

TO INVENTORS.

An experience of more than thirty years, and the preparation of not less than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequalled facilities for procuring patents everywhere. In addition to our facilities for preparing drawings and specifications quickly, the applicant can rest assured that his case will be filed in the Patent Office without delay. Every application, in which the fees have been paid, is sent complete—including the model—to the Patent Office the same day the papers are signed at our office, or received by mail, so there is no delay in filing the case, a complaint we often hear from other sources. Another advantage to the inventor in securing his patent through the Scientific American Patent Agency, it insures a special notice of the invention in the SCIENTIFIC AMERICAN, which publication often opens negotiations for the sale of the patent or manufacture of the article. A synopsis of the patent laws in foreign countries may be found on another page, and persons contemplating the securing of patents abroad are invited to write to this office for prices, which have been reduced in accordance with the times, and our perfected facilities for conducting the business. Address MUNN & CO office SCIENTIFIC AMERICAN.

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.

Valves and Hydrants, warranted to give perfect satisfaction Chapman Valve Manuf. Co., Boston, Mass.

Assays of Ores, Analyses of Minerals, Waters, Commercial Articles, etc. Technical formulae and processes. Fuller & Stillman, 40 & 42 Broadway, N. Y.

Save your Fuel.—From one fifth to one-third of the usual amount of coal bills can be saved by the use of fire-proof non-conducting Asbestos Coverings on hot air and steam pipes, boilers, heater pipes in dwellings, etc. The genuine can be procured only of The H. W. Johns Manufacturing Company, 87 Maiden Lane, New York, patentees and manufacturers of Asbestos Paints, Roofing, etc. 2d hand 2 H. P. Engine and Boiler, \$140. Geo. F. Shedd, Waltham, Mass.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Moore's Regulating Valve, working between high and low pressure. L. Moore, No. 17 11th St., Louisville, Ky.

Dead Pulleys that stop the running of loose pulleys and their belts, controlled from any point. Send for catalogue. Taper Sleeve Pulley Works, Erie, Pa.

Sci. Am.; a full set for sale. A. F. Park, Troy, N. Y. Steel Stamping Figures, 1-16 to 1/2 in., \$1; Alphabets, \$3; Dies to order. S. M. York, Cleveland, O.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y. Partner Wanted.—See advertisement on inside page.

The only Engine in the market attached to boiler having cold bearings. F. F. & A. B. Landis, Lancaster, Pa. Bl'ks, Mech's, Ma'fs., address Box 73, Williamantic, Ct.

Johnson's Universal Lathe Chucks; the best are the cheapest. Lambertville Iron Works, Lambertville, N. J.

No more danger from kerosene. Sample of patent Safety Valve that fits any lamp, and effectually prevents an explosion, sent by mail for 25 cents. Agents wanted. W. B. Post, 15 Dey St., New York.

Best results obtained from Success Turbine Water Wheel. References given. S. M. Smith, York, Pa.

Right to manufacture a salable Patented Article desired. W. F. Adams, 602 North 4th St., Camden, N. J.

For Sale.—Brown & Sharp Universal Milling Machine; Bement Profiling Machine; first-class 2d hand Machine Tools. E. P. Bullard, 14 Dey St., N. Y.

Texas Machinery Depot for any kind of machinery or special hardware. P. H. Gerhard, Austin, Texas.

Send for circulars of Indestructible Boot and Shoe Soles to H. C. Goodrich, 40 Hoyne Ave., Chicago, Ill.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N. J.

1,000 2d hand machines for sale. Send stamp for descriptive price list. Forsaith & Co., Manchester, N. H. Gallard & Co.'s Improved Hydraulic Elevators. Office 206 Broadway, N. Y., (Evening Post Building, room 22.)

Iron, Brass, and Steel Wire. Needle pointed English Steel Wire, for all purposes, W. Crabb, Newark, N. J.

For Fire or Power Pumps, address the Gould's Manf. Co., Seneca Falls, N. Y., or 15 Park Pl., N. Y. city.

Brush Electric Light.—20 lights from one machine. Latest & best light. Telegraph Supply Co., Cleveland, O.

The Hancock Inspirator received a gold medal at Paris, as being the best boiler feeder ever made, and the Old Colony Railroad (who have twenty-three machines in constant use) have just given it their unqualified indorsement, as the cheapest and most effective feeder ever used on their locomotives. Those interested are referred to their letter of recommendation, which may be found in our advertising columns.

J. C. Hoadley, Consulting Engineer and Mechanical and Scientific Expert, Lawrence, Mass.

The Lathes, Planers, Drills, and other Tools, new and second-hand, of the Wood & Light Machine Company, Worcester, are to be sold out very low by the George Place Machinery Agency, 121 Chambers St., New York.

For the best advertising at lowest prices in Scientific, Mechanical, and other Newspapers, write to E. N. Freshman & Bros., Advertising Agents, 186 W. 4th St., Cin. O.

H. Prentiss & Co., 14 Dey St., N. Y., Manufs, Taps, Dies, Screw Plates, Reamers, etc. Send for list.

Hydraulic Elevators for private houses, hotels, and public buildings. Burdon Iron Works, Brooklyn, N. Y.

Bolt Forging Machine & Power Hammers a specialty. Send for circulars. Forsaith & Co., Manchester, N. H.

Solid Emery Vulcanite Wheels.—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Eagle Anvils, 9 cents per pound. Fully warranted.

Bevins & Co.'s Hydraulic Elevator. Great power, simplicity, safety, economy, durability. 94 Liberty St. N. Y.

Manufacturers of Improved Goods who desire to build up a lucrative foreign trade, will do well to insert a well displayed advertisement in the SCIENTIFIC AMERICAN Export Edition. This paper has a very large foreign circulation.

Two fine Astronomical Telescopes, 3 in. and 7 in., by first-class English maker, cheap. I. Ramsden, Phila.

Gold Chronometer Watch, by first-class English maker; cost \$200, price \$135; latest patented improvements. I. Ramsden, 21 Christian St., Philadelphia, Pa.

For Town and Village use, comb'd Hand Fire Engine & Hose Carriage, \$350. Forsaith & Co., Manchester, N. H.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Inventors' Models. John Ruthven, Cincinnati, O.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Warranted best and cheapest Planers, Jointers, Universal Woodworkers, Band and Scroll Saws, etc., manufactured by Bentel, Margendant & Co., Hamilton, Ohio.

Mill Stone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 64 Nassau St., N. Y.

The best Friction Clutch Pulley and Friction Hoisting Machinery in the world. D. Frisbie & Co., N. Haven, Ct.

Latest and best Books on Steam Engineering. Send stamp for catalogue. F. Keppy, Bridgeport, Conn.

Improved Meat Cutter. Capacity 600 lbs. an hour. Circular and price list, J. W. McFarland & Co., Alliance, O.

Cutters shaped entirely by machinery for cutting teeth of gear wheels. Pratt & Whitney Co., Hartford, Conn.

Hydraulic Cylinders, Wheels, and Pinions, Machinery Castings; all kinds; strong and durable; and easily worked. Tensile strength not less than 65,000 lbs. to square in. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

The new "Otto" Silent Gas Engine is simple in construction, easy of management, and the cheapest motor known for intermittent work. Schleicher, Schumm & Co., Philadelphia, Pa.

Vertical & Yacht Engines. N. W. Twiss, New Haven, Ct.

Pulverizing Mills for all hard substances and grinding purposes. Walker Bros. & Co., 23d & Wood St., Phila., Pa.

Correct time for Holidays, Whist and Dinner Parties, is the Vanity Fair Cigarettes, with your monogram.

The SCIENTIFIC AMERICAN Export Edition is published monthly, about the 15th of each month. Every number comprises most of the plates of the four preceding weekly numbers of the SCIENTIFIC AMERICAN, with other appropriate contents, business announcements, etc. It forms a large and splendid periodical of nearly one hundred quarto pages, each number illustrated with about one hundred engravings. It is a complete record of American progress in the arts.

NEW BOOKS AND PUBLICATIONS.

UPLAND GAME BIRDS AND WATERFOWL OF THE UNITED STATES. Part X. By A. Pope, Jr. New York: Charles Scribner's Sons. \$2.50.

The tenth and final number of Mr. Pope's illustrations of the principal Upland Game Birds and Waterfowl of the United States is devoted to the canvas back duck and the brant. The entire series comprises life size drawings in color of twenty species, male and female, or forty specimens in all, by an artist sportsman who has given to them years of patient and painstaking study. The printing reproduces the artist's water color effects admirably.

HAND BOOK OF ALABAMA. By Saffold Berncy. Mobile: Register Print. \$1.50.

A useful volume for those seeking information with regard to the government institutions and resources of Alabama. The State Geologist, Dr. E. A. Smith, contributes a valuable section on the geology of the State and its mineral resources (with a revision of Professor Tuomey's Geological Map of the State), and Mr. Haralson a review of the cotton manufactures of the State and its advantages for such industries. Parts X., XI., XII., and XIII., are devoted to the agricultural products, soils, capabilities, advantages, forest and forage products of Alabama. A report on the climate of Alabama and its adaptation to health and comfort is contributed by Professor William H. Anderson, of the State Medical College, Mobile.

HYGIENE OF THE BRAIN AND NERVES. By M. L. Holbrook, M.D. New York: M. L. Holbrook & Co.

A book of exceptional value; sensible, timely, practical; indeed one of the very few books that everybody should read. It discusses with singular directness and intelligence one of the most dangerous features of American life, high pressure activity, and unwise eating and drinking, combined with a fatal anxiety to accomplish in one year more than there is time for in two; an anxiety, we may add, which makes life at once brief, hurried, fretful, and unenjoyable, with the result in most cases of early nervous breakdown and practical life failure. If read and heeded, as it ought to be, the volume in hand will do much to correct this characteristic mistake in American life. The strong positions taken by Dr. Holbrook with regard to proper habits of eating, sleeping, working, and playing, are fortified by citations from the writings of a score or more of prominent thinkers and scientists, and twenty-eight letters from prominent men and women, describing their physical and mental habits, and giving practical deductions from their personal experience.

ANNUAL REPORT OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION FOR 1877. Washington: Government Printing Office.

In addition to the customary review of scientific work carried on under the auspices of or assisted by the Smithsonian Institution, this volume is enriched by an able review of color blindness in its relation to accidents by rail and sea, by Professor Holmgren, of the University of Upsal, Sweden; a large number of valuable communications on American antiquities; a dozen short memoirs on meteorological subjects, and other papers of permanent interest.

THE YOUNG SCIENTIST. Industrial Publication Company. New York: 50 cents a year.

A monthly journal for boys, devoted to simple experiments in chemistry, amateur mechanical work, etc.

CATALOGUE OF THE LIBRARY OF THE UNITED STATES PATENT OFFICE. Washington: Government Printing Office.

This is substantially the first printed catalogue of the Patent Office Library, which now contains some 24,000 volumes, not including duplicate specifications of patents and pamphlets.

THE AMERICAN QUARTERLY MICROSCOPICAL JOURNAL. Vol. I. No. 1. Edited by Romya Hitchcock. New York: Hitchcock & Wall. \$3 a year.

In view of the numerous failures of high grade periodicals in this and other special departments of science, the projectors of this handsome quarterly are to be commended for courage, if for nothing more. The initial number is highly creditable to them and to their department of scientific research. We sincerely hope that it will be well sustained.

MANUAL OF MINERALOGY AND LITHOLOGY. By James D. Dana. New York: John Wiley & Sons.

This, the third edition of Professor Dana's useful manual, is almost a new book throughout. It has been rearranged and rewritten, and the author believes, materially improved. The chapter on rocks has been increased in fullness so as to make it a prominent part of the work.

JOURNAL OF THE BRITISH SOCIETY OF TELEGRAPHIC ENGINEERS. Nos. XXII. and XXIII. London and New York: E. & F. N. Spon. 1878. 15 shillings.

Contains, in addition to brief communications, correspondence, abstracts, etc., a valuable paper on "Insulators for Aerial Telegraph Lines," by John Garvey; and several papers and discussions on sound in relation to the telephone, microphone, etc.

THE MAGAZINE OF ART. Illustrated. New York: Cassell, Petter & Galpin. \$3 a year.

Among the more attractive periodicals that have come to our table the past year the Magazine of Art must take high rank. The eighth number of the first volume was reached in December, and there is every reason to wish it a long life as a representative of fine art.

ART INDUSTRY. New York: Howard Lockwood & Co. \$2 a year.

Of Art Industry but three numbers have been issued, and these have given promise of future usefulness. It is specially devoted to the artistic industries and is finely illustrated. The reading matter is readable and instructive.

BULLETIN OF THE UNITED STATES NATIONAL MUSEUM.

We have received from the Department of the Interior the following issues of the Bulletin of the United States National Museum:

No. 7. Contributions to the Natural History of the Hawaiian and Fanning Islands and Lower California. By Thomas H. Street, M. D.

No. 8. Index to the names which have been applied to the subdivisions of the class Brachipoda. By W. H. Dall.

No. 9. Contributions to North American Ichthyology. No. 1. By David S. Jordan.

No. 10. The same. Part II.

No. 12. The same. Part III.

Also recent issues of the Bulletin of the United States Geological Surveys of the Territories:

Vol. III, No. 4; and Vol. IV, Nos. 1, 2, and 3. Also, miscellaneous publications:

No. 9. Descriptive Catalogue of Photographs of North American Indians. By W. H. Jackson; and No. 10. Bibliography of North American Invertebrate Palaeontology. By C. A. White, M.D., and H. A. Nicholson, M.D.

PHOTOGRAPHS OF THE MOON.—It is fortunate at this time of increasing interest in the moon that arrangements have been made for supplying cheaply and in any quantity Mr. Rutherford's splendid photographs of that satellite. Mr. Oscar G. Mason, of the Photographic Department of Bellevue Hospital, of this city, has undertaken the publication of these valuable aids to the study of the moon, at rates which bring them within the reach of all; and as he has not only made all the prints hitherto furnished, but assisted Mr. Rutherford in making the negatives, there can be no doubt of his doing the work well. Three series of prints are offered, the first showing the different phases of the moon, in dimensions ranging from 17 1/2 to 21 inches; the second series, nine views, eight inch image; the third, nine views, four inch image.

Mr. Mason is also prepared to furnish prints from Mr. Rutherford's negatives of the solar spectrum, recently made with his interference gratings. The prints from these plates give the finest picture of the solar spectrum yet produced.

SOME AMERICAN MAGAZINES.

Scribner's Monthly, which began by rivaling the best popular magazines of the time, has steadily gained in force and excellence. The later volumes not only surpass the earlier, but their steady improvement, especially in the matter of illustration, has compelled a corresponding advance in the quality of American art work, both for books and for periodicals. A host of attractions are announced for the new year.

St. Nicholas has no rival. Its bright and seductive pages furnish more that is calculated to cultivate in the young a taste for pure and instructive reading, and with it a taste for all that is true and clean and kindly in life and conduct, than anything else we know. And it is admirably free from the goody-goody stuff so commonly manufactured for children's reading. It is needless to add that it is absolutely free from the other extreme of juvenile literature—the viciously sensational.

The Popular Science Monthly promises to add to its solid attractions, and they are numerous, the merits of the Popular Science Supplement also, a magazine which has been in many respects the more solidly valuable of the two. In other words, the Monthly is to be enlarged,

so as to make it represent the scientific field more completely, by absorbing the Supplement, but without any increase in its price. This will be especially gratifying to those who have wanted both publications, yet have felt unable to afford the cost of the two.

The removal of the North American Review to New York, and the change of plan in making it more alive to timely questions of public moment and their discussion by men of experience and practical information, rather than by closet students, have added much to its force and value; certainly to the mass of active men who care more to know what prominent men are thinking about matters of general interest, than for the lubrications of pure scholarship.

Notes & Queries

(1) C. R. writes: I am making some simple laboratory experiments and find alcohol very expensive for heating retorts, flasks, etc. Is there any method of constructing a lamp to burn kerosene, by which the soot and smell may be avoided? There is no gas in my house. Is there any other substance I can use, supposing kerosene is not available? A. Kerosene has not been successfully used for the purpose mentioned. The substitutes for alcohol are wood naphtha (crude methylic alcohol) and gas, the latter used with a Bunsen burner to secure perfect combustion.

(2) C. D. F. asks: 1. Why do opticians charge so much more for lenses (4 or 5 inches in diameter) of short focus (6 or 7 inches) than they do for lenses of same diameter and long focus? A. Because the more convex and shorter focus lenses are of necessity ground singly, whereas several of the longer focus lenses may be ground at one operation. 2. If the difference is in the processes of manufacture, why will not one process answer for both thick and thin lenses? A. Common convex lenses are secured to a convex tool or form and ground by moving over them with a gyratory motion a concave tool, the contact surfaces being charged with the grinding or polishing material. It is obvious that the form having the least convexity will contain the greatest number of lenses. 3. Why is crown instead of flint glass used for condensing lenses, when the refractive power of flint is greater? A. Crown glass of a uniform density is more easily made than flint glass of the same quality. 4. Is there a stereoscopic camera, which takes the views erect instead of reversing them, as in an ordinary instrument? We think not. 5. If not how are the prints made on one piece of paper, and mounted without cutting apart and changing the right for the left? A. The prints or the negative must be cut and transposed, or the views must be transposed in the camera. 6. Why is it necessary that there should be an odd number of cutting edges in the fluted countersink described on page 387, vol. 39? A. It insures a smooth cut. 7. What is used with mercury for tempering drills, which will make them tough enough to stand in drilling tempered steel? A. Nothing. After hardening draw the temper as near as possible to the cutting edge.

(3) C. L. S. asks: 1. Should the ratio between the teeth of different gears be the same as that between their diameters? A. Generally, yes. 2. What is the best work on cotton manufacturing; also on mill engineering? A. Address the book publishers who advertise in our columns for catalogues.

(4) C. L. U. writes: 1. I have 12 lbs. of zinc in three gravity batteries; the current is not strong enough. I would like to make a Bunsen battery; could I make one, using the above zinc, and how? A. The zinc should be recast in cylindrical form, with a slit in one side to permit of circulation. 2. What is the meaning of "ohm" as used in telegraphy? A. The ohm is the unit of resistance to the passage of an electrical current; it is equivalent to a wire of pure copper one twentieth of an inch in diameter and 250 feet in length, or 330 feet of No. 9 iron wire.

(5) E. E. H. asks: How can I finish parlor brackets, made of walnut and cigar box lumber, cheaply, durably, quickly, and beautifully? A. Varnish the lumber before sawing, saw with thin boards between and on the sides of the lumber, and use a fine saw.

(6) S. G. B. asks: 1. Can insects and snakes hear? A. Yes. 2. How are knife blades tempered, so as not to warp? A. By plunging them straight down in the water in the process of hardening.

(7) M. L. A. asks how to drill a hole one half inch in diameter through the bottom of a large glass flask. It is intended for a home made electrical machine. A. A copper tube 1/2 inch in diameter pressed against the glass lightly and plentifully supplied with emery and water, and rotated by means of a lathe or drill stock, will accomplish it.

(8) C. E. O.—Directions for making induction coils are contained in the SCIENTIFIC AMERICAN SUPPLEMENT No. 160.

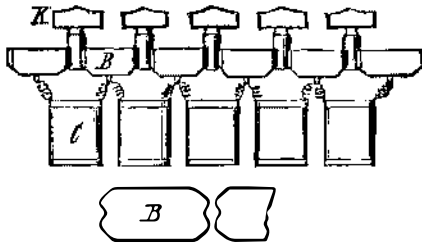
(9) E. K. asks: Who was Eastlake, and what are his principles of design in furniture? A. Eastlake is a living designer of furniture, etc., in London, Eng.; also art critic and author. His work on household art is published by Scribners. Clarence Cook's work, also published by Scribners, will explain Eastlakism.

(10) G. W. B. states that the shrinking and swelling of the wooden cases of telephones is one cause of derangement. We suggest soaking the wood in melted paraffine or giving them a coat or so of shellac varnish in the inside.

(11) F. S. writes: I am a surgical instrument maker, and in my work I have to bend steel rods, which must be polished before bending, as they have to be perfectly round when bent. The bending of the rods is done with a wooden mallet. 1. Is there anything that can be put on the steel or in the fire by which it might be kept from scaling? A. Apply to the steel before heating a thin paste of 75 parts of sifted wood ashes, and 25 parts of fat clay without sand, mixed with water. 2. Can you give me a receipt for soldering steel to malleable iron? A. Use silver solder.

(12) H. A. D. writes: 1. How can I fix up a small, cheap electric light so as to exhibit it before a large class? A. The simple electric light apparatus described in SCIENTIFIC AMERICAN SUPPLEMENT No. 149 would probably answer your purpose. 2. How much battery power would I require? A. 6 or 8 Bunsen cells. 3. Would a machine 7x4 inches generate sufficient electricity for it? A. As we do not know what kind of machine you refer to we cannot say SUPPLEMENT No. 161 contains instructions for making a machine that will answer the purpose. 4. Should I use an induction coil? A. You may obtain beautiful effects by using an induction coil in connection with vacuum tubes, but a very brilliant light cannot be obtained in this way. 5. Have you given information as to how to make induction coils? I am getting up some experiments for the purpose of giving a free exhibition to school children. By answering the above, you will confer a favor on an amateur, and may thus stimulate young minds to look into facts for themselves. A SCIENTIFIC AMERICAN SUPPLEMENT No. 160, will contain full instructions for making induction coils.

(13) H. C. and others.—The principle of the rheostat may be understood by referring to the engraving. Several coils, C, of measured resistance, are connected with brass blocks, B, which are fitted into



the top of the instrument. The first brass block is connected with one terminal of the first resistance coil; the second brass block is connected with the other terminal, and with one terminal of the second coil; the other terminal of the second coil is connected with the third brass block, and so on. The adjacent ends of the blocks are notched to receive the keys, K. Whenever one of the keys is inserted, the coil immediately below it is cut out of the circuit, and the current passes directly from one of the brass blocks to the other, through the key.

(14) J. M. asks how the wire should be wound on an electro-magnet. A. The manner of winding the wire on an electro-magnet is shown so clearly in the cuts as to require little explanation. Fig. 1 shows the two soft iron cores separated from the soft iron bar to which they are attached after being wound.

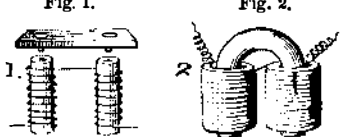
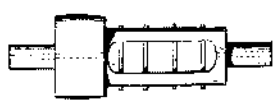


Fig. 2 shows the manner of connecting the spools of a U electro-magnet. If the iron core were straightened and the spools placed together, it would be seen that one spool is simply a continuation of the other.

(15) Maudie writes: I am a little girl eight years old. In a little book my papa got of you, called the SCIENTIFIC AMERICAN Reference Book, I found a rule for making soap bubbles, and as I like real well to blow soap bubbles, I got papa to get me the glycerin and I tried it just as the rule says, but I could not make any, they would not even form in the pipe. Papa says perhaps the printer made a mistake and that I might write to you about it. I have tried so many ways to make soap bubbles that papa calls me his little chemist and says I ought to have been a boy. The best way I have found is to put half an ounce of castile soap in a pint of distilled water. I have blown bubbles from this 4 inches through that would last 2 minutes, and I have blown them as large as 7 inches through. A. You probably used too much water or diluted glycerin. The recipe, which we have often tried with very satisfactory results, is given by Professor Josiah P. Cooke, as follows: "Procure a quart bottle of clear glass and some of the best white castile soap (or, still better, pure palm oil soap). Cut the soap (about 4 ounces) into thin shavings, and, having put them into the bottle, fill it up with distilled or rain water, and shake it well together. Repeat the shaking until you get a saturated solution of soap. If on standing, the solution settles perfectly clear, you are prepared for the next step; if not, pour off the liquid and add more water to the same shavings and shake as before. The second trial will hardly fail to give you a clear solution. Then add to two volumes of soap solution one volume of pure concentrated glycerin." "The New Chemistry," p. 29. Grand soap bubbles can be blown with this preparation.

(16) G. F. C. asks how to make a simple wire straightener? A. Such a tool is shown in the accompanying cut. It consists of a casting about 10



inches in length, having on each end a bearing which may be supported in suitable boxes. The pulley is a part of the casting, and is 3 inches in diameter and two inches wide. Four steel pins are inserted 1 inch apart and a little to one side of a central longitudinal line. A hole a little larger than the wire to be straightened is drilled axially through the bearing. The wire passes through the tool over and under the steel pins. It is well lubricated and is pulled through as the tool revolves.

(17) C. M. sends the following formula: To find the area of a circle, multiply the square of the diameter by 77, divide the product by 100, and add to the result 2 per cent of same (that is, increase the result by 2 per cent). Do you consider the above an easier rule than the usual one (πr^2 , [p. 31416], the solution being identical? Your formula in SCIENTIFIC AMERICAN Reference Book brings the same result. A. In many cases the rule given by you would be simpler.

[OFFICIAL.]
INDEX OF INVENTIONS
FOR WHICH
Letters Patent of the United States were
Granted in the Week Ending
November 19, 1878,
AND EACH BEARING THAT DATE.
[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Acid, making acetic, A. Pirz	209,978	209,979
Adding machine, M. Norgren	209,977	209,977
Animal trap, C. Isbell	210,040	210,040
Animal trap, S. H. Wiesedeppe	210,071	210,071
Azimuths, device for taking, W. Thomson	210,068	210,068
Bag tie and address holder, J. A. Burchard	210,004	210,004
Bag tag and fastener, H. Anderson	210,001	210,001
Bails, maker for pail, L. Williams	209,998	209,998
Bale tie, G. C. Clarke	209,969	209,969
Bark reducer, W. Chicken	210,036	210,036
Barrel maker, Hodgen & Yelton (r)	8,498	8,498
Bed bottom, spring, T. J. Pettit	210,145	210,145
Bed bottom, spring, E. Yeoman	210,000	210,000
Bed, camp, W. G. Richardson	210,148	210,148
Bedstead fastening, T. J. House	210,123	210,123
Bedstead, invalid, G. Iverson	210,126	210,126
Bedstead, wardrobe, D. D. Shupe	210,067	210,067
Bedsteads, folding-leg for sofa, Schultes & Walter	210,156	210,156
Bech dog, C. Morrill	210,140	210,140
Bit brace, C. H. Amidon	210,076	210,076
Blackboard, folding, B. G. Luther	210,044	210,044
Blind, Venetian, E. B. Lake	210,129	210,129
Boat, outrigger, M. F. Davis	209,960	209,960
Boiler, sectional, A. W. Cram	210,013	210,013
Boiler, steam, Firmenich & Stiker (r)	8,494	8,494
Boiler and furnace regulator, J. A. Lakin	209,972	209,972
Boot and shoe sole and heel cutter, J. H. Busell	210,006	210,006
Boot and shoe cleaner, G. F. Ziegler	210,072	210,072
Boot and shoe sole dresser, G. Danforth	210,103	210,103
Boot jack, F. T. Lessen	210,131	210,131
Boot and shoe lasting jack, E. J. E. Rollins	209,996	209,996
Bottle stopper, J. Sr., & A. Douceiron, Jr.	210,105	210,105
Bracelet, L. Heckmann	210,119	210,119
Bracket rod, W. S. Blake	210,084	210,084
Brake, automatic, Elmer H. Hunt	210,039	210,039
Brake, car, C. H. Nye	210,050	210,050
Brake, automatic wagon, J. G. Hart	210,030	210,030
Brake, wagon, I. S. Wright	209,999	209,999
Bran scourer, W. Harris	210,029	210,029
Brush, F. W. Geswein	209,967	209,967
Brush, C. H. Stratton	210,166	210,166
Button, Empson and Brant	209,965	209,965
Button, collar and sleeve, W. P. Dollor	210,017	210,017
Button, collar and sleeve, G. B. Fittz	210,110	210,110
Calendar, C. W. Bryan (r)	8,492	8,492
Canister, G. Lillibridge (r)	8,500	8,500
Car coupling, S. A. Haydock	210,117	210,117
Carrover cinder guard, R. H. Hooper	210,085	210,085
Carbureter, H. M. Dougherty	210,019	210,019
Carriage top, Kuntz & Schroeder	210,123	210,123
Cart, coal, F. Soholes	210,153	210,153
Cartridge extractor, J. S. Shinn	209,969	209,969
Cartridge loader, G. F. Card	209,966	209,966
Chair, invalid, A. Iske	210,125	210,125
Check, draft, etc., bank, F. W. Brooks	210,089	210,089
Check rower, E. Ferguson	210,109	210,109
Churn, S. M. Brown	210,090	210,090
Cigar holder, W. Goodwin	210,022	210,022
Clock regulator, electric, G. Lund	210,133	210,133
Clothes fork, W. H. Castle	209,967	209,967
Clothes pounder, A. Gummer	210,024	210,024
Clothes pounder, F. A. Sumner (r)	8,496	8,496
Clothes rack, J. Wing	210,177	210,177
Coffee roaster, Stevens & Moore	209,991	209,991
Coin wrappers, closing end flaps of, G. Rettig	209,985	209,985
Coloring matters, aniline, F. Z. Roussin	210,054	210,054
Compass, mariner's, W. Thomson	210,060	210,060
Cooler, beer, F. C. Deckerbach	210,016	210,016
Corn sheller, J. Q. & O. R. Adams	210,074	210,074
Corn sheller separator, Herriott & Smith	210,083	210,083
Corset, D. H. Fanning (r)	8,493	8,493
Corset, S. Gutman	210,025	210,025
Corset, W. S. & C. F. Hunt	210,038	210,038
Cultivator, W. T. Addison	210,073	210,073
Diffusion apparatus, R. Sieg	210,138	210,138
Dough machine, soft, H. Duosh	209,963	209,963
Draught evener, M. O. Smith	210,100	210,100
Drill stand, S. W. Davis	210,104	210,104
Drum, heating, W. F. Barker	210,082	210,082
Egg poacher, H. J. Schmid	210,154	210,154
Electric light switch, Sawyer & Man	210,152	210,152
End gate for wagons, A. Gadbouls	210,112	210,112
Engine, steam, E. F. Montague	209,974	209,974
Fertilizer, A. Pirz	209,980	209,980
Fifth wheel for vehicles, S. S. Clear	210,009	210,009
File holder and gauge, saw, G. W. Atkins	210,076	210,076
Filter, J. C. Banks	210,081	210,081
Filter, cistern, V. A. Gates	210,113	210,113
Firearm, breech-loading, J. C. Petmecky	210,144	210,144
Firearm, magazine, A. Burgess	210,091	210,091
Firearms, eight, A. Gipperich	210,115	210,115
Fire escape, Juengst & Bernhard	209,971	209,971
Flue, smoke, A. Heegaard	210,120	210,120
Fork, horse hay, Welsh & Schwenck	210,174	210,174
Furnace, tinner's, etc., gasoline, Gefroerer	210,114	210,114
Gas pressure regulator, P. Noyes	210,141	210,141
Globe, terrestrial, Turnbull & Foster	209,993	209,993
Glue, spreading and drying, E. W. Leggett	210,130	210,130
Grain separator, H. E. Walker	210,063	210,063
Grate, M. T. Bailey	210,077	210,077
Gravel, etc., drier and heater, W. Morgan	210,139	210,139
Grinding machine, L. Bollman (r)	8,497	8,497
Hammock supporter, folding, W. Howe	210,067	210,067
Harrow, farm, P. McDonald	210,046	210,046
Harvester knife sharpener, J. M. Connell	210,011	210,011
Hoop, barrel, L. Reed (r)	8,501	8,501
Hoop cutter, J. B. Dougherty	209,962	209,962
Hoop maker, wooden barrel, Bowen & Nichols	210,085	210,085
Horse and cattle food, H. Braunhold	210,087	210,087
Horseshoe pad, C. A. Wells	210,173	210,173
Horseshoe snow plate, I. Quinby	209,983	209,983
Horseshoe weight, B. F. Porter	210,146	210,146
Hose, Beatly & Haulenbeck	209,953	209,953
Indicator, station, J. Casey	210,008	210,008
Iron, manufacture of, A. J. Moxham	210,049	210,049
Jewel casket, A. Conradt	210,012	210,012
Kiln for drying vegetables, etc., E. Hundhausen	210,124	210,124
Ladder, extension step, Dory & Flint	210,018	210,018
Ladder for gathering fruit, L. H. Titus	210,168	210,168
Lamp extinguisher, A. Brandon	209,965	209,965
Land roller and clod crusher, R. A. Rynerson	210,150	210,150
Lantern, cash & Baron (r)	8,502	8,502
Latch, reversible, W. E. Sparks	209,990	209,990

Leathercomposition, artificial, R. E. Ball	210,079	210,079
Lock, permutation, W. H. Savage	210,066	210,066
Lock, time, J. Weimar	210,070	210,070
Loom picker check, F. McCormick	210,136	210,136
Meat chopper, G. C. A. Juengst	209,970	209,970
Mechanical movement, D. E. Cripe	210,014	210,014
Metallic fastener, G. W. McGill	210,048	210,048
Meter, electric, W. E. Sawyer	210,151	210,151
Middlings bolt, G. S. Cranson	210,102	210,102
Mill for grinding hay, grain, etc., G. B. Porter	209,981	209,981
Mill, rice pounding and hulling, F. Brotherhood	210,002	210,002
Millstone curb and chop conveyer, C. Galagher	210,021	210,021
Millstone driver, F. G. Dorner	209,961	209,961
Mortising machine, S. Stone	210,162	210,162
Nail extractor, C. F. Knauer	210,041	210,041
Nickel ores, etc., working, J. Garner	210,020	210,020
Nipple for nursing bottles, E. Siebenlist	210,157	210,157
Oven, baker's, T. Mayes	210,045	210,045
Oyster opener, P. Helmich	210,033	210,033
Package, sheet metal, J. F. Ross	209,987	209,987
Padlock, W. Baldwin	210,080	210,080
Paper calendaring roller box, J. W. Bicknell	209,964	209,964
Paper cutter, G. A. Walker	209,995	209,995
Paper fastener, F. J. Lippitt	210,132	210,132
Paper machine felt stretcher, O. W. Clark	210,097	210,097
Pavement, composition, J. P. Cranford	210,101	210,101
Pedometer, B. S. Church	210,096	210,096
Pen, fountain, A. T. Cross	209,959	209,959
Pianoforte, J. R. Lomas	210,043	210,043
Pianoforte string, Watson & Bauer	210,172	210,172
Piano violin, F. Harris	210,028	210,028
Plan & bench, D. M. Heald	209,969	209,969
Planing machine, J. Ross	210,149	210,149
Planter, corn, M. Martlehang	209,977	209,977
Planter, seed, R. Fitzsimons	210,111	210,111
Planter, seed, S. R. Hawley	210,118	210,118
Planters, check rower for corn, J. W. Perkins	210,143	210,143
Plow, G. W. Wiggins	210,176	210,176
Plow, G. T. Mettler	210,047	210,047
Plow sulky and cultivator, G. P. Price	210,147	210,147
Plow, wheel, O. S. Macham	210,137	210,137
Potassium, making ferrocyanide of, H. Bower	210,088	210,088
Potato bug catcher, C. P. Steinmetz	210,163	210,163
Potato digger, H. Strait	210,061	210,061
Pottery, glass, etc., cover for, S. M. Laughlin	210,042	210,042
Press, cigar, J. W. Sursa	210,062	210,062
Printing machine, plate, C. A. Guy	210,116	210,116
Pulley, door and gate, H. T. Gates	209,966	209,966
Pulley for window sashes, H. A. Wilbur	209,997	209,997
Pump, J. F. Hess	210,122	210,122
Pump, E. Sanders	210,056	210,056
Pump, J. C. Titus	210,169	210,169
Pump, double-acting force, E. L. Spencer	210,059	210,059
Pump, ice and refrigerating machine, J. C. Mack	210,134	210,134
Radiation of heat, preventing, P. Strelitz	210,060	210,060
Raft, life, C. Behre	210,093	210,093
Rake, horse hay, D. A. Calkins	210,093	210,093
Rake, horse hay, D. F. Hacker	210,026	210,026
Razor strop, A. V. M. Sprague	210,151	210,151
Reflector, P. Cavalier	210,094	210,094
Register, G. C. Smith	210,159	210,159
Sad iron heater, G. Fencil	210,108	210,108
Saddle tree, gig, J. M. Gwinell	210,068	210,068
Salt, manufacturing, H. Ransford	209,984	209,984
Sap spout, J. B. Sargent (r)	8,495	8,495
Sash fastener, Roper & Mitchell	210,063	210,063
Sash fastener, J. W. Thomas	210,167	210,167
Saw swage, S. Kinney	210,127	210,127
Sewing machine, circular, J. Connell	210,100	210,100
Scraper, earth, J. H. Edmondson	209,964	209,964
Screw stock, P. Everitt	210,106	210,106
Screws, making metal, L. W. Stockwell	210,165	210,165
Sewers, etc., air valve attachment, P. F. Morey	209,975	209,975
Sewing machine, L. Heery (r)	8,499	8,499
Sewing machine, J. A. House	210,036	210,036
Shelving, store, J. C. Wright	210,178	210,178
Shoe, etc., fastener, Clouse & Zipfel	210,010	210,010
Shutter, Cruise & Isaacs	210,015	210,015
Sign, rotary, G. H. Rice	210,052	210,052
Slicing machine, J. G. Baker	210,078	210,078
Smokestack and spark arrester, W. M. K. Thornton	209,992	209,992
Smokestack, locomotive, G. W. Turner	209,994	209,994
Souder, deep sea, W. Thomson	210,067	210,067
Spools, making metallic, L. Brightman	210,088	210,088
Spring, car, W. P. Hansell	210,027	210,027
Spring, vehicle, S. Palmatter	210,142	210,142
Spring, vehicle, C. F. Shoemaker	209,989	209,989
Steam generator, sectional, G. Marshall et al.	210,183	210,183
Stove, J. H. Powell	209,992	209,992
Stove door knob, H. A. Tweed	210,065	210,065
Table, J. C. Melcher	210,138	210,138
Tent, A. S. Burt	210,035	210,035
Testing machine, F. Fairbanks	210,107	210,107
Thill coupling, D. Dalzell	210,092	210,092
Tool, garden, J. D. Shaffer	210,155	210,155
Truck transfer, car, T. Post	210,051	210,051
Umbrella cover, G. Held	210,121	210,121
Valve gear for engines, E. Sprague	210,059	210,059
Vegetable cutter, G. M. Clark	210,098	210,098
Vehicle shifting seat, J. A. Hawthorn	210,081	210,081
Veneer cutter, J. A. Waterman	210,171	210,171
Water aerator, J. S. & R. T. Higgins	210,034	210,034
Water closet, W. Bunting, Jr	210,003	210,003
Water closet, D. Wellington	209,996	209,996
Water wheel, J. W. Gray	210,023	210,023
Water wheel, P. Stovall	210,164	210,164
Washing machine, Thapan & Shaw	210,064	210,064
Washing machine, R. M. Wender	210,175	