

pare favorably with those of the American annuals. In the introduction the editor has summarized the progress of the year in saying: "If the year just closing has not been remarkable for the introduction of any new photographic process of cardinal importance, steady progress and improvement in most branches has still to be recorded."

PUBLICATIONS OF THE LICK OBSERVATORY OF THE UNIVERSITY OF CALIFORNIA. Vol. III. 1894. Sacramento: State Office. 1894. Pp. 229.

This report contains not only the purely astronomical work, but also papers treating of apparatus and materials. It will be a sine qua non in every astronomical library but it is also of interest to all cultured readers. The moon supplies a great part of the text, and a most superb series of plates from negatives taken at the observatory illustrate the contour of the lunar surface.

THE REPAIR AND MAINTENANCE OF MACHINERY. By Thomas Walter Barber. With about 400 illustrations. London: E. & F. N. Spon. New York: Spon & Chamberlain. 1895. Pp. x, 466. Price \$3.50.

This practical work seems to really cover, to a certain extent, a new field, relating as it does to the repairing of broken parts of machines. The book is excellently printed and contains a very full text, and it is impossible to believe that it does not fill a most excellent field, and it will doubtless be very acceptable to the practical machinist in this country. It is elaborately illustrated and contains a good index.

THE MECHANISM OF WEAVING. By T. W. Fox. London and New York: Macmillan & Co. 1894. Pp. xx, 472. Price \$2.50.

This work naturally does not lend itself to review. It is enough to say that it appears to embody an elaborate treatment of the subject, with numerous illustrations and full and satisfactory index. In its make-up it is worthy of all commendation; the illustrations are particularly clear and the type and paper most attractive, while as a sample of ornamental and suggestive binding it is especially to be noticed.

SCIENTIFIC AMERICAN BUILDING EDITION. JANUARY, 1895.—(No. 111.)

TABLE OF CONTENTS.

- 1. An elegant plate in colors, showing a Colonial cottage at Williamsbridge, N. Y., recently erected for Chas. H. Love, Esq. Two perspective elevations and floor plans. Cost complete \$4,250. Mr. Arthur C. Longyear, architect, New York City. A pleasing design.
2. A Colonial residence at New Rochelle, N. Y., recently erected for J. O. Noakes, Esq., at Iselin's Park. Two perspective elevations and floor plans. Cost \$5,000 complete. Mr. Manly N. Cutter, architect, New York City. An attractive design.
3. Colonial residence at Montclair, N. J., recently erected for Sylvester Post, Esq. Two perspective elevations and floor plans. Messrs. W. S. Knowles & A. H. Thorp, architects, New York City. A pleasing design.
4. A seaside cottage recently erected for C. H. Manning, Esq., at Kennebunkport, Me. Two perspective elevations and floor plans. A picturesque and unique design after the "New England" lean-to roof order. Mr. H. P. Clark, architect, Boston, Mass.
5. A residence at East Orange, N. J., erected at a cost of \$7,000. Architect Mr. W. F. Bower, Newark, N. J. Perspective elevation and floor plans.
6. The First Presbyterian Church at Stamford, Conn. Two perspective elevations and ground plan. A design of great architectural beauty, treated in the Romanesque style. Mr. J. C. Cady, architect, New York.
7. A residence at Scranton, Pa., erected for E. B. Sturges, Esq., at a cost of \$5,000 complete. Architect Mr. E. G. W. Dietrich, New York City. Perspective elevation and floor plans.
8. A summer residence at Cushing's Island, Me., recently erected at a cost of \$3,100 complete. Two perspective elevations and floor plans, also an interior view. Mr. John C. Stevens, architect, Portland, Me. An excellent example for a summer home.
9. View of the Armory of the Seventy-first Regiment, New York City. Architect Mr. J. R. Thomas, New York City.
10. Perspective view and floor plans of the fourteen story Reliance Building, Chicago.
11. Miscellaneous contents.—Buff brick popular.—Ceiling and cornice tinting.—Home ground arrangement of plants, illustrated.—Stone dressing by compressed air, illustrated.—Brick dust mortar.—Interesting ruin of cliff dwellers.—Removing the front wall of a warehouse, with sketches.—Improved woodworking machine, illustrated.—Buff brick in New York.—Ceiling paper.—"Decore-o," a new material for decorative purposes, illustrated.—Improved gutter hangers, illustrated.—Draughtsman's supplies, illustrated.

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

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural Publication in the world. Sold by all newsdealers. MUNN & CO., PUBLISHERS, 361 Broadway, New York.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

"U. S." metal polish. Indianapolis. Samples free. Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J. For stone quarry engines. J. S. Mundy, Newark, N. J. Smith's Leather Pattern Filler, Akron, O. Sample free. Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Light and Canal Sts., New York. Centrifugal Pumps. Capacity, 100 to 40,000 gals. per minute. All sizes in stock. Irvin Van Wyk, Syracuse, N. Y. Experienced competent agent solicits correspondence. Write him. G. W. S., Room 130, 27 Pine Street, N. Y. Emerson, Smith & Co., Ltd., Beaver Falls, Pa., will send Sawyer's Hand Book on Circulars and Band Saws free to any address.

Patents of merit purchased or placed upon the market. Address with full particulars, Chas. Babson, 24 Congress Street, Boston, Mass.

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

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

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

Woven wire brushes.—The Belknap Motor Co., of Portland, Me. are the patentees and manufacturers of the best woven wire commutator brush on the market.

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

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

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and addresses must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

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

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

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

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

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(6349) S. W. asks: 1. Having given 6 inches as length of coil and 1/4 inch as diameter of iron core, how many ampere turns are required to magnetize the said core to saturation, and how great (approximately) would be the lifting power of the electro magnet so formed? A. Owing to leakage and to the fact that there is no real saturation point, no exact answer can be given. A very large number of ampere turns can be given with increase of the magnetic power on account of the long air path. 2. If I place two electro magnets end to end with poles near together, is the combined attractive power increased, i. e., will the magnets each pull more than they would acting separately on armatures? A. The combined power will be the same if similar poles face the same way.

(6350) T. H. B. writes: 1. Are all points of the earth's surface at the same potential (electrically)? I have heard it said that, owing to presence of certain minerals, metals, or acids in certain combinations, the potential might be higher at one place than at another, and that, owing to this difference of potential, a current might flow in a telegraph wire joining these two places, sufficiently strong to operate instruments in circuit, even when all batteries were removed from the wire. (The line of course being grounded at the terminals.) I have heard that this experiment has been successfully tried on certain lines removed from any sources of induction. Is the current present in the wire due to conditions stated, or is it due to other sources, and is not such a current, if it exist, properly called an earth current? A. Earth currents so called act as described. Their cause is obscure, but they are due to chemical changes. Telegraphic messages have been transmitted by them. 2. What becomes of the energy of a coiled spring when dissolved (under tension) in acid? I have seen the answer to this question in an earlier copy of the SCIENTIFIC AMERICAN, but cannot recall it. A. The so-called energy is simply the capacity to convert heat into mechanical energy. If a spring does work, its temperature falls. By solution in an acid this capacity is destroyed; there is no destruction of energy.

(6351) H. C. R. writes: 1. Do you consider a plastered ceiling safe that has been saturated with water during a cyclone; and then again soaked before the roof could be repaired? A. No; not safe. 2. Would not the vibrations of a power l church organ tend to bring down such a ceiling? A. Yes. 3. Can such a ceiling be thoroughly examined by simply inspecting the keys from above? A. No. 4. Is it not possible for the keys to appear all right, while the plastering has given way below? A. Yes.

(6352) R. W. K. asks: In designing a generator, is it necessary that there should be from five to seven times the weight of iron in the field as in the armature? Is it necessary that the spaces between the pole pieces should be five times the air gap? A. The factors given merely represent good general practice; there is nothing absolute about them.

(6353) A. T. asks if following dimensions and windings of dynamo will generate 30 amperes with a potential of 52 volts at the brushes: Length of wrought iron field magnets 3 1/2 inches by 5 inches diameter, wound with 25 pounds of No. 18 double cotton covered wire, 10 layers, 140 turns on each leg of magnet. Armature 4 1/2 inches diameter, 6 inches long, best laminated iron core, wound with No. 12 double cotton covered wire, 32 coils, 4 convolutions in each coil, speed about 1,800 revolutions per minute, general shape of dynamo about same as 60 light dynamo in SUPPLEMENT, No. 865. A. If you succeed in getting the above results, you will do well. If shunt wound, the product of your armature and field resistance should equal the square of the external resistance, or say three ohms.

(6354) J. P. G. asks: In making a Gramme size 3/4 inch diameter armature of 12 sections, is it absolutely necessary to wind each section in even layers and convolutions if wires on each section are of equal length? A. To secure a uniform current there should be an equal number of turns of wire in each section; the length is not necessarily identical.

(6355) A. B. says: I take the liberty to offer a suggestion to your answer to F. G. C.'s query, No. 6329, in SCIENTIFIC AMERICAN of December 22, for telling the points of the compass by the aid of the sun and a watch. If the hour hand of the watch be pointed at the sun—the watch lying flat—half way between the hour hand and twelve on the dial will be south. After south is located the other points are easily determined. Doubtless a compass would be more correct, but the method given will be found correct enough for ordinary requirements.

(6356) S. R. H. writes: I have a few questions that I would be glad to have answered in SCIENTIFIC AMERICAN. How far could a person live below the surface of the earth, say for instance 1, 2, or 3 miles deep? Would the air become too dense or compact for that? Is it not a fact that the earth's surface acts as a medium line for the center of gravity, atmospheric and water pressure? How far above the earth's surface is the air considered to be pure and healthy, to contain no poison matter? A. The depth at which a person can live below the surface of the earth depends upon the condition of temperature and the constitutional ability of the person to bear heat. The internal heat of the earth increases 1° Fah. for every 50 to 70 feet of vertical depth in various regions, so that from 2,000 to 3,000 feet in depth is about the limit that a man can work. In parts of the earth which have been subject to volcanic action, as in some of the mining districts, the temperature rises somewhat more than 1° in 50 feet, and 120° is the temperature at about 1,500 feet in depth. At this temperature labor is very difficult and forced ventilation has to be resorted to, and by this resource a depth of 4,000 feet may be attained in the undisturbed strata of the earth. The earth's surface is the plane of demarcation for atmospheric and water pressure. The barometer indicates decreased pressure as we go down in mines, the same as in ascending in the air. Water also increases in pressure as the distance beneath the sea. The atmosphere has no known difference in composition at the greatest heights observed. It is its lightness or rarity that affects the lungs at great heights.

TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequal facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

January 8, 1895,

AND EACH BEARING THAT DATE.

(See note at end of list about copies of these patents.)

Table listing inventions with patent numbers and names of inventors. Includes items like Abacus, L. D. Myers; Advertising board, H. D. Stratton; Aging or treating spirits, R. C. Scott; Alarm, See Burglar alarm. Low pressure alarm; Amalgamator, A. Tanner; Anchor, E. B. ...; Animal trap, P. H. Sisson; Annealing box, W. H. Bailey; Antimony, double salts of, O. O. B. Froelich; Applicator, S. J. Bradley; Automatic sprinkler or fire extinguisher, W. Esty; Axle straightening and setting machine, G. L. Collis; Band, clasp, T. W. Jones; Barrel leveling and trussing machine, D. A. Gordon; Basket or carrier for bottles or other articles, H. M. Kobb; Bath apparatus, portable shower, W. E. Dobbins; Battery, See Storage battery; Belt tightener, R. M. Whitney; Bench book, A. McFarland; Bicycle, W. C. Dalgic; Bicycle support, A. M. Ribbany; Blacking box holder, A. L. Higgins; Blacking casing, L. Nearing; Blowing engine or compressor, W. E. Good; Boiler, See Hot water boiler. Pipe boiler. Wash boiler; Boiler brace, P. McGregor; Books, device for handling, Pfund & Jacobi; Boom, F. G. Faxon; Boot or shoe sole or heel paring machine, C. H. & R. H. Southall; Boot or shoe soles, cutter for trimming, J. J. Mabry; Boots, machine for finishing wool, C. H. Woodbury; Bottle filling apparatus, A. Grap; Bottle necks, tool for forming, F. Achtenhagen; Bottles, tool for forming flaring lips on, G. L. Jenkins; Box fastener, W. H. Howe; Brace, See Boiler brace. Folding brace; Braided moulds, method of and device for finishing coverings of, F. Markgraf; Brake, See Carriage brake. Hoisting apparatus brake. Pneumatic brake; Brake, J. Gardner; Brick drier, W. T. Nicholls; Brick kiln, C. J. Holman; Brick machine, Rolfe & Johnson; Brick or tile cutting machine, J. Thompson; Brick truck, A. T. Bemis; Brush mould, W. Morrison; Brush, wire, J. F. Bigelow; Buckle, W. F. Sweet; Buckle, suspender, J. Kennedy; Burglar alarm, electric, Scholes & Myers;

Table listing inventions with patent numbers and names of inventors. Includes items like Burner, See Hydrocarbon burner. Oil burner. Burner for use of crude petroleum, etc., Foster & Hammel; Bust developer, G. C. Hardesty; Button, collar, F. C. Crawford; Button, separable, F. S. Nelson; Caisson for erecting bridge piers, Chechong & Balensiefer; Calculator, Loomis & Phillips; Camera diaphragm, M. Levy; Car bolster, H. R. Stanford; Car coupling, W. McNames; Car coupling, J. E. Forsyth; Car coupling, C. Frost; Car coupling, J. W. Hayward; Car coupling, C. Heise; Car coupling, E. C. Inzerled; Car coupling, W. McNames; Car coupling, H. Rienow; Car coupling, Russell & Perry; Car draught attachment, railway, J. Timms; Car tender, J. E. McBride; Car tender and brake, railway, J. T. Matthews; Car guard, street, W. H. Paud; Car platform life-saving apparatus, street, W. H. Rodgers; Car safety attachment, R. Bustin; Car wheel and axle, mine, L. Barker; Cars, motor suspension for electric street, S. Harts; Carboy holder, J. O. Ratbun; Card grinding machine, C. Mills; Carriage brake, Brown & Welch; Carriage provided with heating apparatus for transporting food, etc., J. Lay; Case, See Egg case. Shipping case. Show case; Cash register, W. G. Latimer; Casks, drums, etc., securing heads of, G. Powell; Cereal reducing machines, receiving trough and cutter for, H. D. Perky; Check wire, mechanism for reeling, W. E. Surface; Chimney lifter, F. Rbind; Clamp, See Trolley wire clamp; Clay shingles, die or mould for making, Murray & Welch; Clippers, gauge or guard plate for hair, J. K. Priest; Clipping machine, electric hair, P. Shannon; Clock level, W. J. Marball; Clothes line reel, Woodward & Geisler; Clothes to clothes lines, device for attaching, O. McShane; Clutch, Akerley; Clutch, friction, W. H. Lindsay; Coal separator, J. R. Richardson; Coffee roaster, D. H. Marsball; Coffin handle, detachable, J. Klar; Collar fastener, horse, P. H. Dubois; Combination bench, G. W. Dunsworth; Combing machine attachment, wool, Smith & DeVries; Computing machine, R. E. McClelland; Conductor, M. D. Law; Conductor support, J. C. Love; Cooker, etc., for food, C. A. Baugardner; Cooking vessel, C. Baumgardner; Coop, etc., folding, T. A. Allen; Coop for poultry, shipping, M. L. Reeves; Copy holder, C. Spiro; Copying bath, capillary, Thorp & Gifford; Cotton press, D. M. Murray; Coupling, See Car coupling. T-bill coupling; Cultivator, R. S. Chaney; Cultivator, B. F. Harford; Curling iron, O. G. Dunnom; Curling iron, Howard & Heilstrom; Curtain stretcher, W. A. Cochran; Curtain stretcher, C. Linder; Cutter, See Potato cutter; Displaying reading matter, device for, H. B. Butts; Distilling and sterilizing water, apparatus for, J. Narel; Ditching machine, H. M. & A. J. Fuller; Door, E. Hines; Door, flexible, E. Brown; Door holder, H. Fletcher; Door stop, L. Funk; Draught equalizer, Smith & Barlow; Drawing and evening sliver, machine for, W. V. Trefball; Drier, See Brick drier. Portable drier; Drying kiln, W. G. Galloway; Drill, See Hand drill; Duplicating machine, as, A. D. Klaber; Dust collecting system, H. L. Day; Dust separator, McNaughton & Seymour; Dye, blue diazo, A. Weinberg; Easel, desk, R. M. Hitch; Eaves trough, W. H. Harris; Egg case, W. A. H. Harris; Electric conductor tension device, J. C. Love; Electric wires, crossarm for support of, E. J. Bullock; Elevator and dump, R. Bullis; Elevator guide post clamping device, M. Christopherson; Elevator safety device, S. P. Kay; Ellipsograph, J. Hottinger; End gates, locking device for wagon, J. T. Duncan; Engine, See Blowing engine. Gas engine. Gas, oil or vapor engine. Gas or petroleum engine. Hydrocarbon engine. Rotary engine. Steam engine; Engine attachment, steam, M. H. Molloy; Entrails, machine for cutting and cleaning; Revels & Eber (C.); Envelope, A. D. Klaber; Escutcheon, C. R. Uhlmann; Fastening and driving tool therefor, metallic, J. A. Guibaud; Feedwater purifier, J. Mohr; Fence, L. M. Shirteff; Fence machine, W. E. S. Moran; Fence post, Pitney & Gardner; Fermenting vat, C. Hauger; File cutting machine, A. Weed; Firearm, gas-operated, C. Johnson; Fire escape, J. J. Haller; Fire extinguisher, automatic, H. H. Bay; Fireproof ceiling, C. F. W. Doebring; Fireproof wall, C. F. W. Doebring; Fluid under pressure, means for transmitting; W. S. Halsey; Folding brace, I. O. Harris; Furnace, See Hot water furnace. Siphon furnace; Furnace, U. P. Smith; Furnace air distributor, Burnshire & Click; Furniture, adjustable support for school, T. R. Roulstone; Game app, C. W. Zarnba; Garment supporter, G. D. Nichols; Garment supporter, C. W. Stinson; Gas, apparatus for making and purifying, R. H. Laird; Gas burner, automatic safety attachment for, H. H. Cummings; Gas engine, J. A. Charter; Gas, oil, or vapor engine, J. Robinson; as or petroleum engine, P. Bilhaut; Gas or vapor and air mixing and spraying device, J. Robinson; Gear cutting, L. W. Whiton; Generator, See Steam generator; Glove holder, S. Free; Grain cleaning and separating machine, C. Cloz; Grate raking and cleaning attachment, J. G. Ernst; Grate raking, S. Todd; Gravel, knife, C. Serbold; Guard, See Car guard. Railway cattle guard. Window guard; Guns, cocking mechanism for breakdown, H. Park; Guns, cocking mechanism for breakdown, J. Rider; Hame, W. Fischer; Hame fastener, W. H. Johnson; Hammock, G. B. French; Hand drill, J. Defatsch; Harrow, J. B. Morrison; Harrow and seeder, combined, S. H. Raymond; Harvester, corn, J. H. Osburn; Harvester reel, J. H. Fulton; Hat and clothes book, Stinebach & Danner; Hat sweats, device for attaching reeds and hanging, C. G. Ives; Hay press, H. O. Hem; Hay rake, A. E. Matwich; Heater, See Hot water heater. Lamp heater. Steam or hot water heater; Heater, H. Gutschmidt; Heel and sole for boots, etc., elastic or anticoncussion, L. Rogers; Hinge, adjustable, J. K. Fagan; Hoisting apparatus brake, A. Bolzani; Hook, See Bench book. Hat and clothes hook. Transfer hook. W. H. Wetmore; Hook and eye, S. L. Slate; Horses, undercheck for, J. R. Buchanan; Hose carriage, B. L. Stowe; Hose rack, B. L. Stowe; Hot water boiler, A. Burt; Hot water furnace, W. C. Johnson;

Hot water heater, J. H. Wynne..... 532,256
House construction, school, A. C. Watson..... 532,253
Hydrocarbon burner, W. R. Jenkins..... 532,202
Hydrocarbon engine, C. & A. Spiel..... 532,219
Indicator, A. K. M. Law..... 532,278
Indicator. See Office indicator.
Injector, B. M. Throop..... 532,297
Ink well, E. Stern..... 532,347
Ink well, J. Werner..... 532,259
Insulated pipe joint, M. J. Locke..... 532,238
Insulator, M. D. Law..... 532,190
Insulator, electric wire, D. M. Rothenberger..... 532,101
Iron. See Curling iron.
Iron or steel articles, process of and apparatus for pickling, W. S. Rawson..... 532,394
Jack. See Lifting jack.
Joint. See Insulated pipe joint. Rail joint. Railway rail joint.
Kiln. See Brick kiln. Drying kiln.
Knitting machine stripping attachment, M. A. J. Keane..... 532,203
Lading blocks, die for applying plastic material to, E. Kempshall..... 532,204
Lamp burner, C. M. Lunn..... 532,077
Lamp, electric arc, A. W. Richardson..... 532,095
Lamp heater, A. L. Robbins..... 532,215
Lamp support, electric, Norton & Scheffold..... 532,391
Lamp support, electric, Schefold & Nortney..... 532,103
Lantern, C. M. Law..... 532,190
Lawn sprinkler, F. J. Meavin..... 532,281
Lifter. See Transom lifter.
Lifting jack, lever, Weiler & Stutsman..... 532,124
Lightning arrester, A. Wurts..... 532,353
Lightning arrester, A. J. Wurts..... 532,354
Lock. See Sash lock.
Loom let-off and take-up mechanism, F. G. Chambers..... 532,312
Loom let-off and take-up mechanism, C. B. Rumsey..... 532,341
Loom reed, C. B. Rumsey..... 532,340
Loom shedding mechanism, H. Wymann..... 532,225
Low pressure alarm, E. G. Whelan..... 532,224
Lubricator, S. Davies..... 532,231
Machine wrench, W. B. West..... 532,350
Marking points and erasing material, holder for, Peterson & Dudley..... 532,245
Measuring instrument, H. Biegel..... 532,073
Measuring vessel, W. H. Kister..... 532,121
Message register, W. M. Wade..... 532,434
Metal articles from dies, apparatus for removing stamped, J. M. Van Fleet..... 532,209
Metals, process of and apparatus for separation of, B. Moebius..... 532,088
Milling paper, E. H. Jacobus..... 532,213
Mill. See Stamp mill.
Moulding machine, W. F. Richards..... 532,214
Mopping machine, L. H. Brightman..... 532,020
Mortising machine, Doane & Sofge..... 532,055
Mower attachment, lawn, C. W. Wheeler..... 532,300
Mower bar lifting attachment, G. R. Parker..... 532,091
Mower clover seed attachment, D. Crough..... 532,300
Mower, lawn, T. W. H. Coldwell..... 532,233
Mowing machine, A. Stevens..... 532,430
Musical instrument string clamp, Hafner & Gove..... 532,053
Musical instrument, note sheet or barrel for mechanical, F. Schaub..... 532,290
Non-conducting covering, E. W. Tucker..... 532,407
Nut lock, H. R. Clark..... 532,277
Nut lock, C. Hahn..... 532,274
Nut lock, T. H. Smith..... 532,163
Office fixture, C. M. Artbur..... 532,247
Oil burner, W. R. Jenkins..... 532,279
Oil burner for lamps or stoves, E. S. Drake..... 532,316
Oil, automatic crank pin, J. Miller..... 532,286
Ore sweeping and reworking device, C. F. Pike..... 532,183
Ore treating apparatus, N. H. Cone..... 532,263
Ores in river bottom, device for washing, C. F. Pike..... 532,182
Oven, portable, D. A. Wesley..... 532,408
Padlock, E. T. Kraim..... 532,234
Paint mixing and grinding machine, T. G. Johnson..... 532,277
Paper, map applying waterproofing to, C. C. Macbrair..... 532,172
Paper watermaking apparatus, W. K. Trotman..... 532,252
Photographic lens tube diaphragm, M. Levy..... 532,327
Photographic objective, P. Rudolph..... 532,398
Photographs on textile fabrics, printing, R. Martin..... 532,173
Piano, upright, H. Ziegler..... 532,257
Pin. See Safety pin.
Pipe boiler, J. Kaine..... 532,071
Pipe cleaner, waste, F. H. Hoyt..... 532,376
Pipe cover, N. Rubenstein..... 532,257
Pleat fastener, F. Plutzer..... 532,247
Plater, J. C. Heades..... 532,189
Plaster attachment, W. L. Stickle..... 532,205
Platform. See Window platform.
Plow, W. W. Newberry..... 532,383
Pneumatic, P. Brown..... 532,058
Pneumatic tool, J. G. Carlinet..... 532,311
Poke, animal, W. J. A. Harnois..... 532,372
Portable drier, M. A. Overton..... 532,089
Post. See Fence post.
Pot and lid, T. Carame..... 532,361
Potato cutting, P. Brown..... 532,228
Powder receptacle, J. & C. M. Gillette..... 532,049
Power transmitting device, T. W. Heermans..... 532,237
Precious metals from sand, gravel, etc., apparatus for separating, P. P. Cuppin..... 532,266
Precious metals from solutions, precipitating, C. Molendauer..... 532,238
Press. See Cotton press. Hay press. Printing press.
Printing machine, G. R. Clarke..... 532,193
Printing press, multicolor, H. R. Corkill, Jr..... 532,417
Printing press, multiple, W. C. Chamberlain..... 532,026
Pulley. See Pulley.
Pulley, automatic gripping cable, J. H. Watts..... 532,349
Pulley shield, apparatus for draining submerged, J. P. Collins..... 532,028
Pulverizing machine, M. B. McLauthlin..... 532,177
Pump, R. S. Chaffee..... 532,025
Pump, J. Pender..... 532,130
Punch, portable, E. B. Cornell..... 532,285
Pycnometer support and dam, W. C. Van Vliet..... 532,120
Rack. See Hose rack.
Rail, C. Sill..... 532,203
Rail joint, A. Gudmussen..... 532,197
Railway car, gun, E. C. Cook..... 532,264
Railway conduit, electric, M. B. Barber..... 532,261
Railway conduit, electric, J. C. Love..... 532,165
Railway converter system, electric, G. W. Swartz..... 532,113
Railway danger signal, D. A. Gordon..... 532,152
Railway rail joint, Hoffmann & Friedlaender..... 532,421
Railway rail and fastening, E. C. Davis..... 532,364
Railway rails, cone or cone for meeting ends of electric, P. Rieth..... 532,185
Railway rails, etc., rolls for reducing, F. P. Maus..... 532,424
Railway signal, J. Wayland..... 532,122
Railway supply system, electric, A. G. Wheeler..... 532,126
Railway switch, R. T. Gilliam..... 532,150
Railway trolley, electric, C. Henry..... 532,200
Railway trolley, electric, J. C. Love..... 532,167
Railways, closed conduit for electric, F. Windle..... 532,302
Railways, safety device for inclined plane, P. A. Deane..... 532,083
Rake. See Hay rake.
Reel. See Clothes line reel. Wire road reel.
Refrigerator weighing and registering attachment, W. B. Dickson..... 532,034
Register. See Cash register. Message register.
Roaster. See Coffee roaster.
Roller mill feeder, J. B. Cornwall..... 532,141
Rope machine, G. L. Brownell..... 532,307
Rotary engine, H. A. House..... 532,065
Rotary engine, W. O'Brien..... 532,179
Saddle, J. A. Metz..... 532,081
Saddle, riding, J. B. Haines, Jr..... 532,419
Safety pin, G. D. Nichols..... 532,243
Salt trough, C. M. Artbur..... 532,247
Sand box spout, J. Hirth..... 532,420
Sanding machine, traverse, Taylor & Clough, Jr..... 532,348
Sash fastener, J. J. Hinkle..... 532,062
Sash lock, P. S. Riedelle..... 532,385
Saw, G. E. Boostrom..... 532,357
Saw set, C. Merrill..... 532,175
Saw tooth, M. H. Goulding..... 532,371
Scale beam computing attachment, E. W. Wise..... 532,129
Scale recording attachment, F. B. Finley..... 532,147
Scraper or excavator, M. Collins..... 532,429
Screw machine, C. M. Spenser..... 532,106
Separator. See Coal separator. Dust separator. Steam and water separator.
Sewing machine, E. H. Smith..... 532,344
Sewing machine table or cabinet, T. Kunatz..... 532,074
Shaking, settling, and compacting machine, J. Baldwin, Jr..... 532,304
Sheet metal, stamping or drawing, F. C. Bellinger..... 532,355
Shipping case and cabinet, C. Madison..... 532,279
Ships and water, means for reducing friction between, J. Thomas..... 532,220
Show case, R. Pollard..... 532,093
Sign, J. A. Daitum..... 532,092
Sign, illuminated street car, J. M. Allison..... 532,411
Signal. See Railway signal. Railway danger signal.
Single-leaf attachment, R. T. Van Valkenburg..... 532,119
Siphon furnace, Sieben & Wagner..... 532,105
Smoke consumer, G. Fox..... 532,446
Spectacle, electric, R. T. Gilberts..... 532,264
Sphere, armillary, S. M. Gibbs..... 532,370
Spike puller, F. Fowler..... 532,149
Spindles, device for tightening loose, P. S. Snyder..... 532,190
Spinning rings, manufacturing, M. D. Marcy..... 532,174

Splice, A. Davy..... 532,365
Sprinkler. See Lawn sprinkler.
Stamp, hand, J. Hoop..... 532,064
Stamper, H. Burson..... 532,223
Stapling machine, W. Brown..... 532,136
Steam and water separator, J. E. Sweet..... 532,296
Steam engine, W. D. Sherman..... 532,250
Steam generator, E. H. Moorman..... 532,084
Steam or hot water heater, D. L. Adams..... 532,014
Still, water, Jackson & Fitzgerald..... 532,372
Stocking, J. Glouton..... 532,186
Stone breaker, G. Lowry..... 532,329
Stones, making paving, A. Typit..... 532,118
Storage battery, T. A. Willard..... 532,128
Stove, cooking, S. Boal (r.)..... 11,462
Stovepipe retaining device, E. G. Lufkin..... 532,584
Street sweeper, H. Mueller, Jr..... 532,176
Surgical needle holder, L. R. Brown..... 532,306
Switch. See Railway switch.
Table. See Transfer table.
Tags to articles, instrument for wiring, W. Young..... 532,400
Tap and reamer, E. Nichols..... 532,285
Teaching embroidery or kindred arts to the blind, M. F. C. Stockmann..... 532,110
Thill coupling, L. Rawson..... 532,249
Thrashing machine and stacker attachment therefor, F. W. Robinson..... 532,428
Ticket railway, W. E. Campbell..... 532,481
Tire, wheel, T. B. Sloper..... 532,189
Tool handle fastening, D. L. & S. C. Dunlap..... 532,366
Tramway, conduit, J. C. Love..... 532,163
Transfer book, P. W. Gates..... 532,321
Transfer table, M. Rounds..... 532,397
Transom lifter, E. D. Merrill..... 532,080
Trap. See Animal trap.
Triturator, A. J. Weatherhead..... 532,254
Trolley arm, underground, P. C. Just..... 532,157
Trolley, self-adjusting, J. Cororan..... 532,031
Trolley support, L. T. Gibbs..... 532,195
Trolley wire clip, J. M. Anderson..... 532,188
Trombone, slide, S. Stephens..... 532,108
Trough. See Eaves trough. Salt trough.
Trousers stretcher, K. S. O'Keefe..... 532,334
Trunk, W. F. Miller..... 532,330
Trunk fastener, F. J. Eganer..... 532,342
Tub, clean roller, W. F. Bradbury..... 532,042
Turbine wheel, steam or gas, C. G. P. De Laval..... 532,232
Type casting and setting machine, J. C. Fowler..... 532,368
Typewriter key cushion, Graham & Savell..... 532,153
Typewriter machine, C. K. Nichols..... 532,211
Vapor generators, initial heater for, L. Flory..... 532,148
Vaporizer, retort, J. O. Peasley..... 532,018
Vaporizing and ignition device, J. Robinson..... 532,097, 532,100
Vat. See Fermenting vat.
Vehicle, electrically propelled, Baker & Elberg..... 532,016
Vehicle running gear, W. A. Sayers..... 532,342
Vehicle wheel, L. A. Sayers..... 532,342
Velocipede multiple speed gearing, F. Bower..... 532,305
Wagon, W. O. Shaubolt..... 532,216
Wagon, coal, Sagie & Taylor..... 532,289
Wagon, dumping, A. Wiemayer..... 532,301
Warp threads, apparatus for drying, G. R. Burns..... 532,262
Wash boiler, A. V. T. M. Stephens..... 532,117
Water heating and filtering apparatus, J. G. Hennes..... 532,374
Weighing and package filling machine, automatic, Dobie & Dewson, Jr..... 532,096
Well machinery, oil, C. F. Rigby..... 532,358
Wheel. See Car wheel. Turbine wheel. Vehicle wheel.
Wheel, F. Klingelbofer..... 532,159
Whiffletree, L. D. Brown..... 532,413
Whiffletree, Sholl & Schneider..... 532,251
Whiffletree book, H. P. Egeal..... 532,146
Whiffletree book, C. W. Phelps..... 532,146
Whistle, steam, F. W. Orelid..... 532,088
Window, J. K. Fagan..... 532,043
Window guard, C. E. Sowaal..... 532,294
Window platform, safety, M. Bourke..... 532,019
Wire bending machine, T. D. Alexander..... 532,410
Wire rod reel, Motrup & Madsen..... 532,019
Wire twisting machine, A. R. Tiffany..... 532,406
Wrench. See Combination wrench. Machine wrench. Tap and reamer wrench.
Wrench, J. H. Himes..... 532,061
Wrench for pipes, etc., J. C. Booth..... 532,192
Yoke, neck, W. A. Whitney..... 532,351

Advertisements.

ORDINARY RATES.

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

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

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

LATHE

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

LATHES. Shapers, Planers, Drills, Machine Shop
One of the Largest Stocks of Supplies.
Catalogue Free. SEBASTIAN LATHES CO.
120 CULBERT ST., CINCINNATI, O.

TOOLS OF ALL KINDS

CATALOGUES FREE TO ANY ADDRESS

Pumping Water by Compressed Air.

We take pleasure in announcing that by arrangements made with J. G. Pohlé, we are enabled to furnish our customers with the

POHLÉ AIR LIFT PUMP,

protected by numerous American and Foreign patents. This department of our business will be under the personal supervision of Dr. Pohlé, the inventor and patentee.

THE INGERSOLL-SERGEANT DRILL CO.
Havemeyer Building, 26 Cortlandt St., New York.

ROCK DRILLS

AIR COMPRESSORS & GENERAL MACHINERY FOR MINING, TUNNELING, QUARRY & RAILROAD WORK

RAND DRILL CO. 23 PARK PLACE NEW YORK

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

WELL DRILLING MACHINERY

MANUFACTURED BY
WILLIAMS BROTHERS
ITHACA, N.Y.

MOUNTED ON SILLS, FOR DEEP OR SHALLOW WELLS, WITH STEAM OR HORSE POWER. SEND FOR CATALOGUE. ADDRESS WILLIAMS BROS. ITHACA, N.Y.

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

OIL WELL SUPPLY CO.

Manufacturers of everything needed for
ARTESIAN WELLS
for ether Gas, Oil, Water, or Mineral Tests, Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. Illustrated catalogue, price lists, and discount sheets on request.

Pittsburg, Oil City and Bradford, Pa.
Also, 32 Cortlandt St., New York.

TYPEWRITERS.

All makes half-price. Rebuilt to equal new. Shipped without deposit to responsible parties in all parts of the world. Unprejudiced advice given. Illustrated catalogue free.

TYPEWRITER HEADQUARTERS, 45 Liberty Street, New York, U. S. A.

The Typewriter EXCHANGE,

8 Barclay St., New York.

We will save you from 10 to 30 per cent. on Typewriters of all makes.

Send for catalogue.

GREAT MINING TUNNELS.— Description of the Revenue tunnel near Ouzay, Col., constructed by the Carolina Company, on Mount Sneffels, and of the Newhouse tunnel now being driven into the mountains at Idaho Springs. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 694. Price 10 cents. To be had at this office and from all newsdealers.

IMPROVED COMBINATION DIVIDER AND CALIPER.

Can be used as a Divider, a Hermaphrodite, Keyhole, Inside and Outside Caliper.

By mail, postpaid.
4 inch.....\$2.00 8 inch.....\$2.50
6 ".....2.25 10 ".....2.75

Mechanics' Fine Tools of all kinds.

Send for Illustrated Catalogue.

Standard Tool Co., Athol, Mass.

WITH WORKSHOP EQUIPED

Without out of Barnes Wood and Metal Working
50 FOOT POWER Machinery you can successfully compete with factories that use steam power, both in quality and profit on product. The only complete line of such machinery made. Have stood the test twenty years. Send for catalogue. Address:
W. F. & JOHN BARNES CO.,
1999 Ruby St., Rockford, Ills.

ELECTRICITY

Mechanics, Steam Engineering, Mechanical Drawing, Architecture, R. R. and Bridge Engineering, Plumbing, Heating, Mining, English Branches. Send for free circular, stating subject wish to study or your address. Correspondence School of Industrial Sciences, SCRANTON, PA.

MAXIM'S FLYING MACHINE.— FULL description of the remarkable apparatus which Mr. Maxim recently propelled through the air with marked success. With 12 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 976. Price 10 cents. To be had at this office and from all newsdealers.

TURBINE WATER WHEELS.
Send for Pamphlet.
JAMES LEFFEL & CO.,
Springfield, Ohio, U. S. A.

CARBORUNDUM

HARDEST ABRASIVE KNOWN. EMERY AND DIAMOND POWDER SUBSTITUTE. IN FLOUR, POWDER, CRYSTAL, WHEEL, SLAB AND HONED FORM.
CARBORUNDUM CO., MONROVIA, CALIF., U. S. A.

If you want the best Lathe and Drill

GNUCKS

BUY WESTCOTT'S Strongest Grip, Greatest Capacity and Durability, Cheap and Accurate.

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

ICE-BOATS—THEIR CONSTRUCTION

and Management. With working drawings, details, and directions in full. Four engravings, showing mode of construction. Views of the two fastest ice-sailing boats used on the Hudson river in winter. By H. A. Horsfall, N.E. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 214. Price 10 cents. To be had at this office and from all newsdealers.

Architectural Books

Useful, Beautiful and Cheap.

Any person about to erect a dwelling house or stable, either in the country or city, or any builder wishing to examine the latest and best plans for a church, school house, club house, or any other public building of high or low cost, should procure a complete set of the ARCHITECTS' AND BUILDERS' EDITION OF THE SCIENTIFIC AMERICAN.

The information these volumes contain renders the work almost indispensable to the architect and builder, and persons about to build for themselves will find the work suggestive and most useful. They contain colored plates of the elevation, plan, and detail drawings of almost every class of building, with specification and approximate cost.

Seventeen bound volumes are now ready and may be obtained, by mail, direct from the publishers or from any newsdealer. Price \$2.00 a volume. Stitched in paper covers. Subscription price, per annum, \$25.00. Address and remit to

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

MILLER & VAN WINKLE

STEEL WIRE AND STEEL SPRINGS

TEMPERED STEEL WIRE
TEMPERED COMPRESSION & EXTENSION SPRINGS
A SPECIALTY.
MACHINERY SPRINGS

OFFICE & WORKS 18 to 24 BRIDGE ST. BROOKLYN, N.Y.

NOW READY!

Fourteenth Edition of Experimental Science

A GREAT BOOK FOR THE HOLIDAYS.

EXPERIMENTAL SCIENCE.

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

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

840 pages, 782 fine cuts, substantially and beautifully bound. Price in cloth, by mail, \$4. Half morocco, \$3.50. Send for illustrated circular.

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