

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.

- Marine Iron Works. Chicago. Catalogue free.
- For logging engines. J. S. Mundy, Newark, N. J.
- "U. S." Metal Polish. Indianapolis. Samples free.
- Gasoline Brazing Forge. Turner Brass Works. Chicago.
- Yankee Notions. Waterbury Button Co., Waterbury, Ct.
- Machinery designed and constructed. Gear cutting. The Garvin Machine Co., Spring and Varick Sts., N. Y.
- FERRACUTE Machine Co., Bridgeton, N. J. Full line of Presses, Dies and other Sheet Metal Machinery.
- Watch and Clock Tools, Small Automatic Machines, Punches and Dies, etc. Waltham Machine Works, Waltham, Mass.
- The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street. New York.
- 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.
- 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 Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication. References to former articles or answers should give date of paper and page or number of question. Inquiries not answered in reasonable time should be repeated: correspondents will bear in mind that some answers require not a little research, and though we endeavor to reply to all either by letter or in this department, each must take his turn. Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same. 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.

(7542) J. D. asks: How many pounds of compression is required to the inch to make liquefied air? A. No amount of compression will liquefy the air, unless it is at the same time cooled to at least 220° Fah. below zero. When cooled to this temperature, a pressure of 565 pounds to the square inch is required to liquefy it. In practice a pressure of from 2,000 to 2,500 pounds per square inch is employed.

(7543) Q. writes: 1. I have a battery composed of four Edison-Lalande cells. What charge should be used in the cells? What E. M. F. should each cell have? What internal resistance should each cell have? A. The Edison-Lalande cell is charged with a 25 per cent solution of caustic potash in water, or one pound of caustic potash to three pounds of water. The E. M. F. of these cells is about seven-tenths of a volt. The internal resistance varies with the different forms from 0.02 ohm to 0.5 ohm. 2. What voltage should it take to electrolyze, at a fairly rapid rate, water, hydrochloric acid, copper sulphate, sodium chloride, sodium sulphate? A. All these substances will be decomposed at a fairly rapid rate with any voltage above 20 volts. 3. Where should one be able to procure, in Canada, sticks of commercial zinc about 6 inches long and 3/4 inch in diameter, and suitable for use in home-made Bunsen cells? A. Zinc rods of this size must be made on special order. Address any dealer in metals. We should advise you not to use a large rod of zinc in a Bunsen cell, but either a plate bent into a cylinder or a Daniell's zinc. For these address any dealer in electrical supplies in our advertising columns. 4. Is there any relation between (a) hardness and density, (b) hardness and ductility, (c) density and ductility? A. No relation is known between these dissimilar properties of matter.

(7544) C. T. P. asks: 1. Would good Lowmoor iron forgings be better for the field magnets of the simple electric motor described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641, than the Russian iron and have them jointed at each end? A. Any good soft wrought iron may be used for the field of the dynamo of SUPPLEMENT, No. 641. Cast iron can be used, but the dynamo will then have only one-half the output which it will have if wrought iron is used. 2. Please give the voltage and amperage of 8 cells of plunging bichromate batteries. A. The working voltage of the bichromate cell averages about 1.8. Eight cells will then have about 14 volts. The current on short circuit is very large, but drops rapidly. No figures can be given for every case, since so many factors enter into the problem: freshness and strength of solution, distance between plates, conditions of zincs. Four amperes is perhaps a fair figure on an ordinary circuit. 3. How large a storage battery would be required to give the same voltage and amperage and how to make one, and the difference in the cost of them. A. You will need the same number of storage cells as of potassium bichromate cells. A charging battery will also be required. The cost of both will be much greater than of one alone. A form of storage cell is described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 845, price 10 cents.

(7545) F. B. F. writes: 1. I have a motor made from the drawings and specifications in the SUPPLEMENT, No. 641, which I wish to convert into a dynamo. What size wire and what quantity will it require on the field magnets? Also what size wire and what quantity and what style of armature will produce a current of 60 volts? A. There seems to be a confusion of ideas here. To convert the motor of SUPPLEMENT,

No. 641, into a dynamo is one thing, to build a dynamo from the sketch inclosed is quite another thing. First, to convert the motor, connect to some source of power and run it up to full speed. In case it does not generate current, disconnect the field circuit and excite the field by a battery. Such small machines are quite likely not to be self-exciting. Second, it is not well to attempt to build a dynamo from your sketch. It is not well designed. The cores of field magnets are 3/4 by 1 3/8 inches, having only 1/2 square inch area of cross section. Quite too small. The space left for a spool and wire is only 3/8 inch by 2 1/4 inches, too small for a winding for 50 volts. The pole pieces are much too heavy for the other parts, and the armature space too large. 2. How many, if any, 50 volt 16 candle power incandescent lamps will it light? What speed will it be required to run it? A. Your expectations in question 2 as to output are quite too large. Such a machine will not light any 16 candle power 50 volt lamps. It might be wound to light a few 6 candle power low voltage lamps. A dynamo which is only 10 inches by 5 inches by 2 1/4 inches cannot furnish a heavy current. You cannot produce a 14 candle power lamp which can be lighted with one ampere at 14 volts. Three and four volts per candle is about as well as any one can do now. Our advice would be to find a plan fully developed for a dynamo which will do the amount of work you need to have done. You can light 8 to 10 lamps of 16 candle power with one horse power. 3. What size and what quantity of wire will it require on armature and field magnets to produce a current that will light 14 candle power 14 volt 1 ampere incandescent lamps, and how many will it light? At what speed will it be necessary to run the dynamo? A. There is a book giving plans for several sizes of dynamo from 1/2 horse power to a 20 light machine by Edward Trevert. This we can send you for \$2.50 by mail.

(7546) J. E. D. writes: 1. Treating on the velocity of falling bodies, Avery's "Physics," on page 107, example 53, statement is made as follows: "From an upper window drop simultaneously, from each hand, an iron and a wooden ball, both of same size, but varying in weight, and observe that both reach the ground practically at the same time." A. The statement quoted above is the theoretical statement usually found without qualification in elementary text books of physics. For small, compact masses of heavy material, such as stone and common metal, falling not more than 200 feet in the open air the actual velocity acquired agrees very closely with that given by theory. 2. Will you kindly give formula governing a lead ball weighing ten pounds, and a wooden ball of same size weighing one pound, dropped from an altitude of 1,000 feet where air pressure is fifteen pounds per square inch at ground? Kindly dilate upon theory, for there is a diversity of opinion here. A. When two bodies of the same size but of different weight fall through the air, the air resists motion unequally. The same laws of pressure which apply to a body at rest, against which the wind blows with a certain velocity, apply to these bodies. Since the same pressure is produced by a body moving against air at rest, as by the air moving with the same velocity against a body at rest. The formulas asked for are those for wind pressure against structures as given in works on engineering. The surface pressed upon is the area of the equator of the ball. The mean velocity of a falling body is the velocity at the middle of the time of its descent. The mean resistance of the air is that due to this velocity as per tables given in engineer's pocket books. This multiplied by surface pressed upon gives total resistance. The difference in air pressure for 1,000 feet is one-half pound per square inch. After all calculations and allowances have been made, the calculated result will probably differ widely from the result of experiment, just as the calculated wind pressure for a bridge differs widely from the real pressure. Nor are there any experimental results to be had. There is no place on the earth where a ball can be dropped in open air 1,000 feet. The Eiffel Tower is nearly this height, being 300 meters. Balls dropped down the shafts of mines nearly realize the conditions imposed.

(7547) W. J. K. asks: 1. What kind of lead is used for storage battery plates, cast or rolled? A. The plates of accumulators are of cast lead. 2. If litharge is used to coat the plates, how long will it take the plates to "form" so that they can be used? A. The length of time depends on the size of plate and strength of charging current, but it is always a number of hours. 3. If the cell is left uncharged, how will it be affected? A. The cell is rapidly destroyed. 4. If it is left charged, how will it be affected? A. If a cell is left charged or uncharged for any length of time without using it, a hard insoluble sulphate of lead is formed which hinders the action, uses up active material, and tends to disintegrate the plate. 5. Does the liquid in the cell ever have to be renewed? A. The sulphuric acid is not used up in the action of the cell, but remains and is used over and over again. 6. How can you tell when the cell is fully charged? A. A cell is charged to 2.5 volts charge till gas is given off rapidly from the plates. 7. About how many amperes will a cell give having five plates, each 3 inches by 1 inch? A. About six-tenths ampere.

(7548) G. H. F. asks: Will the heater described in SUPPLEMENT No. 1112 work on alternating current? A. Certainly. One sort of electric current may be transformed into heat as well as another. The heating effect of a current is proportional to the square of the current in amperes and to the resistance in ohms, or, expressed in letters, to C²R.

(7549) J. R. C. writes: Please give something of the construction of a repeating coil. Such as used in connecting a ground circuit with metallic telephone circuit. A. A repeater coil is an induction coil whose two windings are put on together and are of equal length. One of the windings is used to complete the metallic circuit, the other to connect between the subscriber's wire and the ground, so as to complete his circuit without grounding the metallic circuit. Various sorts and modifications of this can be found in Poole's Telephone Handbook, price \$1.50 by mail.

(7550) C. O. H. writes: 1. I am about to make a new armature of the drum type for motor 641, as I think it will have double the efficiency with the same amount of wire. How many wrought iron rings would be best to use and of what thickness? A. The best thing to do is to buy armature disks punched for

the purpose with projections making grooves into which the coils are wound. These disks are about 3/8 inch thick. The armature will then be built as shown in SUPPLEMENT No. 600, price 10 cents. With paper disks alternating with the wrought iron disks, the armature core should be a little longer than the width of the pole pieces. 2. If practical, I should like to get 110 volts from it when run as a dynamo. Then what size wire should I use and how many layers? A. For 110 volts, use No. 30 A. W. G. single covered wire on armature and No. 28 A. W. G. single covered wire on fields, winding the coils to same size as in original form. 3. Should it be wound in twelve or more sections? A. Twelve is a good number of sections for the armature.

(7551) T. E. says: 1. I intend to make a storage battery of six cells, having a capacity of 100 ampere hours to each cell. They will be made on the Faure system. What would be the highest amperage that could be used in charging them (without injury)? A. Use 6 to 8 amperes per square foot of surface of positive plates, reckoning both sides in charging a storage battery. 2. How many hours would they run four 8-candle power lamps? A. To find the hours, multiply the amperes required for each lamp by 4 and divide the 100 ampere hours by this number. 3. Of how low voltage can a 16-candle power lamp be had? A. Sixteen-candle power lamps are usually made for 100 or for 50-volt circuits. With six cells you will not be able to use a light of more than 10 volts, and to obtain 16-candle power would require 5 to 6 amperes. No incandescent lamp is made to carry so large a current. 4. Does a dynamo and storage battery work well in a low temperature, such as 20 degrees below zero? A. We know no reason why a dynamo should not work just as well at the north pole as anywhere else. The liquid of a storage battery will not freeze at 20 degrees below zero, and the battery will work as long as the liquid is unfrozen.

(7552) W. M. P. asks: 1. How can I change the current of a small magneto (10,000 ohms) so as to get an even and smooth current as from batteries? A. By running it so fast that the impulses of the current are as rapid as those from the battery, which, we hardly need to say, cannot be done. 2. Would it strengthen the current any in a dynamo (110 volts) to excite the fields separately? A. Yes; by just the amount of current which the resistance and self-induction of the field uses up. It is, however, cheaper to furnish this current from the dynamo itself than to provide it from some separate source, if the dynamo gives a direct current. If the dynamo is alternating, it must be separately excited. 3. I have a small one-quarter horse power motor, but do not know how many volts it is wound for. The fields are composed of a large iron ring and there are four places for windings. In each place is wrapped two layers of No. 20 wire. The armature is composed of an iron ring, with eight parts, and is wrapped with No. 24 wire. There is an additional part to the fields which fits inside the armature which looks like a two pole armature, but is fastened to the base. How could I change the windings on this motor so as to run it on a 10 volt current? 4. I have the castings for a small dynamo or motor field, have place for but one winding, and this is 1 1/2. What size wire should I use to make this a dynamo and what to make it a motor? (The armature is a three pole one.) A. Get someone to measure the machines for you and calculate the necessary alterations. These questions illustrate what we are receiving every week—questions which cannot be answered because sufficient data are not given. 5. Is there any way to make a + magnet and a - one? I mean by putting a current into it so that you can shut it off whenever desired. A. No; a positive pole cannot be produced without a minus pole. 6. What use is a condenser to an induction coil? A. To give strength and efficiency to the discharge. 7. What is the difference between a spark coil and an induction coil? A. A spark coil has but a single winding through which the current flows and which gives a spark on breaking the circuit. The induction coil has two windings, and a current is obtained from the secondary whenever the current is made or broken in the primary. 8. Also, how and what is a step up transformer and a step down transformer, and what is the difference? A. By a step up transformer the voltage of a current is raised and by a step down transformer it is lowered. Both are induction coils. We would recommend to you the purchase of Hopkins' Experimental Science, price \$4 by mail, and of the Electrical Library, price \$5 by mail. From such books you can obtain the answers to such questions as the above, besides much other valuable information.

(7553) E. F. S. writes: For reply to question how to make an electric heater, you give me amount and size of wire to connect to arc light circuit. What I wanted was something to connect to ordinary incandescent circuit, even if the heating capacity is very small. A. The directions for an electric heater are the same, for any sort of circuit, arc or incandescent, direct or alternating. Divide the voltage of the circuit by the number of amperes desired and the quotient is the number of ohms of resistance which must be used. The quantity of wire can then be found from tables. If German silver is used, only one-thirteenth as much wire is needed as for copper. If iron is used, take twice as much as of German silver.

(7554) W. B. B. writes: 1. I am building the simple motor described in SUPPLEMENT No. 641. Where shall I connect the battery to the machine, Fig. 9? A. Connect the battery to the binding posts, g and g', in Fig. 9. 2. Please state how to make the battery to run the motor. A. You will find a battery especially adapted to such work as running this motor fully described, with drawings, in SUPPLEMENT No. 792, price 10 cents by mail.

(7555) M. L. asks: What is the meaning or derivation of the word "Breguet," used in describing certain watch movements—as "Breguet hair spring." The word is, of course, French, and cannot be found in dictionaries. A. "Breguet" is the name of a man, a Swiss watchmaker, Abraham Louis Breguet, born 1747, died 1823. See Webster's Dictionary, biographical section. His name is connected with his inventions.

(7556) A. C. S. writes: In your issue of November 19, under Notes and Queries in answer to H. J. L., you stated that the alternating current taken

from the street line can be changed into a direct current by the use of a rotary transformer. Will you please publish in your paper for the benefit of the readers how such a transformer can be made? A. A rotary transformer is a motor and dynamo working together. It is used when a direct is to be changed to an alternating current or the reverse. The current to be transformed is used to drive the motor part and the motor drives the dynamo portion to generate the current desired. As the machine is usually built, only one field winding is used, but a double winding is put upon the armature, one of which is the motor circuit and the other the dynamo. We have not published the design for any such machine. A design is needed for each voltage to which the current is transformed. The company supplying the main current should be applied to for such transformers.

(7557) J. L. B. asks: 1. Can you furnish me with a process of cutting an oval-shaped hole from a plate of double thickness glass, without boring? A. A hole is first to be drilled through the glass with a corner of a file wet with camphor dissolved in turpentine. The plate should rest firmly on a small block of wood directly under the point of the tool, in order to avoid fracturing the glass. When the hole is drilled through it may be enlarged by a round file, wet in the same liquid. If the hole is to be quite large, it can be worked out to its full size by a hot iron, carefully used, cutting a narrow piece, each time starting from the hole and leading the crack into the hole a quarter way around. Patience and experience will, in time, enable you to do a good job. Don't try a plate of any value at first. 2. May the primary of an induction coil be made by using a spark coil? A. It might answer for a small coil, but you had better build your primary up, adapting it to the secondary.

TO INVENTORS.

An experience of 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 unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

JANUARY 3, 1899,

AND EACH BEARING THAT DATE.

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

Advertising apparatus, C. A. Rollason et al.	616,975
Air purifying and ventilating system, W. S. Whitner	616,977
Air tight lid, F. W. Forster	616,990
Alarm. See Bicycle alarm.	
Animal trap, J. H. Hoover	617,160
Auger, earth, Isgrig & Phares	616,928
Ball pedaling brake, V. E. Doremus	616,907
Baking pan, cake, V. D. Allen	616,871
Bale tie making machine, Manville & Weeks	617,253
Barrel pitching machine, E. Rau	617,185
Battery. See Storage battery.	
Bearing, ball, O. C. Knipe	616,941
Bearing for wheels for agricultural machines, E. J. Corser	617,143
Beating apparatus, R. A. Gipple	617,093
Bed bottom, spring, E. J. Antoni	616,874
Bell, bicycle, A. W. Barton	617,220
Bell, bicycle, W. A. Butler	616,833
Bell clamp, bicycle, G. W. Eddy	617,240
Bending machine, C. Seymour	617,195
Bicycle, F. P. Bemis	617,273
Bicycle, M. L. Nichols	616,957
Bicycle alarm, G. F. Hall	617,013
Bicycle brake, A. M. Cushing	616,916
Bicycle brake, Moorhouse & Turner	617,037
Bicycle driving gear, A. Gower	617,095
Bicycle folding basket attachment, McDonald & Norton	617,117
Bicycle fork crown, C. H. Smith	616,980
Bicycle parasol attachment, Harrison & Brown	617,036
Bicycle saddle, T. B. Beck	617,140
Bicycle safety attachment, Wilkins & Moore	617,136
Bicycle support, E. Koehler	617,028
Bicycle support, J. Leach	617,171
Bicycle valve, C. W. Beman	617,231
Billiard cue chalker, C. A. W. & D. Devore	617,272
Billiard cue holder, F. Beattie	617,221
Blender, temper, Watters & Gould	617,036
Box, clover or flax attachment for self, W. Bauer	617,073
Bitumen from sand, method of and apparatus for extracting, A. S. Cooper	617,226
Boiler. See Steam boiler.	
Bolt holder, D. S. Shumate	617,129
Bone black, revivifying, C. Catlett	617,080
Bone black substituting and method of manufacture, C. Catlett	617,079
Bottle, S. E. Wharton	616,996
Bottle, non-refillable, J. R. Lavender	616,944
Bottle stopper, C. O. Rokoten	617,125
Box. See Clothes pin box.	
Brace. See Mining brace.	
Bracket, F. S. Jewett	617,164
Brake. See Back pedaling brake, Bicycle brake, Car brake, Electromagnetic brake, Wagon brake.	
Brake apparatus, J. J. Kennelly	616,933
Bridge, movable, C. L. Strobel	617,201
Bride bit holder, G. Schneider	617,300
Buckle, J. Polka	617,189
Buoy, electric, E. W. G. C. Hoffmann (reissue)	117,706
Burial structure, H. M. Hunter	617,161
Burner. See Gas burner.	
Burner, W. R. Jeavons	617,291
Burner, Lannert & Jeavons	617,243
Burner attachment, B. Strauss	617,200
Button loop, J. Blumenthal	617,074
Calculating machine, H. Goldman	617,044
Callipers, J. H. Culver	617,082
Camera, magazine, A. L. Adams	617,268
Camera, magazine, A. Angel	617,215
Can opener, A. Pass	617,257
Cans, pitchers, etc., closing device for, J. Gawron	616,913
Cane wagon, sugar, M. R. Spelman	617,198
Canopy, head, S. Crocker	616,943
Car, air storage motor, R. Hardie	616,922
Car brake, S. Stitts	617,183
Car coupling, M. M. Bishop	616,881
Car coupling, E. C. Washburn	617,134
Car roof, double, C. H. Hutchins	617,284
Carding engine, dividing apparatus, A. Lejeune	617,286
Carriage top storm curtain, J. T. Lawless	617,294
Case. See Show case.	
Casein with lithium salts, composition of, G. Wentz	617,210
Cement, treating blast furnace slag for, A. D. Ebers	617,241
Centrifugal machine, T. Henderson	617,153
Chair. See Wheeled chair.	
Chuck, E. Marcellie	617,113
Cigar band, A. E. Morris	617,245
Circuit closer, J. D. Garlock	617,287
Clamp. See Self clamp, Cultivator shovel clamp, Jointing clamp.	
Clevis for regulating plow furrows, J. H. Nelson	616,953
Clevis, singletree, G. Thorsen	617,254
Clock bell, alarm, W. E. Porter	617,194
Clothes drier, J. H. Beardsworth	616,840
Clothes line, E. Gilman	617,155
Clothes pin box or holder, R. C. Darnes	617,284
Clutch, friction, H. W. Hill	617,088
Compass, beam, F. A. Hannah	617,011
Concrete breaking machine, Fairchild & Wilton	617,310
Cone and ball bearing, King & Egan	616,937

Conveyer drive chain, A. R. Anthony..... 617.137, 617.138
Cup & gress, C. S. Phelps..... 617.042
Corks, machine for reshaping crown, H. W. Campbell..... 617.277
Corn popper or coffee roaster, rotary, S. P. Pickett..... 616.964
Cotton gin grid, M. D. Darovalva..... 617.220
Counter and shelving, movable combination, D. Hunt..... 617.021
Coupling, see Car coupling, Thrill coupling, Vehicle coupling.
Craie, H. Sawyer..... 617.051
Crate, egg, R. E. L. Gray..... 617.011
Crushing or grinding mill, F. Hamachek..... 616.921
Cuff fastener, F. A. Bagley..... 617.304
Cultivator, J. H. Pattee..... 616.983
Cultivator, W. Ratchiff..... 616.971
Cultivator, N. O. Starks..... 616.966
Cultivator, C. Tanner..... 616.991
Cultivator, riding, J. H. Pattee..... 616.960
Cultivator shovel clamp, R. H. Avery..... 617.217
Curtain pole, window, B. B. Taylor..... 617.203
Cutter head, W. H. Chaffee..... 616.898
Cycle chain cleaner, J. C. Conn..... 617.224
Cycle saddle support, W. B. Wilberforce..... 617.000
Damper, stove, A. Ohnemus..... 617.256
Dental forcep jints, guard for, J. A. Gholson..... 617.247
Detector..... See Fire damp detector.
Disinfecting apparatus, C. J. Wallz..... 616.994
Door, W. D. Plue..... 617.120
Door check, I. Larsen..... 617.106
Door closer, Hogan & McMahon..... 617.159
Door hanger track, L. A. Kirk..... 617.027
Door or gate fastener, E. Aldry..... 616.877
Door or like hook, D. Taylor..... 616.992
Door, storm, O. Cobb..... 617.308, 617.309
Dowel for conduit pipes, S. Carroll..... 616.895
Draught rigning, J. A. Pilcher..... 616.965
Drier..... See Clothes drier.
Drying apparatus, W. J. M. Dobson..... 617.148
Drill..... See Grain drill.
Dumb waiters, automatic lock for, G. Seaberk..... 617.194
Electric conductor support, J. M. Andersen..... 616.872
Electric current supply, etc., apparatus for, Preston & Gill..... 617.121
Electric elevator, J. B. See et al..... 617.128
Electric furnace, J. A. Deuther..... 616.906
Electric machines, means for cooling dynamo, Von Siemens & Rottb..... 616.979
Electric motor, C. R. Meaton..... 617.114
Electric switch, O. H. Schuck..... 617.193
Electric switch, pilot break, Bossert & Holton..... 617.275
Electrical apparatus, J. T. Williams..... 617.017
Electrical conduits, pilot wire rod for, J. Arnot..... 617.216
Electrical distribution system, S. Kirlin..... 617.165
Electricity from machinery of locomotive, means for generating, H. F. Roach..... 617.187
Electrode for storage batteries, tubular, T. A. Willard..... 617.003
Electrode, storage battery, T. A. Willard..... 617.004
Electrodes, means for producing battery, T. A. Willard..... 617.002
Electromagnetic apparatus for actuating mechanism, S. H. Hodgson..... 617.099
Electromagnetic brake, F. C. Newell..... 616.956
Elevator, See Electric elevator.
Elevator, E. M. Fraser..... 617.305
End gate fastener, M. T. Koch..... 617.104
Engine, See Carding engine, Gas engine, Rotary engine, Steam engine.
Engine, O. P. Hartman..... 617.249
Exhibitor and protector, window shade, T. H. Maytag..... 616.950
Eyeglass attachment, C. A. Ethington, Sr..... 617.242
Eyeglasses or spectacles, mounting for rimless, J. Currin..... 616.904
Fare register, H. G. Hartman..... 616.932, 617.269
Fastener stud member, separable, G. E. Adams..... 617.151
Feeding machine, H. P. Feister..... 616.970
Fence, C. J. Quinn..... 617.001
Fence machine, wire and picket, J. R. Jones..... 616.930
Fence wire, J. M. Deming..... 617.084
Ferrule, screw, J. A. Joans..... 616.929
Filter, refining vegetable, B. S. Summers..... 616.988
Filter, faucet, W. H. Vance..... 617.133
Filter for conductor pipes, A. Martin..... 617.032
Filter, water, O. E. Nickey..... 617.177
Fire and steam engine, hydrant, P. Eley..... 617.099
Fire damp detector, G. A. Lyncker..... 617.111
Fire engine use, harness support for, C. C. Rogers..... 617.188
Fireproof door for theaters, F. S. Steward..... 616.987
Fishing tackle, O. T. Dougherty..... 617.236
Floor covering fastener, J. K. Thoma..... 617.204
Flooring, machine for makintongue and groove, G. Johnson, Jr..... 617.023
Flour, etc., manufacture of, E. B. Watson..... 617.266
Flower pot, M. L. Price..... 616.968
Flower stand, A. H. Freese..... 617.050
Fly paper holder, Fernald & Kerten..... 617.243
Fruit from shipment, method of and device for preserving, S. R. Divine..... 617.235
Fruit picker, H. W. Propst..... 617.258
Furnace, See Electric furnace, Roasting furnace.
Furniture, store, Kleiner & Parkinson..... 617.292
Fuse, combined time and percussion, J. A. Walsh..... 617.265
Game, C. E. Gibbs..... 617.306
Game apparatus, ball, Neely & Bradt..... 617.297
Game counter, Markgraf & Boemermann..... 617.174
Gas burner, incandescence, C. S. Pinkham..... 617.044
Gas engine, G. M. G. S. Bunker..... 616.889
Gas generator, acetylene, F. E. Bunde..... 617.246
Gas generator, acetylene, J. L. Gebhart..... 617.262
Gas or vapor burners, automatic cutoff for, C. Barmann..... 617.271
Gas pump or compressor, Smith..... 617.025
Gas vending machine, J. Green..... 616.914
Gearing, chain, J. Haider..... 616.919
Generator, See Gas generator.
Generator, F. J. Furman..... 617.092
Gong, electromechanical, C. E. Beach..... 616.879
Gracie delimeter, Watson & Sawtelle..... 616.878
Grave cover, H. D. Cameron..... 616.894
Grease tr. W. H. Sieben..... 617.057
Grain drill, G. W. Kirkpatrick..... 617.102
Grinding or polishing knife blades, razors, etc., machine for, C. F. Ern..... 616.909
Guitar and mandolin, combined, J. Englund..... 616.956
Hammer, power, H. Whomes..... 616.986
Handle, See Tool handle.
Handle, W. Klein..... 617.108
Hanger, See Sash hanger, Soap hanger, Trousers hanger.
Harness tether, A. E. Lyan..... 617.109
Harrow cleaner, spading, Anderson..... 617.070
Harrow, revolving, F. Tiemann..... 617.063
Harvester, potato, J. P. Brennan..... 616.885
Hatters' kettles, device for cleansing, J. E. Mor-ton..... 617.296
Hay or manure carrier, C. Malmquist..... 616.944
Hay tedder, J. A. Swanson..... 617.202
Head rest, H. M. Joss..... 617.025
Heater, See Kiln heater, Tire heater.
Heel trimming machine, A. McDowell..... 617.038
Hinge, detachable, J. H. Morrison..... 616.922
Hinge detacher, J. H. Phifer..... 617.043
Hox ring, A. Deerwester..... 617.146
Hoisting trip and sling, E. W. Wiley, Jr..... 617.267
Hook, See Door or like hook, Singletree hook, Snap hook.
Horse boot, J. Galpin..... 617.153
Hydraulic jacks, J. W. Burkhardt..... 617.135
Indicator, See Station indicator.
Insecticide and making same, C. E. Hore..... 617.020
Insulating arm, J. D. Talfierro..... 617.062
Iron, See Sad iron.
Jack, See Hydraulic jack, Trip jack.
Jar closure, G. W. Burkhardt..... 616.890
Joining clamp, N. Roberts..... 617.123
Joints for tubular articles, machine for making, J. N. Halifax..... 616.920
Kiln heater, G. W. Soule..... 617.260
Kittling machine, J. F. Nelson..... 617.039
Label holder, F. P. Mensch..... 616.951
Lamp, acetylene generating, H. Oehl..... 617.041
Lamp, cupola tall, E. S. Piper..... 616.966
Lamp holding device, adjustable, M. M. Parvin..... 617.179
Lathe attachment for cutting irregular forms, J. P. Brophy..... 616.887
Leg, artificial, Andrews..... 616.873
Level, ditching, S. Garner..... 616.912
Lever arms to their shafts, means for securing, A. J. Robinson..... 617.124
Light wells, means for closing, M. H. Crittenden..... 616.902
Lightning arrester and fusible cutoff, combined, Lawton & Wilcox..... 617.170
Line liquor, apparatus for making bisulfite of, V. Drewsen..... 617.237
Liquid cooling apparatus, G. A. Barnard..... 617.218
Liquid distributor, J. W. Tallmadge..... 616.990
Liquids from solids, apparatus for separating, Koneman & Hartley..... 617.029
Lock, See Sash lock.
Locomotive, compound, S. H. Dunning..... 617.238
Loom, W. S. Thomas..... 617.311
Loom battens, means for securing shuttle blocks to, O. W. Schaum..... 617.191
Loom let-off motion, wear, Power & Ball..... 617.045
Loom pattern arresting mechanism, G. F. Hutchins..... 617.200
Mandolin, F. Isbell..... 617.250
Manual power press, Dewes & Shedlock..... 617.147
Matting, A. Buchwalder..... 617.076
Mattress, wire, J. M. Mer..... 617.173
Measuring machine, rope, E. G. Chilton..... 617.300

Hope-fisements.

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.



WOOD or METAL WORKERS
without steam power can save time and money by using our
Foot and Hand Power Machinery
SEND FOR CATALOGUES—
A—Wood-working Machinery.
B—Lathes, etc.
SENECA FALLS MFG. COMPANY,
695 Water St., Seneca Falls, N. Y.



POWER & FOOT LATHES SHAPERS, PLANERS, DRILLS, MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES. CATALOGUE FREE
SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINNATI, O.

Foot Power and TURRET LATHES, Planers, Shapers, and Drill Presses.
SHEPARD LATHE CO., 133 W. 2d St., Cincinnati, O.

Walworth's Solid Die Plate

The Standard
Price List on application to
WALWORTH MFG. CO., 20 Oliver St. BOSTON, MASS.

HIGH GRADE WOOD WORKING MACHINERY

Single Machines or Complete Equipments for Any Class of Work.
Your Correspondence is Solicited.
Illustrated Matter and Prices on application.
J. A. FAY & CO.
10-30 John St., CINCINNATI, OHIO

WORK SHOPS

of Wood and Metal Workers, without steam power, equipped with
BARNES' FOOT POWER MACHINERY
allow lower bids on jobs, and give greater profit on the work. Machines sent on trial if desired. Catalogue Free.
W. F. & JOHN BARNES CO.
1999 RUBY ST., ROCKFORD, ILL.



PATENTED HOLDERS and INSERTED CUTTERS for Turning, Forming, Boring, Threading, Boring, Cutting-off and Knurling. Time and stock saved in forging, and grinding made easy by these constructions.
Ask for Patent Tool Holder Catalogue.
The Pratt & Whitney Co., Hartford, Conn., U. S. A.

ROUND OR SQUARE BASE SKINNER

Improved PLANNER CHUCKS. Heavy, strong accurately made. Greater capacity than any other chuck. Set screws of crucible steel. All nuts case-hardened. Drop forged steel wrench with each chuck. Holds straight or tapered work. Can be instantly adjusted from 0 to greatest capacity.
SKINNER CHUCK CO., Church St., New Britain, Conn.

THE OBER LATHES

For Turning Axe, Adze, Pick, Sledge, Hatchet, Hammer, Auger, File, Knife and Chisel Handles, Whitfield, Yokes, Spokes, Porch Spires, Stair Balusters, Table and Chair Legs and other irregular work.
Patented. Send for Circular A.
The Ober Lathe Co., Chagrin Falls, O., U. S. A.

GET THE RIGHT ANGLE

The easiest method of ascertaining the proper angle required in any work, is to use our
ANGLE INDICATOR,
which can be used in connection with a universal bevel for transferring any given angle. It is as accurate as our Micrometer Protractor. In degrees, not made in minute. Nicely graduated from 0 to 90, and well finished. Every mechanic, carpenter, machinist, tool-maker, cabinetmaker, draughtsman and tinsmith should own one. It is an indispensable tool to all using angles. Can be used for lathe work without the bevel. Price \$1.
J. Stevens Arms & Tool Co., Chicopee Falls, Mass., U. S. A.

JUST WHAT EVERY YOUNG ELECTRICIAN WANTS!

THE MODEL DYNAMO-MOTOR.
Will Decompose Water, Do Electro Plating, Light Incandescents, Lamp ps, Run Machinery, etc.
Send 2c. stamp for illus. catalogue.
Elbridge Electrical Apparatus Co., Elbridge, N. Y., U. S. A.

THE HARRINGTON & KING PERFORATING CO.

LARGEST MANUFACTURERS IN THE WORLD OF PERFORATED METALS
STATION F CHICAGO, U. S. A.

Mechanical movement, Z. T. Furbish..... 616.911
Merry-go-round, R. H. Hanskey..... 616.923
Metal bar straightening machine, L. H. Brightman..... 617.253
Metal calking tool, J. F. Schlick..... 617.054
Metal working machines, tool holder for, J. J. Dahl..... 617.008
Metals and ores, electrolytic apparatus for treating, C. D. Burton..... 616.891
Microscope, Bausch & Lombier..... 617.007
Mill, See Crusbink or grinding mill, Windmill.
Mining brace, D. Jacobs..... 617.163
Minnow bucket and trap, combined, S. Heberling..... 616.924
Motor, See Electric motor.
Motor force, means for converting heat into, Argens & Brun..... 617.032
Mowergrass catcher, lawn, O. A. Young..... 617.006
Mule, self-acting, J. Kamden et al..... 617.045
Nail, hook, or staple, H. Traun..... 617.094
Nail making machine, G. Goddu..... 616.918
Nail making machine, G. Goddu..... 616.918
Necktie holder, circular button combined, Austin & Crow..... 616.876
Night soil, etc., apparatus for destruction of, J. H. Mitchell et al..... 617.254
Numbering machine, W. W. Sawyer..... 617.052
Nut lock, T. Harding..... 617.015
Nut lock washer, L. E. Ely..... 616.963
Nut tapping machine, Carter & Wright..... 617.078
Ordnance breech mechanism, M. A. Lynch..... 617.110
Ore grinder and amalgamator, J. Gerstle..... 616.915
Paint sample, S. D. Pierce..... 617.119
Pan, See Baking pan.
Pan lid, frying, J. A. Bowers..... 616.883
Paper, wrap, M. Kinnard..... 616.939
Pen yielding support, J. J. Jones..... 616.931
Pencils, penholders, etc., combination attachment for, W. W. Dodge..... 617.149
Perforating machine, H. S. Griffin..... 617.012
Photograph dark room, N. Harrison..... 617.017
Photographic developing apparatus, N. Wright..... 616.959
Pick, F. Kortick..... 617.105
Picker, See Fruit picker.
Pictures or advertisements, apparatus for producing successively changing, C. Fougerat..... 617.244
Pile, See Safety pile.
Pipe, See Tobacco pipe.
Pipe connection, E. H. Israel..... 617.251
Plant protector, L. J. Merriman..... 617.034
Plow, wheeled, N. O. Starks..... 616.984
Pole and doubletree coupling plate, G. W. Conrad..... 616.900
Pole, shaft coupling bolt for vehicles, E. L. Lowe..... 617.107
Pottery and making thereof, C. O. Purinton..... 617.239
Press, See Copying press, Manual power press, Printing machine, W. Spalckhaver..... 616.982
Pulverizing apparatus, W. A. Koneman..... 617.030
Pump, C. A. A. Barthel..... 617.242
Pump curb, C. A. Barthel..... 617.219
Pumping and measuring apparatus for oil, etc., G. Hollan..... 617.019
Purlings, etc., machine for making, H. Dahlman..... 617.283
Puzzle, J. W. Sturges..... 617.050
Railway electric block system, H. Baluss, Jr..... 617.139
Railway rails of differential size, joining, A. A. Strom..... 617.059
Railway rolling stock, means for altering gages of, L. Pearce..... 617.180
Railway switch mate, C. F. Kress, Jr..... 617.167
Railway systems, timing apparatus for trolley, H. Garrett..... 617.010
Railway track structure, C. F. Kress, Jr..... 617.166
Railway train signal apparatus, C. N. Frederickson..... 617.088
Razor stripping and honing apparatus, Platt & Dos Passos..... 617.182
Razor stropping machine, G. Beston..... 617.274
Refrigerator, P. L. Cron..... 617.144
Register, See Fare register, Weight register, Weighing, See Hog ring.
Removal, R. F. Herreshoff..... 616.926
Rotary engine, F. J. Bates..... 617.072
Ruler and spacer, S. C. La Due..... 616.943
Sad iron, core heating, H. P. Carver..... 616.846
Safety pin for scarfs, etc., J. E. Fuller..... 617.091
Sandpapering machine, A. C. De Wolfe..... 617.233
Sash balance, Z. M. Lindner..... 616.947
Sash holder, P. Marshall..... 616.949
Sash lock, T. B. Stevens..... 617.131
Saw, butcher's, G. Nusser..... 617.178
Saw guerd, F. A. Eastman..... 617.239
Saw, hacks, E. H. Hickox..... 616.927
Saw setting machine, G. W. Kent..... 616.927
Sawing machine, Kelly, A. C. Wood..... 617.005
Scissors, ball bearing, T. Murphy..... 617.176
Screen, E. C. Smith..... 617.197
Screw driver, F. Rainwater..... 617.046
Sewing and plaiting machine, G. H. W. Curtis..... 617.221
Shade and curtain hanger, window, J. Abrahams..... 617.303
Shade fixture, window, J. Scarlett..... 617.190
Shaft loop, T. Lee..... 616.945
Sheet metal plates, die for, L. L. Sagendorph..... 616.976
Ship's ventilator valve closer for, G. J. N. Carpenter..... 617.077
Shirley, B. Bernstein..... 617.077
Show case, revolving, Levitt & Hunt..... 617.252
Signal, See Train order signal.
Silk, manufacturing artificial, Fremery & Urban..... 617.009
Slit, A. B. Cook..... 617.263
Sluice, electrolytic reducing and amalgamating, J. H. Jory..... 617.024
Snap hook, C. A. Conger..... 617.081
Soap hanger, E. Roenius..... 617.259
Soap kneading machine, A. & E. Des Cressonnes..... 617.282
Soil for planting, apparatus for preparing, D. Mackay..... 617.112
Sole cutting machine, C. E. Goddard..... 616.917
Spindle driving bands, mechanism for guiding and applying tension to, J. Boyd..... 617.276
Spinning mule, W. V. Honey..... 616.939
Spring wheel, F. L. & A. Koehler..... 616.942
Sprinkler head, automatic, G. E. Higgins..... 617.097
Sprocket wheel and chain, J. S. Kidd..... 616.936
Stackers, turn table for automatic, J. Galland..... 617.236
Staircase covering, D. W. Walker..... 617.203
Stake pocket, J. C. Kinsey..... 616.940
Station indicator, T. C. Neeger..... 616.954
Steam boiler, Richards & Shipley..... 617.050
Steam boiler, B. T. Stauber..... 617.261
Steam boiler, water tube, J. Provuncher..... 617.238
Steam engine, A. B. Sells..... 616.973
Steam generator water return system, E. P. Holly..... 617.100
Step cover fastener, D. Walker..... 617.207
Sterilizing and washing machine, combined, W. N. Carter..... 617.279
Stoking, J. E. Nelson..... 617.044
Stoker, mechanical, D. R. Ward..... 617.302
Stopper, See Bottle stopper.
Storage battery, F. W. Schneider..... 616.978
Stove, folding camp, W. S. Ray..... 617.122
Strainer and filter, J. W. Hyatt..... 617.352
Street sweeper, G. E. Schepert..... 617.055
Suspender end, C. F. Edgarton..... 617.085
Switch, See Electric switch, Telephone exchange switch.
Syringe, C. Savino..... 617.127
Syringe and atomizer, E. A. Franklin..... 617.245
Syringe nozzle, E. T. Pearl..... 616.958
Tabl A. H. Morris..... 617.255
Tag, O. L. Athorpt..... 616.875
Tannin extracts, making, J. Blair..... 616.882
Telephone exchange switch and signal apparatus, W. W. Dean..... 617.145
Telephone receiver, J. J. Mulconroy..... 616.953
Telescope mounting, C. A. R. Lundin..... 617.106
Test apparatus, traveling, E. Speiden, Jr..... 616.963
Thawing apparatus, R. A. Lackman..... 617.168
Theatrical stage appliance, O. Gates..... 617.154
Thill coupling, J. D. Brown..... 617.142
Thill coupling, W. Pearce..... 617.181
Threshing machine attachment, C. D. Chalfant..... 616.893
Threshing machine straw rack, F. B. McDaniels..... 617.116
Ticket, railway mileage, W. A. Thrall..... 617.203
Tipple, C. S. Farrer..... 617.087
Tippler, rotary, F. Turnbull..... 617.055
Tire cleaner, pneumatic, W. Glasgow..... 617.288
Tire heater, Ferguson & Holmen..... 617.152
Tire inflatable, C. A. R. Lundin..... 616.901
Tire, pneumatic, S. Pattinson..... 616.982
Tires, etc., elastic filling material for cycle, J. Deborde..... 617.230
Tires, machine for repairing pneumatic, F. W. Maxson..... 617.033
Tires on carriage wheels, device for putting on rubber, C. H. Prescott..... 616.967
Tobacco pipe, J. Mitchell..... 617.036
Tool combination, N. O. Henault..... 617.018
Tool handle, Tveit & Overson..... 617.206
Tool chest, C. H. B. Bowers..... 617.069
Towing machine, J. A. Mumford..... 617.175
Toy, F. C. Freeman..... 617.089
Toy, W. W. Watt..... 617.209
Toy, G. W. Wright..... 617.213
Track fastening device, F. La Forest..... 617.031
Train order signal, H. De Witt..... 617.232
Trap, See Animal trap, Grease trap.
Trip jack, E. T. Trefethen..... 616.993

HELP YOURSELF

to a better position, a better salary, by securing a technical education. Our method leads to sure success. Complete courses in

ELECTRICAL ENGINEERING

Steam, Mechanical or Civil Engineering; Mathematics; Chemistry; Mining; Mechanical or Architectural Drawing; Surveying; Plumbing; Architecture; Metal Pattern Drafting; Prospecting; Book-keeping; Shorthand; English Branches

TAUGHT BY MAIL

Chronicler free. State subject you wish to study. Estab. 1891. 45,000 students and graduates. The International Correspondence Schools, Box 942 Scranton, Pa.

\$2.00 a Month

WILLIAMS' SHAVING SOAPS

MAKE CLOUDS OF THICK CREAMY LATHER

THE ONLY KIND THAT WILL THOROUGHLY SOFTEN THE BEARD—SOOTHE AND REFRESH THE FACE—AND MAKE SHAVING A POSITIVE LUXURY.

Williams' Shaving Stick, 25 cts.
Genuine Yankee Shaving Soap, 10 cts.
Luxury Shaving Tablet, 25 cts.
Swiss Violet Shaving Cream, 50 cts.
Jersey Cream (Toilet) Soap, 15 cts.
Williams' Shaving Soap (Barbers'), 6 Round Cakes, 2 lb., 40c. Exquisite also for toilet. Trial cake for acc. stamp.

THE J. B. WILLIAMS CO., Glastonbury, Conn.
London, 64 Great Russell St., W. C. Sydney, 10r Clarence St.
Williams' Soaps sent by mail if your dealer does not supply you.

Simplex Time Recorder.

So named because it is simple in construction, simple in operation and simple of record. Saves maximum of time with minimum of labor. Registers by the push of a button—nothing more. One hundred men can register in one minute on one Recorder. Adapted to large or small concerns. No keys, checks, cards, tape or ink-ribbon. For simplicity, compactness, durability and quick registration absolutely without rivals.

Full description for the asking. ASK NOW.

Heywood Brothers & Wakefield Company,
195 CANAL STREET, NEW YORK.
N. B.—For prices, state number of your employes.

50 YEARS' EXPERIENCE

PATENTS

TRADE MARKS, DESIGNS, COPYRIGHTS & C.

Anyone sending a sketch and description may quickly ascertain our opinion free whether an invention is probably patentable. Communications strictly confidential. Handbook on Patents sent free. Oldest agency for securing patents. Patents taken through Munn & Co. receive special notice, without charge, in the

Scientific American.

A handsomely illustrated weekly. Largest circulation of any scientific journal. Terms, \$3 a year; four months, \$1. Sold by all newsdealers.

MUNN & Co., 361 Broadway, New York
Branch Office, 625 F St., Washington, D. C.

MAKE YOUR T SQUARES SELF FASTENING. Nickered and polished attachments. Complete by mail. \$1. Give full length of blade.

Finely finished self fastening T Squares, all sizes, from \$2 up. Short squares are self fastening on long boards.

CHAMPION T SQUARE CO., 90 W. Van Buren St., Chicago

Every Tool for Every Use

A complete list of all the Tools made for any and every purpose, all fully described and accurately illustrated will be found in the 1898 edition of MONTGOMERY & CO'S

TOOL CATALOGUE.

It contains 510 closely printed pages with index. Book is pocket size, 6 1/2 x 4 1/2 inches, with rounded edges and stitched covers. Sent free by mail on receipt of 25 cen.

MONTGOMERY & CO.
105 Fulton Street, New York.

TRUSCOTT VAPOR MARINE MOTOR

ARE GUARANTEED TO GIVE SATISFACTION DURABLE IN CONSTRUCTION AND EASY AND SAFE IN OPERATION

TRUSCOTT BOAT MFG CO. ST. JOSEPH, MICH. U.S.A.

Founded by Mathew Carey, 1785.

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

Our New and Enlarged Catalogue of Practical and Scientific Books, 92 pages, 8vo, a New Catalogue of Books on Steam, the Steam Engine, etc., and our other Catalogues, the whole covering every branch of Science applied to the Arts, sent free and free of postage to anyone in any part of the world who will furnish us with his address.



IF YOU SHOOT A RIFLE. Pistol or Shotgun, you'll make a Bull's Eye by sending three 2c. stamps for the Ideal Hand-book "A." 126 pages FREE. The latest Encyclopedia of Arms, Powders, Shot and Bullets. Mention SCIENTIFIC AMERICAN. Address IDEAL MFG. CO., NEW HAVEN, CONN., U. S. A.

PURE WATER The RALSTON STILL placed upon your kitchen range will supply the family liberally with sparkling distilled water. Most Scientific in construction. Largest guaranteed capacity. Highest award at Omaha Exposition. Endorsed by Ralston Health Club. Send postal for booklet "B" to The A. R. BAILEY MFG CO. 54 Maiden Lane, N. Y.

Queen Transits and Levels High Grade Instruments with the Latest Improvements. 160 page Engineering Catalogue on application. THE QUEEN 240 page Mathematical Catalogue on application. ENGINEERS' AND DRAFTSMEN'S SUPPLIES QUEEN & CO., Optical and Scientific Instrument Works. 59 Fifth Ave., New York. 1010 Chestnut St., Phila.

The Typewriter Exchange 1 1/2 Barclay St., NEW YORK 156 Adams St., CHICAGO 38 Bromfield St., BOSTON 817 Wyandotte St., KANSAS CITY, MO. We will save you from 10 to 50% on Typewriters of all makes. Send for Catalogue

TYPEWRITERS HALF PRICE We will sell you any typewriter made for one half regular price, many for one quarter. Every machine guaranteed in perfect order. TYPEWRITERS SOLD, RENTED, EXCHANGED. Sent anywhere with privilege of examination. Send for Illustrated catalogue. 211 La Salle St., Chicago.

National Health Club FREE MEMBERSHIP FOR 30 DAYS. Advantages Gained. It will be the aim of this club to educate people how to keep well, and how to treat all chronic diseases by practical common sense methods. Every wife and mother should be on the list.

Health Appliances at Wholesale Prices. People are becoming educated in the use of many health appliances, such as Rubber Goods, Exercisers, Batteries, Massage Rollers, Vapor Bath Cabinets and many other devices. Now by getting these in large quantities the Secretary can obtain anything desired by members at wholesale prices. Send your address and stamp for copy of PHYSICAL MAN. Address S. A. DORLAND, Sec., Lock Box 173, Toledo, Ohio.

WELL DRILLING Machines Over 70 sizes and styles for drilling either deep or shallow wells in any kind of soil or rock. Mounted on wheels or on sills. With engines or horse powers. Strong, simple and durable. Any mechanic can operate them easily. Send for catalog. WILLIAMS BROS., Ithaca, N. Y.

DON'T LEAVE YOUR KEYS in the front door. Fasten them to the pocket or waist-band with a key chain secured by the Improved Washburn Patent Fastener. Slips on easily, grips like a firm death, don't tear the fabric, released instantly. By mail, 25 cents. Catalogue of other novelties, free. AMERICAN RING CO. Box P. Waterbury, Conn.

A.W. FABER Factory Established 1761. LEAD PENCILS, COLORED PENCILS, SLATE PENCILS, WRITING SLATES, STEEL PENS, GOLD PENS, INKS, PENCIL CASES IN SILVER AND IN GOLD, STATIONERS' RUBBER GOODS, RULERS, COLORS AND ARTISTS' MATERIALS. 78 Reade Street, New York, N. Y. Factory Established 1761.

PURE WATER is distilled water. Nothing but distillation will eliminate both organic and inorganic impurities. An ordinary cook stove is all you need with THE SANITARY STILL to give you plenty of pure, sparkling water, treated with sterilized air. Free booklet. Our \$10.00 STILL has twice the capacity of others. Write at once for particulars. CUPRIGRAPH CO., 120 No. Green Street, Chicago.

Table listing various mechanical parts and their prices, including items like Trousers hanger, Truck, piano, Truss, Tubes from metallic ingots, Typewriter machine, Valve, Valve gear, Valve operating mechanism, etc.

Table listing various designs and their prices, including items like Badge, Bicycle frame, Bicycle saddle, Boot or shoe tip, Cabinet, Car body bolster, Clamp member, Clothes line post, Cream separator, Curtain, Egg tester, File or holder, Golf ball, Grate bar, Heel counter, Hook, lacing, Horseshoe, Hub, ball bearing, Jig screens, Lamp body, Paper border, Paper, wall, C. Ruffy, Pencilholder attachment, Printing machine, Shirt waists, Thread guide, Wheel, sprocket, etc.

Table listing various trade marks and their prices, including items like Antidote to cocaine, Bicycles and parts thereof, Bonbons, Butter, Canned goods, Chili spice preparations, Cotton goods, Creosote phosphite, Dry goods, Furniture polish, Lamps, Medical compound, Medicinal compounds, Medicinal liquid, Medicinal preparation, Medicinal preparations, Metal polish, Non-heat-conducting materials, Oatmeal, Oil, olive, Remedy for certain named diseases, Remedy for drunkenness, Ribbons, Sanitary lotions, Soap, chamois, Telephone, Watch movements, Watches, etc.

Table listing various labels and their prices, including items like "Anglo-Saxon Brand Peaches", "Guarded Spring", "Hecla", "Helen", "Iron-Brou", "Irontdale Spring Water", "Old Virginia", "Perfection Liquid Food", "The Great Eagle Pile Cure", "Washed", etc.

Table listing various prints and their prices, including items like "Fit Reform Clothing", "Fit Reform Clothing", "The Elgin Shirt", etc.

A printed copy of the specification and drawing of any patent in the foregoing list or any patent in print issued since 1853 will be furnished from this office for 10 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York. Special rates will be given where a large number of copies are desired at one time. Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of \$40 each, if completed, or be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

CAN I BECOME AN ELECTRICAL ENGINEER?

For our Free, handsomely illustrated book entitled "Can I Become an Electrical Engineer?" Address THE ELECTRICAL ENGINEER INSTITUTE OF CORRESPONDENCE INSTRUCTION, Dept. A. (Conducted under the auspices of "THE ELECTRICAL ENGINEER"). Endorsed by Every Prominent Electrical Engineer. 120-122 Liberty Street, New York, U. S. A.

WE WILL DOUBLE YOUR SALARY

if you will study at home in spare time. Courses in Electrical, Mechanical, Civil and Mining Engineering, Mechanical Drawing and Machine Design, Architecture, etc. Cost, next to nothing. Best text books free. Write for free illustrated 100 p. S. A. Circular. Sample pages of text books, drawing plate and booklet of letters from students all over the world. THE UNITED CORRESPONDENCE SCHOOLS, 156 Fifth Ave., New York.

METAL CHECKS, BADGES and PLATES OF ALL KINDS. A. WIEBKING, 603 Mildred Ave., Chicago.

FOR SALE One 24 light dynamo, one-eighth horse fan motor and one Burt's Solar Compass with tripod complete. Geo. Wilson, Madelia, Minn.

DYNAMO and MOTOR CASTINGS from 1/4 to 1 horse power. Send for Catalogue. Book telling how to make a 2 light dynamo, 10 cents. THE BUBBER COMPANY, LYNN, MASS. Box 5. A.

TALKING MACHINES A SPECIALTY. MAGIC Lanterns Want d AND FOR SALE HARBACH & CO., 809 Fifth St., Phila., Pa.

DIES AND DIE MAKING Written for shop and tool-room use. 96 illustrations. Sent postpaid for \$1. J. L. Lucas, 10 Fuller St., Prov., R.I.

HANSON HYDRAULIC RAM. Brass delivery valve seal with leather washer. Superior air-sniff. Pumps at rate 1 ft. head to 30 ft. elevation; least head 2 feet. Performs 100 per cent more duty than other rams. Prices reduced Circular/rev. F. B. Hanson, 176 Center St., N. Y.

A Well Known Firm in Russian Poland desires to represent in this country, preferably dealers in Sewing Machines and similar branches. Would also undertake to act as agents for or sell on commission other current articles. First class references. Address, H. O. 3526, care of RUDOLF MOSSE, Hamburg, Germany.

DORMAN'S VULGANIZERS are used all over the world.

Exclusive Manufacturers of Steam Machines for Rubber Stamps. We also make Dry Heat Vulcanizers. Complete outfits from \$10 to \$100. All Stamp and Stencil Tools and Supplies. Brass and Steel Dies for all purposes. Seals, Engraving and Die Sinking of all kinds. Established 1860. Printing Presses, with complete outfits, from \$1 to \$100. Send for Catalogue. THE J. F. W. DORMAN CO. 121 E. Fayette St., Baltimore, Md., U. S. A.

GOLD, SILVER, NICKEL and METAL PLATING

NEW QUICK PROCESS. MODERN METHODS. PROFITS IMMENSE. You can positively make \$5 to \$15 a day, at home or traveling, doing plating and selling Prof. Gray's Plating Outfits, Dynamos, etc. Unequaled for plating watches, jewelry, tableware, bicycles, all metal goods. Heavy plate. Warranted. No experience necessary. LET US START YOU IN BUSINESS. We do plating ourselves. Have experience. Manufacture the only practical outfit, including dynamo, tools, lathes and materials. All sizes complete. Ready for work when received. Guaranteed. WE TEACH YOU the art of plating, furnishing and trade secrets FREE. Failure impossible. THE ROYAL OR NEW DIPPING PROCESS. Quick. Easy. Latest method. Goods dipped in melted metal, taken out instantly with finest, most brilliant plate, ready to deliver. Thick plate every time. Guaranteed 5 to 10 years. A boy plates from 200 to 300 pieces tableware daily. No polishing, grinding or work necessary. DEMAND FOR PLATING IS ENORMOUS. Every manufacturer, jeweler, storekeeper and business man has goods to plate. Every family, hotel and restaurant have goods plated instead of buying new. It's cheaper and better. You will not need to canvass. Do your plating, the same as we, and solicitors to gather work for a small per cent. Replating is honest and legitimate. Customers always delighted. WE ARE AN OLD ESTABLISHED FIRM. Been in business for years. Know what is required. Our customers have the benefit of our experience. WE ARE RESPONSIBLE and Guarantee Everything. Reader, here is a chance of a lifetime to go in business for yourself. WE START YOU. Now is the time to make money. Sample of tableware plated on our machine for two-cent stamp. WRITE TO-DAY. Our New Plan, Testimonials, and Circulars FREE. Don't wait. Send us your address anyway. Address D. V. GRAY & CO., PLATING WORKS, 505 Elm St., CINCINNATI, OHIO

Big Four Route

the Best Line from Chicago, Peoria, Cleveland, Indianapolis, to all FLORIDA POINTS. CHOICE OF ROUTES from CINCINNATI or LOUISVILLE. Write for Rates, Time, etc. E. O. McCORMICK, Pass. Traffic Mgr., Cincinnati, O.

POULTRY ROMANCE would make a good title for our 278-page BOOK ON POULTRY, for it reads like a romance. Tells all about hatching and brooding chicks; gives plans for poultry houses; description and cuts of all leading breeds of pure bred fowls and incidentally about the "OLD RELIABLE" INCUBATOR. 10c. gets a copy. RELIABLE INC. & BROODER CO., Box 105, Quincy, Ill.

The Wooden Hen A faultless hatching machine for 50 eggs. Price \$7. Heat and moisture regulation and ventilation, absolutely perfect. A book about the Wooden Hen, and one about the Excelstor Incubator, will be sent free to any one naming this paper. GEO. H. STAHL, QUINCY, ILL.

THE CYPHERS Incubator and Brooder The Only Practical System of Incubation. Moisture Self-Supplied and Regulation Absolute. Produces Strong, Healthy Stock. GOES FREIGHT PREPAID. Send 10c. for fully Illustrated Catalogue to the CYPHERS INCUBATOR CO. Box 95, Watland, N. Y.

WANTED.

GENERAL AGENCY or control for Pac. Coast of patented articles. W. H. Menkel, O. San Francisco.

REFRIGERATION One to 25 tons daily capacity. Challoner's Sons, Oshkosh, Wis. ICE MACHINE

ICE MACHINES, Corliss Engines, Brewers' and Bottlers' Machinery. THE WILTER MFG. CO., 899 Clinton Street, Milwaukee, Wis.

Electrical and Mechanical Model Work. Fine Machinery. M. E. SANGER, 62 Cortlandt St., New York.

FILMS & MACHINES FOR ANIMATED PHOTOGRAPHS

TURBINES Send for Catalogue "M." JAS. LEFFEL & CO., Springfield, Ohio, U. S. A.

EXPORT TO GERMANY We desire to represent manufacturers of Tools for metal working, Lathes, Drills, Grinding and Polishing Machinery, also rough iron Pipes and Fittings. Address letters, stating terms and particulars to Schonbach & Dietzmann, Leipzig-Entritzsch, Germany.

GAS and GASOLINE ENGINES WATER MOTORS BACKUS WATER MOTOR CO. NEWARK, N. J., U. S. A.

New Catechism of the Steam Engine For Engineers, Firemen, Mechanics and Amateurs. 480 pages, 325 illustrations. Bound in green silk cloth, size 6 3/8 x 1 1/4 in. thick. Simple, thorough and complete. Readily understood, and gives instructions how to run all types of steam engines. Price \$2.00, postpaid. THE A. UNEL & CO., 63 Fifth Ave., New York.

AMERICAN DESK \$33.33 DELIVERED EAST OF THE MISSISSIPPI. HOWARD & CROSBY ST. NEW YORK. SEND FOR CATALOGUE.

PRICES \$3.50-\$12.50 A FREE BOOK. How to get well and how to keep well, and look well. 90 per cent of sickness can be avoided. OUR cabinet is the ONLY one with a Door, and can be folded into 6 in. space. LOOK OUT! for fake affairs that pull over the head. Don't buy any cabinet before seeing it. We send on approval. Others dare not. WE WANT LIVE AGENTS! 10,000 Cabinets sold in past 8 months by agents. Send this ad. and get FREE BOOK. Robison Thermal Bath Co., Scientific American, 712 to 717 Jefferson St., TOLEDO, O.

12-100 SOU. THERMAL BATH CABINET

AMERICAN DESK \$33.33 DELIVERED EAST OF THE MISSISSIPPI. HOWARD & CROSBY ST. NEW YORK. SEND FOR CATALOGUE.

PRICES \$3.50-\$12.50 A FREE BOOK. How to get well and how to keep well, and look well. 90 per cent of sickness can be avoided. OUR cabinet is the ONLY one with a Door, and can be folded into 6 in. space. LOOK OUT! for fake affairs that pull over the head. Don't buy any cabinet before seeing it. We send on approval. Others dare not. WE WANT LIVE AGENTS! 10,000 Cabinets sold in past 8 months by agents. Send this ad. and get FREE BOOK. Robison Thermal Bath Co., Scientific American, 712 to 717 Jefferson St., TOLEDO, O.

\$3 a Day Sure Send us your address and we will show you how to make \$3 a day absolutely sure; we guarantee it. You work in the locality where you live. Send us your address and we will explain the business fully. Remember we guarantee a clear profit of \$3 for every day's work, absolutely sure, write at once. ROYAL MANUFACTURING CO. Box 713, DETROIT, MICH.