

SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

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

Vol. XLV.—No. 24.
[NEW SERIES.]

NEW YORK, DECEMBER 10, 1881.

[\$3.20 per Annum.
[POSTAGE PREPAID.]]

EDISON'S NEW STEAM DYNAMO.

In our issue of November 19 we described the Edison system of electrical conductors now being placed beneath the street pavements of New York city. We now present our readers with an engraving of one of the gigantic dynamo-electric machines of the type to be used in supplying the current to the conductors above referred to. This particular machine is an exhibit at the Paris Electrical Exhibition, but it differs but slightly from the others of the same class. The dimensions and weight of this machine are briefly as follows:

Weight of cast iron sole plate upon which dynamo and engine are placed, with pillow blocks, 9,600 lb.; magnets complete, 24,500 lb.; armature complete and shaft, 8,500 lb.; engine, 10,000 lb.; total weight 44,600 lb. The total weight of copper on armature and magnets is 3,600 lb. Principal dimensions: sole plate, $12\frac{1}{2} \times 8\frac{1}{2}$ feet; length of magnets, 8 feet; length of armature, 5 feet (commutator makes additional length of 9 inches); diameter of armature, 28 inches; engine cylinder, 11 inches by 6 inches; capacity, 2,400 gas jets.

In the Edison system an engine of great power is connected directly with the armature shaft of a single dynamo capable of economically converting the power of the engine into electric energy for distribution to lamps and motors.

The speed of the engine and armature is 350 revolutions per minute. The boiler pressure is 120 lb. With engines of the most perfect build, and with the armature weighing 8,500 lb. as a fly wheel, the Edison machine attains great uniformity in speed and consequently insures perfect steadiness in the light. The armature is arranged on Siemens' principle, the wires being replaced by bars of copper. These bars lie close to each other around the cylinder which forms the armature, and they generate the current. Their extremities are connected with disks of copper laid one against the other at the ends of the cylinder and insulated from each other. Each bar is fastened to its corresponding disks in such a way as to form a single circuit enveloping the cylinder longitudinally, the bars are coupled two-and-two, with the commutator blocks, which are made after the Gramme pattern. Figs. 2 and 3 give an idea of this new arrangement. The center of the cylinder itself outside of the rotating axle consists of

a cylinder of wood, which in its turn is surrounded by a thick tube made of a series of very thin disks of iron, separated from each other by tissue paper. This arrangement facilitates the rapid changes of polarity in the plates. This tube is terminated at its two extremities by two thick clamping disks, which are made to compress the others laterally, and the copper disks of the working coil occupy the two compartments at the extremities of the cylinder, as seen in

Fig. 2.

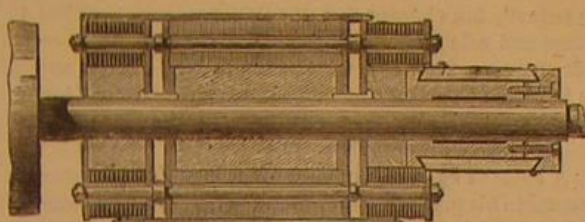
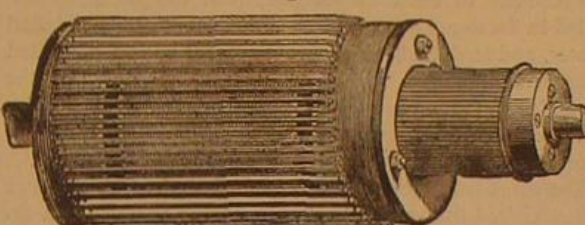


Fig. 3.



SECTIONAL AND PERSPECTIVE VIEWS OF THE ARMATURE.

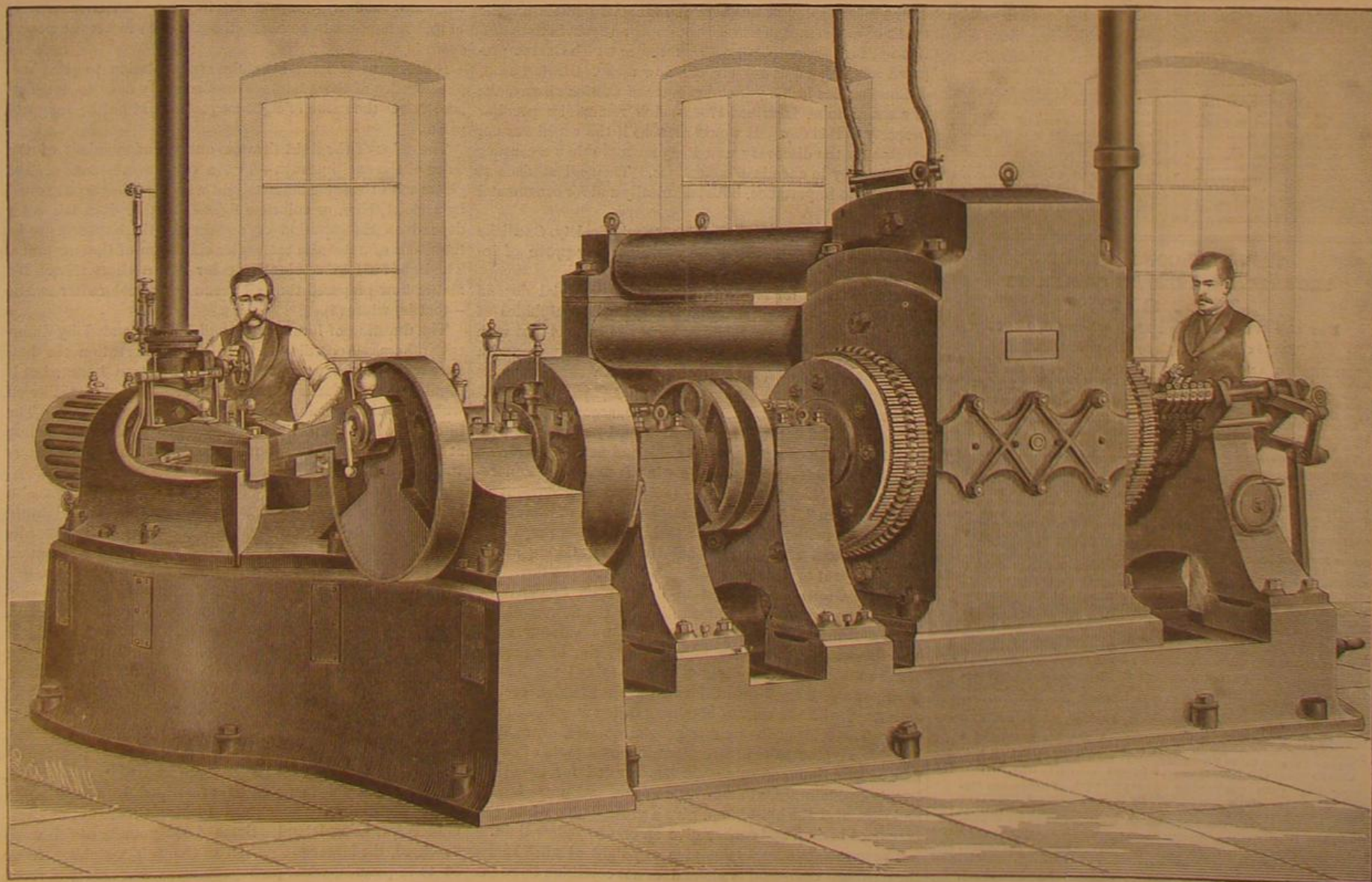
Fig. 2. Under such conditions as these, the resistance of the generator is small and permits of great subdivision of the current in multiple arc; there is no insulation to be burned, and it is possible in case of the deterioration of the bars to renew them easily, for they are simply screwed against their corresponding copper disks. In the new arrangement adopted by Mr. Edison, the field magnets lie horizontal, as shown in our engraving, instead of being placed in the vertical.

The central station now in process of construction will be provided with twelve steam engines of 150 horse power each, actuating dynamo electric machines, each of which will be capable of supplying 2,400 lamps of eight candle power. The current furnished to these lamps comes through the large sized conductors laid in the streets, from which smaller conductors lead into the houses. These conductors virtually bring the poles of the generator into each house, where the lamp wires can be brought in connection with them, thus rendering each house independent of any other, both for a supply of light and motive power.

An Acetate of Soda Stove.

An alleged improvement by a Dresden chemist, Herr Nieske, in the new method of heating with acetate of soda, consists in mixing hyposulphate of soda with the acetate. The former melts more quickly than the latter, and retards crystallization in cooling. Herr Nieske uses one volume of acetate with ten of hyposulphate. The cases are filled to the extent of three-fourths, hermetically closed, and kept in hot water till one no longer hears a sound from crystals within, on shaking. The cases will then give an equable heat from ten to fifteen hours, according to size. A room stove, acting on this principle, is described by Herr Nieske in the *Deutsche Ind. Zeitung*. It consists of an inner and an outer cylinder, the latter having numerous small holes. In the space between the two stand three of the heating cases. These can be easily lifted out by the handles, and put into water in the central cylinder, which can be heated in position by means of a burner below (or removed to be heated elsewhere). This done, the cases are lifted into their places in the annular space. The stove runs on casters and has a cover. The water in the inner cylinder furnishes, by evaporation, a wholesome degree of moisture.

DISCOVERY OF EXTENSIVE PINE FORESTS.—The recent exploration party of Colonel Mercer up the Spanish River, in the province of Ontario, is said to have discovered vast pine forests, containing upward of 24,000,000,000 feet of a superior quality of pine lumber, with facilities for getting it to market equal to the best.



EDISON'S STEAM DYNAMO-ELECTRIC MACHINE AT THE PARIS ELECTRICAL EXHIBITION.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN,

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy one year postage included..... \$3 00
 One copy, six months, postage included..... 1 60
 Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$3.00 each; additional copies at same proportionate rate. Postage prepaid.
 Remit by postal order. Address
 MUNN & CO., 37 Park Row, 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 with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, postage paid, to subscribers. Single copies, 19 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of seven dollars. Both papers to one address or different addresses as desired.

The safest way to remit is by draft postal order, or registered letter. Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, \$5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, DECEMBER 10, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

Accumulation, met., principle of.....	372	Lime as a preservative.....	378
Acetate of soda stove, an.....	367	Luminous paint.....	368
Agricultural inventions.....	378	Mantelpiece, artistic.....	374
Alaskan mines.....	378	Mechanical inventions.....	374
American cattle, infection of.....	372	Memory in chess playing.....	378
Ammonia in pulmonary diseases.....	375	Mine, Alaskan.....	378
Ancient great lake in the West.....	375	Mines of Tasmania, the.....	375
Arsenic in caustic soda.....	374	Muscular power of insects.....	370
Artistic mantelpiece.....	375	Mortality from snakes and tigers.....	376
Bottle wrapper, novel.....	371	Paint, luminous.....	368
Bu k, the, of a ton of coal.....	373	Paris electrical exhibition.....	377
Burns, the treatment of.....	376	Patent, a, can it be sold for debt?.....	368
Can a patent be sold for debt?.....	376	Patent commutes, the, resig. of.....	369
Carbolic powder.....	375	Perfumes, poisonous.....	374
Car couplers, self-acting.....	372	Photograph, large, a.....	371
Cars, cattle, improvement of.....	373	Pine forests, extensive.....	367
Cattle, American, infection of.....	372	Plague, a, among the violets.....	374
Cattle cars, improvement of.....	373	Plugs, cause of showing.....	373
Cheese playing, memory in.....	378	Poisonous perfumes.....	374
Coal, the bulk of a ton.....	373	Powder, carbolic, another.....	374
Coffee, action on the stomach.....	375	Power, muscular, of insects.....	370
Commissioner of patents, resigns.....	379	Pulmonary diseases, ammonia in.....	375
Corwin's, the, collections.....	370	Purification, gas, by apatite.....	379
Cotton spindles in Fall River.....	375	Putty holes, cause of showing.....	372
Diseases, pulmonary, ammonia in.....	375	Radiometer, new appl. of the.....	372
Double-driving tricycle.....	372	Refuse, utilization of.....	373
Dynamo, new steam, Edison's.....	375	Shattering, hollow steel, in France.....	371
Edison's new steam dynamo.....	375	Smallpox.....	369
Eight thousand ton steamer.....	371	Soldering iron, improved.....	371
Electric exhibition at Paris.....	377	Spindles, cotton, in Fall River.....	375
Electric light in Barcelona.....	370	Squid, giant, another.....	370
Engineering inventions.....	378	Steamboat inspection.....	370
Exhibition, int., of elec. at Paris.....	377	Steam boiler notes.....	370
Forests, pine, extensive.....	375	Steamer, 800 ton, another.....	371
Gas purification by apatite.....	379	Stove, acetate of soda, an.....	371
Glove, husking, new.....	374	Strontianite.....	375
Husking glove, new.....	374	Sugar, action of on the stomach.....	377
Insects, muscular power.....	370	Sugar process, Bonnet's.....	377
Inspection, steamboat.....	370	Sulky, trotting novel.....	374
Int. exhib. etc., of elec. at Paris.....	377	Tasmania, the, mines of.....	375
Inventions, agricultural.....	378	Ton of coal, a, the bulk of.....	373
Inventions, engineering.....	378	Torpedo versus fire.....	372
Inventions, mechanical.....	374	Treatment, the, of burns.....	376
Inventions, miscellaneous.....	371	Tricycle, double driving.....	372
Inventions, new.....	371	Trotting sulky, novel.....	374
Inventions, recent.....	373	Vanadium in caustic soda.....	374
Int. a, soldering, improved.....	371	Violets, the, a plague among.....	374
Lake, great, ancient, in the West.....	375	Wrapper, bottle, novel.....	371
Light, electric, in Barcelona.....	370		

TABLE OF CONTENTS OF
 THE SCIENTIFIC AMERICAN SUPPLEMENT
 No. 310,
 For the Week ending December 10, 1881.

Price 10 cents. For sale by all newsdealers.

I. ENGINEERING AND MECHANICS.—Gas Engines at the Paris Electrical Exhibition. 1 figure. Clerk's Gas Engine.....	433
Large Planing and Slotting Machines. 2 figures. Improved 17 foot 6 inch vertical planing machine.—Improved 4 foot stroke vertical slotting machine.....	430
Krupp's Improved Gas Generator Compound with the Older Apparatus of Lemens. 2 figures. Krupp's Gas Generator.....	430
On the Manufacture of Projectiles. By J. DAVIDSON. 4 figures.....	431
The Manufacture of Mineral Wool.....	431
II. ELECTRO-METALLURGY.—Electro-Metallurgy. Cleansing and preparing objects for electro-plating.—Cleansing copper and copper alloys.—Cast iron, wrought iron and steel.—Zinc, tin, and lead.— Scratch brushing.—Silver deposits.—Gold deposits.—Hoth baths.— Bath for iron and steel uncased.—Cold electro-gilding bath.— Management of the hot bath.—Nickel plating.—The battery.—Pre- paring the work.—Copper deposits.—Formulas for hot and cold baths.—Copper deposits by dipping.—Electro brass plating.—Formu- lae for brass baths.—Management of the bath.—Tin plating pro- cess.—Electrotyping.—The stereotype process for reproducing metals, etc.—Reproduction by electrolysis.....	430
III. NATURAL HISTORY, ETC.—Prize Animals at the Interna- tional Exhibition of Dogs, Eleve, Belgium. 11 figures, folio page.....	433
On the Discoveries of the Past Half Century Relating to Animal Motion. By Dr. J. BURDON-SANDERSON. The nature and regula- tion of muscular action.—Relation of nerve action to muscular contraction.—The development of scientific physiology.....	435
Notes on the Migration of Birds. By H. D. MINOT.....	430
IV. TECHNOLOGY AND CHEMISTRY.—Reproduction of Negatives for Single Transfer Carbon Printing. By W. T. WILKINSON.....	431
Affinity and Valency. By FRED. D. BROWN.....	439
Improved Retort for Coal Gas.—1 figure.....	439
Ferrous-Oxalate-Ultraviolet Developer. By Capt. W. DE W. ABNEY.....	439
V. HYGIENE, MEDICINE, ETC.—Rabies.—A possible cause and a probable preventive. By Dr. L. L. DORR.....	437
Heavy Paraffin Oil in Pharmacy. By CHARLES SYMES.....	438
Catsup under the Microscope. 3 figures.....	439
VI. PHYSICS AND PHYSICAL APPARATUS.—Phenomena Devel- oped by Heliostatic Star Disks. By G. W. ROYSTON PIGOTT.— 1 illustration.—6 figures.....	434
New Action and Pressure Apparatus. By Dr. ROBERT MUECKE.....	435
VII. AGRICULTURE, HORTICULTURE, ETC.—Storing Cabbages.....	430
The Culture of Tuberoses.....	430
VIII. MISCELLANEOUS.—The Railway Disaster at Charenton.....	435
France.—2 figures.—Full page illustration.....	432
Suggestions in Decorative Art.—Rose wall paper.—1 figure.....	432
Rose Pattern Wall Paper Decoration.....	432
Professor Louis Pasteur.—Portrait.....	435

CAN A PATENT BE SOLD BY SHERIFF FOR DEBT
LIKE OTHER PROPERTY?

This question is frequently asked, and heretofore, in the absence of any definite decisions of the courts, we have been accustomed, for many years, to answer that an ordinary sheriff's sale of a patent would be invalid, while an assignment of the patent by the owner would hold good and carry title against such sheriff's sale. Further, we have held that the proper way for a creditor to obtain title to a debtor's patent is to procure an order from a competent court, compelling the debtor to sign a deed of conveyance.

This subject has lately received the attention of two separate courts, and we will here present the substance of both decisions.

The first case was in the Supreme Court of the District of Columbia, Murray vs. Ager, decided January, 1881. Murray, having recovered a judgment of \$2,164 against Ager, who was the patentee of certain grain-dressing inventions, represented to the court that the only means he had to realize on his judgment was from the patent. Murray accordingly asked the court for an order compelling Ager to execute such assignments of patents to the purchaser as might be necessary to carry the title, in conformity with the patent laws.

The defendant admitted the judgment and ownership of the patents, but claimed that the latter were not subject to seizure and sale under the proceedings. The lower court took the same view and dismissed the bill; but on appeal the Supreme Court of the District reversed the decision of the lower court, and, in a very interesting and exhaustive decision, held substantially as follows:

"A court of equity may direct the sale of the interest of an inventor in his patent in order to satisfy a judgment obtained against him in a court of law, the writ of execution having been returned *nulla bona*, and for that purpose will require the patentee to make an assignment of the patent, as provided in Section 4,898 of the Revised Statutes of the United States, and in default of such assignment within a limited time, will appoint a trustee, with authority to execute the same."

The second case occurred in the Supreme Court of California, Pacific Bank vs. Robinson, decided April 19, 1881.

The court held that "a patent right issued under the laws of the United States may be required to be assigned to a receiver, under proceedings supplementary to execution, who may sell the same and apply the proceeds in satisfaction of judgment."

Thus, although an ordinary sheriff's sale of a debtor's patent right would be good for nothing, it appears from the foregoing cases that, when proper supplementary proceedings are taken, the courts may compel the debtor to make an assignment of his patent for the benefit of his creditors, or appoint a receiver for the patent, whose conveyance to the purchaser would be good.

LUMINOUS PAINT.

The introduction at this time of luminous paint is not the result of any recent discoveries or improvements in its manufacture, for we are told that the substance which Canton prepared was as good as any one can now make. Prof. Tuson, of London, has in his possession some of Canton's own make in a sealed tube, inscribed 1764, which retains its peculiar property to this day. It would seem as if the world was not yet ripe for the discovery, and it lay for more than a century a curious toy in chemical collections. Then all at once it springs into importance, both technically and for ornamental purposes.

In a lecture before the Berlin Polytechnic Society, Gaedicke gave some details of its history, which may prove of interest.

All the recipes for making the luminous material depend upon the formation of sulphur compounds, sulphides of barium, strontium, or calcium. They either set out with the sulphates, which are reduced in different ways, or with carbonates or oxides, that are treated with sulphur or its compounds.

The Poligonian phosphorus was made, according to John, from pulverized barytes, free from iron, by mixing it with gum tragacanth to a cake, drying this and heating it for an hour between layers of coal in a wind furnace. Osann reduced the sulphate of barium by igniting it in a current of hydrogen. In 1750 Markgraf heated sulphate of lime with charcoal—a method still in use to-day. Canton prepared a phosphorescent sulphur compound of lime, taking as his material burnt oyster shells, which he treated with flowers of sulphur. Grotthus attempted to improve on this method, and Osann modified it by substituting for the flowers of sulphur a metallic sulphide, which gave up sulphur when heated, such as sulphides of antimony, tin, or mercury. Wach returned to Canton's method, but mixed the flowers of sulphur with small quantities of metallic oxides, such as antimony, with the view of obtaining different colors in this way. The color of the light is generally white, or, at first, bluish. Hyposulphite of strontium, or equal parts of carbonate of strontium and sulphur, when ignited for twenty or twenty-five minutes, at first over an ordinary Bunsen burner and then over the blast lamp, give a green light, while carbonate of barium and carbon give an orange-yellow light.

The pure sulphides do not give any light at all. Hence the chemical composition alone does not condition its power of giving out light, since of two substances having the same composition, one may be luminous while the other is not.

It seems rather as if the power of giving light depends not only on the correct chemical composition, but also upon a definite molecular condition. Hence it happens that the luminous substance obtained from burnt mother of pearl is better than that from burnt oyster shells; also that when slaked lime is the material employed the result differs from that obtained from aragonite, although in all four cases the resulting substance has the same chemical composition. The luminous material is scarcely at all attacked by the common atmospheric influences.

The action of light upon such substances may be compared to striking a bell. A momentary impulse excites it and causes the bell to vibrate and give forth a tone, which tone lasts for a certain length of time, continually growing feebler, until finally it ceases entirely. So, too, the phosphorescent body. Excited by a momentary illumination it gives out a bright light at first, which grows weaker and weaker, until at last it can only be perceived by a perfectly quiet eye in the deepest darkness, and at last comes to rest. The after-illumination of these substances under discussion last much longer than the after-sound of a bell, since the waves of light are much finer than the metallic vibrations of a ringing bell.

Most sources of light will excite phosphorescence in these substances, *e. g.*, a petroleum lamp, gaslight, and even a match. In these cases, of course, the substance must be brought close to the source of light. It is excited especially by burning magnesium wire and by the electric light, but daylight is the best. Since water does not affect this substance, and since its luminosity is not due to oxidation, and hence does not need the presence of atmospheric air, it will give light under water.

An alcohol lamp flame colored yellow by common salt will not excite it, but if the alcohol flame is colored blue by copper it will. In the sun's rays those which lie in the violet and ultra-violet act the most energetic, and they decrease in power toward the yellow. It is remarkable how the yellow and red rays destroy the effect of the opposing violet rays by extinguishing or considerably weakening the luminosity caused by these latter. Similar relations prevail when the substance is covered with colored glass. Dark blue glass, although it seems to considerably weaken the light, permits all the active rays to pass through, and at times, when daylight contains many of the red and yellow rays, a substance that has been covered with blue glass is more strongly excited than if exposed to pure daylight, because the blue glass prevents the extinguishing action of the red and yellow rays. If a surface that has been covered with phosphorescent paint is first excited and then one half covered with pasteboard and the other with yellow glass, the extinguishing effect of the latter will be very noticeable. The portion covered with pasteboard will continue luminous after that which was covered with glass is almost total dark.

Heat has a peculiar effect upon the phosphorescent body after it has been isolated. It causes it to give a more intense light for a short time, but the luminosity is then of shorter duration than it otherwise would be. Heat acts here somewhat as it does on a magnet, driving out the active power, so that it requires to be charged over again to set the power again in action.

It seems as if light bears the same relation to the phosphorescence of these bodies that electricity does to magnetism; hence the name of light-magnet would not be inappropriate.

The color of the light thrown out is independent of the color of the exciting rays—*i. e.*, a certain substance always glows with the same colored light whether it has been excited by a violet, blue, or colorless light. Neither does the color depend on the addition of certain metals, but seems to be the result of a definite molecular condition of the substance. The light emitted retains its color but a short time. No matter how prepared they all get to be one color after awhile—that is, white (?).

The duration of luminosity is differently stated by different authors. According to Gaedicke's observation the best ones made at the present time last nineteen hours; but it requires perfect darkness and an eye entirely at rest, like on waking in the morning, to detect the faint glimmer. The intensity of the light, like the sound of the bell, is greatest at first and then decreases more rapidly than it does afterward.

Its luminosity is instantly destroyed by chlorine gas, also by hydrochloric and nitric acids; more slowly by sulphuric acid. It is further destroyed by substances which darken its color, hence it cannot be mixed with varnishes that contain lead and blacken; iron is also injurious because it rusts.

When used as a paint it is mixed with some adhesive substance like glue, and can then be mixed with oil, water, or a light-colored varnish, and applied repeatedly to the object that is to be rendered luminous. It is well to prepare a white ground for it with chalk or zinc-white mixed with a little copal, which may be dissolved in oil of turpentine.

P. N.

A Large Catch of Striped Bass.

A very extraordinary catch of striped bass was made November 18, by the Blackford Fishing Company, of Montauk Point, Long Island. Some 4,000 pounds of fish were captured, the larger proportion of the fish weighing from 50 to 75 pounds, while perhaps as many more escaped from the nets. The majority of the fish were females, their eggs not being matured.

SMALLPOX.

There are few diseases that possess more interest, both for the physician and the public, than smallpox, and hence we take pleasure in laying before our readers a description of the treatment which has been used for many years with great success by Dr. Alban S. Payne, late Professor of Theory and Practice in the Southern Medical College, Atlanta, and Honorable Fellow of the Medical Society of Virginia, etc. The following is an abstract made by his permission from one of his lectures on smallpox.

Prof. Payne states that as early as 1846, when at the Smallpox Hospital in New York city, he noticed that the primary or initial fever of smallpox could be detected by the pulse before any other symptom appeared. This pathognomonic pulse is one peculiar to smallpox, a pulse *sui generis* difficult to describe, but recognizable by any physician who will patiently and carefully investigate the subject until his finger becomes educated. When once recognized it can never be forgotten, any more than a physician who has once learned to detect the hemorrhagic pulse could forget its peculiar thrill imparted to his educated finger.

Having learned to recognize the initial fever by its peculiar pulse, he next proceeds to vaccinate. If this is done within ten or twelve hours after inception of the initial fever the patient will have slight indisposition, without a sign of eruption, and as positive exemption from a recurrence of the disease as if he had had it in the most malignant form. The most remarkable feature about the whole thing is that if the patient is vaccinated early after the initial fever sets in, he may be then allowed to go where he pleases without fear of giving the disease to others. The ingrafting of the vaccine matter upon the primary variolous fever seems to have the power to destroy its ability of reproduction or propagation entirely. Another peculiarity is this: If an unprotected patient is vaccinated before the inception of the initial fever, and the vaccine takes, but does not prevent, only modifies the disease, the eruption will be varioloid in its appearance and characteristics. But if vaccinated after the commencement of the initial fever, and too late to entirely prevent an eruption, the eruption will resemble in size and other characteristics the smallpox eruption, it matters not whether there is one or a hundred pimples. There is as great a difference in the appearance of the varioloid eruption and the smallpox eruption as there is between gray and yellow.

Dr. Payne divides smallpox into confluent, semi-confluent, discrete, modified, and manipulated, the latter being a term of his own invention. In 1873 smallpox broke out in his neighborhood, in Virginia, and was of the variety known as *variola nigra*, and when not modified by some benign influence was invariably confluent. Those in and around Manassas were of the same variety. Being called to attend a colored chambermaid who had but recently aborted, and who was in a room over the kitchen of a large hotel near his own dwelling, he recognized in her the pulse peculiar to smallpox, and the next day the eruption appeared. In regard to isolation he says: "I saw it would never do to remove this woman, and I determined to isolate the case and abide the consequences, be they what they might. If I have her removed, I said, the poor woman must die, and the prevailing winds will blow the virus for miles down the valley below, and the disease will spread beyond control. But by isolating the case I have every confidence in my ability to check it. But should she die, she must be removed for burial (and that she will die there is a strong probability), and my plans will be defeated, and I shall incur the reproach of all my friends and neighbors. These were grave considerations, and I was by no means reclining on a bed of roses. Firm in faith of the greatest good to the greatest number, I never faltered. I said to myself, if she dies I will wrap her from her toes to the crown of her head in double linen, and with the aid of some one who has had the smallpox I will bury her." This was January 11, 1873. By the 30th she was convalescent, having had it in the semi-confluent form. Three persons who were in the room at the time were ordered to report to the doctor twice daily. One of them gave the peculiar pulse on the 24th and was then vaccinated. He was indisposed for two days, arm sore, but no pustules appeared. The others, who had been vaccinated before, did not take it.

Another case described by Dr. Payne occurred in January, 1873. He was called on the 24th to see W. J., suffering from an eruption which he recognized as varioloid. He vaccinated the father and two sisters, but an old aunt refused to be vaccinated, although she had not been vaccinated in many years, and she died on the 10th of February. The next day, January 25, he found the brother at home with the peculiar pulse. As he was unprotected Dr. Payne vaccinated him at once, and the very next day his arm looked as if vaccinated eight days before; it rapidly became sore; he was indisposed for two or three days, and recovered without a single sign of eruption.

In another case of an unusually poor and shiftless colored people, the whole family of eight persons, of all ages and both sexes, occupied a house that had only one room, in which the cooking, washing, and everything else had to be done. Good air and cleanliness were impossible. The father suffered from a very malignant case of varioloid and was terribly scarred up, but the rest of the family, none of whom had ever been vaccinated before, were vaccinated after the initial fever began, and escaped with slight attacks. One of the women had twenty pustules, but no scars; another had two or three pimples; a third had two on her face and one on the bottom of each foot; a fourth had no eruption. The

boys had about twenty pustules each. We might quote numerous other cases of whites and blacks where vaccination after the initial fever had set in was followed by the arms becoming rapidly sore, malaise continued for a day or two, and rapid recovery with slight eruption or none at all.

On the 28th of January Prof. Payne's own family were exposed to smallpox, and the initial fever revealed itself in all their pulses on February 2. He revaccinated them; their arms became rapidly sore; there was very slight malaise for two days, and convalescence without any eruption.

Let us suppose a house located in the middle of a large prairie, and we see the grass burning at a distance, but the flames bending straight in the direction of the house. Would it not be the most sensible thing we could do to fight fire with fire, and, starting a counterfire, burn the grass around the house so that when the approaching flames reached the ground burned over the fire would have to stop for the want of combustible material and save the house? This is just what Dr. Payne proposes to do in treating smallpox. He recommends isolation, and giving the smallpox to all near by and likely to be exposed to its direful influences. Visit the parties twice a day, and as soon as the fever of inception is recognized vaccinate them, and the disease must stop for the want of material to feed upon. Hauling around to hospitals and pest houses is the best way to spread the disease.

Prof. Payne has tried his plan in more than a hundred cases, extending over a period of thirty-four years, without a failure. He now calls upon medical men to repeat his experiments and report on them.

STEAM BOILER NOTES.

It seems from a letter to the *Railroad Gazette* from London (England), date of October 1, that Glasgow locomotive builders almost invariably make their boilers with longitudinal butt joints, having inside and outside covering plates quadruple riveted. For the transverse or circumferential seams the practice is about equally divided between butt-joints with outside covers only, with two rows of rivets, and the ordinary single riveted lap joint. The longitudinal joints are invariably placed above the water line. The one that joins the ends of the plate to which the dome is attached is generally put directly under the dome, and in some shops this is made a welded joint. The shell plates are thicker than those used by American builders, being from seven-sixteenths to nine-sixteenths of an inch thick. Rivet holes are sometimes drilled, other times enlarged from smaller punched holes by reaming, but neither of these methods is as common as one would infer from reading English engineering journals. Builders who drill the rivet holes do not complain of the extra cost of doing it, while those who are not prepared, suitable facilities being absent, to drill are inclined to exaggerate the cost of drilling or reaming over that of punching. In all these respects the writer of the letter referred to seems to approve of the English methods of locomotive construction.

It may be doubted whether with our superior American plates we may not make as good boilers by punching as the English can by drilling. Experiments showing that American punched plates have as much remaining strength as the same plates have with drilled rivet holes have been made, and in some exceptional cases punched bars have shown greater strength than drilled ones. Notable among such experiments are those made by Hoopes and Townsend, of Philadelphia, and published in the *Railroad Gazette* some time prior to 1880. It is claimed that soft tough iron will be somewhat compressed and strengthened just around the hole if proper tools are used to do the work, while hard, brittle, and granular iron will be injured by crumbling under the action of the punch; such plates are stronger when drilled; they are, however, unfit for boiler construction.

A question may also be raised as to the method of placing the dome upon a longitudinal seam. Much depends on the skill and faithfulness of the workmen in fitting the dome flange to the true cylindrical form of the shell, and it is probable that a riveted seam would tend to complicate the work and cause imperfections that would be less likely to occur in fitting the flange to a smooth and perfectly rolled portion of the plate at some distance from the seam. Therefore, unless it can be shown that the dome actually strengthens the seam, which is probably the notion that induces this practice, it will be an open question whether or not it is advisable to follow the plan.

With a perfectly smooth welded seam, which can be rolled into a perfect cylindrical form after being welded there can be no objection, provided always that the dome flange also coincides with the true cylinder of the same radius as the exterior of the shell. Slight variations even in the form of these parts when separate become important when riveted together; the dome flange, being imperfect and rigid, will distort the shell, and when acted upon by an internal pressure of 150 pounds to the square inch, tending to cause sections made on central planes cutting the envelope in any and all directions into true circles; in other words, to make the envelope a hollow globe, will place the parts in an unnecessary and exaggerated state of tension. The letter says:

"The method of supporting fire-box crown plates seems to be about equally divided between the system of direct staying with screw stays, and cross bars or 'girder-stays,' as they are called here, slung to the outside shell or roof of the fire-box. Both methods are very unsatisfactory, and in a great measure unmechanical."

It will probably appear on carefully studying this subject that the thrust of the expanded furnace acting through rigid

stays, which are not only slings but also struts, has a greater effect on the shell than the internal pressure itself; moreover, the thrust tends to distort while the pressure tends to restore the supposed true curve, and these antagonistic forces not being always evenly balanced cause motion, cross bending, and tensions concentrated in limited areas, resulting in grooving, which is simply an indication that the part grooved has become a hinge upon which the adjacent parts turn, exposing the disturbed structure of the metal to the chemical—meaning simply the corroding—effect of the steam or water, either of which, if they are moist and contain air or free oxygen, as they always do unless specially deaerated, will almost equally cause grooving of a bent or over-strained plate or brace inside of a steam boiler.

At a late meeting of the Common Council, the Detroit, Mich., inspector of steam boilers reported his total receipts for the month of October as \$886.

About five hundred boilermakers of Detroit recently struck for an increase of twenty-seven cents additional pay per diem. The Union No. 3, of the United States, which includes the Detroit boilermakers, addressed a circular to their employers two or three months ago, and lately they sent a letter to every employer, notifying them that they would not accept anything less than the increase demanded. It is also understood that none of the manufacturers will reply to the document. It is a fact that with very few exceptions all the boilermakers in the city have already quit.

It appears from a late number of *L'Ingenieur-Consell* that the Belgian Association for the Surveillance of Steam Boilers has made a report showing that they have two thousand boilers under inspection, and that during the existence of the association it has had but two accidents. A clause has been lately added to its rules to the effect that its responsibility will cease on notification of the discovery of a dangerous defect in any member's steam boiler till such time as the defect shall be repaired in accordance with its directions.

By the force of the explosion at the Alvarado Sugar Mill, Cal., on September 27, the second boiler was rendered useless; the roof of the boiler house was blown to pieces and scattered in every direction, and the main mill was ignited by the flames.

RESIGNATION OF THE COMMISSIONER OF PATENTS.

In the resignation of the Commissioner of Patents, Mr. Edgar M. Marble, the service loses an officer that can ill be spared.

Under his administration the business of the office has been conducted with commendable promptness and impartiality, and much has been done to increase the efficiency of the service and its value to inventors and patentees.

It is a pity that the government will not deal more liberally, not to say justly, with the Patent Office, and through it with inventors and the public at large. While the office is much more than self-sustaining, indeed is annually turning over a large sum to the treasury, it cannot for any length of time command, for it is not allowed to adequately pay for, the service of men who, like Mr. Marble, have exhibited unusual executive ability.

As a consequence the office now loses a chief whose temper and capacity and exceptional knowledge of patent law, not less than his hearty sympathy with the spirit and purpose of the patent system, have proved him to be the proper man for the place.

It is not easy to find men so well fitted for the severe, complicated, and, at the same time, delicate duties of the Commission of Patents. For such service, more especially in an office with large surplus revenue, the government ought to be willing to pay as liberally as business corporations can, and give as ample a guarantee of permanence in the employment. We understand that Mr. Marble has accepted more lucrative employment as Land Commissioner for the Northern Pacific Railroad Company.

Steamboat Inspection

The annual report of the Supervising Inspector-General shows that the tax collected from licensed officers of steam vessels amounts to about \$7.50 per capita, which appears to be largely in excess of the needs of the inspection bureau. This year alone the surplus is nearly \$9,000, while the accumulated surplus now lying idle in the Treasury amounts to a total of about \$650,000, which Gen. Dumont thinks would suffice for the expenses of his department for a term of fifteen years, if the tax should be reduced about 50 cents for each license per annum. He therefore recommends that Section 4,458 of the Revised Statutes be so amended as to require from each master, engineer, pilot, and mate, the sum of 50 cents for every certificate granted.

His report shows that during the five years ending with 1881, 22,132 steamers were inspected, 932,500,000 passengers were carried, and that 1,053 lives were lost by steamboat disasters, which is an improvement over the preceding five years, when less work was done at a greater cost, and a less number of passengers were carried with a greater loss of life from disasters.

Ball Holes in Glass.

Reviewing the evidence in the second trial of Jesse Billings, Jr., Dr. Lewis Balch, of Albany, N. Y., sets it down as established that a ball fired through glass may make a hole enough smaller than the full size of the ball before firing to prevent an unfired ball of like caliber passing. In an experiment with a baseball it was found that the hole made was too small by one-third to let the ball be passed through.

THE MUSCULAR POWER OF INSECTS.

The muscular system of insects is in no wise inferior in power to that of vertebrate animals, and it may even be asserted that it is capable of developing an infinitely greater amount of force. Observation has demonstrated this most fully. Who has not seen the ant dragging along prey ten or twenty times larger than itself? Who has not watched the motions of certain small flies as they unwearyingly poised for hours around the chandeliers and other objects in our houses? And who has not ascertained that the horse-fly follows and beats the best horses running at full speed?

In order to render the fact more striking, M. Felix Plateau has undertaken an ingenious series of experiments of the most demonstrative character. He has caused small wagons filled with weights to be drawn by cockchafer in the manner of oxen; he has loaded swift-flying insects with weights; and he has thus, in the first place, ascertained this great fact, and that is, that muscular power is in inverse ratio to size—the smallest insects being capable of displaying the greatest effective force. Then he established the fact that a cockchafer is infinitely stronger than a horse, that it is even twenty-one times stronger, and that a bee is even thirty times more vigorous. The fact is that a horse cannot exert a stress beyond the sixty-seventh of his weight, while a cockchafer can easily draw a load equal to fourteen times its weight, and a bee, harnessed to a little wagon twenty times heavier than itself, can put the same in motion without any trouble. In other words, a cockchafer is capable of drawing with ease fourteen, and a bee twenty of its like. Can any one conceive of the wonders that man would accomplish were he so fortunately endowed, and had he at his services domestic animals possessing the muscular power of the insect? We stand in astonishment before the gigantic monuments of antiquity, but how much more gigantic would be the structures that man would erect had he at his service the power possessed by the most insignificant fly! Fig. 1 will give an accurate idea of the apparatus employed by M. Plateau to measure the amount of traction that insects are capable of exerting. Insects, being obliged to expend much power in order to sustain their flight, are not capable of lifting a very great weight, and they can scarcely carry prey that is heavier than themselves. Such is the case with the dragon-fly, represented in the engraving loaded with a ball of wax.

Insects may be separated into two great divisions: (1) Those which have alar muscles inserted directly into the wings, and which have an independent system of muscles for each of these organs (the majority of *Neuroptera*, for example, in which each pair of wings may co-operate in flight without the intervention of the other pair), so that the removal of one of the pairs of wings does not carry with it the loss of power of flight. (2) Those which have only one system of muscles operating either one pair of wings or the two pairs. In the first case a single pair of wings is used in flight (*Coleoptera*, *Orthoptera*); in the second, the two pairs, connected with one another, are moved as one (*Lepidoptera*, *Hemiptera*, *Diptera*). It is essential to remark that wings do not perform the same rôle in all insects, and that they have neither the same dimensions nor the same structure in all groups. M. De Lucy has demonstrated that the surface of the wing decreases in proportion as the weight and dimensions of the animal increase; thus, for example, the gnat, which weighs four hundred and sixty times less than the stag-beetle, has fourteen times more surface than the latter, and the lady-bug, which weighs one hundred and fifty times less than the stag-beetle, has five times more surface. And we have daily before our eyes other examples of this same fact in butterflies (*Limenitis*, *Morpho*), with their delicate bodies and immense wings, and gad-flies, with their heavy, thick-set bodies and narrow wings. It may be readily conceived from this that there is no fixed relation between this surface and that of the animal to be lifted; but there is, as Pettigrew has observed, an invariable relation between the weight of the animal, the surface of the wings, and the number of oscillations that these make in a given time, "the problem of flight resolving itself into another one of weight, of power, of velocity, and of small surface, or, indeed, into a second one of feeble density, middling power, small velocity, and great surfaces—weight being an indispensable condition." Thus, the number of beats or oscillations of the wing being, in a common fly, 330 per second, and in a bee 190, they are, in a dragon-fly, no more than 28, and in the cabbage butterfly only 9 (M. Marey).

It is generally believed that, in all insects in general, the nerves form an aeriferous, tracheal network which is thought to play an important rôle. But this is not so. In *Lepidop-*

tera, *Neuroptera*, and *Hymenoptera*, all the nerves contain a trachea, but in *Coleoptera* and *Diptera* there is only one tracheal branch, this being in the costal nerve; the development of the tracheal network and of the nerves is correlated with the dimensions of the wings.

Many authors have tried to make out that the elytra co-operate in flight, and have asserted that these often act as parachutes during descent; but observation does not justify their opinion. The *Cetonia* (4), whose wings remain joined during flight, seemed an embarrassing exception, but M. Poujade, a young naturalist, has published some excellent figures representing a series of insects in the attitude of

Hymenoptera may even be removed completely without preventing aerial locomotion.

I will add to this subject an experiment of my own. Having caused all the humble bees met with on a trip to the Botanical School of the Garden of Plants to be captured and brought to my study, I anesthetized each in turn, and sure of operating on them without lesion, I as delicately as possible cut off their lower wings. The window was wide open and the weather was fine; and as each amputated individual came to, he took his outward flight, apparently not the least bit affected by the loss of two of his members. The next day I captured my invalids on the flowers around the school, at some hundreds of feet from the place of operation.

In the *Diptera*, however, the loss of the small rudimentary organs called the "halters" or "poisers," which take the place of the inferior wings, destroys the power of flying upward. Physiologists and naturalists have ascertained this fact, but without being able to give a reason for it that is entirely satisfactory. Dr. Jousset de Bellesme, as a result of some interesting experiments in 1878, was led to believe that the function of these halters was to restrict the course of the wing backward, to thus carry the axis of sustentation forward of the center of gravity, and thereby provide for upward flight.

From all such experiments as permit of measuring the effective surface of the wing there is derived one fact of capital importance, and that is, that the membranous posterior portion of the wing may be clipped and trimmed and mutilated with impunity, but that the anterior stiff edge must not be removed nor even wounded, for the costal and subcostal nerves perform precisely the same rôle as the cross stick in a kite—and what child is there who does not know that the removal or even the breaking of that stick will prevent his plaything from rising in the air?—J. Künckel, in *La Nature*.

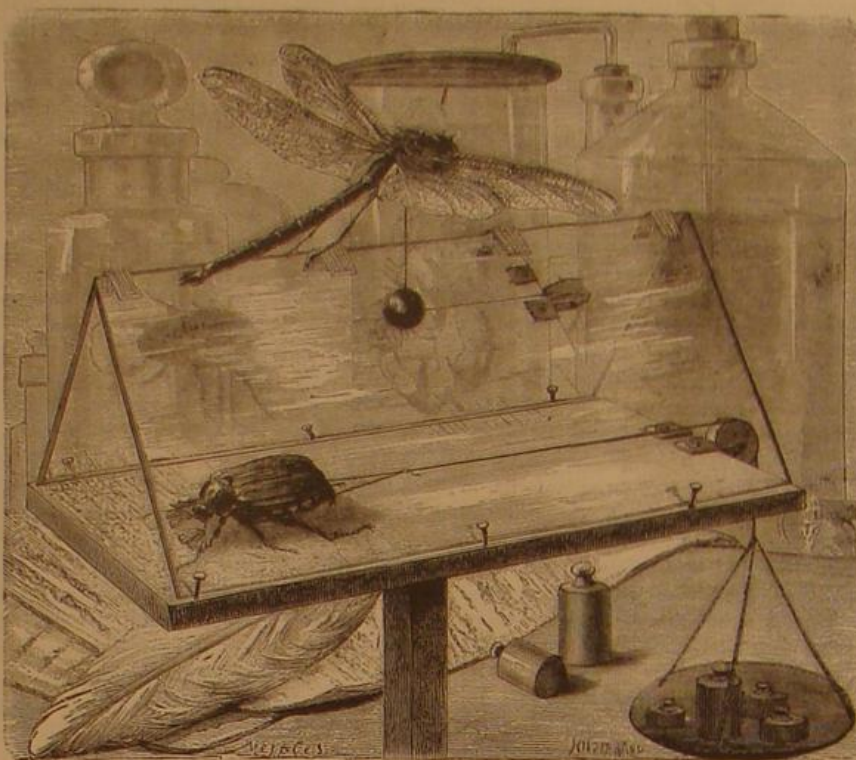


Fig. 1.—APPARATUS FOR MEASURING THE MUSCULAR POWER OF INSECTS.

flight, and an examination of these shows us that many of the insects put their elytra in such a position that the latter cannot possibly obtain any purchase on the air. The *Necrophori* (8 and 9) and the *Silphæ* (2) straighten their wings, invert them, and arrange them on the abdomen in a horizontal plane; the *Onthophagi* (5 and 6) raise them simply, and cause them to turn about the suture as if on a hinge; and the *Histri* (7) place their elytra perpendicular and horizontal to the axis of the body, but, extended, they hardly exceed the auxiliary pieces of the lower wing. Nos. 2 to 9 are instructive in more senses than one, for they show us the very peculiar position of the median legs, raised above the body, while indicating to us the position of the anterior edge



Fig. 2.—THE FLIGHT OF INSECTS.

of the wing during flight, thus allowing us to understand that it really operates like a kite. Thus we see a new confirmation of the explanation that we have given of the mechanism of flight.

The alar surface is, by all means, infinitely too great, and it may be largely reduced without detriment. This fact has been most fully demonstrated by the experiments of MM. Girard, Pettigrew, and Jousset de Bellesme. At least a third part of the four wings of dragon-flies and a third part of the two wings of common flies may be removed perpendicularly to the anterior edge without modifying the flight of these insects; and the hind wings of some butterflies and

After a severe northwesterly storm at St. John, Newfoundland, accompanied by the highest tide observed there for many years, a giant squid came ashore near the steamer wharf, Portugal Cove, Nov. 12. It was captured by fishermen, and is the first fresh and un mutilated specimen ever secured. It measures thirty three feet from the tail to the extremities of the long tentacles.

The Corwin's Collections.

The collection of specimens and relics brought back from Arctic regions by the Arctic cruiser Corwin is described as large and interesting. Lieutenants Myrick and Doty have accumulated a rare assortment of models of weapons and boats used by the tribes inhabiting the extreme northern limits of the habitable portion of the globe. These models include boats of various shapes and character, hunting weapons, pipes, bird traps, nets, and other trinkets which would prove invaluable to a collector of the curios in any portion of the world. Dr. Ross, of Washington, who accompanied the expedition, has a collection of very rare specimens from the Alaskan and Siberian coasts, as well as from Herald Island and Wrangell Land. Among these are specimens of the flora, vegetation, soil, and minerals of the newly acquired territory, New Columbia. Among the flora may be seen some of the most delicate and beautiful flowers, and while all are void of brilliant colors, the leaves and blossoms, all of delicate tints, are very beautiful and extraordinarily curious as coming from an unexplored land so close to the North Pole. The grasses are also delicate, and resemble both the common bunch and "foxtail" variety of California and the blue grass of the Eastern States. The rock from Wrangell Land is a coarse blue sandstone, a fine slate, and some pale drab sandstone, all good building material. The specimens of coal from Cape Lisburne, on the north coast of Alaska, are of a deep black color, soft and bituminous. It is easily ignited, and emits a strong sulphuric odor. From Herald Island the Corwin brings some fine specimens of granite, which is susceptible of a high polish. It is gray in color, and resembles the granite of Lake Superior and the coast of Maine. Among the curiosities in the possession of Mr. Haloran, the boatswain of the Corwin, is the tooth of a mammoth found upon the shores of Siberia. It is as large as a 20-pound cannon ball, and being petrified, is equally as heavy. The collection of curios brought down from the Arctic by the Corwin is, perhaps, the most interesting of any brought to San Francisco.

THE ELECTRIC LIGHT IN BARCELONA.—We learn from Don Francisco Tarre, of Barcelona, Spain, that the electric light is now being successfully introduced in that city by the Spanish Electrical Society. The Gramme machines are used.

Another 8,000 Ton Steamer.

We recently gave an account of the coming over here of the new steamer City of Rome, and now we have to record the arrival of another great vessel of the same class, the Alaska, of the Guion line, between New York and Liverpool. On this her first passage, as a matter of precaution, steam was only carried at 65 lb., though she is fitted to carry 100 lb. Her best run was 402 miles in a day; but it is believed she will, before long, make 440 miles.

The Alaska is an admirably proportioned vessel. Her gross tonnage is 8,000; tubular length, 526 feet; breadth, 50 feet 6 inches; depth, 40 feet 7 inches to upper deck, 48 feet 7 inches to promenade deck. Her engines are of the compound, inverted, direct acting, cylinder type, the high pressure cylinder being 68 inches in diameter, and the two ton pressure cylinders 100 inches diameter each. The indicated horse power is 11,000, the highest on any steamer in the world. She is built with five decks, the first being the promenade, which runs the full length of the deck, excepting for short breaks aft and forward. For the accommodation of cabin passengers her fittings are most complete, the large saloon being the entire breadth of the vessel and situated amidships. Tables and revolving chairs are provided for 280 passengers, and the upholstery and other furnishings are handsome. Besides the large air ports along the sides of the saloon, there is a stained glass dome overhead, thus furnishing ample light and ventilation at all times. The staterooms are ranged on either side of long passageways, forward and aft of the saloon, each connected with the steward's department by electric bells and furnished with electric lights. The smoking room, ladies' boudoir, social hall, and card rooms are elaborately fitted up. The second cabin is aft, and much attention has been paid to the comfort of second class passengers. The steerage is well and conveniently arranged. The officers' quarters are on the main deck. The vessel is steered by steam, and has steam windlasses and winches for weighing anchors and handling cargo.

She has four masts, the two forward ones being square rigged, and the others schooner rigged. She is built of iron in a series of water-tight compartments, and is provided with the most modern methods for insuring safety and comfort at sea.

Large Photograph.

A photograph, probably the largest ever printed upon a single sheet of paper, is now on exhibition in the art gallery of the American Institute. It is not uncommon to see several views which have been separately printed on small sheets of paper and pasted together to make a panorama of large industrial works, etc., but this remarkable specimen was printed from seven negatives on one sheet of paper, and covers an area of over ten feet in length by about eighteen inches in height. It is a panoramic view of the Centennial grounds in Philadelphia, Pa., and so perfectly are the negatives joined that it is impossible to locate the joints. Were it not for the announcement of the exhibitor that it was printed from seven negatives, no lay observer would imagine that it was other than a single view printed from a single negative.

Duplicates of this picture have been sold at very high prices as sample works of photo art. One was presented to Queen Victoria, and is said to occupy a conspicuous place in the royal gallery. This work is from the gallery of F. Gutekunst, No. 712 Arch Street, Philadelphia.

His exhibit includes other fine specimens. A notable one is a picture five feet long by eighteen inches high, also on a single sheet; and some large views in printer's ink which combine the effect of fine steel engraving with exactness of detail that can only be obtained by the use of the camera. This latter style is especially desirable for views of engineering structures and machinery, which enables the observer to study construction with confidence.

Antidote to the Poison of Serpents.

Very interesting experiments have been made in Brazil, by M. De Lacerda, which have established the fact that permanganate of potash is one of the most energetic antidotes to the venom of snakes. M. De Lacerda has addressed a memorial of his important works to the Academy of Sciences (meeting of the 12th of September, 1881).

The result of these researches is really astonishing: thus, in a series of experiments, frequently renewed, of injecting the active venom of *bashrops*, diluted with distilled water, in the cellular tissues or the veins of dogs, M. De Lacerda found that the permanganate of potash was able to stop completely the manifestation of local injuries from the venom. Yet the same poison, which had served for these experiments, being injected without antidote into other dogs, always produced great local tumefactions, with loss of substance and destruction of tissue.

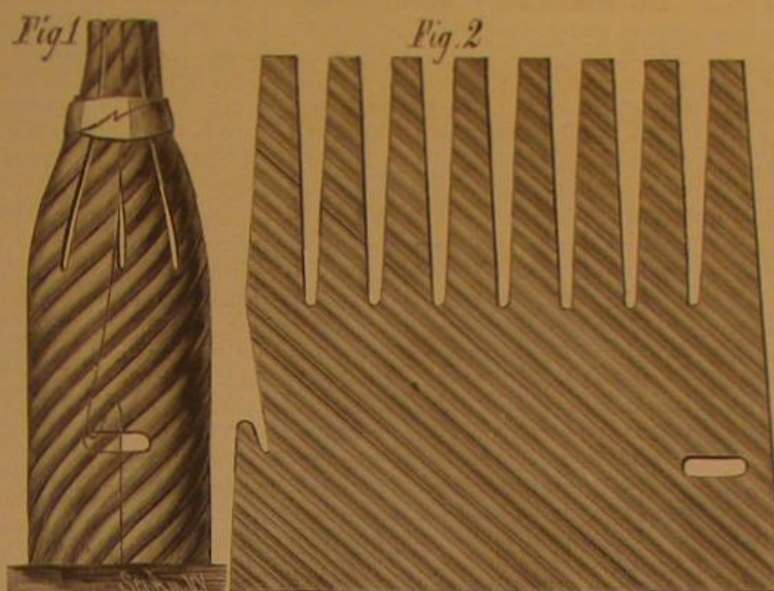
These very remarkable results have been stated on various occasions, not only by the Emperor of Brazil, who assisted at these experiments, but also by physicians, professors of faculties, and members of the diplomatic corps.

NOVEL BOTTLE WRAPPER.

The engraving shows an improved protective bottle wrapper lately patented by Messrs. H. J. Mark and W. F. Martinek, of St. Louis, Mo.

The body of the wrapper is made of veneer or pasteboard, having attached to it thick paper corrugated diagonally. At one edge of the wrapper there is a locking tongue, and near the opposite edge there is a slot for receiving the tongue.

The upper edge of the wrapper is slit to form a series of elastic fingers, which are drawn together about the neck by

**NEW BOTTLE WRAPPER.**

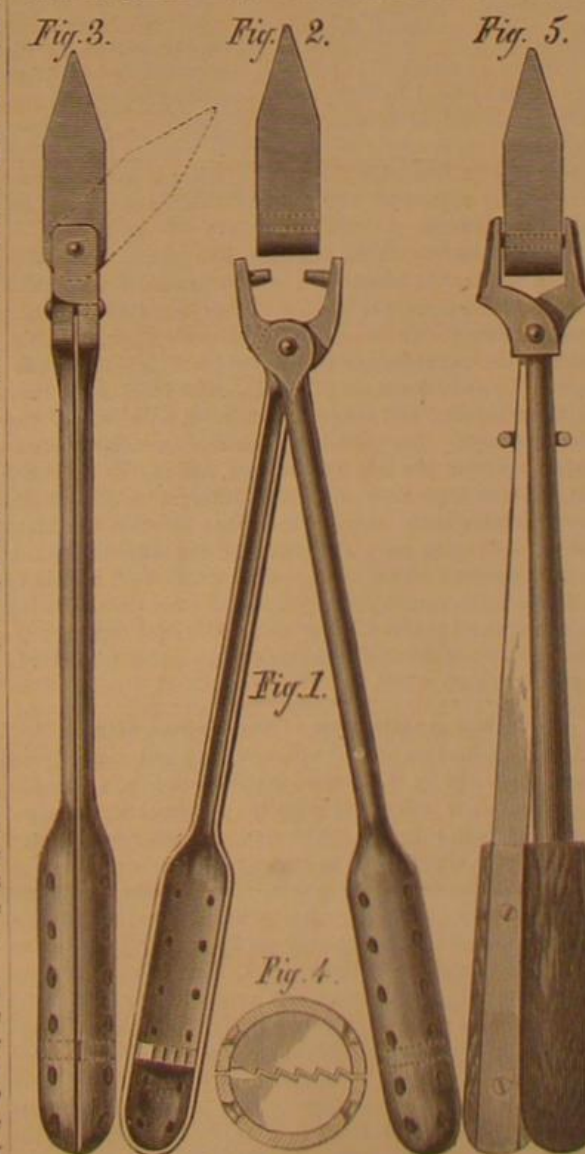
means of a paper band or tie. Fig. 1 shows the wrapper in its flat state; and Fig. 2 shows the manner of applying it to the bottle.

IMPROVED SOLDERING IRON.

The engraving shows a convenient means of adjusting the coppers of soldering irons on their handles, and also for keeping the handles cool.

Fig. 1 is a side view, with handles in an open position. Fig. 2 is a side view of the copper. Fig. 3 is a side view, showing the handles closed and the copper attached. Fig. 4 is a cross section on line *xx* of Fig. 1, and Fig. 5 shows a modified form for wooden handles.

The two portions of the handles are pivoted together to form the jaws, each having a pin or lug on its inner face. The copper is of suitable form, having a cross aperture, into which the pins of the jaws enter when the handle is closed.

**IMPROVED SOLDERING IRON.**

The shanks of the handle are formed of malleable iron, and their outer ends are enlarged to form a hollow handle. This portion has numerous perforations, which allow circulation of air to keep the handle cool.

On the inner side of the handle are ratchets for engagement

when the two parts are closed, to prevent them from slipping apart. With this construction the handles can be removed from the copper while it is being heated, and heating of the handle prevented. The copper may be turned at the desired angle before being clamped tightly by the jaws, and the angle may be readily changed while the tool is in use.

In using wooden handles in place of the hollow bulbs, the inventors provide a ring on the shank, as shown in Fig. 5, which, when slid outward, holds the jaws closed.

This invention was lately patented by James and Thomas H. Hughes, of Spencer, Mass.

MISCELLANEOUS INVENTIONS.

Manufacturers of paper-hangings will find it to their interest to examine the paper-hanging machine and rack recently patented by Mr. Henry Staib, of New York city. In the manufacture of paper-hangings the web of paper as it comes from the printing machine is carried to a rack, where it is suspended to dry in loops on sticks placed at intervals. This invention principally relates to mechanism for taking the paper and carrying it upon the racks, and to the racks used for supporting the paper, whereby the work is facilitated and the operation rendered automatic. In this mechanism rocking arms, which receive their motion from a rotating shaft, first move downward, and, striking a projection on a belt, which has its return movement controlled by a weight, cause said belt to carry the lower stick of a pile of sticks out upon the rocking arms, which are notched to receive the stick. These arms then move upward and deposit the stick, having the paper over it, on rack-bars above in front of paws attached to slide-bars. A loop of paper is thus carried to and remains suspended from the rack, while the rocking arms move back to receive another stick and loop. The slide-bars then move forward and the paws carry the stick and loop of paper, after which said bars move back to receive the next stick brought up by the rocking arms, and at the next forward movement both sticks are carried forward. This operation is continued to any desired extent. There is also combined with the slide-bars a roller for automatically marking the web to insure uniformity of the rolls into which the paper is finally made, and a counter for registering the number of loops of paper.

Mr. William T. Lyons, of Decherd, Tenn., has patented an improvement in ice machines which is deserving of notice. The invention consists in a refrigerating apparatus composed of an air-exhausting pump and an air-supply pump separately connected with a series of pipes in a refrigerating chamber for obtaining circulation of air through said pipes by the operation of the pumps, the exhausting one of which is of greater capacity than that which supplies air to the pipes, whereby the air is rarefied, and the atmospheric air drawn in by the smaller pump, in passing through the rarefied air, absorbs more or less heat and reduces the temperature in the refrigerating chamber to the extent required.

An improved life preserver, which appears both simple and practicable, has been patented by Mr. Rosendo Torras, of Brunswick, Ga. This device mainly consists of two parallel cylinders made of any suitable, flexible, waterproof material, supported internally by longitudinally arranged helical springs, and connected externally by gyves, the rings of which encircle the cylinders, and which gyves may be laced with tie ropes. This construction admits of the cylinders being compressed in direction of their length and retained in a small compass, and, when distended, of their forming a pontoon for buoying shipwrecked persons. The extensible cylinders are fitted with flexible receptacles for food and water arranged within the springs and accessible from the exterior by necks projecting through the gyves. There is also combined, with the device, an oar for steering or propelling the raft, and which is constructed so that it may be used to lock the cylinders both in their distended and closed conditions.

An automatic hog-feeder, the object of which is to facilitate the feeding of hogs and prevent waste of the food, has been patented by Mr. Hiram T. Phenix, of Oketo, Kan. This device is formed in part of a box of any desired length and depth, according to the number of hogs to be fed and the quantity of food to be given at a time, and of such a width that two hogs may feed from opposite sides without their heads coming in contact. Said box, which has openings in its opposite sides of a size sufficient for a hog to insert its head only, is divided by longitudinal and transverse partitions into food chambers and feeding compartments having inclined covers and regulating slides, whereby the food is only supplied as it is eaten and the escape of food from the food compartments can be shut off when desired. By means of this feeder the hogs cannot waste the food, and cannot get their feet into it and dirty it.

A very simple and useful fastening for pocket book handles, which provides for the handle being shut up within the pocket book when not required for use, has been patented by Mr. Thomas P. Spencer, of New York city. The invention consists in the combination with the pocket book frame having slots and bars across the slots, of hinged straps connected with the handle, whereby the said handle can be swung down into and inclosed within the said pocket book, the cross bars of the slots forming the hinge pivots of the straps to which the handle is attached.

The Infection of American Cattle on English Ships.

A very instructive report has been submitted to the Department of Agriculture by Dr. Charles P. Lyman, veterinary surgeon, who was sent by the department to England last summer, to investigate the origin of the foot and mouth disease which had appeared in certain shipments of American cattle. The course of the cattle on this side had been carefully traced, and no signs of the disease had been detected along the roads or in the stockyards the cattle had passed over and through.

It appeared certain, therefore, that the disease was caused by infection, communicated to the cattle after they were shipped from American ports. After very careful inquiries, Dr. Lyman discovered that the vessels, portions of whose cargoes of cattle were condemned, had brought to the United States on their outward voyages general cargoes, among which, in many cases, were such articles as "bales of goat skins," "casks of salted skins," "bales of unwashed Australian wool," "bales of Russian wool," "bales of raw skins," "casks of wet skins," "bundles of grain bags," and "bundles of head ropes." In many cases these articles were carried in those portions of the vessel which were occupied by cattle during the return voyage. Dr. Lyman found, however, that upon some of the vessels upon which the disease was found to prevail upon their arrival in England, no such articles had been carried on the outward voyage. The fact that hides, skins, and wool had been carried was not, therefore, sufficient to explain the subsequent outbreak of the foot and mouth disease on apparently uninfected vessels.

Cattle shipped to Great Britain, whether from the United States or from the continent of Europe, are tied to stanchions by ropes passed around their horns, these ropes being technically known as "head ropes." Dr. Lyman found, after careful investigation, that it is a common practice to drive the animals ashore with these "head ropes" still attached to their horns. Sometimes these ropes are detached before the cattle leave the stockyards, but frequently they go with the animal to the butcher. Dr. Lyman also discovered that these "head ropes," gathered from cattle received from France and Germany, as well as from the United States, are often shipped to the United States to be used in tying other animals shipped to Europe.

Following up this clue, Dr. Lyman became convinced that in most cases the infection had been conveyed by the indiscriminate use of head ropes impregnated with the virus of the disease. It was by means of such head ropes, according to Professor Brown, of the British Veterinary Department, that the disease had been introduced into the London yards from France, in September, 1880, and subsequently conveyed to the Liverpool stockyards.

Dr. Lyman proposed, as a preventive of future outbreaks among American cattle in transit, that the department ask Congress to pass a law prohibiting the introduction of all articles from the foreign animal wharves of Great Britain. One would naturally think that the hazard attending the use of old head ropes would be sufficient, now that it is known, to deter our enterprising cattle shippers from using them.

Touching the condition of American cattle on their arrival in England, Dr. Lyman says, that notwithstanding the much greater distance they are necessarily carried, they arrive with fewer bruises and in better condition generally than do those from some of the neighboring European ports. This gratifying condition of affairs is due to the good care and improved methods of ventilation, etc., adopted by the owners of steamships. The losses of cattle on shipboard from January 1, 1880, to September 30, 1880, exceeded five per cent; in the corresponding months of 1881 the losses were about two and one-half per cent.

Torpedo versus Fire.

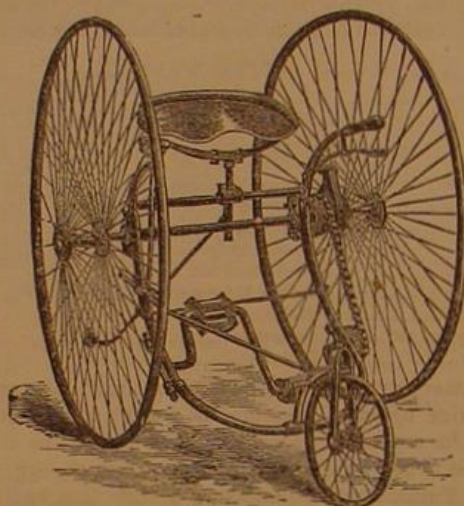
Torpedoes had been up to a very recent date considered in the exclusive light of their destructive properties—it is gratifying to see that they can also be put to the use of preserving property from fire. On the 10th of August, one of the magnificent steamers belonging to the French Transatlantic Company was at Goletta, discharging. Her name is a well known one, as it reminds us of one of the founders of that company; it was the *Isaac Pereire*. So late as one o'clock in the morning the work of discharging had been going on under the superintendence of Captain Araud, the commander; he then went a last time round the ship, and retired to rest. At two o'clock he was roused by an alarm from the fore part of the ship. The *Isaac Pereire* was on fire, and the fire had spread with such a rapidity that the crew had to leave their quarters without saving anything. The steerage passengers, surrounded as they were by the raging element, were saved only owing to the unremitting exertions of the crew and the skillful maneuvering of the commander, who swung his ship, and, placing her before the wind, thus limited the advance of the fire and kept the stern untouched. Meanwhile the purser and doctor were busy protecting the saloon by closing the bulkheads and disposing the hose. The sound of the bell had called the assistance of the men-of-war at anchor in the harbor, and soon twenty-two steam launches and other boats had come to the rescue. Commander Araud wanted to scuttle the forepart of the ship, but the heat was so intense that the men who attempted it, although protected by a continuous and powerful stream of water thrown upon them, had to fall back, not without having been severely scorched. Commander Araud then applied to the officers from the men-of-war for a torpedo, but they at first declined to take

such a responsibility upon themselves, a responsibility which the commander did not hesitate to assume. A torpedo was procured, and everybody taken away from the ship, with the exception of Commander Araud, who stood on the bridge. A first torpedo missed fire, a second sent the *Isaac Pereire* down stem foremost. Her commander, who had not left the bridge, was safely rescued from the water, having only by a miracle escaped being hurt by the explosion. The *Isaac Pereire* will be easily raised.—*London Review*.

Double-Driving Tricycle.

Considerable activity has of late sprung up in the manufacture of tricycles, which are considered as safer vehicles than the bicycles, especially for those who are not gifted with the natural skill necessary for working the latter. We here give a cut of a new English tricycle by Hillman.

The driving wheels, 50 inches in diameter, run in double ball bearings, affixed to the back of the frame, which is composed of seven-eighths inch steel tubing. A single length of tube bends in hook form at the top above the bearings, being strengthened close to the bearings by a transverse tube, carrying the seat socket. The loop formed by the main portion of the tubing sinks in a hollow curve forward, the sides running parallel and uniting in a bowed front, from the center of which the backbone of the rudder wheel departs. This rudder wheel is 17 inches in diameter, runs in ball bearings, and works in a fork head, with gaping slot, to allow of greater facility in turning. The hook-like ends of the upper part of the frame are used for affixing the handles to an ordinary pear-shaped, purchase handle finding a place on the left hand side, while the right-hand end of the frame finishes in a socket, in which an upright rod works,



bearing a spade handle at its upper end and a pinion wheel at its base, which, working in a ratchet in connection with the rudder wheel, forms the guiding communication. The pedal shaft is double-cranked, provided with rubber pedals, and works at each end in parallel bearings. The safety of the rider is secured by light rods proceeding backward, and carrying a small safety-wheel at their junction. The spring is placed at right angles to the machine when a seat is supplied, and in a line with the running when a saddle is preferred; it is adjustable to height of rider, and places him well over his work.

The chief feature of the machine, however, is the double driving action. It consists of a stout toothed wheel and box, all in one piece, the outside of this box forming a fine broad surface for the strap brake to work upon. On the inside of the box there are two toothed wheels and two pinion wheels; the former are placed about an inch apart; they are the same size, and are each connected with one of the driving wheels. The pinion wheels are fixed upon studs projecting from the side of the case, and are so arranged that, while each pinion gears with a different toothed wheel, they gear with each other in the space between the main wheels, one pinion projecting forward, the other backward, for the purpose. This arrangement causes both wheels to be driven when running straight, at the same time allowing the outer wheel to travel faster as requisite for turning purposes, and when driving ahead an equal amount of power is imparted to each wheel.

A New Application of the Radiometer.

A new application of the radiometer to photometrical purposes, suggested by M. Coulon, is described in *La Lumière Electrique*. The instrument is really a photometrical balance, and is simple in principle, although some rather complicated arrangements are required to prevent disturbance from surrounding influences. It is generally known that the movement of Crookes' radiometer is now ascribed to the action of radiant heat, although at the time of its discovery the motive power was thought to be light. M. Coulon, however, claims to have proved by experiment that a radiometer of which the temperature is constant, revolves solely under the influence of light. Whether this contention is well founded or not remains to be proved by independent observation. Upon this principle the Coulon photometer is based, and the name *athermanous* which it bears is a further evidence of the importance attached to this rehabilitation of Crookes' supposed discovery of the motive power of light. The apparatus consists of a radiometer bulb, fixed in the middle of a cube-shaped metallic box, having four glazed apertures in its sides. Horizontal rays of light from two opposite sources can enter by two of these openings, while the others allow of observations being made of the bulb. The box is filled

with water, which, by means of four vertical pipes surmounting spirit lamps, is maintained at a constant temperature above that of the radiant heat, at this point, of the light-source to be measured and compared. In practice about 100° Fahr. is found sufficient. The radiometer bulb contains, *in vacuo* as usual, a disk movable round a vertical axis; the half disk on each side of the axis being black and the other white. Suppose, now, a single source of light to be directed on the bulb from one side, it attracts the white half and repels the black, so that the disk turns edgewise to the light, and presents a side view to the observer in front. If another light of equal brilliancy acts simultaneously on the other side, and at the same distance from the disk as the first, the counteraction of the two lights results in the disk presenting its sides to the direction of the light and its edge to the observer. When unequal lights are to be compared, the disk or one of the lights may be shifted until the relative distances of the two sources determine their intensity in the usual way. It is stated that the apparatus is not patented.

Correspondence.

The Principle of Mutual Accumulation.

To the Editor of the Scientific American:

In the issue of your SUPPLEMENT, date of November 19, appears a special article by Dr. Gustave Glaser. This article contains some historical remarks that I am sure you, with the usual American desire to give every man a fair hearing, will allow me to object to. Dr. Glaser offers therein what he is pleased to think unimpeachable evidence of the prior right of Dr. Werner Siemens to the discovery of the principle of "mutual accumulation" in dynamo-electric machines. But Dr. Glaser is too evidently biased. He does not accord to Sir Charles Wheatstone that preparation of a great discovery that he accords to Dr. Werner Siemens, unwittingly thereby paying Sir Charles the greater compliment, since he acknowledges a difference only of a month in publication. Now, sir, I have had the honor of having been chief assistant to Sir Charles Wheatstone for a considerable period, and the greater honor by hard work to have been placed in close familiarity with so eminent a man of science, who was pleased to show me, many years before this claim of German priority became so pressing, the notes of his experiments on this principle of "mutual accumulation," made several years before publication. Before his death, however, Sir Charles told me that he believed that priority was really due to H. J. Orst, the Swedish electrician. As Sir Charles Wheatstone has been dead some years, I have, of course, no personal interest other than that due to the memory of an old master, in claiming for him the priority due to him, except it be a new version of the trite saying, "Dead men can tell no tales" (for themselves).

Dr. Glaser says: "But by a comparison of both lectures it is plain to see that Mr. Wheatstone mentions nothing that had not been said six weeks before publicly by Dr. Werner Siemens in Germany." There is, sir, a great deal, which even the Dr. C. William Siemens, of London, is good enough to acknowledge in his paper read before the Royal Society recently on March 4, 1880. PAGET HIGGS.

Self-Acting Car Couplers.

To the Editor of the Scientific American:

In an article from W. S. Huntington, published November 19, on requirements for car couplers, he says: "Any number of cars coming in contact should be coupled automatically; but it should be so arranged that no coupling will be effected unless so desired."

Admitting, for the present, that the first requirement has been filled, does Mr. Huntington believe that it would not be practically easy to fill the second requirements? It is so natural for most draw heads not to couple that a hundred different modes can be suggested to prevent an automatic coupler from working, but with all of them it is necessary for the brakeman to do something: either pull a chain, drop a pin, or move a lever, thus throwing some obstruction in the way of or changing the position of the parts and preventing coupling. But if they are left in that position, the next time the draw heads came together they would not couple, and so would not fill the first requirement until the obstruction was removed and the parts rearranged. So that simply to keep the cars from coupling, it is necessary to make two trips, one to set the obstruction and one to remove it afterwards.

Another of Mr. Huntington's requirements is that the draw heads can be uncoupled from the ground or top of the cars without going between them. If this was complied with would it not be much easier, quicker, and safer to allow the cars to couple and then go there and uncouple them, making only one trip instead of two?

Of course, with an automatic coupler, it is necessary, after uncoupling, that the draw head remain uncoupled until the cars separate; and it is also necessary that the uncoupler adjust itself, so as not to prevent another coupling. These last are practical, but think it will be some time before a draw head is invented that will decide for itself when the brakeman wants it to couple and when not to.

An interesting note from Paget Higgs, the well known author of the work on "Electric Light," and of other volumes, appears in this column. He corrects the statement of a correspondent who gave to Dr. C. W. Siemens the priority of the "mutual accumulation" principle.

RECENT INVENTIONS.

A strikingly novel improvement in pillows and bolsters has been patented by Mr. William T. Doremus, of New York city. The object of this invention is to prevent the stuffing of pillows and bolsters from being crowded out of place by pressure applied to parts of the said pillows and bolsters. The invention consists in a pillow or bolster formed of a central roll surrounded by two or more parallel rolls, connected with the said central roll along its sides. This not only prevents the stuffing from being crowded out of place by use, but the pillow can be adjusted for the head to rest upon one of the surrounding rolls or in the space between two rolls. Some of the rolls may be made harder than others, and thus allow the user a harder or softer support for his head.

A patent has been granted to Mrs. Helen M. Snyder, of Pine Bluff, Ark., for an improvement in preparing, painting, and mounting photographic pictures. The object of the invention is to produce colored photographic pictures mounted on plain or curved surfaces, and which shall be durable and superior in appearance. The invention consists in a process which is divisional into four parts, namely: first, saturating the picture by immersion in melted paraffine; second, heating by immersion in hot water to render the picture pliable and transparent; third, attaching the picture to heated glass coated with paraffine; and fourth, rubbing down the picture while kept warm. Photographic pictures thus prepared and treated are superior in transparency and beauty, permanent, of brilliant color, and free from bubbles and discolorations; also, when painted on the face, give better opportunity for artistic work, and may be perfectly sealed to curved surfaces.

An improvement in children's carriages, which is valuable for the safety it secures, has been patented by Mr. Hiram Seaman, of New York city. The object of the invention is to prevent accident from the wheels of the carriage running over obstructions, and also by rolling down inclines when the carriage is unattended. The invention consists in hanging the forward axle of the carriage at its center on a spindle which projects from the forward end of a longitudinal rod that connects at its back end with the rear axle of the carriage. By this construction either front wheel is free to rise in passing over an obstruction without tilting the carriage body, and the forward axle can be turned to anchor the carriage.

Mr. Ambrose A. Hastings, of Newark, N. J., has patented certain useful improvements in lamps. The object of this invention is to improve the light-giving qualities of lamps and secure greater safety in their use. To these and other ends the globe or part globe of the lamp is made of one piece with the oil chamber; the neck of the lamp, which is grooved, and the burner-collar, which is formed with a flange, have combined with them a rubber packing ring and a clamping plate secured by a nut, whereby the burner collar is firmly connected with the lamp; the part globe, which is stationary, is formed with recesses, and has combined with it an upper removal part, and spring buttons applied to both sets of recesses to hold the two parts of the globe together, and whereby the upper part of the globe may be readily removed; also there is combined with the stationary part of the globe and the clamping plate a key for operating the stem of the wick feeder, held disengaged from said stem by a spring, whereby the wick can be adjusted without interfering with the removal of the burner.

Mr. King G. Streeter, of Littleton, N. H., has patented a very neat and durable glove fastener. In this device a tubular shank, having an eye on its outer end, is secured to the glove on one side of the wrist opening. Through this eye is loosely fitted a wire bent in reverse directions at its opposite ends, which latter have knobs that prevent the wire from dropping out of the eye. In using the fastener one end of the wire is passed through the buttonhole in the glove wrist, and said rod or wire then used as a lever to draw the parts of the glove wrist together. The other end of the rod is next passed through the button hole, and the rod afterward adjusted to bring its central portion within the eye. The buttonhole is fitted with an oblong eyelet to prevent the glove wrist from being worn or torn around the buttonhole.

Improvement of Cattle Cars.

In their bid for an improved cattle car the American Humane Association laid down as a requisite the ready adaptation of the new device to old cars. A pioneer in the invention and introduction of cars for transporting cattle humanely writes us that his long study of the problems involved have made it plain to him that old cars cannot be satisfactorily altered to meet the conditions required. He says:

"To successfully feed and water cattle in a railroad car, and give them opportunity for rest, the animals must be separated, each one being placed in a separate stall or compartment.

"The separating partitions must be made flexible, yielding, or elastic, so that the animals cannot be injured by the jerking of the cars, and so that they will yield when the animals lie down.

"They must be made adjustable, so that the width of stalls can be changed to suit animals of different sizes, and they must be made removable, to facilitate the loading and unloading of the cattle, and so that the car body may be cleared for the loading and carrying of ordinary freight on return trips.

"A transverse position of the stalls has been proven to be the most simple, practical, and economical.

"Practical trials have demonstrated that the feeding and drinking troughs may be one and the same, hinged to fold into the wall space of the car when not in use, or covered with a suitable lid when not in use.

"Each car must be independently organized, so that it will be a complete stable within itself—that is, it must have troughs and water tanks and feed bins, to carry at least one day's supply of feed and water for the animals in the car, so that in case of drought or of accident or detention to trains the animals may still be fed and watered.

"The water tank should be in the roof of the car or underneath the floor of the car, out of the way.

"The feed bins should be on the roof of the car, and this, together with the water tank, should be so arranged that the attendant from the top of the car can feed and water the animals, if need be, while the train is in motion."

To meet these conditions satisfactorily, he affirms, new cars must be constructed.

It is possible, however, that some of our inventive readers may think differently. It is certain that a successfully altered car, infringing no devices already patented, would be a desirable property, as well as the means of hastening the much desired reform in the carriage of live stock.

The Bulk of a Ton of Coal.

The newspaper discussions of the tricks of the retail coal trade and the too common practice of delivering short weights have brought into prominence the question of checking the dealers' weights by cubic measurements. The following table for determining by measurement the weight of coal was given the *Herald* by a presumably honest dealer:

Color of Ash.	Name of Coal.	Cubic Feet to 2,000 lb.	Cubic feet to 2,240 lb.
White.	Honey Brook.	34.5	38.6
White.	Hazleton.	34.3	38.9
White.	Sugar Loaf.	34.8	38.9
White.	Old Company's.	34.8	38.9
White.	Spring Mountain.	34.8	38.9
White.	Greenwood.	34.8	38.9
Pink.	Cross Creek.	35.1	39.2
Pink.	Council Ridge.	35.1	39.2
Pink.	Buck Mountain.	35.1	39.2
White.	Locust Mountain.	35.5	39.6
White.	Mahanoy.	35.5	39.6
Gray and red.	Shamokin.	36.9	41.0
Red.	Lorberry.	37.3	41.4

Another gives a table by which small consumers can determine by barrel measure the weight of coal delivered. Using for a measure an ordinary flour barrel, the following are said to be average measurements for stove, egg, or grate coal. Furnace coal will measure a trifle less, and nut coal more.

One Ton	Barrels.
Lehigh coal will give	8½ @ 8½
Scranton will give	9½
Lackawanna will give	9 @ 9½
Red ash (varies greatly) will give	8½ @ 10
Reading (hard white ash) will give	8½ @ 8½
Locust Mountain will give	8½
Cumberland will give	9

The Utilization of Refuse.

A system of destroying the noxious properties of refuse and converting it into more or less useful matter has now had a fairly extended trial at several towns in England, notably Leeds, Blackburn, Warrington, and Derby, and has been found fairly successful. Leeds has led the way in these improvements, and the municipal authorities are satisfied with the result. The furnaces and other appliances were designed by a Mr. Fryer, of Nottingham, and their first practical trial was made at Burmantofts, about two miles from the Town Hall of Leeds, by the erection of a six-celled destructor and a carbonizer. The destructor consists of six (or more) compartments or cells, built in brick, lined with fire brick, and tied together with iron rods. It occupies a space of 22 feet by 24 feet, and is 12 feet in height. An inclined road leads to a platform over the top, and another incline leads from the level of the firing floor to the adjoining road. Each cell is capable of destroying or carbonizing seven tons of refuse in twenty-four hours, and to secure the greatest economy, the work goes on uninterruptedly. The cells consist of a sloping furnace, with hearth and firegate covered by a reverberatory arch of fire brick, with one opening for the admission of refuse, another for the escape of the gases, and a furnace door for the removal of clinkers. The refuse is emptied on the platform, and shoveled into the cell, falling first on the incline, thence reaching the sloping hearth, whence, when sufficiently dry, it is pushed on to the fire, where, owing to the radiant heat of the firebrick arch, it burns fiercely, the products of combustion being gases, a fine ash, and clinkers. Every other cell is provided with an opening large enough to take in infected bedding, mattresses, etc., as well as diseased meat. The gaseous products of combustion pass through a flue to a boiler, which supplies steam to a horizontal engine driving two mortar mills. In these mills the clinkers are mixed with lime, and ground into an excellent mortar, which sells readily at 5s. a load; while the tin cans and iron are sold for old metal. No fuel of any kind is required, the cinders and other combustibles found in the refuse supplying all that is needed.

During the year 1879 the following is an account of the work performed by the Burmantofts destructor: 14,000 tons of rubbish; 190 beds and mattresses; 264 carcasses of pigs

attacked by some fever; 1 cow, 10 sheep and lambs, 23 quarters and 13 cwt. of bad meat. The staff required for each "shift" comprises a foreman, who acts as engine driver, four furnacemen, and one laborer. Besides the destructor there is also a carbonizer, which is necessarily built in a different manner, as it is used to convert street refuse and vegetable matter into a charcoal, which sells at the rate of 30s a ton. The carbonizer consists of a group of brick cells, each having a separate furnace. It is 26 feet long, 12 feet wide, and 15 feet 6 inches high. The "shoot" is fitted with sloping plates, which project from its sides, and form a kind of spiral cave or ledge, which, near the bottom of the cell, takes the form of a fire block, resting on a wall which divides the contents of the cell from the gases of the fire. The vegetable and other refuse to be converted into charcoal is filled into this chute or well in a solid mass, the eaves or ledges forming on their underside a flue, so that the matter is gradually heated as it slips down the well, until, at the bottom, it is surrounded by nearly red-hot fire brick. The charcoal is withdrawn at the bottom, and is placed in a cooler worked by the steam engine, and each cell is capable of treating 2½ tons of vegetable and street refuse in twenty-four hours. The cost of a complete establishment, with a six-celled destructor, an eight-celled carbonizer, boiler, engine, mortar mills, buildings, etc., is £4,500. No nuisance of any kind is experienced in the vicinity of the depots, and the refuse which might, under other circumstances, be deposited in places where it would become the hotbed of disease, is effectually destroyed or utilized.—*Building News.*

What is the Cause of Plugs or Putty Holes Showing?

As for the above there are a great many answers given. Almost every painter you ask will give you a different reason, while the majority of them will tell you when the plugs show that it is the fault of the body-maker in not putting them in right, and the body-maker will tell you that it is the painter's fault, and so it goes.

We have heard some men tell us the way they overcame this difficulty of keeping the plugs from showing, which is to avoid putting any glue in the hole; glue the edges of the plug only, and as you drive it in, avoid coming in contact with the head of the screw, because if you let it touch the screw the wood is temporarily upset, and as it seeks its natural condition, and being free to expand but one way because of the screw head back, they are bound to come beyond the panel on the outside surface, but if they are not driven back upon the screw head it will be more than likely, instead of showing on the outer surface, to go the other way, which would prevent it from showing.

Be this true or not, we cannot tell; but there is one thing certain, they show, and the painter cannot stop this, and therefore should not be to blame. There are very few places where there are plugs put in that they do not show, and how to remedy it, so far as the painter is concerned, will remain a mystery.

In putting nail holes or screw heads, we do not favor the plan of most body-makers putting the brads or screws in as deep as they can get them without going clear through the panel, as it is very hard to get the lead color in these deep holes. But where this is the case, we must do the best we can with the priming and leading. We must get in the holes all we can, and as far as we can, and then take some hard drying putty and fill the holes about half full, and when this is dry fill up the rest of the holes. This putty, we think, is the best, because it dries firmer and harder, and there is not so much danger of shrinkage as there is in putty made of whiting. The first putting in a deep hole cannot dry as quick as the outer part, on account of the air not getting to it so well. If you should putty them full with the one puttying, there will invariably be trouble with shrinking or swelling of the putty. Some painters do not use putty for brad holes, but fill them up with paint and filling. Should there be any places that are not entirely filled up after the body is rubbed down they then use the putty. We have no experience in this way of working, but give it as one of the methods described to us.

We have seen brads and screws where they have been put in level with the surface or a little below, after being puttied and painted, and no trace of them could be found, and sometimes remained hid a great deal longer time than some that are put in deep; but of this you cannot convince the woodworker or get him to acknowledge any of the theory presented on this question.

Now we have seen the brad level with the panel and no putty used, and yet show as if it had been puttied, and the putty swollen out. This, we think, is caused by not having thoroughly seasoned wood, and is occasioned by the shrinking of the panel. Some painters imagine the putty is more inclined to show by the wood swelling than by its shrinking, because, as they say, in driving a brad or nail into the wood, the wood being pressed away to make room for the nail, the damp weather will swell the wood around the nail, and thus force the putty out. We have noticed the swellings do not look the same at all times. Sometimes very bad, and again hardly visible to the eye. Whether dampness causes this, we are unable to say, but are inclined to think it has somewhat to do with it.

The only thing we can do is to use thoroughly seasoned lumber, have the woodworker to drive the nail or put the screw in so as to require the least amount of putty, and then for the painter to let the putty as well as the paint have time to dry. We have seen painters putty a job, and a few hours

afterward give a coat of paint, so that he may finish the putting the next day; now it has been puttied twice before the first has had time to dry, and consequently will show every place where there is a nail or screw, because no precautions have been used against it.—*Carriage Monthly*.

NEW HUSKING GLOVE.

The engraving shows a device for protecting the parts of a glove most exposed to wear in husking. It is applied to a glove of ordinary make, and consists of a coil of wire surrounding each finger and the thumb of the glove. The coils are fastened at the front and back by means of small metal clips riveted to the glove. These clips are sustained by straps fastened to the same rivets, and extending down the back of the glove to a point near the wrist, where they pass out through slits in the glove, and are received by buckles attached to the wrist portion of the glove, so that the straps can be tightened or loosened to sustain more or less of the strain on the fingers and back of the glove.

This invention was lately patented by Mr. J. F. Glidden, of De Kalb, Ill.

Arsenic and Vanadium in Caustic Soda.

Since caustic soda is no longer exclusively made from crude soda and lime, but is also produced directly from red liquor, the product is often contaminated with undue proportions of chlorides, sulphates, carbonates, even nitrites, and sometimes cyanogen compounds. The author has now also met with arsenic and vanadium in caustic soda. The latter impurity may be disregarded, being rare and very minute; but the former is more serious. A sample of this caustic soda, dissolved in dilute sulphuric acid, and the solution tested directly in Marsh's apparatus, yielded a strong arsenic mirror. Assay by means of precipitation with hydrosulphuric acid, etc., yielded 0.16 per cent of arsenic acid. The same sample contained also 0.014 per cent of vanadic acid. The latter may be recognized by passing through a solution of the caustic soda a current of hydrosulphuric acid, when the liquid will finally assume an intense reddish-violet. This is filtered and acidulated with dilute sulphuric acid, when a precipitate will be obtained, which, after being washed, will produce with borax a yellow bead in the outer blow-pipe flame, and a green bead in the inner. On heating the precipitate in the air, a reddish-yellow mass is obtained, which is soluble in ammonia with a yellow color. The latter solution, slightly acidulated with hydrochloric acid, yields a bluish-black precipitate with infusion of nutgalls.—*Dingler's Pol. Jour.*

NOVEL TROTTER SULKY.

The axle of the sulky shown in the cut is curved upward and extends over the horse. The horse travels between the wheels, and the driver's seat is at the summit of the axle.

The shafts, formed of a continuous piece, meet in a curve at the rear of the horse, and are attached to the axle at a suitable height.

To prevent the irregular movements of the horse's body from being transmitted to the vehicle, the inventor attaches springs to the upper and lower side of each shaft and to the harness saddle.

It is claimed that this improved sulky is safer than those of ordinary construction, and enables the horse to make greater speed.

This invention was recently patented by Mr. C. F. Stillman, of Plainfield, N. J.

A Plague Among the Violets.

Another interesting problem for microscopists to solve is the cause of the disease which has broken out among the violets, an account of which was lately given by a leading florist.

When the disease commenced its ravages, some three years ago, violet growing was so far in the hands of a single producer that he had won the titular dignity of the violet king among New York florists. His vast plantation was wrecked in one summer, and he was financially prostrated by the operations of an invisible enemy. The season had been rather dry, and the blight was attributed in this special instance to the substitution of well for brook water in irrigating the plants. Experience soon furnished an emphatic negative to this theory, and showed that the disease was a true blight, like the potato rot, the vine disease, the pear tree blight, and similar destructive agencies that infest the vegetable kingdom. In the violet the disease makes its appearance while the plants are in blossom. The first symptom is the development of nearly circular spots on the petals of the flower, which resemble the spots caused by the concentration of the beams of the sun upon the surfaces of the leaves of plants by the refractive agency of raindrops after a summer shower, the globular and lenticular shape of the drop rendering it equivalent to a minute burning glass, concentrating the rays of the summer sun upon the surface beneath, and completely destroying the delicate vessels thus exposed to intense heat. After this symptom appears, the destruction of the plant is a question of a few hours only;

the leaves become limp and wilted, the stem withers from the root, and the delicate organism is soon transformed, from the minutest rootlet to the tip of the leaf, into a dry and lifeless effigy. The origin and natural history of the violet blight have not yet been investigated.

Poisonous Perfumes.

Various cases of poisoning from the use of perfumes have been reported in recent English journals. In one instance a



GLIDDEN'S HUSKING GLOVE.

little girl had bought some heliotrope perfume at a bazar, and had applied it on her face. This caused a vesicular eruption, swelling, itching, and in fact erysipelas, which lasted for some time. The scent was made with some of the products of coal tar, and not with the odoriferous principles of plants, thus acquiring its irritating properties.

MECHANICAL INVENTIONS.

Mr. Andrew Hein, of Trenton, Mo., has patented an improved vehicle wheel, by which friction is reduced. The object of this invention is to facilitate the construction and



STILLMAN'S TROTTER SULKY.

easy running of vehicle wheels. The invention consists in providing the hub of the wheel with metallic bands having end cups adapted to contain boxes that carry rollers which bear on the inner circumference of the said cups or hub band extensions. The whole weight of the axle and the load supported by it rest on the rollers which run on the inner faces of the cups, so that the vehicle wheel will move more easily.

A very simple and useful improvement in clocks for night use has been patented by Mr. Ferdinand A. Jaekel, of Cincinnati, Ohio. The object of this invention is the pro-

duction of a clock the dial and hands of which may be projected upon a canvas or similar surface, like the pictures of a magic lantern, so as to be plainly visible at night. The invention consists in a transparent dial behind which is to be arranged a light, and which has a central stud that carries two wheels, arranged one behind the other, the central portions or bodies of which are also transparent, and have delineated on them, respectively, an hour hand and a minute hand. These wheels mesh with cog wheels on the hand arbors of a clock movement, which may be supported by a stand formed by a chamber for holding the light in rear of the transparent dial. By this construction and arrangement, all the advantages of an illuminated clock are obtained at a comparatively small cost.

An improvement in thill couplings, which provides for a ready and convenient coupling and uncoupling of the thill, firmly holds the latter to the axle, and avoids accidental uncoupling, has been patented by Mr. Herbert K. Forbis, of Danville, Ky. In this invention the thill is united to the jaws of the clip by a bolt or pintle which has an angular arm fast on its back end. This arm, when the thill is coupled, rests on the axle, and is held against the same by a spring latch bolt, the nose of which is beveled to permit of said bolt being forced back by the arm when the latter is adjusted to bear on the axle, after which the spring shoots the bolt and locks the arm. This prevents the removal of the pintle except by holding back the latch bolt and moving the arm of the pintle away from the axle.

A very useful invention, in the shape of a square attachment for saw blades, has been patented by Mr. Thomas U. Mekeel, of Poughkeepsie, N. Y. In this invention the heel portion of the blade of a handsaw has attached to it, by a pin passing through the blade, two bars or strips, that is, one on each side of the blade. These bars are formed with their edge or face toward the point of the saw straight and true. They constitute the head of the square or bevel, and can be turned on the pin which attaches them to the blade, either one independently of the other, to bring their faces at any angle to the back edge of the saw. Ordinarily they will be retained at right angles, in which position they may be held by a spring catch. This invention combines two tools that are generally used together, and the attachment, which is inexpensive, can be readily applied without injury to the saw blade. If desired only one pivoted bar may be used.

Mr. William C. Jones, of Coffeeville, Miss., has patented an improved baling press. The press, which is of a very strong and durable construction, offers every facility for baling cotton and other substances with precision and dispatch. It comprises a stout frame having an upper baling box, which is open below for reception of the follower, and has its sides and ends hinged to open downwards for convenience in removing the bale. Said ends fit grooves formed in the sides, and the latter when closed are secured by hooks. The head block fits within rabbets in the frame to allow it to be slid out for convenience in inserting the material to be pressed. The follower is worked up and down by a rotating screw box formed by the hub of a crown wheel, driven by a pinion, on the shaft of which are large and small pulleys for giving a slow pressing movement and quick return action of the follower.

Mr. William W. Wythe, of Ocean Grove, N. J., has patented an improved speed recorder for railway trains. In this improved apparatus the drum, which carries the chart, receives its motion from the axle of a car, by an eccentric on the axle acting against one or other of two pawls attached to levers on opposite sides of the axle, and provided with disks which operate respectively, according to the direction in which the car is moving, upon one or other of two elastic chambers that compress the air within them. These chambers are connected with two other flexible chambers that act upon levers having pawls which engage with a wheel of a train of gear to rotate the drum in either direction. A pencil moves over the ruled paper of the rotating chart in such manner that the diagonal lines produced are in the direction in which the train is moving, thereby obviating confusion in reading the record. This movement of the pencil is effected by a combination with a loose spur wheel of pinions, a spring operated detent, cord, spring drum, and other devices controlling a pencil-carrying rack bar. In this speed recorder compressed air is used not only to produce the movement, but also to indicate the direction of the prime mover.

Mr. James C. Scott, of Manchester, England, has patented an improved dividing engine, which is very ingenious. The invention consists in an arrangement whereby change wheels are dispensed with and an increased accuracy of division is secured. This is accomplished by causing the handle which gives motion to the movable part always to start from the same point, and to finish, after the required number of turns and fractions of a turn, against an adjustable stop on a graduated disk, after which it is turned in the reverse direction back to the starting point, which is a single notch in the disk that a spring-trigger in the handle

engages with. The apparatus may be used for setting out, cutting, or working divisions on circular or straight lines.

Mr. Fredrick Schneider, of Pagosa Springs, Col., has patented a very useful improvement in open links. The object of the invention is to provide a new and improved open link which is simple in construction and effective and convenient in use. The invention consists in an open link formed of two U-shaped sections provided with internal opposite projections at the ends, which sections are united by a connecting plate provided with recesses in the longitudinal edges to receive the projections at the ends of the U-shaped sections, all these parts being held together by a flat sliding cap and a split spring bolt passing through said cap and the connecting plate.

Mr. William E. Varney, of Daytonville, Iowa, has patented an improved fly-net punch. The object of this invention is to provide a machine for punching holes for the net strands in the leather bars or straps more rapidly and accurately than is now done and without removing any of the leather. The invention consists of a fly-net bar punch, in which a two-pronged fork or punch is reciprocated up and down, within a frame mounted on a table, by means of gearing and a flywheel shaft connected by an eccentric with the punch shaft, and in which the strap or bar to be operated upon is intermittently and automatically fed along the table by mechanism deriving its motion from the flywheel of the device. With this machine the work of preparing the straps or bars for fly netting for horses, etc., is performed with great economy of time and labor.

An improved vehicle gear, the object of which is to provide easier riding springs for buggies and other vehicles, has been patented by Mr. William Lockwood, of Madrid, N. Y. The invention consists in a combination of semi-elliptical springs, centrally secured on the top of the side bars in direction of the length of the latter, and curved end springs passing around the side bars up to and connecting with the extremities of the semi-elliptical springs. This improvement forms a very simple, easy, effective, and economical spring gear.

Mr. John M. Doyle, of North Springfield, Mo., has patented an improved bench dog. The object of this invention is the production of a movable and adjustable bench dog for carpenters' use, and it consists of a notched sliding rack bar or claw and a pivoted toothed lever secured in an angle frame, which frame is adapted to be attached to the bench by means of a lateral bolt or arm entering holes in the side of the bench. A ratchet construction of the frame and a pawl on the lever provide for locking the claw up to the work, and for releasing it therefrom when required. The simplicity and utility of this invention will be apparent to every carpenter.

The Mines of Tasmania.

A serious mining fever has been developed in Tasmania—the old Van Diemen's Land—based chiefly upon tin. The Mount Bischoff tin mine, described as a mountain of metal to be quarried rather than mined, is apparently one of the richest if not the richest deposits of tin in the world.

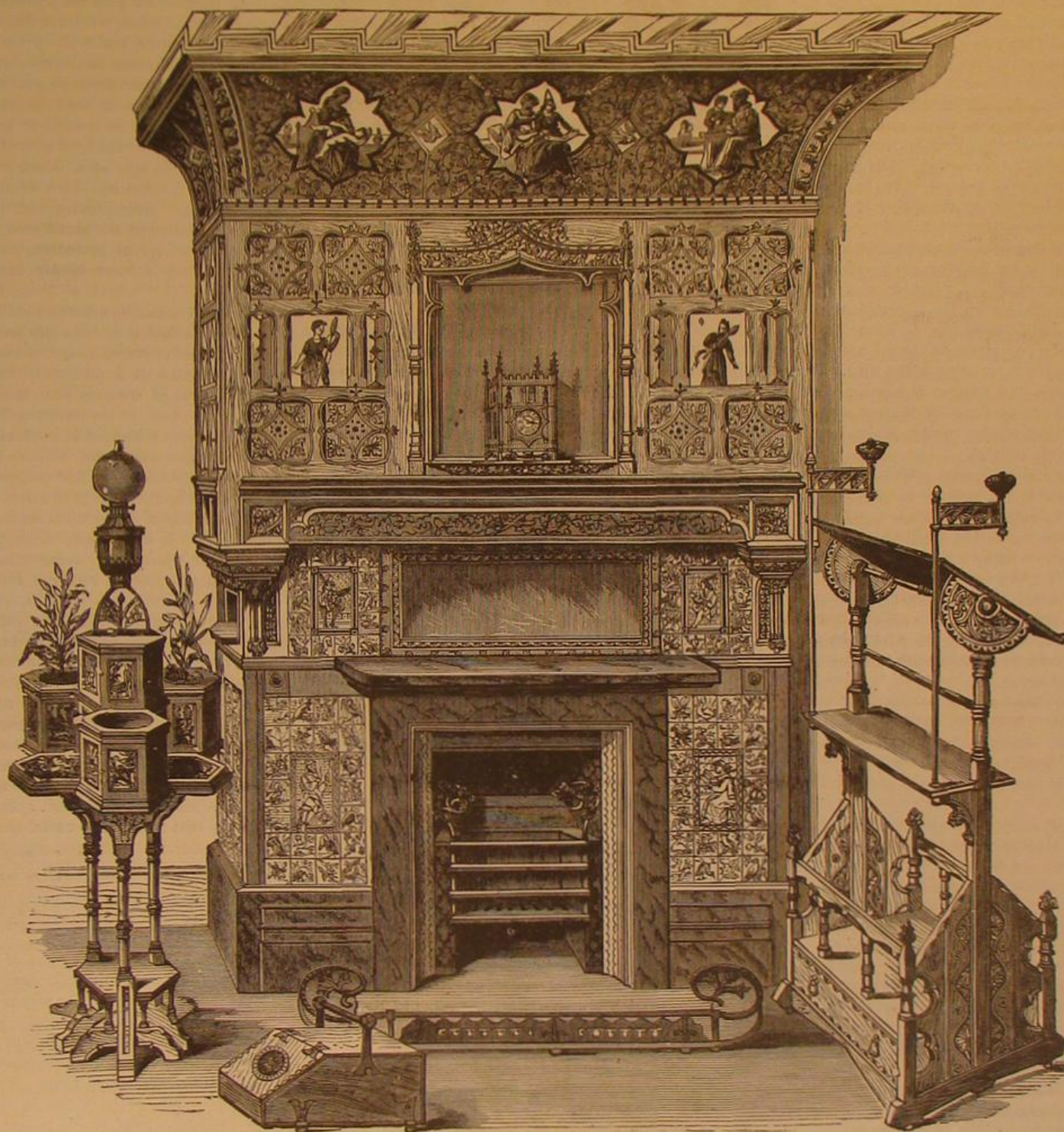
It was in the year 1872 that large deposits of tin ore were first discovered at Mount Bischoff, on the northern side of the island, opposite to Victoria. From the outset the mine

in its product of tin proved to be what the Burra Burra of South Australia was first as a copper mine, namely, a deposit so vast as to render superfluous the ordinarily tardy and expensive operations of mining. A mining fever set in, and successively were discovered, not merely many more tin deposits, but also gold, silver, bismuth, antimony, iron, and coal apparently inexhaustible.

From the year 1866 to June 30, 1879, the returns of gold were 48,753 ounces from the alluvial and 72,184 ounces from the quartz.

ARTISTIC MANTELPIECE.

The engraving represents a magnificent mantelpiece made by Messrs. Cox & Sons, of London, England. The wrought metal work is of exquisite workmanship, and the tiles,



MANTELPIECE BY COX & SONS LONDON ENGLAND.

painted panels, and diapered patterns are thoroughly artistic. The woodwork is workmanlike in its construction, and the whole design, while massive and imposing, has an elegance that is extremely pleasing.

An Ancient Great Lake in the West.

The last quarterly report of the Kansas State Board of Agriculture contains the following: In the geological development it is conceded by scientists that the eastern portion of Kansas, a portion of Nebraska, Southern Iowa, Northern Missouri, etc., was once covered by a fresh water lake, and this body of water received numerous rivers and smaller streams; and that their turbid waters deposited a sediment, varying from a few feet to 150 feet thick.

Strontianite.

Since it has been shown by Professor Scheibler, of Berlin, that strontium is the most powerful medium of extraction in sugar refinery, owing to its capacity of combining with three parts of saccharate, the idea suggests itself that the same medium might be successfully employed in the arts, and form a not uninteresting subject of speculation for the chemist. Hitherto native strontianite—that is, the 90 to 95 per cent. pure carbonate of strontia (not the celestine which frequently is mistaken by the term strontianite)—has not been worked systematically in mines; but what used to be brought to the market was an inferior stone collected in

various parts of Germany, chiefly in Westphalia, where it is found on the surface of the fields. Little also has been collected in this manner, and necessarily the quality was subject to the greatest fluctuations. By Dr. Scheibler's important discovery a new era has begun in the matter of strontianite. Deposits of considerable importance have been opened in the Westphalian districts at a very great depth, and the supply of several ten thousand tons per annum seems to be secured, whereas only a short time ago it was not thought possible that more than a few hundred tons could in all be provided.—*Chemical News.*

Ammonia in Pulmonary Diseases.

At the meeting of the Royal Belgian Academy of Medicine, April 30, 1881, M. Melsens presented a memoir on the therapeutic applications of ammonia, its salts or its complex compounds, requesting that a committee be appointed to examine into the value of his conclusions relative to this question. M. Melsens' communication discusses the applicability of ammonia and its compounds to diseases of the respiratory organs. He concluded, from the fact that phthisical patients are benefited by inhaling the vapors of carbonate of ammonia emanating from stables, that the continuous and moderate inhalation of that salt would be efficacious in other pulmonary affections. He accordingly made the experiment upon himself during an attack of bronchitis, by wearing in a bag attached to his shirt several pieces of ammoniac carbonate. Having been completely cured in a few days by this treatment, he subsequently employed it in his practice, with uniform good results. He also applies the remedy directly to the respiratory passages, by means of the spray, with equal success.—*Bulletin de l'Académie Royale de Médecine de Belgique.*

Carbolic Powder.

A dry powder, containing a definite quantity of carbolic acid, in which

form the latter is most easily used as an antiseptic, is prepared, according to a Berlin journal, as follows: 60 parts of rosin and 15 parts of stearine are melted together with a gentle heat, and when the mass has somewhat cooled, but is still liquid, 25 parts of carbolic acid are added. The mixture is then mixed with 700 to 800 parts of precipitated carbonate of calcium, and by careful trituration reduced to a uniform powder. This is to be applied by means of a sprinkling box, which may be securely covered after use.

The powder may be applied either directly to wounds and sores, so as to produce an antiseptic scab, or it may be used for the extempore preparation of carbolicized jute dressing by placing several layers of jute, each separately dusted over with the powder, upon each other.

Cotton Spindles in Fall River, Mass.

The latest published statistics, as found in Earl's "Fall River and its Manufactories of 1880," indicate that very considerable additions have been made to the number of spindles in the city. On the first of July last there were 1,429,412 in operation in the city. At the time of the publication of Earl's book there were 1,364,199. This increase does not include any of the new mills. The new Border City, Sagamore, Shove, Bourne, Globe yarn mill, and the new corporation recently formed will add over 200,000 spindles more, making over 1,629,412 spindles in the city.—*Providence Journal.*

ENGINEERING INVENTIONS.

An improvement in presses for compressing meal, bran, cotton seed, sawdust for fuel, and other materials into cakes, has been patented by Mr. John W. Fredrick, of Indianapolis, Ind. This invention relates to hydraulic presses used for compressing various materials into cakes, and has for its object the quick removal without breakage of the compressed cake. The material to be compressed is packed within a press box, which is open at its ends, and the box then placed on one of its ends within a cap which is mounted on the ram. Power is next applied to the ram to raise the box on a fixed cylinder, which enters the box at its opposite end. When sufficient pressure on the material has been thus obtained, the box is further raised by supplementary means, and blocks are arranged between the cap and bottom of the box and the ram again raised, which causes the compressed cake to be forced out of the bottom of the box. The invention is a perfectly practicable and useful one.

An improved car coupling, which combines with it a cushioned bumper and furnishes a yielding drawhead, has been patented by Mr. Darwin S. Walrath, of Ingham's Mills, N. Y. In this coupling the frame of the device and drawhead are mounted in slots formed in the beams of the car platform, with a spring between them, and both have a limited longitudinal movement in opposite directions. When the cars are ready for coupling, a crossbar, which engages the connecting bolt, rests on a table formed on the bumper head which has been forced forward by the spring of the intermediate bumper when the cross bar was raised by an uncoupling lever. The cars having been brought together the connecting bolt or link enters the bumper head and forces it back against the bumper, which is a double or compound one, the springs of which absorb the concussion. In the meantime the crossbar has dropped from its supporting table into position in front of a projection on the connecting link, which is thereby prevented from being withdrawn. One of the springs of the compound bumper is heavier than the other, so that the power for drawing the car will come against the rearward thrust of that spring, which thus furnishes a yielding draw for the car.

In improved sectional steam boiler, which is economical of fuel, quick to generate and superheat steam, easy of repair, and occupies but little ground room, has been patented by Mr. Milton W. Hazelton, of New York city. The body of the boiler consists of a central upright cylinder provided with a series of radiating tubes, closed at their outer ends and arranged in successive planes one above the other, the tubes and spaces of the several series alternating with each other. A series of vertical tubes are set in the spaces between the outer ends of said radiating tubes, and arranged to extend from near the water line above these tubes to the bottom of the central cylinder, and communicating at their ends by horizontal pipes with said cylinder. A tubular water jacket is formed around the fireplace by a double series of vertical and horizontal pipes connecting with the central cylinder, and the steam chest, at top of the boiler, is fitted with vertical smoke-flues for superheating the steam.

Mr. Charles Ebel, of New York city, has patented an improved hydrant. This invention provides, in a very simple and effective manner, for emptying the nozzle pipe of a hydrant of water in cold weather, to prevent injury from freezing. To this end the stem of the valve which controls the admission of water to the nozzle pipe is extended downward below said valve, and carries on its lower end a reverse valve which, when the nozzle pipe valve is closed, opens communication between a lower extension of the nozzle pipe and a waste chamber, which is arranged below it, and which is fitted with a pipe that connects with the sewer, thus allowing any water that may be left in the nozzle pipe to run off. A separate valve is used to close this pipe that connects with the sewer whenever it is not necessary to empty the nozzle pipe, as, for instance, during warm weather.

An improved car coupler, which is simple, strong, and durable, and allows of the cars being coupled and uncoupled without dangerous exposure to life or limb, has been patented by Mr. Oliver S. Riggs, of Allentown, Pa. This invention relates to that class of couplers called "self-couplers," and it consists of a flaring mouthed drawhead containing a pivoted elbow drop-catch for engaging the coupling link, held down by rod and spring and raised by lever, and containing, also, a curved plate rigidly secured in rear of the drop catch for guiding the coupling link and holding down its engaged end. The lever which raises the drop-catch is an elbow one arranged on the exterior of the drawhead, and may have attached to it a rod extending forward for the engineer to uncouple the cars while in motion.

Mr. William Johnstone, of Ottawa, Canada, has patented an improved steam boiler. The invention consists in a combination with an upper cylindrical chamber, which forms both a water and steam receptacle, of an annular lower water chamber surrounding the grate, upright water tubes connecting said chambers and forming the exterior wall of the boiler, drop tubes for containing water depending from the upper chamber into the fire chamber, and a series of short upright tubes projecting from the lower annular chamber at the feed opening to the fireplace and connected by a cross pipe with the upright tubes which connect the upper and lower chambers. This constitutes a cheap and efficient boiler for generating steam for mechanical uses, for heating dwellings, and for other purposes.

An improved boat lowering and detaching apparatus, which is both rapid and safe, and is automatically released when the boat touches the water, has been patented by Mr.

Albert Willis, of Colusa, Cal. The invention consists in an upright at each end of the life-boat, to the top of each of which uprights a short arm or beam is pivoted, the loose end of which passes into an aperture in a beam pivoted to the lower end of the upright, this upper beam being held in the aperture by a safety chain and by a pintle passing through a ring attached to a string or chain fastened to the davit, whereby when this string is drawn taut by the descending of the boat the ring pulls the pintle out of its aperture, so that the lower beam can drop when relieved of its strain—that is, when the boat floats—thus permitting the upper arm to swing upward and the ring of the pulley block to slide from a hook on the upper pivoted beam, thereby causing the boat to be detached from the pulley.

Messrs. Watson P. Widdifield and Anson T. Button, of Uxbridge, Ontario, Canada, have patented an improved car brake. The object of this invention is to provide an efficient car brake which will permit the brakes to be applied simultaneously to all the cars of a train from a single point, and with an equal pressure. The brake is of that description in which a continuous rod, formed of sections, extends longitudinally with the cars, and is jointed between the latter, said rod sections being coupled for rigid rotation with each other and connected with devices for rotating the rod, and also to the brake devices. The invention consists in a combination with the brake devices and a rotary gear operated directly by the axle for applying them, of a continuous rod or shaft extending throughout the length of the train, and an equalizing device placed between the said continuous rod and the rotary gear. It also includes a coupling of novel construction for the continuous rod, and various other details and combinations, which add materially to the efficiency of the brake.

Mr. Isaac H. Allfree, of Pittsburg, Pa., has patented a very useful valve and valve gear for steam engines. The invention relates to an improvement in valves and valve gear for steam engines, designed to secure a balanced action for the valve, a reverse movement for the engine, and an automatic variable cut-off with great economy of material and space, as well as great simplicity of parts. It is more particularly intended for upright engines. In it the steam cylinder, main valve casing, and reversing valve casing are all cast in one piece in the form of parallel cylinders, and provided with transverse external ribs to form steam ports. The main valve casing is made longer than the steam cylinder, which has ports at its ends, and the reversing valve casing has ports opening into the end and middle of the main valve casing, and both casings are fitted with balanced piston valves, which are double headed and tubular. The invention also includes a combined reversing and cut-off valve and a variable cut-off gear arranged in line with the valve and connected by reciprocating rods or stems having an adjustable connection between them. Means also are provided for definitely increasing or shortening the distance between the valve and its variable cut-off, whereby the valve may be reversed at will and the cut-off gear still be made to coast with said valve in either of its positions. The invention likewise includes other new and useful features.

Action of Coffee and Sugar on the Stomach.

M. Leven has communicated to the Paris Society of Biology some experiments which he has made on this subject on dogs, with the assistance of M. Semerie. The action of coffee on the stomach has been much discussed and variously interpreted; the majority of writers admit that coffee stimulates the circulation and provokes hyperemia of the gastric mucous membrane, but they have not adduced experimental proof of the fact.

The contrary opinion is supported by a certain number of observers, to whom M. Leven has given in his adhesion. He recalls to mind the experiments which he made some years since on caffeine absorbed by frogs, guinea pigs, and rabbits. It retarded the action of the heart, which, at the same time, became strong; it increased the arterial tension; like the vaso-constrictor agents, it dilated the pupil. Caffeine has even been used in certain cases to replace digitaline, of which it has, to a great extent, the properties, though in a smaller degree.

The latest experiments of M. Leven were as follows: He gave to a dog a meal of 200 grammes of meat; he then administered an infusion of 83 grammes of coffee in 150 grammes of water; the animal was then killed, and, at the end of three hours, the stomach still contained 145 grammes of meat, while in the absence of coffee it only contained about 100 grammes. The abdominal mucous membrane was pale as well on the external surface as in the interior, and the vessels were strongly contracted. It follows, then, that coffee, producing anemia of the stomach, retards digestion; and, he anemia repeating itself, ends by bringing on habitual increased congestion of the stomach, which, according to M. Leven, is synonymous with dyspepsia.

It is well known, and English physicians have laid great stress upon this point, that the abuse of coffee and tea often brings on gastralgia, dyspepsia, and, at the same time, more or less disturbance of the apparatus of innervation. It is, therefore, necessary precisely to distinguish the local anemia produced by coffee on the stomach from the more general action exercised by it over the central nervous system, and which has conferred on it the merited qualification of an intellectual drink. In opposition to coffee, sugar is, according to M. Leven, an eminently digestive substance; and he does not fail to order it in certain cases of dyspepsia. He

has made the following experiments: He gave to a dog 80 grammes of sugar at the same time as 200 grammes of meat; six hours afterward there was nothing found in the stomach but 20 grammes of undigested meat. The abdominal mucous membrane was red and turgid, the liver was wholly congested.

M. Leven draws this practical lesson from his experiments: that the infusion of coffee should be sufficiently sweetened to stimulate the secretory function, and thus assist digestion.—*British Medical Journal*.

The Treatment of Burns.

The *London Medical Record* says that Dr. J. Troizki, in a Russian medical journal, adds his testimony to that already published as to the value of solution of bicarbonate of soda as a dressing for burns. He says that during the previous year he noticed twenty-five cases of burns, mostly of a severe nature. Sixteen of them were received in a fire in a village, during a strong wind, when the inhabitants, in order to save their property, were obliged to work in the flames. In all these twenty-five cases bicarbonate of soda was exclusively applied. The result of this treatment was so favorable that the author considers himself justified in pronouncing this remedy the best and most efficient in burns of all kinds and degrees. Even in extensive burns of the second and third degrees the pain was soon alleviated by the application of compresses soaked in a solution of bicarbonate of soda; and the wounds soon healed, leaving but few scars, and no impairment of the functions of the affected parts. No evil results from this extensive use of bicarbonate of soda, which might suggest the reception of carbonic acid into the blood, were noticed.

As regards the application of bicarbonate of soda in burns, the author distinguishes three methods: (1.) Powdered bicarbonate of soda is strewn over the burned parts. (2.) Linen rags, sprinkled with a solution of bicarbonate of soda (1 in 50) are laid on; as soon as these rags become dry they are replaced by others, or are moistened again in the solution. (3.) Linen rags are applied in the same manner, but are kept constantly upon the burns, and moistened by pouring the solution over them. The first method suffices only for burns of the first degree. Change of the moistened rags is chiefly adapted for burns of the third degree, attended with much suppuration. In exchanging the dry rags the pus which has accumulated underneath them must be carefully washed off, that it may not be received into the blood; and then a fresh rag soaked with the solution must be placed upon the clean granulating surface. The third method is applied solely in burns of the second degree. Changing the compresses would in these cases only irritate the exposed surface, and, by causing a more copious suppuration, delay the healing process. The beneficial effect upon burns of the solution of bicarbonate of soda the author considers to be due to the anæsthetic, antiseptic, and disinfecting property which the bicarbonate owes to the ready disengagement of carbonic acid from it. Herr Troizki has also made experiments with other antiseptic and disinfectant agents, but has come to the conclusion that none are so useful as the soda.

Great Mortality from Snakes and Tigers in India.

It may be startling to Europeans to learn that no fewer than 21,990 persons were killed in India during the year 1880 by snakes and tigers. It is, too, at first sight, eminently unsatisfactory to hear that this loss of life, instead of decreasing with the advance of civilization, has actually increased during the past five years; the number of victims in 1876 did not exceed 19,273. This statement appears almost incredible, and requires explanation, which will probably be found in the greater accuracy with which causes of death have been returned in India in recent years. The largest fatality from snakes and wild beasts occurs in the Bengal Presidency, where during last year 10,064 persons are said to have died from snake bites, and 359 to have been killed by tigers. It appears from the weekly returns issued by the Sanitary Commissioner of the Punjab that during the fortnight ending August 27 last no fewer than 113 deaths resulted from snake bites in fifty-two of the largest cities of that province—equal to nearly 3,000 per annum. As the fatality from this cause is probably larger in the rural than in the town districts, it is evident that the province of Punjab must be responsible for a very large proportion of the excessive fatality from this cause in the Bengal Presidency.—*London Lancet*.

Gas Purification by Apatite.

It is announced in a recent number of the *Revue Industrielle* that the first cargo of 500 tons of Canadian phosphates, from the mines at Buckingham, province of Quebec, has been delivered at Bordeaux. Apart from the use of this mineral for agricultural purposes it is proposed to utilize the Canadian apatites (calcium phosphate) in the purification of coal gas, presumably from ammonia. If the process succeeds there will probably be a rise in the value of these phosphates, which already constitute an important branch of industry in the province of Quebec. It is not stated how the apatite is to be used in the purifiers, but it would probably be only employed somewhat after the manner of the artificial superphosphate process for the elimination of ammonia. The mineral will, therefore, be ground and employed in its raw state, with what success remains to be proved, since, although presumably cheaper than commercial superphosphate, it is not so pure and free from inert constituents as the artificial substance.

NEW INVENTIONS.

An improvement in escapements for watches, etc., whereby a more regular and uniform movement is obtained, has been patented by Mr. Edward Wensch, of Vienna, Austria. The invention consists in an anchor rod pivoted on the top plate of the works, and having its lower end T-shaped, with a tooth engaging with the escapement wheel at the ends of this T-shaped part, and the upper end of this rod provided with a fork surrounding an eccentric on the shaft of the balance wheel, above which eccentric there is a plate with a pin at the edge, which a spring presses against for imparting motion to the balance wheel. By these means the escapement wheel does not directly transmit the motive power of the clockwork to the balance, but the movement depends on the power of the above-named spring which always remains regular. For pendulum clocks, the construction is slightly modified.

An automatic flood gate, which can be removed from the flume very conveniently when desired, has been patented by Messrs. Cornelius B. Bradshaw and James Hewett, of Neillsville, Wis. Combined with the flume is a gate arranged to swing on horizontal pivots, and having an excess of weight below said pivots and an excess of superficial area above the pivots, which may fit in upright grooves in the sides of the flume. If the flume is empty the gate will be inclined and closed by the descent of its heavier lower end, and the water as it enters will be stopped by the gate. When, however, the flume is full, the water will act upon the gate to turn it into a horizontal position, or nearly so, and thus permit of the water flowing out of the flume. This automatic gate will be found to be of great service in floating wood, as it collects a quantity of water, and by suddenly releasing it produces a powerful current to float off the logs. It may be easily removed by an ordinary windlass when required, and, if desired, may be provided with an operating lever and a latch for locking it when closed.

Mr. Asahel J. Goodwin, of Brookline, Mass., has patented valuable improvements in invalid bedsteads. The improvements relate to invalid bedsteads having sectional bottoms fitted for adjustment to vary the angle of the sections to suit the comfort of the patient and the necessities of the case. The object of the invention is to permit a larger range and variety of adjustment than has heretofore been possible, and also to obtain durable construction, combined with convenience of manipulation. The bed bottom is made up of a vertically adjustable central section, and two end sections fitted to swing for varying their inclinations, and one of which is in two parts hinged together. A stretcher also is used. The bed bottom sections are pivoted, and the head one works in slotted socket plates having flanges to form bearings for the pivots, heads on which enter the slots that provide for the removal of the section. Said socket plates, which are applicable to other sections and parts, have circular projections at their backs which enter holes in the rails. An ingenious combination of cams, some of which are formed with folding ends to facilitate transportation, ratchets, racks, pinions, levers, and other devices, serve for adjustment of the sections, both separately and collectively, and for retaining them in position, the whole providing for nearly every possible position of the body.

An improved buckle, for use in securing the ends of straps without sewing or rivets, and especially useful in attaching parts of harness, has been patented by Messrs. James W. Sweeney and William H. Lowe, of Walla Walla, W. T. The invention consists of a two-part box buckle, each part being of tubular form and provided with a wedge-shaped tongue. These tongues serve to hold the ends of the strap or straps in between them and enter respectively the box part of the other, and are formed with pins which engage with holes in the strap ends. One of these tongues is hinged to give room for insertion or removal of the ends of the strap, and is provided with a spring catch to hold the two parts of the buckle together when closed. Any strain on the straps tends to draw the two parts of the buckle more tightly together.

A very compact and useful improvement upon baby jumpers, which mothers and nurses will be able to appreciate, has been patented by Mr. Wesley Roberts, of Martinsville, Ill. The invention consists of a baby jumper which is readily convertible into a small table, and which, when extended to adapt it to its primary use, forms a very stable device for the child to jump, whirl, or swing upon with perfect safety. To these ends or purposes the spring pole of the jumper is hinged midway of its length to admit of its being folded into a contracted space and horizontal position. The support within which the pole plays, and which is provided with a pole-sustaining spring, is also hinged to fold up, the platform, which is removable and forms the table top, rests upon a sliding extension, and hinged wings or supports are provided to give an extended base support to the whole structure.

Mr. David Britton, of Jonesborough, Ill., has patented a fruit drier, which has superior drying facilities and offers increased conveniences for inserting, changing, and removing the fruit. It consists of a drying house having a separable strip in its roof to provide for the escape of the moist air and to promote circulation of the heated air, a furnace for heating the incoming air, guiding, and distributing plates for the air to, at the sides of and above the furnace, a series of tracks or ways on opposite sides of the interior of the drying house and arranged one above the other to support tiers of drawers which hold the fruit to be dried, and separable end frames having crossbars and hinged doors to pro-

vide for the entry and removal of the drawers with very little waste of heated air.

The International Exhibition and Congress of Electricity at Paris.

OPERA BY TELEPHONE.

The most crowded place in the Exhibition is the *Théâtre de l'Opéra*. Here from eight to eleven on three evenings in the week are to be seen four long queues waiting for their turn to enter one of the four rooms where the mysterious music is to be heard. Round the walls of each room are hung telephones in pairs, some twenty pairs in all, and the same number of persons are admitted. On putting the telephones to your ears you hear the music which is being performed more than a mile distant. Some of the singers seem to be on your right hand, others on your left, and it sometimes happens that a particular voice is quite piercing in its loudness. There are in fact ten transmitters disposed along the front of the stage, near the footlights, and ten wires leading from them, two of which are connected with the telephones intended for your two ears. Special precautions are taken to prevent the action of the transmitters from being disturbed by the tremors of the boards under the feet of the actors, the transmitters being supported on India-rubber and loaded with lead. The telephonic apparatus employed is that of the Ader system.

THE DOLBEAR TELEPHONE.

The greatest novelty as regards principle is exhibited in Dolbear's telephone, in the United States department. The receiver has no magnet, but has two parallel metallic plates near together, and electrically insulated from each other. One of them is connected with the line wire, and the other (in the specimen here exhibited) with the return wire. These two wires are connected with the terminals of the secondary coil of a small Ruhmkorff at the sending station; and the voice of the speaker produces variations in the primary current, on the usual plan of varying the resistance in the circuit of a local battery by variations of pressure. The secondary circuit is not completed inasmuch as the two plates do not touch; but the opposite electricities which are transmitted to them attract each other on electrostatic principles, and the plates are thus made to vibrate in unison with the voice of the speaker at the sending station. The instrument exhibited is very effective, and reproduces a whisper with greatly increased intensity. It is claimed that this invention does away with the disturbance experienced in other telephones from currents in the neighboring wires, inasmuch as such currents will not affect the attraction between the plates. We should add that the instrument exhibited speaks fairly even when the plate next the ear is disconnected from the wire intended for it, but of course less loudly than when the connection is made. This is just what one would expect from electrostatic attraction, the attraction of a charged for an uncharged body being less than that between two bodies oppositely charged.

EDISON'S ELECTRIC METER.

We have had an opportunity of seeing the system adopted by Mr. Edison for the measurement of the quantity of electricity consumed in each house which receives a supply from one of his mains. A definite proportion (one thousandth part) of the whole current which goes through the house is shunted through a cell containing two copper plates in a solution of sulphate of copper. The positive plate loses, and the negative plate gains, an amount of copper exactly proportional to the quantity of electricity which passes. There are two such cells in series, one serving as a check upon the other, and the whole arrangement is kept under lock and key, to be opened only by Mr. Edison's agents when they come round to inspect the meters. As the lamps supplied (of a given type) are almost precisely alike in their resistance, and the current, when flowing, is always nearly the same, this arrangement gives a practically accurate measure of the illuminating power supplied.

ITALIAN MAGNETO-MACHINES.

Much interest has been excited by the exhibition of three magneto-electric machines constructed by Prof. Pacinotti, of the University of Cagliari. One of these, constructed at Pisa in 1860, is the earliest example of the principle of the ring-shaped armature, since embodied in the machines of Gramme and Brush. It was originally constructed as an engine to be driven by a current from without; but it was also used as a generator of electricity, and both these uses of it were described in a paper in the *Nuovo Cimento* in 1864. The machine contains an iron ring like an anchor ring, round successive portions of which are wound coils of insulated copper wire in depressions cut in the ring to receive them. The intervening portions of the ring are thus (as in the Brush machine) enabled to come very nearly into contact with the surrounding fixed magnets. These consist of two half rings which are the pole pieces of two straight electro-magnets. The coils above mentioned are connected in a series, and their junctions are in connection with the several segments of a commutator, as in the Gramme machine.

The second machine was constructed in 1873, and described in the *Nuovo Cimento* in 1874. It is a generator of electricity, of the kind now known as the shunt dynamo—that is to say, the current generated is divided in parallel circuit between the fixed electro-magnet and the external resistance. This is done by means of two pairs of brushes making contact with different sections of the revolving commutator. The ring is replaced by a flat cylinder, across which the successive coils are wound in depressions made for the purpose, the directions of winding being the same as in the Siemens

continuous current machine, which was invented about the same time. The connections of the successive coils with one another and with the segments of the commutator are the same as in the first machine.

The third machine, which was constructed in 1878 on a model dating from 1875, is of a type of which, so far as we know, it is the only example. The idea of it is taken from the well-known experiment (Arago's rotations) in which a revolving horizontal copper disk causes a large magnetized needle balanced above it to revolve in the same direction. The explanation of the effect was first given by Faraday. It depends on the action of a current generated in the copper disk by its motion in the magnetic field due to the needle. The strongest current flows along that diameter which is parallel to the needle, and the current is completed through the circumferential portions of the disk. Pacinotti virtually cuts away all except the diametral portion and one of the two circumferential portions; in other words, he takes a wire and bends it into the shape of the letter D. This is one convolution of his revolving coil; the next is like the same D tilted a little; the next is tilted a little more, and so on; the straight part of the wire passing through or nearly through the axis of the coil, and the curved part being in the circumference. There is no room for a core in the ordinary sense, as the wires occupy nearly the whole interior space; but pieces of iron are so disposed partly within and partly without the coil as to serve the purpose of a core, by increasing the induction of the fixed magnets.—*Nature*.

Bonnefin's Sugar Process.

Mr. Bonnefin does away with the cane mill, of which one-third of the power is wasted by putting it into motion, and the other two-thirds are unprofitably used in crushing the cane so imperfectly that a proportion of juice, equal to half the quantity extracted, is left and lost in the megass. He substitutes in its stead his "pulpifactor," which consists of two series of vertical saws specially made for cutting sugar canes, and fixed to two frames, the whole working by a reciprocating motion with but small power to lift the tool, which afterwards precipitates itself with its own power, increased by its weight and velocity. Each series of saws reduces at one stroke a bundle of ten canes into slices. These slices, falling into a disintegrator running at high speed, are reduced into a fine pulp, which is pressed by means of two small rollers. The whole of the juice is thus forced out of the cells, and the woody matter is removed in a dry state. The juice thus extracted is mixed with lime as each gallon is produced, and in a proper proportion as it runs to a continuous preparator, when it is heated in a few minutes up to 95° C., or 203° Fah., but never beyond this temperature. During this short time it is cleared of all the suspended matters. This is effected by passing the juice over a table constructed with a series of corrugations forming a long continuous passage, the heat being applied beneath the table. The suspended matters settle by gravitation and are deposited in pockets placed at intervals along the route the juice has to travel.

The juice is now in a favorable state of lightness, fluidity, and temperature for effective filtration in Mr. Bonnefin's capillary elastic filter. This filter consists of a series of metallic rings covered with India-rubber, the internal diameter being twelve inches. The rings are placed horizontally in a press, and over each alternate ring is hung a filter cloth made of pure unspun cotton of the finest fiber. The rings and cloths are closely pressed and held together by means of screws, their number being governed by the rate of filtration required. The sirup is pumped into the press and passes through the whole series of rings and cloths, the solid impurities being intercepted and retained by that portion of the filter cloth which covers the opening in the ring, while the sirup passes by capillary attraction through the surrounding portions of the cloth, and is delivered in a perfectly pure and clear condition at the outlet. The purified juice on leaving the filter is ready for treatment either in the ordinary way, by the vacuum process, or by Mr. Bonnefin's evaporator and concentrator, in which the process of crystallization is much more rapidly performed. In the evaporator the juice is quickly deprived of its contained water, while the concentrator brings it into the condition of sound sugar in a very short space of time. It is claimed by Mr. Bonnefin that by his process all the operations, from the moment the cane is placed in the pulpifactor to the time of the crystallization of the sugar, do not occupy more than one hour. This shows a marked advance upon the ordinary process, which occupies from six to twelve hours. The following are the chief advantages in favor of Mr. Bonnefin's process: With his pulpifactor and accessories he claims to extract from the cane all the saccharine juice. With his continuous preparator, he prevents acidity or fermentation, clears the juice of all the suspended matters, and prepares it for the operation of purification or refining. With his capillary filter he completely purifies the juice, and utilizes all sediments and any washings of the factory. His aim is to make direct from the cane only one quality of sugar, that is, pure white refined sugar, to obtain the uncrystallizable sugar clear and bright, notwithstanding the coloring matters and the foreign salts, and to do this with a palpable economy of time, labor, fuel, machinery, and buildings.

A REMEDY FOR HICCOUGH.—Dr. M. S. Leslie, of Lexington, Ky., says that the best remedy in ordinary hiccoughs is about twenty-five grains of common table salt, placed in the mouth and swallowed with a sip of water.

AGRICULTURAL INVENTIONS.

Mr. Isaac S. Bates, of Minonk, Ill., has patented an improved fender attachment to cultivators. In this improvement, the beam of the cultivator has combined with it a laterally adjustable clamping plate having upper and lower eyes, and united by screws with a clamping plate on the under side of the beam. Through these upper and lower eyes, a rod capable of being raised or lowered is passed and pivoted at its lower end to the upper middle portion of the fender, which is connected at its end by a hooked rod with the axle or frame of the cultivator. This construction not only admits of a lateral adjustment of the fender in both directions, but also of its vertical adjustment, to suit the height of the corn or other plants in the row, and it has a free connection with the rod which provides for its vertical adjustment. Although here only one beam is referred to, the invention is of course applicable to the series of beams in a wheel cultivator.

Mr. Oren Stoddard, of Busti, N. Y., has patented a combined hand seed planter and fertilizer distributor, which has a very perfect action and separates the fertilizer from the seed in the ground. In this device, a central box in which phosphate or other fine fertilizer is placed has combined with it outer side boxes for reception of the corn or other seed. Followers terminating in or connected with a handle above, serve, by a suitable construction of the interior of the boxes, to discharge, as they are thrust downward, the fertilizer and seed in measured quantities into the ground, the same passing out through or between elastic plates which form the necessary openings in the soil, while the bottom of the boxes act as a stop to insure the seed being planted at a uniform depth. By this construction the seed for each hill will be divided, and the fertilizer will be deposited in the space between the parts of the hill without being in contact with the seed, so that the seed will not be injured or killed by the fertilizer. Connected with the fertilizer follower are levers, having attached covering plates which, as said follower is drawn upward, force the soil into the openings in which the seed and fertilizer have been deposited, and cover the seed.

Mr. Ludwig Silland, of Edwardsville, Ill., has patented an improved harrow. In this improvement the harrow proper is made up of several interchangeable duplicate sections. The invention consists in the peculiar construction and arrangement of the draught devices and connecting links, whereby the draught can be applied to two or more sections of the harrow as desired. To this end the draught beam is transversely divided into two sections united by detachable plates. One of these sections is permanent and the other removable. On the permanent section, at about the middle of the length of the entire beam, is an eyebolt, and near either end of the beam are corresponding eyebolts. A link connects the eyebolt at the end of the removable section with a central draught ring that is attached by a hook to the central eyebolt fast on the permanent section. Said ring is also connected by another hook with a second ring which is attached by links to the middle and end eyebolts on the permanent section of the beam. By this construction, when it is desired to use three harrow sections, the pull is made on the central ring, but when the removable section of the beam and one harrow section are detached, then the hooks are disengaged and the draught is made on the other ring. The invention has much merit.

An improvement in cultivators, patented by Mr. Johann C. F. Hammer, of Cullman, Ala., has no small amount of merit. The object of this invention is to furnish cultivators so constructed that the plows can be adjusted to keep them parallel with the line of draught. To this end the standards of the plows which are connected with the side beams are journaled at their upper ends to turn in said beams and secured by clamp nuts at their tops, and the braces of the plows are bent to one side at their upper ends and there notched, and pass through eyebolts which project up through the side beams, and are held by clamp nuts on the tops of said beams. With this construction, by loosening the clamp nuts of the standards and braces of the plows, the latter can be adjusted parallel with the line of draught whatever be the inclination of the side beams, so that the plows will always work squarely in the ground.

Memory in Chess Playing.

Wonderful as are the feats of chess-players, who can work out a game or a series of games without seeing the board, there is nothing really remarkable in them. When once mastered, the trick is not only fairly easy of performance, but the fact that the process is purely mental rather facilitates than impedes the action of the mind. To the "blind-folded" chessplayer there is present a mental picture of the board with the pieces in position. He can change the position of the men as easily as he can think, and after he has once mastered the difficulty of fixing the mental picture, it is distinctly before him. Some players, who do not in their common process of memory use picture phantoms, work out the moves as algebraical propositions are occasionally worked, by phantoms of sound; but, as a rule, chess-players are mental-picture-readers, and can at pleasure call up any one of several pictures of boards as they last conceived them. The most difficult feat, and one which very few mental chess-players can accomplish, is to play two or three games simultaneously, the moves made by their opponents being told them in close sequence and their own moves being directed after all the reports of the proceedings of their opponents have been received. Thus, if there be several players

against the one mental player, he must be told and remember what each of his adversaries has done before he begins to give the instructions for his several counter-moves. In this exploit the most perfect development of the mental faculty of distinct picturing and the displacement and recall of mental pictures at will is exhibited. The prodigious difficulty of the feat can only be realized in the attempt to perform it. Even the expert blindfolded chess-player can rarely succeed in accomplishing the performance we have attempted to describe.—*Lancet*.

Alaskan Mines.

We had a conversation the other day with Col. A. F. Williams, of Oakland, who has recently returned from a prospecting voyage in Northern Alaska. From him we learn some interesting facts concerning the mining resources of the region. Col. Williams left here with a party, on a schooner, in May last. They went up through the Aleutian islands and through the Behring Sea into Norton Sound; but most of the time was spent in Golovin Bay, on the north coast of Norton Sound. Here are high rocky mountains, steep and abrupt, though there are large prairies next to the coast.

Col. Williams went with a whale boat 100 miles up the Fish River and sent a party overland. A land party also traversed the region, and quite an extent of country was located.

The principal location made was a galena lead or deposit. We have seen assay certificates by Prof. Price, giving the value at 83 per cent and 85 per cent lead, and \$121 and \$161 silver. This is almost pure galena, that containing 86 per cent lead.

Col. Williams says the Esquimaux utilize this by putting a piece in the bullet mould and running lead around it, to make bullets.

The country all about the region visited by Col. Williams and party is a very difficult one to prospect in, but this is not on account of the heavy timber, as most people suppose. This heavy timber is more prevalent in the southern part of the Territory. But there is a heavy coat of moss covering the whole face of the country, making it very hard to get about. In fact, it is a most villainous country to get about in. The moss is from one to two feet thick, and the ground is more or less boggy, so that if one steps off the moss bed, he is apt to get into the bog. Ten or twelve miles is a good day's travel, so it is very hard to prospect.

There are belts of timber here and there, but the mountains are generally barren and free from brush and trees. Yet there is timber here and there, and plenty for fuel or mining purposes.

The country rock is mainly a micaceous slate; but no gold was found. The mountains seem to be of a white spar, which some suppose to be lime. There are great dikes of granite extending for miles and miles. No sulphurets of iron were found anywhere. There is plenty of mica in great scales and sheets.

The schooner was taken into Golovin Bay and there anchored. The prospecting expedition went out from this point. They were in 64° 30' N. and 163° W. Overland, they were not more than 50 miles from Kotzebue Sound, in the Arctic.

Col. Williams judges this to be a good mineral region. The Esquimaux talked a good deal of the lead mines they knew of elsewhere. He has no doubt there is a good deal of mineral thereabouts.

The expedition left here on the 5th of May last, and met the ice on June 1. They coasted around Norton Sound some 200 miles. There are a couple of thousand Esquimaux camping around the shores of the sound. The party found them very generally willing to do anything asked of them. These natives packed the ore down to the vessel from the mine, some 15 tons being taken out for shipment.

When they return in the spring, horses will be taken up and sleds will be used for hauling ore. There is plenty of feed and hay along the coast.

They have an average of good weather in the summer, about as they have it in New York. August is wet but not cold. The first frost came on September 15. In June the sun was out of sight about two and a half hours; it was broad daylight and no stars to be seen for two months. There are five good working months for surface work, and when once underground deep enough, the men can work all winter. There is timber within half a mile of the mine, so there is no difficulty in building houses to make the men comfortable. Col. Williams says the ore can be put down here in San Francisco at a cost not to exceed \$50 per ton. It is unnecessary to reduce it at the mine, as there is over 1,600 lb. of lead to the ton of ore.

Col. Williams had met some men who had come from 1,500 miles up the Yukon River. Up there they had been making from \$10 to \$15 per day to the hand in placer mines. They can only work about four months in the year. A little stern-wheel trading steamer now runs up the Yukon, to about 1,800 miles from the mouth. She only makes two trips a year. Her timber was got out here, and she was put together at St. Michaels.

There are only four white women in the Territory north of Kodiak. One lady is at St. Michaels, and she told Col. Williams that it was no colder there than at her native place, Portland, Maine. There is also a Chicago lady four miles from St. Michaels. There is one at Ounalaska, the port of entry, 2,100 miles from here, and one on the Island of St. Paul.

Col. Williams says there is an abundance of plumbago all through that country. His party is the first that ever visited that region. At the mine they sunk twenty feet, but did not get through the frost—the frozen ground. The heavy coat of moss seems to protect the ice, as ice is protected in sawdust and blankets. The tops of the mountains are free from the moss. The mosquitoes are innumerable and very annoying, fiercely contesting their rights to the country. They seem to breed in the ice.

When the party started away, they stopped with their vessel to get water, and while at anchor a severe gale drove the vessel ashore and wrecked her, she being a total loss. The Esquimaux took the party to St. Michaels in skin canoes, where some of them joined the revenue cutter Corwin, and were brought to this port.—*Min. and Sci. Press*.

Lime as a Preservative.

Lime, it is well known, preserves ironwork; and Wren, in his "Parentalia," mentions the freshness of iron cramps which had been bedded in mortar for 400 years. It is usual to lime white iron mains, tanks, and other articles to prevent rust; and bricklayers are in the habit of smearing their trowels with mortar. In the demolition of old buildings the ends of joists, ceiling-laths, quarters, plates, and bond timber which have been bedded in lime-mortar, are usually found in a sound condition, in spite of their having been bedded all round. Higgins, in his well-known treatise on "Calcareous Cements," now rather an antiquated work, speaks of the value of lime-water or water freed from "acidulous gas." Something of this protection is rendered to wood and iron which are covered with lime. It is well known that an alkaline solution prevents corrosion of iron; and Mallet, in his work on "The Action of Air and Water upon Iron," proposed lime-water to replace bilge-water, and thus prevent the internal corrosion in iron ships. Lime has a powerful affinity for oxygen, and to this cause may be attributed its preservative effects upon iron and other materials.

It would be interesting to record the many evidences of the value of lime in arresting decay. As long ago as 1769 a Mr. Jackson, a chemist, obtained permission to prepare timber for the shipyards, by immersing it in a solution of salt water, lime, muriate of soda, etc.; another practical experimentalist suggested slaked lime, thinned with a solution of glue, for mopping the timbers of a ship. The preservation of timber has been attempted by surrounding it with pounded lime, and several attempts have been made to preserve timber by the use of lime. Mr. Britton, in his work on "Dry Rot," mentions a number of cases where lime has been of service. He says "quicklime with damp has been found to accelerate putrefaction in consequence of its extracting carbon; but when dry and in such large quantities as to absorb all moisture from the wood, the wood is preserved and the sap hardened." "Vessels long in the lime trade have afforded proof of this fact, also examples in plastering laths which are generally found sound where they have been dry." The joists and sleepers of basement floors are rendered less subject to decay by a coating of limewash; and this might be renewed at intervals. The same writer adds, "it does not appear practicable to use limewater to any extent for preserving timber, because water holds in solution only about 1-500 part of lime, which quantity would be too inconsiderable; it, however, renders timber more durable, but at the same time very hard and difficult to be worked."

These facts are instructive; they show, at least, that lime in a sufficient quantity kept dry is a valuable preservative agent, and some practical chemist might earn a deserved repute if he could prepare a lime solution that would be capable of rendering so substantial a service to all builders. Such a solution would be at least sufficiently remunerative to make it worth while to try a few experiments in this direction.

It is stated on good authority that the white ant in India costs the government £100,000 a year for repairing wood-work, bridges, etc., caused by its depredations. Concrete basements have been found to resist the encroachments of the ant. Dr. Darwin proposed a process of timber preservation some years ago, in which an absorption of limewater was effected, and after that had dried, a weak solution of sulphuric acid, so as to form sulphate of lime in the pores of the wood. The growth of dry-rot or fungus on timber has been prevented by limewater, and many instances have been mentioned of its value.

The cleansing and sanitary virtues of lime are more generally known. The painter uses limewater to kill the grease upon his work instead of turpentine; and soot stains on the outside of flues have been removed by the agency of thick warm limewash. The value of limewash as a wash for walls, as a purifier of the air in sheds, stables, and other buildings is unquestionable, though all limewashed roof timbers have rather a rough and penurious look. As a preservative coating to the joists of floors and other timbers not exposed to damp, it seems worthy of a more extended trial.—*Building News*.

HOLLOW STEEL SHAFTING IN FRANCE.—Hollow steel shafting is being introduced into France. It is made by casting the metal around a core of lime, the ingot being finally rolled into shafting, the lime core going with it and diminishing in diameter in the same proportion as the metal, even when the total diameter is reduced as low as one fourth of an inch.

Business and Personal.

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

To Users of Steam.—No one using steam can afford the loss of fuel and power consequent upon the use of inferior non-conducting steam pipe and boiler coverings. Asbestos has proven the most effective and economical material for the purpose, and is employed in the form of a cement and a fireproof felt for a lining or insulator under hair, felts, etc.

The genuine Asbestos Cement Felt consists of fine long Asbestos fibers and a cementing compound which forms a light, porous, fireproof covering, partaking of the nature of a felt and a cement. It is prepared ready for use, can be easily applied by unskilled workmen, and forms the most effective, durable, and economical non-conducting covering in use for steam pipes, boilers, and other heated surfaces.

The genuine Asbestos Air Chamber Covering consists of an insulating lining or a sheathing made of pure Asbestos, combined with a thick felt or wadding of pure Asbestos, to be applied directly to heated surfaces and covered with one or more layers of hair felt and an outer layer of Asbestos sheathing, thus securing the advantages of hair felt without the liability of its being ignited or charred by fire. The great advantage of the genuine Asbestos coverings for steam pipes, boilers, etc., over any other forms of non-conducting coverings, aside from their economy, superior effectiveness, and fireproof qualities, is that they are manufactured in convenient form ready for use, and can be easily applied without the aid of skilled labor. The H. W. Johns Mfg. Co., 87 Maiden Lane, N. Y., are the sole manufacturers.

Partner Wanted.—With small or large capital. Inclose stamp to Box 36, Kent City, Mich.

For Sale.—1 Engine Lathe, Fitchburg, 7½ ft. x 15 in.; price, \$33. 1 Iron Planer, planes 7½ ft. x 34 in. x 30 in.; price, \$50. Address Concord Axle Co., Fisherville, N. H.

A. C. E., four years on the Midland Railway, England, and ten years constructing and working railways in British India, desires employment. Good draughtsman and surveyor. Address Assoc. M. I. C. E., Mount Athos, Campbell Co., Va.

Wanted.—S. tuition by a Gold, Silver, and Nickel Plater; 22 years' experience. Address Plater, Oakville, Ct.

Blake's Belt Studs. The strongest fastening for old and new belts. Greene, Tweed & Co., 118 Chambers St., N. Y.

Workshop Receipts.—A reliable Handbook for Manufacturers and Mechanics. \$2, mail free. Ornamental Penman and Signwriter's Pocketbook of Alphabets. 20 cents. E. & F. N. Spon, 446 Broome St., New York.

For Sale.—Patent on Ice Machines. W. J. Lyons, Decherd, Tenn.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N. J.

Mailed free. Catalogue of Books for Engineers. Theoretical and Practical. E. & F. N. Spon, 446 Broome St., New York.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Telegraphic, Electrical, and Telephone Supplies, Telegraph Instruments, Electric Bells, Batteries, Magnets, Wires, Carbons, Zincs, and Electrical Materials of every description. Illustrated catalogue and price list, 72 pages, free to any address. J. H. Bunnell & Co., 112 Liberty St., N. Y.

Walrus Leather, Walrus Wheels, Emery, and Glue for Polishers. Greene, Tweed & Co., 118 Chambers St., N. Y.

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

For Sale.—A complete set of Patterns, Flasks, and Core Arbors, for making Cast Iron Flanged Pipe, Elbows, Tees, and Greenhouse Fittings. Will be sold low to clean out a branch of a business. Address C., Box 1356, New York.

Abbe Bolt Forging Machines and Palmer Power Hammer a specialty. S. C. Forsyth & Co., Manchester, N. H.

Foot Lathes, Fret Saws, 90 pp. E. Brown, Lowell, Mass.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Punching Presses & Shears for Metal-workers, Power Drill Presses, 25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N. Y.

Pure Oak Leather Belting. C. W. Army & Son, Manufacturers, Philadelphia. Correspondence solicited.

The Best constructed low priced Engines are built by E. E. Roberts, 107 Liberty St., New York. Communicate.

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

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro. 234 Broadway, New York.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

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

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsburg, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr. & Bros., 331 Jefferson St., Philadelphia, Pa.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Improved Skinner Portable Engines. Erie, Pa.

Peck's Patent Drop Press. See adv., page 333.

Learn Telegraphy. Outfit complete, \$4.50. Catalogue free. J. H. Bunnell & Co., 112 Liberty St., N. Y.

List 27.—Description of 3,000 new and second-hand Machines now ready for distribution. Send stamp for same. S. C. Forsyth & Co., Manchester, N. H., and N. Y. city.

Saw Mill Machinery. Stearns Mfg. Co. See p. 323.

Cope & Maxwell Mfg. Co.'s Pump adv., page 334.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 332.

Supplee Steam Engine. See adv. p. 370.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 330.

Safety Boilers. See Harrison Boiler Works adv., p. 349.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co., Box 423, Pottsville, Pa. See p. 349.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 349.

Common Sense Dry Kiln. Adapted to drying all of material where kilns, etc., drying houses are used. See p. 350.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'Frs, 23d St., above Race, Phila., Pa.

Silica Paints (not mixed); all shades. 40 Bleeker St., N. Y.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Ball's Variable Cut-off Engine. See adv., page 354.

Paragon School Desk Extension Slides. See adv. p. 356.

Brass & Copper in sheets, wire & blanks. See adv. p. 354.

The None-such Turbine. See adv., p. 350.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

Berryman Feed Water Heater. See illus. adv., p. 356.

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

Ajax Metals for Locomotive Boxes, Journal Bearings, etc. Sold in ingots or castings. See adv., p. 355.

Eagle Anvils, 10 cents per pound. Fully warranted.

Geisler's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Geisler Mfg. Co., Waynesboro, Pa.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 355.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares, notions, and novelties in the above line, a specialty. See advertisement on page 355.

Magic Lanterns and Stereopticons of all kinds and prices. Views illustrating every subject for public exhibitions, Sunday schools, colleges, and home entertainment. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., New York.

Draughtsman's Sensitive Paper, T. H. McCollin, Phila., Pa.

New Economizer Portable Engine. See illus. adv. p. 356.

Combined Concentric and Eccentric Universal and Independent Jaw Chucks. The Pratt & Whitney Co., Hartford, Conn.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

The Sweetland Chuck. See illus. adv., p. 356.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Solomon's Parallel Vise, Taylor, Stiles & Co., Riegelsville, N. J.

Skinner's Chuck. Universal, and Eccentric. See p. 355.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

For Machinists' Tools, see Whitcomb's adv., p. 356.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from \$1 to \$5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) I. P. F. writes: I have a four-foot drum beneath the floor. Can I belt to a twelve-inch pulley overhead at right angles to it, both horizontal, and have it work satisfactory? A. Yes.

(2) L. J. K. asks how lacquer is made, applied to brass, etc., so as to produce the smooth and permanent polish seen upon fine electrical and optical instruments. I have often tried various recipes, but have always failed in producing good results. A. For receipts for lacquers, see page 299, vol. xiv. Heat the articles to be lacquered, and lay on a thin even coat of the lacquer quickly. If it is small, so that the lacquer chills it, it is better to lay on a very thin lacquer, expose the piece in a Japanese's oven at a moderate temperature until the varnish has dried and fused, and then apply another coat and heat again to produce the requisite gloss and finish.

(3) A. E. B. writes: In tracing out the connections in the switch used with the magneto machine, illustrated on your front page last week, I find that the plate 14 is connected with plate 4. Is this correct? Should not 14 be connected with 13? A. 14 should be connected with 13. The mistake is one easily made by the artist. It was noticed and corrected before the printing of the edition was far advanced.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

November 8, 1881.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York City. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Adjustable seat, G. G. Richmond	249,401
Alarm. See Burglar alarm. Fire alarm.	
Asbestos roof paint or composition, F. M. Hibbard	249,399
Axle and hub attaching device, F. Rice	249,358
Axle bearing for vehicle wheels, A. E. Wallace	249,378
Axle lubricator, Marks & Iverson	249,194
Axles, washer for carriage, B. F. Allen	249,151
Ball ears to covered vessels, attaching, G. W. Knapp	249,371
Banjo, H. C. Dobson	249,321
Bedstead, wardrobe, D. H. Wheeler	249,431
Berth for passenger steamers, G. Leve	249,376
Berth, self-leveling, J. H. Laskey	249,247
Berth, self-leveling, D. Parks	249,254
Blacking box, A. French	249,167
Block. See Pulley block. Switch block.	
Blood, instrument for transfusion of, E. E. Allen	249,385
Book support, G. D. B. Adams	249,216
Boot and shoe last, E. N. Higley	249,354
Boot and shoe pattern, W. B. White	249,389
Boot blacking apparatus, C. Goldthwait	249,336
Box. See Blacking box. Packing box.	
Box nailing machine, Knass & Grammes	249,345
Bracelet, M. Lehrfeld	249,375
Braid or ribbon holder, J. A. Bowman	249,153
Brake. See Car brake.	
Brewing purposes, mixture or grist for, F. J. Geis	249,332
Buckle hook, J. C. Hyde	249,360
Burglar alarm, H. H. Ward	249,430
Burner. See Incandescent burner.	
Button or stud, W. Heeren	249,319
Button, separable, I. L. Garside	249,168
Cable way, H. Casebolt	249,300
Can. See Milk can.	
Can case, J. M. Bean	249,290
Car brake, W. L. Chambers	249,372
Car brake, P. M. Dalton	249,236
Car brake, J. K. Tremain	249,372
Car coupling, W. L. Fisher	249,327
Car coupling, L. King	249,329
Car coupling link, H. F. W. Liebmann	249,377
Car coupling pins, process of and machine for making, C. H. Williams	249,281
Car, railway, S. D. King	249,370
Car ventilator, railway, J. Shepherd	249,294
Cars, ventilating, J. D. Birmingham	249,220
Carburetor, metrical, W. M. Jackson	249,363
Carburetor, rotary, H. C. De Witt	249,163
Carpet stretcher, Hart & Ware	249,176
Carriage, child's, C. Pfeiffer	249,335
Carriage curtain fastening, E. P. Blinn	249,296
Carriage seat, W. A. Eddy	249,332
Carriage spring, B. F. Lewis	249,189
Carriage wheel, G. R. Clarke	249,223
Carrier. See Sash carrier.	
Cartridge, W. T. Chamberlain	249,301
Case. See Can case. Map and chart case.	
Cash carrier and fare collector, J. F. King	249,369
Chain link, ornamental, A. H. Alsfeld	249,132
Chair. See Child's chair.	
Child's chair and carriage, J. W. Kenna	249,363
Chimney, L. E. Clawson	249,308
Churn, W. J. Dixon	249,330
Churn, Hutchison & Wiley	249,259
Cigarette mouth piece, I. S. Elkins	249,163
Clamp. See Wedge clamp.	
Clasp. See Garment clasp.	
Cleaner. See Coffee cleaner.	
Closet. See Water closet.	
Coffee cleaner and grader, E. Rakestraw	249,308
Collar support, shirt, J. T. Lynch	249,373
Cooking apparatus, J. B. Crocker	249,100
Cooler. See Milk cooler.	
Corn cutter, green, A. P. Woods	249,441
Cornet, E. Dupont	249,313
Corset, J. Bowers	249,294
Corset, T. S. Gilbert	249,335
Cotton gin condensers, bearing for, S. M. Davis	249,313
Coupling. See Car coupling. Shaft coupling.	
Thill coupling. Whiffletree coupling.	
Cup. See Lubricating cup.	
Current wheel, H. G. Cady	249,299
Cutlery handle, pocket, J. M. Haigis	249,344
Cutter. See Corn cutter.	
Cuttle fish bone holder, H. Ireland	249,361
Damper, stovepipe, C. B. Clark	249,303
Desk, cylinder, C. Blake	249,292
Door spring, P. K. O'Lally	249,293
Dough machine, soft, H. S. Dosh	249,227
Earring fastener, Hegde & Wagener	249,338
Earring shield, R. Oliver	249,301
Electric machine, dynamo, C. A. Hussey	249,241
Electric signal apparatus, C. E. Buell	249,306
Elevator. See Mineral and water elevator.	
Engine. See Rag engine. Rotary engine. Rotary steam engine.	
Exhaust mechanism, variable relief, J. C. Titus	249,421
Fabrics, manufacture of ornamented, W. Hadden	249,342
Fan and clothes rack, combined, W. S. Squires	249,414
Faucet for shipping cans, J. Marshall	249,195
Feather renovator, F. W. Proffen	249,395
Fence, barbed, S. H. St. John	249,413
Fence wire, barbed, C. F. Washburn	249,312
File, bill, J. E. Gorman	249,328
Filter, A. M. Granger	249,339
Fire alarm, J. C. Mealon	249,197
Firearms, slide trigger for, Hill & Dixon	249,340
Fire extinguisher, C. L. Garfield	249,336
Fire extinguisher, automatic, F. Grinnell	249,171
Fire extinguisher, chemical, J. R. Wilson	249,282
Fire iron holder, C. M. Burgess	249,156
Fire ladder, S. M. Stewart	249,416
Flanges of angle bars, machinery for changing the angle of, W. E. Highfield	249,352
Flower stand, C. F. Hall	249,173
Fulling mill, W. C. Wood	249,440
Garment clasp, U. R. Stanton	249,415
Garments, pressing and drying, L. Wolf	249,439
Gas meter register, J. Foxall	249,329
Gaseous fuel, apparatus for generating, A. Ponsard (r)	249,424

Gearing, chain, J. Maslin	249,249
Glove fastening, F. A. C. J. Omlor	249,290
Gold and silver, wet process for the extraction of, W. L. Thompson	249,419
Governor, pressure, L. Grannan	249,160
Grain binder, S. S. Jackman	249,181
Grain binder, S. D. Locke	249,348
Grain binder, G. B. Shafer	249,163
Grate, W. C. Jennings	249,163
Guard. See Key hole guard.	
Gun, machine, J. Phelan	249,304
Gun, magazine, C. W. Scharf	249,406
Gun, magazine spring, J. H. Randell	249,359
Hammock, self-leveling, J. Robertson	249,403
Handle. See Cutlery handle.	
Harness, J. Straus	249,387
Harness cleaning and polishing composition, H. N. Wheeler	249,422
Harrow, A. J. Puryear	249,396
Harvesting machine, R. Eickemeyer	249,376
Hay rack, J. L. Owens	249,392
Hay, straw, etc., apparatus for stacking, L. & T. Roseman, Jr.	249,413
Hinge, lock, C. B. Clark	249,304
Hinge, reversible spring, G. M. Jewett	249,364
Hog scraping machine, adjustable traveling, M. Crawford	249,159
Holder. See Braid or ribbon holder. Cuttle fish bone holder. Fire iron holder. Pen holder.	
Hollow articles in which lightness, rigidity, and impermeability are required, manufacture of, F. Walton	249,427
Hook. See Buckle hook. Snap hook.	
Hub, J. A. Hudgens	249,258
Hub attaching device, J. R. Anderson	249,217
Ice cream freezer, H. Morris	249,294
Ice making machine, G. Wacker	249,211
Incandescent burner, W. M. Jackson	249,292
Insulating electrical conductors, A. T. Woodward	249,384
Iron. See Waffle iron.	
Jack. See Lifting jack.	
Joint. See Rail joint.	
Key hole guard, Grill & Retz	249,240
Knife. See Veneer cutting knife.	
Knitting stockings, C. Winterbottom	249,383
Lamp, electric, H. J. Muller	249,387
Lamp, electrical, H. B. Sheridan	249,408
Lamp, mill, P. Wall	249,177
Lamps, flame regulator for burners of heating, H. J. Haight	249,243
Last, E. N. Higley	249,354
Lift or hoist or other elevator, D. Edwards	249,125
Lifting jack, H. R. Ferris	249,225
Lifting jack, A. T. Wilson	249,436
Lock. See Nut lock. Wagon seat lock.	
Loom picker staff, A. M. Wade	249,376
Lubricating cup, R. J. Hoffman	249,179
Lubricator. See Axle lubricator.	
Map and chart case, H. E. Moon	249,198
Mat, J. B. & C. Z. De Young	249,317
Measure, bucket, etc., W. J. Smith	249,308
Meat by refrigeration, preservation of, J. A. Whitney	249,434
Meat chopping machine, J. Sander	249,405
Metal working machine, compound, D. C. Burdick	249,297
Metal rolls, machine for grooving, C. Moore	249,392
Metals, embossing and shaping, W. H. Malory	

Rivet or riveting machine, C. M. Platt.....	249,355
Rope fastener, J. Gibbons.....	249,354
Rotary engine, W. H. Roneh.....	249,403
Rotary engine, combined gas, air, and steam, W. H. Wignmore.....	249,214
Rotary steam engine, C. B. & H. H. Halstead.....	249,345
Saddle girth, side, W. McNaught, Jr.....	249,380
Sash fastener, T. R. Miller.....	249,350
Sash fastener, C. E. Steiler.....	249,359
Saw kerfs, expandable wedge for opening, C. C. Dedernick.....	249,315
Seals, shackle wire and cord for, Howlett & Brooks.....	249,357
Seat. See Adjustable seat. Carriage seat.	
Separator. See Ore separator.	
Sewer trap, A. R. & R. Robb.....	249,360
Sewers, invert block for, G. W. Hader.....	249,307
Sewing machine, button hole, F. Simmons.....	249,411
Sewing machine feed mechanism, J. H. Ballard.....	249,155
Sewing machine shuttle, G. W. Loomis (P).....	9,923
Sewing machine trimming attachment, W. Diebel.....	249,318
Shaft coupling, Dyson & Paramore.....	249,324
Ships, construction of, C. A. H. C. de Winter.....	249,442
Shirt, F. Kivi.....	249,186
Shoe, G. B. Singenthaler.....	249,410
Shoe button and fastener, Burr & Mercer.....	249,298
Shoe fastening, C. F. Spencer.....	249,306
Snap hook, J. Gibbons.....	249,333
Soap boiling apparatus, A. H. Pritchard.....	249,256
Soldering copper, S. Woodhead.....	249,215
Soldering implement, J. Doyle.....	249,229
Soldering sheet metal cans, apparatus for, R. Kent.....	249,243, 249,244
Sole forms for beating-out machines, making, F. Winslow.....	249,438
Sole pricking and trimming machine, C. W. Giddenden.....	249,307
Sole pricking, trimming, and channeling machine, E. F. White.....	249,279
Spinning and doubling machine, Bastow & Woodhead.....	249,289
Spinning frames, mechanism for operating the guide bars of, G. W. Card.....	249,157
Spinning mule, M. Mullany.....	249,199
Spring. See Carriage spring. Door spring.	
Springs, device for equalizing the tension of, D. Shive.....	249,409
Stand. See Flower stand. Switch stand.	
Steel compound for welding, Patten & Emery.....	249,393
Steel, hardening and treating, W. B. Cargill.....	249,222
Stocking, hose, and sleeve supporter, E. H. Russell.....	249,261
Stone and crushing ore, machine for breaking, R. D. Gates.....	249,391
Store, L. F. Betts.....	249,319
Store grate, H. M. Ryder.....	249,305
Store, lamp, B. F. Lancaster.....	249,372
Stores, extension top for oil and gas, M. C. Armour.....	249,287
Street curb, W. Reddall.....	249,400
Supporter. See Stocking, hose, and sleeve supporter.	
Switch. See Railway switch.	
Switch block, reversible, C. R. Smith.....	249,265
Switch stand, D. Tracy.....	249,422
Table leaf support, P. S. Crawford.....	249,312
Telephone, electric, W. Main.....	249,190
Telephone exchange system and apparatus therefor, J. I. Sabin.....	249,262
Telephone, speaking, R. Eickemeyer.....	249,233
Telephone system and apparatus, E. A. Eckert.....	249,164
Thill coupling, H. S. Mertz.....	249,281
Tie. See Railway cross tie. Railway tie.	
Tire tightener, J. D. Jones.....	249,242
Tobacco, tag for, F. E. Henig.....	249,351
Tool, combination, H. M. Dixon.....	249,319
Torpedo, rocket, W. H. Mallory.....	249,192
Toy trumpet, N. D. Hauser.....	249,247
Trap. See Sewer trap.	
Truck, R. S. Harrison.....	249,346
Tux for bridges and halters, throat, H. F. Smith.....	249,412
Valve, safety, J. Arthur.....	249,218
Vapor burner, G. W. Clough (r).....	9,922
Varnishing machine, Cutting & De Laney.....	249,225
Vehicle, spring, G. Decker.....	249,316
Velocipede, B. Smith.....	249,207
Velocipede, railway, J. Murphy.....	249,151
Vener cutting knife, Mark & Martineck.....	249,379
Ventilator. See Car ventilator.	
Vinegar making apparatus, J. Cushing.....	249,161
Waffle iron, C. B. Clark.....	249,305
Wagon bodies, combined corner iron and gate lock for, Comstock & Vanorman.....	249,310
Wagon seat lock, Comstock & Vanorman.....	249,309
Washing machine, N. Williams.....	249,435
Watch plate, C. C. Hinkley.....	249,366
Watch regulator, C. R. Kinehan.....	249,367
Water and gas pipes, stop box for, P. White.....	249,213
Water closet, M. J. O'Brien.....	249,291
Water meter, rotary, J. F. Davenport.....	249,162
Water motor, F. W. Tuerk, Jr.....	249,274
Wedge clamp, H. B. Richle.....	249,259
Weighing and packing machine, G. D. Van Hoesen.....	249,210
Well, boring oil, R. Egan.....	249,231
Wells with concrete, cement, etc., cylindrical tube for use in waling up, M. Nelson.....	249,289
Wheel. See Carriage wheel. Current wheel. Metallic wheel.	
Whiffletree coupling, J. O'Brien.....	249,252
Windmill, E. Wilson.....	249,427
Wire, barbed, A. Gunderson.....	249,173
Wire, machine for feeding, H. Thompson.....	249,209
Wire rope attachment, W. P. Healer.....	249,177
Wrench. See Pipe wrench.	

DESIGNS.

Finger ring, T. Pester.....	12,567
Store, cooking, I. A. Sheppard.....	12,568
Wall pocket, S. Ball.....	12,566

TRADE MARKS.

Beer, Lager, J. Seeger.....	8,826
Cigars, H. C. Palmer.....	8,823
Cigars, cigarettes, and smoking and chewing tobacco, B. Baron & Co.....	8,819
Cologne water, E. W. Hoyt & Co.....	8,821
Cotton piece goods, Stark Mills.....	8,822
Cotton piece goods, Amory Manufacturing Company.....	8,825
Pianofortes, D. H. Dunham.....	8,820
Spirometers, M. Souville.....	8,824

English Patents Issued to Americans.

From November 4 to November 8, 1881, inclusive.

Bed, revolving, D. C. Otis et al., New York city.	
Drill, rock, L. B. Stone, Marblehead, Mass.	
Electric lamp, L. Daff, Brooklyn, N. Y.	
Sewing apparatus for heavy work, E. H. Smith, N. Y. city.	
Ship's berth, J. H. Porter, Boston, Mass.	
Shims paper, P. E. Minor, Schenectady, N. Y.	
Telegraph cable, C. L. Gore, New York city.	

BEAUTIFUL HOLIDAY PRESENT.

DR. SCOTT'S ELECTRIC BRUSHES.

EXTRAORDINARY OFFER.

During the next 30 days, any Drug or Fancy Store will let you have either the Hair or Flesh Brush on trial, and if they fail to Cure Headache, Neuralgia, Rheumatic Pains, etc., in a few minutes, or quickly Cure Dandruff, Falling Hair, and Baldness, take them back in good condition and the Price will be refunded. They are not Wire, but Pure Bristle Brushes. Sent on the same terms, postpaid, on receipt of three dollars, by GEO. A. SCOTT, 842 Broadway, New York.

'The Harp that once through Tara's Halls.'
THE HARP-ETTE,
\$1.50. — OR — \$2.50.
AMERICAN ZITHER.



The Best Low Priced String Instruments in the World. The easiest instrument to learn to play and as sweet and melodious as a harp or violin. It is used by pegs and a key, same as a piano. (A key gives free will, chime) and is adjustable to any pitch. It will play any tune splendidly, both for solo music and accompaniment to voice, organ or flute. Also good for dance music. You can learn one of the easy waltzes in a few minutes. They are very handsome in appearance, being thoroughly made of hard woods, highly finished, and is an ornament to any room. It is a great favorite with the ladies, and thousands are learning to play it. Price, 19 strings and key, only \$1.50. 16 strings, only \$2.50. Instruction and 14 popular airs, set to music for the Zither, free with each. N. B.—Do not confound this superior instrument with a cheap imitation, advertised at some, or less price. Address THE MASSACHUSETTS ORGAN CO., sole manufacturers, 57 Washington Street, Boston, Mass. Sent to any address on receipt of price.

INDUCED HYSTERICAL SOMNAMBULISM AND CATAPLEXY. By William J. Morton, M.D. An interesting paper descriptive of several remarkable cases of somnambulism and induced delusions, and cataplexy and aphasia, observed by the author during a morning clinic of Prof. Charcot at the Salpêtrière. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 256. Price 10 cents. To be had at this office and from all newsdealers.

ALUMINUM GOLD WATCHES.

A \$15
WATCH
FOR
\$10.



Gents—The Aluminum Gold Watch I purchased from your firm three months ago retains its color as brilliant as when first received. I deeply regret sending my second order because I wished to test the metal. I can now conscientiously recommend them. I enclose \$10.00 for one more Aluminum Gold Watch, same as the first. M. M. Watts, Hawthorn, Fla., Nov. 24, 1881.

Gents—The second lot of \$10.00 Aluminum Gold Watches received all right. I enclose Money Order for \$5.00. I am glad to see the watches, and other watches and goods from your Catalogue. Forward at once and oblige. George F. Wilson, Grand Forks, Dakota, Oct. 20th, 1881.

Gents—The Aluminum Gold Watch I purchased from your firm is as good a time-keeper as I ever saw. I enclose \$10.00 for one more. I enclose the money for another watch. Yours, Respectfully, T. D. Cooley, Dealer in General Merchandise, Williamstown, N. C. March 15th, 1881.

Send money by Post Office Money Order, or Registered Letter. We will send the watch C. O. D. if Two Dollars is sent on account, the balance can be paid at the Express Office when the watch is delivered. Let us hear from you with an order.

WORLD MANUFACTURING CO., 122 Nassau Street, New York.

NEW YORK STENCIL WORKS.

STEEL LETTERS. STAMPS. STEEL DIES & 87-NASSAU ST. N.Y.

PRODUCTION OF SOUND BY RADIANT ENERGY.

An important contribution to Physical Science by Alexander Graham Bell, wherein the author describes in detail the most recent researches of himself and Mr. Sumner Tainter on the action of radiant energy upon various solids, liquids and gases; and also their experiments upon substitutes for selenium in electrical receivers, upon the measurement of the sonorous effects produced by different substances, and upon the nature of the rays that produce sonorous effects. Accompanied by 14 figures illustrative of apparatus used. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 251. Price 10 cents. To be had at this office and from all newsdealers.

WILEY & RUSSELL MFG COMPANY.

GREENFIELD, MASS. "LIGHTNING" (trade mark).

Manufacturers of Screw Cutting and other labor-saving Machinery and Tools. Bolt Cutters for hand or power in large variety. The celebrated Lightning Screw Plates in various assortments. Taps, use in the bit-bronze. The Green River Taper Drilling Machines, Green River Tire Sanders, Horse Shavers' Vices, Tire Wrenches, Tire Bolt Wrenches, Nut Wrenches, Counter-sinks, etc., etc. Send for illustrated price list.

STEEL NAME STAMPS, POSTPAID, 15 CENTS PER LETTER. STEEL STAMP WORKS, New Haven, Conn.

WALRUS LEATHER.

Sole purchaser wanted for Walrus Leather, indestructible material for pistons of pumps, emery disks, and belts. Free on board of Hamburg.

HUGO M. TRICHMANN, Dresden, Germany.

Spinners' and Shippers' Cotton Bale Buckle.



Serially numbered. A complete check against fraud in weight and packing, also a protection in case of damage by fire or water. Only one check to each bale. This check to be the only shipping mark recognized. Made of the best malleable iron. Can be attached at compress for immediate shipment. Address S. N. DRAKE, Cincinnati, O.

Foreman Wanted for Reduction Works.

In California—American—25 to 40 years of age, with practical experience in furnace operations, an energetic worker, skillful and ambitious. Must present satisfactory references from former employers regarding character and ability to perform work in the best and most economical manner. Address confidentially, P. O. Box 1018, San Francisco, California, until December 1.

RELATION BETWEEN ELECTRICITY AND LIGHT.

A lecture delivered at the London Institution by Dr. O. J. Lodge, in which the author discusses the relation between electricity and light. A number of the typical and most important points in the relation between electricity and light. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 275. Price 10 cents. To be had at this office and from all newsdealers. The same number contains an article on some "Interesting Electrical Researches."

WOOD WORKING MACHINERY.

IRON WORKING TOOLS. SPECIAL TOOLS. H.B. SMITH MACHINE CO. SMITHVILLE, BUR. CO., N. J. CIRCULARS FREE.

Advertisements.

Inside Page, each insertion --- 75 cents a line.
 Back Page, each insertion --- \$1.00 a line.
 (About eight words to a line.)

Engravings may have advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

WOOD WORKING MACHINERY.
 PLANING, MATCHING, MOLDING, MORTISING, TENONING, CARVING, MACHINES, BAND & SCROLL SAWS, UNIVERSAL VARIETY WOOD WORKERS & CO. CINCINNATI, O. U.S.A.

"THE MAYFLOWER," Vermontport, Mass. The cheapest, largest, and best Family Story paper. 35 cash presents to every 5th and 10th multiple as well subscriber. Send a three cent stamp for sample copy.

INVENTORS.

There has never been a better time to sell good inventions or to secure capital for the purpose of developing them. Money is unusually plenty and capitalists are actively seeking good investments. We undertake the sale of patents, entire or in part, secure partners, and form joint stock companies. Highest references given. Circulars free.

E. L. RICHARDS & CO., 733 Broadway, New York.

BAND SAW BLADES. Patent Process. Send for sample saw and catalogue. H. A. KIMMEL, Agt., 614 Filbert St., Philadelphia, Pa.

MINERAL WOOL.

This fireproof and indestructible material successfully prevents loss of heat by radiation, keeps frost from water pipes, deadens sound, checks spread of fire in walls, partitions, doors of dwellings. 25 cts. per cubic foot. U. S. MINERAL WOOL CO., 16 Cortlandt St., N. Y.

What will the Weather be to-morrow?

A Barometer and Thermometer combined, that foretells correctly any changes in the weather 12 to 24 hours. Warranted Perfect and Reliable. We will send it, delivered free, to any address on receipt of One Dollar. The Best Weather Indicator in the World. Just the thing for a CHRISTMAS PRESENT. Agents wanted everywhere. Send for circular. Beware of imitations. OSWEGO THERMOMETER WORKS, Oswego, N. Y.

SINGERS SPEAKERS. To know your full voice power, highest, most musical tones, use the SINGERS SPEAKERS. To cure coughs, throat, hoarseness, and asthma, use VOICE BARS. Trial box, 25 c. Circulars free. Young & Co., 94 N. 4th St., Cincinnati, O.

VACCINATION OF ANIMALS. BY PROF.

Pastour. An address before the International Medical Congress, bringing to notice a new advance in the study of Microbes as applied to the prevention of transmissible diseases in animals. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 300. Price 10 cents. To be had at this office and from all newsdealers.

MALLEABLE AND FINE GRAY IRON, ALUMINUM, STEEL, CASTINGS FROM RUBBER, PATENTED FIRE TIRING JAPANESE, PORTLAND CEMENT, THOMAS DEVIN & CO. LONDON AND AMERICAN ST. PHILA.

The Popular Science Monthly.

FOR 1882.

Conducted by E. L. & W. J. YOUNG.

"The Popular Science Monthly" was established to raise the standard of popular reading in this country. Magazines are more and more taking the place of books; first-class minds are devoting themselves with increasing readiness to the work of popular instruction; and, when their sterling contributions upon the most important subjects could find no place in our widely circulated periodicals, it became necessary to have a magazine that would give expression to advancing scientific thought for the benefit of the more intelligent classes of the community. In the efficient performance of this service, "The Popular Science Monthly" is now generally recognized as without a competitor.

Those who desire to know what is going on in the world of thought in these stirring times, when new knowledge is rapidly extending and old errors are giving way, will find it year by year increasingly necessary to subscribe for "The Popular Science Monthly."

It contains portraits of distinguished men of science, and each number has one or more illustrated articles. Terms, \$5.00 per annum, or 50 cents a number.

D. APPLETON & CO., Publishers.

1, 3, & 5 BOND STREET, NEW YORK.

BRACE ST.—JAS MURDOCK JR.—CINCINNATI—GERMAN BRASS COPPER SILVER. SEND WIRE, ROD, SHEET & TUBE IN THE THREE METALS, & ANY SIZE.

PATENTS.

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 thirty-five years' experience, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for 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 entrusted 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 them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, free of charge, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents, 37 Park Row, New York.

BRANCH OFFICE—Corner of F and 7th Streets, Washington, D. C.

THE WALLACE DIAMOND CARBONS.

Telegraph, Telephone, and Electric Light Supplies.

THE ELECTRICAL SUPPLY CO.

109 Liberty St., New York.

TO FOUNDERS AND MACHINISTS.

FOR SALE AT A BARGAIN.

A set of PULLEY PATTERNS from 6 to 96 inches diameter (solid and split) and for particulars to AUG. P. BROWN, 51 Lewis St., New York.

SPECTRUM ANALYSIS APPLIED TO THE SOLAR SYSTEM.

A very instructive lecture by Dr. William Huggins, giving an exceedingly interesting resume of the results which have been obtained in recent years by a study of the stars through spectrum analysis. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 241. Price 10 cents. To be had at this office and from all newsdealers.

PORTABLE POWER DRILLS.

TAPPING, REAMING & BORING MACHINES. EMERY WHEEL GRINDERS. WOOD BORING MACHINES. STOW FLEXIBLE SHAFT CO. LIMO. 1509 PENNA. AVE. PHILA. PA.

HOLIDAY GOODS.

Are you looking for them? Send for our list. Price list. Mail orders a specialty. STAND. SILVER CO., 41 Barclay St., N. Y.

12c.

"A Violet from Mother's Grave," & 49 other popular songs, words and music entire, all for 12c. PATTEN & CO., 41 Barclay St., N. Y.

FOR SALE OR RENT.
A large Foundry and Machine Shop (nearly new) for sale or rent, on North River, at this place. Terms so commodating. Address JOHN W. F. ALLEMONG, Brooklyn, N. Y.

PRINTING INKS.
THE "Scientific American" is printed with CHAS.
TENEK JOHNSON & CO.'S INK. Tenth and Lombard
Sts., Philadelphia, and 39 Gold St., New York.

SCIENTIFIC AMERICAN

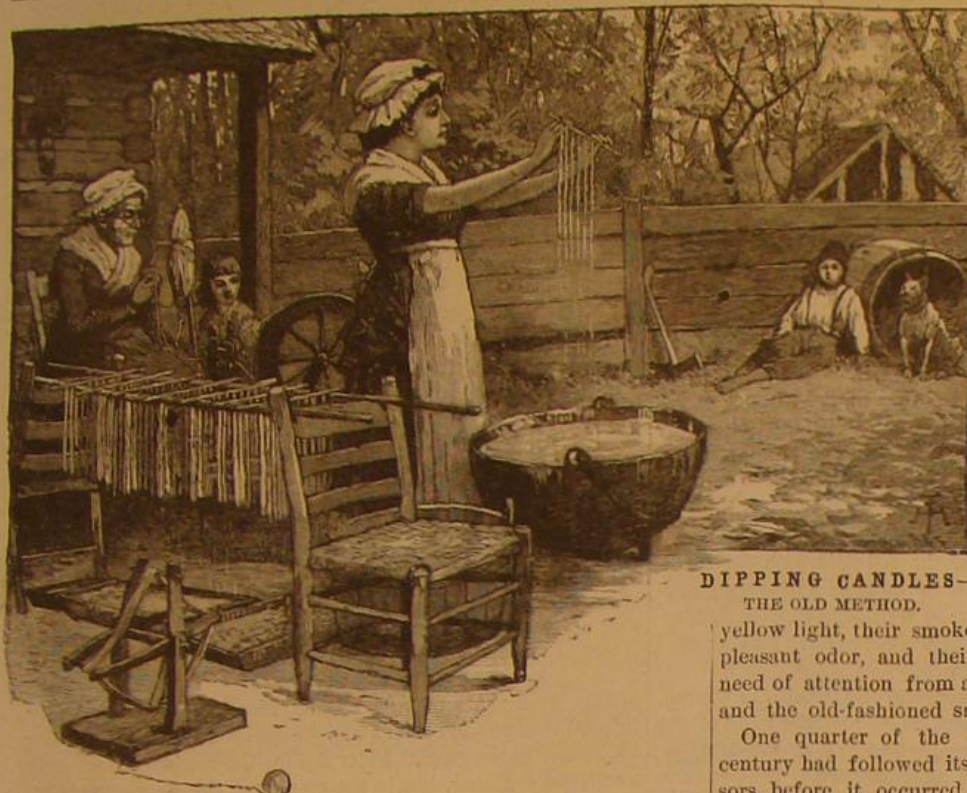
[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

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

Vol. XLV.—No. 25.
[NEW SERIES.]

NEW YORK, DECEMBER 17, 1881.

[\$3.20 per Annum.
[POSTAGE PREPAID.]]



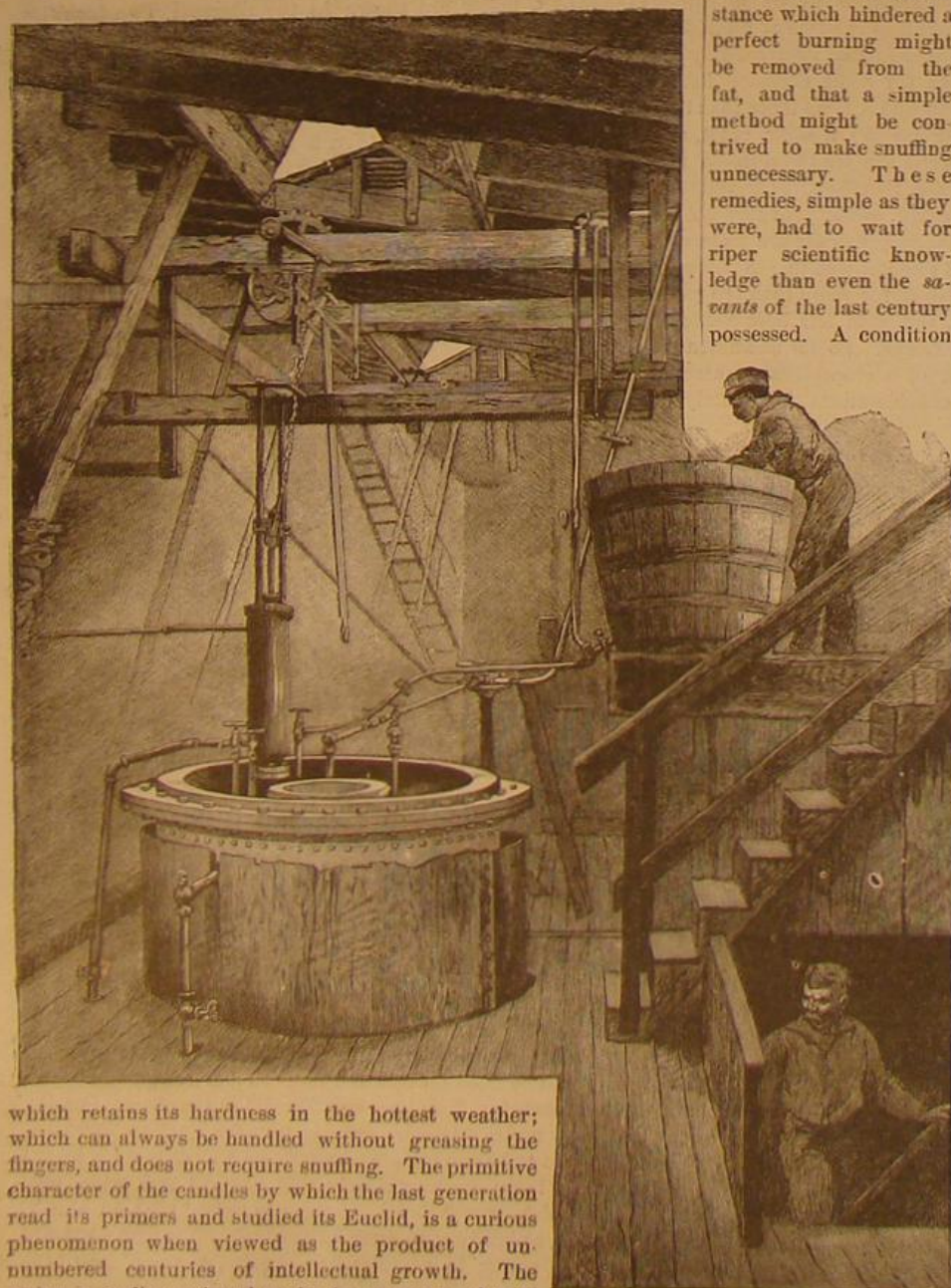
DIPPING CANDLES—
THE OLD METHOD.

yellow light, their smoke, their unpleasant odor, and their frequent need of attention from a deft hand and the old-fashioned snuffers.

One quarter of the nineteenth century had followed its predecessors before it occurred to man that tallow candles might be made hard enough to keep the year round without melting, that the smoke was caused by imperfect combustion, that the substance which hindered a perfect burning might be removed from the fat, and that a simple method might be contrived to make snuffing unnecessary. These remedies, simple as they were, had to wait for riper scientific knowledge than even the savants of the last century possessed. A condition

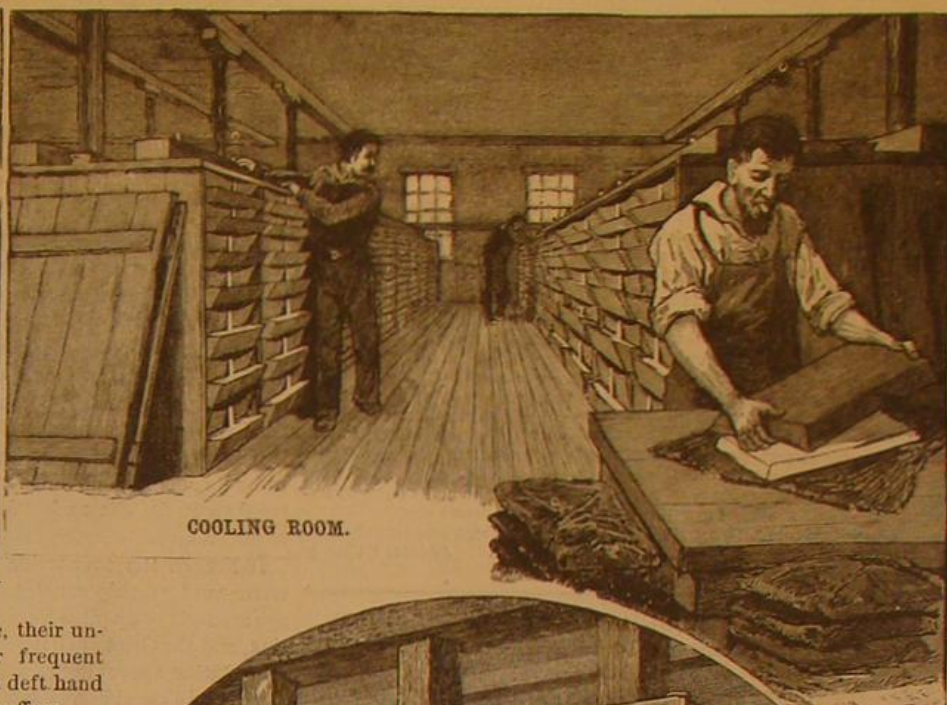
AMERICAN INDUSTRIES.—No. 79. THE MANUFACTURE OF CANDLES.

It is only the history of the modern candle that is written—the graceful, slightly, and tapering cylinder which burns with a clear white and brilliant light; that neither smokes nor “drips;”



THE DIGESTER.

which retains its hardness in the hottest weather; which can always be handled without greasing the fingers, and does not require snuffing. The primitive character of the candles by which the last generation read its primers and studied its Euclid, is a curious phenomenon when viewed as the product of unnumbered centuries of intellectual growth. The vision is easily conjured up in the memory, of their



COOLING ROOM.



COLD PRESSING.

precedent was a knowledge of the nature of fats and of that energetic display of chemical action which we now call combustion.

The progressive steps in candle-making from the age of the primeval savage up to the
[Continued on page 386.]



HOT PRESSING.

HOW CANDLES ARE MADE.—MANUFACTORY OF PROCTER & GAMBLE, CINCINNATI, OHIO.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... \$3 20
 One copy, six months, postage included..... 1 60
 Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$3.20 each; additional copies at same proportionate rate. Postage prepaid.
 Remit by postal order. Address—

MUNN & CO., 37 Park Row, 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 with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of seven dollars. Both papers to one address or different addresses as desired.

The safest way to remit is by draft postal order, or registered letter. Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, \$5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, DECEMBER 17, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

Accidents, railroad.....	384	Inventions, new.....	391
Amateur mechanics.....	391	Lead in bromide of potassium.....	389
American industries.....	386	Lead in cider and vinegar.....	392
American triumph, an.....	389	Life, the duration of.....	392
Boiler explosion in Ohio.....	384	Lighting, storage of, proposed.....	390
Boiler notes, steam.....	389	Manufacture of candles.....	388
Boilers, cast iron flat heads for.....	389	Mechanical inventions.....	393
Brass, burnished, some things in.....	391	Mechanics, amateur.....	391
Bromide of potassium, lead in.....	392	Medieval cuisine, a.....	392
Candles, manufacture of.....	388	Meteorite, a fall of, in England.....	389
Cider, lead in.....	390	Miller's live.....	393
Curious freak of a dog.....	389	Notes and queries.....	394
Duration of life, the.....	392	Ohio, terrible boiler explosion in.....	384
Electric lighting, Am. triumph.....	389	Otto gas engines at Paris.....	390
Engineering projects, some great.....	384	Projects, engineering, some great.....	384
Europe, to reach in five days.....	389	Railroad accidents.....	389
Explosion, boiler, in Ohio.....	384	Rain of spider webs.....	389
Flat heads, cast iron, for boilers.....	389	Shutter fastener, improved.....	391
Freak, curious, of a dog.....	389	Some things in burnished brass.....	391
Gas engines, Otto, at Paris.....	390	Spider webs, rain of.....	389
Glass, a new variety of.....	390	Steam boiler notes.....	390
Gulloline, origin of the.....	392	Steamship project, a new.....	390
Industries, American.....	386	Storage of lightning, proposed.....	390
Inventions, mechanical.....	393	Vinegar, lead in.....	390
Inventions, miscellaneous.....	388	Webs, spider, rain of.....	389

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 311,

For the Week ending December 17, 1881.

Price 10 cents. For sale by all newsdealers.

I. ENGINEERING AND MECHANICS.—Amateur Mechanics.—How to make a useful lathe at small cost.—Drills and drilling.—Tempering.—Centering and steadying.—Chucking.—40 illustrations, with many figures, showing lathes, tools, processes, etc.....	4051
The Fontaine Locomotive.—Both sides of the controversy touching the merits, principles, efficiency, and behavior of the new type of locomotive engine.—Articles from the SCIENTIFIC AMERICAN and the Railroad Gazette, with letters from the General Manager and the Mechanical Superintendent of the Canada Southern Railroad.....	4054
The St. Gothard Tunnel.—An interesting account of the enterprise, with a description of the interior workings.....	4056
The Manufacture of Wood Pulp.—The mechanical method.—The chemical method.—Recent improvements.—Uses of wood fiber.....	4057
Metal Castings of Insects, Flowers, etc.....	5057
Practical Notes on Plumbing. By P. J. DAVIES. (Continued from No. 309.)—Underground joints.—Rolled joints.—Pneumatic tube joints.—Bad shaped joints.—Branch joints.—Bolt or Tommy.—Slope branch joints.—Soil pipe branches.—Soldering branch joints.—Wiping branch joints, horizontal into upright, flange, and block joints.—Putty joints.—Figs. 14 to 37.....	4058
II. ELECTRICITY, LIGHT, HEAT, ETC.—De Meritens's Electric Accumulator.....	4060
Electrical Novelties at the Paris Electrical Exhibition.—The Edison exhibit. (Incandescent lighting system.—Steam dynamo-electric machine.—Microtasmeter.—Odoroscope.—Webermeter.—Electrometograph.)—The electric motor for balloons.—The Kautner pyrophore.—The Maxim system of electric lighting.—Uniform time service.—Electric lighthouses.—Electric cables.—Electric photography.—Exhibits of MM. Bolvin, Lemoine, and Semze.—The Cummings periphery contact key for telegraphy.—Advantages of Bjerknes's apparatus.....	4060
III. TECHNOLOGY AND CHEMISTRY.—The Manufacture of Artificial Hydraulic Lime at Meudon, near Paris.....	4061
Solution of Chlorine in Water. By M. BERTHELOT.....	4061
The Manufacture of Water Gas. By G. E. STEVENSON. Improvements in the Low-Strong Process.—The Strong-Quaglio and Dwight Apparatus. 1 figure.....	4062
Conline and its Compounds.....	4063
IV. ASTRONOMY, ETC.—Meteors. Meteoric showers.—Height of meteors.—History of meteoric observations.—Falls of meteorites.—The shower of the Leonides.—Relation of meteors to comets.—Number of meteors daily.—Composition of meteors.—Meteoric dust. Growth of the earth by meteoric additions.—The zodiacal light.—Origin of meteors.—Meteors as a source of solar heat.—The meteoric theory of solar heat insufficient.....	4065
The Arctic Expeditions. The Corwin and the Jeannette.....	4066
V. NATURAL HISTORY.—Migration of Birds at Night.....	4063
A New species of Shrew Mouse. 1 figure.....	4063
The American Horse. By E. L. BERTHOUD.....	4063
A Defense of Horse Clipping.....	4063
Darwin on the Work of Worms.....	4063
Tree Planting.....	4064
VI. PHYSICS.—Ball Holes in Glass.....	4061
On Drops Floating on the Surface of Water. By Prof. OSBORNE REYNOLDS.....	4062

SOME GREAT ENGINEERING PROJECTS.

The shortening of commercial routes by means of ship railways and ship canals seems to be the great ambition of the engineers of to-day.

In addition to the De Lesseps Ship Canal at Panama, the Eads Ship Railway at Tehuantepec, the Florida Ship Canal, the Chesapeake and Delaware Ship Canal, the Cape Cod Canal, and others in the interior of this country, there are several other important projects of like nature under way or in prospect in various parts of the world. The old project of connecting the Bay of Fundy and Baie Verte, on the Gulf of St. Lawrence, across the Isthmus of Chignecto, has lately taken new form. It is now proposed to make the connection by a ship railway eighteen miles long, thus making a short cut for navigation between the United States and the ports on the St. Lawrence Gulf and River, and saving the long and dangerous voyage around Nova Scotia.

The projector of the ship railway, Mr. H. G. O. Ketchum, writes us that the plan grew out of a desire to save lockage and a deep channel in the design of the Baie Verte Canal. His first plan was to lift vessels by hydraulic power on pontoons and then float them through the canal. The idea then occurred that they might as well be lifted to the surface of the ground and hauled across the neck of land on rails. The road may be level and perfectly straight from end to end. The plan has been submitted to the Dominion Government and is favorably entertained. Mr. Ketchum has issued an interesting pamphlet relative to the project, which may be considered at greater length elsewhere.

Across the ocean the construction of the tunnel under the British Channel, connecting England with the Continent, is being prosecuted with an energy which is indicative of ultimate success, and thus far no obstacles have been encountered to make the undertaking a difficult or exceptionally hazardous one.

In France the connection of the Atlantic with the Mediterranean by a ship canal, to save the long and stormy voyage around the Spanish Peninsula, is under serious consideration, and the Council-General of the Seine have just adopted a resolution approving of the project.

The ship canal across the Isthmus of Corinth, in Greece, to shorten the route to Constantinople and the ports of the Black Sea, has, we believe, been definitely determined upon.

In the far East a bolder and more important project is in contemplation, with a view to shortening the commercial route to China and Japan by six hundred miles or more. At the head of the Malay Peninsula is the Isthmus of Kra, connecting Upper with Lower Siam; and by the cutting of a ship canal at this point, about thirty miles in length, the need of sailing around the peninsula might be obviated. At Kra, the Malay Peninsula, which stretches southward for five hundred miles to Singapore, is at its narrowest breadth, and the distance across from the side of the Indian Ocean to that of the China Seas is further decreased by the existence of natural waterways for some distance inland from both shores. From side to side it is no more than fifty miles, and the Pakchan River, on the western coast, and the Htassay on the eastern, afford the ready means of further reducing it. The distance, therefore, over which it would be necessary to cut a canal would probably not exceed thirty miles. The neighboring districts are known to be fertile and to contain great mineral wealth. A tin mining company has been established for more than ten years at Malewon, on the Pakchan, and gold has been found in the neighboring stream of the Lenya. So far as known the engineering difficulties are not of a stupendous character, and political drawbacks and considerations fortunately do not exist.

The French appear to have taken the lead in proposing this important commercial short-cut, and, if the opinion of the London Times is well founded, the Government of British India will not decline to actively participate in its execution.

RAILROAD ACCIDENTS.

Railroad statistics show that there were an unusual number of accidents attended with fatal results on American railroads during the year ending October 31, 1881. They foot up 1,492 accidents, by which 397 persons were killed and 1,687 more were injured, being a monthly average of 124 accidents, 33 killed, and 141 injured.

The month of October, as reported by the Railroad Gazette, shows a greater number of accidents than the monthly average for the year, although the fatality was slightly less, the total for the month being 131 accidents, 31 persons killed, and 133 more injured. Of the October accidents, 51 were collisions, 77 derailments, 2 boiler explosions, and 1 fire. More than half the number of mishaps, where the time of day was reported, happened in the daytime, which appears to be remarkable, although it is said to be not an uncommon thing for more train accidents to occur in daylight than in the night time.

January took the lead in number of accidents, 223 having occurred in that month, while the greatest number of fatal casualties were in September, namely, 56 killed.

There were no less than four successful attempts at train wrecking in October. In one case obstructions were put on the track, in another a rail was removed, and in two more switches were misplaced. In only one case were the wreckers caught, and they are to be tried for murder, an engineer having lost his life in the wreck.

Six broken bridges are in the record for the month, an

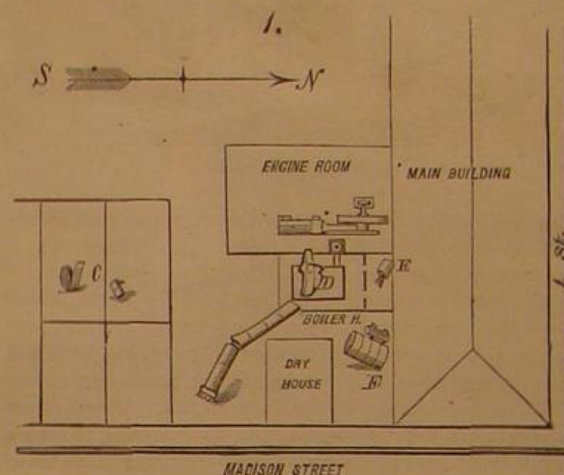
unusually large number. One of these had its abutments washed out, and in two other cases they were small wooden bridges.

TERRIBLE BOILER EXPLOSION IN OHIO.

The new Dayton Wheel Works, one of the finest manufacturing of light vehicle wheels in this country, owned and occupied by Pinneo & Daniels, Dayton, Ohio, was, on October 25, the scene of a most astonishing and lamentable boiler explosion.

Three persons were killed, a number severely injured, and extensive damage was done to the works.

Henry Rokel, the only man in the fire-room at the time of the explosion, which took place at the noon hour, was blown into the fuel room and fatally mangled. Katie Makley, a girl of thirteen years of age, was killed by a flying brick while at play with her companions in St. Joseph's school-yard, a square away from the boiler house. A young man



Plan of Dayton Wheel Works.—(C, rear end of boiler. D, girder of plates. E, front end of boiler. F, boiler No. 1.)

of seventeen years of age, named Mostbaum, was so badly injured that he died soon after the accident. He was eating his dinner in the yard. Peter Aplin, the engineer, formerly a railroad engineer, but in the employ of this firm since 1852, in their old works and their new, was in the engine room oiling his engine and preparing to start up the machinery. He was thrown among the ruins badly bruised and cut about the upper part of his body, but able to dig himself out. A number of others were injured. There were fifty or sixty workmen in the main building.

The plan of the works and the distribution of the parts of the broken boiler are shown in the diagram, Fig. 1. The four story main building and the wings, all of brick, are shown in Fig. 2. Other buildings, including a large dry-house, shown in the foreground of the diagram Fig. 1, are omitted from Fig. 2 for the sake of clearness of illustration.

The one story building (Fig. 2) in the angle was the boiler house, in which were two horizontal tubular boilers, 5 feet diameter by 16 feet long, each containing 46 flues, 4 inches



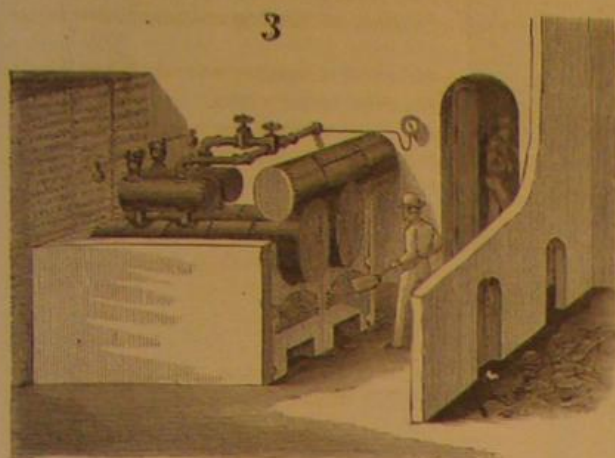
Dayton Wheel Works before explosion.

diameter, full length of the boiler. The steam drums, shown in Fig. 3, were 24 inches diameter by 7 feet long, upon which were attached the safety valves and steam connections, as shown. Each boiler had also a mud drum, 18 inches diameter by about 6 feet long, seen in Fig. 5.

The shells of these boilers had double riveted longitudinal seams, were new less than a year before the explosion, and originally had the appearance of being what they were intended by both makers and users to be—sample pieces of workmanship. The iron was five sixteenths charcoal brand, slightly under thickness, ranging from 0.29 inch to 0.33 inch, and said to have a tensile strength of 55,000 pounds to the square inch; meaning simply that a strip 1 inch wide, 0.29 inch thick, would break, if steadily pulled without shock, torsion, or bending, under a force of $(55,000 \times 0.29) = 15,950$ pounds acting in a direct line parallel to the plane of the strip, as in a testing machine, for example.

These boilers were provided with the usual attachments, including two steam gauges, one in the fire-room and one in

the engine room. They had, however, a common attachment to the boilers, not shown in the engravings. The water was fed into the front ends of the boilers and blown out from the rear end of the mud drums. There were two 4-inch safety valves, each having its own separate stand pipe communicating directly with the steam chamber of each boiler, as it properly should do.



Interior of Boiler House.

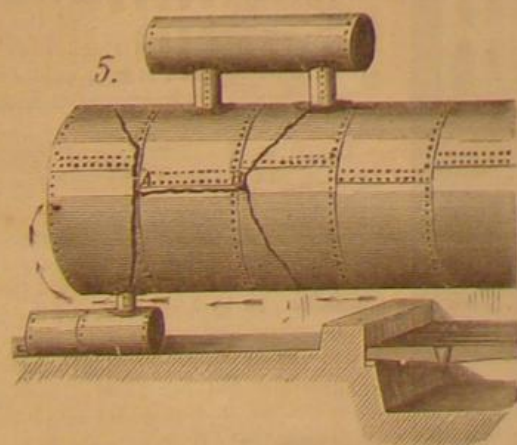
The boilers were tested at a pressure of 140 pounds and put in operation about the beginning of 1881. The fuel used was chips, shavings, and refuse of hard dry timber from the factory, which was stored in the fireproof fuel room, shown at the right of Fig. 3. The steam was distributed at a supposed maximum pressure of 80 to 90 pounds through 6-inch main steam pipes to a 20-inch by 42-inch automatic cut-off engine running at 69 revolutions per minute. Direct steam was also used for the dry-houses and for warming the work rooms. The duty of the engine was to drive a large lot of improved hub, spoke, and felly machinery for making light carriage wheels.

About 12:45 P.M., October 25, the destruction shown in Fig. 4 suddenly took place, caused by the bursting of the shell of right hand or No. 2 boiler. The primary rupture began at the left-hand side, or toward No. 1, on the line A B.



Boiler Explosion at Dayton Wheel Works.

Figs. 5 and 8, just below the overlapping end of the plate at the seam; the secondary rupture, taking the course indicated by the irregular lines in Fig. 5, which extended entirely around the boiler, the force of the expanding water, gushing from this long and suddenly made opening, tore off and flattened out the girdle of plates shown in Fig. 8, and 9,000



Boiler No. 2, showing initial rupture, A B, and secondary lines of rupture running round the boiler.

pounds of water, more or less, practically exploded simultaneously with its release, giving out as much as 100 heat units per pound of water, each unit capable of raising 772 pounds one foot high. The force, then, including the free steam from both boilers, would probably exceed 500 millions of foot-pounds, which may be considered ample when set free in the fraction of a second to produce the observed effects.

Relating to the cause of the initial rupture a quotation from the Dayton Journal is admissible, though it should be taken with caution, as there are several obvious errors in the article. That paper reports the engineer as having said:

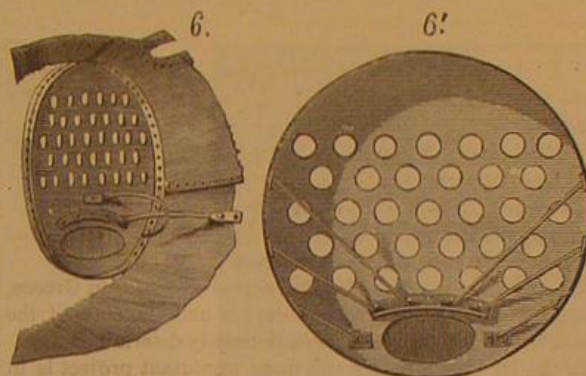
"At 12:25 o'clock he had three full gauges of water, and the steam had run down to 75 pounds. In the morning he had carried 90 pounds."

Again, after he had directed Rokel to put fuel in the furnaces so as to keep the fire from dying out, he is reported as having said he "saw that the engine room gauge showed 80 pounds of steam in the engine room, and Rokel cried out to me in the boiler room that the gauge there indicated 75 pounds."

The engineer continues: "The boiler was scaled pretty thick, and I had tried to get as much of it off as I could, but I think the scales had crystallized (the iron?), and thus caused the explosion. This boiler always leaked at this place, and I felt that it was dangerous, so it was repaired last week. It was placed in the house last December, and appeared strong."

The repairs were, calking a longitudinal seam on the other, right-hand, side of the boiler shell, at I, Fig. 8, near the rear head, which had given warnings of its frail condition, while the seam, A B, might not have leaked before rupture took place.

The fact in the case is that the initial defect was a partial fracture just at the edge of the lap, A B, plainly indicated by the different colors on the fractured edge; old black oxide



Rear end of boiler after explosion. Rear end of boiler before explosion.

extending in places nearly half across the fractured edge, indicating brittle, "cold short" iron. And the same is seen at the seam where the marks of the calking tool plainly indicate the location of the leak spoken of by the engineer as having lately been repaired "because he felt that it was dangerous," I, Fig. 8.

The parts of No. 2 boiler are shown on plan, Fig. 1, C being the rear end in the yard of a dwelling 150 feet from the boiler house, shown on a larger scale, Figs. 6 and 6'. D, Fig. 1, is the position of the girdle of plates, enlarged in Fig. 8. E is the point where the front end lay with the dead Rokel, shown enlarged in Fig. 7. F, Fig. 1, shows the position of No. 1, the unbroken boiler, which turned end for end and tore off the corner of the dry-house in the foreground of the plan.

Experts, and especially professional boiler experts, are accustomed to ask steam users to believe that the use of steam can be made safe, and that there is no mystery in boiler explosions; that they are the result of carelessness, ignorance, bad iron, or bad workmanship; but it seems rather discouraging to such as desire to get an idea when they may safely continue to use their boilers, to be put off with such stuff as that contained in the following certificate, which we quote from a local newspaper:

"We, the undersigned, at the request of Messrs. E. H. Brownell & Co., and Messrs. Pinneo & Daniels, have made a thorough examination of their boiler that exploded October 25, 1881, and find the iron in the boiler to be first-class, made by the Licking Rolling Mill Company, and the workmanship good. We are satisfied that Messrs. Pinneo & Daniels took all due pains and spared no expense in having their boiler fitted up in first-class shape, and had provided more than ordinary means for the safety of their boilers, and cannot see that any blame can be attached to Messrs. Brownell & Co. as makers, or Messrs. Pinneo & Daniels. We find that Mr. Peter Aplin bears the name of a careful and experienced engineer, and one of the best in the city. By testing one of the steam gauges, we find it worked correctly. We find no indications of low water. We find it impossible to determine the cause of the explosion.

AID COLLINS,
Of the Hartford Steam Boiler Inspection
and Insurance Company.

JOHN L. PFAU,
Of the Swift Iron and Steel Works.

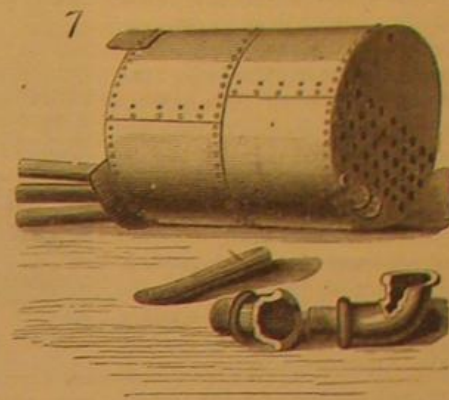
J. H. VAILE,

Of Smith, Vaile & Co.

SIMON SPARKS, M. M.,
With Woodsum Machine Company."

The owners of these new and apparently well made and thoroughly equipped boilers ought not to be told that it is impossible to determine the cause for the explosion. They, in common with most thinking men, no doubt believe that there was a sufficient cause, which somebody ought to be able to explain.

Although a greater pressure than 80 or 90 pounds is not needed to account for this destruction, yet it is not improbable that the pressure, even with two steam gauges themselves in order, and two safety valves of ample size, might have been much above the indications reported. The gauge pipe common to both gauges being accidentally obstructed is all that we require, together with the faulty safety valves, which are illustrated on an enlarged scale in Fig. 9, to fatally

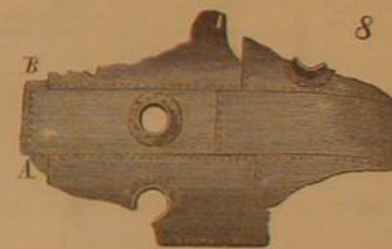


Front end of boiler after explosion.

mislead an observer as to the pressure actually endured by the boilers, both of which were in use at the time of the accident. With perfect safety valves, the boilers being sound and good, the hardest firing would not have dangerously increased the pressure, even though the temporary fireman was densely ignorant of the duties of a boiler attendant.

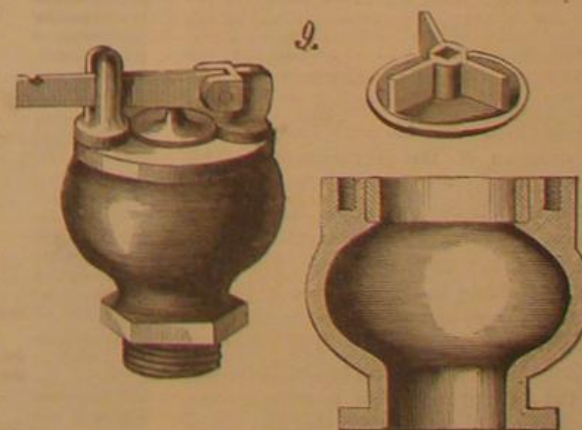
Referring to the cut (Fig. 9) it will be seen that the safety valves were broad disks with three short guide rings and a broad seat. The short blunt stem or teat on which the lever rests is seen to be very close to the lever pivot, barely two inches. These teats were not turned, and might or might not be in the axis of the valve. If the point upon which the lever rests is not central, then a uniform pressure upon the disk below would raise only the side having the larger radius, and "jam" the rings fast in the seat or guide ring. Once in that plight the current of steam toward the crescent-shaped opening would impinge on the rings and tend to increase the difficulty without materially relieving the boilers of pressure. One of these valves bore marks of having been jammed in this way so as to bruise the guide rings.

The SCIENTIFIC AMERICAN has made a careful examination of the exploded boiler of Messrs. Pinneo & Daniels, and



Girdle of plates torn from No. 2 boiler. A B, line of initial rupture. I, locality of leak mentioned by the engineer.

finds that the explosion was due to the bad quality of the iron at the line A B; that the plate at this point was brittle; that this brittle iron was subjected to slight hinge-bending motions, caused by variations of pressure on the flattened portion of the boiler at the broad seam; that these motions tended to crack the poor iron; that the plate at the line A B showed the existence of a crack of older date than the explosion; that the steam pressure indicated by the engine



Details of Safety Valve.

room gauge was sufficient to cause the explosion, in view of the cracked and impoverished nature of the iron.

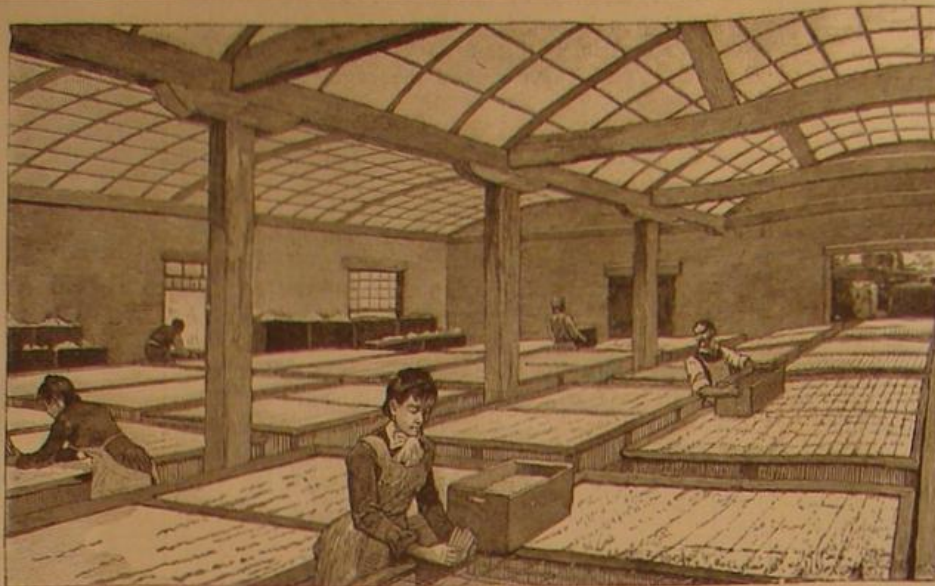
Speed of the Servia.

The new Cunard steamer Servia was tested for speed November 19. The vessel was repeatedly run at the measured mile, and ultimately taken out into the channel and run back between the Cumbrae and Clock lighthouses, a distance of 15½ statute miles, the result of the day being that she attained the remarkable speed of 20½ statute miles per hour, having on board 2,500 tons of dead weight.

THE MANUFACTURE OF CANDLES.

[Continued from first page.]

nineteenth century were not many. First the pine knot, then the oil nuts on a skewer—which is now the means of illuminating used by the Otaheitan and Society Islanders, who are not far behind the rural housewife of not long ago, who gathered rushes, peeled them on one side, and soaked the pith in the skimmings of the bacon pot, or our mothers, who hung a row of wicks of cotton yarn upon a stick, and dipped the wicks into the melted tallow prepared only by the removal of the membranes, etc., in the shape of cracklings. The operation had to be repeated several times, until sufficient tallow had hardened around the wick to make a not very shapely cylinder, the sticks being supported, while the tallow cooled, by parallel bean poles or quilting frames. Dipping day then was not looked forward to with pleasure by the cleanly housewife: it was dirty work at best—the kitchen floor was bound to suffer unless the weather permitted the dipping to be done in the yard or under the cover of the woodshed. Cool days in the spring or fall were chosen, so that the tallow might harden quickly and evenly, and if the attic supply gave out in the midst of warm weather, the grocery had to be patronized for the crude mould candles just coming into use. In those days the construction of kettles specially adapted to melting the tallow and keeping it at an even temperature, and a contrivance for expediting the dipping by putting the rods with the rows of looped wicks upon a revolving rack, marked substantially all the ad-

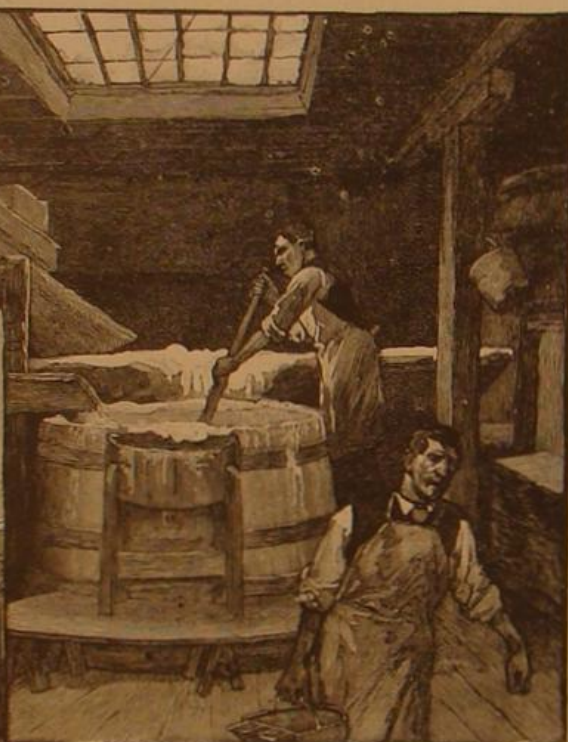
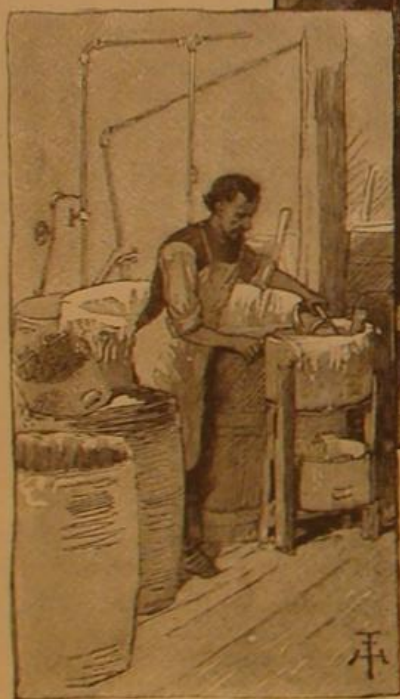


THE BLEACH.

"Asser's Annals" preserve the great king's directions: "He commanded his chaplain to supply wax in sufficient quantities, and he caused it to be weighed in such a manner that when there was so much of it as would equal the weight of seventy-two pence, he caused the chaplain to make six candles thereof, each of equal length, so that each candle

medium for the poor of large cities, and for all classes in small towns and villages where there are either insufficient or no gas works. Country hotels and taverns are large consumers, and the preference of many people for candles over lamps, as portable lights, keeps up a constant demand in all sections. Candles likewise are the true aristocrats among illuminators, and the renaissance in art taste which holds no illuminating medium to be quite so beautiful and effective as the candle for dinner tables and party and ball rooms, calls for an extensive manufacture of fine grades. Now, it is not the beauty of the polished brass or silver candelabrum alone which makes appeal to the æsthetic judgment, for, except the yet imperfect electric light, no illuminator can give so pure and white a light as a perfect candle. The finest fruit of science applied to the once homely industry is the stearic acid mould candle of to-day, which is not only quite as handsome in appearance as the wax

candle, but burns with equal brilliancy and purity, and has to a great extent usurped the place of the more costly light. The mines of the far West share with the boudoirs and salons and dining rooms of the East in the consumption of the best of these candles. A very large proportion of the finest grades goes to Nevada, Colorado, and the other mining



TEMPERING.

might have twelve divisions marked across it." Each of these divisions burned one-third of an hour, so that the six candles lasted one day.

The discovery of gas lighting and improvements in lamps have done much to curtail the manufacture of candles, but it is yet a vast industry. An estimate of the consumption in the United States places it at twenty-two millions pounds annually. Candles are still the staple illuminating



SCRAPING OFF SURPLUS.

vance of the tallow chandler's art. Aided by all these appliances, a workman could dip probably three or four thousand candles in a long day, and congratulate himself on his luck and his skill, but in the warm weather he had to do the dipping in the cool of the very early morning, and doubtless he often wondered if the time would come when his work could proceed in defiance of the thermometer. This method of dipping candles for the trade came down to our own day. Moulds were invented in Paris in the eighteenth century, but it was not until the whole process of candle-making had undergone a change that they came into general use and stopped the domestic manufacture. The history of tallow-candle making up to the invention of the modern method is a curious one, because of the long time that the crude methods obtained, and it has its complement in the fact that wax candles are still made by kneading the softened wax to the wick with the fingers; the candle is then given a symmetrical shape by rolling it between marble or wooden slabs. Moulds cannot be used here, because of the great shrinkage which melted wax undergoes while cooling. Doubtless the wax candles were made in this way which King Alfred caused to be marked into divisions and shut up in this horn lantern, that by their graduated burning he might apportion his hours to study and devotion and sleep.



CUTTING AND CARRYING OFF.

States and Territories of the Pacific slope, the high temperature of the mines demanding a very hard and pure candle. The old candle would be entirely useless here, for tallow melts at from 90° to 104° Fah., and the temperature of the deep mines of Nevada often reaches 120° and even 130°. A good stearic acid candle will withstand a temperature of from 15° to 10° more than this.

To the vast manufactory of Procter & Gamble, in Cincinnati, the most complete and extensive on this continent, we go for our illustrations and our description of their process, for there the most recent and most perfect of scientific and mechanical appliances are kept at work, and the latest of scientific research is constantly utilized. More than one hundred thousand candles are sent out from this factory every day, which, if moulded into one candle, would make it eleven miles in length. Every step of the process through which they pass, from the time the fats are deposited into the emptying room until the pretty cylinders, snugly packed in boxes, are sent to all parts of the world, is full either of interest to the student or entertainment to the simply curious. For the edification of the seeker after knowledge as well as those whose curiosity interests them in wishing to know "how to make candles," we will give both the scientific and the mechanical means of candle-making.

The stearic acid candle, which is now the principal candle of trade, represents the high-water mark of the progress in candle-making which began fifty years ago. Unlike its primitive predecessor, the tallow dip, it is a product of scientific study, and one of the many triumphs of philosophic chemistry. The movement which effected a complete revolution in the industry, and ran a rapid growth after once it was started, was an outcome of the discoveries of M. E. Chevreul, the French chemist, published to the world in 1823, in his book, "Recherches sur les Corps Gras, d'origine animale." In it lies the foundation of all our present knowledge of the chemistry of fatty oils, and this knowledge is the starting point of modern candle-making. Chevreul established the scientific fact that, as a rule, all fatty oils, both liquid and solid, are neutral compounds of glycerine and the so-called fatty acids. In tallow and other candle fats, these acids are stearic and oleic. A third acid, called margaric, also enters in small proportions, but it occupies very little attention. Stearic acid is a crystalline substance, unctuous to the touch, but not greasy. It melts at a temperature a little short of 150°, and when burned through a wick gives out a white and clean light. Oleic acid is liquid at common temperatures, and was the cause of the melting of the old tallow candles at a temperature 50° lower than is withstood by pure stearic acid. The glycerine base caused them to burn yellow, and to smoke with an offensive odor. The discovery of the chemical properties of these constituent elements of candle fat led with a single step to the fundamental idea of the



MOULDING.

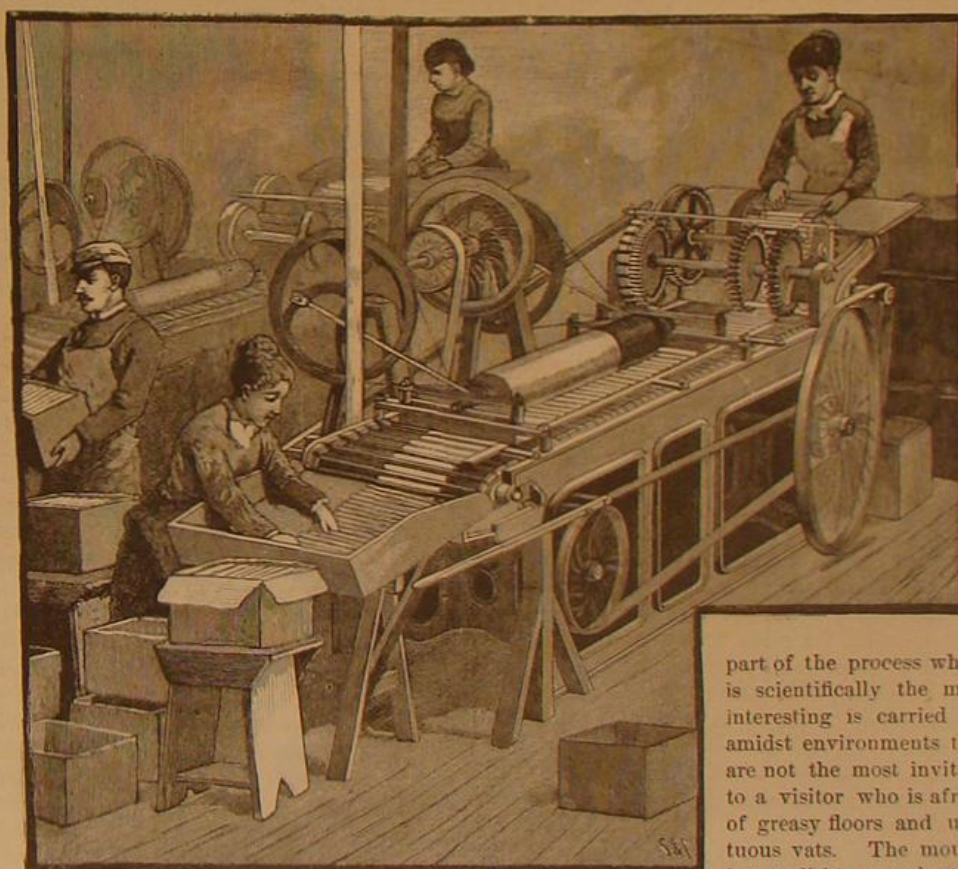
lowering the temperature of the acid before pouring it into the mould, and in heating the mould to receive it. Improvements were also successively made in the methods of preparing the fat, and when, finally, American ingenuity was brought to bear upon the mechanical side of the problem, a machine was developed out of Sieur de Brez's last-century mould that has marvelously simplified and cheapened the manufacture of candles. The purification of the fat had done much to improve the combustion, and the smoke had been abolished; the flame, too, had become much brighter and clearer, and the snuffing of the wick had become less necessary, for, the combustion being more perfect, the wick, whose only duty is to conduct the oil to the flame, was more nearly consumed. A little attention to the making of wicks soon banished the snuffers and the snuff tray to the curiosity shops of the antiquaries.

The old-fashioned wicks were simply twisted. Cambaceres conceived the plan of plaiting them, with one strand drawn tighter than the others. In the candle the wick is kept straight by the hardened fat, but, when released by the flame, the tightened strand draws the end of the wick over to one side, so that it is brought in contact with the outer envelope of the flame, where the combustion is most perfect because of the liberal supply of oxygen received from the air, and thus the wick is continuously consumed. The process is helped by steeping the wick in boracic acid, in order that a glassy bead may be formed at the end of the wick, and drop off by its own weight. This plan was suggested by De Milly in 1830.

Fortunately, a promenade through the factory in fancy is attended with consequences much less disagreeable than the actual walk, for all that



RAISING THE CANDLES



POLISHING.

part of the process which is scientifically the most interesting is carried on amidst environments that are not the most inviting to a visitor who is afraid of greasy floors and unctuous vats. The moulding, polishing, and packing, however, have picturesque phases which appeal

improvement in candle-making: the oleic acid and glycerine are deleterious to the candle, and must be removed; and all the steps since taken—and they followed hard on the heels of the first—have looked to the doing of this in the most expeditious and cheap manner, and the perfection of the moulding machinery. Naturally the first processes were chemical, but they put a great obstacle of costliness in the way of the manufacture which almost proved fatal. The early industry, after surmounting this difficulty by combining mechanical means with chemical in separating and purifying the fats, again came near suffering shipwreck from another cause. It was found by the French chandlers, to whom belongs much credit for developing as well as originating the modern method, that the stearic acid on cooling in the mould crystallized, and the candles became unsightly, brittle, and uneven of combustion. The remedy appeared to lie in breaking the grain of the acid, and this was done by the introduction of a powder. Unfortunately, white arsenic was the powder chosen, and the result was so noticeably injurious to health that Chevreul's discoveries were brought into disrepute, and the early art

of stearic acid candle-making was almost annihilated. Better study found a simple and harmless remedy to lie in

to even a dainty æsthetic sense. Three processes are necessary in the preparation of the fat for the mould.

The glycerine must be removed, the acids must be freed from the new base combined in getting rid of the old, and the solid acids must be separated from the liquid. In the first process the principle followed is the law in chemistry, according to which a strong base under favorable conditions will separate a weaker one from its acids by combining with the acids and taking the place of the weaker base. The fat is thereby saponified, a soap being formed, which is next decomposed, the fatty acids liberated and then separated. In this last process begins the employment of mechanical instead of chemical means, for, though repeated dilutions would effect a more perfect separation of the acids, the plan pursued is quicker, cheaper, and sufficiently effective for the purpose desired.

The saponification of the fat is accomplished in an apparatus called, in chandler's parlance, the "digester." It consists of a copper cylinder inclosed within an iron one, and a pump arranged to force the contents of the inner cylinder from the bottom to the top. Into this the fat, which



HAND POLISHING.

has been melted out of the barrels by steam, is run and is mixed with lime and water. The mixture is kept at a heat of 600° Fah. by steam which is let into the outer cylinder at a pressure of two hundred and fifty pounds to the square inch. The water, being the heavier, sinks to the bottom of the copper cylinder, whence it is pumped and thrown on a perforated plate above the fat, that it may fall through it in many little streams. This agitation is kept up for eight or nine hours, after which it is found that the lime has united with the fat acids and formed a soap, while the water has consorted with the dissociated glycerine. The contents of the cylinder, after being permitted to remain at rest for a time, separate into two strata, the lime soap on top, the crude glycerine and water below. These are blown off to separate vats by the power of steam. It is from the candle factories that the enormous supply of glycerine comes, which is now a very important article of trade. A few years ago it was wasted; now it is sent to the manufacturing chemist, who purifies it by distillation and filtration through bone charcoal, and puts it upon the market. It is put to a great variety of uses, many of which depend upon its peculiar properties of non-volatility and absorption of atmospheric moisture. Harness makers and leather workers use it in making leather pliable; it is put into gas meters because it does not freeze except at a very low temperature; modelers keep their clay studies moist with it; tobaccoists sweeten chewing tobacco with it, and ladies apply it to their hands and faces to soften the skin. Much of it goes into the manufacture of the terrible explosive nitro-glycerine, which is made by treating it with a mixture of sulphuric and nitric acid, or concentrated nitric acid. Not less than three million two hundred thousand pounds of glycerine are produced by the candle factories and utilized every year in this country, and yet so late as the year 1854 it was counted as worthless, and was run off into the sewers.

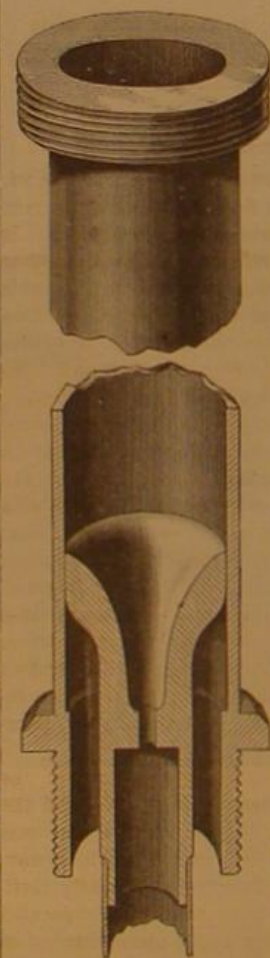
When the French chandlers first began the manufacture of the new-process candles, and for a long while after, they permitted the lime soap to become hard, and then ground it up in order to dissociate the lime from the fat acids. Now this is done without delay, the liquid soap being run into lead-lined vats with a proportion of sulphuric acid added. The chemical principle involved is the same as in the more laborious process of saponification; the glycerine base has been supplanted by the lime base, and this must now be got rid of. The sulphuric acid takes hold of the lime, forming sulphate of lime, and the acids float off free. In these vats, between which the paths are narrow and the walks greasy, the liquid settles in three strata—the first, the fat acids, now free of their base, but still mingled; the second, an acid water; the third, sulphate of lime, a waste. They are easily drawn off without mixing, and the fat acids, by washing in boiling water, are cleaned of all traces of the sulphuric acid, and we are now done with the chemical processes, and our product is a fat which contains the solid and the liquid acids. If cooled rapidly or kept agitated while cooling, the acids become so intermingled that they cannot be separated by mechanical means, which at this stage of manufacture must replace the chemical, on the score of cheapness. If the fat is cooled very slowly, however, it has been found that the solid acids will crystallize, while the liquid acid, the oleic which it is desired to banish, will lie snugly ensconced between the crystals, to be afterward forced out by heavy pressure.

The cooling of the fat is a slow process. It is run into shallow pans, lined with enamel to prevent the acids from eating the metal, and permitted to remain in a warm room two or three days. These pans are arranged in sections, like alcoves in a library, one row of pans underneath the other, and each extending a slight distance alternately to front or rear beyond the one above it. The hot fat is conducted over the top of the alcove in a wooden chute, and the filling of all the pans down to the floor is accomplished by taking a plug from the chute immediately over the top pan. When this is full it overflows at the front end by means of the slight depression made at that end, and the overflow is caught by the pan below, and so on down to the bottom. When the fat is become hard it is a cake of a brown, greasy mass, not unlike unrefined maple sugar. The discoloration comes from the oleic acid, which permeates the whole cake and can be forced from between the crystals of the hard acids by pressure with the thumb. The cakes are wrapped in heavy woolen cloths, piled into hydraulic presses between iron plates, and the pressure applied. A dark oil gushes from the woolen, pours over the edges of the plates, and is caught up beneath the press to be used in soap-making. The cakes have now been squeezed down to less than two-thirds of their original thickness, and the mass presents a yellowish-white appearance. By breaking it, its crystalline texture can still be seen despite the fact that the shape of the crystals has been ruined by the pressure it has undergone. They are still somewhat greasy to the touch, for in this first pressure only fifty per cent of the



STAMPING.

oleic acid has been removed. They now succeed to a second pressure, this time in a horizontal press, and between hollow iron plates that are kept hot by steam. Still wrapped in the woolen cloths, they are suspended between the plates in bags of horsehair cloth, and a very heavy pressure is applied from the end. When the cakes issue from this process



A MOULD.

they are as white almost as snow, very hard and dry, and when broken into small particles have a flaky appearance. The mass is now almost pure stearic acid, and is ready to be moulded into star or adamant candles. Without an exception, this single hot pressing is deemed by other manufacturers to be sufficient for their higher grades of candles, such as are used for mining, dining room, or library, but Messrs. Procter & Gamble have learned that by again breaking up the cakes, melting, panning, and pressing in the hot press, a much better candle is produced, better because there is no smoke, the light is whiter, and consequently much stronger, and the candles last longer. These are strong points, especially where the candles are to be used for mining or in a close room, or where a pure, soft, white light is desirable, such as at a dinner party or reception.

These are the scientific phases through which the stearic acid candle goes; what follows it is simply the fruit of the inventive faculty of our day. The visitor emerges from dark basement rooms, where he has been moving between tubs and under pipes and chutes all dripping with liquid grease, into a room on the ground floor. Here there is light

purified, sometimes colored, and brought to the temperature requisite for moulding. Utility is here, of course, the guiding consideration, but the group of big and little tubs, with the men moving among them, is not without its picturesque element. Upon the edges, and hanging from the spouts at which the moulder fills his double-lipped can, the candle fat has hardened in fantastic shapes, with surfaces of ivory-like smoothness and sheen. The floor of the room is covered with moulds. In these moulds there is little remaining of the group of tin tubes through which the domestic candle maker, who had got beyond dips a few years ago, laboriously drew her wicks, to fasten them below with a knot, and above by looping them over little sticks. The tubes are now fixed in a frame having troughs along the top, into which they all open. They end below with the shoulder of the candle, and the moulds for the tips are the upper ends of piston rods, which, by a rack and pinion, are forced upward through the tubes to expel the candles, and which, when at rest, fall snugly into the shoulders. These rods are hollow, and the wicks pass continuously through them from bobbins placed in the floor of the frame. Care is exercised to have the fat at a temperature just above the melting point, to heat the mould to receive it, and immediately to cool it rapidly by forcing around the tubes a blast of cold air, so that the fat shall not crystallize as it did in the panning. When the candles are hard, the surplus fat in the troughs is removed, and a few turns of a handle forces them upward out of the moulds and into a rack placed on top of the machine to receive them. The lower

board of the receiving rack is slightly shifted, so that the edges of the openings through which the candles pass catch the shoulders of the candles, and prevent them from dropping back into the moulds with the piston rods. These rods in expelling the candles draw up with them wicks for the next pouring, and in falling back into position pull the wicks taut and into place through the middle of the tubes. The candles in the rack are left until the next mouldful is cold; then the wicks are cut by passing a knife between the mould frame and the rack, and they are emptied into boxes, which are mounted on trucks, and pushed from mould to mould. Bleaching, polishing, stamping, and packing are all that remain to be done. The first process takes place in the adjoining room already mentioned; a few hours of sunlight bleaches the yellowish tinge out of the fat. Common grades are then rubbed with cloths and packed; better grades are polished by a machine, into one end of which they are fed by one woman, while another packs them into boxes from the other. The process is very simple: a grooved cylinder receives the candles from the feeder, and after carrying them past a revolving saw, which cuts off the butts evenly, deposits them upon a bed plate between the rods of an endless frame with linked sides, kept in motion by cog wheels. Over this bed plate they roll under a revolving buffer, which gives them a vigorous brushing from end to end, and gives them the beautiful porcelain finish as they pass toward the end where they roll off into the packer's box. All grades are stamped with the name of the maker, and in some instances the trade name of the candle, "Composite," etc. This stamp is melted into them by a branding iron as they pass through a small machine, which, like the polisher, is fed by a grooved cylinder.

MISCELLANEOUS INVENTIONS.

Mr. John B. Casley, of Coolville, Ohio, has patented an improvement in metal roofing. This invention relates to that class of metal roofs in which the ends of the sheets are bent upward to form flanges which are held on the roof by anchors. The invention consists in the combination, with flanged roofing plates, of an anchor provided with one or more prongs at the upper end and with an enlargement or bead at the inner end. This anchor is passed into a slit or cut in the edge of the roofing strips or boards, the enlarged part or bead resting against the inner surface thereof, whereas the prongs project above the flanges of the metal sheets, and are then bent down over these flanges. The flanges may be bent one over the other, or the joint may be covered by a cap. By this invention the plates are held firmly by the anchors, and can be attached to the building very rapidly and conveniently. The plates can be attached to the sides of a house in the same manner.

A very efficient carpet stretcher has been patented by Mr. David G. Rulon, of Monmouth, Ill. In this device a clutch bar, which lies flat upon the carpet, and has inclined steel points that catch into the latter, is connected by cords or chains with a rear bar, which is provided with steel points that pass through the carpet and into the floor. The clutch bar is moved forward to stretch the carpet by a lever having a steel point that sticks into the floor, said lever passing through a loop in a draw cord, that rests by its loop in any one of a series of hooks on the lever, while the ends of the cord are connected with the clutch bar by draw rods, which keep



said bar from turning. After the carpet has been fully stretched, the clutch bar is carried over and behind the rear bar, out of the way, to provide for tacking the carpet down near the wall.

An improved spring lock earring has been patented by Mr. Fred R. Bassett, of Paw Paw, Mich. The invention consists in hinging the hook to the pendant, and providing a spring for holding the hook open or closed, the hook being formed with square faces at the pivot for the impingement of one end of the spring upon either one of said faces, accordingly as the hook is thrown open or closed. This improvement not only gives greater convenience in attaching, fastening, and removing the ring from the ear, but less gold wire is required for the hook, no eye is needed for fastening the end of the hook, and the hook is not liable to be broken, as it does not have to be bent every time the ring is inserted and removed from the ear, as is the case with the ordinary style of hooks.

An improved sofa bed, which is free from complicated devices to adapt it for use as a sofa or a bed, and which may be so adapted without unduly stretching or crowding its upholstery, has been patented by Mr. Herman A. W. Maereklein, of Hartford, Conn. In this improvement the hinged back and main frame of the sofa have combined with them hinged plates, which, when raised or closed, hold the back in a vertical position, and, when lowered, permit the back to occupy a horizontal one. The stationary sofa arms and the lowering back have also combined with them bolsters hinged to said arms at their rear ends and avoiding the appearance of a hinge joint at the sofa front. Furthermore, the back and seat are connected by hinges having pin joints on a line with the tops of the springs in the seat, whereby all undue crowding and stretching of the springs are avoided.

Mr. King G. Streeter, of Littleton, N. H., has patented a very neat and durable glove fastener. In this device a tubular shank, having an eye on its outer end, is secured to the glove on one side of the wrist opening. Through this eye is loosely fitted a wire bent in reverse directions at its opposite ends, which latter have knobs that prevent the wire from dropping out of the eye. In using the fastener, one end of the wire is passed through the button hole in the glove wrist, and said rod or wire then used as a lever to draw the parts of the glove wrist together. The other end of the rod is next passed through the button hole, and the rod afterwards adjusted to bring its central portion within the eye. The button hole is fitted with an oblong eyelet to prevent the glove wrist from being worn or torn around the button hole.

A simple and inexpensive fastening for hats and bonnets, which may be secured in position without the use of needle and thread, has been patented by Mrs. Josephine A. McK. Bouvier, of Denver, Col. The invention consists in a button having a portion of its back cut away to form an opening, and the remaining portion of said back provided with a keyhole slot, which communicates with said opening, and is adapted to receive a knotted cord. This cord, which may be elastic, being thus secured at its one end, without sewing to the button, may be attached at its other end to the hat by a clasp, and said button, when securing the hat to the head, be passed through a looped cord secured to the other side of the hat by clasp or otherwise.

An improved ore concentrator, which is designed to be connected with crushing rolls or other crushing machines, or to receive the ore directly from them, has been patented by Mr. William Thurmond, of Rosita, Col. In this concentrator a V-shaped box set slightly inclining from a horizontal position, and formed with an enlarged cylindrical chamber at its narrowest end, is connected at said end with an exhaust fan and provided at its opposite end with a current regulating slide. Within the V-shaped chamber of the box is a rocking or vibrating frame, having screens of various degrees of fineness for separating the different grades of crushed ore, while the dust and lighter particles are drawn out by the fan. Chutes in the bottom of the box conduct the graded ore to suitable receptacles, and a separate chute carries off the gangue. Ore concentrators thus constructed are said to perform their work perfectly.

An improved tire-tightener, which operates by expanding the felly of a wheel to completely fill the tire and thus firmly unite the felly and the tire, has been patented by Mr. Benjamin F. Carlon, of Red Oak, Iowa. The device consists of two arms having jaws and banding screws at their outer ends to receive and hold the felly, which arms are pivoted to a forked swivel head loosely mounted in the top of a capstan head on a screw which fits into a threaded aperture of a pedestal or base that rests against the hub of the wheel between the spokes. By turning in a given direction the capstan head of the screw the felly will be expanded as required, and washers can be passed into the joint to fill up the space between the ends of the fellys. This useful contrivance may also be used as a jack to lift wagons and other loads.

An improvement in photographic apparatus, which possesses both novelty and merit, has been patented by Mr. David H. Houston, of Cambria, Wis. The object of this invention is to facilitate taking a number of photographic views successively and in a short time. The invention consists in a camera with a receptacle or box at its inner end containing a roll of sensitized paper or other suitable tissue, and an empty reel, upon which the sensitized band is wound as rapidly as it has been acted upon by the light, thus obtaining a number of views successively upon the same band,

which is afterward divided as required. Said band is arranged to pass from the supply roll to the take-up reel, over rollers at a suitable distance apart and through slots in front of the box. On the shaft of one of these rollers is a pointer for indicating the amount of tissue drawn to form one negative, and a perforator on said roller for indicating the dividing points in the band for a series of negatives. The end pieces of the front end frame of the bellows of the camera also is arranged to swing on the sliding side pieces of the bellows box.

Correspondence.

Curious Freak of a Dog.

To the Editor of the Scientific American:

Being a constant and close reader of your valuable paper, and having gleaned many curious and instructive facts of natural history from its pages, it has occurred to me that the following freak of a dog which we own would not be uninteresting to some of your readers.

"Simmons" (that is the dog's name) is very remarkable for her sagacity, and often excites remark by the "reasonableness" of her actions. She is a constant companion of the boys, and seems to consider herself one of them. She has been a mother three times; the third time some ten days or so ago. At her two former *accouchements* she did herself credit by the respectable size of the family she brought to light; but this last time she gave birth to but one pup. Two or three days before the birth of this pup there was a litter of kittens born on the place. Simmons, disgusted at the smallness of her family, and evidently thinking that the cat had more than her share, captured one of the kittens in the absence of the old cat, and carried it in her mouth to where she kept her pup, and deposited it in her basket. In a short time she was suckling both the pup and kitten, who were hard at work side by side. The next day the kitten was taken away in the absence of Simmons, but on her return she bunted up her adopted child and brought it back to her basket, where it has remained until now. Simmons has now been nursing the kitten for more than a week, the kitten seeming to be perfectly satisfied with her foster-mother.

This may not be an isolated case of the kind, yet it is nevertheless remarkable.

H. U. ONDERDONK, M.D.

College of St. James, Washington Co., Md., Nov., 1881.

Rain of Spider Webs.

To the Editor of the Scientific American:

I notice in the SCIENTIFIC AMERICAN of November 26, 1881, an article headed a "Rain of Spider Webs." This rain occurred in Wisconsin in the latter part of October. It might be interesting to refer to another locality and another date, where and when a similar shower was seen. In this place (Bloomington, Indiana), on October 9, about two o'clock, my attention was called to the number of spider lines streaming from a telegraph wire running from the house at a height of about eighteen feet from the ground. At this time I did not notice any in the air, but going along the road I observed some webs on the fences, but not in great numbers. Returning to the house a little before five o'clock, we found the telegraph wire almost fringed with them; every two or three inches, as far as we could see, there were streamers of cobwebs of from four or five inches in length to about fifteen feet, all directed nearly horizontally toward the south. We now saw in the air many lines detached, drifting southward in constantly varying curves. These lines were plainly visible at a distance of over two hundred yards, glancing in sunlight reflected from or reflected by them. We observed, also, several tufts or "parachutes" floating with the spider lines.

I find recorded in my notebook another instance of the same kind. It occurred September 20, 1874. Noticed the appearance about five o'clock. The air at this time was filled with dust, the season being very dry. The long waving lines of light, whose general direction was nearly vertical, were seen drifting from north to south nearly parallel to the ground. They could be seen at the same distance as those already described. We watched them till sunset; for a few minutes but few could be seen, then the number would increase, but upon the whole there seemed to be no diminution as long as the sun shone upon them. The tufts of *gathered cobwebs* were more numerous than in the shower of October 9.

T. A. WYLIE.

Bloomington, Ind., Nov. 23, 1881.

Cast Iron Flat Heads for Boilers.

To the Editor of the Scientific American:

As the question of the safety of cast iron "flat" boiler heads for cylindrical boilers appears again to have come to the surface, I give you below what has been the practice in past years by builders of high standing in proportioning such heads, and which have been used without accident.

The proportions of one builder are as follows: For boiler 24 inches diameter, heads $1\frac{1}{2}$ inches thick; for boiler 28 inches diameter, heads $1\frac{1}{2}$ inches thick; for boiler 30 inches diameter, heads $1\frac{3}{4}$ inches thick; for boiler 36 inches diameter, heads $2\frac{1}{4}$ inches thick; and of another extensive builder: For boiler 30 inches diameter, heads $1\frac{1}{2}$ inches thick; for boiler 36 inches diameter, heads $1\frac{3}{4}$ inches thick; for boiler 42 inches diameter, heads 2 inches thick.

I have also examined the heads of old boilers which had

been in use for years carrying 80 lb. steam, heads 36 inches diameter and $1\frac{3}{8}$ inches thick; and of others in use for years carrying 110 lb. steam, heads 36 inches diameter and $1\frac{1}{2}$ inches thick.

OBSERVER.

[The above data is furnished to us by an experienced steam engineer, and is brought out, we presume, by the recent publication, in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 308, of Mr. W. Barnett Le Van's letter relative to the Gaffney boiler explosion, Philadelphia. In that letter Mr. Le Van states, among other things, that no competent engineer would approve of flat cast iron heads, especially 36 inches diameter and 2 inches thick. We think that Mr. Le Van is greatly mistaken. If the information we have received is correct a very large proportion of all the ordinary cylinder boilers now running have flat heads, have been run for many years in safety, and were originally, and are still, approved by competent engineers.—Eds.]

An American Triumph in Electric Lighting.

To the Editor of the Scientific American:

SIR: I have been somewhat surprised to find that no mention was made, except in the foreign papers, of an extraordinary test of electric lights made during the Electric Exhibition at Paris. It was a test made for the *Credit Lyonnais*, the great French financial institution, who were negotiating for the Brush patents for France, and consisted in running two 40-light machines in series burning 38 lights each, 76 lights in all, on a twenty mile circuit, 16 hours a day for 30 days. The lights, during the whole period, burned with great steadiness, and the test was so satisfactory that, at its conclusion, the patents for France were purchased for between \$400,000 and \$500,000. This is the largest sum that has been paid, I understand, for any electric light patents of any American inventor. The French company, I was told in Paris, had already begun an immense manufactory for the manufacture of apparatus.

C. C. RUTHRAUFF.

Cleveland, Ohio, Nov. 25, 1881.

Fall of a Meteorite in England.

BY PROF. A. S. HERSCHEL, M.A., F.R.S.

A stonefall took place at 3:35 P.M., on March 14, 1881, a mile and three-quarters from Middlesborough, in Yorkshire, along the branch line of the Northeastern Railway from Middlesborough to Guisborough, at a place known as Pennyman's Siding, on the railway. The fall was accompanied by the usual thunder-like report, not heard at the place where the meteorite struck the earth, but as far off as Northallerton and Welbury, in Yorkshire.

Some workmen's attention on the railway was drawn for about four seconds to a whirring noise overhead, followed immediately by a heavy thud in the ground near them; and on searching in the direction indicated by the sound, they found the stone, about three minutes afterwards, at the bottom of a hole eleven or twelve inches deep, which had formed almost vertically through an inch of coke ballast and through thin growing turf and stony clay below at the foot of the slight embankment of the railway, four yards from the nearest line of rails, nineteen yards from the signal box of the siding, and forty-eight yards from the place where they stood when they heard the sound. The foreman narrated the occurrence, and placed the stone in the hands of the engineer of the Darlington district of the railway, Mr. Cudworth, in whose possession it now remains as property of the railway company; but it was submitted to me on March 25 for examination, and on Saturday, March 26, I visited the place of fall with Messrs. Cudworth and Ellinor, and the workmen under them, and with some scientific friends. A photograph of the site, and of the group of men finding the stone, has since been made, and steps are being taken for preserving the hole in the ground in a box fitted and screwed together round the earth about it, which will be thus bodily removed.

The stone weighs 3 lb. 8 oz. 83 grains, and is of a low pyramidal shape like an upper oyster shell, 3 in. thick and rather less than 6 in. x 5 in. in length and breadth. The interior is visible at points of the frayed edge and is gray, with very little interspersed grains of iron pyrites, and apparently no iron; and a magnet is not sensibly affected by the mass. Its specific gravity roughly determined is a little greater than 3.0. The flat back surface of the meteorite is covered with a rough brown crust, while the blunt conical front surface is deeply scored and furrowed radially from the center, and polished like fresh molten slag and of a lead-gray color.

The singular form and contour of the stone make it very desirable that, whatever provision is finally made for its preservation and mineralogical examination and description, it should not undergo more defacement from its original integrity than is absolutely necessary.—*Monthly Notices R. A. S.*

Lead in Bromide of Potassium.

Maschke has found bromide of potassium in the market which is contaminated with lead. It is soluble to a clear liquid only after addition of an acid; the larger crystals are remarkable by their transparency and their form, being a compound of octahedra and cubes. In testing for lead, sulphuric acid cannot be used, since the resulting sulphate of lead is soluble in bromide of potassium. But if hydrosulphuric acid or sulphide of ammonium is used, no doubt can arise.—*Pharm. Zeit.*

STEAM BOILER NOTES.

On the 14th of October a locomotive used for yard work on the Wabash, St. Louis, and Pacific Railroad was damaged by the explosion of its boiler while crossing the Mississippi River at Keokuk, Iowa. The forward part of the boiler was blown open and torn in pieces, the bridge was considerably damaged, and three men who were in the cab were slightly injured. The boiler has the reputation of being more than twenty years old. The engineer says it gave way while the water stood at the upper gauge cock, and under a pressure of 120 pounds of steam.

Perhaps he is right. Hundreds of boilers have done relatively the same thing. Doubts might arise in the minds of thoughtful practical readers as to the perfect condition of his safety valve, the accuracy of his steam gauge, by which the safety valve may have been adjusted, and the time that elapsed after his noting its indication and before the explosion. It is not necessary, however, in order to account for explosions of this class, to suspect that other conditions existed than those stated by this engineer. It is the result of natural laws and perfectly in accordance with practical experience that this twenty year old steam boiler should have acquired an obscure weakness of sufficient extent and so located as to allow a plate of its shell loaded with an internal pressure of nearly eight tons to the square foot to turn outward, as a door pressed by a high wind might burst open from steady depreciation of its fastenings, or as a flood-gate might give way when the rising pressure had overcome its resisting power. These similes are intended as illustrative of the manner of the breaking merely, and here the similarity ends, because the effect of the explosive expansion, the liberated water having a temperature of 138° Fahr. above the atmospheric boiling point, is more like that of the burning of gunpowder than of winds or floods. The effects that follow its sudden release are similar to those that follow the firing of the powder.

On the morning of the 26th of October the engine of a freight train on the Indiana, Bloomington, and Western Road exploded its boiler just as it was starting from Champaign, Ill., with a freight train. The force of the explosion was downward, lifting the engine from the track and throwing it over. The fireman was fatally scalded and a brakeman hurt.

The boiler of a sugar house on John Dymond's plantation, at Belair, Plaquemines Parish, La., exploded November 24, completely wrecking the boiler house and badly wounding the following persons, who were taken to New Orleans by the steamer Daisy, and sent to the Charity Hospital: Joseph Meinker, foreman, leg broken and badly scalded, and Martin von Miller, Henry Clade, John McNorton, Edgar Batleye, Charles Creeland, and Ned Dunham, all badly scalded.

The October issue of the Hartford Steam Boiler Inspection and Insurance Company's circular contains the reports of their inspectors for the month of August, which shows that the total number of visits of inspection made during the month was 1,815, and the whole number of boilers inspected was 3,539. Of this number 1,289 were thoroughly examined both externally and internally, and 419 others were subjected to the hydrostatic test.

The whole number of defects found was 1,414, of which number 388, or nearly 28 per cent, were dangerous.

The detailed statement of the defects is given, which includes the notable items of 140 fractured plates, more than half of which were considered dangerous; 33 water gauges were defective; 18 safety valves were overloaded; and 121 steam gauges defective; while 49 boilers were found having no steam gauges whatever.

Although the modern steam gauge is now considered almost as much a necessity as the safety valve itself, yet it is questionable whether, as it is now often found telling a false story about the pressure in the boiler, it is not actually a dangerous appliance. It certainly should be kept in good order and be of tested, not only in its working range of indications, but above the limit, where it is very important that it should work freely. It is probable that the Hartford Company's inspectors rely upon the safety valves that have been adjusted by their own standard gauge, rather than upon such delicate and variable things as spring gauges. This is inferred from the fact that some of their risks have been continued from year to year on boilers having no pressure gauges at all. Time was within the remembrance of engineers now living when spring steam gauges were almost unknown. The safety valve was often consulted in those days, and was prompt to answer.

A New Variety of Glass.

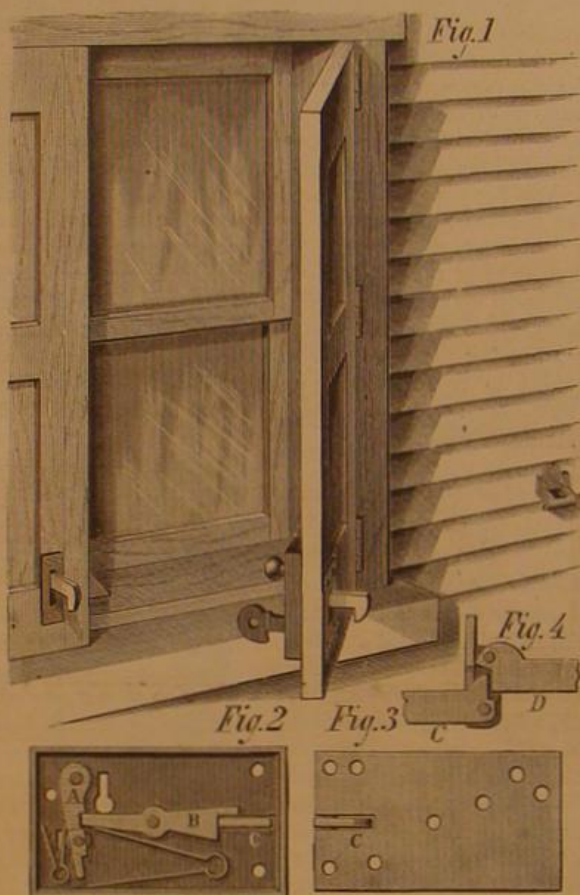
A Vienna chemist has recently discovered a new variety of glass. It does not contain any silica, boric acid, potash, soda, lime, or lead, and is likely to attract the attention of all professional persons on account of its peculiar composition. Externally it is exactly similar to glass, but its luster is higher and it has a greater refraction, of equal hardness, perfectly white, clear, transparent, can be ground and polished, completely insoluble in water, neutral, and it is only attacked by hydrochloric or nitric acid, and is not affected by hydrofluoric acid. It is easily fusible in the flame of a candle, and can be made of any color. Its most important property is that it can be readily fused on to zinc, brass, and iron. It can also be used for the glazing of articles of glass and porcelain. As hydrofluoric acid has no effect on the new glass it is likely to find employment for many technical purposes.—*Wiener Gewerbe Zeitung*.

IMPROVED SHUTTER FASTENER.

The engraving shows an improved fastener for blinds, shutters, and doors, which is so arranged that the inside catch for holding the shutter closed serves as a means for unfastening the outside catch from its wall loop. The inside catch can be locked securely with or without a key, but cannot be unlocked without the proper key.

Fig. 1 is a perspective view of a door, door frame, and a portion of the outside wall of a building, showing the improvement applied to the door; Fig. 2 is a view showing the locking bolt, pawl, and springs inside of the frame or case; Fig. 3 is an inside view of the back plate; Fig. 4 is a detail of the pivoted ends of the two catches and a part of the back plate of the case.

The frame or case of the fastening is composed of a rectangular box and a back plate. Inside of the case is a dog, A, provided with a spring, a locking bolt, B, and spring. The case has a keyhole and a slot for receiving the shank of the inside catch, C, and a slot for the neck of a knob or finger catch attached to the dog, A. On the back of the plate are two flanges to which are pivoted the inside catch, C, and directly above it the outside catch, D, as shown in Fig. 4. This catch extends through the shutter, and is designed for engaging with a wall loop and holding the shutter open. By raising the inside catch, C, the outside catch can be freed from its loop. The shank of catch, C, passes



AYER'S SHUTTER FASTENER.

freely through the casing, and has a loop for the finger, and a hook with a beveled nose to engage with the sill piece.

The bolt, B, is pivoted in the middle, and has a right angular notch in one end to engage with the shank of catch, C, as shown in Fig. 2, and safely lock this catch down.

The tapered end of the bolt, B, is designed to engage in a notch made in the edge of the dog, A, when the bolt, B, can only be moved by means of the key.

To unlock the bolt it is obvious that the key must be used, and when the bolt is held in an unlocked position to allow catch, C, to play freely, the tapered end of the bolt will be engaged by a shoulder near the free end of the dog. When the shutter is closed and the catch, C, is engaged with the sill piece by simply raising slightly the knob attached to the dog, A, the bolt, B, will lock the catch, so that it cannot be released from the sill piece except by the key.

This invention was recently patented by Mr. Henry B. Ayer, who should be addressed care of J. Hennessey & Bro., 123 Magazine street, New Orleans, La.

A New Steamship Project.—To Europe in Five Days.

A project is on foot in this city to establish a purely American line of fast passenger steamers to ply between New York and some port on the British coast. The plan, according to its projector, Mr. Jacob Lorillard, is to build ships which will take passengers from New York Monday morning and place them in London before Saturday night, making the trip from land to land in five or five and a half days.

Mr. Lorillard said to a *Times* reporter: "Our vessels will be 500 feet long, and will be built of steel to reduce weight. They will be provided with power three times as great in proportion to their displacement as is obtained by ships now afloat. These features mean speed. They will be divided into water-tight compartments, rendering them absolutely unsinkable. There will be fifty such compartments in each ship. That means safety. We shall carry no freight of any sort. We shall provide no accommodations for emigrants. Everything is to be in first-class style. Our vessels will be

virtually floating palaces. What Pullman's parlor coaches are in the railway service our ships will be on the ocean.

"We shall build three ships to start with. Each ship will have accommodations for 500 passengers, and each will probably cost over \$1,000,000, probably \$1,250,000. As yet it is impossible to quote exact figures. The estimates we desire are not yet given us. We shall not run to Liverpool. Our landing place will be Milford Haven, in Wales, which is 200 miles nearer London than is Liverpool. Its harbor, too, can be entered on all tides. Upon this side of the ocean we shall save thousands of dollars yearly by the fact that we shall be able to escape wharfage assessments. Carrying only passengers, it will be our plan to anchor in mid-stream, as do men-of-war, and have shore communication by means of tenders. Lying off the Battery, we would be as easily accessible as are vessels at the city piers."

"When will you be ready for business?" asked the reporter.

"By the spring of 1883, but not before. Our vessels are yet to be built, and the greater part of our arrangements in other matters are still incomplete. But by the date I mention we shall certainly be in perfect readiness. Our success is assured so far as capital goes."

The line will be called the "American Express Line."

PROPOSED STORAGE OF LIGHTNING.

A correspondent suggests that Faure batteries be connected with lightning rods to accumulate the electricity of storms. In this way, he thinks, a vast amount of electricity might be stored for mechanical uses, "with results exceeding anything ever dreamed of in perpetual motion."

There are several objections to the plan.

In the first place an electrical condenser would be better adapted for the storage of the high tension currents developed in storms than the Faure battery is. The metal plates and acidulated water of the Faure battery would form so good a conductor for lightning that very little chemical work would be done in it; and it is this chemical work by the electric current which "charges" the battery, and thus prepares it for the subsequent redevelopment of electric energy under proper conditions. Experiments which we have made with the high tension currents developed by a Holtz machine show that such currents do have an appreciable effect upon the Faure battery, but the quantity of energy stored is comparatively very small.

By the use of condensers lightning might be stored, but such high tension electricity is as ill adapted for the operation of mechanical motors as dynamite is as a fuel for the steam engine.

Even if the sudden and violent energy of lightning could all be locked up by chemical action, and subsequently redeveloped in a quantity current, as in the Faure battery, the quantity of electricity to be had from storms is too small to pay for storage.

In one of his experimental investigations, Faraday determined that to decompose a grain of acidulated water an electric current powerful enough to keep red hot a platinum wire one one-hundred-and-fourth part of an inch in thickness, must be sent through the water for the space of three minutes and three-quarters.

This quantity of electricity he shows to be equal to 800,000 charges of a Leyden battery of fifteen jars, each containing 184 square inches of glass coated on both sides, equivalent to a "powerful flash of lightning." In other words the quantity of electricity involved in the lightning stroke—and it is quantity alone that is available for mechanical use—is very small.

In another connection Mr. Faraday demonstrates the fact that the electricity which decomposes a certain quantity of matter—a grain of water, for example—is exactly equal to that which is evolved by the decomposition of the same matter.

An ordinary galvanic cell, therefore, must evolve as large a quantity of electricity as would suffice for a respectable storm. For so small a quantity of electricity it obviously would not pay to set an expensive trap in the form of Faure batteries and lightning rods, even if the electricity of storms could all be captured that way. It would be vastly cheaper to generate the same quantity of electricity by means of galvanic batteries; and there are many cheaper sources of mechanical energy than the galvanic battery is.

Lead in Cider and Vinegar.

A recent report of the Connecticut State Board of Health mentions a remarkable series of cases of lead poisoning in Fairfield County, of that State. The source of the poison was finally traced to the barrels which the thrifty farmers had used for the storage of cider. The barrels had been used for holding boiled linseed oil. Some of the litharge (oxide of lead) employed in preparing the oil had been deposited on the inside of the barrels as a sedimentary coating, which the cider had dissolved. Obviously the proportion of dissolved lead was increased when the cider was kept long enough to turn to vinegar. In this case, as in so many others, the evil wrought by want of thought was serious if not fatal.

The Otto Gas Engines at Paris.

In the distribution of awards at the Exhibition of Electricity, in Paris, the Otto motor received a gold medal, the highest award given to machines of this class. As an indication of the success of these motors, it is said that over seven thousand of them have been put in operation during the past four years.

AMATEUR MECHANICS.

SOME THINGS IN BURNISHED BRASS.

The old and commendable fashion of making ornamental objects from solid hand-wrought metal is being revived to a wonderful extent. Steel, iron, brass, and copper are wrought into a thousand beautiful and useful forms, and the gilded and tinsel objects of recent days are now set aside for substantial and elegant solid cast and hand-wrought ornaments. It will require only a suggestion to set the amateur mechanic at work at this sort of thing, when his dwelling will soon be adorned with articles that will be the more valuable for having been produced at home.

Brass tubing and rods of round hexagonal and octagonal section, plain and perforated strips of different widths and thicknesses, half round and semi-hexagonal strips, and brass buttons, knobs, and nails of various shapes, may be purchased, so that the amateur will readily find available materials for the kind of work suggested. Half-inch square tubes, strips of brass half an inch by one-sixth of an inch, a few brass buttons, and a few knobs, are required for the easel shown in Fig. 1. The tubes may be draw-filed, then finished with the different grades of emery paper with oil, or they may be polished on an emery wheel, and the final finish may be imparted by using the finest French emery paper with oil.

When two tubes cross each other they may be halved together precisely as in wood-work, and may be fastened by soldering with soft solder.

When the end of a tube abuts against the side of another tube it may be fastened solid enough for all practical purposes by soft soldering by means of a blowpipe. Of course the joint may be brazed or soldered with silver solder, but as great strength is not required it is unnecessary to take that amount of trouble.

A very good way of fastening is to solder a plug in the end of the tube that abuts against the side of another tube, and to put a screw laterally through one into the plug in the other. In this case it is well to leave a slight feather on opposite sides of the abutting tube to engage the corners of the tube to which it is attached.

The scrolls should be attached by means of small screws. The panels consist of thin pieces of board covered with velvet or plush of any suitable color.

They are inserted from the back, and are provided with a number of large convex nails. The support for the picture is movable up and down on the side pieces of the easel, and may be secured at any desired point by the milled screws.

The frame shown in Fig. 2 will require no special description. The main portion of it is made of square brass tubing. The side bars are made of round brass rods with turned end pieces, as shown. The mat of thin wood is covered with velvet or plush. The picture and glass are placed behind the mat; the latter is provided with small brass ears, which are fastened to the back of the frame by screws. The knobs at the top, bottom, and sides of the frame and easel are turned and attached with solder.

Fig. 3 shows a tripod stand for a nautilus shell, with an ornamental shell placed below it in the center of the plate,

forming the triangular base. Fig. 4 shows a clock case, consisting of an ordinary box of suitable size covered with plush or velvet, and inclosed in a frame of brass.

The frame is built up in the manner already described from square brass tubing split lengthwise through diagonally opposite corners. The lower portion of the frame consists of a wide band of brass, having a light bead soldered to its upper edge and a heavy bead soldered to its lower edge. A number of the brass nails are placed at regular intervals and soldered at the back of the brass base. The rail at the top is made of hexagonal brass tubing, and the small balusters are turned from brass rods. The palette and brushes are sawed from a plate of brass, and attached by

All of these articles may be lacquered, but they present a more elegant appearance if the metal is left unprotected and cleaned occasionally with rottenstone and oil.

There is hardly any limit to the number of elegant and useful articles that may be made of such materials, with the expenditure of little thought and labor. M.

NEW INVENTIONS.

Mr. Richard B. Ireland, of Trenton, N. J., has patented an improved switch signal. The object of this invention is to give notice of open or misplaced switches and draw-bridges by an alarm on approaching engines, and thereby obtain security against accident additional to the usual signals. The improvement consists in the combination, with the switch-operating mechanism, of a turning dog located near the rails, and used in connection with a gong-operating lever on the engine.

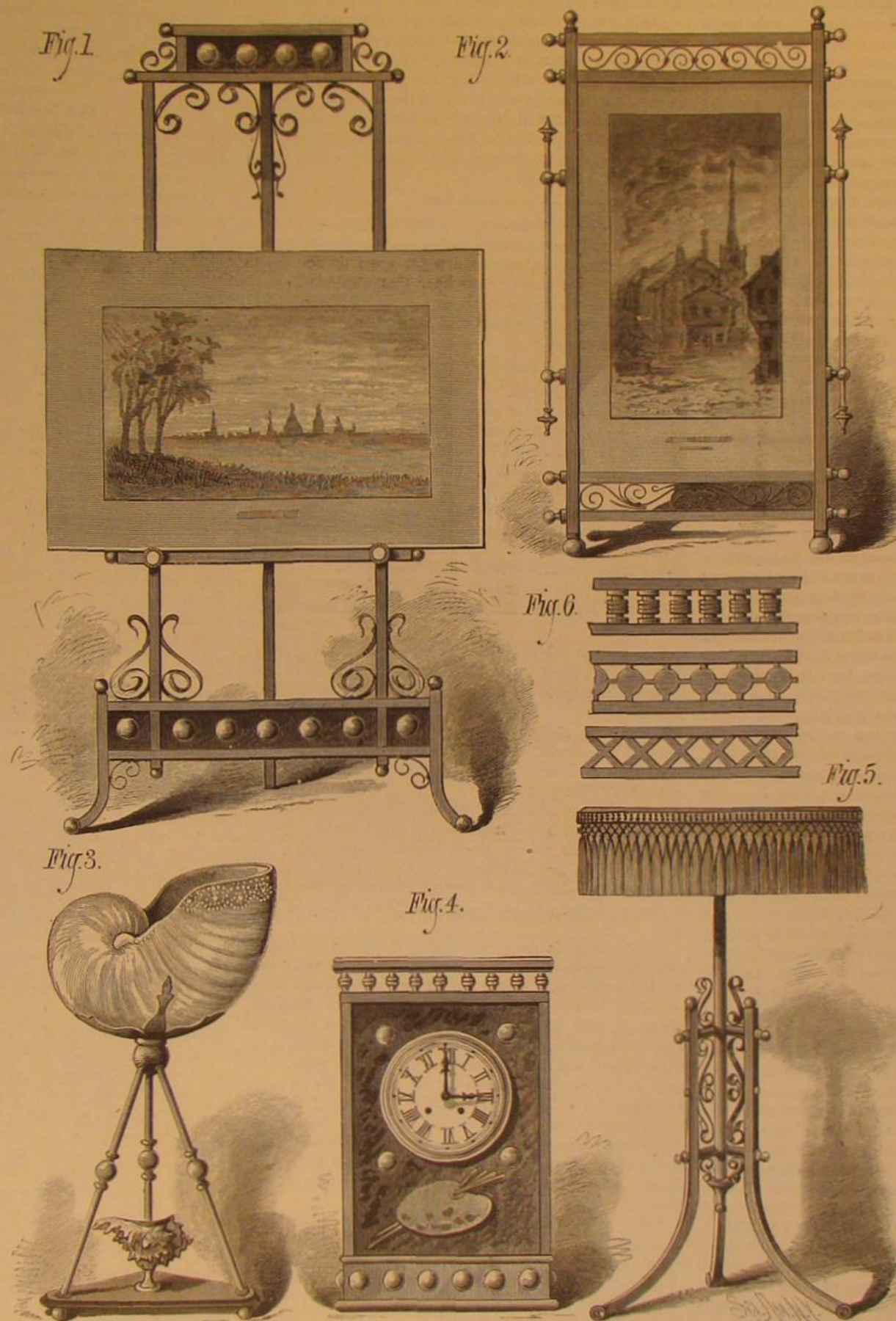
Mr. John A. Hudgens, of Pine Bluff, Ark., has patented an improved hub, having a tapering metallic axle box provided with a circular shoulder near its inner end, against which the inner hub collar abuts when the wheel is put together. The portion of the periphery of the axle box which receives the hub collars or flanges and spokes, is made polygonal in form, and the remaining outer portion of the axle box is made cylindrical and screw-threaded on its outer surface to receive the nut which holds all together.

Mr. Augustus P. Nance, of Batesville, Ark., has patented a cotton cultivator by which several rows or drills of cotton may be cultivated at a time, whereby unnecessary expense of time and labor may be saved. The invention consists in two parallel horizontal beams, supported upon two double runners arranged near their ends, and a series of knives and plows which are adjustably secured to the two beams. The beams for general use will be about forty-four inches in length, and are secured to the tops of the runners and connected with each other by clips. The runners are so constructed that they will rest upon the ground only at their forward and rear ends, the intervening space being occupied by the knives and plows.

An improved grain-cleaning machine has been patented by Mr. Baxter Wright, of Marshall, Minn. This invention relates to cer-

tain improvements in grain-cleaning devices of that type in which one or more inclined sieves are provided with a series of check boards, which, reaching nearly to the sieve, retard the passage of the grain and facilitate elimination of the cockle and small seed, by causing them to pass through the said sieve, while the clean grain passes out at the end of the screen.

A valuable improvement in electric lamps has been patented by Messrs. Edwin M. Fox and Ludwig K. Böhm, of New York city. This improvement relates to electric lamps in which vacuum chambers are employed, and its object is to facilitate the insertion and removal of the carbon, as well as the operation of drawing the vacuum, and to dispense with the usual operation of sealing the drawing nipple by melting. For these purposes the invention consists in the



ORNAMENTAL ARTICLES IN BURNISHED BRASS.

tacks soldered to the back. The patches of color are produced by different colors of sealing wax. Four brass nails are inserted around the dial to relieve the blank spaces on the plush. The clock and its plush-covered case may be removed from the brass frame when it is desired to clean the latter.

The table shown in Fig. 5 is of the same general character as the other articles, and will not, therefore, need particular description. The central portion is of three-quarter inch round brass tubing. The legs are of five-eighth square brass tubing. The top is of wood, plush-covered and fringed, and provided with a border of perforated brass.

Fig. 6 shows different kinds of panels. The balusters in the upper one are turned in the two lower ones; they are cut from sheet metal.

combination of a vacuum chamber formed with a neck and a sealing plug or stopper, having its longitudinal axis coincident with the longitudinal axis of the neck, and bearing the conducting wires; both the stopper and the neck being formed with openings arranged to be turned into or out of registration to permit the lamp to be first exhausted and then sealed.

Mr. James F. King, of Aubrey, Kan., has patented an improved cultivator shovel. In this improvement, the point of the shovel is securely held in position by causing it to form a beveled joint with the lower end of the upper plate, and backing the latter and the point, by a supporting plate riveted to the upper plate and bolted to the point, and the whole secured to the standard of the plow by a bolt passing through both plates. This forms a very strong construction of the shovel, and provides alike for the ready substitution of a new plow point when necessary, and for the replacement of either of the plates, or removal of the whole from the standard.

An improved water-indicating gauge cock device, which serves to indicate with greater accuracy the depth of water in the boiler, regardless of any deviation from a horizontal position of the boiler, has been patented by Mr. Joseph B. Snyder, of Montpelier, Ohio. The invention consists in a combination with a boiler, having a plate arranged to separate the water from the steam space of the boiler and provided with upwardly projecting steam distributing tubes, of a series of water gauges attached to pipes placed above and below said plate and extending about half way into the boiler.

Mr. George A. Deitz, of Denver, Col., has patented an improved method of preserving grapes, which consists in packing or embedding them in carbonized wheat bran or hulls, which substance has a disinfecting quality and tends to exclude the air and prevent its circulation, as well as maintains a comparatively even temperature. Grapes thus packed will be preserved a longer time and in better condition than when packed in other fine material commonly employed heretofore—such, for example, as sawdust, uncarbonized bran, fine cut paper, and kiln-dried meal.

Mr. David W. Lloyd, of Pittsburg, Pa., has patented an improved metal lathing and furring. The invention relates to metal lathing and furring to be applied to ceilings or walls having iron girders for the purpose of holding the plaster, to which girders wooden laths cannot be applied, or to which it may not be desirable to apply wood on account of fire risks. The invention consists of metal furring strips applied transversely to the girders and having dovetail notches in their edges, with which are combined laths made of sheet metal bent into a dovetail shape in transverse section, said laths being slipped endwise into the notches in the edges of the furring, and being firmly held in a transverse relation therein, without nails or other special fastenings. This forms a very simple and secure construction and provides for the proper retention of the plastering.

An improved axle lubricator has been patented by Mr. Isaac N. Snedecor, of Gainesville, Ala. This invention relates to axle lubricators for railway cars in which the oil is conveyed from a reservoir beneath the axle to one above it by means of a suitable rotating device attached to the end of the axle. Therefore, in lubricators of this description, a slight longitudinal oscillation of the axle has been sufficient to strain or displace the rotating device, and the supply of oil has usually been more copious than necessary. The present improvement obviates these defects, besides being otherwise advantageous. It consists in a brush wheel fitted on a pin in the end of the axle so as to rotate with it, and held up against the end of the axle by a spring, but capable of movement along the pin. The brushes on this wheel strike a pin in the upper reservoir to discharge the oil, and a diagonally grooved box distributes it over the bearing.

Mr. Albert C. Ellithorpe, of Chicago, Ill., has patented a very efficient safety device for elevators. The invention generally consists in a combination, with an elevator car provided with a brake mechanism, of an auxiliary air shaft, a cage moving up and down within said shaft and provided with an upper and lower valve operated by the resistance of air in the shaft, and a connection between the cage and elevator car adapted to be broken or detached by the resistance of the air when an accelerated speed is imparted to the car either from breakage of the lifting rope or other cause. In the event of the elevator car moving with too great velocity downward, a corresponding increase of velocity is imparted to the cage upward, and the resistance of the air in the shaft causes the valves in the cage to prevent air contained in the upper closed portion of the shaft from passing the cage, thereby producing a strain on the cage which breaks its cable and causes the brakes on the car to be applied. A valve at the bottom of the shaft, opening upward, admits air to prevent a vacuum when the cage is moving upward, and assists in establishing an air cushion when the cage descends too rapidly.

Mr. Peter D. Graham, of Black Hawk, Col., has patented a combined calipers, rule, and beam compass. In this invention the calipers are formed with an arm extending backward from the joint which unites their legs. The outer end of this arm is formed or provided with a pointed extension which may be used as one of the legs of a beam compass by screwing the extension arm of the calipers on to a screw-threaded reduced portion of the end of a measuring rule, a sliding scriber or leg with caliper attachment being fitted for adjustment on the rule to complete the beam compass. By removing the calipers from the rule, then they and the rule

may be used separately, and the pointed extension of the calipers' arm, when made detachable, may be used as a scratch awl. This makes a convenient combination of several instruments used in the same trade.

Mr. Henry H. Thorp, of New York city, has patented a valuable improvement in types for curved or sloping-line work. In ordinary types the letters are formed on bodies of irregular widths bearing no special proportions to each other; hence, when set up in curved or sloping lines they cannot be justified with the ordinary quads that are used in straight-line work, accordingly the work of setting types of the ordinary construction in curved or sloping lines is very tedious. The object of this invention is to produce, with types in position, curved and serpentine lines by casting the faces of some of the types in different positions on the type bodies and the types of runningwise widths that are multiples in one way and fractions in another of certain units. The invention consists in forming the type bodies according to their faces or letters of runningwise widths that are multiples of a measure of which the width of the body having the narrowest letter represents the unit, the wider type bodies being cast or formed of runningwise widths increasing regularly in eighths, quarters, or other regular multiples of the unit, these widths of the type bodies being also fractions of their bodywise heights.

The Origin of the Guillotine.

The *Journal* has frequently called attention to the SCIENTIFIC AMERICAN, not only as a paper specially devoted to science, but as a weekly newspaper that abounds in what may be styled the cream of interesting general news.

In the SCIENTIFIC AMERICAN of November 5 the following item is published:

"A MEDIEVAL GUILLOTINE."

"The Chapel Bridge, at Lucerne, contains a mediæval painting representing the persecution of the Helvetian Christians under the pagan emperors of Rome. On the right side of the picture a number of Christians are being hurled into a river, perhaps the Reuss. On the left side a very evident guillotine is erected; one Christian lies with his head on the block, and the huge iron is just about to be let drop upon him, while a number of headless bodies lie around with the heads close beside them. It is commonly believed that this decapitating machine was the invention of Dr. Guillotin, a French physician, and member of the National Assembly of 1789. The Lucerne painting was made at a much earlier date."

According to Gibbon, the most severe persecution of the Christians occurred toward the close of the reign of Diocletian, who reigned twenty years, and resigned on 1st May, A.D. 305.

The painting at Lucerne probably refers to the persecutions of this period, when many of the Christians were beheaded; and this would, therefore, appear to be the earliest indication of the guillotine.

In Camden's "Britannia," translated by Edmund Gibson, and published in 1695, a large folio of over 1,200 pages, written by Camden nearly three hundred years ago, and devoted by him to what was then the antiquities of England, on pages 726 and 727, the following interesting description of the guillotine will be found, under the account of Halifax:

"But nothing is more remarkable than their methods of proceeding against Felons; which, in short, was this: That if a Felon was taken within the Liberty with Goods stolen out of the Liberties or Precincts of the Forest of Hardwick, he should, after their Markets or Meeting days within the town of Halifax, next after his apprehension, be taken to the Gibbet there, and have his head cut off from his body. But then the fact must be certain; for he must either be taken *handhabend*, i. e., having his hand in, or being in the very act of stealing; or *backberend*, i. e., having the thing stolen either upon his back, or somewhere about him, without giving any probable account how he came by it; or lastly, *confession'd*, owning that he stole the thing for which he was accused.

"The cause, therefore, must be only theft, and that manner of theft only which is called *furtum manifestum*, grounded upon some of the foresaid evidences. The value of the thing stolen must likewise amount to above 13 d. 6 s. for if the value was found only so much, and no more, by this Custom he should not dye for it.

"He was first brought before the Bailiff of Halifax, who presently summoned the Frithborghers, within several Towns of the Forest; and being found guilty, within a week, was brought to the Scaffold. The Ax was drawn up by a pulley, and fasten'd with a pin to the side of the Scaffold. If it was an horse, an ox, or any other creature, that was stolen; it was brought along with him to the place of execution, and fasten'd to the cord by a pin that stay'd the block. So that when the time of execution came (which was known by the Jurors holding up one of their hands) the Bailiff or his Servant whipping the beast, the pin was plucked out, and execution done. But if it was not done by a beast, then the Bailiff or his Servant cut the rope.

"But the manner of execution will be better apprehended by the following draught of it."

Immediately following there is shown on page 727 a picture which is in itself a curiosity, showing:

"A. A. The Scaffold.

"B. The piece of wood wherein the Ax is fixed.

"C. The Ax.

"D. The Pulley by which the Ax is drawn up.

"E. The Malefactor who lyes to be beheaded.

"F. The pin to which the Rope is ty'd that draws up the Ax."

The foregoing extracts are copied by word, by letter, and punctuation, according to the text, by which it will be noted that the important nouns are spelled with a capital letter; that Ax is spelled both with and without an e at the end; that the word horse has an prefixed; that die is spelled *dye*, and 'd for *ed*, etc.

The title of this imposing and interesting work is "Camden's Britannia, newly translated into English, with large additions and improvements, published by Edmund Gibson, of Queen's College, in Oxford," and this description of the guillotine is one of the "additions" by the translator. The original work was first published in Latin about the year 1580. In twenty years this important work went through six editions, the result of twenty years of personal research in almost every county in England. The translation by Gibson was published in 1595.—*Bueyrus (O.) Journal*.

The Duration of Life.

From a paper read before the Investigators and Physicians, at their Salzburg meeting, by Weismann, the *Chemiker Zeitung* makes the following extracts:

In the first half of his address the speaker endeavored to show that the very great difference in the duration of animal life did not depend solely upon the anatomical and physiological proportions of their bodies (size, complicated structure, early maturity, etc.), but that it depended far more upon the exact accommodation to its conditions of life in the different species, and that in the course of the formation of new species corresponding to changes in the conditions of life it may be lengthened or shortened.

The second half of the paper discussed the manner in which we may suppose such an accommodation to the conditions to exist.

If we inquire what are the mechanical changes which may cause a lengthening or a shortening of the duration of life, it will lead us to one of the most difficult of all physiological problems, namely, what is the reason of death taking place—why must an animal die?

It is well established that in the higher animals the vital processes are combined with a change in the morphological elements of most of the tissues, and it is but natural to seek for a cause of death in a limit to the multiplying power of the cells, which does not, of course, exclude the idea that death may occur much sooner too.

Upon this hypothesis it would follow that there is a certain normal number of cell generations for each species (although varied within wide limits), and that the maximum length of life is governed by this. We do not comprehend why one cell must divide or segment itself ten times, a thousand times, or a hundred thousand times, and then the process should cease. This subdivision and segmentation, from a physiological standpoint, could continue for ever.

It is only by considering it from the utilitarian standpoint, upon the ground of expediency, that we can understand the necessity of death, and the same ground favors the utmost shortening of life. The individual by contact with the outer world around becomes worn and used up, so that it would be indispensable that it be replaced by new and more perfect ones, even if it contained within itself the power of living on for ever.

It does not, however, follow from the expediency of death that internal causes, lying in the very nature of life itself, should be excluded, as, for example, the floating of ice on water is expedient (answering a purpose), but at the same time depends upon its molecular structure.

Still Weismann does not believe that a definite limit has been set upon life simply because it, from its very nature, could not be endless, but that it is limited because the unlimited duration of the individual would be an *inexpedient luxury*, and he considers death to be a phenomenon of accommodation. The power of living for ever has been lost because it was no longer necessary.

Death is not an attribute that belongs to all organisms; there are many of the lower organisms which, although they can be destroyed, are not compelled to die. In the division of the amoeba we cannot call it death, for where is the corpse? Let us suppose an amoeba to possess consciousness; it would then on dividing say to itself: "I have cut off from myself a daughter." I do not doubt that each half would think that the other half was the daughter, and would look upon itself as the original individual.

If, then, death is necessary for the higher animals, why not for the lower? Are they not decimated by their enemies? Do they suffer no defects? Do they not wear out? In the lower organisms there is but one alternative: complete integrity or total destruction; they cannot suffer a normal death because the individual is identical with the propagating cell. In the multicellular organisms there are different kinds of cells, so that death is possible, and we see that it follows.

The kind and quantity of propagation does not depend merely upon the nutrition of the cells, but also upon their specific nature, as seen most distinctly in the phenomenon of inheritance, and it is a necessary sequence of this view, if we look upon death as foreordained, because it is the inherited end of that segmentation process whose beginning was the sulcation. (Cells multiply by subdivision, but before this takes place they become furrowed, or *sulcated*, at the point where division subsequently takes place.)

MECHANICAL INVENTIONS.

Mr. John G. Carnahan, of Oxford, Ind., has patented an improvement in stem-winding watches which is both simple and efficient. The invention relates to that class of stem-winding watches in which the winding and hand-setting mechanism is engaged with the gearing for winding up the mainspring and the gearing for setting the hands by the longitudinal movement of the stem. In the present invention, when it is desired to set the hands, the stem is first drawn out, which causes a collar on the inner end of it to bear on a stud in the shorter arm of a two-armed curved lever and so depress the long arm of the latter, which turns a yoke and disengages the gearing from the mainspring arbor, and connects an independent wheel with the hand-setting train to which motion is imparted by turning the stem. As soon as pulling on the stem ceases the yoke is thrown back to its place by a spring. Normally another wheel, carried by the yoke, meshes with the arbor wheel of the mainspring, and is thus always ready for winding by pressing down upon and turning the stem.

An improved cotton gin has been patented by Mr. Joseph Kopfer, of Amite City, La. In this improved gin the power is applied by band and pulley to the saw shaft, and the brush cylinder which operates in connection with the saw is driven by frictional contact of pulleys fast on the shafts of the saw and brush cylinders. To vary the pressure of these pulleys one upon the other, and to relieve them from contact when required, the bearings of the brush shaft are adjustable by means of a cam lever. This not only provides for wear of the driving surfaces of the two pulleys, but saves much wear by readily permitting of the stoppage of the brush cylinder. Combined with the brush cylinder is a picker to straighten the fibers of cotton passing through the gin. This picker, which is armed with rearwardly-projecting spikes that are swept by the brushes, is driven by band and pulley from the saw shaft, and is partially inclosed by a shield which is constructed so as to present no salient angles to interfere with the brush in its revolving movement.

Messrs. Stillman W. Robinson and Lewis C. Kiser, of Columbus, O., have patented an improved air compressor. The frame of this machine is of triangular form, containing the air receiver within it and having four cylinders arranged at the corners of it, two of which are for air and two for steam, and a single shaft located at the apex of it. This shaft is provided at its opposite ends with cranks, each of which is connected with a pair of cylinders at one end of the compressor, which cranks are arranged to secure equalization of power and resistance. Such arrangement of parts is both compact and efficient. In this arrangement, also, two connecting rods are combined with a single crank by means of a block rigidly connected to one of the rods and turning upon the crank pin, and carrying also the joint pin for the other connecting rod, whereby frictional resistance is reduced. Furthermore, the air cylinder and eduction pipes have combined with them pockets containing the induction and eduction valves and passages, which pockets are made detachable and interchangeable to facilitate repair.

Mr. Christopher Lewis, of Columbus, Ohio, has patented an improved continuous rolling mill. This invention relates to mills for rolling rails, girders, plates, etc., and its object is to permit more rapid working and to reduce the manual labor ordinarily incident thereto. The invention is an improvement in that class of rolling mills in which several pairs of rolls have their alternate pairs arranged to be run in reverse direction to those next adjacent, and in which a laterally adjustable carriage takes the rail and transfers it from one pair of rolls to the next, so that it is passed through one pair of rolls in one direction and is returned through the next pair of rolls in the reverse direction. The invention contemplates the taking of a piece of steel from the furnace in the shape of a bloom and entering it between the first pair of rolls, whence it proceeds on through the machine without handling and comes out a perfect rail; and to this end the improvement consists in combining the series of rolls whose alternate pairs have a reversed movement with a set of carriages of constantly increasing length, a set of tracks for carrying them from the line of one pair of rolls to the next, and a corresponding set of piston rods and steam cylinders grouped together at one side of the machine, which piston rods connect with the carriages to shift them at the will of the engineer in charge. The invention also comprises means for causing the ingot or unfinished rail to be fed forward to the rolls after the carriages bring them successively into line with the rolls; and also means for turning over the article being rolled to suit the different positions in which it may be required to be passed through the rolls.

Mr. James A. Bonsack, of Bonsack's, Va., has patented an improved cigarette machine. This invention is an improvement upon a previously patented machine by the same party, and which comprised a combination of a concave with suitably covered rollers, and also a reciprocating belt for distributing and spreading the tobacco for a uniform and homogeneous feed, also a peculiar tapering tube having an endless belt passing through it for receiving the tobacco and causing it to be curled up longitudinally to form a filler, likewise a second endless belt, that carried the filler and a strip of paper through another tube that wrapped the paper around the filler and held it while being pasted. The present invention consists in a combination with a toothed distributing roller and a double concave, of a toothed roller at the entering side of the concave, for co-operation with

the latter, to feed the stock to the distributing roller and prevent it from piling up on the outside. It also comprises a brush at the delivery end of the spreading belt and its reciprocating frame, for preventing the adhesion of tobacco to said belt; likewise a toothed belt operating in combination with toothed and plain rollers, to prevent piling; also a pressing roller for forcing the tobacco down between the teeth of the belt before passing beneath the concave; and a trough-like device for forming a continuous filler, composed of three endless belts and a pressing contrivance, backing strips applied to said belts, and pulleys for distending the latter. The invention also includes a holder for the cigarette and means for projecting said holder and the cigarette during the operation of cutting the latter.

Mr. John H. Munson, of New York city, has patented an improvement in button-hole sewing machines. The object of this invention is twofold, namely, first, to avoid the inconvenience and expense of the breaking of the friction spring which bears on the carrier plate of a button hole sewing machine, to hold said plate steady during the movement of it, which breakage has been due to the gradually increasing pressure as the work advances; and, secondly, to apply the requisite friction to the carrier plate before the sewing commences, and thereby avoid that unsteadiness of the carrier plate and irregularity of the sewing at the commencement of the button-hole, which takes place when the friction spring is fitted so that it does not touch the carrier plate till after the sewing has commenced. To these ends the invention consists in a friction arm pivoted to the bed plate, and bearing at its free end on the sliding carrier plate, by the action of a spiral spring contained in a socket that is fixed on the bed plate. This arm is so arranged that it bears on the carrier plate in a direction at right angles to the first or straight movement of said plate, so that the spring acts before the sewing commences. Said spring is arranged around a pin pivoted to the under side of the friction arm, and is held between a flange on the pin and the bottom of the hole in the socket. By this construction the required pressure can be obtained without risk of breakage, and the proper working of the machine is facilitated.

Live Millers.

The title chosen for this article is an American phrase, but not the less expressive on that account. We have certainly no desire to aid in the Americanizing of our institutions or our language, but we should be very happy if, to any extent, we could be instrumental in infusing into the minds of the millers of the United Kingdom some portion, and the more the better, of that energy which the Americans inherit from ourselves, and which, greatly to their credit, they have improved upon. The phrase is used by our brethren across the Atlantic not as expressive of vitality in the ordinary physical sense, but as indicative of the possession of a keen sensitiveness to all the influences which affect the trade with which they are identified, and a lively appreciation of the varied circumstances which, at any and all times, go to the promotion of its interests, or which may militate against them. That all the American millers are "live" in the specific sense referred to cannot, we suspect, be affirmed, for "Sleepy Hollows" still exist in that favored region of the world, just as they did when poor, simple, henpecked, ne'er-do-wellish Rip Van Winkle took that memorable "nap" of his. There are, however, a very large and constantly increasing number of millers in the United States who are "live" in the strictest sense of the term as the Americans use it.

To how many of those in the United Kingdom can it be applied in a sense equally strict? We are happy to think that their number is large, and that within the last few years their liveliness has been getting more robust, while their numbers have been gradually increasing. There are indeed few millers in the country who are not "live" in the sense of looking after what they conceive to be their true interests. They strive to get the best price they can for their flour, and to obtain the raw material of their manufacture in the cheapest possible markets. They entertain thoroughly orthodox views on forward sales and long credits, although, after the manner of human nature generally, their practice in these particulars occasionally gets the better of their theoretical principles, much to their loss. They have a virtuous horror at anything savoring of laxity in the due return of sacks, and in commercial matters they have the fullest assurance that they know how many beans make five.

To be a thoroughly "live" miller in the present day, when forces have to be contended with which up to within a few years were, if not actually non-existent, so quiescent as not to disturb the steady current of the trade, requires the possession of other and higher attainments than those necessary to shield the members of the trade from the pitfalls of forward sales, long credits, and sack keepers. To be thoroughly "live," a miller at the present time must have the fullest appreciation of the changes which have taken place in the circumstances and conditions of the trade, not merely in his own country, but in every country where milling ranks as a chief industry. The history of our cotton manufactures shows how fortunes were made, and the wealth of the country increased by the skill of our manufacturers and operatives in utilizing the raw material of the Southern States of America, and selling the manufactured products to Americans and other nations. It is not at all likely that our millers will attempt to do with wheat what our Lancashire mill-owners did so successfully with cotton; but it need not be

said that it is necessary that they should keep themselves thoroughly *au courant* with reference not only to the price of wheat in the various wheat-growing regions of the world, but with the conditions under which it is cultivated, the natural enemies with which it has to contend during its growth, the average surplus of the material which the different countries have at their disposal for export, the facilities which exist for its transportation to our markets, and the rates at which transport can be effected.

The "live" miller must be a diligent reader, in order that his mind may be stored with facts bearing upon his trade in all its departments. Reading is, in a very special sense, the bread which sustains his vitality in a trade aspect, and if it is not systematic and sustained, but by fits and starts, to fill up an unoccupied hour or pass an evening which hangs heavy on his hands, his vitality will suffer.

In order fairly to appreciate the changes which have been effected on the circumstances and conditions of his trade, the miller to be really "live" must have recourse to reading, because, as a rule, he cannot devote the time which would be necessary to acquire the requisite knowledge at first hand. Even supposing this could be done, he would require to be constantly on the move to keep his information abreast of the progress which is now going on with such rapid strides that the novelty of this year stands a great chance of being obsolete next. Books, and more especially the journals devoted to his trade, which photograph every step of the progressive march, are his towers of observation, from which, without leaving the precincts of his study, and incurring the expense, the fatigue, and the dangers incident to long and frequently repeated journeys, he can scan the entire field of milling practice and ascertain how and in what respects that of his foreign rivals differs from his own. Possessed of this knowledge, the "live" miller feels his vitality quickened, and as he studies the means used by his rivals for the purpose of securing the results they severally desiderate, he becomes conscious of an accession of energy which enables him to adopt measures of combating their rivalry with, at all events, a fair certainty of success.

The motto of "live" millers is "Never say die." They feel that what is possible for others can always, at the very least, be attempted by themselves. If they become convinced that they have been pursuing a wrong course, they console themselves with the comforting proverb, "It is never too late to mend." If wrong, they had, up to the other day, the entire trade for company, and being readers, they know at what precise point they discovered that a new path had been opened up, which was declared to be the only right and safe one, and they have sufficient data to enable them to decide, with some approximation to correctness, what degree of truth there is in the allegation. It is the "live" miller only who has the wisdom to know when he is wrong and the courage to take the requisite steps to put himself right, if he possibly can.

Although "it is never too late to mend," he does not defer the reformatory effort a moment after he is convinced that amendment is indispensable. He may—for is he not human?—have a lingering affection for the path he has traveled in so long, and with much comfort and profit to himself, just as one has an affection for the old suit of clothes, which has almost become part of one's self, rather than for brand-new garments, which suggest no higher or more tender ideas than the tailor and the tailor's bill; but he screws his "courage to the sticking place," and discards the well-worn paths, just as he lays aside—perhaps with the sentimental tribute of a sigh—the well-worn garments. He cannot afford to gratify prepossessions which tug at his heart to the detriment of his purse, and although the music of the mill stones may be sweet to his ears, he throws them aside the moment his commercial sense is convinced that rollers or dismembrators are means for the production of flour for which there will be a larger demand and a higher price than for that produced by mill-stones.

"Live millers," so far as trade matters are concerned, obey the dictates of science rather than those of sentiment. For them the age of faith is no longer existent, and however positive may be the dogma and venerable the dogmatist, they insist on the subjection of both to the crucial test of investigation. They object to nothing merely because it is new, and they discard nothing because it is old. "What can it do?" is their question to anything recommended for their acceptance, and if the answer is demonstrably satisfactory, acceptance is the result. They are pre-eminently anti-rule-of-thumb men, but they are equally impatient of scientific theories until they have been proved to harmonize with sound and profitable practice. They have no objection to spend money in trying experiments if these give *prima facie* promise of success, but they have a very decided exception to "leaps in the dark," which in most cases result in loss of time and loss of cash, a double waste for which there is no recompense. "Live millers," in fact, are men of sense as well as men of science, who take a pride in their trade, not only as it is the method of making, if not in all cases fortunes for them, but fair competences; they also take a pride in it as a means of bringing the higher powers of their mind into that healthy play which yields the highest form of enjoyment which reasonable men can desire. They no doubt regard their mills as money-making shops, but they also contemplate them in another aspect, viz., as establishments in which processes are carried forward related to the manufacture of a material which constitutes the most important factor in the alimentation of civilized mankind.—*London Miller.*

Business and Personal.

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

Interesting to Manufacturers and Others.—The world-wide reputation of Asbestos Steam Pipe and Boiler Coverings, Roofing, etc., has induced unscrupulous persons to sell and apply worthless articles, representing them as being made of Asbestos. The use of Asbestos in these and other materials for structural and mechanical purposes is patented, and the genuine are manufactured only by the H. W. Johns Manufacturing Co., 87 Maiden Lane, New York. This Company have recently perfected certain processes whereby they produce Asbestos Millboards, Sheathing, and Paper of a quality superior to any ever before produced. The Asbestos Millboard is well known by engineers throughout the world as being the only indestructible material for forming gaskets for "manhole plates," cylinder heads, etc. Thin Asbestos Sheathing is rapidly coming into use for rendering wooden buildings, partitions, floors, etc., fire-proof. They have also perfected the manufacture of an improved Steam Packing composed entirely of Asbestos in all sizes, from that of lamp wick to a rope of two and a half inches in diameter, which is rapidly superseding all other kinds of steam packing. This Company are also the sole manufacturers of the genuine Asbestos Liquid Paints, which not only command the highest price of any paints in this country, but are also shipped abroad in large quantities. Their descriptive catalogue is full of interesting matter pertaining to the various uses of the wonderful mineral Asbestos.

The Hollowware Cleaner Company, of Harvey, New Brunswick, are making an ingenious Cleaner for Lamp Chimneys, etc. It consists of a spear-shaped rubber bag mounted on a handle. It inflates with air after introduction within the chimney, and cleans every part thoroughly and quickly.

For Sale.—Patent of a simple and durable Plaiting Machine, making automatically and rapidly side space and box plaiting in all kinds of material. W. H. Bramhall, 128 Chambers St., New York.

Transits and Levels, second-hand, wanted. Send size, and name of maker, to Keuffel & Esser, New York. Lightning Screw Plates and Labor-saving Tools, p. 380.

The Car Revolver, advertised in another column, is offered on very favorable terms; only \$2.75, gold mounted.

\$300 cash for ent. pat. of Egg Beater. See illus. Sci. Amer., vol. xiii., page 115.

Pure Grain Nickel, Rolled and Cast Anodes, Nickel Salts. Greene, Tweed & Co., 118 Chambers St., New York.

For Sale.—A Engine Lathe, Fitchburg, 7½ ft. x 15 in.; price, \$33. 1 Iron Planer, planes 7½ ft. x 34 in. x 30 in.; price, \$30. Address Concord Axle Co., Fisherville, N. H.

Workshop Receipts.—A reliable Handbook for Manufacturers and Mechanics. \$2, mail free. Ornamental Penman and Signwriter's Pocketbook of Alphabets, 20 cents. E. & F. N. Spon, 446 Broome St., New York.

For Sale.—Patent on Ice Machines. W. J. Lyons, Decher, Tenn.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N. J.

Mailed free. Catalogue of Books for Engineers. Theoretical and Practical. E. & F. N. Spon, 446 Broome St., New York.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Telegraphic, Electrical, and Telephone Supplies, Telegraph Instruments, Electric Bells, Batteries, Magnets, Wires, Carbons, Zincs, and Electrical Materials of every description. Illustrated catalogue and price list, 72 pages, free to any address. J. H. Bunnell & Co., 112 Liberty St., N. Y.

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O. Abbe Bolt Forging Machines and Palmer Power Hammer a specialty. S. C. Forsaith & Co., Manchester, N. H. Foot Lathes, Fret Saws, &c. 90 pp. E. Brown, Lowell, Mass.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Punching Presses & Shears for Metal-workers, Power Drill Presses, all sizes. Power and Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 Liberty St., N. Y.

Pure Oak Leather Belting. C. W. Army & Son, Manufacturers, Philadelphia. Correspondence solicited.

The Best constructed low priced Engines are built by E. E. Roberts, 157 Liberty St., New York. Communicate.

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

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 348.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

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

The New Lace Cutter saves cut on each side. Leather cut. Sample by mail, 50 cts. Greene, Tweed & Co., N. Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsburg, Pa.

Best Oak Tanned Leather Belting, Wm. F. Forepaugh, Jr., & Bros., 231 Jefferson St., Philadelphia, Pa.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Improved Skinner Portable Engines. Erie, Pa.

Learn Telegraphy. Outfit complete, \$4.50. Catalogue free. J. H. Bunnell & Co., 112 Liberty St., N. Y.

List 27.—Description of 3,000 new and second-hand Machines, now ready for distribution. Send stamp for same. S. C. Forsaith & Co., Manchester, N. H., and N. Y. city.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad., p. 349.

Safety Boilers. See Harrison Boiler Works adv., p. 349.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co., Box 421, Fotterville, Pa. See p. 348.

Ajax Metals for Locomotive Boxes, Journal Bearings, etc. Sold in ingots or castings. See adv., p. 365.

The Sweetland Chuck. See illus. adv., p. 366.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Solomon's Parallel Vice, Taylor, Stiles & Co., Riegelsville, N. J. Skinner's Chuck. Universal, and Eccentric. See p. 365.

For Machinists' Tools, see Whitcomb's adv., p. 366.

Peerless Colors for Mortar. French, Richards & Co., 410 Callowhill St., Philadelphia, Pa.

The Twin Rotary Pump. See adv., p. 350.

Millstone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 61 Nassau street, New York.

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

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Telegraph, Telephone, Elec. Light Supplies. See p. 380.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa. Gould & Eberhardt's Machinists' Tools. See adv., p. 382.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. J. S. Graves & Son, Rochester, N. Y. The Medart Pat. Wrought Rim Pulley. See adv., p. 382.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 381.

Centrifugal Pumps, 100 to 35,000 gals. per min. See p. 381.

Pays well on small investment.—Stereopticons, Magic Lanterns, and Views illustrating every subject for public exhibitions. Lanterns for colleges, Sunday schools, and home amusement. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., N. Y. Barrel, Key, Hoghead, Stave Mach'y. See adv., p. 381.

Sewing Machines and Gun Machinery in Variety. The Pratt & Whitney Co., Hartford, Conn.

Portable Power Drills. See Stow Shaft adv., p. 380.

For best low price Planer and Match, and latest improved Sash, Door, and Blind Machinery, send for catalogue to Rowley & Hermance, Williamsport, Pa.

Draughtsman's Sensitive Paper, T. H. McCollin, Phila., Pa.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Av., Phila. P. See Bentel, Margedant & Co.'s adv., page 382.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 382.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 381. Totten & Co., Pittsburg.

Electric Lights.—Thomson Houston System of the Arc type. Estimates given and contracts made. 631 Arch, Phil. 4 to 40 H. P. Steam Engines. See adv., p. 382.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from \$1 to \$5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) G. D. wants to know what is meant by the term 10 lines, 16 lines, 17 lines, etc., used in connection with watches and telescopes? A line is one-twelfth of an inch, and is usually employed in measuring the diameter of lenses, watch glasses, etc.

(2) W. and D. ask: How will it be best for us to attach two engines of unequal size to a counter shaft, each to have only its share of the load at varying strain, such as saw mill work? The engines are 7x10 and 8x12; each has its own boiler and will carry different pressures of steam—say 80 and 100 lb. steam pressure. A. All that is necessary in this case is to proportion the driven pulleys so that when the shaft to which they are attached revolves at its regular rate, the driven pulleys will have the same peripheral speed as their respective driving wheels when running at their normal rate.

(3) L. D. S., of Ill., says: I have just put an iron force pump in a well, on a galvanized iron pipe. Was recommended to use the galvanized iron, so as to prevent the iron from rusting and giving a taste to the water. Now I am told by parties who appear to have some knowledge on the subject, that the galvanized iron is poisonous. Will you be kind enough to give your advice on the subject through the SCIENTIFIC AMERICAN? What kind of a stock or pipe would you attach to an iron force pump? A. The safest pipes are those of plain iron. Galvanized iron pipes should not be used for conducting drinking water, as the zinc dissolves and the water containing it is poisonous. We have heretofore published accounts of fatal results from the use of such galvanized iron pipes in the vicinity of Boston, Mass. In the case of our correspondent perhaps the length of his pump pipe is so small that bad

results would not ensue, provided care is taken not to use the water that has been standing for any length of time in the pipe.

(4) R. E. E. asks: How can a round stick, 1 inch in diameter, 3 feet 7 inches long, be bent on a circle the diameter of which is 38 inches? We have tried to bend them of ash, but one-third breaks in bending. We want to make them of beech and birch. Can you inform us how we may bend them without breaking? A. Submit the wood to the action of boiling water for twelve hours, then bend over a suitable form, and clamp in position until dry.

(5) J. A. P. asks: 1. Is there any cheap mode of roughing iron or steel so as to make its surface resemble that of very fine emery paper? A. It may be done by etching, by first stippling the surface with wax or some other protective coating. A sand blast would probably be cheaper if the steel were required in any quantities. 2. In what way can I coat a metal rod with rubber? A. Dip it in a solution of rubber in bisulphide of carbon, or wrap with raw rubber, and vulcanize. You can also do it by coating the rod with cement and drawing over it rubber tubing.

(6) B. T. H. asks: Is the quantity or intensity current required to work a telegraph line with metallic circuit of 600 feet in length, with two instruments? A. It depends upon the resistance of the magnets of the instruments. If they are of low resistance use a quantity current.

(7) W. W. asks: Does any action on the zinc in the gravity battery take place when the circuit is broken? A. Yes; there is more or less local action.

(8) W. M. asks: Can you give a good receipt for a cement to glue cloth to wood? I want to put a new cloth on my library table. A. See Cements, page 2510, SUPPLEMENT No. 158.

(9) J. W. J. writes: In preparing a Faure secondary battery, should the red lead be allowed to dry before the strips are rolled into a coil? A. No.

(10) S. L. G. asks: 1. How many feet of pipe, twelve feet long and two inches inside diameter, will be required to obtain eight horse power, the water to be in the pipe and the pipes in the flame? A. If pipes are twelve feet long, you will require twenty-four pipes. 2. How thick should the pipes be to allow a margin of 50 per cent for safety? A. Ordinary lap-welded water and steam pipes are amply strong. 3. I want the pipes to be horizontal. Would bridges be necessary to prevent sagging. A. If horizontal they should have a central support; but placed horizontal the steam formed cannot readily escape, and if the heat is strong there will be risk of burning the pipes. 4. At what temperature does water boil in half an atmosphere? A. 180° Fahrenheit.

(11) J. B. H. says: I have some plaster casts of jaws and teeth which I wish to duplicate. It is very difficult to do this in plaster. Is there not some elastic gelatine compound which will take the shape and pull off, which will answer as a matrix? A. Gelatine moulds are prepared from glue and glycerine. Digest good glue over night in just enough cold water to cover it, and dissolve this by aid of heat over a salt water bath in a quantity of concentrated glycerine equal to that of glue taken. Continue the heating for half an hour, then pour into pattern. The outside of these moulds may be rendered non-absorbent of water by dipping them in solution of one ounce bichromate of potash in one pint of water, and exposing for half an hour to strong sunlight.

(12) D. R. writes: I heat my office with live steam from the boiler, and have to carry it some fifty feet or more in pipes overhead through a part of the mill where heat is not needed, and where the air is very cold owing to the outside doors being more or less open all day, and I find the steam condenses a great deal in passing through this cold room. I want something to cover them with that will prevent a considerable loss of this condensing. I want something that I can mix up and put on myself. Would common clay, put in a wooden box, answer? A. Perfectly dry sand may be employed advantageously in the way you suggest. Coal ashes answer very well.

(13) C. H. W. asks: What would be the effect of forcing a succession of charges, one at a time, into the cylinder of any of the different forms of explosive engines (as the Otto gas engine or the Brayton oil vapor engine), and exploding each charge by itself and preventing any escape of the gases resulting from the explosion? 1. Would the pressure accumulate and prevent the explosion of the charge? A. The pressure would have little effect upon the explosibility of the charge under the circumstances. 2. Would the pressure increase and cause the gases resulting from the explosion to condense? A. The gases produced would condense.

(14) J. K. writes: I send this day some specimens of ore. Please state in SCIENTIFIC AMERICAN what minerals they contain, if any, and whether they are worth an assay, and also what minerals such looking stone indicates? A. A calcareous trap rock; contains no minerals of value.

(15) T. and H. ask: Can you give me a receipt for a cement for securing rubber to cast or malleable iron that will stick hard, also that can be washed in hot water without injury? A. Try the following: Melt together in an iron pot equal parts of gutta percha and shellac. Apply hot. See other receipts on page 2510, SUPPLEMENT No. 158.

(16) H. W. B. writes: In your issue of November 19, you give an article on poison. A friend and I, to decide a dispute, are anxious to ascertain the shortest time that twenty grains of cyanide of potassium will kill a person in—that is to say, how soon he will be absolutely dead. A. Under ordinary circumstances insensibility and death would probably take place within ten minutes after the poison had been swallowed. The action of the poison is rarely delayed more than a few minutes.

(17) R. M. says: In this week's Notes and Queries (No. 25), E. J. D. wants to know if hot water will kill the scale bug on his orchard trees. If he will

get linseed oil (boiled) and paint it over the trunks and the larger limbs, and as much as convenient on the smaller branches, he will effectually kill this pest and do the tree much good besides.

(18) E. M. says: Referring to your answer to E. M. (3), page 330, current volume (receipt for liquid shoe polish), it should read 1½ lb. of shellac instead of ounces. I have tried it, and found that with this quantity (1½ lb.) of shellac it makes an excellent dressing for shoes, and looks well on iron if the latter is not liable to be too strongly heated. It will not stand freezing.

(19) F. R. G. asks: 1. What is the size of the induction coils used in connection with the telephone? A. In the Blake transmitter the coil is about 2½ inches long, 1¼ inches diameter, with a ½ core, consisting of a bundle of fine wires. The primary wire consists of four layers of No. 24 wire. The spool is filled with No. 36 wire. 2. What sizes of wire are generally used? A. In the Edison transmitter the coil is much larger, being about 4½ inches long, 1¼ inches diameter, with a 1¼ inch core of fine iron wires. The primary consists of four layers No. 18 wire, the secondary is of No. 34 or No. 36 wire.

(20) A. G. asks: How is japper's gold size prepared? A. One gallon of linseed oil is boiled in a capacious pot for two hours; eleven ounces each of dry red lead and litharge and five ounces of copperas is then gradually sifted in while the oil is kept hot and constantly stirred from the bottom up. When the oil has been boiling about three hours, and the driers are all in, add two pounds of gum anime, previously fused and mixed with three and a half pints of raw oil, and continue the heating and stirring for about five hours, or until it hangs in strings from the ladle yet drops in lumps. Let the contents of the pot cool down somewhat, then mix it with three gallons of oil of turpentine (away from any flame or fire). This gold size ought to dry in fifteen minutes or less under favorable conditions. It improves by keeping when properly prepared.

(21) W. H. H. asks: By what process are the plumes of pampas grass colored the various colors? A. The aniline or coal tar dyes are employed for this purpose. Use a hot dilute solution in water (or water and spirit) of the appropriate color. A bath of tannin in water before dyeing renders the substance more easily and perfectly colorable. For red or reddish shades an after-bath of chloride of tin is frequently employed to bring out the color.

(22) S. H. asks: How much copper steam pipe surface is required to evaporate 2,400 pounds of saturated salt water per hour? A. About one thousand cubic feet of surface, with steam at 25 pounds pressure.

(23) E. T. S. asks: What will remove the ink put on the page of a book by a rubber hand stamp four years ago? It is both blue and red, and is an aniline ink. I have tried sulphuric, nitric, muriatic, acetic, oxalic, tartaric, and citric acids, and they are no go. A. Try the following: Digest half a pint of water with three-quarters of a pound of fresh chloride of lime (bleaching powder) for several hours; then draw off the clear liquid and mix it with about one-fourth its volume of strong acetic acid. The solution can not be kept for any length of time.

(24) J. S. W. asks: What kind of sizing will hold gold bronze on paper and Bristol board so the bronze will not rub off? A. Bronzing gold size is japper's gold size (see answer to A. G.), kept till very bright and tough from age, and then mixed with a little (about 10 per cent) of very old carriage varnish.

(25) J. P. M. says: We draw our water supply for our boilers from the river, and the water has oils and acids mixed in it from the mills up stream. Can you suggest any way to obtain relief from the oil or the acids? A. You might draw your water into tanks, let it settle for a few hours after filling them tap twelve inches above the bottom of the tanks, letting the water pass slowly through a barrel filled with coarse and fine gravel and limestone or marble, the water passing in at the bottom and flowing out of the top of the filter.

(26) F. M. writes: Will you please be good enough to decide the following question: Which has the most power: an engine 12x30, or an engine 11x24, steam 80 lb., other things being the same in both; the piston running the same number of feet per minute on each? A. The difference in useful power yielded by a 12 inch by 24 inch, and that by a 12 inch by 30 inch steam engine, each making the same piston speed, using steam at the same initial temperature, pressure, and saturation, and expanding (including ports and clearances) in the same ratio, will not be perceptible in practice. Experiments have been made that indicated a gain in short stroke engines, on account of less cylinder condensation; but it is probable that only the most careful experiments, following great exactness in construction of ports, clearances, and cut-off, would make the gain perceptible in this case.

(27) J. H. R. asks (1) how to change the specific gravity or degrees of density of sulphuric acid. For instance, I have sulphuric acid of 50°, how can I change it to acid of 60°? A. The only practical way to concentrate sulphuric acid is by evaporating off the excess of water over a fire. Vessels of platinum and lead are used to hold the hot acid. Where small quantities of the acid are to be concentrated glass vessels may be employed. 2. Will the same hydrometer do for sulphuric as for nitric or muriatic acid? A. Yes. 3. How is potash crystallized? A. Evaporate the aqueous solution to complete dryness over a water or sand bath; then heat the mass to fusion in a clean iron pan over the fire, cover it securely, and let it cool slowly. 4. Will not wrought iron answer as well as cast iron for field magnets of a dynamo electric machine? A. Yes.

(28) J. T. C. says: I have tried to make the phosphorescent paint noticed in SUPPLEMENT of January 18, 1879, but after repeated trials have had no success, and do not know to what to ascribe my failures. Can you give me any additional particulars? A. See Phosphorescent Substances, page 53, vol. xiv. 2. I have used strontium chloride instead of strontium carbonate.

Will that make any material difference? A. Strontium chloride is not suitable for the purpose; use the carbonate.

(29) A. S. P. writes: Please answer through SCIENTIFIC AMERICAN what is the best method of washing white zinc paint, soap, or borax, or what? A. Use a moderately stiff brush, and a weak hot solution of sal-soda followed immediately by plenty of cold water.

(30) E. E. M. asks: 1. Will you please give me a recipe for making a good indelible ink to be used with a pen? A. Dissolve asphaltum in any essential oil and color with old printer's ink and a little lamp black. A little benzole will give the ink greater fluidity. 2. Is osmium or any other metal infusible? If not, at what temperature does it fuse? A. Osmium can be fused by means of the oxyhydrogen blow pipe or electric arc, but under such conditions the liquid volatilizes as rapidly as formed, so that it can hardly be said to liquefy. Osmium is the most refractory of metals. The point of liquefaction (or volatilization) has never been accurately determined. 3. What is its specific gravity? A. In the black pulverulent state its specific gravity is about 10; but when heated to the fusing point of rhodium it acquires a density of 21.4—at a still higher temperature it volatilizes. 4. Who was the discoverer of nitrogen and whence its name? A. N (nitrogen) was discovered by Rutherford in 1772. The name was derived from niter, of which it is an essential constituent.

(31) W. F. E. asks: What are the ingredients required to make a good durable waterproof liquid stove polish. I have seen some such polish, and wish to know how it is made. I want a polish that will not burn off and give an offensive smell at the first fire, and should a sample stove be out in a shower the polish ought to resist the action of the water. A. You can try the following: Purified black lead (graphite) reduced to a very fine powder, one pound; per chloride of iron, half an ounce. Moisten with just enough water to form a stiff paste, and mix intimately by trituration in a mortar, and gradually add water sufficient to reduce the paste to a liquid. Shake before using.

(32) W. C. B. asks: Can you furnish me with any process or formula for bleaching and deodorizing dark or off colors of tallow and grease? A. The following treatment is recommended: Briskly agitate the fused grease with about three per cent of sulphuric acid and two per cent of a saturated aqueous solution of bisulphite of soda. Then run the mixture into a deep narrow cylindrical vessel, and agitate the whole violently by dry steam injected in small quantity at the bottom, for half an hour or more. Run off, let cool slowly, and while still fluid draw off the clear portion—without disturbing any sediment. Agitate again by injected steam with about twenty per cent of water and let stand to separate and harden.

(33) E. S. R. asks: What is the preparation used for silver plating spoons and table ware, etc., and where can it be procured? A. See Electro-Silver Deposits, page 81, vol. xlv., and column of Business and Personal.

(34) C. B. asks: Can you tell me where I can find practical information on gilding and electroplating? A. You will find a comprehensive paper on the subject of electroplating and gilding in SCIENTIFIC AMERICAN SUPPLEMENT, No. 310.

(35) W. A. M. asks: How can I print in gold or silver letters on black cotton tape? A. Use printer's gold size with the type (see answer to other correspondent on this subject), and, when partly dry, dust the printed parts with gold bronze.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

L. W. D. P.—1. The clay is quite impure, but if burned would probably make good soft brick. 2. Marmolite, with a little calcite—no commercial value. 3. Schistose rock carrying a little copper carbonate.—S. M. C.—They are crystals of quartz—not precious stones but sometimes when very clear and well formed marketable in small lots.—J. R. E.—Syenitic rock bearing red hematite iron ore.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

November 15, 1881.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866, but at increased cost, as the specifications not being printed, must be copied by hand.

Adding machine, P. C. Forrester..... 249,606
Ash chute for buildings, G. A. Fisher..... 249,604
Axle and axle box, P. K. Hughes..... 249,778
Axle box, car, S. A. Bemis (r)..... 9,925
Balls, die for forming, A. R. Byrket..... 249,683
Basin, lavatory, C. E. Robinson..... 249,549
Battery, See Galvanic battery. Voltaic battery.
Bedstead, E. M. Brown..... 249,454
Bedstead frame, C. E. Hamus..... 249,481
Bench dog, C. P. Whitman..... 249,563
Bicycle, F. W. Bacon..... 249,447
Billiard table, W. G. Morse..... 249,541
Boat, J. Dean..... 249,461
Boiler, See Steam boiler.
Boiler pedestal, G. Beck..... 249,722
Boiler tube joint, J. A. Reed..... 249,546

Boat and shoe sole burnishing machine, C. H. Trask..... 249,698
Boat and shoe sole pricking machine, J. E. Wiggin..... 249,713
Boat and shoe upper protector, Glazier & Tayte..... 249,610
Boots and shoes, manufacture of, M. M. Hally..... 249,467
Bottle, pepper, H. J. White..... 249,562
Box, See Fruit and berry box.
Boxes, slate frames, etc., bent corner for, C. J. Higgins..... 249,468
Bracket, See Dental bracket.
Brake, See Car brake.
Buckets and other vessels, cover for sap, C. D. Reynolds..... 249,673
Buckle, Drury & Van Camp..... 249,510
Buckle and loop, harness, M. W. Lynch..... 249,647
Buckle, breeching, F. E. Droll..... 249,597
Buggy top, S. N. Lennon..... 249,535
Buildings, construction of, J. B. Love..... 249,545
Burner, See Vapor burner.
Butter package, E. Hayward..... 249,619
Button or stud, N. Nelson (r)..... 9,931
Button, sleeve, C. M. Underwood..... 249,559
Buttons, apparatus for trimming the circumferential edges of, Kennedy & Dism..... 249,635
Calculator, mechanical, G. F. Houck..... 249,621
Can, See Shipping can.
Can jacket, C. Riessner..... 249,674
Cant hook, A. Sanford..... 249,682
Car brake, B. Cade..... 249,584
Car brake, Sampson & Schoonover..... 249,486
Car coupling, S. A. V. Hartwell..... 249,616
Car coupling, J. B. & H. H. McCartney..... 249,653
Car coupling, Phillips & Cox..... 249,597
Car coupling, J. W. Thomson..... 249,605
Car coupling, G. W. Whittington..... 249,712
Car coupling, automatic, M. R. Hubbell..... 249,626
Car ventilation, passenger, T. P. Kinsey..... 249,533
Carriage, baby, J. L. Finn..... 249,512
Carriage spring, G. B. Salade..... 249,680
Carriage steps, forming, W. W. Knowles (r)..... 9,929
Carriage top, child's, J. A. Crandall..... 249,592
Carrier, See Trace carrier.
Cartridge loading implement, F. G. Farnham..... 249,464
Chair, See Swinging chair.
Chandelier, extension, J. T. Bruen..... 249,500
Check hook, C. B. Payne (r)..... 9,932
Churn, A. P. Frederiek..... 249,515
Cigar and pipe lighter, C. A. Haskins..... 249,520
Cigarette machine, C. Boyce..... 249,452
Clamp, See Door and sash clamp. Sash cord clamp.
Cleaner, See Knife cleaner.
Clock, I. Lofda..... 249,537
Clock, calendar, B. B. Lewis..... 249,536
Clock, electric, C. E. Trask..... 249,699
Clothes drier, Ellis & Pierce..... 249,511
Clutch for converting motion, J. W. Ross..... 249,485
Coffee mill, J. Deibel..... 249,507
Coffee pot, R. S. Wilson..... 249,565
Coke furnace and apparatus connected therewith, R. Thomas..... 249,694
Compressible cast metal pipe, J. A. Reed..... 249,547
Cop winder, C. F. Ritebel..... 249,481
Corset, J. Hilborn..... 249,524
Corset stay, C. A. Williamson..... 249,564
Cot, folding, C. L. Ames..... 249,444
Coupling, See Car coupling. Thill coupling.
Crank handle, C. T. Wright..... 249,720
Crate, See Poultry crate.
Cultivator, E. L. Walker..... 249,702
Cut-off mechanism, M. Jacker..... 249,630
Cutter, See Vegetable and plant cutter.
Cylindrical power, automatic, T. E. Hutchinson..... 249,629
Damp, stovepipe, J. H. Goodfellow..... 249,516
Dead centers, device for overcoming, M. S. Weller..... 249,492
Dental bracket, J. D. Clark..... 249,587
Diamond cutting machine, A. Hessels..... 249,523
Diamonds in metallic plates for stone saws, securing, Lucas & Keys..... 249,646
Digger, See Potato digger.
Direct acting engine, A. H. Wagner..... 249,491
Door and sash clamp, A. W. Ale..... 249,568
Draught regulator, White & Cornwell..... 249,711
Drier, See Clothes drier. Feed drier.
Dropper, See Seed and fertilizer dropper.
Drywood, etc., apparatus for drying spent, H. C. F. Störmer..... 249,688
Eaves trough hanger, N. H. Long..... 249,539
Electric circuits, switch board for, F. Blake..... 249,574
Electric light, C. E. Ball..... 249,496
Electric machine, dynamo, C. P. Jürgensen..... 249,694
Electric machine, dynamo, F. Von Hefner-Altenek..... 249,485
Electric machine, dynamo, A. Wirsching..... 249,716
Electric pad, J. L. Rowe..... 249,550
Electric wires, metallic lock clip for joining, Shaw & Pumphrey..... 249,684
Elevator, See Sawdust elevator.
Engines, See Direct acting engine. Rotary engine. Steam engine. Traction engine.
Evaporator, See Fruit evaporator.
Explosive compound, T. Varney..... 249,701
Explosive compound, C. W. Volney..... 249,490
Eyeglass spring, G. W. Phenix..... 249,666
Eyelet, A. Delkescamp..... 249,593
Faucet, self-closing, Boyle & Huber..... 249,579
Feed drier, E. Roat..... 249,577
Fence, T. G. Brooks..... 249,453
Fence, barbed, D. Hepp..... 249,522
Fence wire stretcher, E. M. Crandal (r)..... 9,926
File, bill, C. M. Tyler..... 249,700
Firearm, breech-loading, D. B. Duncan..... 249,568
Fire extinguisher, automatic, F. Grinnell..... 249,466
Fish dressing machine, M. J. Palsen..... 249,663
Flour, manufacturing, M. Harmon..... 249,725
Fluids, apparatus for separating, G. De Laval..... 249,731
Flushing valve, D. Thompson..... 249,826
Frame, See Bedstead frame.
Fruit and berry box, C. W. Weston..... 249,561
Fruit evaporator, H. C. Grover..... 249,613
Fruit picker, B. M. Crider..... 249,460
Fume arrester, J. V. Woodhouse..... 249,719
Furnace, See Coke furnace.
Furnaces, preparing, indurating, and solidifying calcareous lining materials for, J. Reese..... 249,548
Galvanic battery, A. C. Harris..... 249,614
Garbage receptacle, V. Borst..... 249,576
Gas scrubber, hot, C. W. Isbell..... 249,528
Generator, See Vinegar generator.
Grain binder, L. Miller..... 249,656
Grain binders, bundle compressor for, L. Miller..... 249,657
Grain meter, H. Gerred..... 249,609
Gymnasiums, spring board for, F. Medart..... 249,475
Hame, J. B. Law..... 249,641
Handle, See Crank handle.
Hanger, See Eaves trough hanger.
Harness, overcheck attachment for, F. L. Jones..... 249,633
Harness pad plate, J. Thomas..... 249,493
Harvester binder, S. D. Locke..... 249,472
Harvester binders, tension device for, L. Miller..... 249,655
Hoop lock, J. E. Youngs..... 249,566
Hat and coat rack, J. R. Paimenberg..... 249,480

Hay press, L. B. Lathrop..... 249,640
Head covering, R. Gray (r)..... 9,928
Hides and skins, curing, W. Maynard..... 249,540
Hinge for school furniture, C. M. Hughes..... 249,627
Holder, See Sponge holder.
Hook, See Cant hook.
Horseshoe, J. D. Billings..... 249,573
Hub for vehicles, metallic, E. P. Newman..... 249,660
Inhaler, medicinal, J. W. Snyder..... 249,553
Jack, See Railway jack. Wagon jack.
Jack for metal lasts, S. Mawhinny..... 249,651
Jigger or potter's wheel, J. Cook..... 249,458
Joint, See Boiler tube joint. Pipe joint.
Journal and box, W. H. Foye..... 249,697
Knife cleaner, E. Ferguson..... 249,465
Ladder, step, J. G. Mooney..... 249,476
Lamp, carriage, O. W. Swift..... 249,690
Lamp, electric, P. Jablockhoff (r)..... 9,935
Lamp, electric light, H. F. Joel..... 249,632
Lamp, hollow stem, D. C. Ripley..... 249,676
Lamps, apparatus for suspending, raising, and lowering electric, J. F. Behn..... 249,449
Leather stuffing machine, F. Carl..... 249,455
Light, See Electric light.
Lightning rod, H. W. Spang (r)..... 9,934
Liquids, package for holding and transporting, H. Mattullath..... 249,650
Lock, See Hasp lock. Nut lock. Seal lock.
Looms, back standard for gauze weaving, J. Latus..... 249,470
Lubricator, W. P. Phillips..... 249,543
Mail bag fastener, Strong & Burnside..... 249,589
Mains, machine for tapping, D. T. Hubbell..... 249,536
Maltng apparatus, grain, W. Andrew..... 249,570
Mattress, woven wire, T. T. Prosser..... 249,545
Meter, See Grain meter.
Milk and cheese vat, A. H. Snyder..... 249,686
Mill, See Coffee mill. Rolling mill. Stamp mill. Windmill.
Millstones, feeder and separator for, J. Hutchison..... 249,628
Mitering machine, T. E. King..... 249,688
Motor, See Steam motor.
Musical instruments, device for mechanically operating, C. C. Reynolds..... 249,482
Necktie fastener, S. Hayen, Ainé..... 249,618
Nipples while being threaded, device for holding, C. Copman..... 249,594
Nut lock, H. Berlin..... 249,572
Oil, separating water and gas from, E. P. Shetter..... 249,487
Optometer, A. L. Smith..... 249,585
Overshoe, A. S. Hubbard..... 249,623
Overshoe, L. Piles..... 249,668
Packets of powdered materials, etc., for sale, apparatus for making up, G. Pritchard..... 249,544
Packing for stuffing boxes, G. Van Wagenen..... 249,560
Pad, See Electric pad.
Pantaloons, J. H. Douglas..... 249,596
Parer, corer, and slicer, apple, J. Clark..... 249,456
Parer, potato, J. E. Hoff..... 249,726
Passenger register, G. D. Paul..... 249,542
Picker, See Fruit picker.
Pipe, See Compressible cast metal pipe.
Pipe joint, O. L. W. Dietz..... 249,594
Plane, edge, C. A. Kilpatrick..... 249,637
Plow, J. J. Holland..... 249,727
Plow, sulky, E. M. Carroll..... 249,501
Plow, wheeled, G. T. Drake..... 249,509
Plows, welding steel points to cast iron, J. Griffith..... 249,518
Pool table, P. Ryan..... 249,679
Pot, See Coffee pot.
Potato digger, S. B. Parker..... 249,664
Potato peeler, H. Law (r)..... 9,930
Poultry crate, T. L. Blanford..... 249,498
Powder, See Tooth powder.
Power, See Cylindrical power.
Press, See Hay press.
Pressure relief apparatus, automatic, W. Woerle..... 249,718
Printing press sheet delivering apparatus, C. B. Cottrell..... 249,505
Protector, See Boot and shoe upper protector.
Pulleys, etc., process of and machine for covering, W. Howard..... 249,525
Pulverizing machine, W. H. Thompson..... 249,489
Pump, L. Bouvier..... 249,499
Pump, J. E. Maynard..... 249,632
Pump, double acting force, H. P. Minot..... 249,658
Pump, force, E. Erlson..... 249,603
Pump or exhausting apparatus, S. L. Fox..... 249,514
Pumps, stop valve for house, J. E. Boyle..... 249,578
Pyroxiline, etc., drying apparatus for treating, J. B. Edson..... 249,600
Rack, See Hat and coat rack.
Railway crossing, F. C. Weir..... 249,705
Railway frog, J. A. & A. H. Howland..... 249,469
Railway frog, F. C. Weir..... 249,708
Railway jack, Shoudy & Licher..... 249,488
Railway signal, J. L. Poulk..... 249,669
Railway switch, L. C. Weldin..... 249,710
Railway switches, head chair for, W. A. Cooper..... 249,721
Railway tie, J. Clark..... 249,503
Railway wrecking frog, J. L. Owens..... 249,479
Railways, snow excavator for, W. Choate..... 249,586
Refrigerating barrel, Lenz & Sauer..... 249,642
Refrigerator, G. R. Wight..... 249,714
Register, See Passenger register.
Regulator, See Draught regulator.
Rein supporter for harness, J. Jaeger..... 249,631
Revolver, W. Mason..... 249,549
Rolling mill, D. B. Oliver..... 249,622
Rotary engine, D. O. Holman..... 249,620
Rowing, apparatus for practice, J. R. Lomas..... 249,644
Rubber transfer sheets, frame for stretching, G. W. Selts..... 249,532
Rudders to vessels, attaching, Watson & Durell..... 249,704
Sash cord clamp, C. J. Scheelky..... 249,739
Sash cord guide, A. Millar..... 249,654
Saw guide, G. H. Zschech..... 249,721
Saw set, E. Larson..... 249,639
Sawdust elevator, McIntyre & Parish..... 249,474
Scale, W. W. Reynolds..... 249,463
Seal lock, H. Clarke..... 249,457
Seat, See Theater, etc., seat.
Seed and fertilizer dropper, combined, Brill & Emory..... 249,580
Seed, preparing cotton, T. Taylor..... 249,691
Sewing machine, T. A. Macaulay..... 249,648
Sewing machine, M. Schwalbach (r)..... 9,933
Sewing machine, Steward & Diamond..... 249,554
Sewing machine, W. W. Wells..... 249,739
Sewing machine cabinet, D. H. Coles..... 249,300
Sewing machine ruffing attachment, J. S. Baker..... 249,571
Shipping can, safety, M. F. Bell..... 249,450
Shirt, J. Sample, Jr..... 249,681
Shoe, waterproof, M. R. Bissell..... 249,497
Sifter, coal and ash, J. Bullock..... 249,582
Signal, See Railway signal.
Sirup dasher, automatic, R. Robinson..... 249,678
Skate, W. A. Sutton..... 249,535
Skate, roller, W. A. Sutton..... 249,536
Soap, machine for shaping, O'Keefe & Robertson..... 249,532
Soap, manufacture of, De La Vega & D'Oliveira..... 249,508
Soap, soft, T. W. Nichols..... 249,478
Spark arrester, D. Wiser..... 249,717

Sponge holder for slate pencils, Coles & Luckhurst..... 249,527
Spoon and ladle, L. P. Cottle..... 249,450
Spring, See Carriage spring. Eyeglass spring.
Stamp mill, F. L. Presten..... 249,672
Stand, See Switch stand. Wash stand.
Steam boiler, N. W. Pratt..... 249,670
Steam boiler, portable, G. Selden..... 249,683
Steam boiler, sectional, L. W. Chadwick..... 249,585
Steam engine, compound, Babcock, Wilcox & Pratt..... 249,446
Steam engine, duplex, G. Ash..... 249,597
Steam engine lubricators, equalizing trap for, G. H. Edgerly (r)..... 9,927
Steam motor, S. W. Hudson..... 249,527
Steam or heating air, apparatus for superheating, S. N. Carvalho..... 249,592
Steering wheels, friction lock for, S. B. Gresson..... 249,517
Stocking supporter, J. L. Moore..... 249,659
Stove, cooking, J. M. Killin..... 249,656
Stove grate, J. Ringen..... 249,675
Stove, heating, M. C. Hawley..... 249,617
Stove urn, H. M. Ryder..... 249,551
Strainer for liquid vessels, H. C. Alden..... 249,494
Supporter, See Rein supporter. Stocking supporter.
Swinging chair, P. Johnson..... 249,530
Switch, See Railway switch.
Switch stand, F. C. Weir..... 249,706
Table, See Billiard table. Pool table.
Tank valve, J. E. Boyle..... 249,577
Telephone, D. H. Fitch..... 249,605
Telephone circuits, switch board for, G. L. Anders..... 249,145
Telephone system, W. J. Green..... 249,611
Theater, etc., seat, E. F. Underhill..... 249,558
Thill coupling, I. R. Dunning..... 249,590
Tie, See Railway tie.
Tire tightener, T. Dillon..... 249,595
Tobacco, apparatus for reswetting, J. W. Cooke..... 249,501
Tool handle attachment, J. L. Coleman, Jr..... 249,588
Tooth, artificial, J. O. Flower..... 249,724
Tooth powder, W. Doepf..... 249,462
Toy suspension bridge, W. W. Barnes..... 249,448
Toy trundle, H. T. Hembold..... 249,521
Trace carrier, J. Thomas..... 249,692
Traction engine, B. S. Benson..... 249,451
Trestle and scaffold, J. M. Downs..... 249,598
Tricycles, speed attachment for, Howard & Stall..... 249,622
Valve, See Flushing valve. Tank valve.
Valve, F. Grinnell..... 249,612
Valve and valve seat, combined, L. W. Truesdell..... 249,557
Valve gear, steam engine, J. H. Eickershoff..... 249,692
Vapor burner, M. Mahony..... 249,473
Vat, See Milk and cheese vat.
Vegetable and plant cutter and harvester, R. T. Pettibone..... 249,665
Vehicle gear, G. G. Buckland..... 249,581
Vehicle, two-wheeled, C. Thomas..... 249,730
Vessels, self-leveling furniture for, W. D. F. Jarvis..... 249,529
Vinegar generator, Oeters & Stute..... 249,661
Voltaic battery, A. C. Harris..... 249,615
Wagon bed, B. P. Joiner..... 249,531
Wagon jack, C. C. Farmer..... 249,463
Wagon running gear, J. W. Harris..... 249,519
Wagon, side bar, C. D. Le Grand..... 249,471
Wagon, spring board, Stearns & Bidwell..... 249,687
Wash stand, commode, W. T. Egbert..... 249,697
Washing machine, H. Anderson..... 249,569
Washing machine, L. A. Blake..... 249,575
Washing machine, J. F. Lippincott..... 249,643
Water filter, rain, N. H. Long..... 249,538
Water filtering and cooling apparatus, R. H. Franklin..... 249,608
Wheel, See Wind wheel.
Wind wheel, S. W. Walker..... 249,703
Windmill, C. F. Willner..... 249,715
Window, J. Thompson..... 249,697
Wire barbing machine, D. G. Wells..... 249,495
Wrench, A. Nelson..... 249,477

DESIGNS.

Carpet, C. Magee..... 12,572
Umbrella or parasol cover, W. A. Drown..... 12,569
Wall paper, E. Leissner..... 12,571
Watch case, H. Untermeyer..... 12,573, 12,574

TRADE MARKS.

Agricultural implements and machines, certain, Collins Company..... 8,832
Bags, D. W. Manwaring..... 8,836
Beer, bottled, American Beer and Ale Bottling Company..... 8,837
Bitters, J. E. Ri Dou..... 8,842
Blacksmiths' and machinists' tools, all kinds of, Wiley & Russell Manufacturing Company..... 8,845
Cambries, R. D. Wood & Sons..... 8,861
Canned goods, certain, J. H. W. Hucks & Co..... 8,838
Clothing, boys', A. Shuman & Co..... 8,844
Cotton goods, A. McLean..... 8,857
Cotton piece goods, Amoskeag Manufacturing Company..... 8,846, 8,847
Cotton piece goods, Langdon Manufacturing Company..... 8,855
Drygoods, fancy, E. Flaxland..... 8,833
Earth working tools, certain, Collins Company..... 8,833
Edge tools, certain, Collins Company..... 8,829 to 8,831
Linen fabrics, G. Riggs..... 8,843
Meats and hams, cured, W. G. Bell & Co..... 8,828
Medical compound for diseases of the skin, W. Mulchahey..... 8,866
Medicinal preparations, R. H. Higgins & Co..... 8,837
Pencils and rubber erasers, G. Schwahhüsser..... 8,858
Pencils and rubber erasers, drawing lead, G. Schwahhüsser..... 8,860
Pencils, drawing lead, G. Schwahhüsser..... 8,850
Pencils, lead, E. Faber..... 8,836
Quicksilver flasks, Quicksilver Mining Company..... 8,841
Razors, knives, and scissors, W. Brokhahne..... 8,848 to 8,851
Saws, H. Disston & Sons..... 8,862 to 8,865
Shirts, collars and cuffs, J. McDonald, Jr..... 8,840
Stationery, E. Faber..... 8,835
Stove, certain kind of, Magee Furnace Company..... 8,839
Studs, shirt, Horton, Angell & Co..... 8,854
Tobacco pouches, India-rubber, G. Coles..... 8,832

NEW BOOKS AND PUBLICATIONS.

LITTLE FOLKS' EVERYDAY BOOK. Edited by Amanda B. Harris. Boston: D. Lothrop & Co. Price \$1.00.

This little volume, prepared upon the plan of the birthday books which are so popular nowadays, is destined to win merit and good favor wherever it goes. It contains a picture, a verse, and a blank for every day of the year, together with twelve full page pictures in color, representing the various months of the year, designed by G. F. Barnes.

IMPORTANT BOOKS

FOR

Clock and Watch Makers and Jewelers.

Beckett.—A Rudimentary Treatise on Clocks, Watches, and Bells. By Sir Edmund Beckett, Bart., Pres. of British Horological Institute. Illustrated by numerous engravings. Sixth edition, revised and enlarged. 12mo. \$1.75.

Kemo.—The Watch Repairer's Hand Book. Being a complete Guide to the young beginner in taking apart, putting together, and thoroughly cleaning the English Lever and other Foreign Watches, and all American Watches, with illustrations. By F. Kemo. 12mo. \$1.25.

Byrne.—Hand Book for the Artisan, Mechanic, and Engineer. Comprising the Grinding and Sharpening of Cutting Tools, Abrasive Processes, Lapidary Work, Gem and Glass Engraving, Varnishing, and Lacquering, Apparatus, Materials, and Processes for Grinding and Polishing. By Oliver Byrne. Illustrated by 185 engravings. 8vo. \$5.00.

Geo.—The Practical Gold Worker, or the Goldsmith's and Jeweler's Instructor in the Art of Alloying, Melting, Reducing, Coloring, Collecting, and Refining; the Processes of Manipulation, Recovery of Waste, Chemical and Physical Properties of Gold; with a new system of Mixing its Alloys; Solders, Enamels, and other Rules and Recipes. By Geo. E. Geo. Jeweler. 12mo. \$3.50.

Geo.—The Silversmith's Hand Book. Containing full instructions for the Alloying and Working of Silver; its Solders; the Preparation of Imitation Alloys, Methods of Manipulation; Prevention of Waste; Instructions for Improving and Finishing the Surface of the Work, with other Useful Information and Memoranda. By Geo. E. Geo. Jeweler. Illustrated. 12mo. \$3.50.

Queller.—Practical Guide for the Manufacture of Metallic Alloys. Comprising their Chemical and Physical Properties with their Preparation, Composition, and Uses. From the French of A. Guettier. By A. A. Fesquet. 12mo. \$3.00.

The above, or any of our Books, sent by mail, at the publication prices, free of postage, to any address in the world.

A Special List of Important Books for Jewelers, Gold and Silversmiths, together with our other Catalogues, covering every branch of Science applied to the Arts, sent, free of postage, to any one in any part of the world who will furnish his address.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers, and Importers,
810 WALNUT STREET, PHILADELPHIA, PA.

TOOLS
TAPS, DIES, VISES, CHUCKS, LATHE, SCREWS, FILES, FEELERS, STOPS, SUBS.

TOOLS for Machinists, Carpenters, Amateurs, Jewelers, Model Makers, Blacksmiths, etc. Send for Catalogue, and state what kind of Tools you require.

TALLMAN & McFADDEN,
607 Market St., Philadelphia, Pa.

RIDDELL'S
NEW ELEMENTS OF HAND RAILING.
Revised edition, containing 41 plates, 13 of which are entirely new, with accompanying letterpress descriptions. Price \$7. E. CLAXTON & CO., 380 Market St., Phila., Pa.

RUPTURE
cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

DO YOUR OWN PRINTING
Presses and outfits from \$3 to \$500.
Over 2,000 styles of type. Catalogue and reduced price list free.

H. HOOVER, Phila., Pa.

\$66 a week in your own town. Terms and \$5 outfit free. Address H. HALLETT & Co., Portland, Me.

MACHINISTS' TOOLS.
NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.

Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

ROOFING.
For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

SEND TO LONDON BERRY & ORTON
PHILA PA FOR
THE BEST BAND SAW BLADE

WATCHMAKERS.
Before buying lathes, see the "Whitcomb," made by AMERICAN WATCH TOOL CO., Waltham, Mass.

Pamphlet Printing. Best work—lowest prices. 75c. a 12mo page for 1,000 copies. Circulars for inventors printed very cheap. Local Printing House, Silver Creek, N. Y.

MACHINERY
of every description. 121 Chambers and 106 Reade Sts., New York. THE GEORGE PLACE MACHINERY AGENCY.

\$72 A WEEK. \$12 a day at home easily made. Costly outfit free. Address TRUB & Co., Augusta, Me.

PENSIONS For SOLDIERS,
widows, fathers, mothers or children. Thousands yet entitled. Pensions given for loss of finger, toe, eye or ear, various veins or any disease. Thousands of pensioners and soldiers entitled to INCREASE and BOUNTY. PATENTS procured for inventors. Soldiers land warrants procured, bought and sold. Soldiers and heirs apply for your rights at once. Send 2 stamps for "The Citizen-Soldier" and Pension and Bounty laws, blanks and instructions. We can refer to thousands of Pensioners and Officers. Address N. W. Fitzgerald & Co., PENSION & PATENT AGENTS, Lock Box 108, Washington, D. C.

DRUNKENNESS OPIUM HABIT CURED
By LESLIE E. KEENEY, M.D., Surgeon, C. & A. R. Dwight, III. 127 Books Free.

\$5 to \$20 per day at home. Samples worth \$5 free. Address STINSON & Co., Portland, Me.

HAND BLOWERS and PORTABLE FORGES
made by EMPIRE PORTABLE FORGE CO., Cohoes, N. Y., are the strongest and best. Send for circulars.

HEAR YE DEAF!
CARMORE'S ARTIFICIAL EAR DRUMS
As invented and worn by him perfectly restoring the hearing. Entirely deaf for thirty years hears with them, even whispers, distinctly. Are not observable, and remain in position without aid. Descriptive Circular free. John Carmore, S. W. Cor. 5th & Race Sts., Cincinnati, O.

Shafts, Pulleys, Hangers, Etc.
Full assortment in store for immediate delivery.
WM. SELLERS & CO.,
79 Liberty Street, New York.

Profitable to Everybody

INTERESTED IN

Farms, Lawns, Cattle, Buildings,
Gardens, Fruits, Horses, Dairying,
Flowers, Grains, Sheep, Swine,
Orchards, Cotton, Poultry, Bees.

House-keepers, City, Village, Country. Youth & Children.

BEST RURAL and FAMILY JOURNAL in the WORLD!

THE American Agriculturist,

so named 40 years ago, when started as a Rural Journal, but now enlarged to embrace the whole range of human labor and care . . . and illustrated with about

A Thousand Original Engravings

and Sketches of Labor-saving, Labor-helping Contrivances to aid Out-door and Indoor Work; fine Engravings of Animals, Plants, Flowers, Implements, Houses, Out-buildings, with many pleasing, instructive Pictures for Young and Old. Full of

Most Useful Information,

Instructive, Practical, thoroughly Reliable. No one can read a Volume without getting many Hints and Suggestions that will each richly repay the small cost.

Many Humbugs Exposed.

For 30 years the American Agriculturist has constantly investigated and exposed multitudes of Humbugs and Swindling Schemes, and thus saved its Readers Millions of Dollars. This will be vigorously followed up during 1882.

DISTINGUISHED CONTRIBUTORS:

Besides a strong Editorial force, and many contributions from all parts of the country, the following are among the Special Contributors:

Professors in Agricultural Colleges.
Pres't John Bascom, LL.D., Wis. University.
" A. S. Welsh, LL.D., Iowa Agr. Coll.
" A. L. Lantard, N. Y. Veterinary Coll.
Prof. F. H. Storer, Harvard Uni. Agr. Dpt.
" D. D. Slade, do. do.
" G. C. Caldwell, Cornell Uni. Agr. Dpt.
" J. B. Roberts, do. do.
" James Law, do. Vet'y Dpt.
" W. J. Neal, Mich. Agricultural Coll.
" A. J. Cook, do. do.
" W. O. Atwater, West'an University.
" C. E. Bessey, Iowa State Agr. Coll.
" S. A. Knapp, Iowa State Agr'l Coll.
" E. M. Shelton, Kan. State Agr. Coll.
" G. C. Swallow, Agr. Dept. Mo. Uni.
" C. L. Ingersoll, Purdue Univ. (Ind.).
" J. M. McBryde, Tenn. Uni. Agr. Dpt.
" W. S. Townsend, Ohio Uni. Agr. Dpt.
" W. H. Jordan, Pa. Agr'l College.

Useful Everywhere.

Though issued for convenience in the Metropolitan City, which affords the best mechanical appliances, artists, etc., the AMERICAN AGRICULTURIST is adapted to the whole country, EAST, WEST, NORTH, SOUTH, and on account of its engravings, its general information, its humbug exposures, etc., it is very useful to every one, no matter where residing, or how many other journals are taken, and it is equally adapted to residents of City, Village, and Country. . . . It is the

Cheapest Journal in the World,

taking into account its large size, the Engravings, the great amount of useful information, etc., etc.

TERMS: \$1.50 a year; four copies, \$5.00; 15 cts. a number.

(One Specimen Copy sent post-paid for 10 cents.) Those subscribing for 1882, before Dec. 10, will receive the Journal for Dec. free.

Premiums to Clubs.

433 Valuable Premium Articles, also many Good Books, offered to those who gather and forward two, three, or more subscriptions. Illustrated Premium List sent post-paid to all desiring it.

TRY THIS a year . . . it will PAY WELL.

PUBLISHERS,
ORANGE JUDD CO., 751 Broadway, New York.

ELEVATORS. Steam and Hand Power. CLEM & MORSE, 411 & 413 Cherry St., Phila., Pa., and 108 Liberty St., New York.

\$5. The Wonderful Mechanical Piano-ette. \$5.

The most marvellous mechanical invention of the age. It will play any tune in a melodious and pleasing manner. Difficult and simple music produced in a masterly style, and it can be played by a child as well as by a grown person and will furnish music for social gatherings of any description, playing hour after hour, without any knowledge of music being required in the operation. The most wonderful of all musical inventions is a machine which in a purely mechanical manner produces any kind of music, Waltzes, Polkas, Marches, &c., &c., without any practice or knowledge of music whatever; in this respect far superior to any music-box, for there is no limit whatever to the number of tunes it will play. The perforations in a flexible strip produce the effect. It has just been perfected (the accompanying cut showing it in its improved form), and is having the largest sale ever obtained by a musical instrument in the country. It has fine, melodious cases, highly decorated, the notes or bars (the music-producers) are metal, on some principle as a tuning fork, which produce clear and melodious notes, and never get out of tune; the bars are struck by strikers, the same as the wires are in a piano, only they work automatically instead of by the fingers. The strip of prepared paper in which the notes are stamped or perforated, is about 10 inches wide, and as it passes through the rollers and over the keys, the strikers spring through the perforations in the paper and strike the right note; this is all done automatically, without any assistance from the operator (except turning the rollers), and the tunes played perfectly. It would be one of the most appropriate presents to make any one, especially where there is no other musical instrument. Its execution is admirable, and its capacity of capability almost unlimited. It is selling faster than any musical instrument ever invented. The music is fine, and everybody delighted. The price of the Piano-ettes only \$5, including a selection of popular tunes. Music, 20 cts. a tune.

Wishing an agent in every town, we have concluded to offer sample of Piano-ette, SPECIAL TO AGENTS, with two tunes, to those who will push the sale, for only \$4, or with 12 tunes, for \$5.50. MASSACHUSETTS ORGAN CO., 57 Washington St., Boston, Mass., Sole Manuf'rs.

THE STEARNS MANUFACTURING CO.,
ERIE, PENNSYLVANIA, make a specialty of improved
SAW MILL MACHINERY.
Designed in its construction for producing lumber economically and rapidly. Plans and estimates for Mills of any capacity furnished on request. Also build
ENGINES, BOILERS, AND MACHINERY IN GENERAL.

THE LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD.

MOSS ENGRAVING CO.
INCORPORATED 1850. (MOSS'S NEW PROCESS.)
535 PEARL STREET, COR. ELM, NEW YORK.
Engravings of Portraits, Buildings, Landscapes, Machinery, Maps, Etc., for Newspapers, Books, Catalogues, Etc. Much cheaper than Wood Cuts.

FOREMAN Wanted for Reduction Works
In California—American—25 to 40 years of age, with practical experience in furnace operations, an energetic worker, skillful and ambitious. Must present satisfactory references from former employers regarding character and ability to perform work in the best and most economical manner. Address confidentially, P. O. Box 1078, San Francisco, California, until December 1.

THE PARAGON SCHOOL DESK
AND
GARRETSON'S EXTENSION
TABLE SLIDE
MADE BY
BUFFALO HARDWARE CO.
SWAN ST. BUFFALO, N.Y.
SEE ILLUSTRATED EDITORIAL SEPTEMBER

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

AGENTS CRB BOW STRAP & FORTUNE. Address
RIDEOUT & CO., 10 Barclay St., N. Y.

PATENT
COLD ROLLED
SHAFTING.

The fact that this shafting has 75 per cent. greater strength, a finer finish, and is truer to gauge, than any other in use renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLIER'S PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to
JONES & LAUGHLIN,
Try Street, 2d and 3d Avenues, Pittsburgh, Pa.
Corner Lake and Canal Sts., Chicago, Ill.
77 Stocks of this shafting in store and for sale by
FULLER, DANA & FITZ, Boston, Mass.
Geo. Place Machinery Agency, 121 Chambers St., N. Y.

New and Valuable Offer for Loose Pulleys.
Its use on Loose Pulleys will prove it to be efficient, keeping the pulley oiled from three to four weeks with one filling. Price from 25c. to 50c. each. Sample sent by mail on application. Give diameter and speed of pulley. Send for catalogue etc.
VAN DUZEN & TIFF,
Cincinnati, O.

ROOT'S NEW IRON BLOWER.

POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED,
Has Fewer Parts than any other Blower.
P. H. & F. M. ROOTS, Manufacturers,
CONNEERSVILLE, IND.
S. B. TOWNSEND, Gen. Agt., 6 Cortland St., 8 Day St.,
COOKE & CO., Selling Agents, 9 Cortland Street,
JAS. BEGG & CO., Selling Agents, 8 Day Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.

THE LARGEST MACHINERY DEPOT
IN AMERICA.
STANDARD MACHINERY FOR ALL PURPOSES.
H. B. SMITH MACHINE CO.
ESTAB. 1849. 925 MARKET ST. PHILADELPHIA.

FOR INFORMATION CONCERNING
Holly Water Works,
FOR
CITIES, VILLAGES, SUBURBAN TOWNS,
FACTORIES, ETC.,
Apply to the
HOLLY MFG. CO., LOCKPORT, N.Y.
Or C. C. HILDRETH, Sec'y,
157 Broadway, New York City.

WITHERBY, RUGG & RICHARDSON. Manufacturers
of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

"The 1876 Injector."
Simple, Durable, and Reliable. Requires no special valves. Send for illustrated circular.
WM. SELLERS & CO., Phila.

MAGIC LANTERN CATALOGUE, 150 pp., 8c.
MAGIC LANTERN
AND
60 VIEWS ONLY \$20.
MAGIC LANTERNS AND SLIDES WANTED.
WONDERFUL AUTOMATIC ORGANS, only \$5.
Slides of Assassination of President Garfield a Specialty.
Circulars free. THEO. J. BARBACH, 809 Filbert St., Phila., Pa.

SUPPLIE
ENGINE. Improved plain Slide Valve. Simple in construction, durable and economical. Manufactured by
Supplie Steam Engine Co.,
Columbia, Pa.

WATER ELEVATOR, OR STEAM JET PUMP.
For Pumping Hot Cold, or Dirty Water, Lye, Tan Liquor, Acids, Slips, etc., this Pump is durable, effective, economical, reliable, and low priced. With 50 lb. steam a 1 in. \$8.50 pump raises 300 gal. per hour, 50 ft. high. With 55 lb. steam a 2 in. \$16 pump raises 2,100 gal. per hour 50 ft. high. Ten made. State for what purpose wanted, and write for prices, etc.
VAN DUZEN & TIFF, Cincinnati, O.

\$777 a Year and expenses to agents. Outfit free.
Address P. O. VICKERY, Augusta, Me.

TIGHT & SLACK BARREL MACHINERY
A SPECIALTY
JOHN GREENWOOD & CO.
ROCHESTER N.Y.

Advertisements.

Inside Page, each insertion --- 75 cents a line.
Back Page, each insertion --- \$1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

FOR SALE OR RENT.

Old established Foundry, Machine Shop, and Planing Mill. Excellent location. Plenty of work. Address L. M. NEWBURY, Sparta, Wis.

NEW YORK BELTING AND PACKING COMPANY.

Largest Belt Ever Made!
1 1/2 mile long, 3 feet wide.
IS OF OUR MAKE. EQUALS 500 OX HIDES.
37 & 38 PARK ROW, NEW YORK.

SHAFTS PULLEYS HANGERS

At Low Prices. Large Assorted Stock.
A. & F. BROWN, 37-61 Lewis St., New York.

ERICSSON'S

New Caloric Pumping Engine

FOR DWELLINGS AND COUNTRY SEATS.
Simplest, cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.

DELAMATER IRON WORKS

C. H. DELAMATER & CO., Proprietors.
No. 10 Cortlandt Street, New York, N. Y.

RUBBER COVERED STEPS
Prevent Accidents from slipping. The hand-somest and safest carriage-step made. Forged from best iron and formed with a sunken panel, in which is secured a plating of richly moulded Rubber. Durability warranted. Illustrated circular free.
RUBBER STEP MANUFACTURING CO., Boston, Mass.

H.W. JOHNS' ASBESTOS LIQUID PAINTS,

ASBESTOS ROOFING.
ASBESTOS BOILER COVERINGS.
ASBESTOS LINING FELT.
ASBESTOS STEAM PACKING.
ASBESTOS WICK PACKING.
ASBESTOS FLAT PACKING.
ASBESTOS MILLBOARD.
ASBESTOS GASKETS.
ASBESTOS SHEATHINGS.
COATINGS, CEMENTS, Etc.

Descriptive price lists and samples sent free.

H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.

PORTER MANUFACTURING CO., Ltd.
New economical. Only portable made with return line.
Absolute safety from explosion and from sparks.
Send for circulars to Porter Mfg. Co., Ltd., 100 G. Young St., London, E.C. 2, England.

FOR SALE CHEAP—PATENT No. 22,061—CAR COUPLER.
E. E. FOGUE, Quincy, Ky.

Jarvis Furnace Co.

Patent Setting for Steam Boilers Burns Screenings and Slack Coal without Blast. No. 1 Oliver St., Boston; No. 94 Liberty St., New York; No. 709 Market St., St. Louis; No. 15 Second St., Baltimore.

Print Your Own Cards, Labels, etc. Press \$3. Larger Size \$5.
13 other sizes. For business, pleasure, old, or young. Everything made by printed instructions. Send two stamps for Catalogue of Presses, Type, Cards, etc., to the factory.
Kelsey & Co., Meriden, Conn.

SPEAKING TELEPHONES.

THE AMERICAN BELL TELEPHONE COMPANY.
W. H. FOGG, President. W. R. DRIVER, Treasurer. THOS. N. VAIL, Gen. Manager.

Alexander Graham Bell's patent of March 7, 1876, owned by this company, covers every form of apparatus, including Microphones or Carbon Telephones, in which the voice of the speaker causes electric undulations corresponding to the words spoken, and which undulations produce similar articulation sounds at the receiver. The Commissioner of Patents and the U. S. Circuit Court have decided this to be the true meaning of his claim; the validity of the patent has been sustained in the Circuit on final hearing in a contested case, and many injunctions and final decrees have been obtained on them.

This company also owns and controls all the other telephone inventions of Bell, Edison, Berliner, Gray, Blake, Phelps, Watson, and others.

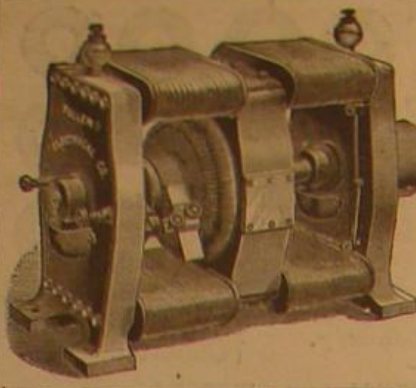
(Descriptive catalogues forwarded on application.)
Telephones for Private Line, Club, and Social systems can be procured directly or through the authorized agents of the company.

All telephones obtained except from this company, or its authorized licensees, are infringements, and the makers, sellers, and users will be proceeded against. Information furnished upon application.

Address all communications to the
AMERICAN BELL TELEPHONE COMPANY,
95 Milk Street, Boston, Mass.

INVALID RECLINING WHEEL CHAIR.
Rev. Leonard Bacon, D. D.
Hon. A. H. Stephens, and others
recommend them.
any position
Send for circular to
FOLDING CHAIR CO., New Haven Conn.

SURGICAL
Instruments, Artificial Limbs, and Apparatus for the treatment of the various diseases of the human body.
J. W. BOWEN & SONS, 1207 Arch St., Philadelphia, Pa. Established 1860.



ELECTRIC LIGHT.

THE FULLER ELECTRICAL COMPANY, having perfected their system of Electric Lighting, are prepared to furnish the Improved Gramme Dynamo Electric Machines and Electric Lamps, either for single lights or for from 2 to 20 lights in one circuit.

This apparatus is unequaled for durability, steadiness of light, and economy of power, and requires less attention than any other.

For price list and further particulars, apply to

THE FULLER ELECTRICAL COMPANY,
44 East Fourteenth Street, NEW YORK.

BEAUTIFUL HOLIDAY PRESENT.

DR. SCOTT'S ELECTRIC BRUSHES.

EXTRAORDINARY OFFER.

During the next 30 days, any Drug or Fancy Store will let you have either the Hair or Flesh Brush on trial, and if they fail to Cure Headache, Neuralgia, Rheumatic Pains, etc., in a few minutes, or quickly Cure Dandruff, Falling Hair, and Baldness, take them back in good condition and the Price will be refunded. They are not Wire, but Pure Bristle Brushes. Sent on the same terms, postpaid, on receipt of three dollars, by GEO. A. SCOTT, 842 Broadway, New York.

COE BRASS MFG. CO.
BRASS AND COPPER MATERIALS FOR METALLIC IN SHEETS, AMMUNITION A SPECIALTY. WIRE AND BLANKS

FRIEDMANN'S PATENT EJECTORS

Are the cheapest and most effective machines in the market for

Elevating Water and Conveying Liquids

from Mines, Quarries, Ponds, Rivers, Wells, Wheel Pits; for use in R. R. Water Stations, Factories, etc. They are specially adapted for conveying liquids in Breweries, Distilleries, Sugar Refineries, Paper Mills, Tanneries, Chemical Works, etc. Send for illus. catalogue to

NATHAN & DREYFUS,

Sole Manufacturers, NEW YORK.

THE COMMON SENSE DRY KILN.



In solving the true principle of seasoning, extracting the sap from the center by suction, rapid circulation of air, with moderate heat, we offer the cheapest kiln in construction, quickest in operation, and perfect in results. Prevents checks, warp, or hardened surface.

ST. ALBANS M'F'G CO., St. Albans, Vt.

OPERA GLASSES Microscopes, Spectacles, Thermometers, and Compasses. R. & J. BECK, Manufacturing Opticians, Philadelphia, Pa. Send for Illustrated Priced Catalogue.

NO MORE USE FOR OIL ON MACHINERY

Oil Lubricating Compound, manu'd by HOLLAND & THOMPSON, Troy, N. Y. Avoids hot journals, dripping, and waste. Send for catalogue of Grease and Cups for all kinds of machinery.

OPEN BACK PRESSES.

STILES & PARKER PRESS CO., Middletown, Conn.

THE AUTOMATIC SHADING PEN



MAKES A SHADED MARK OF TWO COLORS AT A SINGLE STROKE. SAMPLE SET OF 3 SIZES BY MAIL \$1. CIRCULAR AND SAMPLE WRITING FREE.

J. W. Stoakes, Milan, O.

BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS. For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guano, Oil Cake, Feed, Corn, and all other materials. Also, for grinding Spices, Coffee, Cocoa, Sugar, Salts, Soda, etc., and whatever cannot be ground by other mills. Also for Paints, Printers' Inks, Paste Blacking, etc. JOHN W. THOMPSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.

RAILROAD DEPOTS IRON BUILDINGS WHARF SHEDS SUGAR HOUSES SAWMILLS COTTON STORES PUBLIC MARKETS (CARBONATED RETORT HOUSES) WALTER C. BURGESS & CO.—GLASGOW—SCOTLAND.

Steel Castings

From 1/4 to 15,000 lb. weight, true to pattern, of unequalled strength, toughness, and durability. 15,000 Crank shafts and 10,000 Gear Wheels of this steel now running prove its superiority over other Steel Castings. Send for circular and price list.

CHESTER STEEL CASTINGS CO.,
46 Liberty St., Philadelphia, Pa.

Send for Circular & Price List of

COPE & MAXWELL M'F'G CO'S

New and Improved Styles of

STEAM PUMPS

—AND—

BOILER FEEDERS.

"THE BEST MADE."
Address HAMILTON, OHIO.

WOODWORKING MACHINERY,

For Railroad Sheds, Planing Mills, Car Builders, Cabinet, Carriage, Wash, Door, and Blind Makers.
S. A. WOODS MACHINE CO., 172 High St., Boston; 91 Liberty St., N. Y.; 61 S. Canal St., Chicago.

GOLD PENS.

PENCILS, HOLDERS, CASES, &c.

The CALLI-GRAPHIC Pen.

A GOLD PEN and RUBBER HOLDER, containing ink for several days' writing. Can be carried in the pocket. Always ready for use. A luxury for persons who care to preserve their individuality in writing.

MABIE, TODD & BARD,
180 BROADWAY, NEW YORK.

Send for Price-List.

OUR GOODS ARE SOLD BY FIRST-CLASS DEALERS.

EAGLE ANVILS. 1843.

Solid CAST STEEL Face and Horn. Are Fully Warranted. Retail Price, 10 cts. per lb.

LITTLE WONDER.



DICKINSON'S ADJUSTABLE DIAMOND TOOL.

and Shaped Diamond Carbon Points, indispensable for Truing Emery Wheels, Grindstones, Hardened Steel, Porcelain, and Paper Calendar Rollers, Drilling, Planing, Moulding, Millstone Dressing, and Sawing Stone.

J. DICKINSON, 64 Nassau Street, New York.

C. J. GODFREY & SON,

UNION CITY, CONN.

Manufacturers of Metallic Shells, Ferrules, Cups, Blanks, and any and all kinds of small press and stamped work in Copper, Brass, Zinc, Iron, or Tin. Drawn Brass and Steel Ferrules for File, Chisel, and other Tool Handles, also Pocket Watch Safes of various styles, are specialties. All kinds of notions, small wares, or novelties in the above line made to order. Work finished plain or nickel plated as desired. Correspondence solicited and estimates furnished.

JENKINS PATENT VALVES

THE STANDARD MANUFACTURED OF BEST STEAM METAL.
JENKINS BROS. 71 JOHN ST. N.Y.

Working Models

And Experimental Machinery, Metal or Wood, made to order by J. F. WERNER, 62 Centre St., N. Y.

Steam Fitters' & Plumbers' Supplies.

STURTEVANT'S FAN BLOWERS.

ALBERT BRIDGES, 46 Cortlandt Street, New York.

LITTLE GIANT

FRENCH BATTERY

Relieves Rheumatism and all Nervous Complaints. Supersedes all others. Send for circular.

C. E. JONES & BRO.

Cincinnati, Ohio.

IRIDIUM:

THE HARDEST METAL KNOWN.

Not attacked by acids or alkalis; not oxidized in the air; almost infusible. Manufactured under John Holland's process (patented May 10, 1881) by

THE AMERICAN IRIDIUM CO.,

S. E. Corner Pearl and Plum Sts., Cincinnati, Ohio.

FREE

For Ten Cents, new article. One agent sold 500 in two days, 4400 in 43 days, big profit. World W'g Co., 122 Nassau St., New York.

Leffel Water Wheels,

With recent improvements.

Prices Greatly Reduced.

8000 in successful operation.

FINE NEW PAMPHLET FOR 1879.

Sent free to those interested.

James Leffel & Co.,
Springfield, O.

110 Liberty St., N. Y. City.

THE BAKER BLOWER.

(FORCED BLAST.)
The revolving parts are all accurately balanced. Warranted Superior to any other.
WILBRAHAM BROS.,
No. 218 Frankford Avenue
PHILADELPHIA, PA.

SEND FOR OUR CATALOGUE.

KORTING UNIVERSAL

Double Tube Injector,

FOR BOILER FEEDING.

Send for Circular.

OFFICES AND WORKHOUSES:
Phila.—12th & Thompson Sts. New York—100 Liberty St.
Boston—7 Oliver St. Chicago—84 Market St.

HARTFORD

STEAM BOILER

Inspection & Insurance

COMPANY.

W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.

J. B. PIERCE, Sec'y.

BRADLEY'S CUSHIONED HAMMER

BRADLEY & COMPANY SYRACUSE, N. Y.

Stevens' Roller Mills,

FOR GRADUAL REDUCTION OF GRAIN.

Manufactured exclusively by

JOHN T. NOYE & SONS, BUFFALO, N. Y.

ICE AT \$1.00 PER TON.

PICOT ARTIFICIAL ICE CO., Limited,
P. O. Box 383, 142 Greenwich St., New York.

Guaranteed to be the most efficient and economical of all existing Ice and Cold Air Machines.

Model Engines.

Complete sets of CASTINGS

for making small

Model Steam Engines 1 1/2 in. bore, 3 in. stroke, price \$4

ditto 2 in. bore, 4 in. stroke, price \$10, same style as cut;

Gear Wheels and Parts of Models. All kinds of Small

Tools and Materials. Catalogue Free. GOODNOW &

WIGHTMAN, 176 Washington Street, Boston, Mass.

HOPE FOR THE DEAF

Dr. Peck's Artificial Ear Drums

PERFECTLY RESTORE THE HEARING

and perform the work of the Natural Drum.

Always in position, but invisible to others.

All Conversation and even whispers heard distinctly.

We refer to those using them. Send for descriptive circular with testimonials. Address

H. F. K. PECK & CO., 855 Broadway, New York.

BEECHER & PECK,

Successors of MITCHELL PECK, Manufacturers of

PECK'S PATENT DROP PRESS.

11 Regular sizes. Hammers

from 50 to 2500 lb. Drop

and Machine Forgings.

Drop Dies. Address

Lloyd & River Sts.,

New Haven, Conn.

ASTHMA

Quickly and Permanently

CURED

Dr. Stinson's Asthma Remedy

is unequalled as a positive

Alternative and Cure for

Asthma and Dyspepsia.

and all their attendant evils. It does not merely

afford temporary relief, but is a permanent cure.

Mrs. R. F. Lee, of Belmont, O., says of it: "I am

surprised at the speedy effects of your remedy. It is

the first medicine in six years that has loosened my

cough and made expiration easy. I now sleep all

night without coughing." If your druggist does not

keep it, send for treatise and testimonials to

H. F. K. PECK & CO.,

855 Broadway, New York.

THE Hancock Inspirator,

THE BEST BOILER FEEDER KNOWN.

Over 22,000 in use on Locomotive, Sta-

tionary, Marine, and Portable Boilers.

THE HANCOCK INSPIRATOR CO.,

BOSTON, MASS.

ROCK DRILLS & AIR COMPRESSORS.

INGERSOLL ROCK DRILL CO.,

1 PARK PLACE NEW YORK.

WM. A. HARRIS.

PROVIDENCE, R. I. (PARK STREET).

Six minutes walk West from station.

Original and Only Builder of the

HARRIS-CORLISS ENGINE

With Harris' Patented Improvements

from 10 to 1,000 H. P.

Send for Circular

to Wm. A. Harris, Providence, R. I.

or to J. B. Pierce, Hartford, Conn.

or to J. M. Allen, Hartford, Conn.

or to W. B. Franklin, Hartford, Conn.

or to J. B. Pierce, Hartford, Conn.

or to J. M. Allen, Hartford, Conn.

or to W. B. Franklin, Hartford, Conn.

or to J. B. Pierce, Hartford, Conn.

or to J. M. Allen, Hartford, Conn.

or to W. B. Franklin, Hartford, Conn.

or to J. B. Pierce, Hartford, Conn.

or to J. M. Allen, Hartford, Conn.

or to W. B. Franklin, Hartford, Conn.

or to J. B. Pierce, Hartford, Conn.

or to J. M. Allen, Hartford, Conn.

or to W. B. Franklin, Hartford, Conn.

or to J. B. Pierce, Hartford, Conn.

or to J. M. Allen, Hartford, Conn.

or to W. B. Franklin, Hartford, Conn.

or to J. B. Pierce, Hartford, Conn.

or to J. M. Allen, Hartford, Conn.

or to W. B. Franklin, Hartford, Conn.

or to J. B. Pierce, Hartford, Conn.

or to J. M. Allen, Hartford,

SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

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

Vol. XLV.—No. 26.
[NEW SERIES.]

NEW YORK, DECEMBER 24, 1881.

\$3.20 per Annum.
[POSTAGE PREPAID.]

PROPOSED NEW SYSTEM OF WATERWORKS FOR CHICAGO.

We have received a copy of the proposal made, September 10, 1881, by Mr. Wm. Golding, M.E., of New Orleans, La., to the Board of Public Works of Chicago, for the erection of new pumping machinery for the waterworks of that city. This proposal is accompanied by engineering drawings, and taken altogether is quite a remarkable document, reflecting much credit upon the author. It illustrates a system that contains points of unusual practical excellence coupled with great simplicity and economy of construction. In our opinion it deserves the attention of hydraulic engineers and water directors in all parts of the country. The first general requisite of a good water delivering mechanism is thorough efficiency in doing its work; next, such a simplicity of construction that any moderately equipped foundry or shop can manufacture the machinery or enlargements when required,

while any ordinarily intelligent engineer can set up the same and easily keep it in effective operation. All these features are fully realized in Mr. Golding's system, and will commend themselves to engineers.

In view of these considerations we have thought that our readers would be interested in the following brief review of the salient features of the system, which, with our engraving, we derive from the printed proposal before mentioned.

The general ideas of the author in designing this system are well set forth in his preface; some of them may provoke discussion; but the more they are discussed the better. They are substantially as follows:

"Principles were created with the earth. The utilization of principles forms the various branches of science. To separate and convey material is allotted to mechanics. In moving a quantity of material an equivalent is expended, which

equivalent is denominated power. The mechanical combination for conveying material will be appreciated in the proportion as the useful work performed approximates the power expended. When a unit of power is expended, a unit of work is performed, but not always desirable or useful work, as, for instance, in faulty or inappropriate design, the combination may absorb largely of the power which it is intrusted to transmit.

"When a quantity of water is to be elevated, a very large combination of two or more pumps may be selected, which, as usual and proper in such design, will make but few strokes or repetitions per minute to accomplish the desired result, and will require the entire flow to and from the pumps to be started and checked at each repetition and so absorb much power, which waste of power may be obviated by adopting

[Continued on page 404.]

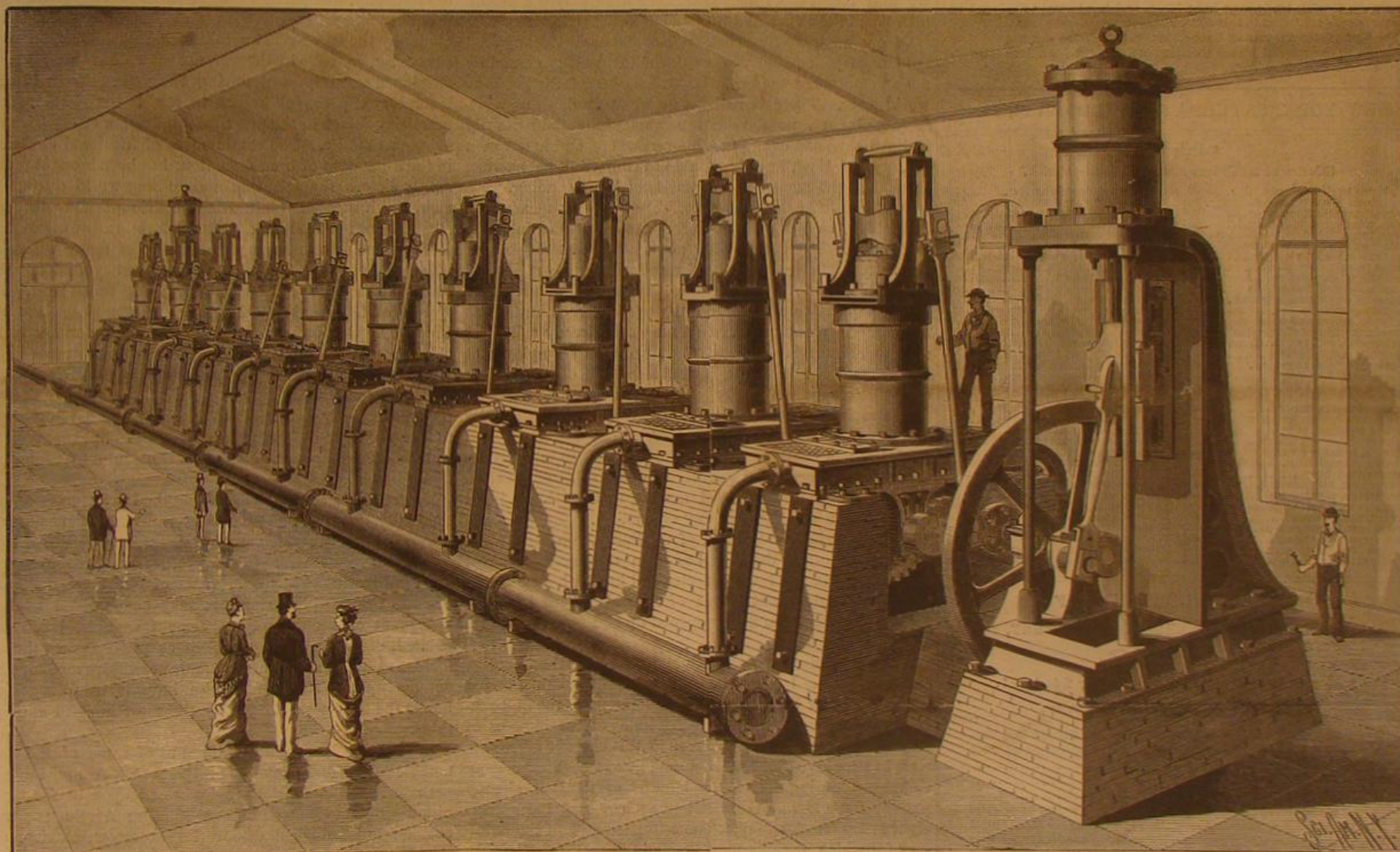


FIG. 2

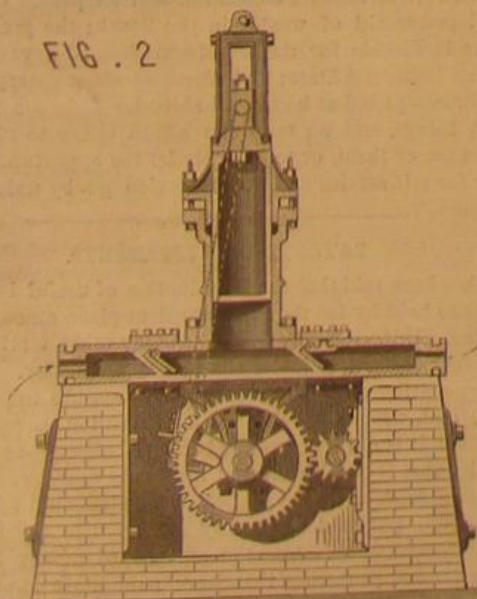


FIG. 3

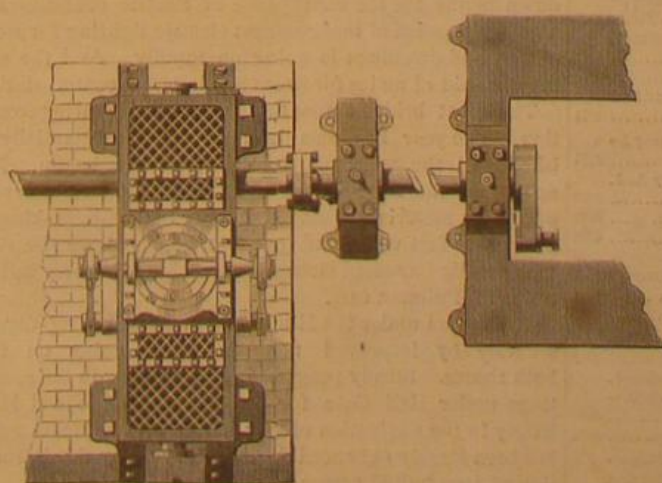
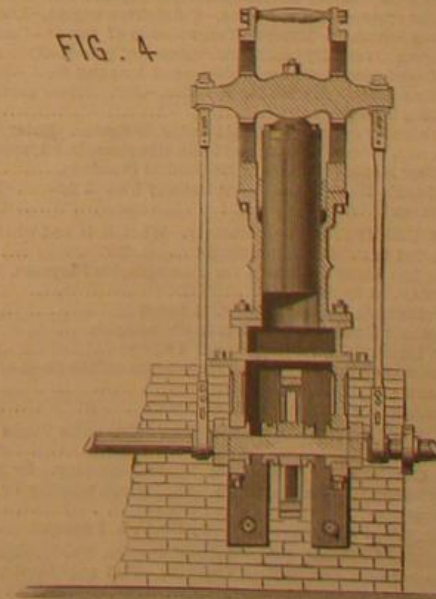


FIG. 4



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... \$3 20

One copy, six months postage included..... 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$3.20 each; additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 37 Park Row, 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 with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of seven dollars. Both papers to one address or different addresses as desired.

The safest way to remit is by draft postal order, or registered letter.

Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, \$5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ³⁷ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, DECEMBER 24, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

A glance backward, etc.....	40	Light, electric vs. gas.....	406
American Health Association.....	402	Magneto-electrical machine.....	403
Barcelona, citadel park of.....	407	Mechanical inventions.....	408
Bees, are they a nuisance.....	408	Naval and coast defense.....	410
Bees, intoxicated.....	409	Notes and queries.....	410
Boiler explosion, experimental.....	403	Nutritive value of gelatine.....	408
Bridges, railway, vibration of.....	401	Ocean steamer, great, another.....	407
Carbon transparencies.....	408	Park, citadel, of Barcelona.....	407
Chicago waterworks.....	399	Patent decisions.....	404
Citadel park of Barcelona.....	407	Patents as investments.....	400
Decay of the stomach cured.....	402	Pic iron breaker, Blake's.....	402
Decisions, patent.....	404	Pileocarpin, effects on hair.....	402
Defense, naval and coast.....	401	Railway bridge, vibration of.....	401
Depolarization of electrodes.....	407	Redwood, durability of.....	403
Diphtheria, salt in.....	401	Salt in diphtheria.....	401
Dynamic electricity.....	407	Sand, black, iron from.....	408
Electric light in theaters.....	406	Screw and gear cutter.....	406
Electric light vs. gas.....	406	Servia, the ocean steamer.....	402
Electrodes, depolarization of.....	407	Squirrel, flying, the.....	409
Elias magneto-electric machine.....	403	Steam boiler notes.....	405
Engineering inventions.....	406	Steamer, ocean, great, another.....	407
Explosion, boiler, experimental.....	403	Steamer shafts, breaking of.....	405
Flying squirrel, the.....	409	Stomach, decay of cured.....	402
Gas for whooping cough.....	405	System, new, waterworks.....	399
Gelatine, nutritive value of.....	408	Teleg. wires, underground in Germ.....	409
Health Association, American.....	402	Transparencies, carbon.....	408
Intoxicated bees.....	409	Underground tel. wires in Germ.....	409
Inventions, engineering.....	406	Vessels wrecked, com. with.....	407
Inventions, mechanical.....	403	Vibration of railway bridge.....	401
Inventions, miscellaneous.....	409	Waterworks, Chicago.....	399
Inventions, recent.....	408	Waterworks, new system.....	399
Investments, patent vs. as.....	400	Whooping cough, gas for.....	405
Iron from black sand.....	408	Wooden columns, strength of.....	406
Lathes, remarkable.....	403	Worm wheel and gear cutter.....	406
Light, electric, in theaters.....	406		

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT,
No. 312,

For the Week ending December 24, 1881.

Price 10 cents. For sale by all newsdealers.

I. ENGINEERING AND MECHANICS.—Improved Fifteen Ton Traveling Crane, Designed for service in the construction of Port Alfred Harbor, South Africa. 3 figures.....	4967
Improved Steam Boiler. 1 figure.....	4966
The Elevated Railways of New York.....	4968
Some of the Developments of Mechanical Engineering during the Last Half Century. British Association Paper. By Sir FREDERICK BRAMWELL. The steam engine.—Evaporative condenser.—Steam navigation.—Marine governors.—Light engines and boilers.—The Perkins system.—Ether engine.—Quicksilver engine.—Locomotive engines.—Brakes.—Motors.—Transmission of power.—Compressed air locomotives.—Hydraulic transmission of power.—Electric transmission of power.—The manufacture of iron and steel.—Bridges.—Machine tools.—The sewing machine.—Agricultural machinery.—Printing machinery.....	4968
Amateur Mechanics. Metal turning, 29 figures. Rotary cutters, 12 figures. Wood-working and lathe attachments, 9 figures.....	4971
A New Method of Keeping Mechanical Drawings.....	4973
Achard's Electric Brake for Railway Use. 2 figures. Plan and elevation.....	4974
II. ELECTRICITY, ETC.—Electricity. What it is and what may be expected of it. By JACOB REESE.....	4974
Electric Light Apparatus for Photographic Purposes. By A. J. JARMAN. 2 figures.....	4976
Desautel's Electric Lighter. 1 figure.....	4976
Solenoid Underground Wires in Philadelphia.....	4976
Dr. Herz's Telephonic Systems. 2 figures.....	4976
Decision of the Congress of Electricians on the Units of Electric Measures.....	4977
Secondary Batteries. By J. ROUSSE.....	4977
III. TECHNOLOGY AND CHEMISTRY.—Domestic Sugar Production.....	4980
M. Garnier's New Methods of Photo-Engraving. By Major J. WATERHOUSE.—Photogravure.—Photograph printing by vapor.—Atmography.....	4982
Dangers of Pyrogallol Acid. By Dr. T. L. PHIPSON.....	4982
IV. ARCHITECTURE, ETC.—Artists' Homes, No. 12.—Wm. Emerson's house, Little Sutton, Chiswick.—Full page illustration and large size longitudinal section.....	4978
Memorable English Houses. 4 figures.—Newton's house.—Flaxman's house.—Canning's house.—Johnson's house.....	4980
V. GEOGRAPHY.—Herald Island.—On the summit.—A midnight observation.—Plant life on Herald Island.—Inhabitants of the cliffs.....	4980
VI. METALLURGY.—The Treatment of Quicksilver Ores in Spain.....	4977
VII. AERONAUTICS.—The Balloon in Aeronautics.....	4977
VIII. BIOGRAPHY.—Franz List.—Large portrait.....	4981

A GLANCE BACKWARD AND FORWARD.

As we approach the end of another twelvemonth the usual questions arise: What has been the character of the year's events? What its progress? What its promises?

Naturally those things which bear most directly and forcefully upon a man's life and study and daily labor will seem to him to be the most important. The business man, the engineer, the artisan, the student, the inventor, will each review the past or contemplate the future in his own way, by the light of his individual or professional experience and hopes.

But there are events, achievements of labor, discoveries, inventions, and the like, which all men make note of sooner or later, and which give to the year its historic character. Who can name those of the year just closing?

The task would not be so hard if each year stood alone in its work or measurably distinct, like the links of a simple chain; or if it were possible for men to pick out infallibly from the complicated tissue of current events those most worthy of commemoration. But the great work which was brought to fruition this year was begun perhaps a decade, perhaps a century ago. The invention, observation or discovery by which the year 1881 will be best known a century hence is most probably yet unreported or hid away in the mass of the year's records, with its importance unsuspected or at best but vaguely recognized, even by the man whose name it will make known to many generations. Our point of view is so close that we cannot well see the things our descendants will see most plainly when the things we now magnify most will, perhaps, have gone to the limbo of forgetfulness.

Of some things, however, we may be sure; and, though we may forget them next year, they have played a prominent part in the current history of the past four seasons.

Of one thing we can speak with confidence. Though not the best of years, 1881 will go down to history as certainly not an empty or a bad one. Crops have been fairly good the world over. There have been no great famines, no widespread plagues, no devastating wars. The industriously inclined have had enough to do everywhere, and in our own country, at least, have been able to command an average amount of the mental and material good things going.

Our industries, on the whole, were probably never more flourishing, more varied, or more reasonably hopeful as to the future. There have been no general disturbances of labor nor anything tending to throw large numbers of men and women out of employment. Commercial failures have been comparatively few, and every productive industry has thriven. In many departments the work already called for and undertaken is sufficient to insure steady employment for men and machinery for several if not all of the months of the coming year.

The rapid extension of our railway system, in the older States as well as in the newer Territories, has given and doubtless will continue to give employment to vast armies of out-door laborers and scarcely smaller armies of machinists, mechanics, iron and steel makers, and workmen in all the arts tributary to the railway system.

The industrial development of the South, Southwest, and Northwest during the year has been unprecedented, vast acres of virgin and long neglected soil having been brought under cultivation, vast stores of natural wealth in forest and mine having been newly opened up and made accessible by new roads.

As the commercial and financial center of the country, and now, as the late census has shown, the manufacturing center also, New York naturally feels intensely the quickening pulse of general activity. An index of the impetus of national prosperity, we have seen in this city and across the river in Brooklyn over four thousand houses begun and many completed during the eleven months of the year already passed, not a few of these structures covering large areas eight or ten stories high. The estimated cost of the buildings for which permits were granted during the first eleven months of the year exceeds fifty-five million dollars.

The lighting of our streets and squares by electric lamps was officially begun less than a year ago. The work of putting down mains for the conveyance of electric conductors for a general system of incandescent electric lighting for stores, offices, and dwellings is going on rapidly. And the same may be said of mains for steam heating from central stations.

The great bridge across the East River is nearing completion. The year has seen the approaches substantially finished and the work on the superstructure begun. Now nearly all the floor beams are laid. The original plans have been materially changed during the year, making the bridge five feet wider and four feet higher above the river, with greatly increased strength, to enable it to carry railway trains of Pullman cars.

The tunnel under the Hudson is progressing rapidly and securely by improved methods, work going on from both shores. Steady progress is also making in the excavations under Hell Gate for the removal of Flood Rock. Safety in the navigation of our harbor and adjacent waters has been largely enhanced during the year by the introduction of iron hulled passenger and excursion steamers.

In marine engineering the most notable progress has been seen in the building of steamships exceeding 5,000 tons and up to 8,000 tons, and in the substitution of steel for iron, as in the construction of the Servia. On the destructive side we have seen the successful testing of the Ericsson torpedo boat Destroyer, the less successful testing of the Alarm, and the launching of some notable torpedo-boats in England.

Besides the work of civil engineering already noticed are several more or less important ones, begun or completed, which should not be forgotten. Another line of railway communication across the great West has been completed in the Southern Pacific road, and rapid progress has been made toward the completion of the Northern Pacific. Canada has undertaken a rival transcontinental railway still further north, and has done considerable serious work upon it during the year. Our northern neighbor has also completed the improvement of the Welland Canal, a work lately pronounced by high authority to be the best of its kind in the world. Our southern neighbor, Mexico, has manifested unwonted activity in railway extension, and unwonted wisdom in greeting cordially American enterprise therein, and in the Tehuantepec ship railway scheme of Capt. Eads. At Panama the De Lesseps canal project has been seriously begun, surveys and some excavations have been made, and a heavy tribute paid to the evil genius of the climate in death and disease among the engineering staff and the small army of laborers employed. The St. Gothard Tunnel through the Alps has been opened to traffic, and the projectors of the English Channel Tunnel have given earnest of their sincerity in steady and promising work in actual drifting under the sea. The new Eddystone Lighthouse has been completed. The centennial of the birth of George Stephenson has been duly celebrated in England, and duly commemorated in this country by a commendable advance in the speed of fast trains between our principal cities. Though built last year, the Fontaine locomotive makes its mark by actual service this year.

Not the least notable characteristic feature of the year has been the increasing attention given to useful applications of electricity, due partly to rapid advances in electric lighting, but more perhaps to the prominence given to electrical affairs by the successful exhibition at Paris. The storage of electricity, so called, though not new, has been greatly developed and improved during the year. From being a laboratory experiment known to few it has risen to be a promising factor in the practical application of electricity to every-day affairs. The employment of frictional electricity in the separation of bran from flour has been brought prominently before the scientific and milling world during the year, and a successful mill using electric purifiers throughout has been established. The electric railway has been more extensively tested in the carrying of many thousands of passengers at the Paris Exhibition; and ground has been broken for a commercial electric railway in Ireland. The system of telephonic stations for civic purposes begun in Chicago has been much extended, adding materially to the efficiency of the police system. Among the undeveloped but very promising discoveries made public during the year in connection with electricity we must not forget the experimental researches which have produced the photophone, thermophone, and other applications of radiant energy in the transmission of speech. Much that is useful may come from them.

The researches of Pasteur among the lower forms of life, especially those associated with certain malignant diseases, have given results which are perhaps more pregnant of benefits to come to humanity than any other work of the century. If by cultivating the specific virus of our more malignant diseases the morbid elements may be deprived of their malignant character and yet remain capable, when inoculated, of making the organism as proof against the true disease as a real attack of it would, preventive medicine has entered upon a stage of infinite importance to mankind. So far the tests seem to justify the most hopeful anticipations.

Enough has been said to remind us of some of the more notable results and promises of the year. A multitude of perhaps equally important topics crowd upon us for recognition—progress in the industrial arts; Arctic research; comets; archaeological discoveries in Egypt, Mexico, and elsewhere; the Atlanta cotton fair and its proofs of an undeveloped world of wealth in the South; the great works begun in Florida for the transformation of a vast swamp into an industrial State; and scores of other enterprises begun or completed at home and abroad. This is a period of great things, and no man can afford either to remain in ignorance of them, or to supinely let the opportunities they offer for self service and public service go by unimproved.

PATENTS AS INVESTMENTS.

It has been said that the introduction of useful inventions seems to hold by far the most excellent place among human actions. Unfortunately this, like many other truths, is not sufficient of itself to incite the inventive faculty. In these money-getting times mere sentiment succumbs to pecuniary gain, and, when the value of an invention is called into question, it is not its moral or beneficial effect upon the community that is considered, but rather the more practical one of its influence upon the pocket. Do patents pay? is a question often put and frequently answered in the negative, but erroneously so. For the amount of money invested, there are few properties that have paid more handsomely. Take the leading investments of the day; how many of them are gigantic failures? Of course all patents do not pay, neither do all investments in any description of property; but in these days of wild speculation, railroad bubbles, and bank failures, it may be very opportunely asked whether thirty-five dollars, or a little over two dollars a year, paid to the government for a seventeen years' exclusive right in and to

some useful invention, is not a promising investment? It at least is not a very extravagant one.

We all know of patents that have paid their millions, but we do not all know of the many thousands upon thousands of patents which have realized for their owners amounts varying from five thousand to fifty thousand dollars and upward. Contrast these realizations and the paltry outlay required with other investments, and where is the property which yields as large a return? That many patents do not pay is not always the fault of the invention, but not unfrequently is due to the want of proper commercial management, or to the clumsy form in which the invention, perhaps a very meritorious one, has been ushered to the public. But even these patents ultimately sometimes prove valuable, on account of the principle involved or some one particular construction or combination they cover, so that holders of subsequent patents are compelled to pay tribute, and it is never safe to consider a patent worthless because it is dormant. Its day, after the lapse of years even, may come unexpectedly.

Again, inventors frequently are at fault in not following up their inventions by fortifying the original patent with subsequent ones covering improvements in matters of detail. Nor should repeated failure discourage an inventor; for, if only one patent out of every ten pays, it will many times more than compensate for the cost of the ten. Not merely scientific men and mechanics, but men of leisure, will do well, then, to consider whether a patent, if only as a speculation, is not a cheap investment, even if the weightier consideration of advancing the cause of science or adding to human comfort, by ever so small a step, be altogether discarded.

VIBRATION OF RAILWAY BRIDGES.

It is not at all improbable that the coming railway engineer will design bridges and superstructures and machinery with a view to obviating the injury done to these structures by vibration caused by rolling stock in motion. To build a bridge capable of sustaining heavy loads is the aim of the engineer. He may accomplish this to his entire satisfaction so far as a dead weight is concerned; a tremendous load causes but little deflection, and the bridge is pronounced perfect. In one sense this would be a correct verdict, and yet it would not contain all the elements of a perfect bridge. The bridge is calculated to support a load much greater than it will ever be called upon to sustain, and the ordinary load will not strain any of its members by reason of the factor of safety. But when there is an undue or excessive vibration, the fibers are disturbed and a gradual weakening of the material is the result. To prevent vibration and unequal deflection it is important that the supports be made as uniform as possible. By making one portion of the rail support, whether on bridges or grade, stronger than another, the deflection being unequal, causes a vertical oscillation of rolling stock which is not only destructive to the stock but also to the substructure. This destruction arises not only from disturbance of foundations, but by reason of the tendency of long-continued vibration to separate the particles which constitute the mass of the material. We take a piece of tin, lead foil, annealed wire, or some similar metal, and bend it, and there is no perceptible injury or tendency to break, but we repeat the bending process between our thumbs and fingers, and pretty soon the fibers part and there is a break. This is precisely the case with an iron girder or other member of a bridge. Thus constant vibration has a tendency to weaken and destroy these structures, and to this may be assigned the cause of many mysterious and disastrous bridge failures. This vibration also tends to weaken joints and rivets, and unless the structure is under constant and thorough inspection disaster may occur. How to prevent excessive vibration is the question; but probably to follow the plan of the deacon in his construction of his "wonderful one-hoss shay," to "make each part as strong as the rest," would be as effective as any.

A cat, in walking along a large beam in a wood frame building has not the slightest effect on the structure; but let the feline take a lively trot on the beam, and the whole building trembles. A horse, in walking across a bridge, causes no perceptible vibration, but a trot gives it a thorough shaking up; and this vibration continues for some time after the animal has left the bridge. This vibration is more destructive than an excessive load moving slowly. A locomotive, in crossing a bridge at a high rate of speed, shakes the structure by the counterbalances on the driving wheels, precisely as the cat or the horse shakes the barn or the bridge.

The remedy for this, then, would seem to be to run slow over bridges, but this is obviously impossible with our high velocities on lines where bridges are frequently met with. It only remains, then, to prepare the bridges in all the details of construction to resist vibration as far as possible.

The above has reference to vertical disturbances; but the lateral strain, caused by the natural sway from side to side, which is the result of uneven surfaces, and the space left for lateral play between the flanges and the rails, is equally damaging to bridges. There is more or less lateral oscillation of rolling stock that cannot be avoided. This causes a series of vibrations in that direction which has the same tendency to weaken the members as the vertical disturbance.

It is claimed by good authority that long continued vibration crystallizes metal, which of course renders it unfit for

service, and bridges that have seen long service should be examined to ascertain the exact state of the metal. The frequent breaking of rails is, no doubt, owing in a great measure to vibration as the primary cause. Many rails break near the ends, especially when the splices are loose and the ties near the joint and under it are "low." The ends of the rails being depressed by the wheels, spring back to their normal position, and vibrate with a singing noise like a huge tuning fork. If this looseness of joints continues long, a break is sure to follow. Oscillation produces vibration, which, in turn, produces crystallization, cracks, and breakages.

In a bridge, if one member is more exposed to vibration than another, it will in time become weakened, and the whole structure may fail mysteriously. A proper arrangement of stays and braces will prevent vibration, and this is a subject worthy the attention of engineers.

NAVAL AND COAST DEFENSE.

The annual reports of our military and naval authorities have lately given special emphasis to the well known facts that, though our relations with the rest of the world are friendly, war is ever liable to arise, and a sudden war would find our coasts utterly defenseless and our navy inadequate for any service likely to be put upon it.

A complete revolution has been wrought in the material and methods of naval and coast defense during the past fifteen years; and as a nation we have done little or nothing to keep ourselves abreast of the military and naval progress of the world. Meantime, our prolific inventors have been steadily at work devising new means and appliances of which the nations of Europe have not been slow to avail themselves; so that we as individuals have put into the hands of possible enemies the means of doing us fatal harm. Unless we bestir ourselves as a nation and begin to guard our rich and vulnerable seaports by defenses at once adequate for present needs and susceptible of easy strengthening as new needs may arise, the neglect may cost us in a day, in property destroyed and ransom demanded by a dashing enemy, more than it would have cost to make every seaport on the coast practically impregnable. The Chief of Engineers, General Wright, states the case very compactly when he says in his report:

"For many years no appropriations whatever have been made for the construction of new works or for the modifications of the old works which were built before the introduction of modern ordnance and armored ships, and which latter, although there were none better in their day, are now most of them utterly unfit to cope with modern ships of war. The earthen batteries more recently built in the positions which are available for such batteries in our harbors are generally in effective condition, though by reason of the late increase in the power of ordnance some of them should be strengthened by thickening the parapets and coverings of magazines. The casemated works of which our seaport defenses are necessarily largely composed were built when wooden walls were the only protection of guns afloat. Now ships of war are clad in armor up to two feet in thickness, and the old smooth-bores have been replaced by rifled guns, the largest of which throw shot of nearly a ton weight, and which burn at each discharge nearly a quarter of a ton of powder. While other maritime nations are adding to their already powerful navies heavily armored ships of war, which are armed with 81 and 100 ton guns, and which cost, exclusive of armament, more than \$2,500,000, they are building armored defenses for the protection of their own coasts. Great Britain has already 500 guns in position behind armored defenses. We have not one such gun, nor have we any armored defenses whatever."

Approving of the position taken by the Chief of Engineers the Secretary of War lays proper stress upon the fact that "modern wars come on suddenly, that serious international disputes occur between nations the relations of which are apparently the most unlikely to be other than friendly, and that a condition of readiness for defense and an attitude of belligerency are sometimes the best preventives of actual war. We know that the necessary new works and the proper modifications of our old works will require many years for their completion, and it seems simply a matter of common prudence that we commence without delay and under liberal appropriations to put our coasts in an efficient condition of defense."

As to the means of coast defense the opinion of General Wright that the most efficient, most enduring, and least expensive are fortifications and torpedoes, is unquestionably the true one. One gun properly mounted and handled on land is as efficient as several guns of equal power afloat, owing to the greater certainty of aim.

An armored fort on land can have its power of resistance increased unlimitedly and much more rapidly than increased power of penetration can be given to guns. Not so with floating forts: their buoyancy is limited and their security is gone the moment a gun is made of greater penetration than they were built to withstand. Several fixed forts (whether simply revolving, or both revolving and movable about a defensive mole) can be built for the price of one sea-going ironclad mounting as many guns of like caliber; and the fixed fort is not liable to be enticed away, as ironclads are, leaving a harbor defenseless.

Our geographical position and general policy forbid offensive war on our part, thus relieving us absolutely of the need of building the huge sea-going fortifications of the sort favored by European powers. This fact is clearly though

grudgingly recognized in the recent report of the Naval Advisory Board, convened last summer to consider plans for the reconstruction or rather recreation of our Navy. They say:

"Since it was decided that iron clads must be left out of consideration, it became necessary to determine upon auxiliary means of defense, which, although not so far-reaching in their protection, should still hold foreign armored fleets in check until armored defense could be provided."

Naturally professional spirit led the Board to contemplate only floating "armored defenses," the best service of which, as we have seen, may more cheaply and efficiently be rendered by armored defense on land.

The auxiliary means of defense recommended by the Board for immediate construction are:

Two first-rate steel, double-decked, unarmored cruisers, having a displacement of about 5,873 tons, an average sea speed of fifteen knots, and a battery of four eight inch and twenty-one six-inch guns. Cost, \$3,560,000.

Six first-rate steel, double-decked, unarmored cruisers, having a displacement of about 4,560 tons, an average sea speed of fourteen knots, and a battery of four eight-inch and fifteen six-inch guns. Cost, \$8,532,000.

Ten second-rate steel, single-decked, unarmored cruisers, having a displacement of about 3,043 tons, an average sea speed of thirteen knots, and a battery of twelve six-inch guns. Cost, \$9,300,000.

Twenty fourth-rate wooden cruisers, having a displacement of about 793 tons, an average sea speed of ten knots, and a battery of one six inch and two sixty-pounders. Cost, \$4,360,000.

Five steel rams of about 2,000 tons displacement, and an average sea speed of thirteen knots. Cost, \$2,500,000.

Five torpedo gunboats of about 450 tons displacement, a maximum sea speed of not less than thirteen knots, and one heavy powered rifled gun. Cost, \$725,000.

Ten cruising torpedo boats, about one hundred feet long, and having a maximum speed of not less than twenty-one knots per hour. Cost, \$38,000.

Ten harbor torpedo boats, about seventy feet long, and having a maximum speed of not less than seventeen knots per hour. Cost, \$250,000.

With the exception of the cruising torpedo boats recommended, all of the proposed vessels would seem to be gravely inefficient with respect to sailing capacity. An unarmored cruiser carrying only light guns, if unable to overtake a first class merchant ship or run away from an armored vessel carrying heavier guns, would be of very little use in actual warfare. They might be comfortable for naval officers to cruise in in times of peace, for lying off popular summer resorts, or for picnicking along friendly foreign shores; but they would not do to rest national security and honor on in times of serious conflict. Instead of speeds of from ten to fifteen knots an hour, our unarmored cruisers should aim to be able to make, when occasion demanded, not less than eighteen knots, and from that to twenty-five knots. Both armored and unarmored war ships of thirteen knots and less have gone out of fashion the world over, and except in a war of grain ships and mackerel smacks, the proposed thirteen knot rams would be as useless as so many billy-goats.

Our cruisers should be built with special reference to staunchness and speed. With proper coast defenses we would not be likely to be involved in war with any nation likely to hurt us except in harrying our coast-wise commerce or the foreign merchant marine, which is to be developed, we trust, in the near future. Against such an attack the means of striking back in kind would be our best weapon. And the same fast cruisers, wind-wafted for the most part in time of peace, would be best adapted for the scientific, humane, and other peaceful occupations likely to engage them during most of their lives. Instead of idling at home or in foreign ports, we should like to see our navy always engaged in works of exploration, scientific investigations at sea, or cruising up and down the great commercial routes for the protection and relief of mariners and travelers. They should hover upon the track of storms like Mother Carey chickens, in search of distressed or disabled merchantmen; and the practical schooling in seamanship, pluck, and energy, which our naval officers and men would thus gain in times of peace, would stand us in good stead during the trying times of war, should war ever prove honorably unavoidable.

Salt in Diphtheria.

In a paper read at the Medical Society of Victoria, Australia, Dr. Day stated that, having for many years regarded diphtheria, in its early stage, as a purely local affection, characterized by a marked tendency to take on putrefactive decomposition, he has trusted most to the free and constant application of antiseptics, and, when their employment has been adopted from the first, and been combined with judicious alimentation, he has seldom seen blood poisoning ensue. In consequence of the great power which salt possesses in preventing the putrefactive decomposition of meat and other organic matter, Dr. Day has often prescribed for diphtheritic patients living far away from medical aid the frequent use of a gargle composed of a tablespoonful or more of salt dissolved in a tumbler of water, giving children who cannot gargle a teaspoonful or two to drink occasionally. Adults to use the gargle as a prophylactic or preventive, three or four times a day.

How Voltaire Cured the Decay of his Stomach.

In the "Memoirs of Count Segur," there is the following anecdote: "My mother, the Countess de Segur, being asked by Voltaire respecting her health, told him that the most painful feeling she had arose from the decay in her stomach and the difficulty of finding any kind of aliment that it could bear. Voltaire, by way of consolation, assured her that he was once for nearly a year in the same state, and believed to be incurable, but that, nevertheless, a very simple remedy had restored him. It consisted in taking no other nourishment than yolks of eggs beaten up with the flour of potatoes and water." Though this circumstance concerned so extraordinary a person as Voltaire, it is astonishing how little it is known and how rarely the remedy has been practiced. Its efficacy, however, in cases of debility, cannot be questioned, and the following is the mode of preparing this valuable article of food as recommended by Sir John Sinclair: Beat up an egg in a bowl, and then add six tablespoonfuls of cold water, mixing the whole well together; then add two tablespoonfuls of farina of potatoes; let it be mixed thoroughly with the liquid in the bowl; then pour in as much boiling water as will convert the whole thing into a jelly, and mix it well. It may be taken alone or with the addition of a little milk in case of stomachic debility or consumptive disorders.

FIG IRON BREAKER.

Among the exhibits at the American Institute Fair this fall, no machine attracted more attention than "Blake's pig iron breaker," exhibited by the Blake Crusher Company, of New Haven, Conn., the original patentees and manufacturers of the "Blake challenge rock breaker" of world-wide reputation. The pig iron breaker was designed and built in response to repeated solicitation from foundrymen and others for a machine to break pig iron into pieces, seven to eight inches in length, for foundry purposes.

Heretofore this has been done by hand, either by lifting the pig bodily and throwing it down on a V-shaped mass of iron or by striking with a sledge hammer. The work, especially in the case of the tougher varieties of iron, was necessarily severe, slow, and expensive. Repeated blows with a heavy sledge hammer wielded by a practiced hand would often fail to break a pig of iron. The pig iron breaker is strong and effective, and so simple that the illustrations of it which we present leave little to be desired in the way of explanation. The pig is fed in on an inclined or yielding trough, furnished with rolls, passed over a V-shaped knife to an adjustable stop on the end of the sliding head, A. This sliding head is provided with two knives, equidistant from the center knife on which the pig is supported, and has a motion of two inches.

The sliding head descends, and a piece of the pig extending from the center bearing or knife to the "stop" is broken; it ascends, the pig is struck forward, and another piece is broken from the pig by its subsequent descent. In this way successive pieces are broken from the same pig with great rapidity and ease, with an expenditure of but from two to three horse power. In fact the product of the machine is limited only by the rapidity with which it is fed. Iron can be broken as rapidly as it can be discharged from the cart or car which brings it to the foundry yard.

The machine may be stationary and run by belt or by small engine bolted to the side of its timber frame, to which steam is conveyed by pipe from the boilers at the works where it is used, or it can be mounted on a car with engine and boiler and be moved on a track along the piles of iron to be broken.

The Blake Crusher Company is now mounting one in this way for the Albany and Rensselaer Iron and Steel Company, Troy, N. Y., where 500 tons are broken daily for making Bessemer steel. At present the pigs are broken by hand into but two pieces.

It is thought that the breaking of pigs into a greater number of pieces by machine will secure a more intimate admixture with the fuel and fluxes in the cupolas, greater economy

not only in heating but in melting, and a greatly increased product of steel in the same number of hours.

The machine is the invention of Theodore A. Blake, Mining Engineer and Secretary of the Blake Crusher Company, New Haven; was patented May 3, 1881, in the United States, also in England. It received the award of "medal of excellence" at the recent fair of the American Institute, where the Blake Crusher Company was awarded the semi-centennial gold medal for their challenge rock breaker.

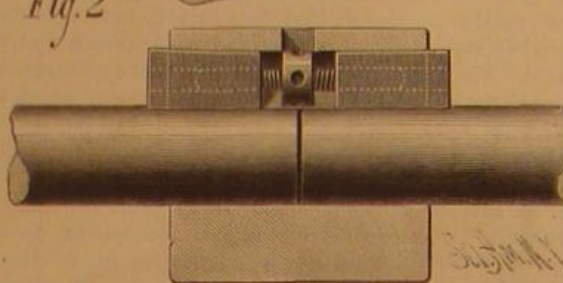
IMPROVED SHAFT COUPLING.

We give an engraving of an improved shaft coupling lately patented by Messrs. J. B. Dyson & S. K. Paramore, of New Britain, Conn. It is very simple, easily constructed and easily applied, and when it becomes necessary to dis-

Fig. 1



Fig. 2

**NOVEL SHAFT COUPLING.**

connect the shafts it is easily removed. The adjacent ends of two shafts are inserted in a sleeve which fits the shafts and has a longitudinal groove formed in its inner surface. This groove is tapered or inclined on the top from its ends toward its center, as shown in the sectional view, Fig. 2.

Two keys, corresponding in shape to the groove, fit against the inclined bottom of the groove. The inner sides of the keys are concave or flat to rest upon the sides of the two shafts. One key has a right screw hole and the other a left screw hole cut through it, into which fit the threads of the

direction the keys are pushed outward, releasing the shafts. It will be noticed that the sleeve is slotted transversely opposite the collar of the screw to allow the lever or operating handle to be inserted in the holes in the collar and turn the screw. It is unnecessary to mention the advantages possessed by this coupling, as it can readily be seen that it is in every particular a practical thing.

The American Public Health Association.

The American Public Health Association, in session at Savannah, Georgia, December 1, elected the following officers: President, Professor R. C. Kedzie, of Michigan; First Vice-President, Dr. Ezra M. Hunt, of New Jersey; Second Vice-President, Dr. Albert L. Gehon, U.S.N.; Treasurer, Dr. J. Berrier Lindsley, of Tennessee; Executive Committee—Dr. James E. Reeves, West Virginia; Dr. Stephen Smith, New York; Dr. Thomas L. Neal, Ohio; Dr. J. G. Thomas, Georgia; Edward Fenner, Louisiana; and Dr. John H. Rauch, Illinois. The papers read at this meeting have covered, as usual, a wide range of topics relating to public sanitation. The meeting next year will be at Indianapolis.

The King of Siam to the United States.

General Halderman, our Consul General in Siam, has received from His Majesty the King of that far off country a promise to furnish a memorial stone for the Washington National Monument.

Another Great Ocean Steamer.—The Servia.

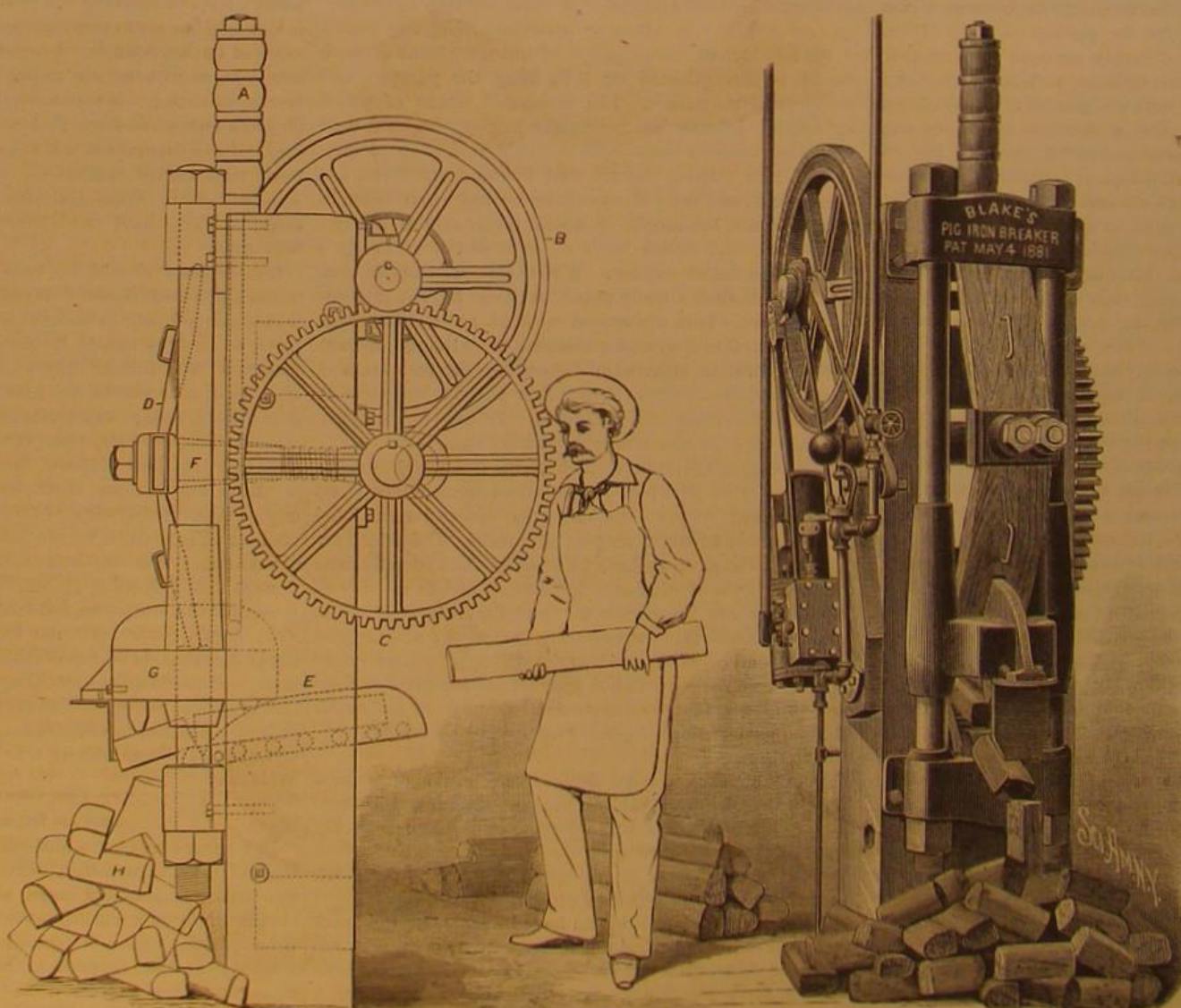
The new Cunard steamship Servia arrived at this port Dec. 7, after a stormy passage of thirteen days. For the first seven days she had to buffet severe head winds, at times approaching a hurricane. Her best day's run was on the 6th, when she made 406 miles. Her gross tonnage is 8,500 tons; engine power, 10,000 horse power.

The length of the Servia is 533 feet; breadth, 52 feet; depth, 44 feet 9 inches. Her cargo capacity is 6,500 tons, with 1,800 tons of coal, and 1,000 tons water ballast. She has a double bottom on the longitudinal bracket system. The anchor davits are 8 inches and the chain cable pipe 23 inches in diameter. The propeller shaft weighs 26½ tons, and the propeller, boss, and blades are 38 tons in weight. The machinery consists of three cylinder compound surface condensing engines, one cylinder being 72 inches and two 100 inches in diameter, with a stroke of piston of 6 feet 6 inches. Her boilers are seven in number, 6 of them double and 1 single ended, all made of steel. She has 39 corrugated furnaces. There are 168 state rooms, with accommodation for 450 first class and 600 steerage passengers, besides a crew of 200 officers and men.

The ship is divided into nine watertight bulkheads, and carries twelve life-boats. In the engine and boiler spaces are water-tight doors which can be shut from the upper deck in case of accident in about two seconds. The keel of the ship has five thicknesses, making a total thickness of 6¾ inches. The riveting was done by Tweedell's hydraulic riveter, and all the frames and beams of the vessel were riveted by this process. The lower deck is of steel, with a covering of teak above the engine and boiler spaces, and the upper and main decks are both of steel with wood coverings. All the deck houses and deck fittings, the positions of which render them liable to be carried away during heavy weather, are riveted to the steel decks underneath.

The Servia is equipped with Muir & Caldwell's steam steering gear, steam winches, a steering gear independent of that managed by steam apparatus, and Sir William Thomson's compasses. Every separate passage in the vessel

is ventilated by a series of ventilators. The cabins and saloons are heated by steam. The construction of the Servia was superintended by Captain Watson, of the Cunard service, and Mr. William Muir, the company's engineer at Glasgow. In every part of the ship the most advanced scientific improvements have been adopted. The very best material has been used.

**BLAKE'S PIG IRON BREAKER.**

right and left screw, whose middle part has a collar formed upon it in which are formed a number of radial holes to receive the end of a pin to serve as a lever or handle for turning the screw.

When the screw is turned in one direction the keys are drawn inward toward each other, and clamp the ends of the shafts securely, and when the screw is turned in the other

EXPERIMENTAL BOILER EXPLOSION.*

Mr. D. T. Lawson, of Wellsville, Ohio, as our readers know, has been conducting experiments with a view to determining the nature of the causes of the explosion of steam boilers, and as a result of these experiments he maintains that his original theory of boiler explosions is correct.

He believes that water raised to a high temperature, when confined and under pressure, will burst into steam when the pressure is removed from its surface; and if the exploding water meets resistance, as in a closed boiler, the effect of the concussion will be greater than the regular steam pressure.

For his experiment, Mr. Lawson had a plain cylinder boiler made in the best manner, of the best iron. It was six feet long and thirty inches in diameter. Its heads were of three-eighths inch flange iron secured by a one inch stay rod running from one head to the other. The shell was of three-sixteenths iron.

The boiler was set in an arch and connected by a pipe with a closed cylinder, into which steam was admitted to suddenly relieve the surface of the water in the boiler from pressure. A first class steam gauge was placed in the bomb-proof and connected with the boiler by a pipe about forty feet long. The valve, controlling the escape of steam from the boiler to the cylinder, was arranged to be operated by a cord from the bomb-proof. The boiler was filled with water eleven inches above the fire line, and the fire was supplied with extra fuel in the form of petroleum, the supply of which could be controlled from the bomb-proof. After a few preliminary experiments the final and successful one was tried on the 16th of June last.

Steam was raised to 260 lb., when the valve was opened, the index of the steam gauge fluctuated some 30 lb., showing an extraordinary disturbance in the boiler, and nothing more. A repetition of this with steam at 300 lb., at 335 lb., and at 365 lb., produced the same results. But when the valve was opened at a pressure of 380 lb., the boiler exploded with a loud report, scattering fragments of its shell, furnace, and stack in all directions. The stone foundations were driven several inches into the ground.

It is stated that there were evidences that the plates were rent at least four times transversely and torn open the entire length. One piece had a hole blown through it about the size of a man's hand.

It was estimated that the boiler would have borne a continuous pressure of over 700 lb. per square inch. There seems to be ample evidence that it required an extraordinary force to effect the destruction of the boiler.

We understand that Mr. Lawson has some further experiments in contemplation which he expects will furnish additional proof of the correctness of his position.

The Elias Magneto-Electrical Machine.

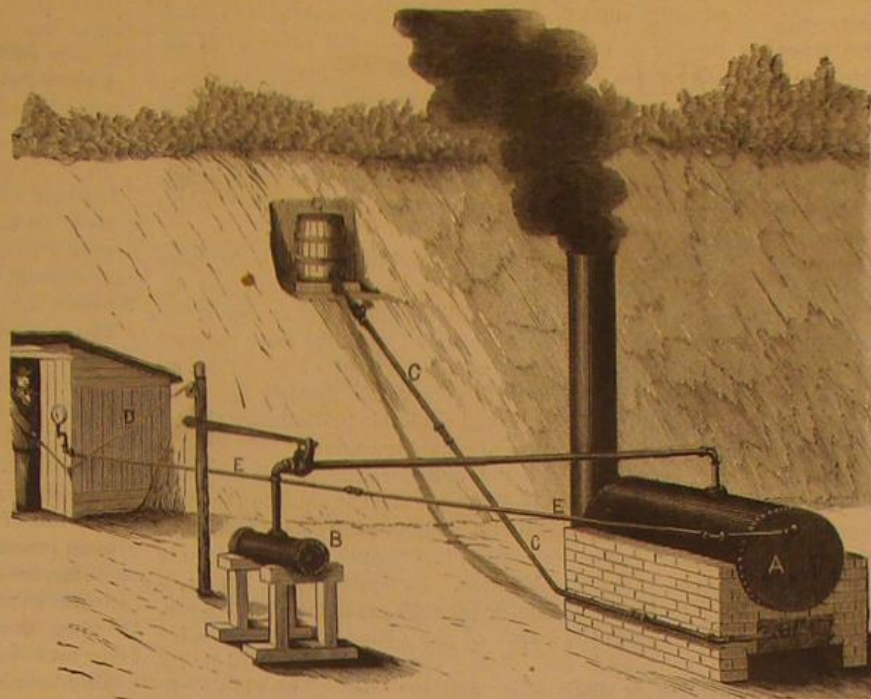
The magneto-electric machine of Signor Paccinotti, which forestalls the "Gramme ring" by several years, has been brought into fresh repute by the discourse of M. Govi delivered at the Electrical Congress, and by its exhibition in the Italian Section of the Exposition at the Palais de l'Industrie.

Close beside it, however, in the Dutch Section, is another old machine which has not received all the attention which it deserves. Indeed it does not appear to have been on view all the time the Exhibition has been practically complete. This apparatus was invented by Herr Elias as far back as 1842, and as it contains a somewhat similar ring to that of Gramme, it may be said to have anticipated Paccinotti to a certain extent. It consists essentially of two concentric rings of soft iron, each about one inch and a quarter broad and half an inch thick, and wound with gutta percha coated wire in six sections. The outer ring is the inducing electro-magnet, which is fixed, and the inner ring is the revolving armature, which is mounted on an axle which carries a slip commutator with contact rubbers of copper after the plan now so universally adopted in dynamo-electric machines. There are six knobs or teeth projecting inward from the outer iron ring and serving for magnetic poles, in front of which the armature coils revolve. The wire is wound continuously on the outer ring, but in the reverse direction in each of the six succeeding sections. This arrangement is designed to make the projecting poles alternately positive and negative. From opposite diameters of this ring a connecting wire runs to the commutator, and connects to three of its six slips alternately. The result is that as the inner armature revolves the alternating currents generated in its coils are led off by the wires connected to the copper rubbers as a continuous

current; for the brush which draws a positive current from one slip also draws a positive current from the next, because the slips are alternately connected to coils on opposite sides of the ring, and passing in front of opposite poles of the electro-magnet.

The machine is exhibited by the Ecole Polytechnique of Delft, and is accompanied by a book on the apparatus, written by its inventor, and published at Haarlem in 1842.

Both its author and printer are now dead, and no other copy is known to be in existence. It contains a very good engraving of the machine as it stands, and we should have liked to reproduce this diagram, but the book is considered



LAWSON'S EXPERIMENTAL BOILER EXPLOSION—ARRANGEMENT OF BOILER.

so rare and interesting that it has been taken away for purposes of translation.

Remarkable Lathes.

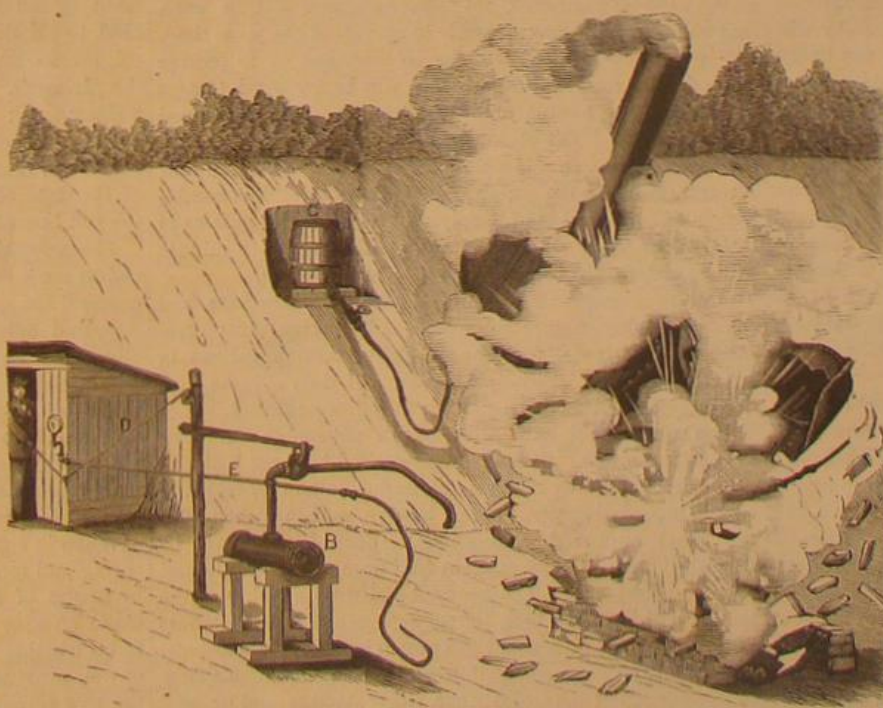
The London Iron Trade Exchange has printed a paper contributed to the Iron and Steel Institute by Colonel Maitland,



FRAGMENTS OF THE EXPLODED BOILER.

Superintendent of the Royal Gun Factory, at Woolwich, Eng., in which appears the following in relation to the gun turning lathes:

"The very nature of the manufactures in the Royal Gun Factory necessitates the turning of very large and very heavy masses. Lathes have therefore been designed and completed in this department remarkable for magnitude and power. They can deal with weights up to 200 tons, and



LAWSON'S EXPERIMENTAL BOILER EXPLOSION.

are sufficiently powerful to reduce by six inches at a single cut the diameter of a 12-foot tube. These lathes have the following dimensions: 6-foot centers, 60-foot beds. There are nearly 200 tons of material employed on each of them, and the maximum power of their gearing is 150 to 1."

MECHANICAL INVENTIONS.

An improvement has been made in double oscillating engines, in which two vibrating pistons, attached to separate rock shafts in axial line with each other, are arranged within sector-shaped chambers, and carry crank arms on the outer ends of their rock shafts. Attached to these arms are rods which serve to reciprocate slides, that work in suitable slideways, and have pivoted to them rods which are connected with cranks on the driving shaft of the engine. This forms a very compact and efficient engine, and is the subject of a patent recently granted to Mr. Robert L. Stevens, of Albany, Oregon.

An improved stop motion for warping machines, which allows the winding of single or double threads, and will insure stoppage of the machine, has been patented by Mr. John B. Greenhalgh, of Blackstone, Mass. This invention is an improvement upon a former invention by the same party. The improved devices are fitted between the cylinder and bobbin stand of the machine. In operation the threads pass from the bobbins, through guides, to and through eyes of fallers, and through a vibrating guide to the beam on the cylinder. The fallers are thus held up out of reach of a rod that is constantly vibrated. A belt shifter is set to hold the operating belt to the fast pulley, and a latch-engaging lever retains the shifter. In case any thread breaks, its faller, being thus released, drops into the path of the vibrating rod, and the rod, by coming into contact with said faller, moves a bar to which the fallers are pivoted, and which projects upward from a shaft that, in thus being partially turned, releases the belt shifting mechanism, and causes the belt to be thrown on to the loose pulley.

Mr. Peter McCourt, of Grand Haven, Mich., has patented an improvement in loose pulleys, whereby the rattling noise usually common to such devices, and which is consequent upon the wearing of their bearings, is avoided. The invention consists in a pulley, which operates as a loose one, rigidly mounted on a shaft having a bearing in its hanger, and having its one end fitting loosely on a box that is loosely mounted on the end of the shaft on which the driving pulley is mounted, so that the loose pulley will not revolve loosely on its shaft, but the independent shaft of this pulley will rotate in its bearings. The loose box in which the adjacent ends of the two shafts have a bearing remains stationary.

A simple but serviceable improvement in harrows has been patented by Mr. John H. Stokesbary, of Aurora, Neb. This invention consists in making the tooth bars of the harrow square with the perforations for reception of the shanks of the teeth passing diagonally through them, and securing the harrow teeth by upper and lower notched or angular washers receiving opposite angular portions of the bars between them, said washers being secured on the teeth against the bars by nuts on the tooth shanks above the bars and shoulders on said shanks below the bars, and serving to strengthen the bars where they are weakened by the perforations for the teeth, and to prevent the said bars from being split by the side pressure of the teeth.

Mr. Kittil Anunsen, of Winchester, Wis., has patented an improved turbine water wheel. This invention consists of a vertical circular case containing a horizontally revolving water wheel having inclined buckets, and containing above said wheel a fixed circular platform having a circle of inclined tubes inserted through it near its periphery, which tubes extend downward to deliver water into the buckets; and it consists, further, of a movable circular disk or cut-off covering the face of the tube platform, and having a circle of inclined apertures corresponding with the tubes, which cut off is capable of being turned about its vertical axis, by any suitable mechanism, for the purpose of closing the tubes or of bringing the apertures in coincidence with them. Means are also provided for clamping the cut-off disk down upon the tube platform and holding it immovable thereon in any desired position, and for releasing it when it is necessary to adjust the cut-off. This makes a cheap and effective water wheel.

A very useful attachment to printing telegraph instruments, in the shape of a tape supporter, has been patented by Mr. Edward J. McLoughlin, of New York city. The object of this invention is to provide a device especially applicable to stock printing telegraph instruments for supporting and displaying the tape as it runs from the instrument and thereby preventing its disarrangement. The device consists of a shallow trough within and along which the tape passes as it is run from a stock or other printing telegraph instrument. This trough is constructed at its one end to admit of its ready attachment by a thumbscrew to the edge of the table on which the instrument sits, and is provided at or near its outer end with a transverse rod arranged to prevent the

* In SUPPLEMENT 313 will be found an essay by Mr. Lawson in which he gives a detailed account of this experiment, and sets forth the principles he claims to have discovered.

tape, as it is handled, from being disengaged from the trough.

A valuable improvement in ore roasting and chloridizing furnaces, especially designed for working gold and silver ore, has been patented by Mr. Robert A. Nevin, of Silver Cliff, Col. The ore to be operated on is first fed into the higher end of an inclined revolving cylinder or furnace, and passing through said furnace is exposed to a gradually increasing temperature as it approaches the fire box of the furnace, whereby said ore is partly or wholly desulphurized. From the lower end of this furnace the desulphurized ore falls, through an inclined passage or chute in the flue which leads to the chimney, into the higher end of a second inclined revolving cylinder or furnace, and as said ore passes through said chute, chloride of sodium is introduced to mix with it and to fall with it into the second cylinder, down through which the mingled ore and salt pass, subject to a gradually increasing temperature, whereby the metallic portions of the ore are chloridized, and the ore is ready for subsequent lixiviation or amalgamation. By desulphurizing the ore before the application of the salt, the metallic portions of the ore and the chlorine of the salt more readily and thoroughly combine, thereby effecting a saving of the salt and of the metals, and, by the passage of the ore from one furnace into the other being continuous, the ore does not become cooled in the operation.

A simple but apparently practicable and effective method of holding underground telegraph wires separate from each other, and properly insulating and protecting them, has been patented by Mr. John B. Morgan, of Kansas City, Mo. In this improvement a succession of metallic boxes, preferably of rectangular form and open at both ends, are arranged in trenches at the requisite depth beneath the surface of the ground. These boxes are formed with outwardly extending flanges along their upper edges and at their ends, which flanges are longitudinally grooved for holding the leaden gaskets or seals with which covers are sealed or jointed to said boxes and with which the boxes themselves are jointed to each other. The covers are scarfed at their ends to form overlapping joints with each other, and are provided with gates for pouring in the molten lead to seal them. Before placing on the covers, however, the boxes are filled with a series of longitudinally grooved boards mounted one upon the other, and having the telegraph wires arranged within their grooves, each board as it is put in place, commencing with the lowermost one, and the wires contained in its grooves, being smeared by a brush with melted paraffine or wax. This thoroughly insulates the wires and acts as a seal between the surfaces of the boards.

Messrs. John E. Chamberlain and George W. Kemp, of Charleston, W. Va., have patented certain improvements in rope railways. This invention relates to inclined rope railways, in which coal, earth, or other material is conveyed from an elevated to a lower point in cars or baskets suspended from a pair of wire cables stretched between the receiving and discharging points at proper tension, the descending loaded car or basket on one cable causing the ascent to the loading point of the empty car on the other adjacent cable. In rope railways of this class, as previously constructed, no means were provided for preventing the bellying or sagging from the main wire cables of the check ropes connecting the suspended cars and the winding drum, which sagging would quite overcome the gravity of the descending loaded car when at a point opposite the ascending car on the adjacent cable and bring both cars to a stop, and consequently compel the use of power other than the gravity of the loaded car to lower the latter to the discharging point. This invention consists in a method of preventing the sagging of the check ropes and thereby dispensing with an auxiliary power, by supporting the check ropes on independent clevises on the main cable. These clevises are flexibly connected, whereby they will spread apart to support the check ropes as fast as the latter unwind. A chain connection is preferred for this purpose. Both of the inclined main cables of the railway are similarly provided with these traveling clevises. The invention also consists in a combination with the car having a hinged bottom, supported by a sliding locking bar and catch, of a bumper at the lower end of either inclined cable, for the bar to strike and release the car bottom and whereby the contents of the car are automatically dumped. These are valuable improvements.

Mr. Charles W. Dean, of Taunton, Mass., has patented an improved cut-nail machine. This machine is more especially designed for making hooked nails, but is also adapted for making nails of various other shapes. When in operation the nail plate is fed by hand or otherwise over a bed knife. A cutting jaw then rocks downward, and with its knife cuts a nail blank, which is instantly gripped between the end of a moving die and a stationary bed die, and is held until it is headed by a movable header. The cutting jaw is provided with an offset carrying a horn, and the heading lever has also a horn. These two horns are connected by a pin which is supported at its ends in socket boxes, of which the one in the cutting jaw horn is adjustable in an elongated slot, to change the throw of the heading lever. As the cutting jaw rocks upward the heading lever is drawn inward until the point of the header is opposite the nail to be headed, when the horn of the cutting jaw tilts upward also, and by means of the connecting pin rocks the heading lever sidewise so as to bring the point of the header to bear with pressure upon the nail end. The operating mechanism is simple and not liable to get out of order,

and every necessary provision is made for removing and replacing the principal working devices, also for changing certain parts to make nails of various kinds.

PROPOSED NEW SYSTEM OF WATERWORKS FOR CHICAGO.

[Continued from first page.]

a combination consisting of a greater number of smaller pumps, each arranged to follow at equal distance. It is everywhere conceded that to obtain the best result from fuel, an expansion of steam varying from four to six times must be practiced.

"Where, as in the case of moving water, the load or resistance is constant, expansion of steam upon a direct acting piston is not practicable. Where the load is elastic and the character of the work to be performed is such as will admit of varying periphery speed, the theoretical economy of expanding steam will be partially realized in practice.

"The speed of pumping machinery should be comparatively slow, and the design should be selected with a view to maintain a uniform flow through the receiving and discharging mains. Many efforts have been made to utilize the principle of expansion of steam in pumping machinery, but so far without success.

"The beam pump, with steam and water cylinder at either end, and with intermediate crank shaft and prodigious fly-wheel, was expected to meet all demands; but in this design the fact that, to reproduce in useful work the extra pressure given to the piston in the commencement of the stroke, an acceleration of speed must be given to the fly-wheel, was overlooked, and it has been found advisable to disengage the expansion gear on this type of pumping engine.

"The compound or double cylinder expansion is the latest effort, yet as the terminal pressure must be equal to the load, and not being provided with reciprocating rotary motion, it is difficult, in fact impossible, to discover any advantage in this complicated combination. By expansion of steam, is meant that when the boiler pressure has followed the piston, say, one-fourth the length of the cylinder, communication with the boiler is cut off and the piston is impelled by the expansion or diminishing pressure, which, providing the boiler pressure be 100 pounds, will give a terminal pressure of 25 and an average 59 pounds. If the load is greater than the terminal pressure is capable of overcoming, the machine will stop. If there be rotary motion, but insufficiently charged by acceleration, it will also stop. If there be rotary motion of sufficient weight and sufficiently charged by acceleration to compensate for the diminishing pressure on the piston, the economy of expansion will be overbalanced by the power expended in acquiring acceleration.

"When the driving engine is permitted to make a greater number of strokes per minute than is being made by the pumps, the varying periphery velocity of the engine occasioned by the varying pressure on piston when working under a high rate of expansion will be inappreciable on the pumps, thus practically permitting a realization of the economy of steam expansion."

Mr. Golding's tender to the Commissioner of Public Works provided for ten single acting plunger pumps 30 inches diameter and 4 feet stroke. The pumps will be driven by spur wheel and pinion from a continuous shaft. The pinion will be permanent on the driving shaft, while the spur wheel will revolve loose upon the pump shaft and so arranged that the pump may be started and stopped at the will of the operator. The pumps will be placed in a continuous line and connected to the pinion on driving shaft in a division of ten. The pinion shaft will be connected by coupling at either end to two duplicate engines, only one of which need be connected, yet the connections will be such that either or both may be made to operate at the same time. The pump connections will be so arranged as to receive water from a receiving main which will be arranged to pass in line with the pumps, and the discharge will be arranged in like manner. The pinion will be geared one to four with the pump so as to allow the driving engine to make four revolutions while the pump shaft makes one. This combination will be capable of supplying fifteen million gallons in twenty-four hours with seven and a half strokes per minute of pumps and thirty revolutions of driving engine.

With the pumps making fifteen strokes per minute, and the two driving engines connected and making sixty revolutions per minute, will supply thirty million gallons in twenty-four hours continuously, and will do the same with one engine by allowing the steam to follow sufficient.

The engines will be furnished with adjustable cut-off or expansion motion. Steam will be supplied by three batteries of boilers, consisting of three double flue boilers, 26 feet long and 42 inches diameter, to each battery, and furnished with the usual approved connections. Each battery will be furnished with an independent feed pump of the beam and balance wheel type. The material and workmanship of the boilers will be of the best, the mountings and appurtenances will be the same as is usual and proper in such combinations. The steam and water connections will be arranged with a view of concentrating the steam upon either engine and of conveying the feed water from either feed pump to either battery of boilers.

The pumps are to be of the most primitive and simple design, consisting of a bucket plunger and a hollow base containing ordinary suction and discharge valves. The plunger has a cross head projecting through guides attached to the top of the pump, and having at each end a connecting rod carried by a crank on the shaft below.

In our engraving the larger view shows the complete sys-

tem. Fig. 2 is a vertical transverse section of one of the pumps; Fig. 3 is a plan view; and Fig. 4 is a vertical section in the direction of the shaft.

The cranks of the several pumps are arranged relative to each other, so that they occupy different positions in the circle. This arrangement renders the flow of water continuous, and brings a practically constant load on the engine, enabling power to be applied to pumping as advantageously as to steam propulsion or manufacturing.

The material, workmanship, appurtenances, and general arrangement of the boilers will be made to conform to the United States Government inspection. The workmanship and material of engines, shafting bearings, and pumps will be in every particular first-class.

DECISIONS RELATING TO PATENTS.

United States Circuit Court—Southern District of New York.

LORILLARD & CO. vs. DOHAN, CARROLL & CO.—TOBACCO PLUG PATENT.

Reissued Letters Patent No. 7,382, dated October 24, 1876, granted to Charles Siedler upon the surrender of original Letters Patent No. 158,604, dated January 12, 1875, for an improvement in plug tobacco.

Wheeler, J.:

The decisions in *Lorillard vs. McDowell* (11 O. G., 640) and *Lorillard vs. Ridgeway* (16 O. G., 123) upon the question of the identity of the reissue with the original affirmed.

The force of English letters patent as references are overcome by evidence showing that the domestic patentee made the invention before the date of the filing of the foreign specification.

The use of screws, nails, coins, and other similar things pressed into the surface of the plugs at certain stages of the manufacture to identify some particular plugs to the manufacturers themselves, and not to go out into the market with the plugs, does not anticipate a mode of marking and identifying each separate plug of tobacco as being of a particular quality, origin, or manufacture, by tin labels or tags, having a desired inscription upon them, and prongs extending backward from their edges, pressed into the plugs in the last processes of manufacture, with their faces even with the surface of the plugs, where they would be held by the prongs and the surrounding tobacco.

Decree for injunction granted.

United States Circuit Court—Southern District of Ohio.

WATKINS vs. CITY OF CINCINNATI.—LAMP BURNER PATENT. Matthews, Cir. J.:

Reissued Letters Patent No. 7,706, being a reissue of patent granted Louis Fischer, March 30, 1869, for improvement in vapor burners, *Held* valid and infringed by burners known as "Globe burner" and "Champion burner."

The Fischer patent held to cover vapor burners having a tube or passage arranged to conduct a portion of the oxygenized vapor from the mixing or gas chamber to a point below where the commixture takes place, in order to heat the fluid in the lower part of the chamber.

Various prior patents distinguished from the Fischer and held not to embody the invention described and claimed in it.

United States Circuit Court—District of Connecticut.

FITCH et al. vs. BRAGG & CO.—SNAP HOOK PATENT.

This is a bill in equity founded upon the alleged infringement by the defendants of Letters Patent granted May 16, 1865, to Charles B. Bristol and others, assignees of said Bristol, for an improved snap hook. The patent is owned by the plaintiffs.

Shipman, J.:

When the claims of a patent are susceptible of various meanings, that construction will be adopted which, in view of the state of the art, limits the patentee to and gives him the full benefit of the invention he has made.

The general terms and sometimes special words in the claims must receive such a construction as may enlarge or contract the scope of the claim, so as to uphold that invention, and only that invention, which the patentee has actually made and described, when such construction is not absolutely inconsistent with the language of the claim. (*Estabrook vs. Dunbar*, 10 O. G., 909.)

When there is a new and beneficial result attained by a new arrangement of the parts of a combination, there is a new combination, although the action of certain elements may remain unchanged.

When in a snap hook the claim was for a combination of spring and recessed tongue, the recess being so located that by reason of the new location of the spring the hook was made cheaper and easier to clean, *Held* that it was immaterial whether the action of the spring had been improved or not, provided that there is a benefit which is the result of the new combination.

Effects of Pilocarpin on the Color of the Hair.

Dr. D. W. Prentiss, of Washington, D. C., gives an account of a remarkable change in the color of the hair from light blonde to black, in a patient while under treatment by pilocarpin, the case being one of pyelo-nephritis; the other being a report of a case of membranous croup, treated by pilocarpin, in which there was also a slight change in the color of the hair.

STEAM BOILER NOTES.

On the 23d of November, the boiler at D. Milliken & Son's tannery, in Bangor, Me., exploded, demolishing the building, in which were seven men. William Barston was blown twenty feet through a window. His left arm and a portion of his left side were badly scalded, his right arm and thumb somewhat injured, and he was also scalded on the right side of his face. Albert Milliken was blown through the roof, but received only slight injury. A man named Ames was knocked down, but was uninjured. The physician says Barston will recover in a few weeks. The boiler was located in a pit below the level of the floor, and when the explosion occurred it was lifted up, went through the side of the building, and landed some distance from the tannery. The roof of the building fell in.

It is reported by a contemporaneous newspaper, technical as to cotton manufacturing in the East, that this "was of the Sullivan pattern" of boiler. Now there are divers "patterns" of boilers bearing this name in New England, and the announcement seems to mean nothing in explanation of the explosion; while users of the later and safer forms of Sullivan origin, which are now said to be accepted for insurance against explosion, may feel undue anxiety for their safety, and the numerous family of boiler-making Sullivans will naturally feel scandalized at the insinuation. It is, moreover, reported that this sample was not only a Sullivan, but it was understood to be a second-hand one.

It may be said, if it was of the same particular "pattern" as its namesake that blew a machine shop to atoms in Ellsworth, Me., in the summer of 1875, on the seventh day of its existence as an active steam boiler, then its having endured the test of practical use long enough to acquire the title of second-hand would indicate that it was a better individual than some of its relatives, a number of whom have gone up in a cloud of dust in early life.

At 10:10 A.M., September 28, an explosion occurred at the works of the Saginaw Barrel Company in Saginaw City, Mich. The explosion occurred in the room used for steaming logs preparatory to cutting them into hoops. The usual method of doing this work was by boiling the logs in large tanks, but in cold weather this was not considered the best way, and other means were resorted to. Charles H. Utter, Alex. Bush, Ira Nichols, and Frank Busshard were seriously injured. Utter was alive at last accounts, but his injuries are fatal. Nichols will likely recover.

The device that was to be substituted for the original was a boiler or shell, forty inches in diameter and about seven feet long. This was furnished with a cast iron head fastened on by bolts to the boiler. On the 26th steam was turned in the shell for the first time, and the scheme seemed to work satisfactorily. On the 28th, however, when the practical test was to be made, the result was far different. The log was put in, the head screwed on, and the steam turned in, when in an instant the whole front, weighing 600 pounds, was blown into fragments.

Mirabile dictu!—wonderful to be told!—and yet this often happens when seam joints are made by bolting together parts whose gasket surfaces do not coincide in form when brought together, touching at two or three points only. A cast iron disk or plate, being one of the parts, may readily be put in a state of tension in making a steam-tight joint, using long wrenches, lengthened perhaps by slipping over the wrench handle an old two-inch pipe, or attaching a block and fall to the eye in the end of the wrench handle, so that only just what was done here at Saginaw would be required to break the head into fragments, though it weighed even more than 600 pounds and was a sound casting at that, till it was overloaded. Or may be the gasket is bad, having thick and thin places or hard and soft places, and continuing to leak, Mr. Steamfitter continues to screw with his compound "purchase" till the bolts are just ready to "part" on the application of the full calculated load of steam pressure, and the thing blows off, to the great astonishment and serious injury of bystanders, who perhaps think it should be strong in proportion to the power applied to the wrench.

Of course it is impossible from this standpoint to say that anything of the kind took place at Saginaw, and the operators there may feel touchy about this hypothesis, but such things have happened in more refined establishments than barrel factories. It is more than probable that construction was faulty or the management bad. It is not at all probable that low water and overheated plates caused a sudden and violent evolution of an irresistible pressure, since no fire was present. It is not impossible, however, that the dynamite advocates may gather comfort for themselves from the possible fact that some malicious person could have concealed a cartridge in or upon the logs that were put in to be steamed.

The boiler in the Yazoo Oil Works, at Yazoo City, Mississippi, burst December 1, demolishing the boiler house and one end of the main building, and injuring seven men, four of them fatally.

John Steinheim was fatally injured by a boiler explosion in the Wadsworth Coal Company's mine near Doylestown, Wayne County, Ohio, at midnight, December 2. Another man was seriously hurt. The wounded men crawled half a mile to get to the surface of the mine.

It appears from the *Ironmonger* that a meeting of a committee of the Smoke Abatement Exhibition was lately held in London, England, where the announcement was made that the Society of Arts had resolved to add to its other prizes a special medal to be given in the name of the society to the inventor of the best smoke-consuming stoves and

grates. Professor Chandler Roberts reported that he had arranged for chemically testing the products of combustion during the trials of the competing exhibits. The object, no doubt, is to ascertain whether or not combustible gas still remains after the elimination of the black color of the smoke.

An ordinance, which was lately approved by the Cincinnati Mayor and Board of Public Works, and which went into effect on its passage, provides for the appointment of an inspector of furnaces. It requires all users of steam boilers and other furnaces to provide some satisfactory method of preventing the discharge of black smoke into the atmosphere.

No doubt the general adoption of an effective apparatus for the actual consumption of the carbon that gives the dark color to the smoke of soft coal and other bituminous fuels would prove a great public benefit by the abatement of the smoke nuisance, and it would also effect a vast saving of fuel in almost every industrial establishment, whether the fuel yields black smoke or otherwise. A change of color, or its absence altogether, does not necessarily indicate that the escaping gases do not still contain combustible elements that should have been burned in the furnace or combustion chamber.

Anthracite furnaces improperly constructed or badly managed have been shown to be quite as wasteful as those that send out dense black smoke from bituminous fuel. In crowded manufacturing cities the peculiar odor of carbonic oxide, etc., a combustible compound from anthracite fires, is often perceived by occupants of dwellings or rooms on a higher plane than the chimney tops from which it escapes; and even in lower places, when the atmosphere is still and the barometer low, it is diffused in such quantity that its odor is perceptible. It may not be more injurious to health than the inodorous gases from more perfect combustion of anthracite, still it is possible that the double object of better air and a saving of fuel may be attained by perfecting the combustion of anthracite as well as bituminous coals.

At the last monthly meeting of the management of the Boiler Insurance and Steam Power Company (Limited), held in Manchester, England, the chief engineer reported that during October, 1881, 5,414 boilers had been inspected, of which number 58 were internally and 896 thoroughly examined; 25 boilers were also tested by hydraulic pressure. The principal defects found in the boilers were as follows: Corrosion of plates and angle irons, 212; fracture of plates and angle irons, 44; safety valves out of order or overloaded, 132; pressure gauges out of order, 67; water gauges out of order, 23; boilers damaged by overheating in consequence of deposit, 3; boilers damaged by overheating in consequence of deficiency of water, 8.

The item of special interest in this report is that relating to safety valves. In a single month it seems that 132 of these attachments were found to be no longer reliable as safety valves. This company has usually claimed entire immunity from destructive and fatal explosions of boilers in its care; and the expression used in this report, together with the large number "out of order or overloaded," without a single dangerous one being noticed, indicates the scrupulous care with which they watch and report this least departure from perfect order in this all-important appendage. It is probable that its inspectors are quite as critical in their observation and treatment of the progress of all kinds of deterioration to which steam boilers are liable, using the "ounce of prevention" in time to prevent the necessity of the "pound of cure." However this may be in its practice, it is here and now recommended as the only way to secure what this company has so often claimed in its reports.

A boiler in James Henry's shingle mill, Grand Rapids, Mich., exploded, November 27, killing Joseph Slater, the engineer, and David Hardy, of Maple Hill. George Bland was slightly hurt. The mill was entirely destroyed, and a dwelling adjoining the mill badly injured.

A boiler explosion occurred at Douglass & Son's mill, at Mud Creek, Texas, November 29, killing four men. The mill was blown to atoms.

Are Bees a Nuisance?

An unusual case is being tried in the Cumberland County (Penn.) Court this week, that of testing by a jury whether the keeping of a large number of bees in a town or borough is a public nuisance or not. The case is from West Fairview, a small town on the opposite side of the river from Harrisburg. Two citizens had about 130 skeps of bees, and as the summer was scarce of material such as the bees feed upon they came in large numbers into the houses, stores, grape arbors, and wherever there was anything for them to feed upon. In one instance they swarmed in a neighbor's kitchen, and were there for days, he not being able to live them, the queen being killed. They were especially bad about canning and preserving time, compelling the housewife to do her preserving in the evening, and in one instance the wife had to climb in and out of the window for days, not daring to open the doors, for the bees would go in by hundreds; persons were stung passing along the streets and highways; entire houses became infested with bees, so much so that the inmates could not retire to rest at night without being stung by the bees; trays of fruit put out for drying were entirely consumed. Indeed, a reign of terror was experienced for several months, until a committee of citizens agreed to abate the nuisance, and, after several efforts, appealed to the court.

The defense claimed that the raising and keeping of bees was an industry, and as such could not come under the head of a public nuisance, and that suit could not be brought nor

damages recovered for the keeping of honey-bees. The attorneys on both sides presented the opinions of several judges and the law points in the case, after which the court decided the case should be tried, and the testimony was received. But one case seems to be on record in the State, and that was tried before Judge Pearson, in Dauphin County, years ago, in which the defendant was adjudged guilty, and had to pay a fine and abate the nuisance.—*Harrisburg Telegraph*.

Correspondence.

Durability of Redwood.

To the Editor of the Scientific American:

Having been a subscriber for the SUPPLEMENT of your paper ever since the first number, and of the paper itself for many years, I do not wish it to be astray on any subject, as I look upon it as a sort of oracle for mechanics of all branches. But somehow or other an erroneous article from a local paper, here called the *Scientific and Mining Press*, in relation to the durability of redwood, has found its way into the columns of your paper.

Redwood, when exposed to alternations of wetting and drying, will not last more than three to five years before it is completely rotted. I am a bricklayer by trade, and have had about seventeen years' experience in this city of redwood houses, and I am certain of what I say. As regards putting redwood under brick walls, it is never done nowadays, and, in fact, never was done in any important structure. Where plank foundations are used here is on made land, in the region of the city front, and then they use plank of what is called Oregon pine, three inches thick; and this planking is supposed to be placed deep enough to be covered at all times with water, so as to exclude the air. Done in this way, I have seen some planks that had been down twenty-five years, and they were perfectly sound. Redwood placed deep enough in water to exclude air will also last for I do not know how long.

Within the last few years a great many houses that had been built of redwood, with 4 x 4 inch redwood posts, resting on a 3 inch plank of redwood for a foundation, have had to be placed on screws and a brick foundation put under them. The wooden houses here are numerous, so there is every chance to see how long redwood will last. I have seen the redwood stringers and sleepers of the street railroads taken up completely rotted after five years.

The particular kind of redwood that some call "black heart" is a humbug. As regards the sinking of redwood, I have often seen that, but they were pieces commonly called waterlogged. Messrs. Fulda Brothers are makers of wine casks, and not builders.

The way the name black heart redwood originated, at least the first mention of it I ever saw, was when the redwood pavements of this city came into disrepute from rotting away so fast. Some contractors said they would not do so if it was the black heart redwood; but the supervisors of the city were not humbugged that time, as they were a week ago, when a man calling himself an engineer, stated in his testimony before them that crude petroleum was not inflammable. Enough further information in regard to redwood can easily be had from any mechanic in the building trade in this city.

San Francisco, November, 1881.

M.

Breaking of Steamer Shafts.

To the Editor of the Scientific American:

In case of an ocean steamer breaking her propeller shaft in a gale of wind, by no means such a rare occurrence, she must do one of two things: "Lay to" under canvas, or become unmanageable in the trough of the sea. The former course, where the modern long steamer is concerned, is an impossibility, and I wish to offer the following suggestion to prevent the latter.

Why not fit, and be kept ready for use in heavy weather, hydraulic pumps on each quarter, at whatever depth below the water line that proved convenient, the nozzles for which could be protruded from inboard whenever required to be used? Exactly similar to the hydraulic propulsion power fitted to H. B. M. S. Waterwitch. The Waterwitch, as a test, was tried in all weathers, and by means of this method obtained a speed of 9½ knots per hour. It was also used by her as an extra and very efficient steering power. In case of the shaft breaking the steamer's engines would be used for pumping and forcing the jet of water outboard on each side, instead of for turning a propeller shaft.

B.

Gas Treatment of Whooping Cough.

In the treatment of whooping cough in gas works, as lately resorted to, especially in London, the purifying chamber consists of a large room with doors and windows freely open, and each contains twenty-four vessels, holding five cubic meters of depurating substance—lime and sulphate of iron mixed with sawdust—through which the gas has to pass. When the workmen are emptying and refilling these vessels, the children with whooping cough are placed around it, and inhale the vapors which escape; they are in an atmosphere containing ammonium sulphide, carbolic acid, and tarry products. As to the efficiency of this treatment, one physician reports that of 120 cases persevered with, in twenty there was entire failure, forty-eight showed improvement, and the rest were cures; it is thought, however, that it acts only upon one element of the malady, viz., catarrh.

NEW WORM AND WORM WHEEL AND GEAR CUTTER.

We give an engraving of an improved machine for cutting that class of worm wheels and endless screws in which the points of the teeth and the bottom of the spaces are formed on a concave outline adapted to the convexity of the screw, in order to present as much bearing surface as possible to its action. The teeth of the wheel in an endless screw are not, as in ordinary gearing, set perpendicularly to the plane of its face, but at an angle and with surfaces corresponding to the inclination and helical form of the thread of the screw. The outlines of the teeth are helical surfaces described about the cylinder, forming the screw with the proper pitch.

The old method of cutting the teeth in the wheel has been to first rough them out with a straight cutter in an ordinary gear cutting engine, and then to give the teeth the proper curved outlines by means of a hob made particularly for the purpose, and revolved in the nicks or spaces made by the gear cutter. It has been ascertained, however, that it is impossible to cut an accurate worm wheel by this process, for the reason that the hob changes the sides of the teeth from a straight line to a helical form, and as the hob has so much metal to remove and also to revolve the wheel, that the motion given to the wheel is far from being accurate. The machine illustrated is intended to cut the teeth in the surface of the wheel as well as to cut the worm or screw perfectly, without regard to size or pitch.

The Hindley screw has much more bearing surface, at least four times as much, as the ordinary worm gearing, a large bearing surface that adds considerably to the durability of the screw and greatly reduces friction. This is a very important advantage, as the common worm has been known to cut away and become completely destroyed in a few hours. The cutting and wearing away of the worm greatly damages the teeth in the worm wheel. The threads in the Hindley screw can be made as long as required, not being confined to any particular length or shape, for the reason that they all point to one common center. For a dividing-wheel, where exact divisions are wanted, the teeth and screw can be made very short, even should a coarse pitch be required. A much steadier motion is obtained where a large number of teeth have a bearing at one and the same time, which makes it valuable for many kinds of machinery, such as elevators, hoisting machinery, cranes, derricks, jackscrews, and all machinery where great steadiness of speed is required.

This form of worm gearing is very strong and capable of resisting any strain that may be brought to bear upon it.

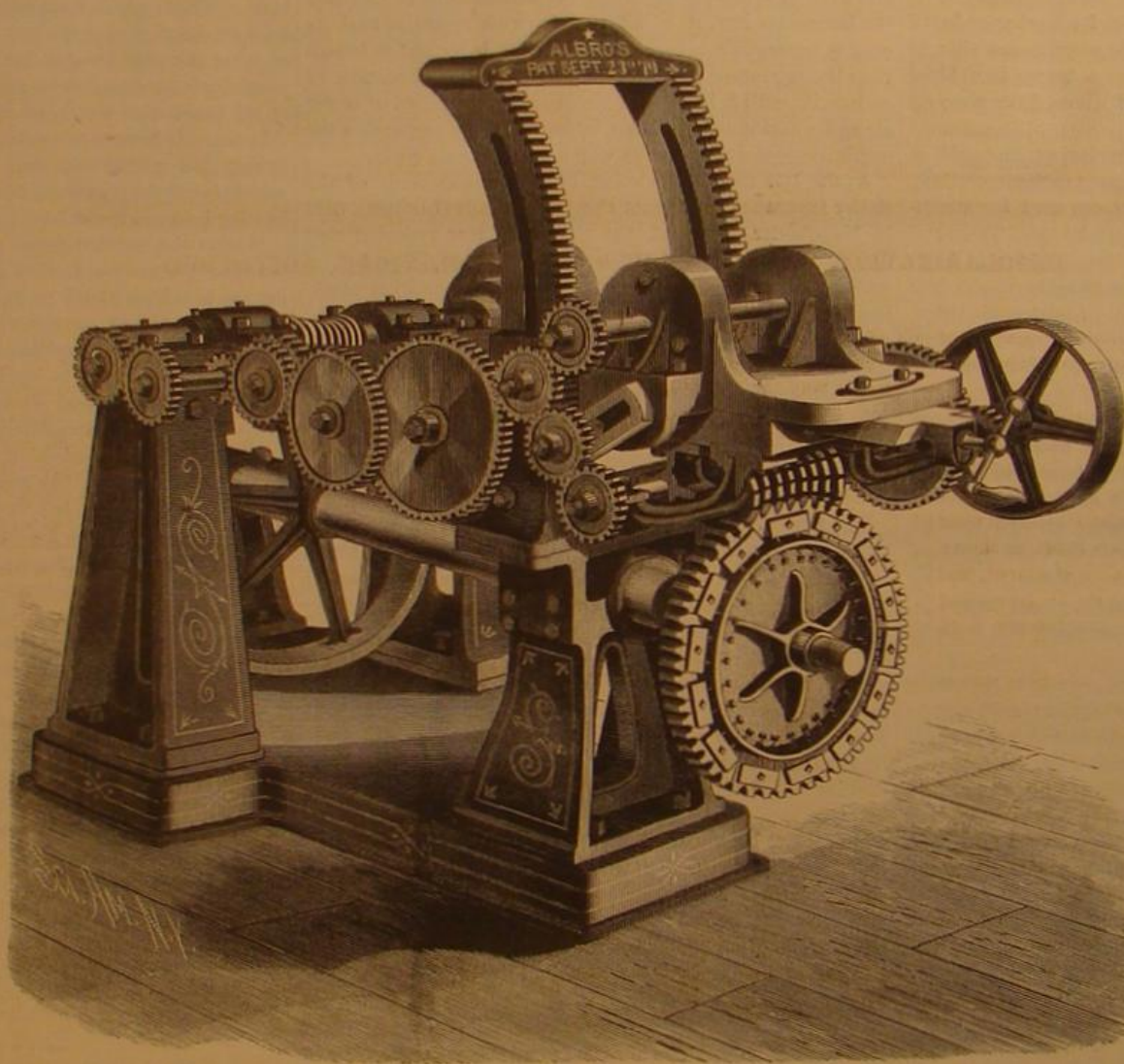
The machine has two columns or standards, one on each side at the rear of the bedplate. On the top of these columns are journal boxes which carry the master worm or screw shaft. This worm or screw drives the master worm wheel, which is directly underneath the worm, and is fitted to the main spindle which runs the entire length of the bedplate, and is held in place by two shorter standards at the front and rear of the machine. The main spindle has a taper hole in the forward end for receiving the steel spindles carrying the gears to be cut.

On the inner side of the two long columns, and central with the journals, there are two trunnions on which the swing frame moves. This swing frame is made strong and rigid, and supports at its free end a compound slide rest by a flexible joint. The slide rest can be swung or revolved completely. This motion is necessary in order to cut bevel and spur gearing. Underneath the slide rest is journaled the cutter shaft, which extends across the slide rest and projects far enough to receive the proper gearing to revolve the master worm shaft. This slide rest has a movement of sixteen inches, and is swiveled in such a manner that spiral and skew gearing may be cut.

Accurate worm wheels are cut automatically in this machine in the following manner: The blanks to be cut are fastened on the steel spindle at the front of the machine, a Hindley worm cutter or hob is fastened on the cutter shaft, and the cutter shaft is connected with the master worm shaft by a train of gearing supported by the swing frame, and in such a manner that they will always remain in gear for the reason that the swing frame turns on the axis of the master worm shaft. Motion is given to the cutter shaft by a spur wheel, pinion, and pulley, and the train of gearing imparts motion to the master worm shaft, which causes the

master wheel and main spindle with the blank fastened on the end to revolve. Both blank and hob or Hindley worm cutter being revolved uniformly, the teeth are cut on the blank with uniformity and accuracy. While the machine is in motion the free end of the swing frame continually falls, and the machine cuts the teeth in the blank to a depth regulated by a stop motion underneath the swing frame.

This machine is especially arranged to cut the Hindley screw. The Hindley blank is fastened on the cutter shaft, and a stiff flange or plate carrying hardened steel tools, the ends of which are made the proper shape and the proper distance from each other, is fitted to the main spindle. Arranged in this way the order of things is reversed, and instead of the hob cutting the wheel, as before shown, the teeth on the sides of the flange are cutting the worm. The pitch of the hob or cutter is made to correspond with the number of teeth to be cut in the blank, and the machine must be geared in such a manner that the cutter makes a revolution to each tooth to be cut. An ordinary cutter is used and fitted to the cutter shaft for cutting spurs, bevels, miters, spirals, etc. The shaft shown at flexible joint controls the automatic feed motion in cutting spur gears, etc. Near the front of the machine there are two toothed sectors, and the swing frame is mortised to allow its movement up and down. At the front of these sectors, and on the top of the swing frame, there is a shaft carrying two pinions which engage with the teeth on the face of the sectors.



THE ALBRO PATENT HINDLEY-SCREW AND GEAR CUTTER.

This shaft is driven by a system of worms and wheels, and effects the downward feeding. A crank is fastened to the end of this shaft to raise or lower the swing frame to any required position.

Further information in regard to this useful invention may be obtained by addressing Messrs. Clem & Morse, 413 Cherry street, Philadelphia, Pa.

The Strength of Wooden Columns.

Some important tests of the strength of wooden columns, such as are in common use in the construction of cotton and woolen mills, have lately been made at the instance of Mr. Atkinson, President of the Boston Manufacturers' Mutual Fire Insurance Company. The tests were made with the testing machine at the Watertown Arsenal. The formulas in use for computing the strength of wooden columns are based on tests applied to columns of about two inches on a side and four or five feet long. The new tests were made with columns of pine and oak of the size and length used in actual construction. All but two were round, hollow columns, of from eight to eleven inches diameter, the two being about nine inches square. The greatest amount of pressure exerted in any case was about 265,000 pounds. The tests have disclosed frequent instances of defective boring in the columns. The object in boring is to open an air passage through the heart of the stick for the prevention of dry rot after it is in position in the building. It is essential, of course, that the bore should extend from end to end, but this has not always been effected. The sticks were bored first from one end and then from the other, and the

borings have sometimes failed to meet in the middle of the stick. The tests also show that to taper the sticks is a mistake, inasmuch as it weakens the column more than has heretofore been estimated. Reasons for exercising more caution in other respects in the construction and adjustment of wooden columns in building have also been disclosed.

Underground Telegraph Wires in Germany.

The *Deutscher Reichs Anzeiger* (September 28) gives the following details of the subterranean telegraph lines at present in working in Germany. The total length of cable is 3,642 miles, the greater portion of which contains seven wires, though on some of the minor lines a four-wire cable is used. 10,170 tons of iron, three-quarters of a ton of copper wire, and 1,836 tons of gutta percha casing were employed on the system. 70 rivers were traversed, requiring between seven and eight miles of subaqueous cable. The first line constructed was begun on March 14, 1876, and the latest (that from Cologne to Aix-la-Chapelle), which is included in the report, was completed on June 26 of the present year.

ENGINEERING INVENTIONS.

Mr. Michael B. O'Neill, of Halifax, N. S., has patented an improved ash pan for locomotives. In this improvement the bottom of the ash box is formed of a series of end-pivoted pans, preferably of semicircular form in their transverse section, and with overlapping flanges on their upper edges. These pans are connected at one of their ends with a bar which has an attached crank movement that is operated by a rod from the cab, for the purpose of turning and dumping the pans and of returning them again to their receiving position. A perforated pipe connected with the water tank, and provided with a cock, passes over the pans for wetting down the ashes before emptying them. By this construction the ashes can be emptied at any time or place. Being wetted, they will not set fire to bridges or sleepers, and being frequently emptied will serve as ballast and prevent growth of grass. The readiness with which the ashes may be cleaned out while the locomotive is in motion is of great advantage. An increased draught results from the ash box being emptied frequently, thus saving labor and fuel.

An improved feed-water heater for steam boilers has been patented, the principal features of which are any number of drums arranged below and at the rear end of the boiler, and which are connected by pipes with the lower water space of the boiler, also, by a series of upwardly inclining pipes, with uprights, situated at the front end of the boiler, and connecting by pipes with the steam space of the latter. These drums serve both as feed water receivers and as mud receptacles, and are provided with water-supply pipes and blow-off connections. They and most of their pipes are exposed to the action of the fire, and consequently both heat the feed water and assist in generating steam, likewise promote circulation within the boiler. The patentee is Mr. George W. Sloane, of Brooklyn (Greenpoint P. O.), N. Y.

Mr. William C. Waring, of Yonkers, N. Y., has patented an improvement in fulling mills. In this improvement the hinged lining plate in the forward portion of the fulling box is vibrated automatically by a crank motion derived from the cam roller shaft which actuates the beater, for the purpose of insuring the dislodgment of the material from the place into which it has been driven by the beater, and for regularly turning the material so that it will be struck by the beater in a new place. Manual labor, too, for vibrating said lining is dispensed with.

The Electric Light vs. Gas in Theaters.

It is said that a marked improvement has been noticed in the acoustic properties of the Grand Opera House, Paris, since the introduction of the electric light. A layer of heated gases acts as a screen for sound, hence the volumes of hot fumes arising from the old gas foot-lights obstructed and muffled, to some extent, the voices of the singers. With the electric light, inclosed in air-tight bulbs, no fumes can be emitted, and very little heat is given off. Hence it benefits the ear as well as the eye.

DYNAMIC ELECTRICITY.

THE DEPOLARIZATION OF ELECTRODES.

BY GEO. M. HOPKINS.

Having explained the causes of the enfeeblement of currents in galvanic batteries in a former paper,* I will describe some of the methods in use for preventing the principal cause, viz., that of the polarization of the negative electrode. In all single fluid batteries this necessarily takes place to some extent, whatever precautions may be adopted for its prevention. The means of depolarizing single fluid batteries are mechanical, and consist in the agitation of the exciting fluid by gravity, as in the fountain battery, by air jets, as practiced by Grenet and Byrre, by stirring the fluid by mechanical means, by rotating or swinging the electrodes, and by roughening the electrode, as in the case of Smee's battery, in which the platinum plate is covered with a deposit of finely divided platinum.

In single fluid batteries the polarization of the negative plate may be greatly retarded by enlarging it so as to afford a great surface for the dissipation of the hydrogen. In two fluid batteries the depolarization is effected by chemical means, and perhaps more perfectly in the sulphate of copper batteries than any other.

In all single fluid batteries the oxidation of the zinc liberates hydrogen at the negative plate, and the hydrogen rapidly reduces the power of the battery in the manner explained in the former paper. In Smee's battery the microscopic points formed by the roughened platinum surface facilitate the escape of hydrogen, and in this way may tend to maintain the power of the element.

In the Grenet battery the negative plate quickly polarizes, rendering the battery unfit for uses of more than a few minutes' duration. However, the agitation of the exciting fluid by the withdrawal and replacement of the zinc restores the battery to its normal strength. Grenet agitated the exciting fluid by means of air blown in through glass tubes, as shown in Fig. 4. This prevents polarization to a great extent, and renders the battery very active. Dr. Byrne, of Brooklyn, adopted this plan of depolarization in his battery with remarkable results.

On page 182 of the current volume of the SCIENTIFIC AMERICAN is shown a zinc-carbon battery employing the bichromate of potash solution as an excitant, and arranged for the introduction of the solution to the cells by air pressure, which may also be made to agitate the solution. This is a very convenient form of battery for experimental purposes and for uses of short duration, as it can be made to yield a strong current while the exciting fluid lasts. The air in all these cases acts only as a mechanical agitator. The fountain battery, described and illustrated on page 150, exhibits another practical method of mechanical depolarization.

Figs. 1, 2, and 3 of the annexed engravings show a purely mechanical agitator, consisting of a system of spring-actuated stirrers, controlled by an electro-magnet of high resistance in a derived circuit. This magnet absorbs but an exceedingly small proportion of the current, and has only sufficient power to move the lever controlling the spring motor.

This motor, which may be of the cheaper class, is mounted on a base, A, secured to two parallel bars, B, carrying the zinc and carbon plates, *z c*, of the battery. These plates are placed flat against the bars, B, and secured by screws and washers. The zinc of one element is connected with the carbon of the next by a wire passing diagonally through the bar, and the first zinc and last carbon are connected with the binding posts at the ends of the bars, B.

The second shaft in the train of gearing is provided with a crank connected by a rod, C, with the lever, D, which is fastened to a rock shaft, and connected with the bar, E, extending the whole length of the battery between the zinc and carbon of each element, and carries a series of vertical rods, F, of vulcanite, one such rod being located between the zinc and carbon plates of each element. The zinc in one of the elements is broken away in the engraving to show this rod. A swinging arm, G, supports the extremity of the rod, E. A high resistance magnet, H, mounted on the base, A, is connected with the two binding posts of

the battery, so as to receive a small portion of the current. The armature attached to the lever, I, when drawn against the poles of the magnet brings the lever, I, into engagement with the fan, J, which is the last element in the train of gearing composing the spring motor. A light retractile spring draws the lever, I, away from the fan, J, and removes the armature from the magnet when the power of the battery is reduced to a certain limit. The spring motor, being free to act, oscillates the rods, F, and by stirring the exciting liquid, disengages the hydrogen from the plates, and brings fresh liquid into contact with the zinc and carbon and restores the strength of the battery, when the armature of the magnet, H, will be acted upon, bringing the lever, I, into engagement with the fan, J, and stopping the action of

carbon about half inch square. The bag is tied around the carbon rod and placed in a jar partly filled with a strong solution of common salt. The zinc consists of a round rod about three eighths of an inch in diameter, like that used in the Leclanché battery. The large carbon surface in this battery polarizes very slowly. One cell of the battery is sufficient to ring a bell on a short circuit.

The chemical method of disposing of the hydrogen in batteries is theoretically and practically the best, and the best example of the most perfect action of this character is found in the Daniell battery, in which the hydrogen resulting from the action of the dilute acid on the zinc is liberated on the surface of the copper plate, where it reduces the sulphate of copper, forming sulphuric acid and metallic copper, the latter being deposited on the surface of the copper plate. So long as sulphate of copper is present in the battery this action continues, and the current from the battery remains constant.

In the Grove battery the hydrogen at the platinum plate decomposes the nitric acid forming hyponitrous acid, which is either dissolved or disengaged as nitrous fumes. In the Bunsen battery the action is the same as in the Grove. When the bichromate of potassium solution is used in the Bunsen battery the hydrogen reduces the chromic acid to oxide of chromium, which remains in solution.

In the gravity battery the action is the same as that of the Daniell. The sulphate of zinc formed in the battery floats on the solution of sul-

phate of copper owing to its lower density. In the Leclanché battery the hydrogen of the decomposed water unites with the oxygen of the manganese.

The depolarization of batteries has been the subject of a great deal of thought and experiment, and, although the discoveries of Daniell, Grove, Bunsen, Leclanché, and other prominent investigators excite our admiration, the subject still affords a wide field for investigation.

Communicating with Wrecked Vessels.

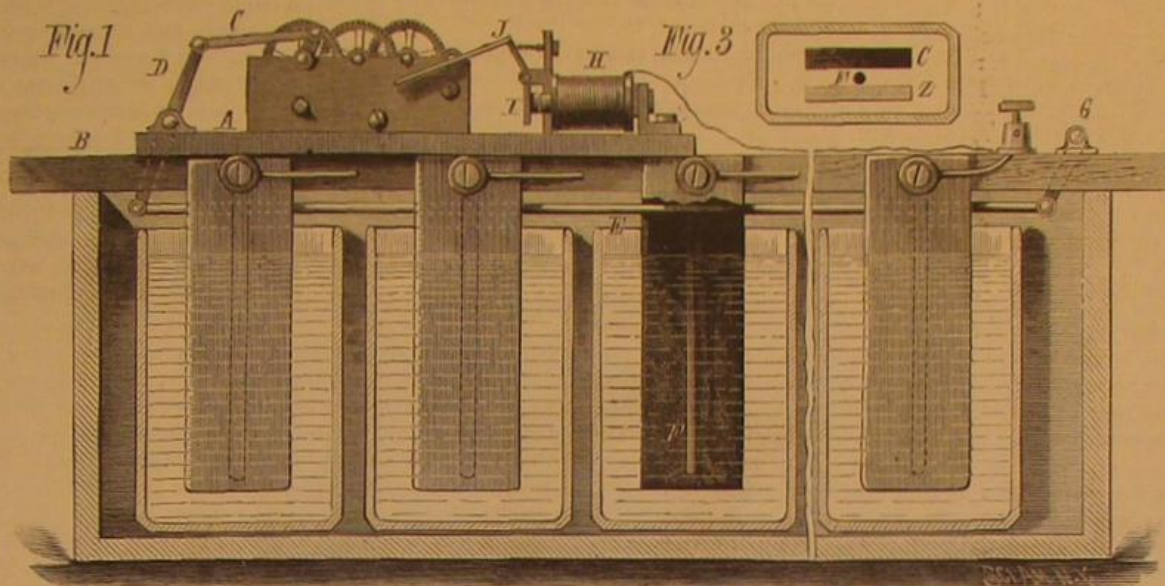
Messrs. Low and Duff, engineers, Dundee, have just made an important improvement in connection with apparatus for communicating with wrecked vessels. It is a new gun which they tried at Monifieth recently, with marked success. The gun is 2 feet long, with a bore $2\frac{1}{4}$ inches, and it is so constructed that the line which is to be fired from it passes through the back end of the gun. In the experiments made recently the line was shot 400 yards with two ounces of powder, which would have sent it further had the line used on the occasion been longer. The cord is coiled in the form of a cop and put inside of a steel canister. This canister is fired out of the gun, and leaves the line streaming behind it. The distance to be covered is simply a question of size of gun and canister. The gun was sent to Birmingham and tested in the most thorough manner in the proof-house there. The twine used in the experiment was made of flax, and carried 200 lb. dead weight with a length of 6 feet of twine.

The Citadel Park of Barcelona.

Marked indications of the growing revival of enterprise and industry of Spain are shown in the old seaport city of Barcelona, in the northeastern corner of the kingdom, on the Mediterranean. It is a city of about 250,000 inhabitants, and a good business place; in fact it may be styled the New York of Spain. We recently chronicled the introduction there of the electric light for street illumination. A recent number of *La Ilustracion*, of Madrid, contains a large and beautiful picture representing different portions of a new park lately inaugurated in Barcelona. Its area is nearly a hundred acres, and was formerly occupied by the decaying walls and ruined ramparts of the old citadel. Here also was the old state prison. These ancient works, relics and mementos of barbarous times, have all given place to the new park of the citadel, filled with marble fountains,

beautiful walks, grottoes, cascades, flowery arbors, shade trees, and other adornments. At the principal entrance the following inscription is set up:

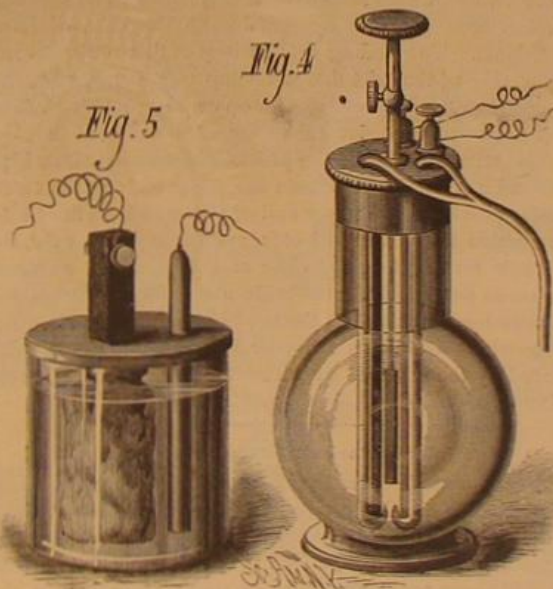
"These parks and gardens being the property of all the citizens, they are all interested in their preservation; and they are accordingly placed under their especial care and vigilance. Signed: The Constitutional Alcalde of Barcelona."



DEPOLARIZATION OF ELECTRODES BY MECHANICAL AGITATION.

the spring motor until the current is again weakened, when the operation just described will be repeated.

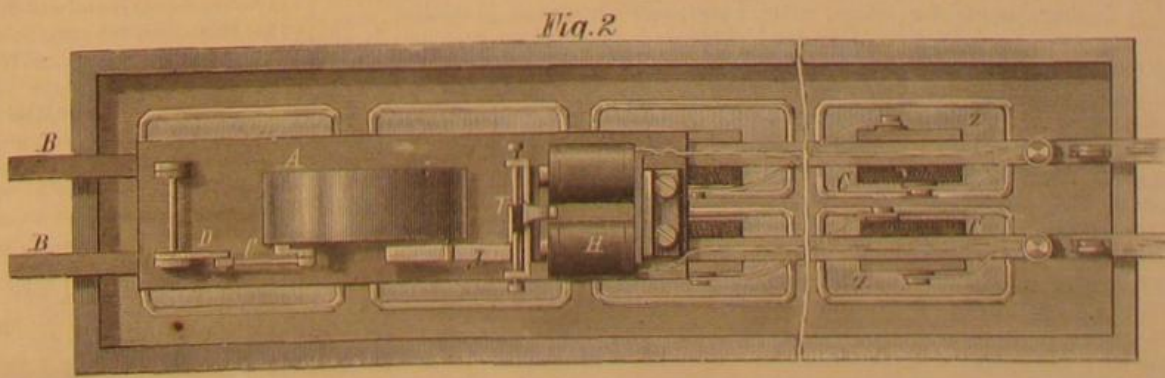
In this way the strength of the battery will be maintained within certain limits, until the liquid is exhausted. Of



GRENET BATTERY, WITH AIR TUBES.—CHLORIDE OF SODIUM BATTERY.

course this system may be extended sidewise or lengthwise as much as may be desired.

At least, all batteries employing mechanical means of depolarization, with, perhaps, the exception of Smee's, are



PLAN OF DEPOLARIZING APPARATUS.

only adapted to uses requiring a very strong current for a limited time.

The enlargement of the surface of the negative plate has great advantages, as it affords an increased surface for the accumulation or dissipation of the hydrogen.

A very simple example of a battery with enlarged negative plate is shown in Fig. 5. A carbon rod is placed in a Canton flannel bag and surrounded with pieces of broken

RECENT INVENTIONS.

Mr. Nelson G. Northup, of Eaton Rapids, Mich., has patented a simple but improved extension step for cars. The object of this invention is to provide a convenient device whereby the steps of cars and other vehicles may, when desired, be quickly lengthened and shortened. The invention consists of a step secured to and combined with the ordinary car or vehicle steps, and made vertically adjustable for the purpose of extending the steps downward to any desired point, and thus affording an auxiliary step under the lower fixed step of the car or vehicle. This auxiliary step may be raised or lowered by means of hangers arranged to slide up and down within tubular guides on the outer faces of the sides of the regular steps, said hangers being formed with racks, with which pinions on a cross shaft operated by a handle or crank are made to engage.

An improved rocking grate, especially applicable to locomotive engines, and designed to prevent ice from collecting on the under side of the grate when the engine is running through snow, has been patented by Mr. John R. Fish, of Grand Rapids, Mich. The invention consists in a combination, in a rocking grate, of bars arched from their ends to their centers with bars which are straight on both their upper and lower faces, each and all of the several bars being journaled and formed with vertical parallel ribs on their sides, and preferably provided with depending legs connected with a shaker bar arranged to extend through the ash pan. The crowns of the arched bars, which alternate with the straight bars, extend considerably above the upper faces of the latter, thus exposing the arched bars to a high degree of heat, which prevents the accumulation of snow and formation of ice thereon. A free passage for air between the bars is insured, fine coal may be burned on the grate, and the latter be readily rocked.

An improvement in machines for the manufacture of ice, which is both economical and gives a large working capacity, has been patented by Mr. Charles W. Gelett, of Oakland, Cal. This invention relates to that part of an ice machine known as the "congealer," and it consists of a thin, hollow, rectangular plate having stops at intervals between the two freezing surfaces, so that the flow of the refrigerant will meet with more or less impediment in passing through the plate, and a more rapid congelation of the water which is directed upon the outside of the plates will take place. These stops are preferably arranged in rows, the stops of each row being at an angle of forty-five degrees to those of the next row, thus keeping up a more thorough agitation of the refrigerating vapor and insuring its contact with the entire side surfaces of the congealer. Any number of such congealers are so arranged within a frame and combined with the gas or vapor reservoir, air pump, pipes, and water-spraying devices of the machine, that ice is formed upon both sides of said congealers.

Mr. Hans J. Müller, of New York city, has patented an improved ore separator. The object of this invention is to provide a new and improved device for separating particles of iron, steel, etc., from granulated or pulverized ore or other material. In this apparatus the pulverized material is placed in a hopper and dropped from there upon a platform or shelf which is vibrated by a ratchet wheel, fast on the shaft of a rotating magnetized cylinder, and engaging with a lever, on the shaft of which is an arm that connects with the shelf. The sand or granulated material slides down said shelf, which is slightly inclined. The particles of iron or steel cling to the cylinder and are scraped from the same by a plate, and drop into a slot or into a receptacle below it, while the particles of sand or granulated material drop from the edge of the shelf into another slot or receptacle beneath it. The apparatus, although simple, is effective.

Mr. James B. Gillham, of Merritt, Ill., has patented an improved car coupling. This invention pertains to self-couplers; and it consists of a drawhead having tongues projecting rearward into corresponding sockets or slots in the drawbar and carrying springs on their ends, and provided, also, with a square collar fitting over the end of the drawbar, said tongues having vertical perforations corresponding with the openings in the drawbar for the reception of the coupling pin, which latter, when coupling, holds both drawhead and coupling link in position; and it further consists of a coupling pin reduced near its point and having a conical extremity for use in connection with the drawhead and drawbar constructed as above, whereby the pin is prevented from being too far withdrawn and the drawhead is retained in position. The pin may be uncoupled, and held when disengaged by an attached rod reaching above the top of the car and capable of suspension on a pin projecting from the front of the car. The invention is an ingenious one.

Mr. Justin J. Langles, of New Orleans, La., has patented a simple but useful adjunct to show boxes. The object of this invention is to provide an ornamental and removable cover for grocery and other boxes, which, while exposing the contents of the box to view, shall be preservative of its contents, and is provided with a lid that may be automatically held open at any point. The invention comprises a frame, which is preferably made of ornamental wood, constructed to fit over and receive within it the upper edges of the box, and provided with inside strips which support the frame upon the top of the box. A lid, which may be also of ornamental wood and has a glass top, is attached to the frame by hinges formed of angular plates which bind the corners of the lid and frame. Pivoted to this lid is an arm, and pivoted to one of the side bars of the frame is a slotted plate, through which said arm passes at an angle, that causes the

plate to act as a clutch upon the downward movement of the arm, except when specially relieved, but permits of a free upward movement of the arm when raising the lid.

Mr. William Hassel, of Brussels, Ill., has patented an improved animal shears. The device comprises a sharp-edged tooth plate arranged to slide on a similar sharp-edged toothed plate which is adjustably fastened to a like toothed bed-plate. This bed-plate has a rigid handle that is provided with a spring which presses against a handle pivoted to the bed-plate and which has a connecting bar pivoted to its upper end. This connecting bar is attached to a strip arranged to slide in a longitudinally slotted guide plate on the bed plate, and having the sliding knife-plate adjustably fastened to it. In this improved shears for clipping wool, etc., a clean cut, with but little risk of injury to the animal, is practicable, and the cutting blades or plates of the instrument may readily be removed when required to be sharpened or replaced.

A novel improvement in bathing tubs has been patented by Mr. Henry Costello, of Brooklyn, N. Y. The invention consists of a corrugated or roughened plate or band of rubber, fabric of wool, horsehair, or other suitable material, permanently or adjustably fixed in or on the sloping back-piece of the tub, where the bather's back naturally rests, so that by gently moving the body from side to side the bather may, with little effort, rub and cleanse his back. In some instances said plate may be an insulated metal one, and an electric current be passed through it, which will have a therapeutic effect on the bather.

A practicable and very useful improvement in drag-saws has been patented by Mr. Marion L. Nichols, of Center Township, Mich. This invention relates to portable sawing machines, and is more particularly applicable to sawing trees or logs. It may be operated by hand through a crank or handle and suitable gearing connected with a reciprocating saw. The invention consists in a combination with the main frame of a saw carrier adjustable about a vertical pivot on a block supported by horizontal trunnions on top of the main frame, locking nuts and convenient adjusting devices being provided to hold the saw carrier in any desired position. The apparatus may be used to saw either vertically, horizontally, or in any intermediate direction, or it may have a universal motion. The feed of the saw may be effected by moving its carrier with one hand while the other hand is applied to reciprocating the saw.

An improvement in ventilators for dwellings and other structures, and which is somewhat diversified in its application, has been patented by Mr. Joseph Patchett, of Lawrence, Mass. The leading peculiarities of this ventilator are the covering of the inlet flue at its top and forming it with side openings, and arranging the top or outer opening of the outlet flue on a higher level than the side opening of the inlet flue, also surrounding the top of both flues with a rim which is secured a small distance from the upper ends of the flues, likewise providing the upper end of either or both flues with a perforated flange and deflector, and other parts or details, the whole serving to give to the outgoing current as direct a course as possible and to provide a circuitous passage for the incoming current. By the use of this improved ventilator the vitiated air of a room or building will be rapidly replaced by the external air without creating cold currents or draughts.

Making Carbon Transparencies.

The method to be described for making transparencies for this purpose is equally applicable to the production of those for the magic lantern, but with this difference, namely, that the pictures must not be printed nearly so deeply, otherwise they will prove too dark and heavy when projected on the screen. We will assume that the negatives are of the ordinary density, and that the tissue selected is that specially prepared for the purpose; but whether it be, or whether another containing less pigment be chosen—the method of using it is the same in either case. One great precaution to be taken throughout all the operations is cleanliness and the avoidance of floating particles, either in the atmosphere or in the developing waters. For sensitizing the tissue a bath should be prepared as follows: Bichromate of potash, 1 ounce; water, 1 pint; liquor ammonia, 15 minims.

When the bichromate is dissolved the ammonia is added and the solution carefully filtered. At this season, when the light is bad or the negatives contain very strong contrasts, the proportion of bichromate may with advantage be increased to one ounce and a quarter and the ammonia to twenty minims, provided the tissue is treated in the way we direct. But if it be simply removed from the bath and suspended to dry in the ordinary manner this proportion will be too great, whatever the character of the negative may happen to be.

The bath being ready, we take some glass plates of convenient size—say twelve inches by ten, or larger—and having rubbed them over with powdered talc and finally dusted them, they are coated with plain collodion of not too horny a kind, which is allowed to set well. The plates are then washed in a dish of water or under the tap to free the film from the ether and alcohol, and are then reared on end to drain somewhat closely (but not too dry) in some place free from dust. It must be borne in mind that any particles which may be allowed to subside on this film or on the tissue when sensitizing will show as specks in the finished transparency. The plates being ready the tissue is cut into pieces rather smaller than the glass plates, and is then sensitized by immersion in the bichromate solution, which should have been poured into a porcelain dish.

After immersion for a time sufficient to render the tissue quite limp and pliable it is removed and placed face downward on the collodionized glass, and the superfluous solution removed by passing a squeegee somewhat firmly over the back of the tissue. This will also expel the air bubbles and insure perfect contact between the tissue and the collodion film. The plates carrying the tissue are now placed in a warm and dry situation. When the tissue is dry, and not before, a penknife is passed round the edges and the tissue stripped off, which will, of course, bring the collodion film with it, and will possess the polished surface of the glass. It may then be cut into convenient sizes and preserved in an airtight case; but a better plan is to allow it to remain on the glass until required for use.

The advantages of this mode of preparing the tissue are manifold. First, the tissue dries from the back; hence the front—that part which forms the picture—remains moist the longest, and, consequently, is less soluble than that in contact with the paper. Secondly, dust has no opportunity of settling on the gelatinous surface during drying. Thirdly, the tissue will not require to be coated with collodion before mounting for development, which it frequently does if it be not in good working condition. Also, its surface being perfectly smooth, better contact with the negative is secured during the printing. It is important that the tissue should be thoroughly dry before it is placed on the negative, or small dark patches—"damp marks"—may be produced. The printing should be carried to at least double the depth required for an ordinary paper print, and, in some instances, as much as three times the exposure may be given with advantage, the development being carried to a proportionate extent to compensate for it. In the finished print no part of the picture should be clear glass, except, perhaps, the extreme highest light. We are now speaking of transparencies for enlarging from. For the magic lantern the printing should not be carried nearly so far; from one and a half times to twice the depth for a paper print will be ample.

We now come to the development. Some plates should be in readiness prepared with one of the substrata. That with the chrome alum and gelatine or the bichromate of potash and gelatine, with subsequent exposure to light, will answer the purpose equally well, it being simply a matter of taste or convenience which is employed. The exposed tissue, together with one of the prepared plates, is now immersed in clean cold water until the tissue becomes limp. The two are then brought into contact under the water, removed, and well squeezed, taking care that no particles of foreign matter get inclosed between them. After remaining for five or ten minutes the print is immersed in water at a temperature of about 90°, and the development conducted as in ordinary carbon printing, except that toward the end of the operation the temperature of the water may be much increased with advantage.

When the development is complete the transparencies are placed in a dish of filtered water, where they are allowed to soak for ten minutes or a quarter of an hour. They are then taken out and placed on blotting-paper or in a rack to dry. It is very important that the gelatinous surface should be protected from dust during the drying, as any particles getting into contact with it will be sure to adhere and show in the enlargement. As the printing is carried to so great a depth and the development effected with hotter water than usual the film is rendered sufficiently insoluble for all practical purposes. Hence the prints will not require fixing in alum solution.—*British Journal of Photography.*

Iron from Black Sand.

A valuable iron ore, in the form of black sand, exists in large deposits on the east beach of Block Island, R. I. D. C. McCotter uses it in making steel. New processes and a machine for separating the iron from the sand have been invented, which clear 100 tons of sand in ten hours. The separation is done by magnets. As the mineral ore pours out of the chutes it is placed in bags, each holding 112 pounds, and shipped to Hoboken, and thence to Rockaway, N. J. There it is loaded on wagons and afterward taken to the furnace. It is mixed with charcoal, taken by elevator into the hopper, and distributed into sixteen large cylinders holding about ten tons, and heated to a red heat; then it is tapped at the bottom and let down into a large oven still kept at a red heat, and there burns out all the charcoal. The iron doors are opened, the sand is hauled out into a large charcoal fire, and forms a mass which is hammered by large steam hammers into blooms, weighing from 200 to 300 pounds.

Nutritive Value of Gelatin.

A dog weighing 11 kilos was kept for three days fasting, and received then daily for nine days 45 grms. gelatin and 200 c.c. water. The excretion of nitrogen in the urine during the fast was daily 2.385 grms.; during the gelatin diet, 7.105 grms. This latter quantity exceeded that present in the daily ration by 0.785 grm. Hence during the gelatin diet 1.600 grms. of the nitrogen of the system was economized, and accordingly the animal lost weight in a smaller proportion than when fasting. The experiment was repeated with an increase of the daily ration of gelatin to 50 grms., but the results were still in accordance with those of Voit, that gelatin indeed economizes albuminoids, but can never entirely cover the waste of albuminoids in the system, and has therefore a much lower dietetic value than albumen.—*N. P. Oerum and Dr. Dittel.*

THE FLYING SQUIRREL.

BY H. W. SEISS.

The flying squirrel—*Sciuropterus volans* (L.), Coues—may be distinguished by the following characters: Head short and rounded; nose blunt; eyes large and prominent; a membrane extending from fore to hind limb on both sides of the body; tail flat and rounded at the tip; general color ashy gray; beneath, cream color; length ten inches.

The favorite home of this species is a woodpecker's hole in some tall tree, not always a deserted one, however, for during the past summer, while walking through some woodlands, in Western Maryland, I noticed a large sycamore tree with several holes of the red-headed woodpecker (*Melanerpes erythrocephalus*) in one of its branches, and upon my companion striking the trunk with a stone, several "red headers" flew out followed by four flying squirrels, which floated out one after the other. It also sometimes shares its abode with screech-owls and bats. But not only does the flying squirrel live in trees; I have observed numerous instances of their having taken possession of marten boxes, crannies in rocks, the eaves of houses, etc.

Some time ago, while staying at a friend's house in Hunterdon county, N. J., I discovered a nest of this species built between the closed Venetian shutter and window of an unused room, the mother gaining admission through the slats. She was quite tame, allowing you to advance within a few feet of the window before making her escape. We made several efforts to capture her without success, and finally, becoming tired of being molested, she decamped with her whole family during the night. The nest contained five young only a few days old.

This squirrel has two litters in a season, and from three to six at a birth; they are blind for about three weeks after their *entrée* into the world. The female carries the young by doubling it up with her fore feet and mouth until she can grasp the thigh and neck. She shows great affection for her offspring, preferring captivity to deserting them.

The usual food of the flying squirrel consists of various kinds of seeds, nuts, and tree buds, but Audubon gives several instances which came under his observation, where it was caught in traps baited with meat, and also an account of several tame ones which devoured a fine grossbeak (*Corythus enucleator*) in a single night.

The so-called "flying" of this little animal is performed in the following manner: first ascending to a height, it springs out into the air, at the same moment extending the fore legs forward and outward and the hind legs outward and backward, thus stretching the membrane to its fullest extent. In this way it floats from tree to tree without any motion of its "wings." The impetus gained enables it to ascend a short distance in a curved line and alight on the object aimed at head up. These flights often measure fifty yards or even more.

Flying squirrels are easily captured in almost any kind of trap baited with hickory or hazel nuts; the trap, however, must be allowed to set over night.

It would be hard to find a more gentle or amusing pet. I have never known it to bite when caught, and it becomes tame in a few hours.

A friend of mine once kept two females for several months; in the evenings they were allowed perfect liberty, and presented a most pleasing sight as they gambled round the room. A favorite trick of one of them was to bury nuts among the wavy tresses of her mistress, returning the next day to find them, and appearing much surprised when they were not to be found. Fig. 1 represents an adult *Sciuropterus*; Fig. 2 a young one about four days old; Fig. 3 is a dissection of the fore leg (natural size), showing the peculiar cartilage which is articulated to the ulnar side of the carpus; it assists to extend the flying membrane.

THE TAPE WORM.

Most of my readers know that the domestic pig is subject to a disease known as "measles," in which the muscles are more or less filled with cysts, which render the pork unfit for food; but I think few are acquainted with its cause.

Man, it is well known, is occasionally infested by a parasite—the so-called "tape worm" (*Tenia solium*)—which may be described as having a tape-like body of varying length, with a differentiated "head" or scolex at one extremity.

This apparently single animal is in reality a colony of mothers and daughters, the scolex being the parent of all.

This "head" is provided with a rostellum, or, as it might be called, proboscis, encircled by a crown of hooks, below which are the suckers; each segment added to the scolex is a complete individual containing a complicated and perfect reproductive system.

The last segment—*proglottides*—which are filled with eggs, break off at intervals, and either the eggs are set free within the intestine of their host, when they are passed out with the feces, or the segments themselves are evacuated.

The tape worm feeds on the juices of the bowel by absorbing the nutriment through its skin, and does not appear to seriously inconvenience its host in any way. In Abyssinia *tenia helminthosis* is a constant and general; indeed the animal is there regarded as a sort of hygienic agent and cultivated rather than discouraged, yet the people are healthy; certain

it is also that wild animals, almost without exception, harbor at least one species of tape worm as a natural condition.

But what has this to do with "measles?" Now to the point. Let us suppose one of the before-mentioned eggs taken into the stomach of a pig, either by its eating the excrement of a person affected or through the water or air; here it hatches, not into a tape worm, but into an animal of oval form, transparent, contractile, in the middle of which are six stylets arranged in pairs; with these it cuts its way through the tissues until the muscles are reached, when, having arrived at its destination, it stops burrowing and surrounds itself with a sheath.

Here the stylets atrophy, a new and quite different crown of hooks is produced, and the parasite becomes a *cysticercus* or vesicular worm, the cyst being about the size of a hazel nut. This constitutes "measles;" the exhaustion or even death attendant on the disease is caused by the scores, hundreds, or even thousands of animals boring through the tissues; once encysted there is no further suffering or danger.

The *cysticercus* remains encysted for months or years, or until the piece of flesh enveloping it is introduced into the stomach of man, in which case it instantly quits its torpid condition, leaves its sheath, makes its way to the intestine, where, attaching itself by its suckers and hooks, it grows—



THE FLYING SQUIRREL.

or rather reproduces—so rapidly that in a few weeks a tape worm of several yards in length is formed, which reproduces eggs, and so *ad infinitum*—from pig to man, from man to pig.

Should the eggs be introduced into man himself or animal other than the hog, the *cysticercus* penetrates the tissues in the same manner, but it is "not at home," and instead of resting in the muscles it makes its way to other organs, such as the brain, heart, or eye, where its presence has caused in man several instances of insanity and death. Should a piece of meat containing a vesicular worm be eaten by a pig or animal other than man a *tenia* is developed, but it also is "not at home," and does not attain its full development.

Both eggs and *cysticerci* are killed by a temperature of 200° Fah., so there is no danger in eating well-cooked pork, even if it contains *cysticerci*.

To prevent hogs contracting "measles" it is only necessary to prevent them having access, either through their food or water, to the secretions of man, and they will not suffer.

Throughout the genus *Tenia* we find this dual life; for instance, the cat has a tape worm, the *cysticercus* of which she gets from the mouse, and the dog one which he obtains from the sheep.

Philadelphia, Pa.

Intoxicated Bees.

IN SCIENTIFIC AMERICAN of October 29, 1881, on page 280, "Botanical Notes," "Milkweed as an Intoxicant" explains what I saw in the summer of 1881. In my garden were several milkweed plants. Bees were very numerous on them: some very lively, others very stupid. I looked for the cause. Saw the longer the bee stayed on the milkweed

blossom the more stupid it became. I cultivate the milkweed for greens. When boiled as such they are first rate. Colebrook, Conn. JAMES B. DUNWELL.

MISCELLANEOUS INVENTIONS.

A cattle car, of decidedly novel and useful construction, has been patented by Mr. Walter I. Tinkham, of Taunton, Mass. The object of this invention is to facilitate the loading, unloading, feeding, and watering of cattle and other animals while being transported. The roof of the car is perforated, preferably by constructing it with a central longitudinal slot, and is made inclining downwardly toward said opening, and beneath the roof a tank is arranged. This construction provides for receiving and carrying a supply of water for the cattle. The water may be drawn from the tank into troughs made capable of being raised and lowered, and, if necessary, provided with upper boxes for holding feed. The door of the car, which is somewhat longer than the height of the car body, has cross cleats on its outer surface, and is fitted to freely slide up and down on rods in such manner that, when lowered, it may be inclined and made to serve as a gang plank.

Mr. Benjamin C. Smith, of Searsport, Me., has patented an improved apparatus for transferring wood-graining; also applicable to transferring any desired design formed by engraving or otherwise upon a plate or block of wood or other material. By this invention the natural graining of wood may be transferred to any desired surface, without applying the color by which the transfer is made to the pattern, so that the depressions of said pattern can never become filled, and the pattern can be used an indefinite number of times. The pattern, which should be a distinctly grained piece of wood, is fixedly supported upon a block or carrier having at its opposite ends rollers, one of which is pressed outward by a spring for the purpose of keeping a band, arranged to pass round said rollers, taut. This endless band may be of rubber-coated cloth, and it is made to travel over the pattern, so that on color being applied by a brush to the outer surface of the band, and a rubber presser being made to bear the latter down on the pattern, the color will be removed from the raised surfaces of the band, and a copy of the graining of the pattern in color will be left on the band. The device at one of its roller ends is then placed against the surface to which the graining is to be transferred, and the block or carrier moved over said surface.

Mr. Charles C. Schill, of Richmond, Ind., has patented an improved flour mill. In this improved mill the grain is placed in a funnel provided with a device for adjusting the discharge, and is delivered on to a revolving plate, from which it is taken by a scraper and passed into a chute that conducts it to a rotating conveyor having wings attached to a vertical shaft. These wings throw the grain with great force between a vertical runner and a vertical fixed stone, which latter is of half-moon shape, with a large semicircular eye at the center, and is fitted to a sliding frame so as to be adjustable toward or from the runner. These stones last much longer and perform their work more perfectly than do vertical stones of the ordinary construction. The runner keeps cooler, as, by reason of the shape of the fixed stone, only one-half of it is in operation at a time, and the stones do not grind upward, which is very injurious to the stones and quality of flour. The conveyor, too, drives in air to cool the stones, and throws off flour dust.

An improved oil-press mat, in which outer wooden leaves lined with wire cloth, and connected by a flexible joint, are combined with one or more middle leaves of wire cloth, secured to said joint, has been patented by Mr. George O. Baker, of Selma, Ala. In using this mat the meal or seed bags are placed between the leaves or aprons in the usual manner. As soon as pressure is applied the wire cloth takes hold by its meshes on the bags, thus effectually holding the bags in place and insuring the even distribution of the seed or meal. The wire cloth also allows free escape of the oil from the bags and out of the mats. This mat can be readily and cheaply manufactured, and possesses great strength and elasticity.

Mr. Isaac B. Potts, of Columbus, Ohio, has patented an improved pipe wrench, consisting of a handle provided with the inclined and serrated stationary jaw at its outer end and the notches on its under side, in combination with a yoke or saddle and movable jaw secured at each end to the said yoke or saddle, and provided with a lip, and the serrated face inclined in an opposite direction to that of the jaw.

Mr. William H. Bryan, of Warm Springs, Va., has patented an improved packet for transporting eggs. In this packet the eggs are carried in boxes mounted one upon another within compartments of a wooden case, which is fitted with a spring-supported false bottom. Each of these boxes is constructed with elastic upright partitions formed by doubling a strip of metal upon itself and springing the two walls of the partition apart at the center. These partitions are secured in the box at right angles to each other, and have their ends passed over to the outer surface of the box. They are arranged so that the eggs are kept from contact one with another, and the top and bottom of the box are cushioned. This construction is very simple and secure against breakage of the eggs.

Business and Personal.

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

The Holidays, with their agreeable festivities, are approaching. The uppermost thought is, "What shall I buy for Holiday Presents for my friends?" We would cordially suggest Dr. Scott's Electric Hair Brush, advertised on our last outside page, as being a most suitable article. It makes a useful, handsome, and indispensable present.

An experienced Machinist and Engineer desires a situation as superintendent, foreman, or engineer in a machine shop, manufactory, or mill. Address C. V. Tut-bill, Station B, Jersey City, N. J.

List of Machinists in United States and Canada, just compiled; price, \$10. A. C. Farley & Co., Philadelphia.

For Sale, several patents. Send for circular. Geo. G. Buckland, Tulare City, Cal.

A man who has satisfactorily served as Machinist, Engineer, and Draughtsman, is desirous of securing a position. Terms moderate. Highest references. Address L. L. Duerden, 3d Ave., between 54th and 56th Sts., Brooklyn, N. Y.

Transits and Levels, second-hand, wanted. Send size and name of maker, to Keuffel & Esser, New York. Lightning Screw Plates and Labor-saving Tools, p. 380.

For Sale.—1 Engine Lathe, Fitchburg, 7½ ft. x 15 in.; price, \$130. 1 Iron Planer, planes 7½ ft. x 34 in. x 30 in.; price, \$350. Address Concord Axle Co., Fisherville, N. H.

Workshop Receipts.—A reliable Handbook for Manufacturers and Mechanics. \$2, mail free. Ornamental Penman and Signwriter's Pocketbook of Alphabets. 30 cents. E. & F. N. Spon. 446 Broome St., New York.

Presses & Dies (fruit cans) Ayar Mach. Wks., Salem, N. J. Mailed free. Catalogue of Books for Engineers. Theoretical and Practical. E. & F. N. Spon. 446 Broome St., New York.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Telegraphic, Electrical, and Telephone Supplies. Telegraph Instruments, Electric Bells, Batteries, Magnets, Wires, Carbons, Zincs, and Electrical Materials of every description. Illustrated catalogue and price list, 72 pages, free to any address. J. H. Bunnell & Co., 112 Liberty St., N. Y.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Abbe Bolt Forging Machines and Palmer Power Hammer a specialty. S. C. Forsyth & Co., Manchester, N. H. Foot Lathes, Fret Saws, &c., 90 pp. E. Brown, Lowell, Mass.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Mann & Co., Publishers, New York.

Punching Presses & Shears for Metal-workers, Power Drill Presses, all sizes. Power and Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 Liberty St., N. Y.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

The Best constructed low priced Engines are built by E. E. Roberts, 107 Liberty St., New York. Communicate.

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

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J. Electric Lights.—Thomson Houston System of the Arc type. Estimates given and contracts made. Gil Arch, Phil.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsburg, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr. & Bros., 341 Jefferson St., Philadelphia, Pa.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Improved Skinner Portable Engines. Erie, Pa.

Learn Telegraphy. Outfit complete, \$4.50. Catalogue free. J. H. Bunnell & Co., 112 Liberty St., N. Y.

List 27.—Description of 3,000 new and second-hand machines now ready for distribution. Send stamp for same. S. C. Forsyth & Co., Manchester, N. H., and N. Y. City.

Ajar Metals for Locomotive Boxes, Journal Bearings, etc. Sold in ingots or castings. See adv., p. 35.

The Sweetland Chuck. See illus. adv., p. 366.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Solomon's Parallel Vice. Taylor, Stiles & Co., Hightstown, N. J. Skinner's Chuck. Universal, and Eccentric. See p. 365.

For Machinists' Tools, see Whitcomb's adv., p. 366.

Draughtsman's Sensitive Paper, T. H. McCollin, Phila., Pa.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 362.

4 to 45 H. P. Steam Engines. See adv., p. 362.

Peck's Patent Drop Press. See adv., page 368.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

Ball's Variable Cut-off Engine. See adv., page 366.

Paragon School Desk Extension Slides. See adv., p. 367.

Brass & Copper in sheets, wire & blanks. See ad., p. 368.

The Chester Steel Castings Co., office 407 Liberty St., Philadelphia, Pa. can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Cope & Maxwell Mfg. Co.'s Pump adv., page 368.

Machine Diamonds. J. Dickinson, 64 Nassau St., N. Y.

Wanted Agency for the Sale of Patented Goods suitable to the manufacturing districts and shipping ports of England and Wales. Address W. H. Essery, Swansea, England.

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

Eagle Anvils, 10 cents per pound. Fully warranted.

Geisler's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Geisler Mfg. Co., Waynesboro, Pa.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 367.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares, notions, and novelties in the above line, a specialty. See advertisement on page 368.

Walrus Leather, Walrus Wheels, Emery, and Glue for Polishers. Greene, Tweed & Co., 75 Chambers St., N. Y. For Mill Mach'y & Mill Furnishing, see illus. adv. p. 366.

Magic Lanterns and Stereopticons of all kinds and prices. Views illustrating every subject for public exhibitions, Sunday schools, colleges, and home entertainment. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., New York.

New Economizer Portable Engine. See illus. adv. p. 368.

Lathes, Planers, Drills, with modern improvements. The Pratt & Whitney Co., Hartford, Conn.

Catechism of the Locomotive, 625 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price \$2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Saw Mill Machinery. Stearns Mfg. Co. See p. 367.

Common Sense Dry Kiln. Adapted to drying all of material where kiln, etc., drying houses are used. See p. 368.

Supple Steam Engine. See adv. p. 367.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

Blake's Belt Stnds. The strongest fastening for old and new belts. Greene, Tweed & Co., 118 Chambers St., N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from \$1 to \$5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) S. W. M. asks: 1. What is tea chest lead solder composed of? A. The solder used is said to be composed of 2½ of lead and 1 of tin fused together. 2. Which is the strongest: two pieces, 2x5, spiked together, or one piece, 4x5, solid? I contend the latter; a friend, the former. A. The latter is the stronger.

(2) M. T. asks: Can you inform me whether glass is now manufactured in a span state tough and malleable? A. Glass fibers such as you describe have not yet been produced. From the nature of the substance it is not likely that a malleable glass can be produced.

(3) M. A. M. asks: 1. How can I make a flour paste that will not sour? A. You will find good receipts for pastes under Cements, etc., in SUPPLEMENT, No. 158. 2. Have you ever published anything on newspaper stereotyping—how to prepare matrix and paste for that purpose? A. See the stereotype process, page 498, SUPPLEMENT, No. 319.

(4) R. R. asks: Can you give the usual proportions of glue, sirup, and glycerine used in making printer's rollers? Also, can you suggest any remedy to make the rollers less tacky or possess less suction in moist, humid weather? A. A good printing roller is prepared as follows: Weigh out equal quantities of good white glue and concentrated glycerine. Soften the glue by soaking it in a small quantity of soft, cold water over night, then heat it over the water bath (a strong salt water bath is preferable with occasional stirring for five hours. Have the moulds (brass) well oiled, and give the composition plenty of time to harden in them. In stirring avoid beating air bubbles into the composition.

(5) T. H. J. asks: 1. How can I deposit a thin coating of copper on soft metal plates? The plates are composed of lead, tin, and type metal, and are about one-sixteenth inch thick and 1½ inch diameter. I wish to face them with copper on one side only. Can you tell me how to prepare the solution? A. Coat the parts not intended to receive a deposit with wax or asphalt varnish; wind a copper wire tightly around the edge of the plate, so as to make a firm electrical connection with the metal; then clean the surface by submitting it to the action of the wire scratch brush, and immediately connect with the wire proceeding from the

zinc plate of the battery, and immerse in the following bath, facing but not touching a plate of clean copper, connected by wire with the copper or carbon of the battery. The bath may be composed of a solution of 2½ pounds of pure sulphate of copper in a gallon of soft water. The water is first heated, the copper salt dissolved in it, and the bath allowed to cool before using. 2. Also, describe how to construct a cheap battery. A. For details of the construction of batteries see SUPPLEMENTS, Nos. 157, 158, and 159.

(6) F. P. S. asks: 1. Can the magneto-electric machine, described in No. 23, SCIENTIFIC AMERICAN, be used for plating small articles of hardware? If so, would it want to be arranged for "quantity" or "intensity"? A. Yes, for quantity. 2. Does hydrogen gas, when mixed with air, form an explosive compound? A. Yes. 3. If so, what proportion of each is necessary for the most marked results? A. For the pure gases, two volumes of hydrogen and one of oxygen, at the same temperature. 4. Is the explosion of the nature of a collapse or an expansion? A. The temperature accompanying the reaction momentarily expands the aqueous vapor formed beyond the volume of the mixed gases used, and the result is an explosion, not a collapse. 5. What is the explosive force per square inch? A. We have no data at hand on this point. It depends greatly upon the conditions—temperature, pressure, etc.

(7) J. A. B. asks: What is the best kind of oil or oils, or ingredients with oil, to use on canvas tents or wagon covers to make them waterproof? I have used linseed oil and beeswax, but the odor from it in summer is very unpleasant, and in winter it freezes so easy that you cannot handle it without first thawing out, as it will all break to pieces just like glass. What I want is something that will leave it pliable, have as little odor as possible, and will not mildew when rolled up wet or stick together in warm weather. A. You will find the information required under Waterproofing, page 81, vol. xiv.

(8) E. M. asks: 1. Will a furnace grate made of pipe for heating water and making steam get coated and stopped up with lime or other impurities in the water if a constant and forced circulation is maintained? A. If the water contains much lime it would gradually deposit and eventually choke the pipes. 2. If so, is there anything that can be put into the water that will prevent it and keep the pipes clean? I propose to supply my grate with water by attaching to the city water pipe, which will furnish a pressure of 40 pounds to the square inch. A. An examination to ascertain the precise nature of the impurities contained in the water would be necessary to properly answer the question.

(9) G. D. asks: What is the best process for melting platinum on a small scale? I cannot get up heat enough to melt it with charcoal fire. Do you know of a book published on compounding metals that would give the information? A. Platinum is melted in flat lime crucibles in the flame of a blowpipe fed with oxygen and hydrogen. It cannot be melted in any ordinary furnace. For books on metallurgy see addresses of booksellers in our advertising columns.

(10) D. J. F. asks: How can I make a white ink that will write on black paper or card; and also, how to make a good black ink suitable for card writing? A. You will find good receipts for white and black ink in SUPPLEMENT, No. 157.

(11) L. J. asks: Can an iron railroad tie, in your opinion, be made practicable? A. Yes; iron ties are in use.

(12) M. J. K. asks: 1. Can you give me a receipt for making a quickly drying polish or varnish to be applied to small turned articles while in the lathe? I want a hard and glossy surface. A. Dissolve ten ounces shellac in one gallon of wine spirit by gently heating over a water bath and stirring. Let it stand for several days in a covered vessel, then draw off the clear portion from any sediment, for use. 2. Can you give me some method of ebullizing articles of this kind? A. Put the wood for about half an hour into a hot solution of one ounce of logwood extract in a quart of water, and then transfer to a warm solution of one pound of copperas in a gallon of soft water, and let it remain in this bath for several hours. Give the pieces a second dip in the logwood and iron liquors, then rinse and dry.

(13) J. W. C. asks: 1. Will you please give receipt for making a stove polish paste that can be put on a stove when hot or cold, and will give a good polish without much friction? A. Reduce pure graphite to finest flour by grinding it in the moist state. Then mix into a stiff paste with a sufficient quantity of hot water in which has been dissolved perchloride of iron in the proportion of a quarter of a pound chloride to the gallon of water. Let it stand, with occasional stirring, for two weeks before using it. A few drops of oil of almonds or cloves may be added to the paste to cloak any unpleasant odor. 2. Please give me directions for making the liquid insulation that I find on wire on Ruhmkorff coil. Think it is varnish, or something similar. A. Use ordinary alcoholic shellac varnish mixed with enough vermilion to give it a suitable color.

(14) N. J. S. writes: At present the hemp binder's twine, passing through the spindles of our balling machines, cuts the edges of the hole in deep grooves. The hardest steel bushings are soon cut, and the twine is thereby injured. As an experiment, we want to countersink a porcelain "pot-eye" in the bushing, to obviate this cutting, if possible. What cement will secure this pot-eye in its place, fastening porcelain to iron? A. You had better try some mechanical method of securing the porcelain on the iron; cement cannot always be depended on for such a joint. You can try the following cement: Melt together in an iron vessel over a moderate fire gutta percha and shellac in about equal proportions, and stir well together. Use hot.

(15) H. L. asks: What is meant by the expression "level of the sea"? A. It is the average level of the water of the ocean where it touches the land.

(16) T. S. asks how two pieces of broken cast iron can be soldered together. A. See answer to A. G., on this page.

(17) A. G. asks (1) how to solder brass and iron together with soft solder. A. Dissolve zinc in muriatic acid until action ceases. Reduce with water, and apply to the surfaces to be soldered. If the brass and iron are clean there will be no difficulty in soldering them together with a soldering iron or blowpipe. 2. How is the wipe lead joint made? A. See Plumbing, in SUPPLEMENT 309.

(18) O. W. B. asks: How can I get a gold plate off a silver watch? A. If the plate is thin dip it momentarily in a little mercury and rub with a piece of soft chamois leather. Repeat the dipping (in fresh mercury) several times or until the gold color has been removed. Then heat the case until the film of mercury adhering to the silver has been dissipated. The mercury should not be allowed to remain too long in contact with the silver. The case should, of course, be separated from the works before being operated upon.

(19) D. H. D. asks: 1. What kind of carbon is used in Blake's transmitter used in connection with the bell telephone? A. Hard electric light carbon. 2. What kind of spring holds it in contact with the diaphragm of the transmitter? A. A piece of watch spring. 3. Is the diaphragm used in Blake's transmitter the same as that in the bell receiver? A. No; it is thicker. It is made of ordinary Russia stove pipe iron. 4. Why are not the Blake and Edison transmitters virtually the same, as the varying conducting power of the carbons under different pressure seems to be the principle on which both act in the telephone? A. The action is about the same when the Blake is working normally. 5. In what number of the SCIENTIFIC AMERICAN is Blake's transmitter fully described? A. SCIENTIFIC AMERICAN SUPPLEMENT, No. 250.

(20) G. F. M. writes: I am making a small magneto electric machine of the Clarke pattern, only with this difference: I intend to use two armatures, one on each side of the exciting magnet. What I wish to know through your correspondents' column is: Cannot I use an electro-magnet instead of permanent horseshoe magnets, and pass the current from the armature coils through its coil from the commutator before using it on the outside for work the two armatures will be set at right angles to each other. A. You can arrange the armatures and magnets as you propose; but for a very small machine permanent magnets are to be preferred to electro-magnets.

(21) D. C. asks: Do you know of any comprehensive tabular statement of liquids generally showing their specific gravity, specific heat, boiling temperatures, ratio of expansion upon being converted into steam under the ordinary pressure of the air, and caloric of fluidity of steam; or does there exist materials for compiling such a statement readily? A. Consult "The Constants of Nature," part I, published by the Smithsonian Institution, Washington, D. C.

(22) S. E. writes: Some time ago we put a set of condenser pipes on our launch which lasted only about five months. The pipes were made of some kind of brass or copper composition, 1½ inch, tin lined. Fearing they would give out at any time we replaced them with a set of galvanized iron ones, 1½ inch; but they only lasted about four months, being completely honey-combed, as were the others, as far as the tin lining. We then replaced the second lot of pipes with the first set, having first given them a coat of a mixture of tar and asbestos, filling all the holes well with the mixture. Now we are in a fix. The pipes are of no use to us, for they will not condense. They worked very well before we covered them. What is wrong, and what kind of pipe should we use, and how long should a set last on our launch, which is covered with yellow metal? The launch is used only eight months of the year, the balance of the time at anchor. A. Copper or tinned copper pipes are the best for condensers. They are less affected than brass or iron. Asphaltum is a very poor heat conductor, hence the failure of the coated tubes, no varnish or enamel is admissible.

(23) W. E. F. asks: Why does solder melt under the soldering "iron," when it will not under real iron, and why is it necessary to have the tool coated with tin? Does it act as a flux? A. Solder will melt under any hot iron, but unless the iron (or other metal) is perfectly free from oxide, perfect contact between the melted solders and the "iron," which is essential, cannot occur. When properly cleaned and coated with tin (or solder) the coating prevents reoxidation of the metal while heating, and the fluid metal follows and can be directed by the tool.

(24) C. W. G. asks: What can be used for blacking scraps of upper leather on the grain side? It must be something that will not smut when dry, and do the work with one application. A. Dissolve one pound of good sulphate of iron in two quarts of warm soft water. It may be applied with a brush or by dipping.

(25) C. and S., of Halifax, N. S., write that they are driving a lot of sewing machines and a Siemens electric light machine with a five horse power caloric engine. They secure uniform motion by applying a four-foot balance wheel to the countershaft of the electric light machine, and say that the light is steady.

(26) C. E. R. writes I am thinking of having a "secondary battery" made for experimental purposes, and wish to ask if you can give or direct me to any lately acquired knowledge relative to its construction? A. We believe the latest thing in this line is to confine the minimum in folds in the lead plates. Woollen flannel as a separating medium is preferable to cotton fabrics.

(27) S. M. asks: Can you inform me how the frosted appearance is given to new silver goods, such as bracelets, brooches, cups, portions of claret jugs, etc., and how I can make some coarse and others finely frosted, according to the article, be it large or small? I should also be thankful if you can give me the same information concerning 18 carat gold. I have often desired a frosty appearance on masonic and other jewelry, and for lack of which my make of jewelry very considerably falls short of finish. I have tried several acids mixed, but with only a sprinkling of success, never approaching near to the frosted appearance I see

on manufactured goods from England. I have also tried experiments with the points of scratch brush; also the positive end of a battery, with the goods hanging in a cyanide solution. This last gave me the best results, but is evidently not the thing. A "dead luster" is imparted to articles of copper or copper alloy by dipping them for a few minutes in a bath composed of—

Nitric acid (36%)	20 pounds.
Sulphuric acid (66%)	10 "
Salt	1/2 pound.
Zinc sulphate	1/2 "

Mix the acids gradually, add the zinc salt, then the salt, a little at a time (out-of-doors to avoid the acid vapors), stir well together, and let it get cold before using; rinse thoroughly, and pass through the cyanide before putting in the plating bath. When such a surface is plated with silver it presents the frosted appearance required. Dead luster gilding is produced by the slow deposition of a considerable quantity of gold, by giving the metallic surface a dead luster before gilding (by means of acids), by first preparing a coating of frosted silver or by depositing the gold upon a heavy copper deposit produced with a weak current in a bath of copper sulphate. See "Electrometallurgy," in SUPPLEMENT, No. 310.

(28) O. P. inquires for a simple method of preserving iron surfaces without paint. A Captain Bourdon has devised simple forms of apparatus for coating iron with Barff's magnetic lacquer. In the course of his experiments he found that the coat of oxide could be formed by the air in the following manner: The serpentine part of a sheet iron reservoir communicates with air which is heated to 248° Fah. The current of hot air, after circulating through the serpentine, reaches the cylinder which contains the articles to be lacquered. The escape spout communicates with a water aspirator regulating the flow of air, which should be very gentle. The internal pressure is little more than one atmosphere, the apparatus being in communication with the open air. The temperature of the air in the cylinders is 536° Fah.; the operation lasts five hours, giving a coat of 0.05 of a millimeter thick (0.002 inch), of a beautiful greenish black, resisting the action of fine emery paper and of dilute sulphuric acid. After the articles are taken from the cylinder they are rubbed with a greasy rag, and spots are removed by fine emery paper or scouring grass. Spots may generally be avoided by suspending the pieces, so that they will not touch each other or the walls. If the temperature is raised to about 572° Fah., a thick coat is secured, but it is apt to scale. Articles thus lacquered have been exposed to snow and rain for a month without getting any spots of rust. If the black coating is removed by emery paper, there is a grayish layer on which rust does not take much hold; the spots can easily be removed by a bit of hard wood. Barff has observed the same peculiarity in articles which have been steam-lacquered.

(29) E. M. B. writes: Will you please inform me, under Notes and Queries, of one or two best modern books on steam boilers? A. "Barr on Steam Boilers;" "Catechism of the Locomotive;" Forney; Wm. H. Shock, U. S. Navy, on "Boilers;" "Heat and Heat Engines," by Trowbridge.

(30) N. S. asks: Would it pay to work a mine of pure mica, if in large sheets, with say \$15 or \$20 freight per ton to San Francisco? A. See article on Mica and its Utilization, page 257, current volume.

(31) W. G. R. writes: In the SCIENTIFIC AMERICAN, dated December 14, 1878, on page 371, you describe a small foot lathe with directions for making the same. If the holes, instead of being babbitted, are bored, and the bars forming the shears are turned, and I should make my own turning and boring, what do you think would be the probable expense of making such a lathe? A. The materials would cost from \$5 to \$6.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

N. F. W.—It is a silicious clay of fair quality. An analysis such as you require would cost \$5.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

November 22, 1881.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Alarm. See Burglar alarm.
Amalgamating gold and silver ores, apparatus for and process of, A. E. Griffiths..... 249,925
Amalgamator and concentrator, C. W. Patten..... 249,791
Amalgams, preparing, W. G. A. Bonwill..... 249,889
Animal shears, J. K. Alwood..... 249,868
Ant trap, S. T. Arnett..... 249,879
Anvil, vise, and drill, combined, Ware & Fleming (r)..... 9,944
Bag. See Feed bag.
Baling press, Dean & Martin..... 249,908
Baling press, P. C. Hudson..... 249,897
Bark cutting machine, W. Chieken..... 249,835
Barrel cover, adjustable, W. F. Hood..... 249,959
Basin valve, catch, J. B. Laumann..... 249,956
Bed bottom, J. Bowen (r)..... 9,941
Bed bottom, spring, J. Bowen..... 249,882
Bed bottom, spring, W. H. Laycock et al..... 250,044
Bed, revolving, D. C. Otis..... 249,787

Bedstead, folding, P. Kotlowsky..... 249,773
Bedstead, invalid, A. J. Goodwin..... 249,934
Belt fastener, P. J. Flanagan..... 249,828
Blasting apparatus, John & Bradley..... 249,841
Blind slot tenoning machine, M. M. Kitz..... 249,950
Block. See Saw mill head block.
Blower, W. D. Smith..... 249,902
Board. See Electric switch board.
Boot and shoe clamp, E. S. Pratt..... 249,795
Boot and shoe sole napping machine, J. W. Rogers..... 250,002
Boot or shoe, J. E. Bloom..... 249,738
Boot tree, J. A. Ambler..... 249,867
Box. See Hop picker's box. Packing and toy box.
Brace, bracket, etc., interconvertible, H. Bogardus..... 249,823
Bracket, H. Unger..... 249,961
Bracket. See Exhibiting bracket. Roof bracket.
Brick press, W. W. Potts..... 249,987
Bridge, draw, E. A. Wible..... 250,027
Bridle, E. E. Venable..... 250,019
Broom, J. W. Bradshaw..... 249,884
Buckle, A. H. Frost..... 249,859
Buckle, trace, J. P. Halsey..... 249,836
Buffing pad, J. W. Rogers..... 250,003
Buffing wheel, J. A. Eno..... 249,914
Bung, W. A. Vreeland..... 250,021
Burglar alarm, Pearson & Eastman..... 249,982
Burner. See Gas burner.
Button, J. McBride..... 249,781
Button, sleeve, Hancock & Richards..... 249,769
Button, sleeve, C. L. Watson..... 250,022
Bux and top, A. E. Garrison..... 249,922
Cake machine, D. M. Holmes..... 249,938
Candy sticks, package for shipping, W. B. Howe (r)..... 9,942
Canteen, W. M. Johnston..... 249,769
Car, cattle, I. M. Lincoln..... 249,779
Car coupling, A. W. Clark..... 249,988
Car coupling, W. C. Kelly..... 249,772
Car coupling, A. L. Miller..... 249,782
Car coupling, M. Robeson..... 249,999
Car, dumping, J. S. Halsey..... 249,928
Car mover, C. T. Barnes..... 249,819
Car, railway, A. Willson..... 249,815
Car starter, W. E. Young..... 250,038
Car, stock, L. Yancey..... 250,031
Car switch manipulator, H. H. Welch..... 250,024
Cars, safety hatch for railway, J. Reilly..... 249,796
Carpet fastener, stair, A. H. Ohmann-Dumesnil..... 249,976
Carriage dash boards, board for, J. Smith..... 249,801
Carriage top, L. K. Brubaker..... 249,741
Carrier. See Egg carrier.
Cartridge implement, J. Pontefract..... 249,966
Caster, J. R. Payson..... 249,792
Chain, O. S. Judd..... 249,947
Chain work for jewelry, E. Vieille..... 250,030
Chair. See Commode chair. Folding chair.
Chair, W. B. Allen..... 249,805
Chair, A. H. Conkling..... 249,801
Chair, H. B. Gates..... 249,759
Cider press, J. Mercler..... 249,852
Cigar holder, E. S. May..... 249,848
Cigar machine, F. P. Hart..... 249,833
Clamp. See Boot and shoe clamp.
Clasp. See Corset clasp.
Clevis, M. Hubbell..... 249,941
Clock case, cut glass, J. H. Welch..... 249,862
Clocks, strike spring for eight day, B. B. Lewis..... 249,845
Closet. See Water closet.
Cloth finishing machine, J. H. Smith..... 249,859
Clothes pounder, F. A. Houck..... 249,940
Clover huller, J. M. Grauf..... 249,756
Coffee scouring machine, G. W. & G. S. Hungerford..... 249,943
Collar connection, horse, C. G. Calo..... 249,894
Coloring matter, J. H. H. O. Gürk..... 249,926
Coloring matter, manufacture of crimson, H. Baum..... 250,038
Commode chair, E. Ottenheimer..... 249,788
Corn husking machine, P. D. Cummings..... 249,744
Corn sheller, J. S. Pursey..... 249,999
Corset, T. C. Bates (r)..... 9,945
Corset case, W. F. Gilbert..... 249,923
Cotton gin, W. L. Ellis..... 249,913
Cotton stalk cutter and puller, W. B. Richardson..... 249,997
Coupling. See Car coupling. Electric cable coupling. Pipe coupling.
Crocheting needle, E. P. Haff..... 249,759
Cultivator, W. L. Bogart..... 249,879
Current wheel and float therefor, A. D. Clarke..... 249,899
Cutter. See Cotton stalk cutter. Tobacco cutter.
Damper for stoves and furnaces, N. Picot..... 249,985
Dental drill tool holder, H. Laurence..... 249,844
Desks, inkstand attachment for writing, S. H. Brown..... 249,992
Dish handle, J. B. Timberlake..... 249,807
Dish washing machine, W. C. Nelson..... 249,973
Ditching machine, S. C. Robinson..... 250,000
Door check, C. Hassinger..... 249,761
Drier. See Fruit drier.
Drier, A. N. Palmer..... 249,973
Dyeing tissue and bonbon papers, I. J. Van Skel-line (r)..... 9,939
Egg carrier, D. Goodwillie..... 249,753
Egg carriers, machine for making, D. Goodwillie..... 249,754
Electric cable coupling, W. W. Jacques..... 249,840
Electric light regulator, C. E. Ball..... 249,872
Electric switch board, L. F. Fouts..... 249,919
Electrical circuits, apparatus for neutralizing induction on, J. Trowbridge..... 249,808
Emery wheels, safety guard for, C. Heaton..... 249,954
Engine. See Hydraulic engine. Locomotive engine. Steam engine.
Exhibiting bracket for stuffed animals, J. Hobson..... 249,936
Fabrics, trimming, S. Arnold..... 249,754
Fan attachment, fly, W. V. Flynn..... 249,917
Fan, toilet, J. C. Stritar..... 250,018
Fanning mill, Martin & Sperry..... 249,789
Fare register, M. W. Spaulda..... 250,011
Farm gate, J. Kurtz..... 249,776
Faucet and ventilator for beer, etc., T. Tracy..... 250,017
Faucet, racking, J. C. Bauer..... 249,796
Faucets, coupling attachment for smooth, J. Hunt..... 249,796
Feed bag, nose, C. J. Gustavson..... 249,927
Fence, J. M. Rowe..... 249,797
Fence, J. Wormuth..... 250,000
Fence, barbed, I. E. Wright..... 249,817
Fence, farm, Lauffer & Zimmer..... 249,778
Fence, hedge, D. S. & D. Younce..... 250,032
Fence, iron, T. Rogers..... 250,046
Fence, portable, J. H. Hancock..... 249,933
Fence, portable, J. J. Hermon..... 249,763
Fence, portable, Petershans & Daines..... 249,983
Fence post, metallic, D. W. Sparks..... 249,903
Fence wire fastening, T. S. Woodruff..... 249,816
Fences, machine for manufacturing barbed wire, D. C. Stover..... 250,014
Fences, tag for barbed wire, J. J. La Fleur..... 249,777
Fender. See Harvester pitman fender.
Field roller and seed and plaster sower, G. G. Lee..... 249,957
File, bill, C. H. Peltier..... 250,045
Firearm, breech-loading, P. Mauser..... 249,867
Fire escape, R. Macdonald..... 249,846
Fire extinguisher, automatic, F. W. Whiting..... 249,843

Fire rescue apparatus, R. Macdonald..... 249,847
Flax puller, S. W. Gaines..... 249,921
Fog horn, J. Brien..... 249,877
Folding chair, I. N. Dann..... 249,905, 249,900
Fork. See Pitchfork.
Fruit drier, J. Mongene..... 249,977
Furnace. See Metallurgical furnace. Ore roasting furnace.
Furnace, Brown & Norris..... 249,891
Furnace and pot stand, M. A. Laska..... 249,955
Gauge. See Mortising machine gauge.
Gas burner, J. H. Smith..... 250,010
Gas from petroleum, process of and apparatus for generating, A. I. Ambler (r)..... 9,940
Gate. See Farm gate.
Gear, J. F. Gilliland..... 249,752
Generator. See Steam generator.
Glass, window, S. Darling..... 249,745
Glassware, machine for finishing open-ended, J. J. Gill..... 249,751
Globe and shade and chimney, combined, W. M. Marshall..... 249,905
Gold and silver ores, smelting, H. Pearce..... 249,981
Grain separator and grader, H. P. Edmonds..... 249,911
Grinding and polishing plow colters, etc., apparatus for, J. T. Duff..... 249,746
Guard. See Pulley cord guard. Saw guard.
Hame, G. J. & J. Letchworth..... 249,958
Hand rake, T. D. Davis..... 250,040
Handle. See Dish handle.
Harness pad, W. V. Kay..... 249,771
Harness trimming, B. J. Welles..... 249,810
Harrow, G. Galmore..... 249,830
Harvester, Kromer & Rinkoff..... 249,774, 249,775
Harvester pitman fender, G. B. Parker..... 249,980
Hay rake, horse, C. A. Werden..... 249,811
Holder. See Cigar holder. Dental drill tool holder. Pencil holder.
Honeycomb uncapping machine, J. Bourgmeier..... 249,881
Hook. See Lacing hook.
Hop picker's box, F. A. Fargo..... 249,915
Horses, device for fastening, J. W. Eldridge..... 249,749
Horses' tails, device for holding, W. B. Butchers..... 249,743
Hub attaching device, A. Warth..... 249,809
Huller. See Clover huller.
Hydrant, W. J. Clark..... 249,836
Hydraulic engine, G. Code..... 249,900
Ice tool, J. B. Fischer..... 249,827
Indigo, manufacture of artificial, A. Baeyer..... 250,035, 250,036
Injector, J. Benson..... 249,876
Insect trap, C. T. Harned..... 249,931
Iron and steel, manufacture of, E. Samuel..... 250,006
Journal bearing, anti-friction, L. Kaufman..... 249,948
Knife. See Pocket knife.
Lacing hook for boots and shoes, G. Van Horne..... 250,018
Lamp, W. Brown (r)..... 9,936
Lamp, electric, A. E. Brown..... 249,921
Lamp, self-extinguishing, D. C. Baughman..... 249,874
Lamp, signal, E. S. Piper..... 249,794
Lamp trimming shears, E. Bailey..... 249,819
Lamps, shade ring for extension, A. H. Jones..... 249,946
Lantern, F. J. Miller..... 249,785
Links, manufacture of, J. M. Baker..... 249,871
Liquids, apparatus for dispensing aerated, G. Reh-fuss..... 249,963
Lock, E. Parker..... 249,789
Locomotive engine, E. Longstreth..... 249,962
Loom picker motion, W. C. Knowlton..... 249,951
Loom shuttle, R. W. Porter..... 249,857
Loom shuttle, C. T. Pratt..... 249,888
Lubricating compound, J. B. Norris..... 249,786
Lubricating compound, E. Smalley..... 250,009
Mash, machine for making sour, J. C. Peden..... 249,783
Meat draining device, P. Springstein..... 250,012
Mechanical movement, P. Broadbooks..... 249,887
Metal ring, hollow, W. Hutchison..... 249,838
Metal shearing machine, B. Gallagher..... 249,749
Metals, composition for coating, A. B. & W. P. Brown..... 249,899
Metallic fastening, G. W. McGill..... 249,850
Metallurgical furnace, W. Moiler..... 249,971
Middlings purifier, C. S. Rider..... 249,908
Mill. See Fanning mill.
Millstone cooling apparatus, H. Dorrity..... 249,910
Millstone driver, L. Reiple..... 249,894
Mirror, ornamental, P. Wiederer..... 250,028
Mortising machine gauge, G. L. Muhn..... 249,784
Motor. See Rotary motor.
Motor, E. Phreaner..... 249,984
Mowing machine, J. L. Abell..... 249,732
Needle blanks, device for feeding, J. Berry..... 249,822
Newspaper wrapper, A. W. Boynton..... 249,883
Oatmeal machine, S. P. Sawyer..... 249,798
Oatmeal machine, S. G. Stein..... 249,801
Oil cloth varnishing machine, J. Haverstick..... 249,762
Oil from water, device for separating, P. Andrew..... 249,888
Oil tank, F. N. Forster..... 249,918
Oils, automatic reservoir for volatile, H. Fritz..... 250,041
Ore, etc., machine for reducing, W. F. Kilborn..... 249,949
Ore roasting furnace, J. M. Thompson..... 250,015
Ores, machinery for crushing and conveying, J. Richards..... 249,986
Oven, portable, Klein & Woodard..... 249,843
Oyster fattening apparatus, V. N. Hughes..... 249,942
Packing and toy box, F. M. Whittlea..... 250,026
Pad. See Buffing pad. Harness pad.
Painting machine, barrel, Heward & Everhard..... 249,933
Paper machines, dandy roll for, J. Randall..... 249,992
Paper, process of and apparatus for bronzing, T. Henry..... 249,855
Peasant and coffee polisher, B. F. Walters (r)..... 9,943
Pedal, A. S. Nichols..... 249,974
Pencil holder, lead, E. Weissenborn..... 250,023
Pencils and pen holders, finger rest for, J. S. Bukeley..... 249,895
Pipe coupling, E. F. Osborne..... 249,977
Pipe cutting implement, F. I. Maule..... 249,908
Pipe wrench, T. D. Mernan..... 249,963
Pitchfork, A. Cox..... 250,039
Plane, bench, G. F. Sawyer..... 250,007
Planing machine, wood, A. W. Stossmeister..... 249,835
Platform. See Stove platform.
Plow attachment, G. Browne..... 249,740
Plow, planting, T. Pates..... 249,730
Plow, sulky, G. Applegate..... 249,869
Plow, sulky, L. Brown..... 249,800
Pneumatic machinery, J. Richards..... 249,936
Pocket knife, E. D. Chamberlain..... 249,836
Poisons, safety cabinet for, H. P. Smith..... 249,830
Post. See Fence post.
Press. See Baling press. Brick press. Cider press. Printing press. Shoe press.
Printing press, P. Miller..... 249,939
Printing press, E. Prouty..... 249,999
Printing presses, feeding attachment for, S. A. Grant..... 249,753
Puller. See Flax puller. Stump puller.
Pulley, belt, S. J. Cilley..... 249,897
Pulley cord guard, sash, C. J. Scheelky..... 249,799
Pulverizer, rotary, T. B. & T. R. Jordan..... 249,770
Pump, J. H. & B. Brannon..... 249,885
Purifier. See Middlings purifier.

Railway signal, D. C. Baughman..... 249,873
Railway signal, electric, W. W. Gary..... 250,042
Railways, safety device for, C. Rutland..... 250,005
Rake. See Hand rake. Hay rake.
Refrigerating apparatus, J. Tiffany..... 250,016
Refrigerator, J. T. Gurney..... 249,758
Refrigerator, J. Hammerl..... 249,929
Register. See Fare register.
Regulator. See Electric light regulator.
Ring, Set Metal ring. Suspensing ring.
Rivet, tubular, M. Bray..... 249,886
Roller. See Field roller.
Rolling billets for plow beams, roll for, C. P. Buckingham..... 249,743
Roof bracket, S. F. Black..... 249,737
Rotary motor, hot air, O. Gildner..... 249,792
Roving, machinery for the manufacture of, E. W. Kelley..... 250,043
Rubber from rubber waste, recovering, N. C. Mitchell..... 249,970
Saw guard, circular, R. W. Taylor..... 249,906
Saw mill head block, G. H. Zschech..... 250,054
Scaffold, G. W. Green..... 249,737
Scale, platform, W. W. Reynolds..... 249,994
Screw plate, L. W. Stockwell..... 249,893
Seeding machine, H. Ogborn (r)..... 9,938
Separator. See Grain separator.
Sewing machine attachment, W. A. Alrich..... 249,738
Sewing machine attachment, Johnson & Reynolds..... 249,768
Sewing machine embroidery attachment, G. W. Baker..... 250,007
Sewing machine table, J. E. Donovan (r)..... 9,937
Sewing machines, edge forming attachment for, J. Benjamin..... 249,873
Shears. See Animal shears. Lamp trimming shears.
Sheller. See Corn sheller.
Shoe, D. B. Felter..... 249,916
Shoe fastening, F. J. Lippitt..... 249,961
Shoe press, A. S. Rogers..... 250,001
Signal. See Railway signal. Switch signal.
Skates, ankle support for, E. G. Macomber..... 249,964
Square, combination, S. H. Bellows..... 249,821
Stamp, hand, W. D. Wesson..... 249,863
Stamp, perforating, H. H. Norrington..... 249,975
Stand. See Furnace and pot stand.
Staple or tag fastener, G. W. McGill..... 249,851
Steam engine, J. Wheelock..... 249,864
Steam generator, F. Shriver..... 250,008
Steel, tempering, united lengths of band, T. Donahue..... 249,939
Stone, artificial, J. Iron..... 250,006
Stool, piano, G. A. Ramseyer..... 249,591
Stopper. See Tube stopper.
Store service system, J. C. White..... 250,025
Stove attachment, vapor burning, Klein & Woodard..... 249,842
Stove for burning petroleum, H. Kock..... 249,862
Stove, heating, J. A. Milliken..... 249,854
Stove, heating, H. L. Palmer..... 249,797
Stove platform, H. J. Palmer..... 249,797
Street, underground, N. Jacobsen..... 249,945
Stump puller, J. Dunn..... 249,747
Suspensing ring, G. W. McGill..... 249,849
Switch signal, R. B. Ireland..... 249,944
Table. See Sewing machine table.
Table leaf support, D. D. Brockway..... 249,888
Tablet, writing, F. S. Hasbrouck..... 249,932
Tank. See Oil tank.
Telegraph receiving apparatus, J. W. Fuller..... 249,999
Tellurian, J. A. Bowyer..... 249,739
Tethering device, J. C. Covert..... 249,944
Thrasher and separator, grain, E. Reese..... 249,858
Timber, railway ties, etc., apparatus for treating, H. E. Kreuter..... 249,953
Tobacco cutter, S. C. Gault..... 249,831
Tongs, pipe, D. Worden..... 250,029
Tongue support, wagon, J. W. Wetmore..... 249,812
Toy puzzle, C. H. Loomis..... 249,963
Trap. See Ant trap. Insect trap.
Trap valve, C. Birkery..... 249,879
Tree. See Boot tree.
Treefall turning machine, F. Lightbody..... 249,980
Trimmer. See Wick trimmer.
Tube stopper, leaky, D. J. Morgan..... 249,783
Tuyere, Edwards & Smith..... 249,911
Type writing machine, J. B. Hammond..... 249,930
Umbrella, H. A. Davis..... 249,967
Vaginal irrigator and urinal, E. J. Holcombe..... 249,907
Valve. See Basin valve. Trap valve.
Varnish, M. Connelly..... 249,832
Vehicle circle plate, I. V. Hicks..... 249,765
Vehicle running gear, E. Whitmore..... 249,814
Velocipede, N. Merrill..... 249,853
Velocipede, railway, Campbell & Prindle..... 249,865
Washing machine, H. Rousseau..... 250,004
Water closet, W. S. Cooper..... 249,939
Water closet, E. S. Hutchinson..... 249,767
Water race, G. Land..... 249,954
Wheel. See Buffing wheel. Current wheel.
Whip, H. Mullen..... 249,855
Wick trimmer, P. G. Beckley..... 249,939
Window screen attachment, B. T. Herold..... 249,764
Wire barbing machine, G. C. Baker..... 249,735
Wood, preserving, S. R. Percy..... 249,936
Wrench. See Pipe wrench.

DESIGNS.

Dinner ware, E. Chetwynd..... 12,576
Finger ring, C. Krauss..... 12,577
Gem setting, W. L. Reynolds..... 12,578
Monument, miniature, E. C. Bruen..... 12,575
Rosette and slide for door spindle locks, W. Whitteney..... 12,581
Stove bracket, W. S. Shippe..... 12,580
Stove, oil, J. M. Reddy..... 12,579
Dinner ware, E. Chetwynd..... 12,576
Finger ring, C. Krauss..... 12,577
Gem setting, W. L. Reynolds..... 12,578
Monument, miniature, E. C. Bruen..... 12,575
Rosette and slide for door spindle locks, W. Whitteney..... 12,581
Stove bracket, W. S. Shippe..... 12,580
Stove, oil, J. M. Reddy..... 12,579

TRADE MARKS.

Cotton piece goods, Naumkeag Steam Cotton Company..... 8,870
Food, infants and invalids, T. Metcalf & Co..... 8,869
Medical compound, R. V. Pierce..... 8,873
Medical compound, certain, R. V. Pierce..... 8,871 to 8,875
Perfumeries, cosmetics, tooth powders, and toilet soaps, Bureley & Co. f..... 8,867
Sewing cotton and thread, J. Brock & Bros..... 8,868
Wine made of malt, hops, and other materials, H. L. Becker & Co..... 8,826

English Patents Issued to Americans.

From November 11 to November 13, 1881, inclusive.

Cloth fastener, G. W. McGill, New York city.
Compositors' rule, L. K. Johnson, Brooklyn, N. Y.
Fages, preserving, K. H. Loomis, New York city.
Moulded metallic bodies, W. H. Mallory, Bridgeport, Ct.
Propelling vessels, W. H. Mallory, Bridgeport, Conn.
Railway signaling apparatus, J. B. Johnson, Boston, Mass.
Slide valve, W. B. Turman, Waldron, Ark.
Torpedoes, W. H. Mallory, Bridgeport, Conn.

A32 CALIBRE \$10.00 REVOLVER FREE TO EVERY READER OF THIS PAPER.

READ THIS

About a month ago we made an offer through the News-papers of a 32-Calibre BLUE JACKET Revolver, and a subscription to the "HOUSEHOLD GUEST MAGAZINE" FOR ONE YEAR, for the low price of \$2.00. We had 5,000 of the 32-Calibre BLUE JACKETS nearly all of which have been sold, or rather given away. They have given such universal satisfaction, and we have received so many high testimonials, together with thousands of calls for a heavier calibre revolver that we have decided to offer our World Renowned 32-Calibre BLUE JACKET for a limited time for the low price of \$10.00. The BLUE JACKET is the most elegant and BEAUTIFULLY FINISHED REVOLVER IN THE WORLD. Every Revolver is Guaranteed in every respect. They are made of the finest steel. The barrel and frame are finest Nickel silver-plated, and the Cylinder and Base Pin are of the finest Gold-plate. Every Revolver is BEAUTIFULLY ENGRAVED. The engraving is then BEAUTIFULLY ENAMELED in blue by a patent process, owned by us. The frame near the handle is set in imitation of beautiful rubies, making a contrast of GOLD, SILVER, BLUE and RUBIES, which taken together with the IVORY HANDLE make a simply beautiful REVOLVER. It must be seen to be appreciated. No one can picture its beauty or describe its actual merits. The name BLUE JACKET is enough to stamp it as a first-class weapon in every respect. It has the New Russian Model Hip Stock exactly fitting the hand, enabling one to hold it firmly and steadily. We guarantee its shooting quality equal to a Smith & Wesson or Colt, and for beauty and durability it cannot be equaled. The Cylinder is provided with a Positive Lock Action holding it firmly in place. It uses the Long 32-Calibre Cartridge making it one of the strongest shooting revolvers in the world. It is the special terror of burglars, highwaymen and tramps. We pledge our reputation that it is the first 32-Calibre Ivory Handle Engraved, Nickel and Gold-Plated Revolver ever sold for less than \$10.00, and the ENAMELED and RUBY FINISH is the FIRST EVER SEEN ON ANY REVOLVER. We purchased these Revolvers partly finished at less than the raw material cost and had them finished as above described for this special purpose, and we hereby guarantee over our own signature to refund money for each and every Revolver found to be different from what we represent it. FOR THREE DOLLARS AND FIFTY CENTS, and TWENTY-FIVE CENTS extra to help to pay postage and packing expenses. We will mail this Revolver to any part of the world, and in addition will enter your name on our Subscription Books for a year's subscription to OUR MONTHLY PUBLICATION, THE HOUSEHOLD JOURNAL. The Journal contains 24 Large Pages, filled with Illustrations, Stories, Sketches, Adventures, Poetry, Anecdotes, Farm and Garden Statistics, The News, Etc. This offer holds good ONLY TILL MARCH 1st, 1882, or until our stock is sold out, after which time we shall be obliged to charge more than double what we do now. Could our stock run out before THAT DATE, we claim THE RIGHT AND PRIVILEGE of continuing your order. As we have only Ten Thousand, we would advise you to order now, as past experience teaches us that they will soon be sold. FREE TO ANY ONE. We will give this Revolver FREE to any reader of this paper who will CUT THIS ADVERTISEMENT OUT, show it to their friends and get six orders at \$2.75 each. After you have done this send us \$2.00 the price of six Revolvers and we will send you one Revolver and a subscription to THE HOUSEHOLD JOURNAL FREE FOR YOUR TROUBLE, and each one in your club will also receive the Journal a year. THE BEST WAY is to order one for yourself first and show it to your friends, you will then find it easy to get others to order, or you desire to speculate, you can easily sell these Revolvers for \$10.00 each. As to our reliability we refer to any Commercial Agency, newspapers, Publishers, or Express Companies in New York City. If this is not sufficient, write us for references which we will cheerfully furnish. Send all Money by REGISTERED LETTER or POST OFFICE ORDER at our risk. When one or more are ordered by Express, at \$3.75 we put in a Box of Cartridges with each Revolver.



THIS CUT IS THREE FOURTHS SIZE.

THE WORLD RENOWNED
BLUE JACKET
IVORY HANDLE
GOLD PLATED
CYLINDER
ELEGANTLY
ENGRAVED
(AND
ENAMELED)
WEIGHT
12 1/2
OZ

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - 1.00 a line.
(About eight words to a line.)
Engravings may be advertised at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

WOOD WORKING MACHINERY.
PLANING, MATCHING, MOLDING, MORTISING,
TENONING, CARVING, MACHINES,
BAND & SCROLL SAWS
UNIVERSAL
AND VARIETY WOOD WORKERS
J. A. FAY & CO.
CINCINNATI, O. U.S.A.

MINERAL WOOL.

This Fireproof and indestructible material successfully prevents loss or heat by radiation, keeps frost from water pipes, deadens sound, checks spread of fire in walls, partitions, doors of dwellings. 25 cts. per cubic foot.
U. S. MINERAL WOOL CO., 16 Cortland St., N. Y.

Spinners' and Shippers' Cotton Bale Buckle.



Serielly numbered. A complete check against fraud in weight and packing, also, a protection in case of damage by fire or water. Only one buckle to each bale. This buckle to be the only shipping mark recognized. Made of the best malleable iron. Can be attached at once for immediate shipment. It cannot be removed without disrupting the bale.
Address S. N. DRAKE, Cincinnati, O.

PATENT'S SOLD Partners
Joint Stock Companies formed. Stock placed for Incorporated Companies. Good investments always on hand. Highest references given. Circulars free. E. L. RICHARDS & CO., Brokers, 733 Broadway, New York.

BOILERS SAFE FROM DESTRUCTIVE EXPLOSION.
25000 H.P. IN USE. - SEND FOR CATALOGUE.
HARRISON BOILER WORKS, PHILA.

SITUATION WANTED.
With some good house or firm. Understands all kinds of hardware tools, farming tools, and Machinery. Will work on moderate salary. Can give first-class references. Address A. C. ANDRE, Beloit, Wis.

PATENT GEAR DRESSING MACHINE
AND IMPROVED LATHES PLANERS & DRILLS.
W. GLEASON, ROCHESTER, N.Y.

300 Choice Poetical Selections for Autograph Albums, neatly bound, 250 spicy Motto Verses, and 25 popular Songs, all for 12c. postpaid. PATTEN & WADE, 40 Barclay St., New York.

What will the Weather be To-morrow?
A Barometer and Thermometer combined, that foretells correctly any changes in the weather 12 to 24 hours. Warranted Perfect and Reliable. We will send it, delivered free, to any address on receipt of One Dollar. The Best Weather Indicator in the World. Just the thing for a CHRISTMAS PRESENT. Agents wanted everywhere. Send for circular. Beware of imitations. OSWEGO THERMOMETER WORKS, Oswego, N. Y.

30 DAYS TRIAL ALLOWED.
We will send on 30 days trial
DR. DYE'S
Electro-Voltaic Appliances.

Invented by the eminent Dr. A. M. Dye, and especially designed for the cure of all Nervous Diseases, General Debility, Lost Vigor and Manhood, the result of abuses and other causes. Also for Liver and Kidney Diseases, Rheumatism, Neuralgia, Paralysis, Rupture, Female Troubles and many other diseases. Wonderful cures quickly effected. Illustrated pamphlet sent free. Address,
VOLTAIC BELT CO., Marshall, Mich.

FINE WOOD PHOTO-ENGRAVING
SEND COPY FOR ESTIMATE.
IT WILL PAY YOU 702 CHESTNUT PHILA. PA.

PICTET ARTIFICIAL ICE. COLD AIR MACHINES

For Brewers, Pork Packers, Cold Storage Warehouses, Hospitals, etc. Send for ILLUSTRATED and DESCRIPTIVE CIRCULARS. PICTET ARTIFICIAL ICE CO. (Limited), 112 Greenwich Street, New York City, N. Y. P. O. Box 3083.

PLANING AND MATCHING MACHINE.
J. B. ROCKWELL & CO., 100 N. 3rd St., N. Y.

Special Machines for Car Work, and the latest improved Wood Working Machinery of all kinds.

ACME GUBE PIPE TONGS
PATENTED IN 1875 FROM 1000 TO 10000 LBS.
MOST EFFICIENT MADE.
ROBEY HALL & CO. SOLE MFRS. ERIE, PA. "C"

SPECIAL MACHINERY, TOOLS, EXPERIMENTAL WORK, ETC. S. M. HENRY, 97 Filbert St., Philadelphia, Pa. Fine work solicited.

OUR CHRISTMAS-BOX FOR LITTLE FOLKS

A GREAT BARGAIN. Each Box contains Twelve Articles, consisting of Toys, Games, and Puzzles. Price by mail, 50 cts. Four Boxes for \$2.00, post-paid. 2 French Dolls. 8 in. tall, 5 in. wide; one with Banged Hair and Black Eyes, and one with Curly Hair and Blue Eyes; different style dresses with each, as a pattern for little ones to make dresses from. Cat.-An ornament for Mantels, Whatnots, Windows, and Dress-Boxes. It is beautifully engraved on thick cardboard, 8 in. tall, 6 in. wide; it is so perfect that it is often taken for a real live cat. The Great Pagoda Puzzle is a new toy affording a delightful and fascinating pastime alike to old and young, made from one piece of paper, and is impossible for any one to make unless instructed. The New Automatic Toy-Grandfather, tossing on his knee the baby. By pulling a string, the head, arms, body, and leg of the old man move, and baby's body and legs also. A very amusing toy for the children. Professor Abbey's Age and Filtration Cards, entertaining and amusing at parties and socials, enabling any one to tell the age of each one present, double-faced on backs are directions, handkerchief filtrations, and humorous escort cards; they furnish innocent amusement. Magician's Own Trick Cards.-These wonderful cards enable one to perform the most astonishing metamorphoses without detection with them; the self-same identical cards you show all eight-spots, all deuces, all spots, etc., etc. Professor Herman's most astonishing performances revealed. Gives us all a chance to see how it is done and the means of doing it. The \$100 Puzzle.-The greatest mystery out; \$100 was offered by the inventor to any one who could pull together, yet it can be done by him in three minutes. The best puzzle yet invented. It consists of the alphabet in full, and also forty-four figures. In England, France, Spain, and America. It is easily understood, and can be played by two or more, not exceeding twelve. It has twelve beautifully colored cards and ninety numbers. The game is fascinating, amusing, and very entertaining for young people. This game has been sold at forty cents, but superior facilities for manufacturing enables us to add it to the Christmas Box. The Articles in Our Christmas Box would cost Two Dollars if bought separately at any store. It is the best bargain ever offered. Send for it. Postage stamps taken. Address plainly, M. F. JONES & CO., P. O. Box 3630, BOSTON, Mass.

ELEVATORS
HAND POWER AND HYDRAULIC
FREIGHT & PASSENGER
SHAFTING PULLEYS & HANGERS
L. S. GRAVES & SON, ROCHESTER, N.Y.

MICROSCOPE WATCH CHARMS show heads of Actresses as large as life, street views, the Creed, Lord's Prayer, etc., only 12c. postpaid, 2c. per doz. Big thing for Agents. PATTEN & CO., 40 Barclay St., N. Y.

"THE MAYFLOWER." Varnmouthport, Mass. The cheapest, largest, and best Family Story paper. 35 cash present to every 5th (and its multiple as well) subscriber. Send a three cent stamp for sample copy.

PAYNE'S AUTOMATIC ENGINES.
Established 1840
Reliable, durable, and economical. will furnish a horse power with one-third less fuel and water than any other engine built not fitted with an automatic cut-off. Send for Illustrated Catalogue "A" 2, for information and prices. E. W. PAYNE & SONS, Corning, N. Y. Box 1207.

BOOKWALTER ENGINE.
Compact, Substantial, Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of
HORSE POWER.....\$340 00
40 ".....250 00
30 ".....200 00
20 ".....150 00
10 ".....100 00
Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio,
or 110 Liberty St., New York.

STEEL NAME STAMPS, POSTPAID, 15 CENTS PER LETTER. STEEL STAMP WORKS, New Haven, Conn.

50 Elegant Genuine Chromo Cards, not unlike, with name, 10c. SNOW & CO., Meriden, Conn.

CLARK'S RUBBER WHEELS.
This Wheel is unrivaled for durability, simplicity, and cheapness. Adapted for Warehouse and Platform Trucks, Scales, Heavy Casters, and all purposes for which Wheels are used. Circulars and Price List free. GEO. P. CLARK, Windsor Locks, Ct.

BEATTY'S Organs. 27 stops, 10 set reeds, only \$90. Pianos \$125 up. Rare Holiday inducements ready. Write or call on Beatty, Washington, N. J.

TELEPHONE SEND FOR NEW CIRCULAR
FITCHBURG ACOUSTIC TEL. CO.
FITCHBURG, MASS.
NEW SYSTEM
TELEPHONE

ORGANITA ONLY \$5
With 35 feet of MUSIC, \$6. With 100 feet of MUSIC, \$8 \$5
PIANO-ETTE \$5. GRAND & CABINET ORGAN \$20
ORGANITAS, MELOPEANS, ORGANETTES, greatest variety, lowest prices
MUSIC and MUSICAL Combined. Anybody can play any tune.
Mannheim Catalogue Free. Agents Wanted. HARBACH ORGANITA CO., Philada., Pa.
GREAT OPTICAL WONDER, Magical Mesascope, only \$2.50.

Horizontal Steam Engines.
For best Automatic Cut-off or Plain Slide Valve of Superior Design. Complete in Every Respect. ADDRESS
LAMBERTVILLE IRON WORKS, LAMBERTVILLE, N. J.

An engine that works without boiler. Always ready to be started and to give at once full power. SAFETY, ECONOMY, CONVENIENCE. Burns common gas and Air. No steam, no coal, no ashes, no fire, no danger, no extra insurance. Almost no attendance.
THE NEW OTTO SILENT GAS ENGINE.
Useful for all work of small stationary steam engine. Built in sizes of 2, 4, and 7 H. P. by SCHLEICHER, SCHUM & CO., 343 Chestnut Street, Phila., Pa. A. C. Manning, 30 Day St., New York, Agent.

WATER ELEVATOR, OR STEAM JET PUMP.
Has no valves or moving parts. Simple and safe. Pump sends, Will pump hot or cold or gritty water or liquids. Will force water through pipes and hose for fire purposes. With 50 lb. steam a 1 1/2 in. jet pump throws full 1/2 in. stream 1500 ft. high. 50 feet. With 25 lb. steam a 3 in. jet pump raises 7500 gallons water per hour 50 feet high. All pumps guaranteed. State for what purpose wanted, and write for prices, etc.
VAN DUZEN & TIFT, Cincinnati, O.

THE BAKER BLOWER.
[PUMPS PLANT.]
The best in the World for Charcoal Blast Furnaces. Also for melting Iron in Cupolas for Stone Foundries, etc.
WILBRAHAM BROS.,
No. 230 Frankford Avenue, Philadelphia, Pa.
SEND FOR OUR CATALOGUE.

12c. "A Violet from Mother's Grave," & 49 other popular songs, words and music entire, all for 12c. PATTEN & CO., 40 Barclay St., N. Y.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS
THOMAS DEVLIN & CO., 1000 AVENUE C, PHILA. PA.

HARPERS CENTURY ATLANTIC, ETC. 2.50
Full of interesting and valuable information. Circulars and Foreign Periodicals. Catalogues free.

T. M. NAGLE, ERIE, PA.,
Manufacturer of
Portable, Stationary, and
Agricultural
STEAM ENGINES.

HAIR & SONS
SPRAY FEED WATER PURIFIER
FOR STEAM BOILERS
U.S. & FOREIGN PATENTS

56 POPULAR SONGS.
WORDS AND MUSIC 10 CENTS.
Containing Selections from "OLIVETTE," "HILLER TAYLOR," "MASCOT," "PINK PINK," ETC. ALSO SENTIMENTAL, COMIC, OLD FASHIONED, IRISH, SCOTTISH AND ENGLISH SONGS. This is without doubt the best collection of songs ever offered for five times the money. Send 10 Cents in Silver or Postage Stamps, and we will forward the whole lot for \$10.00 each. As to our reliability we refer to any Commercial Agency, newspapers, Publishers, or Express Companies in New York City. If this is not sufficient, write us for references which we will cheerfully furnish. Send all Money by REGISTERED LETTER or POST OFFICE ORDER at our risk. When one or more are ordered by Express, at \$3.75 we put in a Box of Cartridges with each Revolver.

WEBSTER'S UNABRIDGED.
In Sheep, Russia and Turkey Bindings.

WEBSTER'S UNABRIDGED NEW EDITION WITH DICTIONARY SUPPLEMENT

New Edition of WEBSTER has 118,000 Words, 3000 Engravings, 4600 New Words & Meanings, and Biographical Dictionary of over 9700 Names. Get the Standard.

THE BEST GIFT
Standard in the Gov't Printing Office, -32,000 copies in Public Schools, -sale 20 times as large as the sale of any other. sold in a Family, in helping its members to become intelligent. Best aid for TEACHERS and SCHOLARS, in SCHOOLS. Most acceptable to Pastor, Parent, Teacher, Child, Friend; for Holidays, Birthday, Wedding, or any other occasion.
Published by G. & C. MERRIAM, Springfield, Mass.

THE MEDART PATENT WROUGHT RIM PULLEY.
THE LIGHTEST STRONGEST NO SHRINKAGE STRONG PERFECT BALANCE.
THE CHEAPEST PULLEY IN THE MARKET
ANY SIZE ON FACE, STRAIGHT OR CONCAVE, WITH OR WITHOUT SPUR, 20" WIDE, DOUBLE DOUBLE OR TRIPLE ARMED, LARGE PULLEYS SPECIALTY.
THE HARTFORD ENGINEERING CO. HARTFORD CONN.

TOY A good Toy can be made with mechanical movement. Patent 171,330. Address J. N. MCCORMICK, New Albany, Ind.

\$88 A week to Agents. \$16 OUTFIT FREE. RIDEOUT & CO., 10 Barclay St., New York.

CUTLER'S POCKET INHALER

Carbolic Acid of Iodine INHALANT.
A certain cure for Catarrh, Bronchitis, Asthma, and all diseases of the Throat and Lungs - even Consumption - if taken in season. It will break up a Cold at once. It is the King of Cough Medicines. A few inhalations will correct the most Offensive Breath. It may be carried as handily as a pen-knife, and is guaranteed to accomplish all that is claimed for it.

Patented through the agency of the SCIENTIFIC AMERICAN in 1881, this Inhaler has since had a larger and more extensive sale than any Medical Instrument ever invented. It is approved by physicians of every school, and endorsed by the leading medical journals of the world. Over 300,000 in use.

Sold by Druggists for \$1.00. By mail, \$1.25. W. H. SMITH & CO., Props., 100 Michigan St., Buffalo, N. Y.

NEW YORK STENCIL WORKS
STEEL LETTERS
STAMP
STEEL DIES, ETC.
87 NASSAU ST. N.Y.

PARTNER WANTED-To improve Water privilege of 300 horse power, on the Republican River, in Northern Kansas; will also be for sale or trade. Inquire of THEODORE HURTZ, Sandia, Kans.

EXCELSIOR Metallic Steel Tapes.
WARRANTED.
Exchanged if not satisfactory.
KEUFFEL & ESSER, New York.

**A VALUABLE PRESENT!!**

We recently purchased at Sheriff's Sale, the entire stock of a dealer in imported lace, at less than one-fourth the cost of importation, which we have made up into handkerchiefs, collars, cuffs, etc., and have in stock 6,000 cabinets as shown in above cut. Each cabinet contains **ONE LACE HANDKERCHIEF**, Four Yards Running, lace finish, One "Coco" Hairpin Cable set with fifty assorted hairpins, best quality, One Bottle of the Celebrated "Coco" Hairbrush, One Glove-Buttoner, One Key-ring, One Case containing four full papers of long-eyed needles of the best quality, and twenty darning bobbins, motto needles, &c., of different kinds. **ALL FOR SIXTY CENTS**, and six cents extra to help pay postage and packing. We have a handsome lace collar to send in place of the handkerchief if any one should prefer it. Our object in sacrificing these goods to the public for the purpose of introducing the **GRAND DUCHESS CALIGNE**, The finest perfume in the world. We are satisfied that every purchaser of this perfume will be our permanent customer. **REMEMBER** we have only 5,000 of these cabinets, and reserve the right to refund the money after they are sold. "First come, first served." Our illustrated catalogue of Laces, Notions, Fancy Goods and Jewellery, sent free upon application. Send postage stamps or check. Address, **E. C. RIDEOUT & CO., 10 Barclay Street, New York.**



TOOLS for Machinists, Carpenters, Amateurs, Jewellers, Model Makers, Blacksmiths, etc. Send for Catalogue, and state what kind of Tools you require. **TALLMAN & McFADDEN, 607 Market St., Philadelphia, Pa.**

RUPTURE

cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

DO YOUR OWN PRINTING

Presses and outfits from \$3 to \$500. Over 2,000 styles of type. Catalogue and reduced price list free.

H. HOOVER, Phila., Pa.

\$66 a week in your own town. Terms and \$5 outfit free. Address **H. HALLETT & Co., Portland, Me.**

RIDDELL'S NEW ELEMENTS OF HAND RAILING. Revised edition, containing 41 plates, 13 of which are entirely new, with accompanying letterpress descriptions. Price \$7. **E. CLAXTON & CO., 300 Market St., Phila., Pa.**

JAS. MURDOCH JR., CINCINNATI. BRASS, COPPER, SILVER. Send for Catalogue. **500 W. 10th St., Phila., Pa.**

SPEAKING TELEPHONES.

THE AMERICAN BELL TELEPHONE COMPANY, W. H. FORBES, W. R. DRIVER, THEO. N. VAIL, President, Treasurer, Gen. Manager.

Alexander Graham Bell's patent of March 7, 1876, owned by this company, covers every form of apparatus, including Microphones or Carbon Telephones, in which the voice of the speaker causes electric undulations corresponding to the words spoken, and which undulations produce similar articulate sounds at the receiver. The Commissioner of Patents and the U. S. Circuit Court have decided this to be the true meaning of his claim; the validity of the patent has been sustained in the Circuit on final hearing in a contested case, and many injunctions and final decrees have been obtained on them. This company also owns and controls all the other telephonic inventions of Bell, Edison, Berliner, Gray, Blake, Phelps, Watson, and others.

(Descriptive catalogues forwarded on application.) Telephones for Private Line, Club, and Social systems can be procured directly or through the authorized agents of the company.

All telephones obtained except from this company, or its authorized licensees, are infringements, and the makers, sellers, and users will be proceeded against. Information furnished upon application. Address all communications to the **AMERICAN BELL TELEPHONE COMPANY, 95 Milk Street, Boston, Mass.**



BARREL, KEG, HOGSHEAD, AND Fan and Stave Joiner.

Slave Machinery.

Over 50 varieties manufactured by

E. & B. HOLMES,

Buffalo, N. Y.

Head Rounding.

ASTHMA

Quickly and Permanently

CURED

Dr. Stinson's Asthma Remedy is unequalled as a positive Alternative and Cure for Asthma and Dyspepsia.

It does not merely afford temporary relief, but is a permanent cure. Mrs. B. F. Lee, of Belmont, O., says of it: "I am surprised at the speedy effects of your remedy. It is the first medicine in six years that has benefited my cough and made expiration easy. I am now sleeping all night without coughing." If your druggist does not keep it, send for treatise and testimonials to **H. P. K. PECK & CO., 833 Broadway, New York.**

FOR FUEL-SAVING CUT-OFF ENGINES.

For Dry Steam Portable Engines.

FOR CIRCULAR SAW MILLS.

For "Mocke County Grain", Conn Mills.

Address, **Taylor Manf'g Co.**

WESTMINSTER, MD.

WATCHMAKERS.

Before buying watches, see the "Whitcomb," made by **AMERICAN WATCH TOOL CO., Waltham, Mass.**

"BLAKE'S CHALLENGE" ROCK BREAKER.

Patented November 18, 1879.

For Macadam Road making, Ballasting of Railroads, Crushing Ores, use of Iron Furnaces, etc. Rapidly superseding our older styles of Blake Crusher on account of its superior strength, efficiency, and simplicity. Adopted by important Railway and Mining Corporations, Cities, and Towns. First Class Medals of Superiority awarded by American Institute, 1879 and 1880.

BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

CRATEFUL-COMFORTING. EPPS'S COCOA BREAKFAST.

"By a thorough knowledge of the natural laws which govern the operations of digestion and nutrition, and by a careful application of the fine properties of well-selected Cocoa, Mr. Epps has provided our breakfast tables with a delicately flavored beverage which may save us many heavy doctors' bills. It is by the judicious use of such articles of diet that a constitution may be gradually built up until strong enough to resist every tendency to disease. Hundreds of subtle maladies are floating around us ready to attack wherever there is a weak point. We may escape many a fatal shaft by keeping ourselves well fortified with pure blood and a properly nourished frame."—*Chil. Sanitary Gazette.*

Made simply with boiling water or milk. Sold in tins only (1/2 lb., and 1 lb.), labeled **JAMES EPPS & CO., HOMOEOPATHIC CHEMISTS, London, England. New York and Chicago Depots, SMITH & VANDERBEEK.**



FOR

HEAVY PUNCHES, SHEARS,

Boiler Shop Rolls,

Radial Drills, Etc.

SEND TO

HILLES & JONES

WILMINGTON, DEL.

**BARNES'**

Patent Foot and Steam Power Machinery. Complete outfits for Actual Workshop Business. Lathes for Wood or Metal. Circular Saws, Tenoners, etc., etc. Machines on trial if desired. Descriptive Catalogue and Price List Free.

W. F. & JOHN BARNES, Rockford, Ill. No. 129 Main St.

THE SCOVILL "Pop" Safety Valve,

SIMPLE, RELIABLE, DURABLE. For Locomotive, Stationary, Marine, and Portable Boilers.

Send for descriptive circulars and price lists to **THE HANCOCK INSPIRATOR CO., BOSTON, MASS.**

**THE NONE-SUCH TURBINE.**

The Latest and Best.

THE TWIN ROTARY PUMP.

The Best Fire Pump Made.

CIRCULAR SAW MILLS.

With Ball's Patent Lever Set.

MILL GEARING & SHAFTING.

Twenty years' experience. We guarantee satisfaction. Tell us your wants, and we will give the information. **CLARK & HEALD MACHINE CO., Turners Falls, Mass.**

TEXAS**ARKANSAS AND LOUISIANA.****CHEAP HOMES FOR ALL!**

50,000 Laborers can get Immediate Employment, at Good Wages, on Farms and Railroads in Texas alone.

THE SOUTH-WESTERN IMMIGRATION CO.

will mail on application, free of cost, postage prepaid, books with maps, giving reliable information of Texas, Arkansas, or Western Louisiana. Address **B. G. DUVAL, Sec'y, Austin, Tex.**



DEAN BROS' STEAM PUMP WORKS, INDIANAPOLIS, IND.

Boiler Feeders, Fire Pumps,

Pumping Machinery for all purposes.

Send for Catalogue.

\$5 to \$20 per day at home. Samples worth \$5 free. Address STINSON & Co., Portland, Me.

A WANTED in every County

in the United States and Canada

to take the exclusive control of territory

for the sale of the celebrated **FOLLETT'S LAMP TIP** pronounced the greatest invention of this century. A necessity to every Oil Lamp. Saves trimming the wick. Positively prevents smoking or flickering. All smell from oil obviated, and doubles the light, fits any Lamp. Sells at sight. Agents can realize handsome and steady incomes. A sample Tip supplied to Agents by mail for 15 cents, currency or stamps. Address immediately for circulars, terms and territory, **FOLLETT LAMP TIP CO., 3 Park Row, New York City.**

THE WALLACE DIAMOND CARBONS.

Telegraph, Telephone, and Electric Light Supplies.

THE ELECTRICAL SUPPLY CO., 109 Liberty St., New York.

\$72 A WEEK. \$12 a day at home easily made. Costly outfit free. Address TRUB & Co., Augusta, Me.

DRUNKENNESS OPIUM HABIT CURED

By **LESLIE E. KEELEY, M.D., Surgeon, C. & A. R. Dwight, Ill. 17 Books Free.**

SWEEPSTAKES, WITH THE ELLIS

Patent Journal Box. The best Planer and Matcher ever made. Planing 30 in. wide, 6 in. thick, weight 2,300 lbs. \$300; planing 24 in. wide, 6 in. thick, weight 2,000 lbs. \$250. Beading, Arbor, and Head, extra \$30. Sash, Door, and Blind Machinery a specialty. Send for descriptive catalogue to Rowley & Hernance, Williamsport, Pa.

SUPERIOR SUBSTITUTE FOR WOOD ENGRAVING. MOSS ENGRAVING CO.

(MOSS'S NEW PROCESS.)

535 PEARL STREET, COR. ELM, NEW YORK.

Engravings of Portraits, Buildings, Landscapes, Machinery, Maps, Etc., for Newspapers, Books, Catalogues, Etc. Much cheaper than Wood Cuts.

THE LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD.

HOPE FOR THE DEAF

Dr. Peck's Artificial Ear Drums

PERFECTLY RESTORE THE HEARING

and perform the work of the Natural Drum. Always in position, but invisible to others. All Conversation and even whispers heard distinctly. We refer to those using them. Send for descriptive circular with testimonials. Address, **H. P. K. PECK & CO., 833 Broadway, New York.**

Applied to all machinery driven by fly-wheels and liable to be broken by power stored in wheels, such as calender rolls, upsetting machines, presses, and wire drawing machines. We warrant to save gearings and all machinery from breaking by using our clutches. Starts gradual stops quick. Any amount of power controlled. Friction Holding Engines and Drums also. Safety Elevators. Can be run faster and stop quicker than any other friction.

D. Frisbie & Co., 123 North 4th St., Philadelphia, Pa.

THE PORTER-ALLEN High Speed Steam Engine.

ADDRESS **SOUTHWARK FOUNDRY & MACHINE CO., 430 Washington Ave., Philadelphia, Pa.**

Pamphlet Printing. Best work—lowest prices. 75c a 12mo page for 1,000 copies. Circulars for Inventors printed very cheap. Local Printing House, Silver Creek, N. Y.

FORSTER'S CRUSHER AND CRUSHER AND PULVERIZER.

The simplest machine ever devised for the purpose.

We warrant 30 per cent. advantage in Crushing with one-third power, and in combined Crushing and Pulverizing do the work of stamp and Burrs at one-third first cost. Can be operated with any kind of power.

Address **TOTTEN & CO., Pittsburg, Pa.**

MACHINISTS' TOOLS.

NEW AND IMPROVED PATTERNS. Send for new illustrated catalogue.

Lathes, Planers, Drills, &c.

NEW HAVEN MANUFACTURING CO., New Haven, Conn.

PATENT QUICK SHAPERS

Adjustable Stroke

Can be Changed while in Motion.

E. GOULD & EBERHARDT, NEWARK, N. J.

MACHINERY

of every description, 121 Chambers and 100 Reade Sts., New York. THE GEORGE PLACE MACHINERY AGENCY.

HAND BLOWERS and PORTABLE FORGES made by **EMPIRE PORTABLE FORGE CO., Cohoes, N. Y.,** are the strongest and best. Send for circulars.

PORTABLE POWER DRILLS. TAPPING, REAMING & BORING MACHINES.

EMERY WHEEL GRINDERS & BORING MACHINES.

WOOD BORING MACHINES. STOW FLEXIBLE SHAFT CO. LIME.

1509 PENNA. AVE. PHILA. PA.

"RELIABLE"

Engines a complete success. Prices still 30 per cent. below those of other makers. Unequaled for efficiency, simplicity, and durability. Prices from \$20 for 10 H. P. to \$300 for 30 H. P. All complete, with Governor, Pump and Heater.

Address, for circular, **HEALD & MORRIS, formerly HEALD, Sisco & Co., Baldwinville, N. Y.**

ROOT'S NEW IRON BLOWER.**POSITIVE BLAST.**

IRON REVOLVERS, PERFECTLY BALANCED,

Has Fewer Parts than any other Blower.

P. H. & F. M. ROOTS, Manufacturers, CONNERVILLE, IND.

S. S. TOWNSEND, Gen. Agt., 3 Cortland St., 3 Day St., COOKE & CO., Selling Agts., 6 Cortland Street, JAS. BEGG & CO., Selling Agts., 3 Day Street, NEW YORK.

SEND FOR PRICED CATALOGUE.

THE WHITE IS KING.

It has the finest finished wood-work and is the BEST MADE. Its machine is self-threading; its bobbins can be changed without removing the work or attachments, and it is simple in construction and light in weight, so that a child can use it. **WARRANTED FOR FIVE YEARS.** Agents can make more money handling the "White" than any other. Address, for particulars, **WHITE SEWING MACHINE CO., CLEVELAND, OHIO.**

ERICSSON'S New Caloric Pumping Engine

FOR DWELLINGS AND COUNTRY SEATS.

Simplest, cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.

DELAMATER IRON WORKS

C. H. DELAMATER & CO., Proprietors, No. 10 Cortland Street, New York, N. Y.

WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Hall & Co., Worcester, Mass. Send for Catalogue.

PROSPECTING MINERAL LANDS A SPECIALTY. CYLINDRICAL SECTIONS OR CORES OBTAINED THE WHOLE DISTANCE BORED. **ARTESIAN WELLS** BORED ROUND AND STRAIGHT ADMITTING A LARGER PUMP AND CASING IN PROPORTION TO SIZE OF HOLE THAN BY ANY OTHER PROCESS. ESTIMATES GIVEN AND CONTRACTS MADE BY THE **PENNSYLVANIA DIAMOND DRILL CO., BOX 423 POTTSVILLE PA.** MANUFACTURERS OF DIAMOND DRILLS. FOR ALL KINDS OF ROCK BORING.

Geo. W. Read & Co.,

Manufacturers of and Dealers in

MAHOGANY,

And all Foreign and Domestic

Cabinet Woods.

SOLE MANUFACTURERS

CUT AND PRESS DRIED

THIN LUMBER,

FOR

CIGAR BOXES,

Panel Stock, Etc., Etc.

Mills and Warehouses

186 to 200 Lewis St., New York.

SEND TO LONDON, BERRY & ORTON, PHILA. PA. FOR

THE BEST BAND SAW BLADE

BATTERIES, WIRES, MAGNETS, INSTRUMENTS, TELEGRAPH AND ELECTRICAL SUPPLIES. CATALOGUE FREE. C. E. JONES & BRO., CINCINNATI, O.

"RELIABLE"

Engines a complete success. Prices still 30 per cent. below those of other makers. Unequaled for efficiency, simplicity, and durability. Prices from \$20 for 10 H. P. to \$300 for 30 H. P. All complete, with Governor, Pump and Heater.

Address, for circular, **HEALD & MORRIS, formerly HEALD, Sisco & Co., Baldwinville, N. Y.**

A BEAUTIFUL HOLIDAY PRESENT. Over 3,000,000 Sold—Phenomenal Success!! DR. SCOTT'S ELECTRIC HAIR BRUSH.

An Honest Remedy

PRESCRIBED AND USED BY OUR BEST PHYSICIANS.

Which has won its way to Royal favor in England, been cordially indorsed by the Prince and Princess of Wales, and written upon by the Rt. Hon. W. E. Gladstone, is now brought to the notice of the American public. It cures by natural means, will always do good, never harm, and is a remedy lasting for many years. It should be used daily in place of the ordinary Hair Brush. The Brush Handle is made of a new odorless composition resembling ebony; a combination of substances PRODUCING A PERMANENT ELECTRO-MAGNETIC CURRENT WHICH ACTS IMMEDIATELY UPON THE HAIR GLANDS AND FOLLICLES. This power can always be tested by a silver compass which accompanies each Brush.

Not a Wire Brush But Pure Bristles.

IT IS WARRANTED TO CURE

Nervous Headache in 5 Minutes! Bilious Headache in 5 Minutes! Neuralgia in 5 Minutes! Dandruff and Diseases of the Scalp! Prevent Falling Hair and Baldness! Promptly Arrest Premature Graying! Make the Hair grow Long and Glossy! The continued use of Pills, etc., works irreparable injury. Ask any Physician.

Will positively produce a rapid growth of hair on bald heads, where the glands and follicles are not totally destroyed.

Proprietors: The Pall Mall Electric Association of London.
New York Branch: 842 Broadway.

"I cheerfully testify to the merits of Dr. Scott's Electric Hair Brush. It cures my headaches within a few minutes. It is an excellent Hair Brush, well worth the price, aside from its curative powers."
Jas. R. Chapman, Mayor.



ALL DEALERS WILL REFUND THE PRICE
IF NOT AS REPRESENTED.

Many thousand similar Testimonials can be seen at our office.

Ask for DR. SCOTT'S, TAKE NO OTHER. See that name is on the box. Avoid WIRE Brushes which injure the Scalp and promote Baldness.

Mention this Paper.

As soon as you receive the Brush, if not well satisfied with your bargain, write us, and we will return the money. What can be fairer? The Proprietors of this Publication know Dr. Scott to be respectable and trustworthy, a Brush has been placed in the hands of Mayor Cooper and Postmaster James of New York, as a guarantee of good faith. Remittances should be made payable to GEO. A. SCOTT, 842 Broadway, New York. They can be made in Checks, Drafts, Post Office Orders, Currency, or Stamps. LIBERAL DISCOUNT TO THE TRADE. Agents Wanted in every Town. Send for a Circular of our Dr. Scott's Electric Hair Brush.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - \$1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

THE Cameron Steam Pump.

OVER 30,000 IN USE.

Specially adapted for use in Gold, Silver, Coal, and Iron Mills; also General Manufacturing and Fire Pumps. Pumps furnished with movable Linings in Iron, Composition, or Phosphor-Bronze.

THE A. S. CAMERON STEAM PUMP WORKS,
FOOT EAST 23d ST., NEW YORK.



KORTING UNIVERSAL Double Tube Injector,

FOR BOILER FEEDING

Send for Circular.

OFFICES AND WAREHOUSES:
Phila.—12th & Thompson Sts. New York—100 Liberty St.
Boston—7 Oliver St. Chicago—84 Market St.

HARTFORD

STEAM BOILER

Inspection & Insurance

COMPANY.

W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.

J. B. PIERCE, Sec'y.

ROCK DRILLS & AIR COMPRESSORS.

INCEROLL ROCK DRILL CO.,
1 PARK PLACE NEW YORK.

Stevens' Roller Mills,

FOR GRADUAL REDUCTION OF GRAIN.

Manufactured exclusively by
JOHN T. NOYE & SONS, BUFFALO, N. Y.

The New Measuring Instrument.

By simply passing it over a surface the exact distance in feet, inches and fractions is recorded on the dial. Supersedes Rule and Tape. Measures Routes on Maps. Large ones in Brass cases, 100 ft. miniature wheel measures, nickel, 10 ft. for watch pendants.

JACKSON & TYLER,
Baltimore, Md.

Fine Tools of all kinds, Lathes, etc.

NEW YORK BELTING AND PACKING

OUR "TEST" HOSE

Is superior to anything ever before made. Every description of Rubber Hose always in stock.
37 & 38 PARK ROW, NEW YORK.

SEND FOR PAMPHLET OF COMPILATION OF Tests of Turbine Water Wheels.
BARBER, KEISER & CO., Allentown, Pa.

FOWLER'S SHORTHAND EXECUTION ENABLES writers of any system to double their speed of writing without sacrifice of legibility. For sale by all booksellers.

The Phosphor-Bronze Smelting Co. Limited.

New Offices and Salesroom,
512 Arch Street,
PHILADELPHIA PA.

PHOSPHOR-BRONZE

Wire, Rods, Sheets, Bolts, etc.

Pamphlets and Particulars on Application.

OWNERS OF THE U. S. PHOSPHOR-BRONZE PATENTS.

Sole Manufacturers of Phosphor-Bronze in the U. S.

JENKINS PATENT PACKING THE STANDARD MAKES A PERFECT JOINT JENKINS BROS. 71 JOHN ST. N.Y.

SHEET METAL DROP PRESSES,
STILES & PARKER PRESS CO., Middletown, Ct.

THE J. L. MOTT IRON WORKS,

88 and 90 Beckman St., New York.
Demarest's Patent Water Closets used almost exclusively in all fine work. Demarest's Water Closets, Latrines and Hoppers for public buildings and factories. Mott's Celebrated Porcelain Lined Baths unequalled for beauty and cleanliness. Sanitary Goods of all kinds.

SHAFTS PULLEYS HANGERS

At Low Prices. Large Assorted Stock.
A. & F. BROWN, 37-61 Lewis St., New York.

PRINTING INKS.

THE "Scientific American" is printed with CHAS. T. JENKINSON & CO.'S INK. Teeth and Lombard Sts. Philadelphia, and 59 Gold St., New York.

FOR SALE OR RENT.

Old established Foundry, Machine Shop, and Planing Mill. Excellent locality. Plenty of work. Address
L. M. NEWBURY, Sparta, Wis.

MAGIC LANTERNS

And STEREOPTICONS, all prices. Views illustrating every subject for PUBLIC EXHIBITIONS, etc. A profitable business for a man with small capital. Also Magic Lanterns for home amusement. 12-page cat. free. McALLISTER, Mfg. Optician, 49 Nassau St., N.Y.

Double Screw, Parallel, Leg Vises.

Made and WARRANTED stronger than any other Vise by FISHER & NORRIS only, Trenton, N. J.

H.W. JOHNS' ASBESTOS

LIQUID PAINTS,

ASBESTOS ROOFING.
ASBESTOS BOILER COVERINGS.
ASBESTOS LINING FELT.
ASBESTOS STEAM PACKING.
ASBESTOS WICK PACKING.
ASBESTOS PLAT PACKING.
ASBESTOS MILLBOARD.
ASBESTOS GASKETS.
ASBESTOS SHEATHINGS.
COATINGS, CEMENTS, Etc.

Descriptive price lists and samples sent free.

H. W. JOHNS M'FG CO.,
87 Maiden Lane, New York.



WATCHMAN'S Improved Time Detector, with Safety Lock Attachment, Patented 1875-76-77. Beware of imitations. This instrument is supplied with 12 keys for 12 stations. Invaluable for all concerns employing night watchmen. Send for circulars to E. IMHAUSEN.

P.O. Box 505, 412 Broadway, New York.

IRIDIUM:

THE HARDEST METAL KNOWN.

Not attacked by acids or alkalis; not oxidized in the air; almost infusible. Manufactured under a Holland's patent (patented May 20, 1881) by

THE AMERICAN IRIIDIUM CO.,
S. E. Corner Pearl and Plum Sts., Cincinnati, Ohio.



FRIEDMANN'S PATENT INJECTOR. THE BEST

Boiler Feeder

IN THE WORLD.

Simple, Reliable, and Effective.

40,000 IN ACTUAL USE.

NATHAN & DREYFUS,

Sole Manufacturers, NEW YORK.

Send for Descriptive Catalogue.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 111 Liberty Street, New York. Wheels and Ropes for conveying power long distances. Send for circular.

Jarvis Furnace Co.

Patent Setting for Steam Boilers Burns Screenings and Slack Coal without Blast. No. 1 Oliver St., Boston; No. 92 Liberty St., New York; No. 309 Market St., St. Louis; No. 18 Second St., Baltimore.

FOR BEST COLD PENS.

Send for Price List to
JOHN HOLLAND, Mfr., 12 West 4th St., Cincinnati.

WM. A. HARRIS. PROVIDENCE, R. I. (PARK STREET). Six minutes walk West from station. Original and Only builder of the HARRIS-CORLISS ENGINE With Harris' Patented Improvements, from 10 to 1,000 H. P.



Columbia Bicycles.

Made of the best material, by the most skilled workmen, expressly for road use.

"Columbias" are the favorite with riders, and their superiority in beauty, structure, and finish is acknowledged by all.

Send 3c. stamp for 34-page catalogue, with price lists and full information.

THE POPE MFG. CO.,

597 Washington St.,

BOSTON, MASS.

ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 31 John Street, New York.