 —By J. DE BREVANS.—A continuation of this exhaustive treatise, giving the distillation of strong liquors.—4 illustrations.. 14126

THE DANFORTH CASE.

Danforth was an assistant engineer on the U.S.S. Philadelphia on a recent voyage. On the morning of November 5, he was in charge of the engine room and engaged in testing the capstan steam pipe with steam up. While his men were distributed at their stations here and there among the machinery, the master-atarms, a subaltern in the marines or police of the ship, suddenly appeared, and, without a word to Engineer Danforth, forthwith arrested one of his machinists under orders from the deck, when Danforth interposed, insisting that an engineer in charge should be informed that one of his men was to be taken from his post, so that he could put another man in his place. The master-at arms quitted the engine room to report that he had been interfered with, and, in the meantime, Danforth, having relieved the machinist that was wanted, sent him on deck to obey the order of arrest. Then came an order for Engineer Danforth to appear on deck forthwith. Engaged as he was in superintending a test with steam up, so he testified, he could not leave at once. "I dared not leave my post at once," he says, "knowing that the chief engineer, my superior, would hold me to a strict accountability if mishap should come, and believing that the officer-ofthe-deck only wanted to see me in reference to the case of the arrested machinist and was not aware that I was seriously engaged.

"I sent him word that I was testing the capstan steam pipe and would come just as soon as I could find some one to relieve me. Then a peremptory order came and, leaving everything, I went on deck. Within an hour after I had, with perfectly honest intentions and a conscientious belief that I was doing my duty, sent the message to the officer-of-the-deck, I had been reported in writing and had been refused any opportunity to make an explanation to any one of the three officers who were to make and forward the reports against me."

This testimony was not impeached before the court martial nor was it denied that Danforth is a faithful and efficient officer, his record being, up to now, without blemish. Notwithstanding this, the jury, composed it should be said for the most part of line officers, brought in a verdict against him; the Secretary of the Navy approving the same and condemning the engineer to a year's suspension on half pay.

The case has excited much interest throughout the service; the engineer officers, or at least those who have expressed their opinions in the public prints, looking upon the verdict as unjust and unmerited; though only what might have been expected from a strict application of the old cast iron rules to must be regarded as altogether new conditions.

It is time this kind of thing was put a stop to, or, if the old rules must stand, that a little common sense be mixed with them.

GOOD ROADS.

The subject of good roads is now occupying a great deal of attention on the part of the public. The American nation appears to be gradually awakening to the fact that the bad roads of this country are unworthy of its position among the nations. We learn what bad roads bring about when we read of mud blockades. Large districts of country are rendered impassable by mud. Almost an entire State is brought into a condition of siege by the muddy roads. The farmers cannot transport their produce, the railroads lose freight, and the speculators seize the opportunity to advance prices of produce.

This is what a mud blockade may mean. The State or region directly affected, the railroads traversing it, and the country at large may all suffer for it. To avoid culiar fitness as a center of such instruction has been such occurrences we need no lessons from modern already explained. A carriage builders' school estabtimes. It is true that the nations of Europe put us to the blush. But we may go back two thousand years for our instructors. The Roman engineers won their fame largely as road makers. The roads which they built are to-day their monuments.

roads. It is stated that in Illinois alone the loss to the of the plant of the Institute and of the long years of community from bad roads last year was as much as \$16,000,000. If this ratio were taken for the whole country, it would give a loss of \$300,000,000. At three per cent such loss would represent a capitalization of nessed remarkable results obtained by the introducten thousand millions of dollars. This is one-sixth of tion of ball bearings and pneumatic tires on racing the total wealth of the country.

The subject of deserted farms has been a subject of concern in the New England States. A farm whose outlets in the spring and fall months are but canals of mud and cobblestones is justly unattractive to the young. They find the enforced isolation unendurable. But replace the bad roads by macadamized or telfordized surfaces, which do not feel the spring thawing and which are always passable, and which are dry a few hours after a rainstorm, and the country will take on a new aspect.

The agitation for good roads was originally undertaken by the League of American Wheelmen. This is an association of bicyclists. On bad roads the bicycle other impending changes the educated technologist rider is at a great disadvantage. Doing his own propelling, he quickly appreciates a change in the road neer's education.

surface. The agitation began to spread. The carriage builders have justly felt that good roads would give them an enlarged market, and have joined the movement. The subject has been lifted up from the limited bicyclist's platform to a national one. A bill has been presented before Congress looking to the establishment of a national highway commission. Special laws have been passed by States for the construction of roads. The effect of such laws has already been widely felt. The formation of a national association for the encouragement of the building of good roads has been effected. The probabilities are that the next ten years will see a great change-almost a revolution. The era of bad roads is certainly approaching its close.

A CARRIAGE BUILDERS' SCHOOL.

The National Association of Carriage Builders held their 20th anniversary recently in Buffalo, New York. Among the subjects treated a particularly important one, and interesting in view of the general movement for the advance of technical education, related to the establishment of a carriage builders' technical school. For some time past a school has been maintained in New York City for the education of young men employed in the carriage factories, apprentices and mechanics who work during the day. These young men gave three nights each week in the carriage builders' school to learn carriage drawing. This is the work that has been done. The Carriage Builders' Association, however, felt that more was required, and advocated the establishment of a true technical school.

As the representative of practical technics in this vicinity the Stevens Institute at Hoboken afforded an obvious opening for the foundation of such a course. The Institute for many years has graduated from its curriculum engineers in the true, practical sense of the term. Its graduates are not only familiar with the mathematics of the subject, with the theory and scientific aspect of their work, but are also practical workmen when they leave it. Special provision is made for giving them a course in practical mechanics, so that they may learn the absolute use of tools. After they leave the college there is no need for them to spend a year or more in the shop. This part of their education is included in their college course.

The faculty of the college have taken a special interest in the carriage builders' school, such as it is. It seems very natural, therefore, that by a slight addition to its force, the Stevens Institute of Technology might supply the needed college for carriage builders. Evening classes in drawing and designing should be kept up for the benefit of workmen and apprentices. Instruction in connection with the regular course in drawing and descriptive geometry would be included in such lines as are required in carriage building. Under applied mechanics the application of the principles of statics and dynamics to suitable problems in carriage building would be given. In shop work the joints used in carriage construction and the tempering of springs are two suggested topics. In the experimental course special examples in testing the strength of springs, joints, and frames would be introduced.

Such in general, with added lectures by specialists, is the programme as suggested by Dr. Henry Morton, the President of the Institute. To carry it out, money is required, and the collection of such money is now being attended to by the association, and they seem to believe that they will succeed in raising sufficient capitalization to enable the Stevens Institute of Technology to establish the special course designed.

The situation of the Stevens Institute of Technology is particularly available, being so readily reached by ferries both up and down town in this city. Its pelished there will have the advantage of a score of years' preceding work done at the Institute, for into the work of the course will enter the experience of the entire faculty. The work done by a regular student in that department will to a great extent be the same as Thus we find ourselves very archaic in the matter of that done by all, so that he will receive the full benefit work of its faculty.

Carriage building is rapidly developing and bids fair to become a true profession. The past year has witwagons, and it is hard to believe that the day is not near at hand when vehicles of luxury will be thus equipped. In the structural department electricity is already playing a part in the welding of tires and in the welding and brazing of joints in general. All this indicates the invasion of the old field of handiwork and apprenticeship by the highly trained mechanic and technologist. The carriage factory may yet be called upon to supply electrically propelled vehicles. Many experimental vehicles of this type have indicated the possibility of future success. In the use of oil fuel and of naphtha engines there is also a possi bility for the future. In carrying out these and many will find in carriage building full scope for an engi-

THE NICARAGUA CANAL CONVENTION.

At the recent New Orleans convention, which was attended by prominent business men from many sections of the country, the main effort was to bring to bear upon Congress sufficient influence to secure government aid in building the Nicaragua Canal,* such aid to be extended in such way as to give the government almost sovereign power over the work. Senator Morgan, of the Committee on Foreign Affairs of the United States Senate, made the principal speech, in which he insisted that the bill now before the Senate, providing for the indorsement of \$100,000,000 canal bonds, ought to be passed, and receive the hearty approval of all intelligent citizens. He said the canal company was willing to give to the government \$70,000,-000 of the bonds, in order to lodge the control of the canal in Washington, and thought that the concession of a neutral strip of land along the canal by Nicaragua would prove to be really the cession of so much territory to the United States. A strong committee was appointed to urge upon Congress "to take such steps and give such financial aid as will insure the speedy completion of the canal at the minimum cost thereof. taking proper security for any credit pledged or money advanced for this purpose, and retaining such control and supervision of the same as will insure the peaceful use of this great enterprise to the commerce of the world at the lowest possible rates."

To Darken Oak.

Oak for decorative wood work is produced by fumigating the material with ammoniacal vapor, which effectively produces the dark coloring so much desired. In accomplishing this, the method consists in placing the material to be darkened in an approximately airtight room in which no light enters; or for small work a packing box will suffice, the joints or cracks to be well pasted over with paper. In this room or receptacle for depositing the furniture or other articles is placed a London, determined not to rest until they had sucflat porcelain or earthen vessel filled with ammonia, the vessel containing the liquid being, of course, set on the ground or floor, that the fumes or vapor may strike to advantage the articles to be darkened; if the apartment is large, two or more vessels containing ammonia may be employed and allowed to remain until the desired effect is secured. The ammonia does not in a peculiar manner upon the tannic acid contained in oak, browning it so deeply that a shaving or two may actually be taken off without removing the color. The depth of shade depends upon the quantity of ammonia used and the duration of exposure.

A Demonstration of the Cholera Bacillus.

At a recent meeting of the Section in General Medicine of the New York Academy of Medicine, Dr. E. K. Dunham gave a most interesting demonstration of the comma bacillus of Asiatic cholera. Tube cultures and surpassed in germicidal power an equally strong soluplate colonies of the organism were projected upon the tion of pure phenol, besides which creolin, although screen, and their morphological and biological characters pointed out. The bacilli themselves were shown under the microscope, both alive in a drop of the cul- insoluble in water, however, these cresols were negture fluid and also stained by the ordinary methods. Photomicrographs of the latter were also shown by means of the dark lantern. The cultures had been made in the usual way from the dejecta obtained from the nine cases of cholera recently observed in New York. In two of the cases cover glasses, prepared directly from the intestinal contents, showed the characbeen required before the bacillus was found. Cultures from some of these cases had been sent to Dr. Petri, brown, oily-looking, clear liquid, with a feebly aromatic director of the bacteriological department of the Imperial Board of Health at Berlin, and a letter in reply had been received from Dr. Petri stating that he could and those made from the cases in Hamburg.—N. Y. Med. Jour.

Oil of Sweet Almonds.

The United States consul in Liverpool recently re- has given to the service of mankind. ceived orders from government to inquire into the manufacture of oil of sweet almonds in England. He reports that two London firms, whom he names, seem to be the principal, if not the only, firms in England for the preparation of an absolutely waterproof ceengaged in this business. Therkernels are crushed by hydraulic pressure, and from the cake thus formed the oil is distilled. The same process is carried on in chromate of magnesia to this mixture, the cement is Havre; but it is said that there the kernel of the peach is used instead of the almond, and that, consequently, idea is that cement of this character would be advanthe oil is cheaper in price and not so good.

The use of rubber tires on private carriages has become quite common in this city. For invalids and nervous persons our physicians recommend their use. But the rubber tire is not only expensive, but lasts only a little while, owing to our rough pavements and street railway tracks. Why will not some one invent a cheaper substance than rubber, which will be more enduring, cost less, and be sufficiently elastic to meet the requirements?

*Illustrations and full details of the canal and its cost may be found in Scientific American Supplements 683 and 687.

The medicinal use of menthol in China and Japan goes back into the dateless ages. Isolated references to its application in the East are met with here and there in the records of western travelers in those parts, but, says the Chemist and Druggist, we shall probably never know the name of its discoverer or the early history of its introduction. We do not even know with absolute certainty when, and by whom, menthol crystals were first brought to the notice of European pharmacologists. It is said that they have been used pharmaceutically on the Continent as long ago as the end of the last century, but if that statement is capable of proof, the drug must have fallen into oblivion shortly after its introduction, for it was certainly utterly unknown, even by repute, to most persons in the drug trade twenty-five years ago. Somewhere about 1864 a consignment of the drug was received in London under the name of Chinese peppermint oil, and passingly commented upon for its curious property of solidifying with a fall in the temperature. To the late Mr. John Mackay, of Edinburgh, belongs the distinction of first having called the attention of British pharmacists to the valuable properties of menthol. Mr. Mackay is believed to have brought "Po-Ho oil" with him from Paris, where it was then sold, in the small red-labeled Chinese bottles familiar to eastern travelers, as a kind of proprietary article. Had menthol been an utterly valueless quack medicine, it would, perhaps, have taken Europe by storm then, and reigned for a season, just long enough to gather a fortune for its first exploiter. But as the drug happened to have a solid therapeutic value, it had to wrestle through the familiar stages of contumely, ridicule, animosity, and unreasoning popularity, just like any new creed or reformer. The commercial history of menthol practically dates from 1878, when an English firm in Yokohama made a small shipment of it to ceeded in securing for the remedy a footing upon the market. After many months their shipment went back, with a note from the agents, announcing that "the stuff" could not be sold here, as no one knew what to do with it. But the Yokohama firm persevered, and they reaped their reward. Four years later menthol crystals were the rage of the season, selling at touch the oak, but the gas that proceeds from it acts | 60s. per lb. wholesale, and carried about in cone shape by all persons with any pretense to the possession of a civilized nervous system.

Lysol.

Attention having been drawn by the recent cholera scare" to the popularity of carbolic acid as a disinfectant, notice is being taken in medical circles of the even superior advantages for many purposes of the cresols as disinfectants. It was discovered that crude carbolic acid made soluble by the action of sulphuric acid free from carbolic acid, was proved to be of unmistakably superior disinfecting activity to the latter. Being lected until the idea was hit upon of combining them with resin soap. Although very efficacious, these preparations were only emulsions; and it remained for the cresols to be made soluble, as now in the form of lysol in order that what can be called the ideal soluble dis infectant should be made generally available. Lysol is produced by dissolving in fat, and subsequently saponiteristic germ. In the seven other cases cultures had fying, with the addition of alcohol, the fraction of tar oil which boils between 190° and 200° Cent. It is a creosote-like odor. It contains 50 per cent of cresols; and it is miscible with water to a clear, saponaceous, frothing fluid. It shows turbidity when mixed with detect no difference between Dr. Dunham's cultures | hard water; but its disinfectant quality is not impaired thereby. It acts, to all intents and purposes, as a soap; and it is admirably adapted for use in surgical operations. According to German testimony, lysol is one of the most precious products of coal tar which chemistry

Waterproof and Fireproof Cement,

Herr Alwin Nieske, of Altherzberg, suggests a method ment, consisting in the addition to ordinary cement of acetate or palmitate of alumina. By further adding made refractory as well as moisture-repelling. The tageous for use in very damp situations, or for tanks, etc., underground. The proportion of palmitate of alumina to be employed will vary according to circumstances, the nature of the mortar or cement, and the character of the work to be done: but 10 per cent of the palmitate would be a good proportion for any kind of hydraulic mortar. If the cement is needed to resist humidity, and be at the same time refractory to fire, a mixture is made in about equal parts of the cement mortar with the palmitate and a chromic magnesia prepared with oxide of chromium, 32 to 42 parts: alumina, 18 to 22 parts; magnesia, 18 to 20 parts. The

into briquettes, which are calcined, pulverized, and kept ready for use.

Method of Capturing Mosquitoes.

An ingenious method of capturing adult mosquitoes in the house is in extensive use in some localities in New Jersey. We have not seen it described in print. and mention it here in the hope that it may be new to some of our readers. It consists in nailing to the end, or rather the top, of a stick the lid of a small tin box, such as a yeast powder box. The stick must be long enough to enable the operator to reach the ceiling, and the tin cover of the box is nailed to it in an inverted position. Into this receptacle is then poured a tablespoonful of kerosene, and the mosquitoes at rest upon the ceiling are easily trapped by simply placing this kerosene cup under them and close up to the ceiling. In their endeavor to escape they fall at once into the kerosene and are killed. On the morning of September 25 the writer captured in this way seventy-five mosquitoes on the ceiling of the room which he had occupied during the night. Most of the seventy-five were filled with blood, which, we think, is a sufficient argument in favor of performing the operation before going to bed rather than after arising !—Insect Life.

Gigantic Steel Works.

The Carnegie Steel Company, limited, was organized ast July with a capital of \$25,000,000. Record has recently been filed at Pittsburg. The Bulletin has the following list of stockholders in the new company: Andrew Carnegie heads the list with \$13,833,333, or \$1,333,000 more than the controlling interest. The other large stockholders are: Henry Phipps, Jr., who holds \$2,750,000; H. C. Frick, \$2,750,000; G. Lauder, \$1,000,-000; W. H. Singer, \$500,000; H. M. Curry, \$500,000; H. W. Borntraenger, \$500,000; J. G. A. Leishman, \$500,000; Wm. L. Abbott, \$250,000; Otis H. Childs, \$250,000; and J. W. Vandervort, \$200,000. There are twenty-three stockholders in all. The works included in the reorganization are the Edgar Thomson, Homestead, Duquesne, Upper and Lower Union Mills, the Lucy Furnaces, Keystone Bridge Works, Beaver Falls Mills, the Scotia Ore Mines, the Larimer Coke Works, and the Youghiogheny Coke Works.

Drake's Columbus Drinking Fountain.

At a cost of fifteen thousand dollars, John B. Drake, proprietor of the Grand Pacific Hotel, and one of Chicago's leading citizens, is just completing in that city a public drinking fountain, which is regarded as one of the most ornamental creations of its kind in the world. The design is Gothic instyle, and the material is a fine warm-tinted coral granite from Italy. The structure occupies a space on the north side of Washington Street, between the city and county buildings, and is 32 feet in height. Below the platform is a chamber which will hold three tons of ice, effectually cooling the water, which flows through coils of pipe below and around the ice.

Mr. Drake has long felt that public drinking fountains in the populous parts of great cities would promote the cause of temperance in the best possible way. Let Mr. Drake's good example be followed by citizens of other cities and towns.

Where Canary Birds Come From.

When the North German Lloyd steamer Herrmann unloaded at New York lately, twenty large bundles shrouded in white cloth were carefully lifted from the hold and placed on the dock. From each bundle came a chorus of angry twitterings and chirpings and much fluttering of wings. Each bundle contained 252 little wooden bird cages, each with a canary bird in it. Immediately every one of the 5,040 birds stretched its little yellow throat in an effort to outsing his neighbor. They carolled and trilled as merrily as if they were looking out on green heath and a blue sky.

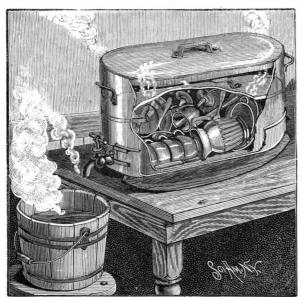
The canaries are of three grades; the \$2.50 birds, the \$5 birds, and the \$10 birds. The ordinary birds are worth \$2.50. A large, fine bird, or one of particularly handsome coloring, brings twice that price, while a distinguished vocalist will bring \$10. All the birds are males and singers. They come from Germany, where they are bred in large numbers. It is probable that all of the 5,040 birds will be sold within a few weeks. This is the busy time in the canary market, and within the past week more than 10,000 of these birds have arrived, classed as live stock.

A Large Hydraulic Ram.

Rife's Hydraulic Engine Manufacturing Company, Roanoke, Va., has recently built a hydraulic ram which yields remarkable results. It is attached to an 18 inch drive pipe with a 4 inch discharge pipe, and weighs aton. This ram, under a head of 7 feet, elevated agallon of water per second to a height of 34 feet. It is said that during the experiment the ram took in the requisite quantity of air and worked very steadily and satisfactorily. It has thus been demonstrated that it is quite within the range of possibilities to make larger mixture of these earths, wetted with water, is formed hydraulic rams than have heretofore been thought of.

AN IMPROVED DISH WASHER.

A simple and inexpensive device for speedily cleansing dishes or other soiled table ware, in a very convenient manner and with small chance of breakage, is shown in the accompanying illustration, the improvement being the invention of Eliza A. H. Wood (deceased) and Mrs. Minni Wood Gordon. The dish holder has a closely-fitting removable cover, and a faucet near the bottom at one end, for freely draining off the water, while within the holder freely slides a comparatively heavy loose lid, designed to rest on the dishes and hold them in place after the hot soapy water has been poured upon them. The holder rests in a cradle, on the lower side of which are rockers, the cradle having a low border wall and flat bottom, and a slot in each end of the border wall of the cradle accommodating the faucet. When the unwashed dishes have been packed in the holder, the hot soapy water



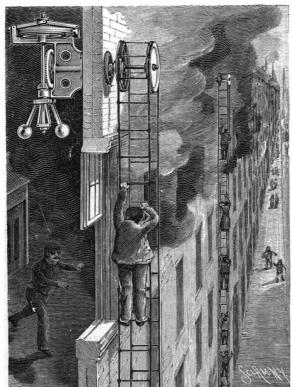
THE WOOD-GORDON DISH WASHER.

poured over them, and the heavy inner lid placed on them, the outside cover is put on and the entire device rocked, to cause a thorough and rapid circulation of the soapy water through the dishes, after which the first water is drawn off and rinsing water used, as desired, in the same way.

Further particulars with reference to this invention may be obtained of Mrs. Minnie Wood Gordon, Bloomfield, Fla.

AN IMPROVED FIRE ESCAPE.

The fire escape shown in the illustration is operated automatically by the weight of the persons escaping from a building to which it is attached, the improvement being designed to supersede the employment of cumbersome and dangerous iron ladders, ropes, cables, etc. The invention forms the subject of a patent recently issued to Mr. William J. McCollum, of No. 182 Van Houten Street, Paterson, N. J. At a suitable point near the windows in the outside wall of the building, near the ceiling of the upper story, is secured a tube, whose inner end is integral with a cast iron bracket



McCOLLUM'S FIRE ESCAPE.

carrying the regulating mechanism of the device. The is a barrel of paint. The pump sucks paint from the shaft on whose outer end are two sprocket wheels, at the surface to be coated. Four workmen with this a suitable distance apart to represent the width of a mechanism can accomplish more in a day than a small ing water. The quantity specified is sufficient for one ladder, the notches in the wheels being spaced to cordarmy of painters could in a week.

respond with the distance between two of the rungs of the ladder, the rungs being attached to endless wire ropes. On the inner end of the upper shaft is a miter wheel in gear with a pinion, by means of which a governor is operated to control the speed of revolution of the shaft, as it is rotated by the weight of one or more persons stepping on the ladder. By the operation of the governor a steel brake band is made to bear upon a brake wheel with a pressure corresponding to the weight which may be placed upon the ladder, enabling persons to descend at a safe and uniform speed, and insuring perfect control, whatever the load. The gov ernor may be regulated to run at any speed desired. When the occupants of the ladder alight the mechanism ceases revolution, a pawl preventing the descent of the other side of the ladder at any time, and enabling it to be used when desired to gain access to the building. To prevent the ladder from becoming slack by wear or changes in temperature, the shaft carrying the lower notched sprocket wheels forming the bottom of the ladder has its bearing in a hollow tube, to which are secured eccentrics with enlarged collars adapted to be clamped by lock nuts, whereby the distance between the top and bottom wheels may be regulated. The rungs of the ladder are tubular, and the entire apparatus is incombustible. The wire rope ladder and the sprocket wheels are galvanized, and therefore will not rust. The regulating device being inside of the building and the main shaft bearings in the wall, these parts are entirely protected from the weather. The wire rope forming the sides of the ladder is passed through bored apertures in the ends of each rung, and firmly fastened by means of a wedge, whereby a very strong ladder is made at a minimum expense, and, being very light, is not in any way a detriment to the appearance of the building. A basket may be hooked on to the ladder for children, or in other cases when desired, and the apparatus may also be used with great advantage as a lowering device for use in warehouses, mills, etc.

Nose and Throat.

In a recent lecture before the Chemists' Assistants' Association, London, by William Hill, M.D., London, the throat was described in detail, and the pharynx and the larvnx pointed out as the two most important parts. The nose has a very important connection with the throat and its disorders. It contains a series of bones called the turbinated bones, which expose a large surface of warm blood, and cause the air inhaled to be warmed ready for the lungs; moreover, the cilia of the nose cause the secretions to move and reject the solid particles it has collected. The nose is the proper organ for breathing, not the mouth. The larynx, which is the air passage, is bounded at its upper extremity by the vocal cords, and has, therefore, the double function of breathing and of phonation. The epiglottis, by altering its form, causes the food to pass down the pharynx, and keeps it from the larynx. In speaking of proper breathing, the author pointed out that diaphragmatic breathing was the proper method, and not clavicular. It was reported that Rubini had broken his clavicle during singing, by persisting in this method of breathing. Throat diseases are often caused by germs, by inhalation of sewer gas, etc. Fortunately, there are other organisms in the throat always ready to attack these germs. The throat was well provided with tonsils, both faucial and lingual. The tonsils produce phagocytes, or leucocytes, amœboid corpuscles which actually swallow up the germs. Why, then, should tonsils be cut out? Because, when they become enlarged and horny, they lose this function, and by removing the horny surface, the newly exposed portion can go on producing the corpuscles. The decay of teeth is largely due to germs. This shows the importance of keeping the teeth in order. Obstruction in the nose is the cause of many throat disorders. Care must be exercised in the use of both alcohol and tobacco; many people can use these luxuries with impunity in moderation, others cannot. People liable to throat disorders should be very chary of eating piquant or hot dishes. Irritating remedies, too, such as cayenne and (except in special cases) tannin lozenges or nitrate of silver, should be avoided. Hot tea, too, is bad.

Painting the World's Fair Buildings.

The painting and decorating of the vast interiors of the great exhibition halls at Chicago is an enormous undertaking. Frank Millet is the artist in charge. A recent estimate of the area to be covered with paint developed the fact that it would be impossible to set enough men at work with brushes to complete the task in time for the opening of the fair. Mr. Millet thereupon contrived a machine for doing the work. It consists of a piece of gas pipe flattened at one end to make a "spray." From this a rubber hose connects with an air pump driven by an electric motor, and beyond this tube forms a bearing for a freely revolving horizontal barrel and the air jet sprays the paint with force upon

AN IMPROVED WOODEN VESSEL.

Ordinary buckets and tubs are being replaced in the South and West by the more expensive but more durable fiber ware and galvanized iron vessels; but the difficulty heretofore experienced with wooden buckets is designed to be obviated by the improvement shown in the illustration, as the staves are thereby prevented from warping in dry seasons, and are securely held in place and tightened when carrying a heavy load in the vessel. The invention has been patented by Mr. Edwin M. Reese, of Santa Paula, Cal. On opposite sides

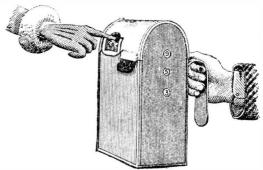


REESE'S IMPROVED BUCKET.

of the upper hoop, a bolt extends through an opening in a stave, and engages at its inner end a brace or segmental hoop, fitted in a recess on the inside of several adjoining staves, the bolt at its outer end engaging an eye on the lower end of a vertically sliding link, which has a hook at its upper end to which one side of the bail is connected. The opening in the stave through which the bolt is passed is of a form to allow room for an up and down movement of the outer end of the bolt, and when the bucket is manufactured the upper hoop is located near the lower edge of the opening, the bolts then being inclined downwardly, as shown in one of the small sectional views. The opening in which the bolt moves is filled with asphaltum, putty, or other suitable material, and when the staves dry up, or there is a heavy load in the bucket, the lifting of it by the bail tends to draw the hoop and the bolts to an upper position, as shown in the other of the small views, thereby closing and tightening the upper ends of the staves to take up possible shrinkage.

A COIN-TAKING AND TICKET-DELIVERING BOX.

By means of the improvement shown in the accom panying illustration, when a coin is pushed into the box, a bell rings and a numbered ticket is delivered, an indicator at the same time recording the number of tickets issued. The invention has been patented by



WILLIAMS' AUTOMATIC CHECK BOX.

Mr. John Williams, of Patricroft, Manchester, England. Within the casing are spring-controlled locking devices, extending into the slideways of the coinreceiving opening, so that the coin, when placed in the mouth of the device, cannot be removed, but causes a drum to be revolved to deliver the ticket. Only one ticket at a time can be removed or automatically delivered from the box.

Further information relative to this invention may be obtained of Mr. Edward Haynes, No. 128 Pearl Street, New York City.

Bouillie Bordelaise.

This preparation has been proved to be a specific for the potato blight caused in Europe by the Phytophthora infestans, and the following formula for its preparation appears in the Kew Bulletin for October:

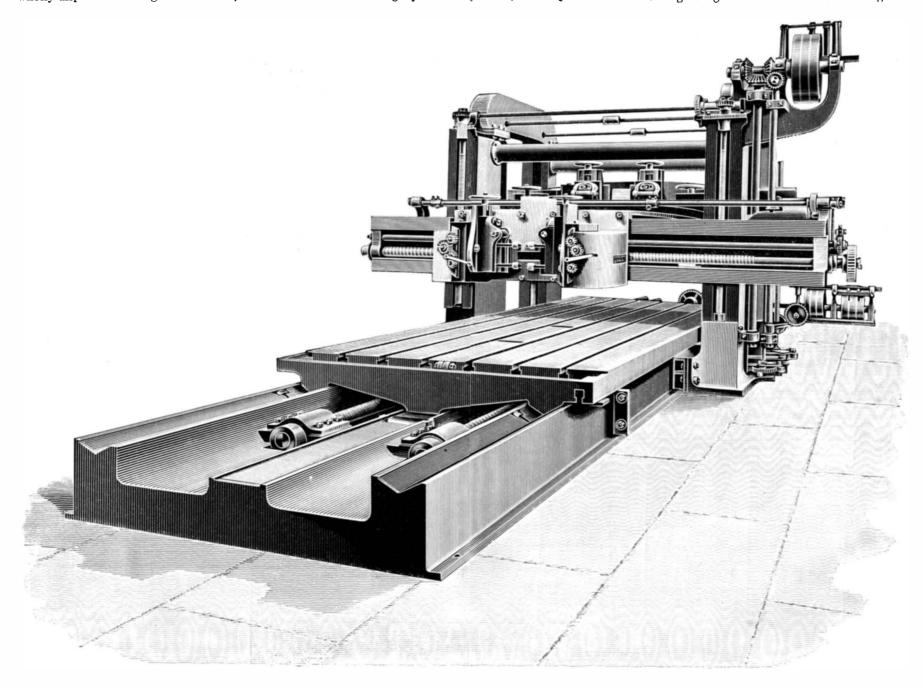
The sulphate is dissolved by suspending it in a coarse cloth, in a wooden vessel containing the water. Slake the quicklime in a separate vessel, and after stirring thoroughly with added water, pass it through a sieve into the copper solution, stir well, and add the remainacre of land.

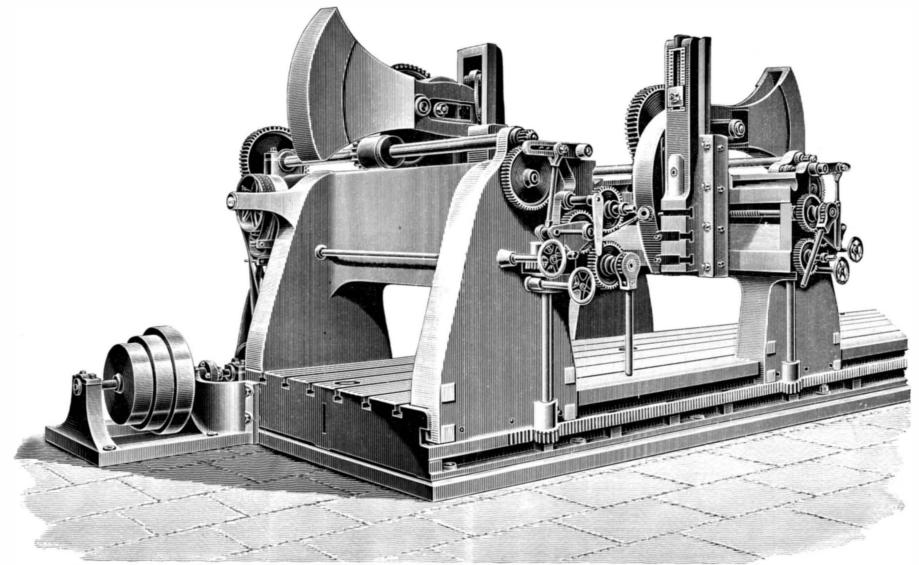
ENGLISH MACHINE TOOLS FOR AMERICA.

Under this head our London contemporary, the Engineer, gives illustrations, which we reproduce, of some new machines, lately made in England for the Carnegie works, and remarks upon the same as follows: "Our friends in the United States cannot as yet | Foundry, Leeds. The former is to plane armor plates | pulleys for the forward and backward motions, and wholly dispense with English assistance, and find it to to 30 feet long by 10 feet by 5 feet, and to plane both self-acting belt guides. There are four strong stand-

planing machine and a slotting machine, supplied this steel screws with long gun metal nuts, ample thrust year to Messrs. Carnegie, Phipps & Co., of Pittsburg, bearings, and intermediate supports. The driving is

their advantage to apply to the English tool makers ways, and is fitted with a cross breast slide, also to when they want thorough excellence. We illustrate a plane both ways. The table is actuated by two strong by Messrs. Smith, Beacock & Tannett, Victoria done by bevel wheels of cast steel, and wrought iron





IMPROVED ARMOR PLATE PLANING AND SLOTTING MACHINES.

placed face to face. The two cross slides, also placed face to face, are raised and lowered by power for self-acting adjustable tool boxes for all angles. The weight of this machine is over 120 tons.

"Last year Messrs. Smith, Beacock & Tannett made for Messrs. Carnegie, along with other machine tools for cutting armor plates, the double-headed armor plate slotting machine which we illustrate, with a bed 35 feet long. There are two strong cross slides, each with standards cast thereto, admitting in width 6 feet 6 inches and 20 inches thickness of armor plate. The machine has strong carriages and slotting rams, with adjustable strokes up to 20 inches, with quick return double-purchase driving gear, and balance weights slightly in excess of that of the rams. There are selfacting motions for feeding longitudinally on the bed by racks and pinions and worms and wheels, and transversely on the cross slides by screws. There is a quick motion for running the slotting heads to and fro on the bed to position required."

American Earthquakes.

RALPH S. TARR.

The Japanese count upon an average of one violent earthquake shock in twenty years, although prior to that of October 28, 1891, there had been no alarming shock for about thirty-two years. Scarcely a day passes without a tremor in some part of the kingdom, and every year records more than one shock which in our country would be the cause of alarm. The people or less violence upon the surface of the earth. How of Japan have become accustomed to quakings of the many of the earthquakes which have occurred far earth, and it requires some very violent shaking up away from any volcano can be attributed to this cause accompanied by the destruction of much life and cannot, of course, be said, but it is a possible cause property to attract universal attention. Since 1633 there have been twelve such shocks, including that of last year, which destroyed in the neighborhood of 8,000 lives, wounded 10,000 more and wrecked not far from 90,000 houses.

constant trembling and quaking of the earth has taught the inhabitants, through centuries of experiplane of fracture, or the fault plane. In this event ence, that an effort to counteract the effects of earth a single shock or many successive shocks of greater or nature. quakings is well worth undertaking. By far the greater loss of life in an earthquake shock comes di- in New Zealand, in 1855, was due to this cause, as we rectly or indirectly from the falling of buildings; and know by the fact that the plane of fracture was visible we find accordingly an effort in regions subject to this evil to construct buildings which are calculated to withstand all but the most violent shocks. In our own country no thought is given to this matter, and our buildings, instead of being calculated to withstand earthquakes, are peculiarly well fitted to become death-dealing instruments in the hands of instable

It is this thought which has induced me to write this article, in which it is proposed to review the points which bear upon the possibility of earthquake shocks rivers by waterfalls or rapids just above tidewater. in our densely populated Eastern States and to call attention to the widespread disaster which would result if our land should be visited by a violent earthquake, or even by one of slight violence.

In considering the possibility of an earthquake shock in any given region there are two sources to which one our Eastern mountains are old and no longer growing, may go for facts. These are the historical record and the study of geological conditions. Both of these promise us comparative immunity from earthquakes, yet both point out clearly that we are liable at any moment to find ourselves violently shaken, though siderable change in the relation of land to sea. The when this may come, or where, no one can tell. I wish to enter into these two inquiries somewhat more in detail and to place before the readers of this journal in this case the datum plane of sea level at hand for the facts as we know them, and to do this it seems comparison, as in the case of the Chilean Andes. well to inquire a little into the cause of earthquake shocks.

The proximate cause of an earthquake is the arrival upon the earth's surface of a series of waves resulting regions may be referred. It is hardly probable that from a jar. An explosion of dynamite will serve as any violent earthquakes can be referred to this cause. well as any other cause to start these waves in motion, It is not at all unlikely, also, that imprisoned gases at-badly shaken. The inhabitants state that the earth and this is what actually did happen when Hell Gate tempting to escape may serve to jar the surface, per- rose and fell in great waves, the trees rocked to and was blown up a few years ago. The waves start out haps even violently. How far this is a vera causa I fro, and were entangled and broken, the earth opened in all directions, tending to move as successive spheres, cannot say, but it may perhaps have been the origin and closed, and it is stated that the inhabitants were but of course being distorted as they pass through of some of the earthquakes in delta regions, and there forced to fell trees and stand upon them to avoid berocks of different densities. They reach the surface in are some facts connected with the earthquake of 1812 ing swallowed in the crevices. There was an incessant a more or less circular form, and places approximately in the Mississippi valley which point to this conclu-quaking of the ground for several successive months, at the same distance on either side of the epicentrum sion. or point directly above the center or focus feel the shock at about the same instant. The shock is most violent directly above the focus and diminishes as you degree of confidence in the stability of the earth, but recede from this point. At the epicentrum the motion there are possibilities which tend to disturb this feeling is vertical, and tends to cause the roof of a house to of security. That the rocks in many parts, as, for infall to the cellar and leave the walls standing; but stance, in New England, are in a state of strain is unaway from the epicentrum the waves emerge at an angle, and the effect is to overthrow houses, chimneys and monuments in the direction from where the waves

universal effects. It is much less easy to state the cause the quarry. Moreover, in our confidence, we should of the jar. Probably, however, nine-tenths of the not forget that regions which have for years been free earthquake shocks are directly or indirectly connected from earthquake shocks are liable to be visited at any ten rocks through the more solid strata of the earth's the point. Without the slightest warning and withcrust. It is as nearly certain as a thing can well be out the least reason to expect danger, this city was

cause of very nearly all the earthquakes of volcanic regions, and these constitute the vast majority of earthadjustment, and each is fitted with two independent quakes. Many such shocks can be connected with eruptions, and some, such as that of Krakatoa, in 1882, are the direct result of the blowing up of a crater by the pent-up lava. In other cases these earth jars are less easily assigned to volcanic activity, even though they occur in volcanic regions. Still it is a fair inference that this is their cause, for there must be a frequent passage of the liquid lava at great depths in the vicinity of volcanoes, even though no eruption results therefrom. Every time this molten rock, in struggling to reach the surface, forces a passage upward, even for but a small distance, its success in rending the rocks is telegraphed to the surface as a wave of motion and is recorded there as a trembling of the earth.

From this cause we in eastern America are happily free, and it is for this reason, in part, that we have more confidence in the stability of the earth than dwellers in lands of volcanic activity. There is good evidence, however, that the subterranean activity of molten rock is not confined exclusively to volcanic regions. Where one volcano is established there are probably many unsuccessful attempts to establish a vent or safety valve to the surface. Dikes of eruptive rocks intruded into the rocks in Central New York, for instance, where, since those rocks were formed, no volcano has existed, are proof of this. The intrusion of such dikes causes the rocks to be rent asunder, and each one must have caused at least one jar of greater and probably an actual cause of many. There is some reason to suppose that this may have been the cause of the shock at Charleston, S. C., in 1886.

In mountainous regions, where the rocks are bent and folded, the strain under which they are placed is the slipping of the rocks past one another in the less violence will result. The violent earthquake shock upon the surface,

Such shocks have undoubtedly occurred in many parts of the Cordilleras, notably in the vicinity of Salt Lake City, where the fault scarps are still visible; and there is every reason to prophesy that they will occur again.

Nor are these faults confined to mountain regions. It is now known to geologists that there is such a fracture plane extending from near New York to the Carolinas, and marked where it crosses the larger If the slipping is still in progress along this plane there may at any time be an earth jar sent out from some point in the fault. Still, although there is danger from this cause, it is much less menacing east of the Rockies than in the Cordilleras. The reason for this is that but, on the contrary, being worn away, while the Rockies and Sierras are still growing. In South America this growth of mountains is so rapid that it has been recorded within the last century by a con-Cordilleras do not seem to be growing so rapidly. although it must be borne in mind that we have not

Another possible cause of earthquake shocks is the collapse of caverns, and to this cause it is probable that many shocks of minor importance in limestone

Studied from the standpoint of cause and effect, we of the Eastern States are justified in feeling a certain doubted. In the granite quarries of Cape Ann, in Massachusetts, blocks which are blasted out expand so that they cannot be placed back again, and there have been cases where the granite has bulged up and snap-Whatever the cause of the earth jar, these are the ped, sending a miniature earthquake shock through with volcanic action or at least with the passage of mol- time. The frightful earthquake at Lisbon in 1755 is to

ards securely fixed to the bed and to each other, and without actual ocular demonstration that this is the visited by one of the most terrible earthquakes on record—a shock which was felt in Scandinavia, in Algiers and on the shores of our great lakes, and which in Lisbon alone killed not far from 60,000 people.

> It has been urged that our Eastern States have been for many centuries, perhaps for thousands of years, practically free from earthquake shocks of any considerable magnitude. The basis for this argument is that there are in many places perched bowlders, and rocking stones and instable columns of rocks which could not have withstood any very severe earth jar. Even if we should grant this deduction it would not of course promise us immunity from such shocks in the future. These facts certainly do not prove that there: have been no shocks of sufficient magnitude to cause: great destruction to our poorly constructed buildings; for, although the perched stones have the appearance of instability, they are often much more stable than even a well constructed building of five or six or more stories. While this argument certainly has much force, it is of less value than might at first sight appear; for earthquakes are peculiar in their action, and often produce much destruction in one place and leave a neighboring spot comparatively undisturbed, since the character of the rock has much to do with the violence of the shock.* Besides this, there are in the Rocky Mountains many instances of poised bowlders, rock pillars, etc., in regions where it seems almost certain that there have been earthquake shocks of considerable violence in recent times.

While the evidence from geology leads us to believe that our Eastern States and, in a much greater degree, our Western States are at any time liable to be severely shaken, though without stating definitely whether they have been or not, the record of history in the two hundred and fifty years more or less of occupancy by Europeans gives us a much more hopeful view of the case. Even history, however, does not leave us entirely free from fear, and, if it did, it could not in this In certain parts of Italy, as well as in Japan, the liable at any moment to be relieved by breaking and instance be thoroughly trustworthy, for the reason that two centuries and a half is but a short time upon which to base an opinion upon the behavior of

> Leaving out of consideration the Mexican and West Indian earthquake shocks, there have been in the region east of the Rockies only three really notable earthquakes in the last two hundred and fifty years, and neither of these, unless it be that of New Madrid, was a really violent shock, although either would today produce much destruction if it were to occur in the neighborhood of our large cities.

> The first of these shocks was the Newburg earthquake, which shook up the region about Boston in the early part of the 18th century, but apparently caused more alarm because of the remarkable bellowing noise which accompanied it than by reason of its destructiveness. While very little damage was done to life and property, it nevertheless served to convince the good Puritans of the instability of the earth and to give to the devout ministers of the Gospel very telling texts. which, however, were not very scientific, since the devil himself was supposed to be the cause of all the uproar and disturbance; and upon this premise the arguments for reform were based. It is probable that a repetition of this earthquake to-day would be very destructive, for the one or two story wooden and log houses of our forefathers are now replaced by high edifices of brick and very weak mortar.

> In 1812 there occurred at New Madrid, in the Mississippi valley, an earthquake the effects of which are still to be seen in a large area of country which became transformed into a shallow lake and which is called in consequence the "Sunk County." Only a few frontiersmen occupied the region at the time, so that we have very little record of the actual condition of affairs; but enough was learned from these and by subsequent studies to show that the region was very and in this respect the earthquake is remarkable as an instance of this phenomenon which is common in volcanic regions, but rare far away from volcanoes.

> The third earthquake, that of Charleston, in 1886, is too recent to call for any description. It is to be noted, however, that there have been other shocks in this region, notably in 1812; but neither of these is to be considered as a violent earthquake, although the character of the buildings in Charleston was such as to give to the last shock trail which tended to make the effect disastrous. The shock was sufficiently violent

^{*} It is usually the case that the greatest destruction occurs on alluvial ground, probably chiefly because of its porosity and its ability to be fractured and compacted.

[†]The earthquakes of the Cordilleras and of California will not be considered, and it is of course understood that for a portion of the two centuries and a half we have had no record of events in the Mississippi

to throw an engine from the track, and to throw down many buildings and destroy some lives; but every year records more violent shocks than this one, in some parts of the earth.

What would happen in New York City if one of these shocks, or, perchance, a more severe one, should be repeated there? It is enough to fill one with alarm to think of the possibilities. Huge, top-heavy church steeples, mammoth buildings with projecting cornices, tumble-down structures, which even now, without the aid of an earth jarring, collapse and destroy human sife—all of these stand ready to be used as death-dealing instruments whenever capricious nature causes a slight movement of the rock in that neighborhood. The occurrence of an earthquake in New York like that which occurred in the prefecture of Gifu, in Japan, a little over a year ago, or like that of Lisbon, in 1755, would remove the city from the face of the earth. This may never come—but, again, it may. Are we doing right in defying nature? We take our chances, and the chances are, it may be said, against any such dire calamity; but, if it should come, and it may, what

If one will examine photographs of the Charleston earthquake, he will notice that the effects of the shock were very different upon adjoining buildings. Some buildings were completely wrecked, while their neighbors were scarcely strained; and, if one will examine the reasons for this, he will find that in most cases it was a question of mortar. Moreover, the buildings which were oldest were apt to be least disturbed—our predecessors used better mortar than we do. The same thing is noticed in the recent earthquake in Japan. The modern pottery and tile buildings were badly wrecked and destroyed, but the old temple of Nagoya stood, and was only slightly damaged.

Our engineering schools instruct their students in the difference between good and bad mortar, and our architects and builders know full well which is good linder of the balance wheel at an average rate of 8,000 through the thickened atmosphere, radiating light and which is bad; but the all-powerful dollar is the thing striven for, and immediate utility is sought after at the expense of strength and permanency. State and national laws are enacted and private rights set aside to prevent the landing of a cholera germ, which and are effected in little equal jumps, the number of might be the means of killing a few thousand people mostly undesirable citizens; but there is practically no protection from falling buildings. A building is condemned, it is repaired, perhaps by painting and the placing of a few timbers; it collapses, an investigation follows, some one is to blame, but no one is found not been destroyed prematurely, must undergo a guilty, and so we are any of us liable to walk into a death trap. The man who first built the building is to sand million of the little jumps that we have spoken blame; those who allow it to remain standing are almost as much to blame; but they reap the reward; some innocent persons suffer loss of life or limb. An tions such as the chronograph and watches giving earthquake shock would effectually raze these to the the date and repeating the minutes, we remain asground, and with an effect, reckoned in loss of life, compared with which a plague of cholera would be but nothing. I sincerely trust that we shall not have the lesson of proper and sensible methods of construction forced upon us in this disastrous manner; but we may.

The Schuylkill Valley.

At the recent meeting of the American Institute of Mining Engineers, at Reading, Pa., the president, Mr. John Birkint ine, took for his subject "The Industrial first made in Pennsylvania in 1692, and the first successful iron enterprises were the Bloomery forge, 1716, and the Coalbrookdale blast furnace, 1720. In 1731 pig iron was sold at the latter furnace for £5 10s. per ton. From 1720 to 1740 a number of furnaces and forges were established in this district. The Warwick furnace was built in 1738, and remained active for 130 years. It was 32 ft. high, with a bosh 71/6 ft. to 9 ft. diameter, blown with wooden bellows, and producing twenty-five to thirty or even forty tons of iron per

The present Warwick furnace—referred to later on is 70 ft. high, 16 ft. diameter at the bosh, and averages 750 tons—maximum, 875 tons—of pig iron per week. in other words, a one horse power would suffice to run figures at 87,724 miles; while the eleventh census figures With the remodeled furnace, powerful blowing engines, and new hot blast stoves, still better results are anticiexist on the globe. And, again, it is the escapement give the astonishing total of 163,597 miles. The following shows the mileage of the stores pated. None of the present industries are over fifty that consumes the greater part of such power. In years old. The Pottstown Iron Co.'s works have grown fact, the escapement wheel sets itself rapidly in mofrom a small plant, employing 200 men, to one which tion and undergoes an abrupt stoppage, which, acnow requires 2,000 men to operate its blast furnaces, steel works, rolling mills, etc., and turns out about 1,000 tons of product daily. These works were pioneers in commercially manufacturing fertilizers from slag. At Birdsboro a forge was established in 1740, and one uncoiling of the hair spring also occasion losses. What of the first rolling mills in the country, and a nail factory, were in operation before the revolutionary war. In this neighborhood is the Cornwall charcoal furnace, 150 years old, the oldest now standing in the country, and near it is the Cornwall bed of soft, magnetic iron about, per day.—La Nature. ore, from which 12,000,000 tons have been taken out. Near Pottsville was the furnace which first introduced the hot blast, and first successfully produced anthracite | day time at San Diego, Cal. A California correspondpig iron, and also the first American blast furnace in ent writes that he was one of many who witnessed the continual operation on anthracite fuel alone for three months.

The practicability of the use of anthracite coal in in one's eyes.

place of charcoal was proved in 1840 by Mr. David Thomas, the first president of the Institute, and the use of bituminous coal naturally followed. Anthracite coal was not shipped in any quantity until 1820, but the output of the Pennsylvania anthracite fields has now grown to exceed 40,000,000 gross tons per annum, for the mining of which \$40,000,000 per year are paid in wages. The Pottsville shaft is 1,586 ft. deep, but this is kept in reserve, and no mining is done. The collieries now at work go as deep as 900 ft., and some produce 375,000 to 450,000 tons of coal per annum, having coal breakers which cost \$75,000 each, and can handle 2,000 tons of coal. There are nine veins of coal, six of which are persistent, and have a thickness of 6 ft. to 33 ft., while the Mammoth vein occasionally exceeds 100 ft. in thickness. The resources of the Schuylkill Valley appear to be far from exhaustion. The annual production approximates 15,000,000 tons of anthracite coal, 600,000 tons of pig metal, and an equal amount of rolled iron and steel, much of which is converted into bridges, roofs, machinery, stoves, hardware, etc., and to these must be added the glass, paper, textile, and other industries, which render this one of the most important mining, manufacturing and industrial districts of the United States.

Statistics of the Running of a Watch.

Watches were formerly highly esteemed, and the greatest care was taken of them, but since they have causes of destruction (falls, dust, sudden changes of compared with any sort of a machine, an ordinary escapement, whose wheel strikes the anchor or the cvblows per hour (with differences of from 3,000 to 4,000, according to the system). Another gearing retards the motion transmitted to the hour hand in the ratio of 12 to 1. All the motions of the watch are discontinuous, which exceeds two hundred million a year in certain watches. Those who are careful about preserving their watches have them cleaned every two years, that is to say, after 300 or 400 million impacts. At the end of twenty years a well made watch, and one that has change of a few pinions, but it is after several thouof, and after the escapement wheel has made tens of millions of revolutions. If to this we add complicatounded at their possibility. As for the distance traveled by the exterior of the balance, that is so unexpected that all our readers, we think, will admit the result only after having verified the calculation.

The balance of a 19 line watch measures on an average 0.66 of an inch in diameter upon the regulating screws. It makes 5 oscillations of one revolution and a half per second, say a travel of 15.5 inches per second, 20 miles per day and 7,500 miles per year in round numbers. Now watches that give the perpetual date are Progress of the Schuylkill Valley Region." Iron was provided with a wheel that makes one revolution in four years. During this time the balance will have made the tour of the world. The small amount of power utilized for the running of a watch is no less extraordinary. According to the Journal Suisse d'Horlogerie, a watch spring weighing 30 grains is capable of running a watch forty hours. At the rate of 72.5 foot pounds available per pound of steel we shall have 0.29 foot pound for forty hours, or 0.00725 foot pound per hour. One horse power develops in one hour $543.75 \times 3,600 = 1,957,500$ f. p. A watch requires then,

$$\frac{0.00725}{-1,957,500} = \frac{7.25}{1,957,500,000} \text{ f. p.}$$

cording to the principle enunciated by Lazare Carnot, always occasions a loss of live power, or, as we would say to-day, a waste of energy. The resistance of the air to the motion of the balance and the coiling and remains for the gearing and the arbors? Not much, assuredly. And all this mechanism, placed under various conditions of position, temperature and air pressure, manages to run at less than a second variation,

phenomenon, and says it was especially noticeable, as 22; Asia, 18,798, of which British India supplied 15,837; the planet could be seen with the sun almost shining Japan, 907; China proper, 124; Africa, 3,992; Aus-

Correspondence.

Another Brooks Comet.

To the Editor of the Scientific American:

On the morning of November 19 I discovered a new comet, in the constellation Virgo. The discovery position was right ascension, 12 hours 56 minutes 40 seconds; declination, north, 12° 59'. Motion, slowly northeast. The comet can be seen in telescopes of WILLIAM R. BROOKS. moderate size.

Smith Observatory, Geneva, N. Y., Nov. 25, 1892.

Fog Lighting in London.

A good deal of silly talk has been heard of late from various quarters respecting the imminent decadence of the metropolitan gas industry; and some of the trade union leaders in particular have tried to make out that there is less employment to be had in gasworks than heretofore, on account of the imaginary falling off in the consumption of gas. All this airy nonsense disappears at the first touch of such a reality as that which recent meteorological influences have put in evidence. A downright dingy, dirty, wretched week of weather, such as we seem to get in London more frequently than ever, makes everybody fly to gas for light and comfort. Not only in the streets, but in the railway stations, when it becomes a question of carrying on business under the worst conditions, the "light of luxury" is left become cheap, they are ruthlessly submitted to all alone; and the reliable friend of the townsman is brought forward as though nothing else had ever been temperature, magnetism, etc.), and the owners are heard of. Although the experience is not a very enjoysometimes astonished at their refusal to run. Yet, as able one, it is instructive to make a pilgrimage through a mile or two of the most frequented of the London watch is a marvel. A few figures will make this un-thoroughfares when at midday it is impossible to see derstood. The spring actuates the barrel, the motion | across the street. Here and there a huge industrial or of which is transmitted through three wheels to the, commercial establishment—a printing house or factory for the manufacture of fancy goods—looms grandly from roof to basement.

The best effect, however, is produced by the shops wherein high power recuperative lamps are hung over the doors, or along the front, or where clustered Argands or flat-flame burners strongly illuminate the goods exposed in the windows. These places irradiate the neighborhood in a style unapproachable by other means. As for the wider street crossings and the railway yards, one longs, in the absence of a sufficiency of high-power gas lamps, for a few good "flares" of the Lucigen type. The sparse electric arcs are utterly ineffective at such times. They seem lost in the upper air; and a curious effect is produced by the unusual prominence of the glowing carbon spark, which gives the most powerful arc the aspect of a rather poor incandescent lamp. As to the latter, their lower tone helps them to penetrate the air that enwraps them like a dirty blanket; but the pleasant fiction about a nominal 8-candle lamp being to all intents and purposes equal to a flat-flame gas burner is utterly demolished by the inconsiderate atmosphere. All these are old truths; but it is just as well to keep them in the front when occasion serves.—Jour. of Gas Lighting.

Railroads of the World.

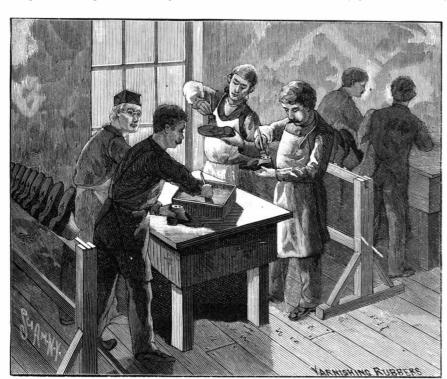
The Census Office has issued a bulletin giving statistics of the railway mileage of the world in 1890. It shows that out of a total railway mileage for the world of 370,281 miles the United States have no less than 163,597 miles, or 44.18 per cent of the whole, and that the railway mileage of the United States exceeds by 3,493 miles the entire mileage of the Old World, Europe's 136,865 miles, Asia's 18,793 miles, and Africa's 3,992 miles making an aggregate of but 159,655 miles. It is interesting to note the astonishing growth of the railway mileage of the United States from the census year of 1830, when there were less than 40 miles of railways, up to 1890. In 1840 the figures were 2,755 miles; in 1850 they had risen to 8,571 miles; in 1860 the total had swelled to 28,919 miles. The census of 1870 showed the mileage to be 49.168 miles: that of 1880 placed the

The following shows the mileage of the world by countries: Germany, 25,969 miles; Austria and Hungary, including Bosnia, 16,467; Great Britain and Ireland, 19,939; France, 22,586; Russia, including Finland, 18,728; Italy, 8,117; Belgium, 3,218; Netherlands, 1,887; Switzerland, 1,929; Spain, 6,127; Portugal, 1,280; Denmark, 1,223; Norway, 971; Sweden, 4,915; Roumania, 1,580; Servia, 327; Greece, 440; Turkey in Europe, Bulgaria, and Roumelia, 1,097; Malta, Jersey, and Man. 68: United States, 163,597; British America, (Canada), 13,322; Newfoundland, 115; Central America (Guatemala, Salvador, Costa Rica, Nicaragua, and Honduras), 559; Mexico, 5,344; United States of Colombia, 231; Cuba, 1,056; Venezuela, 441; Republic of San Domingo (eastern part of the island of Hayti), 71; In August last the planet Venus was visible in the Puerto Rico, 11; Brazil, 5,779; Argentine Republic, 5,129; Paraguay, 149; Uruguay, 470; Chile, 1,926; Peru, 994; Bolivia, 106; Ecuador, 167; British Guiana, tralia, 11,137.

MANUFACTURE OF RUBBER SHOES.

BY B. G. UNDERWOOD.

in spirits of turpentine, though this does not seem to twenty pairs of rubbers, the magnitude of these orders



have led to any practical results. In 1813 a patent was | twice the size, containing about 700 pounds each. The issued in this country to J. F. Hummel, of Philadelphia, for a varnish of gum elastic. In 1831, George H. Richards, of Washington, D. C., received a patent for a fluid caoutchouc and soon afterward Edwin M. Chaffee, of Roxbury, Mass., and others established the pieces are cut Roxbury India Rubber Company, which was chartered in 1833 and was the first company organized in the United States to manufacture caoutchouc into suitable for the waterproof clothing.

Charles Goodyear, in 1835, after devoting much time to experiments, took out his first patent. In 1839 he took out a patent for the sulphuring process, which would have been of little value without the subsequent improvements which he made. The sulphur imparted an offensive odor and did not prevent the rubber from hardening in cold weather. Experiments convinced him that the application of considerable heat would cause the sulphured article to be pliant in cold weather and to increase its elasticity in all temperatures, and the result was his patent issued in June, 1844, which was reissued in 1849, extended in 1858, and again reissued in 1860.

The history of the Boston Rubber Shoe Company, whose plant furnishes us with the accompanying illustrations, is a remarkable one. The company was organized in 1853 and Elisha S. Converse was chosen corrugated treasurer and manager, a position which he has occupied ever since; and to his foresight and ability the company owes its present position, having the largest plant for the manufacture of rubber boots and shoes in the world. The two factories in Malden and Mel-leaves the rose give employment to 3,000 people and turn out sheet smoother 45,000 pairs daily. The Malden factory was burned in 1875, rebuilt in 1876, and in 1882 the Melrose factory was constructed. The number of employes in each is about the same, but in the Malden factory, which is known as factory No. 1, all of the odd sizes are made, the machine shops are located, new designs are perfected, steel rolls engraved and all the miscellaneous work done.

The orders received by this company from its customers run into very large figures. Orders for 15,000 The many good qualities of caoutchouc, or India cases of goods are common, and to-day they have rubber, have been known for a great many years. In several orders on their books for 25,000 cases and one 1791, Samuel Peal obtained a patent in England for order for 30,000 cases. When it is understood that a waterproofing fabrics by means of this gum dissolved freight car will hold 500 cases and a case averages

> will be appreciated, and they have shipped in single orders at one time twenty freight cars to one party in San Francisco and one to Minneapolis, and filled one order recently which filled thirtytwo freight cars and contained 320,000 pairs of rubber goods.

There is enough interesting machinery used in the preparation and manufacture of rubber into boots and shoes to fill this entire paper, and it has been difficult for our artist, in the limited space at his disposal, to select material, but we think the illustrations will fairly represent some of the many processes employed in the manufacture of these articles.

The crude rubber as received from Para, which furnishes the finest grades, is packed in large wooden boxes $4 \times 2 \times 1\frac{1}{2}$ feet, containing about 350 pounds each, and the second grade in boxes

boxes are filled with crude rubber, the pieces being in every possible shape, weighing from 1 to 75 pounds. is shown in the cut at the top of the page, the original be kept apart, as they adhere to each other if brought

by a circular knife to sizes cracking machine. It passes a number of times through these washers, water and steam being sprayed in the rubber during the operation, until it is sheeted in sheets of about 1-16 of an inch thick, first passing through a machine with rolls, and finally through one | with smooth rolls, which and thinner.

The grinding machines have a capacity of about 1,000 in contact. The soles are nearly all cut by hand. This pounds a day, and will handle from 10,000 to 14,000 requires skilled labor, as they are all beveled. A man pounds of fine Para rubber a day, or from 8,000 to 10,000 pounds of the coarser grades.

From the grinding room the sheets of rubber are taken to the mixing room, where they are mixed with

ness, or the right thickness for the uppers of rubbers so largely used.

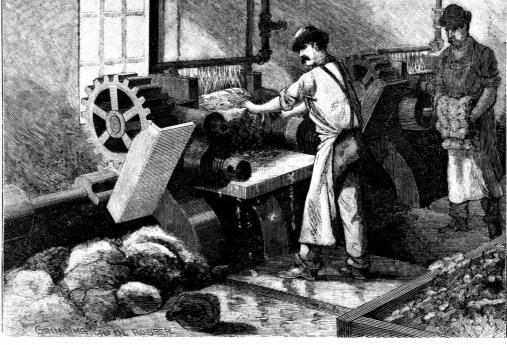
The cloth-calendering machine, which is shown on this page, backs the large roll of cloth, which is seen in the engraving, with rubber. This material is used for lining rubber shoes. The machine has great power, and turns out about ten yards a minute from a roll which is 1¼ yards in width.

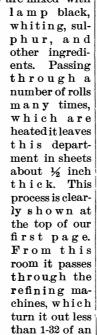
For rolling sheet rubber for boot vamps, it is necessary to run in several thicknesses. This work is done in another rolling machine, which we have not space to show, and the finished rubber sheets are carried by an endless belt into the story above. The this shoets of rubber are stamped by circular steel rolls, on which the pattern is engraved so as to mark the sheets for cutting uppers, which is done in another room.

Rubber boots and shoes could not be made without piping, which is used to hold the different pieces in place. This is cut in strips 18 inches long by 1 inch in width, and 42 of these strips are placed so as to lap over each other, making a width of 10 inches, by an automatic machine. There is nothing that piping will not hold, and we meet this indispensable necessity at all stages of rubber boot and shoe making.

The heel-cutting machine shown on front page takes in solid rubber sheets about one yard square, one inch in thickness, weighing about 90 pounds to the sheet, and from each sheet can be cut from 100 to 230 pairs of heels. The heel-pressing machine shown on front page works by hydraulic pressure of 1,000 pounds to square inch and holds 25 heels. They are subjected to this pressure from 7 to 8 minutes, with from 85 to 90 pounds of steam, and leave the press with the name and number stamped on the bottom, and so nearly finished that only a little trimming is needed about the upper edge before being attached to rubber boots.

The rubber sheets for cutting soles (see first page) vary from 1/8 to 1/3 of an inch in thickness and are a little over a yard in length. It will be noticed that piles of thin wooden boards are shown in nearly every illus-Before going to the washing machine, or cracker, which | tration. This is necessary, as the rubber sheets must



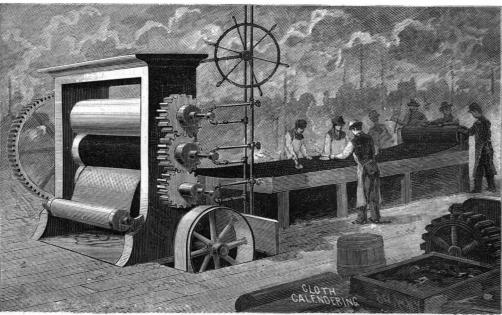


will cut from 900 to 1,000 pairs a day.

Sole rolling is done by a machine shown on front page. This stamps, at the same time, the pattern shown in the bottom of rubbers. The strips each contain soles for ten rubbers, and are placed on thin wooden boards, and are then carried on trucks to the sole-cutting room. There are about thirty different other ingredi- patterns, and sixteen sizes are made from each pattern; ents. Passing but the same pattern can be used for all the different through a sizes. The uppers are cut by hand, with a die and number of rolls mallet, as shown on front page. The average daily many times, capacity of the cutters is from 600 to 700 pairs.

We have only space to show in our illustrations one branch of the actual manufacture of rubber boots and shoes, and we have selected that known as storm slippers, which have recently come into such general use. This slipper was designed by Mr. E. F. Bickford, general superintendent of the company, and the number made of this one brand in 1891 was 800,000 pairs. ly shown at We also give the patterns used in making these slippers. The shoemakers, as the girls are called, make from thirty to thirty-six pairs a day.

Iron cars for carrying rubber goods hold from 210 to 500 pairs, depending upon the size of the manufactured through the goods. The slats holding the rubbers after varnishing refining ma- (see illustration) are placed in these cars, which are chines, which run into the vulcanizing ovens, where they remain in turn it out less a temperature of from 140 to 180 degrees for a period than 1-32 of an of six to seven hours, when the goods are finished, and, inch in thick- after a thorough inspection, are carefully boxed and



MANUFACTURE OF RUBBER SHOES

packed, and can be purchased not only in every village and city of this country, but in most of the cities of Europe.

THE SOUTHERN COTTON HARVESTER.

One of the subjects of invention which seem to have baffied inventors for many years is a practical cotton harvester. The cotton crop is a peculiar one, presenting the necessity of dealing with the delicate fiber and at the same time with twigs, and green and ripe bolls. In harvesting cotton by hand labor, the harvest time is subdivided into three different periods, the first of the crop being gathered from the lower portions of the plant, the second part of the crop being gathered from the central portion, and the third part from the upper portion of the plant. It will thus be seen that the problem is a complicated one, and it is not strange that there should be many failures before cotton harvesting by machinery becomes a commercial success.

To a large extent, cotton planters in the South have been hampered by the difficulty in obtaining labor at the right time, and, as a result, serious losses have followed; but at length a machine has been perfected which reduces cotton harvesting to a certainty. To run this machine, two men and a single team are re- disaster was the branching out beyond a legitimate quired. It will harvest from 5,000 to 6,000 pounds of business, in the taking hold of this and that tempting courage traffic, the directors had made the fare ex-

Stick to a Legitimate Business.

Well directed energy and enterprise are the life of American progress, and safety lies in sticking to a legitimate business. No man—manufacturer, trader, or banker—has any moral right to be so energetic and enterprising as to take from his legitimate business the capital which it requires to meet an emergency.

Apologies are sometimes made for firms who have failed, by recurring to the important experiments they have aided, and the unnumbered fields of enterprise where they have freely scattered their money. We are told that individual losses sustained by those failures will be as nothing compared with the benefits conferred on the community by their liberality in contributing to every public work. There is little force in such reasoning. A man's relations to a creditor are vastly different from his relations to what is called the public. The demands of the one are definite, the claims of the other are just what the ambition of the man may make them.

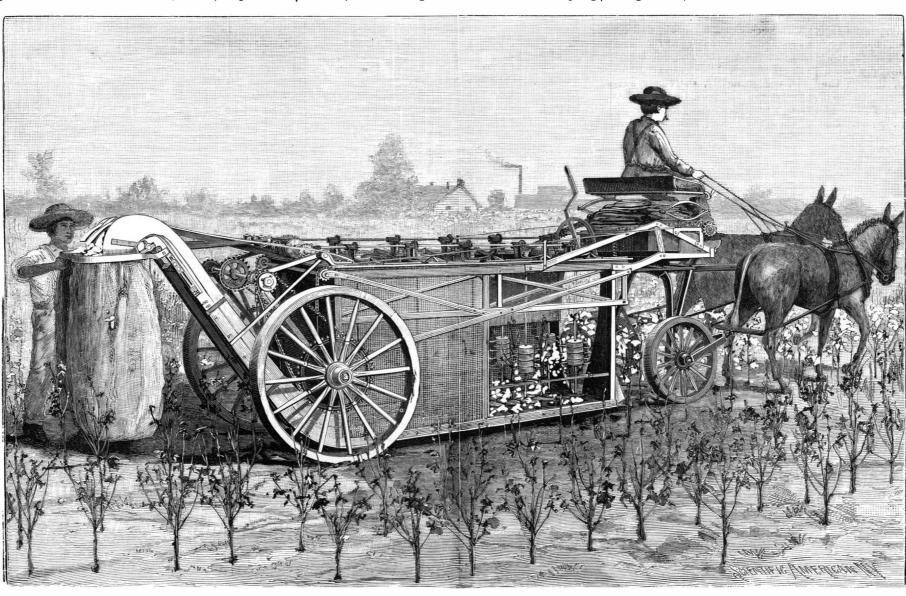
The histories of honorably successful business men unite to exalt the importance of sticking to a legitimate business; and it is most instructive to see that, in the greater portion of the failures, the real cause of

ing through a Virginia, or Ohio, or Indiana, or Kansas highway after a rain, or when the frost is coming out of the ground. Indeed, it is not necessary to make any invidious distinction in favor of any of the States, for the mud of Connecticut or New York, or the sand of Southern Massachusetts or New Jersey, have little to fear, as regards capacity for retarding locomotion, by comparison with the loam of the Mississippi Valley.-Amer. Architect.

A Trip to a Fixed Star.

Dr. David Gill, lecturing recently on "Fixed Stars," hit upon the following adroit method to illustrate the distance to Centauri. The doctor said, as reported in the Boston Globe:

"We shall suppose that some wealthy directors, for want of outlet for their energy and capital, construct a railway to Centauri. We shall neglect, for the present, the engineering difficulties—a mere detail—and suppose them overcome and the railway open for traffic. We shall go further, and suppose that the directors have found the construction of such a railway to have been peculiarly easy, and that the proprietors of interstellar space had not been exorbitant in their terms for right of way. Therefore, with a view to en-



A NEW COTTON HARVESTER.

cotton per day at a cost of \$3 to \$4, as against forty | offer, and, for the sake of some great gain, venturing | ceedingly moderate, viz., first-class at two cents per 100 of \$30. This machine, which is the subject of our engraving, is so simple as to hardly require an explanation. A general description will render its construction and operation clear.

nary wagon gear and inclosed in wire cloth. Within of posterity, for his untiring efforts in favor of the im- the national debt of England, which just covers the the frame are journaled two series of vertical shafts, provement of American roads. We need not repeat upon which are placed beaters having spring arms. Through the bottom of the frame extends a slot, through which the stalks of the cotton plants pass. In the bottom of the frame are arranged conveyors which carry the cotton beaten from the plant rearwardly and upwardly, and deliver it to bags attached to the elevators at the rear of the machine. The slot | it is hard for us, accustomed to the old system, to reathrough which the stalks pass is furnished with series of swinging plates which open only as the stalks pass, thereby keeping the bottom of the machine closed and retaining all of the cotton detached from the plants. The beaters are made adjustable, so that they can be placed at a suitable height to engage the ripe bolls as the machine passes along. One of these machines has been in operation this season in Alabama, yielding the results we have described above.

The New York office of the Southern Cotton Har vesting Company is located at 319 Broadway.

Mr. Isaac Blum is president of the company, and we are informed that Mr. L. R. Turner has been largely instrumental in bringing the machine to perfection.

men picking not over 150 pounds each perday at a cost | where they did not know the ground, and could not foresee the pitfall.

Let Us Have Good Roads.

Colonel Albert A. Pope deserves the thanks of the The machine consists of a frame suspended on ordi- present generation, and will undoubtedly receive those what has been often said here and elsewhere, that the crying need of our country is decent ordinary roads. over which the farmer can haul his produce to market and the city merchant can distribute his goods to his circle of rural or suburban customers with economy, speed, and convenience. As with all inveterate evils, lize the difference which a better one would make in our condition. The number of horses and mules owned in the United States is about sixteen million, and the cost of keeping them is probably not less than two hundred million dollars a year. It is found, by hundreds of experiments, that one horse, working all day, and day after day, can do as much work on a good macadamized road as eight horses can on a road covered with gravel from four to six inches deep, as is usually the case with suburban roads after the annual repairing. Now, bad as are these repaired suburban roads, every person of experience will acknowledge that the labor of pulling a vehicle over them is as

miles. Desiring to take advantage of these facilities, a gentleman, by way of providing himself with small change for the journey, buys up the national debt of England and a few other countries, and, presenting himself at the office, demands a first-class single to Centauri. For this he tenders in payment the scrip of cost of his ticket; but at this time the national debt from little wars had been run up from \$3,500,000,000 to 55,500,000,000. Having taken his seat, it occurred to him to ask: 'At what rate do you travel?' 'Sixty miles an hour, sir, including stoppages,' is the answer. 'Then when shall we reach Centauri?' 'In 48.663.000 years, sir.'"

Manufacture of Cod Liver Oil.

The process of manufacturing cod liver oil at Portugal Cove, Newfoundland, is as follows: It requires, as a rule, 2½ gallons of liver to produce a gallon of oil. The livers are first carefully washed, and must then be "cooked" at once. For this process they are first put into a large tin boiler, which is plunged into a large iron boiler filled with hot water, the water not being allowed to touch the livers, which are thus gently steamed till a quantity of oil is floating on the surface. This is dipped out and filtered through bags of moleskin. The last filtration leaves the oil perfectly transparent, and without any unpleasant taste or smell. nothing in comparison with that involved in wallow- The oil is exported in 60 gallon casks.

Trees in French Cities.

One of the chief beauties of the larger French cities, and second only to their magnificent edifices and monuments, are the trees

The almost interminable vistas of chestnuts and acacias stretching along the broad and superbly paved avenues as far as the eye can reach, their bending ous acid, which is extracted. The sweating lasts Kauri, for instance, if added in too great proportions branches almost touching one another in one endless arch of verdure, form not only a delightful perspective for the eye of resident and visitor alike, but serve to add beauty to cities already beautiful, and grace and symmetry to whatever might be harsh and forbidding.

It must not be presumed, however, that the existence of this veritable rus in urbe is the result of Nature's handiwork alone, for science and art have each in turn lent their aid in converting these great centers into tremendous forest gardens.

In short, the planting as well as the maintenance of the trees in French cities is an item of no little import in the annual budget prepared by the municipal council. Nor does this body look upon their preservation as a matter of less consequence than the repairing of its roadways or the lighting of its streets.

The climate and soil of France are not suited to the nurture and growth of every sort of tree; so that those chosen to line the avenues and boulevards of her cities must be selected with no little judgment.

Chestnuts thrive wondrously. They grow well on a not too rich or generous soil, but require at the same time frequent watering at the roots. The elm is also a favorite tree with the professional landscape gardeners, though they are, unfortunately, extremely susceptible to the destructive work of worms and insects. Maples grow slowly, but they are hardy and strong in the end. Add to these the acacia, the linden, the sycamore, the oak and the buttonwood, and the list of trees that live and thrive to advantage in the great Continental cities approaches completion.

France imports a great many of her fruit as well as shade trees, and the utmost precaution is taken as to where these shall be planted. Handfuls of earth from each and every spot where a tree is to be placed are carefully examined and analyzed. Upon ground rich and moist the trees from the United States grow best. A sandy soil is most favorable to resinous trunks, and so on in proportion to the teachings of science and arboriculture.

In squares and parks, though more especially along the principal thoroughfares, where the trees are planted about twenty feet apart, particular attention is given to the replacing of the dead or dying by healthy trees of the same species. In this way the line of perspective is never broken, nor is the vision repelled by the absence of a single trunk.

It would seem that a great many American cities, with their tremendous expanse of stone, brick and iron facades, might profit in the provision of shade and verdure by the example set by the cities of France. Sidewalk locomotion would be facilitated in the summer months by equal protection from the sun's rays on both sides of the street, while grace combined with genuine utility would serve to make the avenues as attractive, perhaps, as some of them are now forbid-

Charles Kingsley, the great essayist, if I mistake not, is authority for the statement that verdure is just as essential to life as air itself, and that the kitchen garden of the laborer goes as much to add a touch of sunshine to his moral being as a bunch of roses to an invalid or the royal park to the Queen of England. The proof of the theory, which is a truer one than may at first appear, is in the witnessing of the crowds of poor that flock in summer time to any spot where grass and foliage exist. The French know this. They plant trees and lay out flower beds in every available corner within their cities' boundaries, while the benefit wrought thereby is too self-evident to demand in-HORACE G. KNOWLES.

United States Consulate, Bordeaux.

Iron Cinder Paint

Sahlin, the cinder from puddling and excandescent however, is capable of absorbing a great quantity of tained from this source, while being of good enough iron furnaces can be converted into red paint of more or less body. The difficulty consists in reducing the cinder to a sufficiently fine powder; this is effected by means of a Blake crusher and a Cyclone pulverizer. The result of the operation would be to obtain 40 per cent of cinder in a state in which it can be put into fine paint, simply mixed with the ordinary oil mixture. The remaining 60 per cent can still be utilized as a coarser dark red paint, such as is used by the railway companies to preserve iron and steel from oxidizing. The treatment of the cinder is as follows: To 1,000 kilogs, of cinder crushed so as to enable it to pass through a sieve of 100 perforations to the square centimeter add 170 to 200 kilogs, of sulphuric acid of 66° B., destroyed, and the same effect will be produced upon Further work has been abandoned, and the hope of the quantity of acid being in proportion to the lighter or darker shades of paint required. This mixture is that this fluid be carefully tested before use. Some Wells will be sunk on the mainland fourteen miles worked first by hand, and then in a mechanical mixer; manufacturers make a varnish for rubber boots and from the city, and water brought across the bay by when the compound is thoroughly well mixed, it is put shoes of the oil alone boiled to the proper consistency, means of iron pipes. The estimated cost for this work into a bin and there allowed to sweat. This chemical while others add various driers and certain gums. It is \$800,000.

or 155°. The cinder consists principally of silicate of manufacturers to examine carefully the various gums protoxide of iron, and the sulphuric acid eliminates the used in the regular varnishes to see if a certain performed. If this is calcined by the admission of air, it give an added brilliancy and a better durability. Of is converted into free sesquioxide of iron and sulphur-course this amount would naturally be very small, as about four days, and then shows itself accompanied by exhalations of steam and a greenish discoloration of the powdered cinder. As soon as the reaction ceases each of the retorts of the calcination oven is filled with 220 kilogs, of the mass. The fire of the oven is fed with raw petroleum and compressed air. The retorts are raised to a cherry red heat, and the cinder during the calcination is removed in order to bring it as much as possible into contact with the air, so that the oxidation may be rapid. In three or four hours the dark and heavy cinder is converted into a red, light and Many of the goods when they come out of the heater somewhat doughy mass. If, after being analyzed with reactive paper, the acid is found to be completely volatilized, the cinder is allowed to get cold and is then pulverized in a Cyclone pulverizer. The only difference in the pulverization is that all it produces is now reduced to a powder sufficiently fine for the most delicate paint without leaving any residuum. The pulverizer reduces 360 kilogs, of calcined cinder per hour, and produces an excellent paint, the graduation of color of which rests with the operator, according to the quantity of sulphuric acid used in the preliminary operation.—Colliery Guardian, from the Revista Mi-

Rubber Varnish. BY RALPH W. GRAY.

The varnish business, like the manufacture of rubber goods, is what is known as a secret business. There are in the United States about a hundred factories devoted to the manufacture of varnishes for furniture, carriage, and house work, with a few that devote their energies to manufacturing fine goods for artists. The use of varnish primarily is to give luster and durability to whatever it covers. In India rubber work the varnish is put on not alone to add durability, but to prevent the efflorescence of the sulphur. The bases of most varnishes are linseed oil and spirits of turpentine, but to those that are to be used on hard surfaces where a special luster is required certain gums are added to give brilliancy and hardness. These gums are all of the resin families, the best being the hard fossil gums known as Kauri and Zanzibar gums. Cer-

tain varnishes are made from amber and a fine var-

nish is also made from celluloid. The more elastic a

varnish is to be, the smaller the percentage of gum

that is put into it. It follows, therefore, that in mak-

ing rubber varnishes little or no gum is used.

As the bulk of rubber varnish is made of linseed oil, the secret of the business would naturally lie in its preparation. Many of the rubber factories have in connection with their plant a small brick building where is set a large caldron in which the oil is boiled. The operation is more or less attended with danger from fire, and it is therefore conducted at some distance from the main building. Considerable skill is acquired by the men who have charge of manufacturing the varnish, and as a rule those who are expert in this line do nothing else, and they receive good wages. This is just, as they incur considerable peril, many accidents having occurred in which the laborers have been badly injured.

The oil, after having been boiled to the proper consistency, either with or without the addition of a certain percentage of sulphur, Prussian blue, or resin, is taken in the light, clear pasty mass to the varnishing rooms, where it is thinned with spirits of turpentine and applied to the goods by means of brushes. There are no special tests for the quality of varnish, the ordinary way of examining it being to spread a thin film upon a piece of glass and to look through it toward the light, with a view of examining its clearness. Often the piece of glass is put in the sunlight, where the film will dry, and allowed to stand for a been bored at Galveston, Texas. The water supply of A first class varnish during this period should According to a memoir recently published by Mr. A. not shrink largely, nor should it crack. Linseed oil, ing in depth from 825 to 1,350 feet. The water oboxygen, and unless carefully and skillfully boiled, will quality for fire and manufacturing purposes, is totally continue the process and crack.

ing of linseed oil, but it is likely that the subject will investment of \$75,000 in an attempt to obtain a good be investigated thoroughly before long, with the water supply, and therefore the artesian well was means that are now within reach of the modern chemist. As linseed oil itself is a powerful oxidizer, casing. Inside of this a 15 inch pipe extends to a those who purchase it for use in varnish are very par- depth of 870 feet. Next a 12 inch pipe extends to a ticular in getting exactly the kind they need, and will depth of 1,200 feet. A 9 inch pipe was then inserted not take chances on any brands, even if the price be to a depth of 2,363 feet, and from this depth a 5 inch considerably to their advantage. A piece of canvas pipe extends to a depth of 3,070 feet 9 inches. No spread with a linseed oil varnish that has not finished rock whatever was penetrated in reaching this depth its oxidization will in the course of time be thoroughly and the water supply sought for was not obtained. a thin rubber surface. Hence it is quite important obtaining a flow of fresh water on the island given up.

action manifests itself by a rise in temperature to 150° is a question if it would not be wise for these same weak silicic acid, and a sulphate of protoxide of iron is centage of them added to the linseed oil would not would have a tendency to crack when the goods are stretched.

> In an experiment recently tried in a large rubber factory, ten per cent of Kauri gum was added to the varnish and found to be altogether too much; three per cent, however, gave a very pleasing result and seemed to have a luster that was not shown in the regular oil varnish. Varnish for rubber work, as a rule, is applied before the goods are heated; therefore, it has the chance of additional drying during that operation. are quite sticky, but a very little airing remedies this. To-day on almost all rubber goods that are put on the market there is found to be a very fair quality of oil varnish. A good grade of rubber when covered with varnish gives a far better result than a poorer grade, as the solvent often strikes through the shoddy or poor grade rubber and appears on the cloth itself, giving a stained effect and, furthermore, materially weakening the body of the rubber. In experimenting with varnishes a variety of solvents have been tried for the purpose of cutting the boiled oil. Of these any of the hydrocarbons will answer, because they are indifferent to atmospheric action and possess great solvent power. Oil of turpentine, however, is the best, and benzine the cheapest, of the various solvents in use.—India Rubber World.

Hot Water for Hemorrhage.

Dr. Julius Scheff, Jr., of Vienna, according to the current number of Ash's Quarterly Circular, recommends strongly the use of hot water for arresting hemorrhage after tooth extraction. "We are accustomed," he writes, "to stop hemorrhage by the method that has been used for generations, viz., by the direct application of cold water to the wound. Practitioners started with the idea that heat caused expansion of and induced increased bleeding from the vessels; but, on the other hand, cold caused contraction. In an ordinary case of extraction hemorrhage from the arteria dentalis, or from the gums and periosteum, soon ceases; but it frequently happens, even when the patient does not suffer from hemophilia, that there is difficulty in arresting the flow of blood." Dr. Scheff mentions three cases occurring in his practice in each of which there was a history of profuse hemorrhage after extractions. "I allowed one patient," he says, "to take a great quantity of cold water, and yet there appeared not the slightest diminution in the bleeding. I then took a glass syringe and continuously applied hot water, in drops, to the wound, from which the blood previously trickled without cessation. After a few seconds the bleeding diminished, a coagulum was formed, and the bleeding finally ceased. With the second patient, I used hot water at once, and the flow of blood was arrested. In the third case the wound had been bleeding freely for a long time; I plugged the alveolus with iodoform gauze, and on removing the plug the wound bled afresh. I then employed hot water; the hemorrhage ceased and did not recur." Dr. Scheff applies the hot water by means of a syringe, injecting it by drops into the socket of the tooth. The arrest of hemorrhage in surgical operations by the application of heat is a recognized resource, and it would therefore seem that this principle might with advantage be applied in cases of tooth extraction, especially as the mouth is able to bear a very high temperature without inconvenience. In fact, water so hot that it causes pain when the finger is inserted in it will in many cases be tolerated in the mouth.—Lancet.

A Three Thousand Foot Well.

An artesian well over 3,000 feet deep has recently that city is furnished by thirteen unfit for drinking and domestic uses. In view of this Chemically, very little is known concerning the dry-fact, it was decided that the city was justified in the bored. The first 57 feet of the well consists of a 22 inch

JAY GOULD'S TOMB.

Perhaps the most noted financier and railway speculator of the past twenty-five years was Mr. Jay Gould, who died at his home in New York City, on December 2. The tomb erected for him several years since is shown in the accompanying illustration. It is copied after the famous Maison Carre, at Nimes, France, built some two thousand years ago, and perhaps the best preserved and most beautiful specimen of Grecian architecture in existence. Reared as it is upon a grasscovered knoll, where it commands a striking view of the surrounding country, the full beauty of the handsome marble structure, with its graceful Ionic columns, is appreciated by a beholder approaching it from any direction.

The design of the mausoleum was made by Mr. F. T. Fitz Mahony, and it cost \$80,000. It is built throughout of Westerly granite. It is 33 feet long, 22 feet wide, and 20 feet high to the apex of the roof. The technical name of the building would be a Greek hexastyle, peripteral temple. It has six columns in front and eleven columns on each side in single rows. (This is counting the corner columns twice.) Three rows of steps run up to the temple on all sides and form its

stained glass window in the back. This window, which is 6 feet high and 3 feet wide, pictures a choir of an-The roof of the mausoleum consists of granite slabs 32 feet long, each weighing fifteen tons, and so placed together that they overlap, making the roof waterproof. The whole temple weighs about 300 tons, and rests on a solid concrete foundation 8 feet

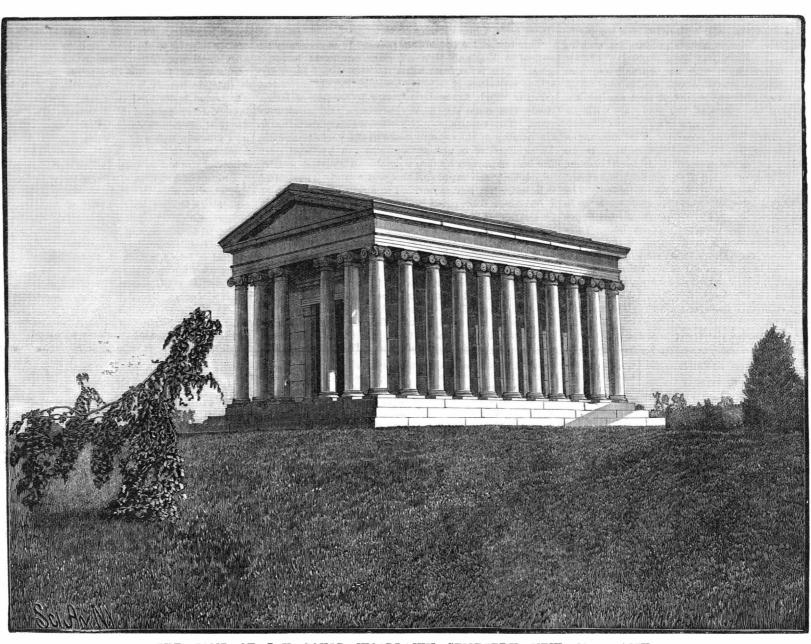
Mr. Gould was born at Roxbury, Delaware County, N. Y., on May 27, 1836, his father being a small farmer, who kept a dairy of twenty cows. As a boy it was Jay Gould's duty to drive these cows and to help his sisters in milking them. He went barefooted and Somerton and Parkland, Pa., on the Reading, which got thistles in his feet. He did not like it, and one day he told his father that he would like to go to keeping a small store in the village. The elder Gould thought his son was too young to go to school, but the son gained his consent by persistence. He soon learned drivers.—Railroad Gazette. to write a good hand, and by writing up the books of the village blacksmith at night he earned enough to take him through a small select school. After that he got a clerkship in a country store. He made himself generally useful, sweeping it out and looking after base. Between the columns and the walls of the tem- business, working from 6 o'clock in the morning until which will be an adjunct to the regular public schools,

97.3 Miles an Hour.

On Friday, November 18, engine 385 of the Central of New Jersey, the Vauclain four-cylinder compound, which several months ago made a record of 91 miles an hour, traveled a mile in 37 seconds, and two consecutive miles in 75 seconds, thus beating its own record as well as all others. This was done with a regular train of four cars, going east, between Fanwood, N. J., and Westfield, the grade being 32 feet per mile, descending. On the same trip a distance of five miles was traversed in 3 minutes 25 seconds, thus making the best record for that distance (87.8 miles an hour). This was between is the same portion of the road where so much fast running has been done heretofore. The grade here school. He was then 14 years old, and his father was is partly descending at 11 and at 37 feet per mile and partly level. This engine, No. 385, has four 78-inch driving wheels, weighs 62 tons, with 441 tons on the

A Manual Training School in Louisville.

The city of Louisville, Kentucky, is to have a fully equipped manual training high school for whites,



THE TOMB OF JAY GOULD, WOODLAWN CEMETERY, NEW YORK CITY.

ple is a considerable space. Columns and walls are 10 at night. He had a taste for mathematics, and got and will be controlled by the school board. The school bare, without the faintest attempt at ornamentation. In the center of the row of columns facing the south time to sweep out the store. it looks as if a column had been removed to make a In a year or so he started out as a surveyor, and was proposed work are given. All teachers in the manual broad passageway. Facing this opening is the double employed to make a survey for a map of Ulster county. training department are to be graduates of some repudoor of the tomb. Each section of this door is 8 By odd pieces of luck through the summer that fol- table manual training school. No special trade will feet high and 2 feet wide, and weighs a ton. The doors are of heavy bronze, and the lower part is Afterward he made similar surveys and maps of Alpaneled and ornamented on the outside with two dragons' heads, a big iron ring swinging in the mouth of each dragon. The upper part of the doors is a fretwork of cherubs and vines, through the opening of which the interior of the crypt can be seen. The interior is 20 feet long, 7 feet wide, and 13 feet high. Its roof is a solid slab of granite, which weighs six tons. The border of the ceiling is paneled with egg and dart moulding. The floor is one plain marble slab. Along the sides of the interior are the catacombs. Of these there are twenty, ten on each side, in double rows. The rows are separated from each other by granite slabs. Each catacomb is 7½ feet long and 2½ merely incidents now, and can only be accepted as a feet wide. Between the lower end of the catacombs and the outside of the wall of the tomb is a thickness of 18 inches. The outer part of this thickness is, of course, granite, but facing the interior the walls are of light pink and cream-colored Tennessee marble,

up at 3 o'clock in the morning to study until it was and its equipment is to be the gift of Mr. A. V. Du

lowed he made \$500 out of his work as a surveyor. bany and Delaware counties, and by that time was worth \$5,000. This he invested in the tanning business, his interest in which he afterward sold, and with all his capital in cash in his pocket bought the entire issue of the first mortgage bonds of the Rutland and Washington road to Troy. They were offered in the market at ten cents on the dollar, and the investment proved exceedingly profitable. It was the commencement with him of a life of dealing in railroad securi-

The history of Mr. Gould's railroad deals and financial enterprises would fill a volume. But they are part of the great movements which went to develop grammes sulphuric acid and 100 liters of water for three his characteristics and renown. He is perhaps most widely known by his connection with the Erie Railroad from 1868 to 1872, and his participation in the is collected, washed, and dried. The product is amor-Black Friday gold excitement of September 24, 1869. highly polished. The light enters the crypt through a He left a fortune estimated at about \$75,000,000.

Pont. In the prospectus some interesting details of the be taught in the school; neither will any articles be manufactured for sale. The shop building will be 132 feet long by 60 feet wide and the school building 122 feet long by 58 feet wide, each being three stories in height. The shops are to be run by independent electric motors, driven by a dynamo actuated by an 80horse power Ball-Wood engine. The cost of the school will probably be \$120,000.

Artificial Gum Arabic.

For the preparation of a so-called artificial gum arabic the Rev. de Chem. Indust.—through Nouv. Remedes, 1892, No. 13 supplem.—gives the following process: 10 kilogrammes linseed are boiled with 80 kiloor four hours. The liquid is then filtered and four times its volume of alcohol is added. The precipitate phous, colorless, insipid, and gives, with water, a thick mucilage.

Essence of Lemon. BY ARTHUR A. BARRETT, MESSINA.

A few notes on the manufacture of essence of lemon will. I hope, be acceptable. In the first place, we all learn in England that essence of lemon is made with an ecuelle. Every book I can find says so, and on coming out here I was not a little surprised when I could not find a single one. The principle on which the extraction of the essence is carried on may be illustrated in this way: If you hold a piece of lemon peel up to the light and turn it inside out, a fine shower of mist will be seen to be forcibly ejected. This is not all oil, but a mixture of oil and water. Most people are unpleasantly acquainted with this phenomenon, though many have not actually seen it, for in peeling a lemon or orange with the fingers a little of the oil is often ejected into the eye, causing a considerable amount of pain. By turning the lemon peel inside out, almost the whole of the essence is removed from the peel, for each little globule of oil appears to be surrounded by water, and the liquid which remains adherent to the peel consists principally of water. As it is impossible to turn every piece of peel actually inside out, the following method is adopted:

One man takes a lemon in his hand, and with three rapid strokes with a large knife cuts off nearly all the peel in three slices. The central portion, which is left, consists of most of the pulp with a little of the peeltop and bottom. This is simply pressed for making lemon juice. The slices pass to a second workman, who sits on a low chair, with an ordinary common quality bath sponge, worth about 6d., in one hand. With the other he presses the slice of peel against the sponge, pressing the edges of the peel only with his fingers, the object being to press the convex piece of lemon peel as nearly flat as possible. The amount of pressure used is very slight, and at first sight it seems incredible that the oil globules can have been broken, but if you try the experiment of turning this exhausted peel inside out, nothing more can be extracted. The sponge is periodically squeezed. One man working in I have not discovered, so as to have very little smell. this way can extract about 1½ pounds (English) essence of lemon per day. To insure the cells being fully charged with moisture, it is usual to allow the lemons to stand in water for a short time; and I myself pro pose washing the lemons in a stream of running water. A second method, which, so far as I know, has not yet been published in England, originated in a clever fraud; but it is now, I believe, a thoroughly well understood business.

* Pharmaceutical Conference Proceedings.

peel packed in brine, which has been exported for the manufacture of candied peel. Formerly the peels were sent in the natural state. They are now exported with about three-fourths of the essence removed. This is accomplished as follows: The lemon, instead of being cut as before described, is cut in two, lengthwise. Should there be any defect in the lemon, the workman contrives to cut it in such a way that, by removing a thin slice, the defect is cut away and two half lemons remain, both free from blemish, and only a thin piece wasted. The pulp and a little of the white is then cut out with a kind of spoon, care being taken not to rupture the oil vessels of the peel. Another workman then presses the half lemon in various directions against a sponge, and, though it is evident that the sponge process is rather at a disadvantage, he manages to extract about three-fourths of the total amount. The quantity of essence obtained in this way is considerable. As a consumer of candied peel, I should be inclined to condemn this process; though, as I have not seen the product and compared it with that made with the oil, I cannot say that it is inferior. It is stoutly maintained that if the essence were not removed it would be destroyed by the brine; and it is possible that there is some truth in this. As the essence made in this way is of superior quality, being made from the finest fruit, I hope it may be so.

This brings me to another point. It is generally assumed in England that all pure essence of lemon is good. This is far from being the case, and I have myself seen essence of lemon containing 15 per cent of turpentine which was really superior to essence of lemon made the same day in my presence, and absolutely pure. This results from the extraordinary variation in the quality of the essence made in the various months. This difference is not noticed much in England, even the best exporters having to make an average sample which they can supply all the year round. Turpentine is in large use, and is purified in a peculiar way, which One exporter is said to use ten tons per annum. Strange to say, the worst qualities of essence all go to London, Manchester, and Glasgow. English wholesale druggists in particular have an unenviable reputation here for buying low qualities. One Sicilian dealer thinks that the climate has something to do with the inability of Englishmen to distinguish between turpentine and essence. In addition to the difference depending upon the season, the product of different districts varies. Experienced buyers claim to be able to distinguish the in the United States.

A large trade has already been done here in lemon district and village in which an essence has been made simply by smell and inspection.

Testing is carried out as follows: A sample is poured out into a tumbler and shaken up after placing the hand on top. Great attention is then paid to the duration and size of the bubbles and froth, the color is noted, and one smell is taken with the glass full and another after emptying it. Turpentine will certainly be detected in this way if over five per cent is present. Conducted in this way the purchase of essence of lemon is a matter requiring great judgment, and most of it being sold by peasants in small quantities, dealers cannot avoid sometimes buying a bad lot. If you make essence in your own works, the difficulties are not removed, only changed the substitution of turpentine for essence by the workmen being frequent and so contrived as to be very difficult to detect. A favorite means of bringing turpentine into the works is by means of a bladder and tube, which is carried as near as possible to the bladder with which we all are provided. It is a very easy matter to empty this and attend to the calls of nature without exciting suspicion.

The following inferior qualities of essence of lemon are distinguished here:

Sacotte.—As soon as the essence is made it is allowed to deposit and the clear portion poured off. There remains a deposit in the bottom which is pressed in a small bag (sac). The essence thus obtained is considerably inferior to the bulk, and in those places where only small quantities of essence are made, and the deposits are left for some time to accumulate, the quality is extraordinarily bad. The cake which is left after expression is distilled in a very rough way, yielding lambicato or distilled oil of lemon. The whole of the distilled essence of lemon which was made in Sicily is now made in this way. Often enough the dregs have commenced to ferment, and in some cases have lost the whole of the lemon smell before being distilled.

Essence of lemon made from the rejected fruit from the warehouses.—In November and December a large amount of fruit is cut and packed, but instead of being at once sent abroad, it is stored in warehouses-fruit gathered at this season having qualities which enable it to be kept longer than any other. Before sending it abroad it is all repacked, the bad and doubtful fruit being used for essence making. This essence never has the fine flavor of its own, described as the smell of the wood (di legno), which is easily recognized.

ACCORDING to the last census there are 33,163 lawyers

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—Thomas Courser, Lake City, Fla. This device has a knuckle with a coupling hook connected therewith, and is provided also with an auxiliary pivoted coupling hook, the latter being concealed when the main hook is in use. The knuckle is adapted to be emp.oyed in the same manner as such conpling devices are ordinarily used, while the auxiliary device may be used in connection with an be employed if any accident happens to the hook of the knuckle. The device is very simple and easily

Snow Plow.—Patrick H. Craddock. Leadville, Col. This is a plow adapted to be secured to the pilot board of an engine, and its construction is such that it will automatically adjust itself vertically or laterally should an obstruction be met with on the track. By an operative mechanism connected with a storage reservoir of compressed air the engineer may elevate or lower the plow as desired. The plow consists of a clearing board or fender in the shape of two sides of a triangle, a cutter being centrally formed thereon and downwardly extending brushes are adapted to engage with the treads of the rails.

Mechanical.

BALANCE WHEEL.-Hiram Bouck and Julius H. Lovendale, Salt Lake City, Utah Ter. This is a wheel having radial and circumferential slots, holes extending through the wall of the wheel being connected with the slots, while screws and nuts may be entered in the holes and fastened in the several slots, whereby an adjustment may be readily made without | ing a swinging support for sashes to facilitate cleaning removing the wheel from the shaft, the weight being them. The improved jack is light and cheap, and is adadjusted to come more or less on one side of the center as desired.

SAW HANDLE ATTACHMENT.—Mitchell Pyper, New York City. Secured to the blade of a handsaw, immediately in front of the handle, are sidepieces forming abutments for a swinging square arm and bevel arms, whereby the saw may be conveniently used as a square and bevel. The swinging arm is piv oted and held by a thumb screw in any desired position. or may be detached at will, it being split longitudinally and held to straddle the saw blade.

Miscellaneous.

TREATING GOLD ORES.—Louis C. Daumas, Paris, France. This invention covers a process and apparatus for extracting gold from the ore. Protochloride of sulphur saturated with dry chlorine is used to dissolve gold at about 130° Centigrade, a double chloride of gold and sulphur being formed. while if the ore contains other metals they are transformed into oxide by roasting. The apparatus com prises a hopper-like receptacle surrounded by a steam

coil, cross pipes extending through the receptacle and a filtering material being held in its lower portion,

SATURATING ARTICLES.—John A. Titzel, Glenshaw, Pa. This invention relates to an improved process of coating or saturating electric cables, to secure insulation, etc., and similarly treating hard and soft wood, terra cotta, etc., rendering the ar ticles treated waterproof and preventing decay. The articles are first subjected to heat, to expand the air and fluids in the pores, and then immersed in a coating or saturating liquid, at a lower temperature, causing opposing drawhead of the link and pin type, or it will the liquid to be drawn into the pores of the heated

> CENTRIFUGAL HONEY EXTRACTOR. Charles W. Metcalf, Santa Paula, Cal. This is a device in which a rotating frame supports swinging holders or baskets, the centrifugal force of the frame causing the honey in the outer half of the combs to be ejected, the baskets then being reversed so that the comb holders change their position and the remainder of the honey is extracted, after which the comb-holding baskets can be readily removed and the holders refilled,

> WINDOW WASHER.—David Mendelson, New York City. This is a simple and cheap apparatus with which a person may stand in a room and readily wash the outside of a window, the apparatus also facilitating the cleaning of the inside of the window, or the washing of a wall or ceiling. It consists of a telescopic main handle in hinged sections, fastening devices fixing the position of the sections, and a fixed jaw and a spring-pressed jaw being carried at the upper end of the handle. The jaws carry a wet swab at on end and a dry cloth at the other.

> WINDOW SASH JACK.—Valentine Schirmer, New York City. This is an improvement on a former patented invention of the same inventor, providjustable to engage fixtures on different windows. The improvement was on exhibition at the late fair of the American Institute, New York City, its simple construction admitting of the window sashes being swung inwardly, either right or left, for the purpose of ventilation or cleaning. One swinging jack or skeleton bracket is sufficient for a building, its weight not exceeding four pounds.

> COIN WRAPPER.—Ferdinand A. Jackel, Memphis, Tenn. This improvement provides an oblong wrapper, properly marked for different values, and gummed at one end, and having also a central longitudinal line of perforations, in which coin may be neat'.y wrapped in specific amounts, and the package quickly separated into two equal portions, thus releasing the coin.

Twine Holder.—Walter T. Hanson, Macon, Ga. This device has a base plate provided with a conical friction plug or spindle to enter the core of a ball of twine, in connection with a stationary angled arm having a suspension eye and guide eyes through which the cord is passed. The holder may be conveniently attached to an overhead support, to a coun-

ter, or be suspended in any position, holding the ball in such manner that the cord may be readily unwound.

BAG HOLDER.—Michael Fortin, Stillwater, Minn. This holder is provided with a frame, with a board held in inclined position on which the bag rests, and the holder, made of a single piece of wire bent to form connected loops engaging staples in the board, has curved arms at right angles to the loops, and having a sliding connection at their ends. The device is of simple and durable construction, self-tightening, and arranged to expand and open the bag when filling it.

LOCK FOR BAGS, PURSES, ETC.—Frederick R. Deck, Brooklyn, N.Y. This lock comprises two leaves placed back to back and having interlocking knuckles, the outer edges of the leaves being flanged and a pivot pin passing through the knuckles of both leaves, while a spring coiled on the pivot pin exerts tension upon the flanges of the leaves. The improvement is designed especially for double frames for double pockets, to lock both sections of the frame, both leaves being controlled by the same spindle and spring, but ach leaf being operated independently,

CASH AND PARCEL CARRIER.—Samuel J. Besthoff, New York City. This improvement provides a car which may be placed upon a cable and carries its own driving mechanism, of a simple, durable, and inexpensive character. The car has a simple automaticlocking device to hold it upon the cable, and the opening of the door of the cash compartment winds up the propelling mechanism. A parcel carrier, to transport goods with the cash, may or may not be used, as desired, in connection with the cash car.

Pick.—Kenneth J. Morrison and Michael McLellan, Stellarton, Canada. This patent is for a pick head having transverse slots to hold removable points, air passages leading from the slots into the eye, this improvement preventing the broken or 'cracked "sound so often made in using picks having emovable points.

DESIGN FOR BOOK REST AND UM-BRELLA HOLDER.—Charles Pegler, Elgin, Ill. This is a combined book rest and cane and mbrella holder exhibiting a novel configuration of parts of bracket-like ends supporting a connecting poard or shelf placed at an angle.

DRAWING INSTRUMENT.—Charles L Davis, New York City. This is a draughtsman's compass designed for conveniently and rapidly drawing spiral lines, ovals, ellipses, and other curvilinear geometrical lines and figures. The improvement is included in a simple and durante construction, and the invention consists principally of a cord connected with one of the legs of the compass and adapted to wind on a drur mounted to rotate-toosely on a spindle held or the other leg at the joint of both tegs.

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 of this paper.

NEW BOOKS AND PUBLICATIONS.

METAL COLORING AND BRONZING. By Arthur H. Hiorns. London and New York: Macmillan & Co. 1892. Pp. xv, 328. Price \$1.10.

The coloring of metals for the production of bronzes and other color effects is every day exciting more attention. The present work quite exhaustively treats of the different aspects of the question and how to treat different metals. Numerous formulæ are given

A PRACTICAL TREATISE ON THE MANU-FACTURE OF PERFUMERY. Comprising directions for making all prising directions for making all kinds of perfumes, sachet powders, funigating materials, dentifrices, cosmetics, etc. By Dr. C. Deite, assisted by Borchert, Eichbaum, E. Kugler and H. Toeffner. Translated by W. T. Brannt. Philadelphia: H. C. Baird & Co. 1892. 12mo. Pp. 358. Illustrated. Cloth. Price \$3.

This work also contains a full account of the volatile oils, balsams, resins, and other materials used in the manufacture of perfumes. This book gives more details of manufacturing perfumes and toilet specialties on a commercial scale than any work on the subject which has come under our notice. The section relating to hair preparations is excellent and the chapter on cosmetics seems to be well up to date. Fruit ethers receive a fair share of attention. The number of receipts given in the book is large.

THE PRACTICAL BRASS AND IRON FOUNDER'S GUIDE. By James Larkin. Philadelphia: H. C. Baird & Co. 1892. 12mo. Pp. 394. Illustrated. Cloth. Price \$2.50.

This is a new and enlarged edition of Larkin's well known work. 'The work has been revised and brought up to date, so as to include Mitis castings, steel castings, bell founding, bronze casting, chill casting, casting without a core, casting on other metals, casting upon inflammable materials, etc. Many sections of the old work have been entirely rewritten.

THE MANUFACTURE OF INK. Comprising the raw materials, and the preparation of writing, copying, and hektograph inks, ink extracts and powders, colored inks, solid inks, lithographic inks and crayons, etc. By Sigmund Lehner. Translated by W. T. Brannt. Philadelphia: H. C. Baird & Co. 1892. 12mo. Pp. 229. Illustrated. Cloth. Price \$2.

The present work is founded on "Die Tinten-Fabrikation." A careful consideration is given to the raw materials, their selection and preparation. A large number of receipts is given, embracing nearly every kind of ink, and the author states that most of the recerpts have been tested. Great attention is paid to

ink specialtion and unusual forms and kinds of ink, such as safety ink, sympathetic ink, stamp inks, etc while the important subject of printing ink is fully treated. Preserving agents for ink, the change of color in old documents and the methods of making faded writing ink legible come in for their full share of attention. This is the only treatise devoted entirely to the subject in print in the English language and is an important addition to technical literature.

THE HARDWOOD FINISHER. With rules and directions for finishing in natural colors and in antique, ma hogany, cherry, birch, walnut, oak, ash, redwood, sycamore, pine, and all other domestic woods. Compiled all other domestic woods. Compiled and edited by Fred T. Hodgson. New York: The Industrial Publica-tion Company. 1892. Pp. 94. Price

This excellent work, with its very practical aspect seems to cover a field that has been perhaps somewhat neglected. It is exceedingly practical, and with numer ous formulæ for all kinds of stains and wood dyes, as well as finishes, is one that is to be found of value to many operatives.

LE CHAUFFAGE ET LES APPLICATIONS DE LA CHALEUR DANS L'INDUSTRIE ET L'ECONOMIE DOMESTIQUE. Par Julien Lefevre, Professeur Suppleant a l'Ecole de Medecine de Nantes, Pro-fesseur a l'Ecole des Sciences. Avec fesseur a l'Ecole des Sciences. 188 figures intercalees dans le texte Paris: Librairie J. B. Bailliere et Fils. 1893. Pp. 356.

The French aspect of this book is evident in the title, and the very large ground which it undertakes to cover is largely devoted to domestic heating, although other heating finds a place in it, and its numerous illustrations and excellent arrangement of pictures indicate good judgment on the part of the editor and pub

Any of the above books may be purchased through this office. Send for new book catalogue just pub lished. Munn & Co., 361 Broadway, New York.

SCIENTIFIC AMERICAN

BUILDING EDITION.

DECEMBER NUMBER.-(No. 86.)

TABLE OF CONTENTS

- 1. Elegant plate in colors, showing a very attractive dwelling at Warberth Park, Pa., erected at a cost of \$4,150 complete. Floor plans and two perspective elevations. John Robinson, architect, Germantown, Pa.
- 2. Plate in colors showing a residence at Springfield Mass. Perspective views and floor plans. Cost \$12,000 complete. Mr. Guy Kirkham, architect. Springfield, Mass. An excellent design.
- 3. A colonial residence at Newton Highlands, Mass Perspective view and floor plans. J. W. Beak architect, Boston. A picturesque design.
- 4. A pretty cottage erected at Bridgeport, Conn., at a cost of \$1.600. Floor plans, perspective, etc. A. M. Jenks, architect, Bridgeport, Conn.
- 5. A dwelling house erected at Warberth Park, Pa. at a cost of \$4,478 complete. Mr. C. W. Macfarlane, architect, same place. A model design Floor plans and perspective.
- 6. A "Queen Anne" cottage erected at St. David's Pa., at a cost of \$5,500 complete. A unique design Perspective elevation and floor plans. F. L. & W. L. Price, architects, Philadelphia.
- 7. A residence in the "Colonial" style of architecture erected at St. David's, Pa. Perspective view and floor plans. Cost complete \$5,800. F. L. & W. L. Price, Philadelphia, architects.
- 8. A residence on Golden Hill, at Bridgeport, Conn Perspective elevation and floor plans. D. R. Brown, architect, New Haven, Conn. An excel lent design.
- 9. A residence recently erected at Springfield, Mass Floor plans and perspective elevation. Cost \$2,490 complete. Mr. A. B. Root, architect, same place. A pleasing design.
- 10. Picture of Aldworth, Sussex the home of Lord Tennyson. Portrait of Lord Tennyson.
- 11. Sketch for a cottage at Saucelito, Cal.
- 12. Design for a thirty-story building.
- 13. Sketch of residence of Mr. Howard Bell, Atlanta,
- 14. Miscellaneous contents: Some of the merits.-Water tight cellars.-Read this with care.-Improve your property.-How to catch contracts.-The education of customers.—Erection of additional buildings .- Concave sounding boards .- A high railway bridge.-A complete steel house front, illustrated.-An improved woodworking machine.-Finely carved woodwork, illustrated .-Steam and hot water radiators, illustrated .-Plaster of Paris.-Disinfection by means of sulphur.—A novel newspaper building.—Fine steel ceiling in an art gallery.

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

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

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

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-Thursday morning to appear in the following week's issue

Acme engine, 1 to 5.H. P. See adv. next issue. "U. S." metal polish. Indianapolis. Samples free. Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J Shingle machinery. Trevor Mfg. Co., Lockport, N. Y. Patent Open-Side Planing and Shaping Machines.

Pedrick & Ayer, Philadelphia, Pa. Wm. Jessop & Sons, the celebrated steel makers, oberve the centennial of their firm next year.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York. Stow flexible shaft. Invented and manufactured by Stow Mfg. Co., Binghamton, N. Y. See adv., page 254. \$200 buys outright a patent on a novel kitchen device Address C. A. B., P. O. box No. 495, Wakefield, Mass.

Screw machines, milling machines, and drill pres The Garvin Mach. Co., Laight and Canal Sts., New York Centrifugal Pumps for paper and pulp mills. Irrigating and sand pumping plants. Irvin Van Wie, Syracuse, N. Y. Portable engines and boilers. Yacht engines and oilers. B. W. Payne & Sons, Elmira, N. Y., and 41 Dey Street, New York.

Wanted-A firm to undertake sale of well-selling prass patent article. Large prospects. Address A.Z., box 773, New York.

To Let-A suite of desirable offices, adjacent to the Scientific American offices, to let at moderate terms. Apply to Munn & Co., 361 Broadway, New York.

Fine Castings in Brass, Bronze, Composition (Gun Metal), German Silver. Unequaled facilities. Jas. J.

McKenna & Bro., 424 and 426 East 23d St., New York. For the original Bogardus Universal Eccentric Mill, Foot and Power Presses, Drills, Shears, etc., address J.S. & G. F. Simpson, 26 to 36 Rodney St., Brooklyn, N. Y.

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

Canning machinery outfits complete, oil burners for soldering, air pumps, can wipers, can testers, labeling machines. Presses and dies. Burt Mfg. Co., Rochester,

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.

Wanted-Engineers and pilots. Twenty licensed gineers and pilots to run small passenger steamers for the summer months of 1893, in connection with the World's Fair. Sober, steady men are invited to write us for further information. Chas. P. Willard & Co., Clybourn and Southport Aves., Chicago, Ill.

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 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.

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

or in this department, each must take his turn.

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

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

to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of Minerals sent for examination should be distinctly marked or labeled.

(4604) O. C. asks: 1. What speed can be had with a 16 foot boat, 4 feet beam, using an engine 21/2 inches bore, 3 inches stroke at about 60 pounds steam pressure? A. You should be able to run the boat 6 miles per hour. 2. What should be the diameter, pitch, and speed of the propeller to give best results? A. Propeller wheel should be 18 inches diameter, 36 inches pitch and make 250 turns per minute. 3. Should the propeller have two or three blades? A. A three-blade wheel is preferred. 4. What size boiler would be required and would the pipe boiler described in the Scientific American Supplement be suitable? A. A vertical tubular boiler having 20 square feet of actual heating surface with shell 22 inches diameter by 36 inches in height, 33 tubes $1\frac{1}{2}$ inch, will give all the steam required. The No. 3 pipe boiler described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 702, with 8 inches addition to the length, will make a safe boiler in which you carry 100 pounds steam pressure if de sired, and large enough for the above speed.

(4605) R. T. McK. writes: Will you please answer me through your columns why it is that you can pump up a higher air pressure than your steam pressure by the gauge on a double acting air pump, the steam and air cylinders being of the same diameter, and the pistons operating on the same piston rod? A. The difference between the initial pressure in the steam cylinder and final pressure in the air-compressing cylinder is due to the difference in the mean pressure for the expansion of steam and the mean pressure for the compression of air. This is at once apparent to the eye when examining the indicator cards of equal sized steam and air compressing cylinders. The mean engine pressure for 70 pounds at 🔏 cut-off is theoretically 52 ponnds per square inch. The mean adiabatic pressure of the air cylinder for delivery of air at 100 pounds pressure is 50 pounds, while the mean isothermal pressure is but 30 pounds. The absorption of the heat of compression by water injection or jacket cooling brings the extremes to a mean, which, if 1/6 is absorbed, will make the mean pressure of the air cylinder about 43 pounds per square inch, with 9 pounds as the margin for compressor friction.

(4606) R. M. asks: 1. Is smoke a wet vatery) or dry vapor? A. Smoke is more or less mixed ith the vapor of water, part of which is derived from ne moisture in the fuel and another portion from the car roofing, box, W. S. Morris. 487,089 (Car street, F. B. Brownell (r). 11,289 (Car street, F. B. Brownell (r). 11,289 (Car street, F. B. Brownell (r). 14,280 (Car street, F. B. Brownell (r). 14,280 (Car street, W. E. Harrington. 487,089 (Car roofing, box, W. S. Morris. 487,089 (Car roofin (watery) or dry vapor? A. Smoke is more or less mixed with the vapor of water, part of which is derived from the moisture in the fuel and another portion from the oxidation of the hydrogen forming part of the fuel. 2. What weight would a ball 100 pounds indicate on a balance if dropped from a height of 100 feet? A. The weight multiplied by the fall is equal to 10,000 foot pounds. If the balance arrests the fall of the ball in 6 inches after contact, the average impact force is 20,000 pounds. See Scientific American Supplement, No. 862, on impact or the force of percussion.

(4607) G. C. W. asks how to bleach the hair of an animal. A. Gascous chlorine and hydrogen peroxide are effectual agents in bleaching hair. The hair should be thoroughly cleaned, with a warm solution of soda, then washed with water. While moist it is put into a jar and chlorine gas introduced, until the air in the jar looks greenish. Allow it to stand for twenty-four hours, and if necessary repeat.

(4608) T. H. says: 1. It is proposed to deliver water in an inch pipe one mile distant over an elevation 120 feet high, the point of delivery is 25 feet lower than the starting point. It is asserted that it would require 75 per cent more force power to deliver at the summit and let it go down by gravity than to continue the pipe the whole distance. Can you throw light on it? A. It will require 52 pounds pressure and the additional pressure due to friction to deliver the water at the summit of the siphon. The down leg can only relieve the pump pressure to the amount of a vacuum, or 14.7 pounds, which may be offset by the friction in the down leg of the siphon. The difference in length of the two legs of the siphon may make a trifling difference only, whether delivery is through the whole length or discharged at the top. 2. Suppose that a shell made of strong steel 11/2 feet in diameter with a cavity in the center large enough to hold 2 ounces of powder (11/2 inches), with a vent of a size to admit the smallest possible wire that would conduct electric fluid, had electricity applied, would the powder ignite? Would there be an explosion, or what would there be? A. The powder would explode and create a pressure of probably 40,000 pounds per square inch, which would fizzle out through the vent and burn out the wire.

TO INVENTORS.

An experience of forty 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 persons 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, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

November 29, 1892,

AND EACH BEARING THAT DATE.

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

Adver	tising novelty or display card, J. Robin-	
801	1	486,899
Agric	n ultural implement, A. Caldwell486,849,	486.850
Albur	n, A. Bartholme s, electro-depositing, S. O. Cowper-Coles	487,170
Alloy	s, electro-depositing, S. O. Cowper-Coles	487,176
Anim	al catcher, A. Otto	486,939
Autor	natic brake, McKee & Hatchett	486.886
Axle,	nauc orake, McKee & Hatchett. car, D., Sr., & D. Roberge, Jr. box, car, S. Robertson. ubricator, H. M. Goodman. vehicle jointed, E. F. Steele. z press, A. Wickey. ry. See Galvanic body battery. ngs, making cages for anti-friction, F. Moss-	486,898
Axle	box, car, S. Robertson	487,231
Axie	ubricator, H. M. Goodman	487,181
A XIE,	venicle jointed, E. r. Steele	487,059
Daim	re Soo Colvenia hade hetters	486,997
Barte	ry. See Garvanic body battery.	
bearing	ngs, making cares for anti-friction, r. moss-	497 104
Red f	olding I Ganev	487,194 486,867
Belt.	electric, J. H. Johnson	487,185
Belt, f	astener, E. I., Matteson	487,021
Bench	dog, C. A. Wavland	487.106
Bevel	W.G. Avery	487,010
Bicyc	le, S. H. Kimball	487,018
Bicyc	le brake, W. T. Lewis	486.935
Bicyc	le saddle support, E. M. Staples	486,935 487,081
Binde	r, C. H. Stoelting	486,989
Bit br	ace, A. Knudsen	487,123
Bodki	n, P. R. Stevens	487,134
Boiler	. See Steam boiler.	
Boiler	furnace, W. R. Parks	486,955
Boiler	furnace and smoke consumer, J. Connelly.	486,854
Boiler	furnace, locomotive or marine, F. Barclay,	486,924
Boiler	'Inrnace, steam, r. Barciay	486,923
Boiste	er plate, D. B. Oli ver	486,890
BOOK,	Diank, H. H. & F. H. Hollmann	487,014
BOOK	guard, Diank or Other, J. D. Mets	487,191
Bottl	g apparatus, O. Lentz	486,877
Bottle	olow	407 000
DOT	Son Confectionery or other how File	201,000
Box.	See Confectionery or other box. File	201,000
Box.	ry. See Galvanic body battery. gs. making cazes for anti-friction, F. Moss- folding, J. Ganey. electric, J. H. Johnson astener, E. L. Matteson dog, C. A. Wayland W. G. Avery. e, S. H. Kimball e brake, W. T. Lewis. e saddle support, E. M. Staples. r, C. H. Stoelting ace, A. Knudsen n, P. R. Stevens See Steam boiler. furnace, W. R. Parks. furnace and smoke consumer, J. Connelly. furnace, locomotive or marine, F. Barclay, furnace, bloomotive or marine, F. Barclay, furnace, blank, H. H. & F. H. Hoffmann guard, blank or other, J. D. Mets. g apparatus, O. Lentz. se, etc., liquid-ejecting device for, F. S. See Confectionery or other box. File xorner, J. Austin	486 844
Box. Box c	See Confectionery or other box. File x. orner, J. Austin	486,844
Box. Box of Box f	See Confectionery or other box. File x. orner, J. Austin	486,844 487,082 487,186
Box. bo Box c Box f Boxes Brace	See Confectionery or other box. File x. orner, J. Austin	486,844 487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Box es Brace Brake	astener, C. D. Suffrms	487,082 487,186
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrins, s, apparatus for making metal, F. J. King See Bit brace. See Automatic brake. Bicycle brake, r brake. drier car, N. Harper. kiln, Conley & Wolfe. kiln, L. H. Reppell. kiln, L. H. Reppell. kiln, conley & Wolfe. gate, draw, A. G. Anderson. bror toaster, R. Martin. e, A. M. Ziegler. e, suspender, A. M. Ziegler. ar alarm, J. H. Pruitt. ar alarm, H. W. Reynolds ar alarm abinet, A. Stromberg er. See Gas burner. Lamp burner. r certractor, contrictions of the seed of the seed.	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908
Box f Boxee Brakee Ca Brick Brick Brick Brick Brick Brigh Buck Buck Buck Burgl Burgl Burgl	astener, C. D. Suffrms	487,082 487,186 486,931 487,174 487,174 486,972 487,161 486,483 487,043 487,043 487,044 486,893 487,128 486,908

Car, street, F. B. Brownell (r). Carbon, electric light, J. Clegg	11,289 487,046 487,212
Car, street, F. B. Brownell (r) Carbon, electric light, I Clegs Carbot, electric light, I Clegs Carbot, electric light, I Clegs Carpiet sweeper, W. J. Drew Carriage, child's, Heller & Hirsch Cartridge, J. A. C. De Latouche Cash electric, N. & N. E. Dillenbeck Cash register, N. & N. E. Dillenbeck Cash register and indicator, C. Carr. Cash register ing and indicating machine, E. N. Foote Celling, fireproof, G. Haves. Centrifugal extractor, W. E. Johnson Chain, drive, A. Worner Chasing mill, H. C. Higginson Cigar machine hopper, M. A. Winget. Cigars or cigarettes, ignition cap for, M. R. Swiss. Clothespin, G. W. McCoole. Clutch, rope, P. T. Sundberg. Coal jig, C. O. Stroh. Cog wheel, F. Saxon. Coin and delivering tick ets, device for receiving, J. Williams	487,050 487,125 487,028
Case. See Packing machine sack case. Cash carrier, N. & N. E. Dillenbeck. Cash register, C. Carr. Cash register and indicator C. Carr.	487,048 486,980 486,979
Cash registering and indicating machine, E. N. Foote. Ceiling, freproof, G. Haves.	487,215 486,982
Centrifugal extractor, W. E. Johnson	486,876 486,920 487,146
Cigar machine hopper, M. A. Winget	486,919 487,108 487,232
Clutch, rope, P. T. Sundberg. Coal jig, C. Q. Stroh.	486,954 487,061 486,907
Coin and delivering tick ets, device for receiving, J. Williams.	487,139
Combination lock, E. Vanwart. Condenser be ad, C. S. Onderdork. Confessor be ad, C. S. Onderdork.	487,138 487,036
Coin and delivering tick ets, device for receiving, J. Williams. Color for printing on textile fabrics, A. Hoz Combination lock, E. Vanwart Confectioner yor other box, H. Buehl Corn popper, A. B. Olson (r). Coupling. See Car coupling. Pipe coupling. Thill coupling.	11,290
Corn popper, A. B. Olson (r). Coupling. See Car coupling. Pipe coupling. Thill coupling. Crate, egg, W. T. Fisher. Cultivator, garden, A. J. Bruner. Cultivator, garden, A. J. Bruner. Cultivator, garden, A. J. Bruner. Cutter bead, E. S. J. Schimer. Cutter bead, E. S. J. Schimer. Cutter head, E. S. J. Schimer. Cutter head, W. B. Huther. Cylinder engine, multiple, E. B. Benham. Damper, C. A. Couch. Display rack, J. H. Best. Door spring, C. Koon. Drapery or garment hook, safety, J. Berkey. Dress pad, S. E. Stanley. Dress pad, S. E. Stanley. Dress pad, S. E. Stanley. Elastic cord and making the same, A. M. Ziegler. Electric current indicator, C. P. L. Noxon. Electric light holder, adjustable, L. S. Pfouts. Woolley. Electrics witch, J. J. Nate. Electrics witch, W. J. Schutz.	487,144 487,113 487,218
Cuspidor, C. R. Price. Cutter. See Buttercup cutter. Cutter head, E. S. Judkins	486,892 487,015
Cutting head, W. B. Huther. Cylinder engine, multiple, E. B. Benham.	486,874 487,084
Display rack, J. H. Best. Door spring, C. Koon. Drapagy or garment book sefety I Barkey	487,110 486,975 487 171
Dress pad, S. E. Stanley Drilling apparatus, J. T. Cowley Egg heater, U. D. Seltzer.	487,164 486,856 487,024
Elastic cord and making the same, A. M. Ziegler. Electric circuit safety device, G. Cutter. Electric current indicator, C. P. L. Noxon	487,042 487,002 487,093
Electric light holder, adjustable, L. S. Pfouts Electric lighting apparatus, automatic, L. G. Woolley	487,022 487,109
Electric lighting apparatus, automatic, L. G. Woolley. Electric switch, J. J. Nate. Electric switch, W. J. Schultz. Electrical apparatus, coil for, H. C. Buck. Electrical transformer, E. Thomson. Electrical transmitting apparatus, Neal & Eston. Electricity, development and distribution of J. J.	487,092 486,987 486,926
Electrical transformer, E. Thomson. Electrical transmitting apparatus, Neal & Eaton. Electricity, development and distribution of, J.	486,888 487 109
Electrode, arc lamp, C. W. Hazeltine Elevator. See Hay elevator.	487,220
Electricity, development and distribution of, J. S. Stone. S. Stone. Electrode, arc lamp, C. W. Hazeltine. Elevator. See Hay elevator. Elevator. J. H. Tardy. Elevator doors, means for operating, R. W. Hare Engine. See Cylinder engine. Rotary engine. Steam engine.	486,953
Engine, J. Smith Engine, J. Smith Engine reversing gear, J. O. Des Chapelles. Engines, bogie frame for locomotive, G. Lentz Eraser, ink, J. E. Mayhew Eugenol benzyl-ether and preparing the same, F.	487,132 487,115 487,187
Eraser, ink, J. E. Mayhew. Eugenol benzyl-ether and preparing the same, F. Ach.	486,976 487,167
Ach Explosive powder, J. V. Skoglund Extractor, See Butter extractor, Centrifugal extractor,	487,080
Fare receiver and register, portable, J. E. Allison Fau cet and bushing, M. Anthony	487,168 487,207 487,116
Feed trough, T. Doolan. Fence, W. Arthur. Fence, C. C. Trout	487,003 487,208 487,083
Fence machine, wire, J. Harper Fence post or base, metallic, O. M. Knox File box W. I. Ohmer.	487,184 486,973 487,150
File box, Ohmer & Wayne. File, check, F. Tremblay. File cover fastener, court. A. E. Walkup.	487,006 486,993 486,962
File, paper, W. I. Ohmer File, paper or music, W. Jeschke Filter, water, J. Da vis	487,230 486,875 486,860
Fire alarm signal apparatus, auxiliary, C. E. Scribner. Fire escape, J. B. Stott.	487,095 487,135
et al	
Fire kindler, S. Elsinger	487,039 486,966 487,004
Fire kindler, S. Eisinger. Flour bolt, W. D. Gray. Fuel feeder, flui d, E. T. Williams. Fumigator, R. Campbell. Furnace. See Boiler furnace.	487,039 486,966 487,004 486,998 487,173
Fire kindler, S. Eisinger. Flour bolt, W. D. Gray. Fuel feeder, flui d. E. T. Williams. Fumigator, R. Campbell. Furnace. See Boiler furnace. Furnace. W. Stubblebine Furnace H. K. Tallmage. Furnace grate, R. Rose (r).	487,039 486,966 487,004 486,998 487,173 487,103 486,990 11,291
Fire kindler, S. Eisinger. Flour bolt, W. D. Gray. Fuel feeder, flui d. E. T. Williams. Fumigator, R. Campbell. Furnace. See Boiler furnace. Furnace. W. Stubblebine. Furnace, H. K. Tallmage. Furnace grate, R. Rose (r). Galvanic body battery, J. W. Shults. Game counter, W. C. & F. N. Weis. Gas burner, safety, B. E. Taylor.	487,039 486,966 487,004 486,998 487,173 487,103 486,990 11,291 486,990 486,991 486,991
Fire kindler, S. Eisinger. Flour bolt, W. D. Gray. Fuel feeder, flui d. E. T. Williams. Fumigator, R. Campbell. Furnace. See Boiler furnace. Furnace. W. Stubblebine. Furnace, W. Stubblebine. Furnace, H. K. Tallmage. Furnace grate, R. Rose (r). Galvanic body battery, J. W. Shults. Game counter, W. C. & F. N. Weis. Gas batter, J. W. Shults. Gas batter diaphragm, A. Henning. Gas washer or scrubber, J. C. Chandler. Gate. See Bridge gate. Tilting gate. Generator. See Steam generator.	487,039 486,966 487,004 486,998 487,173 487,103 486,990 11,291 486,902 486,91 487,051 486,927
Fire kindler. S. Eisinger. Flour bolt, W. D. Gray. Fuel feeder, flui d. E. T. Williams. Fumigator, R. Campbell. Furnace. See Boiler furnace. Furnace. W. Stubblebine. Furnace. W. Stubblebine. Furnace H. K. Tallmage. Furnace grate, R. Rose (r). Galvanic body battery, J. W. Shults. Game counter, W. C. & F. N. Weis. Gas burner, safety, B. E. Taylor. Gas meter diaphragm, A. Henning. Gas washer or scrubber, J. C. Chandler. Gate. See Bridge gate. Tilting gate. Generator. See Steam generator. Glass articles, securing designs on, A. A. Graeser Glove package holder, R. H. Moore. Glove frastening, G. & J. Courcel.	487,059 486,964 486,996 487,074 486,998 487,173 487,103 486,990 11,291 11,291 486,902 486,918 486,918 486,927 487,051 487,175
Fire kindler. S. Eisinger. Flour bolt, W. D. Gray. Fuel feeder, flui d. E. T. Williams. Furniactor, R. Campbell. Furnace. See Boiler furnace. Furnace. W. Stubblebine. Furnace. H. K. Tallmage. Furnace grate. R. Rose (r). Galvanic body battery. J. W. Shults. Game counter, W. C. & F. N. Weis. Gas burner, safety. B. E. Taylor. Gas meter diaphragm. A. Henning. Gas washer or scrubber, J. C. Chandler. Gate. See Bridge gate. Tilting gate. Generator. See Steam generator. Glass articles, securing designs on, A. A. Graeser Glove package holder, R. H. Moore. Glove tastening, G. & J. Courcel. Governor, engine, W. H. Lawrence. Grave box cover, I. Scott. Guard. See Book guard.	487,059 486,966 487,004 486,986 487,173 486,990 11,291 486,902 486,902 486,901 487,051 487,051 487,051 487,175 487,224 486,943
Fire kindler, S. Eisinger. Flour bolt, W. D. Gray, Fuel feeder, flui d. E. T. Williams. Fumigator, R. Campbell. Furnace. See Boiler furnace. Furnace. W. Stubblebine Furnace. W. Stubblebine Furnace, H. K. Tallmage. Furnace grate, R. Rose (r). Galvanic body battery, J. W. Shults. Game counter, W. C. & F. N. Weis. Gas burner, safety, B. E. Taylor. Gas meter diaphragm, A. Henning. Gas washer or scrubber, J. C. Chandler. Gase meter diaphragm, A. Henning. Gas washer or scrubber, J. C. Chandler. Gate. See Bridge gate. Tilting gate. Generator. See Steam generator. Glass articles, securing designs on, A. A. Graeser Glove package holder, R. H. Moore. Glove fastening, G. & J. Courcel. Governor, engine, W. H. Lawrence. Grave box cover, I. Scott. Guard. See Book guard, Gun, quick-fire, A. Odkolek. Gun, repeating air, E. E. Bailey. Gutter protector, J. Gogerty.	487,039 486,966 487,004 486,987 487,173 487,173 487,103 486,990 111,291 486,902 486,991 487,051 487,051 487,127 487,127 487,127 487,224 486,943 486,943 487,169 486,943
Fire kindler. S. Eisinger. Flour bolt, W. D. Gray. Fuel feeder, flui d. E. T. Williams. Fumigator, R. Campbell. Furnace. See Boiler furnace. Furnace. W. Stubblebine. Furnace. W. Stubblebine. Furnace, H. K. Tallmage. Furnace grate, R. Rose (r). Galvanic body battery, J. W. Shults. Game counter, W. C. & F. N. Weis. Gas burner, safety, B. E. Taylor. Gas meter diaphragm. A. Henning. Gas washer or scrubber, J. C. Chandler. Gate. See Bridge gate. Tilting gate. Generator. See Steam generator. Glass articles, securing designs on, A. A. Graeser Glove fastening, G. & J. Courcel. Governor, engine, W. H. Lawrence. Grave box cover, I. Scott. Guard. See Book guard. Gun, quick-fire, A. Odkolek. Gun, repeating air, E. E. Bailey. Gutter protector, J. Gogerty. Halter, N. Gibbons. Hame, J. F. Pye	487,039 486,966 487,004 486,988 487,173 487,103 486,990 11,291 486,918 486,914 487,013 487,127 487,127 487,127 487,124 486,988 487,157 487,124 486,988 487,157 486,988 487,157 486,988 487,154 486,988 487,154 486,988 487,154 486,988
Fire kindler, S. Eisinger. Flour bolt, W. D. Gray, Fuel feeder, flui d. E. T. Williams. Fumigator, R. Campbell. Furnace. See Boiler furnace. Furnace. W. Stubblebine. Furnace. W. Stubblebine. Furnace. H. K. Tallmage. Furnace grate, R. Rose (r). Galvanic body battery, J. W. Shults. Game counter, W. C. & F. N. Weis. Gas burner, safety, B. E. Taylor. Gas meter diaphragm, A. Henning. Gas washer or scrubber, J. C. Chandler. Gas meter diaphragm, A. Henning. Gas washer or scrubber, J. C. Chandler. Gas articles, securing designs on, A. A. Graeser Glove package bolder, R. H. Moore. Glove package bolder, R. H. Moore. Glove package bolder, R. H. Moore. Graveroor oper, I. Soott Guard. See Book gnard. Gun, quick-fire, A. Odkolek. Harvester elevator, J. Gogerty. Hatter, N. Gibbons. Hame, J. F. Pye. Hame fasten er, C. A. Smith. Harrow, P. Blaker. Harvester celevator, M. Kane. Havester elevator, M. Kane.	487,089 486,986 487,004 486,986 487,173 487,103 487,103 487,103 486,990 111,291 486,991 487,051 487,051 487,012 487,013 487,014 487,014 487,014 487,014 486,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943
Fire kindler. S. Eisinger. Flour bolt, W. D. Gray. Fuel feeder, flui d. E. T. Williams. Fumigator, R. Campbell. Furnace. See Boiler furnace. Furnace. W. Stubblebine Furnace. W. Stubblebine Furnace grate, R. Rose (r). Galvanic body battery, J. W. Shults. Game counter, W. C. & F. N. Weis. Gas burner, safety, B. E. Taylor. Gas meter diaphragm. A. Henning. Gas washer or scrubber, J. C. Chandler. Gate. See Bridge gate. Tilting gate. Generator. See Steam generator. Glass articles, securing designs on, A. A. Graeser Glove fastening, G. & J. Courcel. Governor, engine, W. H. Lawrence. Grave box cover, I. Scott. Guard. See Book guard. Gun, quick-fire, A. Odkolek. Gun, repeating air, E. E. Bailey. Gutter protector, J. Gogerty. Halter, N. Gibbons. Hame, J. F. Pye. Hame fasten er, C. A. Smith. Harrow, P. Blaker Harvester elevator, M. Kane. Hay levator, P. Burrell. Hay rack, L. A. Swan. Heater. See Steam heater. Heating apparatus attachment, J. Moak.	487,039 486,966 487,004 486,986 487,173 487,103 486,990 11,291 486,992 486,991 487,051 487,051 487,051 487,175 487,274 487,127 487,189 486,938 487,189 486,938 487,189 486,938 487,189 486,938 487,189 486,938 487,189 486,938
Ach. Explosive powder, J. V. Skoglund. Extractor, See Butter extractor, Centrifugal extractor, Fare receiver and register, portable, J. E. Allison Fau cet and bushing, M. Anthony. Fed regulator, L. S. Campbell. Feed mechanism, self-adjusting, G. Ehrhardt. Feed regulator, L. S. Campbell. Feed trough, T. Doolan. Fence, W. Arthur. Fence machine, wire, J. Harper. Fence post or base, metallic, O. M. Knox. File box, W. I. Ohmer. File box, Ohmer & Wayne. File box, Ohmer & Wayne. File cover fastener, court, A. E. Walkup. File, paper, W. I. Ohmer. File, paper or music, W. Jeschke. Firter alarm signal apparatus, auxiliary, C. E. Scribner Fire escape, J. B. Stott. Fire escape, J. B. Stott. Fire escape, J. B. Stott. Fire deder, fluid, E. T. Williams. Fumigator, R. Campbell. Furnace. See Boiler furnace. Furnace, W. Stubblebine. Furnace, H. K. Tallmage. Furnace grate, R. Rose (r). Gas washer or scrubber, J. C. Chandler. Gaste. See Bridge gate. Tilting gate. Gas meter diaphragm, A. Henning. Gas washer or scrubber, J. C. Chandler. Gaste. See Bridge gate. Tilting gate. Generator. See Steam generator. Glass articles, securing designs on, A. A. Graeser Glove package holder, R. H. Moore. Grave box cover, I. Scott. Gun, repeating air, E. E. Bailey. Gutter protector, J. Gogerty. Hatter, N. Gibbons. Hame, J. F. P. ye Hame, J. F. P. ye Hame fasten er, C. A. Smith. Harrow, P. Blaker Harvester elevator, P. Burrell. Hay rack, L. A. Swan Hatter, See Steam heater. Heater: See Steam heater. Heater: See Steam heater. Heater: See Steam heater. Heating apparatus attachment, J. Moak. Heel press, W. J. Young.	487,089 486,986 487,004 486,986 487,173 487,103 486,990 111,291 486,918 486,991 487,051 487,051 487,127 487,175 486,943 487,186,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943 486,943 487,186
Holder. See Sash holder. Shade holder. Soap cake holder. Spool holder.	
Holder. See Sash holder. Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant	487,209 487,126 487,056
Holder. See Sash holder. Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant	487,209 487,126 487,056
Holder. See Sash holder. Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant	487,209 487,126 487,056
Holder. See Sash holder. Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant	487,209 487,126 487,056
Holder. See Sash holder, Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Minifietree hook. Hook and eye, C. A. Bryant. Horse detacher, H. Leeman. Horseshoe blank bar, C. H. Perkins. Horseshoe blank bars, roll for making, C. H. Perkins. Horseshoe blank bars, roll for making, C. H. Perkins. Horseshoe ealk, detachable, M. J. L. Towler. Horseshoe, nailless, C. W. Crannell. Horseshoeing rack, S. M. Martin. Hub boring machine, D. H. Gowing. Hub, vehicle wheel, C. Whitford. Hubs, dust and mud cap for vehicle, J. Maris lee cake conveyer, G. E. Berna	487,209 487,126 487,056 487,057 487,038 487,177 487,190 486,996 487,189 487,189 487,189
Holder. See Sash holder, Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Minifietree hook. Hook and eye, C. A. Bryant. Horse detacher, H. Leeman. Horseshoe blank bar, C. H. Perkins. Horseshoe blank bars, roll for making, C. H. Perkins. Horseshoe blank bars, roll for making, C. H. Perkins. Horseshoe ealk, detachable, M. J. L. Towler. Horseshoe, nailless, C. W. Crannell. Horseshoeing rack, S. M. Martin. Hub boring machine, D. H. Gowing. Hub, vehicle wheel, C. Whitford. Hubs, dust and mud cap for vehicle, J. Maris lee cake conveyer, G. E. Berna	487,209 487,126 487,056 487,057 487,038 487,177 487,190 486,996 487,189 487,189 487,189
Holder. See Sash holder, Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant. Horse detacher, H. Leeman. Horseshoe blank bar, C. H. Perkins. Horseshoe blank bars, roll for making, C. H. Perkins. Horseshoe blank bars, roll for making, C. H. Perkins. Horseshoe ealk, detachable, M. J. L. Towler. Horseshoe, nailless, C. W. Crannell. Horseshoeing rack, S. M. Martin. Hub boring machine, D. H. Gowing. Hub, vehicle wheel, C. Whitford. Hubs, dust and mud cap for vehicle, J. Maris. lee cake conveyer, G. E. Berna. Indicator. See Electric current indicator. Inhaler, H. Ellis. Injector for locomotives, steam and air, F. Leadbeater. Insect powder distributer, C. H. Joosten. Ironing table, W. H. Little. Isoeugenol benzyl-ether and preparing the same, F. Ach. Ifting jack. Journal bearing, C. A. Burton.	487,209 487,126 487,126 487,126 487,126 487,138 487,17 487,190 486,869 487,189 487,001 486,951 486,934 487,226 487,226
Holder. See Sash holder, Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant. Horse detacher, H. Leeman. Horseshoe blank bar, C. H. Perkins. Horseshoe blank bars, roll for making, C. H. Perkins. Horseshoe blank bars, roll for making, C. H. Perkins. Horseshoe ealk, detachable, M. J. L. Towler. Horseshoe, nailless, C. W. Crannell. Horseshoeing rack, S. M. Martin. Hub boring machine, D. H. Gowing. Hub, vehicle wheel, C. Whitford. Hubs, dust and mud cap for vehicle, J. Maris. lee cake conveyer, G. E. Berna. Indicator. See Electric current indicator. Inhaler, H. Ellis. Injector for locomotives, steam and air, F. Leadbeater. Insect powder distributer, C. H. Joosten. Ironing table, W. H. Little. Isoeugenol benzyl-ether and preparing the same, F. Ach. Ifting jack. Journal bearing, C. A. Burton.	487,209 487,126 487,126 487,126 487,126 487,138 487,17 487,190 486,869 487,189 487,001 486,951 486,934 487,226 487,226
Holder. See Sash holder, Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant. Horse detacher, H. Leeman. Horseshoe blank bar, C. H. Perkins. Horseshoe blank bars, roll for making, C. H. Perkins. Horseshoe blank bars, roll for making, C. H. Perkins. Horseshoe ealk, detachable, M. J. L. Towler. Horseshoe, nailless, C. W. Crannell. Horseshoeing rack, S. M. Martin. Hub boring machine, D. H. Gowing. Hub, vehicle wheel, C. Whitford. Hubs, dust and mud cap for vehicle, J. Maris. lee cake conveyer, G. E. Berna. Indicator. See Electric current indicator. Inhaler, H. Ellis. Injector for locomotives, steam and air, F. Leadbeater. Insect powder distributer, C. H. Joosten. Ironing table, W. H. Little. Isoeugenol benzyl-ether and preparing the same, F. Ach. Ifting jack. Journal bearing, C. A. Burton.	487,209 487,126 487,126 487,126 487,126 487,138 487,17 487,190 486,869 487,189 487,001 486,951 486,934 487,226 487,226
Holder. See Sash holder, Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant. Horse detacher, H. Leeman. Horseshoe blank bar, C. H. Perkins. Horseshoe blank bars, roll for mak ing, C. H. Perkins. Horseshoe blank bars, roll for mak ing, C. H. Perkins. Horseshoe ealk, detachable, M. J. L. Towler. Horseshoe, nailless, C. W. Crannell. Horseshoeing rack, S. M. Martin. Hub boring machine, D. H. Gowing. Hub, vehicle wheel, C. Whitford. Hubs, dust and mud cap for vehicle, J. Maris. lee cake conveyer, G. E. Berna. Indicator. See Electric current indicator. Inhaler, H. Ellis. Injector for locomotives, steam and air, F. Leadbeater. Insect powder distributer, C. H. Joosten. Ironing table, W. H. Little. Isoeugenol bearzyl-ether and preparing the same, F. Ach. Jack. See Lifting jack, Journal bearing, C. A. Burton. Kilin. See Brick kiln. Knife. See Cutter head knife. Label attaching machine, H. W. Morgan. Ladder, fire, R. Brayton. Lamp burner wick raiser, C. Pabst. Lamp purner wick raiser, C. Pabst. Lamp for burning by drocarbon or other oils. S.	487,209 487,126 487,056 487,056 487,056 487,057 487,190 496,869 487,189 486,954 487,122 486,934 487,122 487,225 487,236 487,236 487,236 487,236 487,020 487,02
Holder. See Sash holder, Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant. Horse detacher, H. Leeman. Horseshoe blank bar, C. H. Perkins. Horseshoe blank bars, roll for mak ing, C. H. Perkins. Horseshoe blank bars, roll for mak ing, C. H. Perkins. Horseshoe ealk, detachable, M. J. L. Towler. Horseshoe, nailless, C. W. Crannell. Horseshoeing rack, S. M. Martin. Hub boring machine, D. H. Gowing. Hub, vehicle wheel, C. Whitford. Hubs, dust and mud cap for vehicle, J. Maris. lee cake conveyer, G. E. Berna. Indicator. See Electric current indicator. Inhaler, H. Ellis. Injector for locomotives, steam and air, F. Leadbeater. Insect powder distributer, C. H. Joosten. Ironing table, W. H. Little. Isoeugenol bearzyl-ether and preparing the same, F. Ach. Jack. See Lifting jack, Journal bearing, C. A. Burton. Kilin. See Brick kiln. Knife. See Cutter head knife. Label attaching machine, H. W. Morgan. Ladder, fire, R. Brayton. Lamp burner wick raiser, C. Pabst. Lamp purner wick raiser, C. Pabst. Lamp for burning by drocarbon or other oils. S.	487,209 487,126 487,056 487,056 487,056 487,057 487,190 496,869 487,189 486,954 487,122 486,934 487,122 487,225 487,236 487,236 487,236 487,236 487,020 487,02
Holder. See Sash holder, Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant. Horse detacher, H. Leeman. Horseshoe blank bar, C. H. Perkins. Horseshoe blank bars, roll for mak ing, C. H. Perkins. Horseshoe blank bars, roll for mak ing, C. H. Perkins. Horseshoe ealk, detachable, M. J. L. Towler. Horseshoe, nailless, C. W. Crannell. Horseshoeing rack, S. M. Martin. Hub boring machine, D. H. Gowing. Hub, vehicle wheel, C. Whitford. Hubs, dust and mud cap for vehicle, J. Maris. lee cake conveyer, G. E. Berna. Indicator. See Electric current indicator. Inhaler, H. Ellis. Injector for locomotives, steam and air, F. Leadbeater. Insect powder distributer, C. H. Joosten. Ironing table, W. H. Little. Isoeugenol bearzyl-ether and preparing the same, F. Ach. Jack. See Lifting jack, Journal bearing, C. A. Burton. Kilin. See Brick kiln. Knife. See Cutter head knife. Label attaching machine, H. W. Morgan. Ladder, fire, R. Brayton. Lamp burner wick raiser, C. Pabst. Lamp purner wick raiser, C. Pabst. Lamp for burning by drocarbon or other oils. S.	487,209 487,126 487,056 487,056 487,056 487,057 487,190 496,869 487,189 486,954 487,122 486,934 487,122 487,225 487,236 487,236 487,236 487,236 487,020 487,02
Holder. See Sash holder, Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant. Horse detacher, H. Leeman. Horseshoe blank bar, C. H. Perkins. Horseshoe blank bars, roll for mak ing, C. H. Perkins. Horseshoe blank bars, roll for mak ing, C. H. Perkins. Horseshoe ealk, detachable, M. J. L. Towler. Horseshoe, nailless, C. W. Crannell. Horseshoeing rack, S. M. Martin. Hub boring machine, D. H. Gowing. Hub, vehicle wheel, C. Whitford. Hubs, dust and mud cap for vehicle, J. Maris. lee cake conveyer, G. E. Berna. Indicator. See Electric current indicator. Inhaler, H. Ellis. Injector for locomotives, steam and air, F. Leadbeater. Insect powder distributer, C. H. Joosten. Ironing table, W. H. Little. Isoeugenol bearzyl-ether and preparing the same, F. Ach. Jack. See Lifting jack, Journal bearing, C. A. Burton. Kilin. See Brick kiln. Knife. See Cutter head knife. Label attaching machine, H. W. Morgan. Ladder, fire, R. Brayton. Lamp burner wick raiser, C. Pabst. Lamp purner wick raiser, C. Pabst. Lamp for burning by drocarbon or other oils. S.	487,209 487,126 487,056 487,056 487,056 487,057 487,190 496,869 487,189 486,954 487,122 486,934 487,122 487,225 487,236 487,236 487,236 487,236 487,020 487,02
Holder. See Sash holder, Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant. Horse detacher, H. Leeman. Horseshoe blank bars, C. H. Perkins. Horseshoe blank bars, Coll for mak ing, C. H. Perkins. Horseshoe blank bars, Toll for mak ing, C. H. Perkins. Horseshoe ealk, detachable, M. J. L. Towler. Horseshoe, nailless, C. W. Crannell. Horseshoeing rack, S. M. Martin. Hub boring machine, D. H. Gowing. Hub, vehicle wheel, C. Whitford. Hubs, dust and mud cap for vehicle, J. Maris. loe cake conveyer, G. E. Berna. Indicator. See Electric current indicator. Inhaler, H. Ellis. Injector for locomotives, steam and air, F. Leadbeater. Insect powder distributer, C. H. Joosten. Ironing table, W. H. Little. Isoeugenol bearzyl-ether and preparing the same, F. Ach. Jack. See Lifting jack. Journal bearing, C. A. Burton. Kiln. See Brick kiln. Knife. See Cutter head knife. Label attaching machine, HW. Morgan. Lamp burner wick raiser, C. Pabst. Lamp burner wick raiser, C. Pabst. Lamp, electric arc, C. E. Scribner. Lamp for burning hydrocarbon or other oils, S. A. Johnson. Lamp, gas, L. A. Cooper. Lamp, incandescent, J. H. F. Gorges. Lamp, ask, L. A. Cooper. Lamp, incandescent, J. H. F. Gorges. Lamp, ask, L. A. Cooper. Lamp, J. F. Pye. Latch, C. Orth. Latch, gate, P. T. Rapson. Letter box, house door, C. E. Calvert. Lifter, universal adjustable, J. L. Throop. Lifting jack, E. E. Aiom. Liquids with ozone, treating, Dittrich & Grum-	487,209 487,126 487,056 487,056 487,057 487,190 486,869 487,189 486,951 486,951 487,122 487,123 487,235 487,235 487,236 487,236 487,236 487,236 487,436 487,436 487,156 487,020 487,049
Holder. See Sash holder, Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant. Horse detacher, H. Leeman. Horseshoe blank bars, C. H. Perkins. Horseshoe blank bars, Coll for mak ing, C. H. Perkins. Horseshoe blank bars, Toll for mak ing, C. H. Perkins. Horseshoe ealk, detachable, M. J. L. Towler. Horseshoe, nailless, C. W. Crannell. Horseshoeing rack, S. M. Martin. Hub boring machine, D. H. Gowing. Hub, vehicle wheel, C. Whitford. Hubs, dust and mud cap for vehicle, J. Maris. loe cake conveyer, G. E. Berna. Indicator. See Electric current indicator. Inhaler, H. Ellis. Injector for locomotives, steam and air, F. Leadbeater. Insect powder distributer, C. H. Joosten. Ironing table, W. H. Little. Isoeugenol bearzyl-ether and preparing the same, F. Ach. Jack. See Lifting jack. Journal bearing, C. A. Burton. Kiln. See Brick kiln. Knife. See Cutter head knife. Label attaching machine, HW. Morgan. Lamp burner wick raiser, C. Pabst. Lamp burner wick raiser, C. Pabst. Lamp, electric arc, C. E. Scribner. Lamp for burning hydrocarbon or other oils, S. A. Johnson. Lamp, gas, L. A. Cooper. Lamp, incandescent, J. H. F. Gorges. Lamp, ask, L. A. Cooper. Lamp, incandescent, J. H. F. Gorges. Lamp, ask, L. A. Cooper. Lamp, J. F. Pye. Latch, C. Orth. Latch, gate, P. T. Rapson. Letter box, house door, C. E. Calvert. Lifter, universal adjustable, J. L. Throop. Lifting jack, E. E. Aiom. Liquids with ozone, treating, Dittrich & Grum-	487,209 487,126 487,056 487,056 487,057 487,190 486,869 487,189 486,951 486,951 487,122 487,123 487,235 487,235 487,236 487,236 487,236 487,236 487,436 487,436 487,156 487,020 487,049
Holder. See Sash holder, Shade holder. Soap cake holder. Spool holder. Hook. See Button hook. Drapery or garment hook. Whiffletree hook. Hook and eye, C. A. Bryant. Horse detacher, H. Leeman. Horseshoe blank bar, C. H. Perkins. Horseshoe blank bars, roll for mak ing, C. H. Perkins. Horseshoe blank bars, roll for mak ing, C. H. Perkins. Horseshoe ealk, detachable, M. J. L. Towler. Horseshoe, nailless, C. W. Crannell. Horseshoeing rack, S. M. Martin. Hub boring machine, D. H. Gowing. Hub, vehicle wheel, C. Whitford. Hubs, dust and mud cap for vehicle, J. Maris. lee cake conveyer, G. E. Berna. Indicator. See Electric current indicator. Inhaler, H. Ellis. Injector for locomotives, steam and air, F. Leadbeater. Insect powder distributer, C. H. Joosten. Ironing table, W. H. Little. Isoeugenol bearzyl-ether and preparing the same, F. Ach. Jack. See Lifting jack, Journal bearing, C. A. Burton. Kilin. See Brick kiln. Knife. See Cutter head knife. Label attaching machine, H. W. Morgan. Ladder, fire, R. Brayton. Lamp burner wick raiser, C. Pabst. Lamp purner wick raiser, C. Pabst. Lamp for burning by drocarbon or other oils. S.	487,209 487,126 487,056 487,056 487,056 487,057 487,189 486,934 487,122 486,934 487,123 486,934 487,236

380		
Magnetic separator, T. J. Lovett486,879, 487,073, Membranoid, J. W. Deckert	487,074 487,067	
Magnetic separator, T. J. Lovett486,879, 487,073, Membranoid, J. W. Deckert. Metals, process of and device for reducing volatilized, C.E. Seymour. Meter. See Water meter. Mill. See Chasing mill. Milling machine, E. Rivett. Milling machine, twist drill, P. Hoenscheid Mining engineering method and apparatus, hydraulic, A. M. Rawson	487,160 487,160	,
Moulding machine attachment D. P. M. Shellow	497 OUT	,
Motor See Rotary motor. Mucilage holder, W. B., Gwyn. Mulphe witchboad system, C. E. Scribner. Music stand attachment, H. C. Straley. Neskie fastwer, H. S. Pullman.	487,182 487,096 487,165	
Needle, J. Wiesckel. Nozzle, exhaust, C. W. Umholtz. Oils, refining Canadian or similar petroleum, H. Frasch.	487,137 487,119	
Necktie fastener, H. S. Pullman. Needle, J. Wieseckel. Nozzle, exhaust, C. W. Umholtz. Oils, refining Canadian or similar petroleum, H. Frasch. Ores, extracting metals from refractory, Lewis & Phillips. Ores, reducing, A. J. Rossi. Organ, R. Hunter. Packing machine sack case, E. M. Thompson Packing, rod, G. W. Knowlton. Pad. See Dress pad.	487,188 486,941 487,222	
Packing machine sack case, E. M. Thompson Packing, rod, G. W. Knowlton Pad. See Dress pad. Paper bag machine, W. Liddell	486,960 487,019 487,225	
Packing, rod, G. W. Knowton Pad. See Dress pad. Paper bag machine, W. Liddell. Paper jogger, F. A. Onderdonk. Paper, toilet or wrapping, E. N. Cummings. Parturition shears, W. L. & J. C. Drinkwater. Pattern for draughting garments, adjustable, J. C. Cupler. Pen, F. J. W. Fischer. Penholder G. R. Morrill	487,026 487,068 487,237	
C. Cupler. Pen, F. J. W. Fischer. Penholder, G. B. Morrill. Petroleum, purifying, H. Frasch. Photographic printing apparatus, H. E. Tallman. Piano sounding board, E. Stroud. Pin. See Clothes pin. Pipe. See Soap bubble pipe. Submerged pipe. Pipe coupling, J. Lister.	487,143 487,035 487,216 486,913	
Piano sounding board, E. Stroud	486,936	
Pipe. See Soap Duddie pipe. Submerged pipe. Pipe coupling, J. Lister. Planter, W. M. Holladay. Plow, W. A. Estes Pneumatic tool, J. G. Carlinet. Pole tip, W. I. Schuyler. Pole, vehicle, T. B. Cultra. Post. See Fence post. Potatocoverer I. E. Dodge.	487,142 487,086 486,942 486,857	
Poultry killing apparatus W S Furnes	486,861 487,180	
Powder. See Explosive powder. Press. See Baling press. Heel press. Printing stencil characters consecutively, ma- chine for, E. G. Bates. Propeller, boat, F. Giles.	486,964 487,012	
Printing stencil characters consecutively, machine for, E. G. Bates. Propeller, boat, F. Giles. Propeller, boat, F. Giles. Protector. See Gutter protector. Pulley, electro-magnetic, W. E. Harrington Pulp, moulded pail from fibrous, E. Hubbard Pulverizer or mixer, R. W. Lyle. Pump, pneumatic, R. P. Garsed Puzzle, G. W. Bailey. Rack. See Display rack, Hay rack. Horseshoeing rack.	487,070 487,031 486,937 487,090	
Puzzle, G. W. Bailey Rack. See Display rack, Hay rack. Horseshoe- ing rack. Rail tie, G. H. Sellers.	486,959	
Rail the, G. H. Sellers. Railway rail, F. I. Smith. Railway rail joint plate, E. Samuel. Railway spike, S. H. Bracey. Railway tie and fastening, metallic, L. A. Ken-	487,133 487,078 487,111	
yon. Railway trolley, conduit, B. Olbricht	487,016 486,985 487,072 487,140	
Reel. See Wire reel. Refrigerator, A. McDowell	487,199	
Releasing device, S. G. Todd Ring. See Lap ring. Riprap, anchor, D. Neale Riprap, metallic, D. T. McIntyre	487,062 486,887 486,885	
Rivers or other water channels, deepening, J. Schaffer	486,957 487,172	
Rotary engine, compound, Gambetta & Harsin Rotary motor, R. Hewson Saddle, harness, O. Taber Sash holder. W. Purdon	487,217 487,221 486,912 487,155	
Sash holder, I. A. Shaw. Seaming metal cans, tins, etc., apparatus for double, W. Woolnough. Separator. See Magnetic separator.	487,131 486,999	
Rivers or other water channels, deepening, J. Schaffer. Roof, sheet metal, L. H. Britton. Rosin, package for bleaching and packing, D. W. Ketchum. Rotary engine, compound, Gambetta & Harsin. Rotary motor, R. Hewson. Saddle, harness, O. Taber. Sash holder, W. Purdon. Sash holder, W. Purdon. Sash holder, I. A. Shaw. Seaming metal cans, tins, etc., apparatus for double, W. Woolhough. Separator. See Magnetic separator. Sewing machine, A. Eppler. Sewing machine, Froom. G. F. McCombs487,196, Sewing machine feeding mechanism, G. Schrade. Sewing machine feeding mechanism, A. O. Very. Sewing machine for lasting boots or shoes, A. Seaver.	487,214 487,197 487,079 486,961	
Sewing machine for lasting boots or shoes, A. Seaver. Shade holder, curtain, C. E. Dodd. Shaft, flexible, G. H. Coates. Shafts, vehicle, H. Prenzlau. Share attachment, J. Gilbert Sheet metal vessels, attaching sprouts and lips to, G. W. Knapp. Ships' bottoms, apparatus for cleaning, J. J. McCutchan. Shirt, L. Auer	487,023 487,211 486,852 487,037	
Share attachment, J. Gilbert. Sheet metal vessels, attaching sprouts and lips to, G. W. Knapp. Ships' bottoms, apparatus for cleaning, J. J.	487,120 487,032	
Shoe, A. Eppler, Jr	487,011	
Show windows, adjustable stand for, c. H. Green- hagen Shutter worker, C. Hottes Sifter, ash, C. F. Abbott. Skate, Y. Henderson Slate, school, J. H. De Neut. Snow shoe for vehicle wheels, Stenger & Muns-	487,071 487,009 486,872 487,178	
Snow shoe for vehicle wheels, Stenger & Munster. Soap bubble pipe, W. S. Fickett. Soap cake holder, M. Oefinger. Sod trimming machine, W. Pullar. Spinning mule, self-acting, J. Stark. Spoke socket protecting plate, Weinmann & Lindhorst.	486,988 486,967 487,094	
Sou triming machine, W. Funar Spinning mule, self-acting, J. Stark. Spoke socket protecting plate, Weinmann & Lind- horst. Spool holder, T. Frelinghuysen.	486,945 486,995 486,866	
Spring. See Door spring. Vehicle spring. Stair curve, I. J. Palmer. Stamp, perforating, B. F. Cummins. Stamp, perforating canceling, J. Stenwall.	486,940 486,858 486,906	
Steam boiler, E. J. Moore. Steam boiler, upright tubular, T. S. La France Steam engine, S. Baader Steam engine, C. D. Mosher Steam engine, C. D. Mosher.	487,075 487,124 487,025 486,883	
Steam generator, Arbigole. Steam heater, J. A. Flajole. Step for shelves, J. J. Farner. Still, Dittrich & Grumbacher. Still. adjustable walking, J. L. Pope	486,862 487,117 487,027 486,891	
Stone channeling machine, W. H. Bryant Stool, folding, A. Smith Stool, milk, M. N. Sevier Stool, milk, E. W. Shaw	486,847 487,200 487,099 486,944	
Stove, J. A. Suppiger. Stove, D. M. Thomas. Stove, L. F. Zimmerling. Striking and strength tester, coin-controlled, F. W. Kremer	486,916 486,948 487,033	
Spinning mule, self-acting, J. Stark. Spoke socket protecting plate, Weinmann & Lindhorst. Spoil holder, T. Frelinghuysen	486,986 486,983 487,136	
Telegraph pole, O. M. Knox. Telegraph, printing, Neal & Eaton. Telegraphic apparatus, Parker & Summers Telephone, Hayes & Richards.	486,974 487,229 487,154 487,219	
Telephone exchange system, C. E. Scribner Telephone or other electrical exchange, automatic, A. B. Strowger Telephone switchboard apparatus, C. E. Scribner	487,097 486,909 487,098	
Till coupling, W. H. Hannan. Tie. See Rail tie. Railway tie. Tilting gate, Dull & Moore Time recorder, workman's, R. D. Morgan Time setter and coper A. J. Janson.	. 487,005 . 487,179 . 486,977 . 486,932	
Swing, Alexander & Martindale. Switch. See Electric switch. Table. See Ironing table. Telegraph pole, O. M. Knox. Telegraph printing, Neal & Eaton. Telegraphone, Hayes & Richards. Telephone, Hayes & Richards. Telephone exchange system, C. E. Scribner. Telephone or other electrical exchange, automatic, A. B. Strowger. Telephone switchboard apparatus, C. E. Scribner Thill coupling, W. H. Hannan. Tie. See Rail tie. Railway tie. Tilting gate, Dull & Moore. Time recorder, workman's, R. D. Morgan. Tire setter and coo.er, A. J. Ianson. Tire, pneumatic, P. W. Tillinghast. Tobacco box and cutter, combined, H. J. Saxton. Torg, fire, S. W. Bartholomew. Toy, H. Caspar.	. 486,915 . 487,162 . 486,963 . 486,965	
manush Coo Food though	. 400,040	ŀ
Trough: See Feed trough. Trousers, S. & M. Rachelman. Truck safety attachment, car, L. F. Fisher. Tube flanging machine. J. D. Murphy. Typewriter, electric, Neal & Eaton. Typewriter, electrical, Neal & Eaton. Typewriting and printing instrument, Neal & Eaton. **Description** **Descrip	. 486,984 . 487,228 . 487,227	
Typewriting machine, A. Davidson	, 487,066 . 487,130 . 486,881 . 486,950	
Valve for air and gas compressors, J. Clayton Valve, pop safety, Gray & Rivers. Vanillin, preparing, F. Ach. Vehicle, L. Myers. Vehicle apping H. Electron	. 487,064 . 487,029 . 487,204 . 486,884	
Typewriting and printing instrument, Neal & Baton. Typewriting machine, A. Davidson	. 486,914 . 487,008 . 486,870 . 486,865	
wasning machine, L. J. Wilson Watch case pendant, T. A. Hopkins Water closet flushing device, H. C. Weber	. 487,107 . 487,052 . 486,994	

Water meter, disk, J. A. Tilden	
DESIGNS. Chair, A. Thonet	Wheel. See Cog wheel. 487,017 Wheel, S. H. Kimball. 487,053 Wheelbarrow, A. O. Hubbard. 487,053 Whiffletree, L. S. Flatu. 480,863 Whiffletree, H. M. Wright. 480,947 Whiffletree hook, Evans & Dunlap. 486,229 Wind ow, reversible, J. Farquharson. 487,118 Wive covering machine, J. A. Barrett. 486,845 Wire grip, lineman's, C. A. Svensson. 486,912 Wire rel, W. Dulin. 486,028 Wire springs, machine for compressing and forming the ends of sectional woven, D. A. Cobb. 486,853 Wire stretcher, Stahl & Dickey. 487,101 Wrench. See Ratchet wrench. 487,101
Desk railing, A. C. Hough 22,024 Escutcheon plate, M. Schwendner 22,025 Sash pulley case, S. Palmer 22,026 Tape, C. Sisson 22,027 Type, font of printing, H. Ihlenburg 22,019 to 22,021	DESIGNS.
	Desk railing, A. C. Hough 22,024 Escutcheon plate, M. Schwendner 22,025 Sash pulley case, S. Palmer 22,026 Tape, C. Sisson 22,027 Type, font of printing, H. Ihlenburg 22,019 to 22,021
TRADE MARKS. Apparel, certain under and outer wearing, J. H.	

52	Wall paper, C. Booze	l
02		I
8	TRADE MARKS.	ļ
~		١
37	Apparel, certain under and outer wearing, J. H.	١
13	Norcross. 22,092 Beer, lager, C. Schmidt & Sons. 22,078, 22,079	l
35	Beer, lager, C. Schmidt & Sons	İ
16	Roots and shoes leather F Rryant 92.003	l
13	Boots and shoes, leather, F. Bryant	1
30 ¦	Canned fruits and vegetables, Bloomington Can-	ŀ
	ning Company	ł
36	ning Company	
7ĭ	Canned oysters. Fait & Winebrenner. 22,084 Cheviots, S. A. Crozer & Son. 22,087 Cleansing compound, Zizelman & Bartlett. 22,065	ł
71 42	Cleansing compound, Zizelman & Bartlett 22,065	ı
36	Collars or pads, sweat, E. L. McClain 22,071	ŀ
12	Cosmetics, lotions, perfumery, cream, and soap, Firm of William Rieger	ĺ
57	Dairy products, M. Piowaty 22,085	1
	Envelopes and making paper boxes, machinery	l
61 30	for pasting and folding, Lester & Wasley 22,074	I
ου	Explosives, Westfalisch-Anhaltische Sprengstoff-	ı
	ActGes. 22,099	1
i	Fish, whole, cut, and boneless, E. G. Hotchkiss 22.083	1
64	Flour, wheat, Harrod Milling Co	
12	Garments worn by men and boys, outside, Stein-	١
	hart, Heidelberg & Co	ı
70	Grease, axle, King Manufacturing Co	1
31	Shearer Manufacturing Company	١
37 30	Hats and honnets for ladies misses and young	j
63	boys, and trimmings therefor, C. E. Taylor 22.000	1
00	Horseshoe nails, New Process Nail Company 22,072	ł
	Lead, white, Jacobs & McCafferty	1
59 33	Linen goods, L. Thompson & Co	1
33	Lumber, sawed, Fischer & Burnett Lumber Com-	ļ
78 11	pany	1
IJ	Mineral water, Massanetta Park and Springs Com-	1
16	pany	ĺ
10 35	pany	١
72	Plows. South Bend Iron Works	١
ίõ	Remedies for internal use which contain quinine.	١
	New York Quinine and Chemical Works 22,061	1
	Remedy for the diseases of women, L. Gerstle 22,060	
99	Remedy for the diseases of women, L. Gerstle 22,000 Soap and washing powder, laundry, M. F. Smith 22,063 Soap, toilet, Mulheus & Kropfi 22,063	
	Soap, tollet, Mulneus & Kropii	
	Stoves, oil or gas, Page Bros. & Co	١
62	American Tobacco Company	1
27	American Tobacco Company	1
87 8 5	Orchard Company 22,097	1
	Vegetables and foods prepared thereof desiccated	1
57	raw, D. Aigler	1
57 72	watches, waterbury Watch Company 22,070	i
	raw, D. Aigler	J
91	garnspinnerei	1
17	Earnshinnerer	ı
21 12	A printed conv of the enecification and drawing of	ł

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1883, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

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

Mdvertisements.

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







SPECIAL NOTICE!

Two handsome photo-engraved display sheets entitled,
"Recent Improvements in Air Compressors,"
"Recent Improvements in Rock Drills,"
mailed free to any one who will cut out this advertisement and mail it to us with his name and address.

INGERSOLL-SERGEANT DRILL CO. No. 10 Park Place, New York, U.S. A.



Model & Experimental Work
Small articles manufactured in quantities. Inventions
perfected and developed. Working in Alluminum a
specialty. Sylvester P. Denison, Designer & Builder of Fine Machinery, 143 Centre Street, New York City.



ARTESIAN

Wells, Oil and Gas Wells, drilled by contract to any depth, from 50 to 3000 feet. We also manufacto 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 1,000 feet. Write us stating exactly what is required and send for illustrated catalogue. Address BEAVER STREET, NEW YORK.

TRADES UNIONS, THE TENDENCY of.—By Herbert Spencer. An able paper, pointing out the metal read difficulties of dealing with complex social questions. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 801. Price 10 cents. To be had at this office and from all newsdealers.



The Cheapest, The Best
A complete Electric Motor and
Battery Outlift, instructive and entertaining for old and young, operating by means of our patented
battery pads, doing away with liquid acids and chemicals. Series
by mail or express, prepaid, on
receipt of \$1.25. Electror A overly
\$0.1, Roxbury, Mass, Mira of Toy
Motors, Amateur Electro Italing
Outlits, etc. Send for catalogue.
See "Sci. Am." July 23d.



Surveyors' Compasses, Pocket Compasses, Aneroids. Pedometers, Odometers, Sun Dials, etc. Send for Catalogue

KEUFFEL & ESSER CO., NEW YORK and CHICAGO.



IMPROVEMENTS IN MICRO-AMFROVEMENT'S IN MICRO-graphy.—H. G. Piffard, M.D. Description of an im-proved apparatus for the reproduction on paper of min-ute objects seen through the microscope, and which gives excellent results, with amplifications up to four and five hundred diameters. With 2 illustrations. Con-tained in SCIENTIFIC AMERICAN SUPPLEMENT, No. S67. Price 10 cents. To be had at this office and from all newsdealers.

"THE EXPERT" DATING STAMP. Illustrated in Scientific Am. Sep. 3rd, p 146,
THE GREATEST ADVANCE IN RUBBER DATING STAMPS. COMPLETE FOR EVERY HOUR IN 10 YEARS, with Die to order. Post-paid \$2.75. PR. H. SMITH MFG. CO., SPRINGFIELD, MASS. Sole Mfra Metal-Bodied Rubber Type, &c.. &c. Catalogue free.



Jeful Accurates

Journal Accurat Tob and old, countries, write for full particulars concerning. Tot all old cutilder on tank allan into the honde of its hashings and tallan into the honde of its hashings. PUBLICATION OF THE PROPERTY OF THE PARTY OF THE PARTY OF THE PROPERTY OF THE PROPERTY OF THE PARTY OF THE PAR



J. B. COLT & CO., 16 Beekman St., N. Y. 189 La Salle St., Chicago, Ill.

MECHANICS' TOOLS.

If you are interested in Tools as a manufacturer or amateur, you should have a copy of our new catalogue. Our 1892 edition is a very elaborate and complete book of 704 pages, handsomely bound in cloth. The book will be sent to any part of the world, prepaid, on receipt of \$1.00, and the money thus paid will be refunded with the first purchase amounting to \$10.00 or over. Every manufacturer and amateur should have this catalogue, even if they do not intend buying their Tools and Supplies of us.

MONTGOMERY & CO., Fine Tools, 105 Fulton Street, New York City, N. Y.



Steel Type for Writing Machines, J.D. MALLONEE, M'f'r, STOCKTON, N.Y.

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

THE SECRET OF THE HEAVENS.—
By J. Ellard Gore, F.R.A.S. A discussion of the great
mystery of astronomy. The construction of the starry
heavens; embracing an inquiry into the relation of the
milky way to the system of brighter stars that stud the
midnight sky, and the position of both in space with
with reference to our sun and solar system. Contained
in SCIENTIFIC AMERICAN SUPPLEMENT No. 869.
Price 10 cents. To be had at this office and from all
newsdealers.



INVENTORS' IDEAS put into practical working shape by MILLIKEN & D'AMOUR,
Cor. JOHN AND DUTCH STREETS, NEW YORK CITY.
Machinists, Pattern and Model Makers.



Machine Shop Work.

High Grade Tools;
elegant in design, sulegant in design, sulegant in design, sulegant on design of the cheapest.

Send for catalogue and prices. W. F. & JOHN BARNES Co., 1999 Ruby St., Rockford, Ill.

OPTICAL CONSTRUCTION OF THE Photo-tele Objective.—An explanation, by Prof. A. M. Haschek, of the peculiar construction of the Miethe photo-tele objective, which gives a large image with a minimum of camera extension. With 5 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 871. Price 10 cents. To be had at this office and from all newsdealers.



The Belknap Little Giant Water Motor

Best Water Motor, most powerful and efficient machine on the market.

Electric Motors and Dynamos.
Combined Water Motors and Dynamos.
Cyclone Coffee Mills for Grocers' use.
Combined Motor and Mill in one case,
run by water or electricity.

Write for Circulars.

BELKNAP MOIUN CO., 23 Plum St., Portland, Maine U. S. A.

THE STATE OF THE S Pores Acommon เก็บ

ALUMINUM.—A Pocket Rule, made of this wonderl ful metal, 3 inches long, finely graduated, free by mai-for 25c. Agents wanted. T. F. WELCH, Boston, Mass. PURE ALUMINUM.

PROMOTION OF NAVAL ENGINeers.—A series of questions from the new United States Navy regulation circular, which will prove of interest to steam engineers generally. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 871. Price 10 cents, To be had at this office and from all newsdealers.



RECENT ARCHÆOLOGICAL coveries in Ohio.—By Warren K. Moorehead. An interesting account of the excavations made at Fort Ancient, in Warren County, Ohio, and at the village sites found near the structure. With 15 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. S69. Price 10 cents. To be had at this office and from all newsdealers.



DUNCAN'S PRACTICAL SURVEYOR'S GUIDE. A new, revised, and enlarged edition. - Just ready.

Containing the necessary information to make any person of common capacity a finished land surveyor, without the aid of a teacher. By Andrew Duncan Land Surveyor and Civil Engineer. A new, revised, and greatly enlarged edition. Il ustrated by seventy-two engravings.

one volume, 12mo, 214 pages, price \$1.50 by mail, free of postage, to any address in the world.

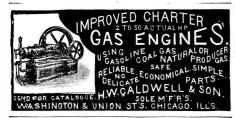
ABSTRACT OF CONTENTS.—Introduction; Object of Surveying; What a survey should include; Definition of points; Determination of a straight line and of a plane surface; Map of a survey; Scales according to which maps of surveys are drawn; Instruments for measuring distances and their use; Instruments forsetting out right angles and their use; Survey of smaller tracts with the assistance of the previously described instruments; Problems; Trigonometrical surveying; Tables of surveys; Systems of rectangular surveying for surveying the public lands of the United States; Index.

E A circular showing the full table of contents of the above book sent free to any one who will apply.

E Our New Revised Descriptive Catalogue of Practical and Scientific Books. 88 pages, 8vo, and our other Catalogues, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

HENRY CAREY BAIRD & CO. NDUSTRIAI. PUBLISHERS, BOOKSELLERS & IMPORTEI 810 Walnut St., Philadelphia, Pa., U. S. A.

BARR'S Book on Steam Boilers, cloth, \$3.00.
are recognized Standard Text Books on these important subjects. New edition just ready. Address, D. Van Nostrand Company, New York, Henry Carey Baird Company, Philadelphia. Baker-Randolph Co., Publishers, Indianapolis and Chicago.



ALUMINUM: ITS USES AND APplications. A valuable and interesting article by G. L. Addenbrooke. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 859. Price 10 cents. To be had at this office and from all newsdealers.

STEEL TYPE FOR TYPEWRITERS



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. 10G Nassau St., N. Y

A GREAT DISCOVERY.

The Cause of Ocean Currents; How and where their Waters are Warmed: An Open Sea and Mild Climate at the Poles; Cause of Northern Lights. All explained in a little book of 32 pages, and sent by mail for one dollar. G. B. SANBORN, BALLARD, KING CO WASHINGTON.



FOR RUNNING LAUNCHES.

Cheapest and Best Engine.

Send for illustrated catalogue free. M. GROB & CO., Leipzig-Eutritzsch (Germany).

Improved Screw Cutting **LATHES** Foot and Power

Drill Presses, Shapers, Band, Circular, and Scroll Saws Machinists' Tools and Supplies. Lathes on tria.

SEBASTIAN LATHE COMPANY, 120 and 122 Culvert Street, Cincinnati, O.

The best Motor in the world for driving all kinds of light machinery, noiseless, neat, compact; invaluable for blowing church organs, running printing presses, coffee mills, ventilating fans, ice cream freezers, meat choppers, etc. In use the world over, and recommended by water companies everywhere. Address for circular, Backus Water Motor Co., Newark, N. J., U.S.A.

THE SIMPLEX PRINTER,



A new invention for duplicating copies of writings or drawings. From an original, on ordinary paper with any pen, 100 copies can be made. 50 copies of type-writer manuscripts pro-circulars and samples. duced in 15 minutes. Send for circulars and samples.

AGENTS WANTED. LAWTON & CO., 22 Vesey St., New York.

REFLECTING TELESCOPES HIGH POWER. Perfect definition. Superior to the Refractor for Planets and close Double or Colored Stars,

efractor for Planets and close Boulde of Strated Circuit ONE-THIRD THE CONT. Illustrated Circuit free. W. C. EDGECOMB, Mystic, Conn.

PRISON REFORM -AN INTEREST ing paper by Tancred Canonico, in which the author follows with a synthetical and rapid glance the gradual change of ideas that afford a key to the present prison reform. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 870. Price 10 cents. To be had at this office and from all newsdea ers.

CHUCKS. Catalogue No. 12, just issued with over 40 new illustrations with over 40 new illustrations. The Cushman Chuck Co., Hartford, Conn.

GAS AND GASOLINE ENGINES

Stationary and Marine. Stationary and Marine.

Makes is own supply of gas from gasoline, and at less expense than any other engine. No bouler coal, or fremun required. Runs with either manufactured or natural gas. Specially adapted for small boats and launchesand electric light work. Circulars free.

CLARK SINTZ, MFR., Springfield, Ohio.





Gibbs Patent Dust Protector bs Patent Dust Protector
tects the nose and mouth from inhaling poisonous dust. Invaluable
in every industry where dust is
troublesome. Perfect protection
with perfect ventilation. Inhalation of dust causes catarrh,
consumption and many other serious disorders. Thousands in use.
Price \$1.00, postpaid in U. S. and
Canada; \$1.40 to foreign points.
Gibbs Respirator Co.,
31 La Salle St., Chicago.

MAN'S UPWARD STRUGGLE. - A man's UPWARD STRUUULL.—A paper by Dr. Eugene Murray Aaron, giving a resume of the anatomical proofs of our former quadrupedal character, and presenting a few of the most marked facts that point unmistakably to the struggle that man has had and is, in a less degree, still having to maintain his erect position. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 867. Price 10 cents. To be had at this office and from all newsdealers.

THIS WIRE STRAIGHTENER

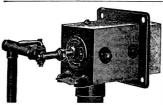


will straighten wire from 1-32 to 1-4 inch diameter and is nicely made and well balanced. PRICE \$12.00.

CHANDLER & FARQUHAR,

So Weshington Street, Boston, Mass.

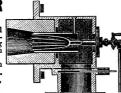
. 179 Washington Street, Boston, Ma Send for Catalogue of Machinist Supplies.



HYDRO-CARBON BURNER

For Burning Crude Petroleum under low pressure (Meyer's patent). Adapted for all kinds of Iron and Steel Forging, Tempering and Welding, Annealing, etc., for Burning Sewer Pipe, Heating Asphalt, Oxidizing Lead, Generating Steam and an endless variety of special work.

Experiment Furnished on application to equip plants with our improved system. Standard Oil Fuel Burner Co. FORT PLAIN, NEW YORK.



PROPOSALS.

U. S. ENGINEER OFFICE, BOSTON, MASS., No-vember 15, 1892.—Sealed proposals for dredging from Winthrop Harbor, Mass., will be received at this office until noon of December 15, 1892, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this of-fice. S. M. MANSFIELD, Lieut.-Col. of Engineers.

U. S. ENGINEER OFFICE, BOSTON, MASS., No-yember 21, 1892. Sealed proposals for dredging from Lynn Harbor, Mass., will be received at this office until noon of December 21, 1892, and then publicly opened. Specifications, blank forms, and all available informa-tion will be furnished on amplication to this office. Specifications, Dialik 1911, tion will be furnished on application to this office.

S. M. MANSFIELD, Lieut.-Col. of Engineers.



CLARK'S

WOOL WASHERS,
WARP DYEING AND SIZING MACHINES,
PATENT RUBBER COVERED SQUEEZE
ROLLS,
POWER WRINGERS FOR HOSIERY AND
VARN DYEING,
DRYING AND VENTILATING FANS,
WOOL AND COTTON DRYERS, Etc.
Catalogues free.

GEO. P. CLARK Windsor Locks, Conn.

THE BEST LOOSE PULLEY OILER VANDUZEN PAT. L. PUL. OILER

Keeps Pulley ciled 3 to 4 weeks with one filling. Cost 25, 30, 40, 50, 65 and 85 cents each. Send Price and TRY ONE. State diameter and speed of Pulley. Will send Catalogue free. Mention this paper. The VANDUZEN & TIFT CO. Cincinnati, O.U.S.A.

REE To every one sending us 50 cents for one year's subscription to "BUBLER'S POPTLAR ELECTRICIAN," a monthly journal for the amateur, experimenter, and public, we will send the control of the control



₽8u **USE GRINDSTONES**?

If so, we can supply you. All sizes mounted and unmounted, always kept in stock. Remember, we make a special type special purposes. The CLEVELAND STONE CO. 2d Floor, Wilshire, Cleveland, O.

HAND AND POWER BALING and PACKING **PRESSES** FOR ALL PURPOSES.

RYTHER MFG. CO., Watertown, N. Y., U. S. A.

WORKING MODELS & LIGHT MACHINERY. INVENTIONS DEVELOPED. Send for Model Circular. Jones Bros. E Co., Cin'ti, O.

"NEW INVENTIONS."

An Engineer, traveling all Russia for first-class London house, could take up one or two good specialties additional. Sole agencies. Ordinary machine useless. Address, W. HOPE CAMPBELL, care of Messrs. EGERTON, HUBBARD & Co., St. Petersburg, Russia.

THE GLOBE AUTOMATIC INJECTOR The Latest and Best BOILER FEEDER Restarting.

Simple Positive Eagle Lubricator Co., 108 Canal Street, CLEVELAND, O.

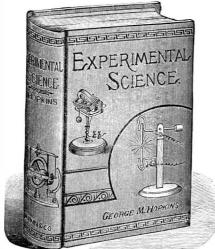
ALUMINUM

In all shapes. Manufactured by Cowles Electric Smelting and Aluminum Co. Correspondence solicited. LOCKPORT, N. Y.

HAVE YOU READ



This new book, by Geo. M. Hopkins, is just what you need to give you a good general knowledge of Physical Science. No one having the spirit of the times can afford to be without the kind of scientific information contained in this book. It is not only instructive, but entertaining.



Over 700 pages: 680 fine cuts; substantially and beautifully bound. Price by mail, \$4.00. Send for illustrated circular

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

-FOR-

FREE SITES TO SUBSTANTIAL

MANUFACTURING ENTERPRISES in the rapidly growing towns of Virginia and West Virginia, possessing CHEAP IRON, CHEAP LUMBER, CHEAP FUEL, and RAILROAD FACILITIES, address J. H. DINGEE, 333 Walnut Street, Philadelphia, Pa., President and General Manager of numerons Land Companies situated along the lines of the Norfolk & Western Railroad.



CASTINGS and Parts for making 8 and 16 Light Dynamos, Simple and Parkhurst Motors and Alter-nating Current Motor.

LATHE CASTINGS.
Electrical Supplies. Send stamp for new Catalogue. PALMER BROS.,

THE MISSING WAR LINK Out of sight from 1861 to 1865, Found in the

THREE EMANCIPATORS,

Valuable information that everybody should have. Sent by mail on receipt of One Dime by JNO. L. SCHILLING, BELLAIRE, OHIO,



INVENTORS and Experimentors can obtain val-ing their ideas. Models and patterns a specialty. Write us. WM. GARDAM & SON, 98 John St., New York.

WIFE SAYS SHE CANNOT SEE HUW
YOU DO IT FOR THE MONEY.
2 Sewing Machine; perfect working reliable, finely finished, daspied to light and heavy
work, with a complete set of the latest improved
attachments frees. Each machine guaranteed for 5

scription of the Parisian Compressed Air Company's new and extensive plant. With 6 illustrations. Con-tained in SCIENTIFIC AMERICAN SUPPLEMENT. No. 863. Price 10 cents. To be had at this office and from all newsdealers.



DELANEY'S
Expansion Packings
for Steam, Water & Ammonia
are best and cheapest.

DELANEY'S
Metallic Gaskets and
Flanges
make everlasting joints.
H. J. Delaney & Co. Mfrs.
Third & Fowler Sts., Milwaukee, Wis.

Amateur Theatricals, Temperance Plays, Drawing-Room Plays, Fairy Plays, Ethiopian Plays, Guide Books, Speakers, Pantomimes, Charades, Jarley's Wax Works, Burnt Cork, Theatrical Face Preparations, Wigs, Beards, Moustaches, and Paper Scenery. New Catalogues, containing many novelties, full description and prices sent FREE! FREE! T. H. FRENCH, 28 West 23d St., N. Y.





"ECONOMY IS WEALTH." Canvassers wanted to sell the New Model Hall Typewriter, Why will people buy a \$100 machine when \$30 will purchase a better one! Send for illustrated catalogue and terms to County Agents. Address N. TYPEWRITER CO.
611 Washington Street.Boston, Mass.
Mention Scientific American,



PERFORATORS OF ALL METALS

For Cotton, Oil and Rice Mills, Sugar Houses, Distilleries, Phosphate and Fertilizer Works, Mining and Concentrating, Gas and Water Works, Elevators, Threshers, Separators, Corn Shellers, and all kinds of Grain Cleaning Machinery. Heavy Steel and Iron Plates and Cylinders for Screening Ore, Coal, Stone. For Filters, Strainers, Ventilators, Oil, Gas and Vapor Stoves and all special purposes. Special sizes for Coffee Cleaning and Roasting Machinery. Perforated Tin and Brass.

The Harrington & King Perforating Co., Chicago, and 284 Pearl St., N.Y.

COMPRESSED AIR.-DETAILED DE-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. 865. Price 10 cents. To be had at this office and from all newsdealers.

GATES ROCK & ORE BREAKER



Capacity up to 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. CATES IRON WORKS, 50 C So. Clinton St., Chicago 136 C, Liberty Street, New York, 237 C, Franklin St., Boston, Mass

Scientific Book Catalogue

RECENTLY PUBLISHED.

Our new catalogue containing over 100 pages, includ-ig works on more than fifty different subjects. Will be alied free to any address on application. MUNN & CO.. Publishers Scientific American, 361 Broadway, New York.

WATER JAMES LEFFEL & CO., SPRINGFIELD, OHIO, U.S.A. Send for our fine WHEELS large PAMPHLET.





DEAF NESS & HEAD NOISES CURED by Pede's Invisible Tubular Bar Cushions, Whismenbard, Successful when the Bar Cushions, Whismenbard, White Bar Cushions, White Bar Cus heard, Successful when all remedies fail. Sold FREE



Advertisements.

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



OVERMAN WHEEL CO. A. G. SPALDING & BROS., Special Agents,

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



AMERICAN SCREW COMPANY, PROVIDENCE, R. I.



B. C. DAVIS, Counsellor at Law, 186 Rewsen Street, Brooklyn, New York, torporations, Joint Stock Companies, and Syndicates rganized to develop mining, industrial, manufacturing and business enterprises and patents—counselled, ad-ised, and financially shaped to interest capital.

THE HUB FRICTION CLUTCH



applied to Pulleys, Gears, Sprocket Wheels, Reversible Countershafts and Cut-off Couplings. The most simple, effective, durable and economical Clutch on the market. Made in sizes to transmit from 2 up to 1000 h. p., at slow or fast speed. Over 10,000 in use. Write for cuts, description, price list and discounts, to the makers,

The James Smith
Woolen Machinery Co.,
411-421 Race St., Phila., Pa.

Before you know it you will be sorry you did not decide earlier

"What to give them."

It is so simple; the one thing that everybody wants and would be made happy by—and you can af-ford it—a new, quick-winding Wa**terbury.** \$4 to \$15.

Elegant and accurate; the gem for a lady's belt; the man's everyday watch—to save a costlier one, perhaps—a pocket guardian for youngsters, teaching them time-value, and saving worry for the elders. All jewelers keep it in all styles. "See it."

Boy's Watch, \$4 to \$10. Men's "\$5 to \$12. Lady's "\$5 to \$15.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had forty-five years experience, and now have unequaled lacilities for the preparation of Patent Drawings, Specifications, and the preparation of Patent Drawings, Specifications, and the preparation of Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure the Treetions concerning Labels, Opprights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases. Hints on the sale of Patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,

361 Broadway, New York.

361 Broadway, New York. BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building near 7th Street, Washington, D. C.

H. W. JOHNS'

Asbestos Sectional **Pipe** Coverings.

Non-Conducting Coverings for Steam and Hot Water Pipes, Boilers, etc. READILY ATTACHED OR REMOVED BY ANY ONE.

ASBESTOS BOILER COVERINGS.



SAWS Wanted 50,000 Sawyers SAWS and Lumbermen to SAWS send us their full address for a copy of Emerson's Law Book of SAWS, new 1892 edition. We are first to introduce NATURAL Wonderful effect upon improving their quality and toughness, enabling us to reduce prices. Address EMERSON, SMITH SCO, CALLIMITED, ACCO. (Limited), Beaver Falls, Pa.

STEREOPTICONS, all prices. Views illustrating ry subject for PUBLIC EXHIBITIONS, etc.

Lanterns for Home Amusements. 236 page Catalogue free. McALLISTER, Mfg. Optician. 49 Nassau St., N.Y.

INVESTMENT SECURITIES.—All classes; industrial real estate and high class speculative properties; correspondence solicited. J. A. GOODWIN, P. O. Box 2538, Boston.

We are prepared to take contracts for applying Steam Pipe and Boiler Coverings in any part of the United States.

H. W. JOHNS MANUFACTURING COMPANY,
H. W. Johns' Asbestos Millboard, Sheathings, Building Felts, Fire-Proof Paints, Liquid Paints,
Asbestos Roofing, Etc.

87 MAIDEN LANE, N. Y. Jersey City, Chicago, Philadelphia, Boston, Atlanta, London. Motor of 19th Century % to 50 H. P.

Can be used Any Place, to do Any Work, and by Any One. No Boiler! No Fire! No Steam! No Ashes! No Gauges! No Engineer! A pertectly safe Motor for all places and purposes. Cost of operation about one cent an hour to eachindicated horse power. Wor circulars etc. address. For circulars, etc., address

Economy, Reliability, CHARTER GAS ENGINE CO.

Simplicity, Safety. P. O. Box148. Sterling, Ill.

THE MODERN MARINE BOILER. BY A. B. Willits, U.S.N. Description of the principal features of the boilers of the United States man-of-war New York, with a plea to inventive minds for the production of a type of boiler which shall do away with the necessity of the present enormously large and heavy shells, and present a lighter substitute that will perform the duties of both envelope and heating surface conjointly. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. S70. Price 10 cents. To be had at this office and from all newsdealers.

GAS of GASOLINE ENGINES STATIONARY and PORTABLE. All Sizes.



VAN DUZEN GAS & GASOLINE ENGINE CO. Cincinnati, O.



"IMPROVEMENT THE ORDER OF THE AGE." The Smith Premier Typewriter

Embodies the most Progressive Mechanical Principles.

All the Essential Features Greatly Perfected.

Perfect and Permanent Alignment.

Easiest Running, and Nearly Silent.

All type cleaned in Ten Seconds without Soiling the Hands. The Smith Premier Typewriter Co., Syracuse, N. Y., U. S. A.

Write "THE PRATT CHUCK CO.," Clayville, N. Y., U. S. A., for free illustrated catalogue of POSITIVE DRIVING DRILLI 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.



LATEST IMPROVEMENTS. NEW STYLE. NEW PRICES.

GROWING RAPIDLY in FAVOR

THE AMERICAN BELL TELEPHONE CO.

95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.



NICKEL **ELECTRO-PLATING** Apparatus and Material.

Hanson & Van Winkle Co.
Newark, N. J.
SI LIBERTY ST., N. Y.
23 S. CANAL STREET,
CHICAGO. THE

For Snap-Shots Out-Doors For Time Exposures In-Doors, For Flash-Lights at Night.

The Junior are the most compact camera made. Perfectly adapted to hand or tripod use. Can be used with roll films or glass plates. Fitted with focusing index and counter for exposures,

\$40 and \$50.

EASTMAN KODAK CO., Rochester, N.Y.

AGING LIQUORS.—BY C. C. STAUF-fer. A brief description of some of the mechanical agencies employed for oxidizing liquors, as revealed by domestic and foreign patents. With 7 figures. Con-tained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 871. Price 10 cents. To be had at this office and from



EDISON INCANDESCENT

Is the only Incandescent Lamp lawfully made.

All others infringe the Edison Patents, and are counterfeits.

See decision of Court of Appeals in case of Edison Electric Light Company vs. United States Electric Light Company, decided October 4, 1892.

Copies of this decision will be sent on application.

GENERAL ELECTRIC COMPANY. BRANCH OFFICES:

PASSENGER & FREIGHT ELEVATORS

VELOCITY OF ICE BOATS. A COL-lection of interesting letters to the editor of the SCIEN-TIFIC 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.

A MODERN BATH.

The Latest and Best.
Quick self-heating or Toilet Cabinet in place of Heater. No bath room required. Ornamental, inexpensive, complete, practical. Desirable for city or town. Send 2 ct. stamp for catal. The Mosely Folding Bath Tub Co., 186 So. Canal St., Chicago.

ICE-HOUSE AND COLD ROOM.-BY R. G. Hatfield. With directions for construction. Four engravings. Contained in SCIENTIFIC AMERICAN SUP-PLEMENT, 59. Price 10 cents. To be had at this office and from all newsdealers.

THE ARMSTRONG MACHINES,



No. 1 cuts off and threads 1 to 3 inch. No. 2 cuts off and threads 1 to

and threads 1 to 6 inch.
Our aim is to make
these machines as good as
are universally acknowl-

our Stocks and Dies, which are universally acknowledged to be THE BEST. To Send for catalogue.

THE ARMSTRONG MFG. CO., Bridgeport, Ct.



ESTABLISHED 1846.

The Most Popular Scientific Paper in the World Only \$3.00 a Year, Including Postage. Weekly-52 Numbers a Year.

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

Terms of Subscription.—One copy of the SCIEN-

TIFIC AMERICAN will be sent for one year-52 numberspostage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of three dollars by the

publishers; six months, \$1.50; three months, \$1.00. Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

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

MUNN & CO., 361 Broadway, New York.

THE

Scientific American Supplement This is a separate and distinct publication from THE

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

obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, \$5.00 a year; or one copy of the Scientific Amfor one year for \$7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check,

MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages: forming a large and splendid Magazine of Architecture, richly adorned with elegant plates in colors, and with other fine engravings; illustrating the most interesting examples of modern architectural construction and allied subjects. A special feature is the presentation in each number of a variety of the latest and best plans for private resi-

dences, 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 full Plans, Specifications, Sheets of Details, Estimates, etc.

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

MUNN & CO., Publishers,

361 Broadway, New York,



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