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

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 This is for our information and not for publication.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.

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.

(4370) T. R. asks: In a dynamo made of the field magnet of Parkhurst motor and drum armature 4½ inches long, 1½ inches diameter, would 250 feet of wire give 25 volts? By winding it with 6 layers of No. 21 wire 350 feet could be wound on; allowing 10 feet wire to a volt it would give 35 volts, and with low external resistance 10 amperes. This would give 350 watts and require about ½ horse power to run it, if my calculations are correct. Is there danger of getting too much wire on and requiring too much power to run it? Could not resistance be introduced and thus decrease the power required? How many ampere turns does this field magnet need to magnetize it fully? A. [T. R.'s query was referred to Lieut. Parkhurst, who has kindly furnished the reply, given below. Although an abstract of the reply would probably answer the purpose, we print it in full to show that it is not always an easy matter to furnish a reply to an apparently simple question.—ED.] Referring to your correspondent's query, I would say that I have worked out the winding with No. 21 wire for the dynamo in question, and I have not the time now for a complete solution of the question. But I can say at once that even granted that No. 21 wire can be wound so as to give 35 volts E. M. F., the carrying capacity of the wire entirely precludes the idea of ever taking out more than 4 amperes as a maximum current. Even this is beyond limit of ordinary safety, and anything more would probably heat the wire of the armature so much as to burn it up, or at least destroy the insulation completely. The most I can figure as possible to put upon the armature is 8 turns per layer per coil, with 12 coils, each 3 layers deep (and it would be a tight squeeze to get on 3 layers per coil on core 1⅛ inch diameter and not exceed 1½ inch for diameter of finished armature); this would give 288 turns of wire upon armature, and this would come somewhere between 300 and 350 feet of wire, the uncertain factor of waste length in the heads not being readily determined except by winding. Of this length of wire, whatever it might be, there would only be about 225 feet not connecting the heads, and of this there would only be about 75 per cent active, or about 170 feet of active wire, or about 85 feet active in each half of the armature. By driving it fast enough this might and probably would penetrate 35 volts E. M. F. The armature with 350 feet No. 21 wire would have a resistance of something over one ohm. The field winding would also, if series wound, have from ⅜ ohm to 1 ohm, so that the lowest resistance allowable in external circuit would be—

$$R_{ex} = \frac{35-8}{4} = \frac{27}{4} = 6{\cdot}75 \text{ ohms.}$$

$$\text{This comes from } C = \frac{E}{\Sigma R}$$

$$C=4 \qquad E=35 \qquad \Sigma R = R_{ex} + R_a + R_f$$
$$R_a = 1+ \qquad R_f = 1$$

$$\therefore 4 = \frac{35}{R_{ex}+2}$$

This would only give 140 watts; and assuming that the dynamo is working at 70 per cent efficiency—as high a rate as can be assumed—this would call for about 200 watts as the actual work expended, or something over ¼ horse power. The armature is small in diameter and is pretty stiff. Mechanically, it probably can stand 6,000 revolutions per minute, and it would have to turn at something like that rate to generate 35 volts E. M. F. The area of magnet limb is only about 2 square inches. Allowing 40,000 lines of force per square inch, and not deducting for leakage, 80,000 lines of force for each magnet is all that can be counted on, or 160,000 lines of force for the field (with no leakage). To generate 35 volts E. M. F. 35×10^8 lines of force must be cut per minute, and since there are about 225 active turns of wire, and 160,000 lines of force, in the field, there will be 225 × 160,000 lines of force cut in each revolution, or the armature must rotate $\frac{3500000000}{36000000}$ per second or 97 + times per second, or 5820 revolutions per minute, to generate 35 volts E. M. F. This is only about 40 feet per minute for the outside wire of the armature, a speed not unusual, in fact general, in large machines. No. 16 wire for the field can carry 4 amperes of current safely. Allowing 25 per cent for insulation and slack winding, 34 turns should be got upon each magnet limb; 5 layers would therefore give 170 turns per limb, or 680 turns for the 4 limbs, and with 4 amperes we would have 680 ampere turns per limb, or 2720 ampere turns in all, which would probably be enough for the purpose. This would probably give rather higher resistance for the field winding than called for, but not enough to make very much difference. The above calculations are only roughly approximate, for as I said above, I have not time to go into the matter in all its detail. They may serve however to show that the machine in question could not under any very probable circumstances ever run up to more than ¼ horse power, and if it ran to much over ⅛ horse power, I would be rather surprised. C. D. PARKHURST, Lieut. 4th Arty.

(4371) N. W. B. asks: 1. An electric motor that takes 110 volts 3 amperes current to run at its full capacity is run as a dynamo; will it have the same output? A. Nearly. 2. How much wire will it take to make an induction coil to get one thousand volts, No. 32 wire, worked by 2 cells Bunsen battery? A. Consult SUPPLEMENT, No. 160, for this information. 3. In winding an induction coil does it make any difference if the wire is not wound in even layers near the primary coil? A. The wire should be wound as compactly as possible. 4. Is it essential that you should be good at mathematics to be a good electrician? A. Yes. 5. In asking you questions in regard to patents, if they are worth patenting or not, do you charge anything for the desired information? If so, how much? A. We give our opinion free of charge. 6. I was testing an electric bell iron frame. If I took hold of the bell with one hand, and the screw that makes the connections with the other one, I received a shock. What was the cause of it? Had about 4 volts, 2 cells plunging battery. A. The shock was due to the induced or extra current generated during the discharge of the bell magnet. 7. Which is the cheapest—to buy an induction coil, say 1,000 volts, or to make one? A. It is probably cheaper to purchase. 8. In making induction coils with more than one electrode, how do you do it—by winding as many wires on it as you want electrodes? A. The binding posts are connected with the winding at different points, so as to include different lengths of the secondary wire. 9. If you choke an electric motor, is there any danger of burning the armature out—100 volts 3 amperes? A. Yes, there is danger of burning out the armature unless the wire is of sufficient size to carry the current.

(4372) E. B. A. asks: 1. What is formula of the solution in the porous cup in the Bunsen cell? A. Make a saturated solution of bichromate potash and water. To this slowly add one-fifth its weight of commercial sulphuric acid. 2. What is the internal resistance of the Daniell cell? A. About 3 ohms. 3. Is there any local action in either of the above cells when not in use? How strong a current will each of these cells give? Is the number of SUPPLEMENT named giving the directions to make an induction coil for medical purposes? A. There is very little local action in a Daniell battery, more in the Bunsen battery. The Daniell battery has an electromotive force of 1·07 volts, and the Bunsen about 2 volts. The current from either is determined by the resistance. The electromotive force divided by the resistance equals the current. $\frac{E}{R}=C$. Induction coil is described in SUPPLEMENT, No. 569.

(4373) C. W. O. asks: 1. How can I get mercury from the stuff on looking glasses? A. Scrape off and boil with a little hydrochloric acid and water. If the mirror is coated with amalgam, this will remove the tin. 2. If I make a Trouve battery such as is described in Notes and Queries No. 3395 (September 26, 1891), with plates 3 inches in diameter, how many such pairs will be required to give 90 watts through zero external resistance? A. We have no exact figures, but a very large number would be needed. The battery is not adapted for high power currents. 3. Is copper 1-100 inch thick, thick enough? A. Yes. 4. Which wears out—zinc or copper? A. The zinc. 5. What is the resistance of motor described in SUPPLEMENT, No. 641? A. About 3 ohms. 6. What number of feet of copper wire will it take to give a resistance of 1 ohm of each size given? 12, 13, 14, 15, 25, 26, 27, 28, 29, 31, 33, 34, 35, A. W. G. A. 615, 488, 386, 306, 30, 24, 19, 15, 12, 7·5, 4·7, 3·74, 2·97.

(4374) W. W. asks: Which is the more economical for heating purposes, hot water or steam? Why and to what extent? Will boilers deteriorate more when idle, when full of water or when empty? Please name some good work on drawing machinery in perspective. A. Hot water circulation for heating buildings and dwellings is the most economical in fuel when the plans favor its proper arrangement. The economy consists in the grading of the fire in moderate weather so that all the pipe circulation may have any desired temperature below that of steam-heated pipes, while for heating by steam a constant and full fire must be kept up at all times or no steam is generated. This applies to low pressure heating. Boilers should always be laid up for summer, full of water that has been boiled by filling the boiler and drawing the fire. Empty boilers rust. We recommend "Drawing for Machinists and Engineers," by Davidson, $2; "Practical Perspective," by Davidson, $1.50; and "Orthographical and Isometrical Projection," by Davidson, $1, mailed.

(4375) J. G. S. asks: Will hay or straw when packed in large quantities and in a damp condition cause spontaneous combustion? A. Yes; heating and spontaneous combustion is one of the liabilities in massing large quantities of hay or straw in such a way that the air will feed the oxidation following the heat of fermentation. This does not apply to ensilage, which must be done in tanks or ground recesses that are airtight at the bottom and sides, so as to hold the carbonic acid gas generated by fermentation, which in turn remains in the tanks by its weight and which drives any air that may be left in the mass out at the top.

(4376) C. L. D. asks: 1. Could a yacht of 140 horse power, burning 3¼ pounds of coal per horse power per hour, be run any more economically by electricity? A. No. 2. How much room would be needed for the storage batteries necessary to supply the above amount of horse power for four days? A. It requires about 8 cells for a horse power, and for a continuous run one charge will last about 6 or 8 hours, working at full capacity. The cells will average about one-half of a cubic foot each. 3. Has coal ever been turned directly into electricity in a battery? A. The nearest approach to this is a thermo-electric or pyro-electric battery.

(4377) A. H. N. writes: 1. I have use for a number of permanent bar magnets. I have a coil of about No. 16 magnet wire; said coil is 5 inches long, 6 layers carefully wound in glue on a dry hardwood spool the shell of which is ⅛ thick, the end flanges or collars ¼ thick. Would it improve this coil as a magnetizer to wind on a pound or so of very fine wire? A. The fine wire would not improve a coil for this purpose, but more coarse wire would undoubtedly render it more efficient with a suitable current. 2. Would it answer for an induction coil, and by removing vibrator and core, and changing connections direct to terminals of primary coil, be suitable for making strong permanent magnets 6 or 8 inches long by ⅜ to ¾ size of hole? A. Six layers of wire is more than is necessary for the primary wire of an induction coil. However, if you were to construct your coil in the manner suggested, you could magnetize with it, but not as successfully as you could with a coil having a larger number of convolutions of No. 16 wire. 3. Is an induction coil and a coil for making permanent magnets practical as a combination? A. No.

(4378) E. N. asks how to make hydroquinone developer. A.

No. 1.

Hydroquinone	6 gr.
Sodium sulphite c. p.	24 "
Water	1 oz.

No. 2.

Carbonate soda	60 gr.
Water	1 oz.

For a developer take of

No. 1	1 oz.
No. 2	2 "
Water	1 "

Use less of No. 2 if it works too fast. 2. How can I give prints a black tone? A.

No. 1.

Powdered borax	100 gr.
Water	10 oz.

No. 2.

Chloride of gold	1 gr.
Water	10 oz.

Mix equal parts. 1 grain of gold will tone a sheet of paper 18×22 inches.

(4379) T. B. H. asks: Does a curved ball really change its course in the air or is it only a deception of the eye? A. Yes; there is no doubt as to a curve or deflection being made from the line of projection by the peculiar twirl given to the ball as it leaves the hand. See a full discussion of the subject, with illustrations, in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 402, 410, 423, on base ball science.

(4380) W. B. asks for a good formula for coating paper with a chloride gelatine emulsion for photographic printing, to take the place of albumen paper. A. SCIENTIFIC AMERICAN SUPPLEMENT, No. 276, for full directions. 2. Please name a good treatise on the manufacture of gun cotton or pyroxilin. A. See "Modern Explosives" by Eissler. Price $4.20.

(4381) Subscriber, Vernon, Texas.—The insect is one of the plant lice. It belongs to the genus Callipterus.

(4382) M. M. says: I was much interested in the question by L. W. A., why the injector works. When the injector (or inspirator) is in operation under high pressure of steam, and the overflow valve is opened, allowing part of water to enter boiler and part to return to well, why don't the water rush out with great force, as there is an opening to interior of boiler through check valve? In balancing a cylinder, how can I tell whether both ends are balanced alike? Is there any rotary steam engine in successful operation, and where? What is the greatest difficulty to overcome to make a rotary compete with a reciprocating steam engine? A. There is a slight contraction in the stream as it passes between the delivery nozzle and the receiving nozzle, and when they are exactly proportioned and adjusted to prevent scattering and overflow, except when starting; the stream not only enters the receiving nozzle intact, but carries a little air with it. The check valve shuts off all flow from the boiler and only opens when the impact from the jet becomes greater than the boiler pressure. In balancing revolving cylinders place one journal in a box held by easy springs, or in an easy-sliding box, or suspended box, and revolve the cylinder or drum by an attachment on the shaft at the solid box end. By revolving at about its proposed speed, the journal in the elastic box will wabble and a piece of chalk held against the end of the cylinder will mark the light side. When one end is balanced, reverse the cylinder and balance the other, and if fine work is required, repeat the operation. We know of very few rotary engines in use, and those not on a large scale. They suit many special wants, but have not yet been brought to match the economy and ease of repair and care of the best reciprocating engines.

(4383) J. S. McD. asks the best method of keeping, during summer months, the pipes and radiators of a hot water heating apparatus. Is it better to keep the pipes and radiators full of water, or should they be kept empty when not in use? Please give me the best plan to preserve pipes, radiators and heater or furnace when not in use. A. A hot water heating apparatus should be laid up for the summer full of water, the same that has been circulating, as such water contains no air, and the boiler and pipes will not rust in water from which all the air has been discharged. If the water has been long in use, and it is desirable to clean out by drawing off, the new water should be heated and a hot circulation made before laying up for the season. The fire chamber and flues should be thoroughly cleaned, and the draught entirely closed to prevent sweating by changes of weather during the summer. Empty boilers and pipes rust very fast, as the inside cannot be made thoroughly dry.

(4384) A. W. T. asks (1) how ordinary tack hammers are magnetized, so they will pick up tacks? A. By passing them through an excited helix; the hammers being made of hard iron, or case-hardened, retain the magnetism. 2. What kind of metal is most easily magnetized? A. Very soft wrought iron is most easily magnetized, but it does not retain its magnetism. You can permanently magnetize hardened steel or case-hardened cast iron. 3. I can magnetize the blades of my pocket knife with a horse shoe magnet, but I have a steel tack hammer that I cannot magnetize with the magnet. Why is it? A. Possibly your steel tack hammer is too soft, or it may be too hard, or possibly your magnet is too small to charge the hammer to any perceptible degree.

(4385) T. H. B. writes: 1. In regard to storage battery described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 845, can it be formed with a gravity battery? A. Yes, by giving it plenty of time, say one month. 2. If so, how many cells of gravity battery (6 x 8) should be used for each cell of storage battery? A. 4 or 8 cells. 3. How should the gravity cells be connected—in series or parallel? A. They should be connected so as to give an E.M.F. of 2¼ volts. 4. How long should the current be allowed to flow before reversal? A. 8 or 10 hours.

(4386) W. H. asks: Can you inform me in what part of the country bird's eye maple grows? A. The "bird's eye" and "curled" maple are accidental growths of the sugar maple, *Acer saccharinum.* It is native through all the Northern States and West to Eastern Minnesota Nebraska and Kansas, and southerly along the Allegheny Mountains to Northern Alabama and Western Florida. It is slightly reduced in size toward the limits of growth; it reaches its greatest development in the States bordering the great lakes.

(4387) J. A. B. says: In making a siphon, I suck the air out. What starts it flowing, and what keeps it flowing? Again, I take the tube and fill it with water and start it flowing. What starts it, and what keeps it flowing? A. The principle of the action of a siphon is due to the fluid leverage of unequal columns of water which are sustained in the bent tube by the pressure of the atmosphere. In whatever way you deprive the siphon of its air the water follows, and when full will run by gravity toward the lowest level with the velocity due to the difference in level less the friction of the pipe. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 793, on siphons, illustrated.

(4388) A. H. S. asks: In what proportion should the ingredients of a tar and gravel roof be mixed? A. Use as little tar as will allow the gravel to be spread with the trowel when hot. Cannot give the parts, as gravel differs in kind and fineness. Use tar that is nearly hard when cold. The gravel should be made hot before mixing with the hot tar. The surface should be sanded as soon as the mixture is spread.

(4389) C. N. asks: Can a circle be described so as to make any three given points the termini of the radii from a common center? A. Yes; draw a line between each of the three points, exactly bisect each, and draw a line at right angles from each bisection. The point of meeting of the lines will be the common center of a circle passing through the three points.

(4390) A. M. asks: Where is the proper position for the steam dome on a horizontal boiler? Does it make any material difference where it is placed in regard to danger of explosion? A. The number of sheet sections in a boiler generally determines the position of the dome. The center of the boiler is the proper place, so that it may gather the steam with equal facility from both ends of the boiler. When there are three sections, the middle one should receive the dome, although there are exceptions to this in practice. With two sections the usual practice, and we think the proper one, is to put the dome on the front section.

(4391) G. T. R. asks: 1. Where do balloonists get the hydrogen to inflate the balloons, or how do they produce it? A. Street gas is generally used. Hydrogen can be made by passing steam over white-hot iron borings and scrap. 2. When petroleum is burned there is great smoke. Is there any material containing oxygen which, if burned with it, would result in consuming this smoke (or unconsumed carbon) or how could it be prevented? A. No such substance is known. Proper burners, atomizing, and strong draught are the proper lines to work on for smoke-consuming. 3. Would black manganese, if heated, evolve oxygen? A. Yes, if heated high enough.

(4392) L. H. D. asks: If a sheet iron armature core be used for simple motor, as in SUPPLEMENT, No. 641, would it give satisfactory results? A. Yes, if made of sheet iron disks or rings.

(4393) E. J. K. asks: 1. What is the exciting fluid used in the Crowfoot gravity battery with zinc and copper elements? A. The exciting fluid is saturated solution of copper sulphate. 2. I am making two cells of storage battery, each cell containing two lead plates 6×8 inches; can I form the cells and afterward charge them with Crowfoot gravity batteries? If not, could it be done by covering them with red lead paste? A. You can form your secondary plates and charge them with the gravity batteries. It is advantageous to apply to lead plates a paste of red lead. 3. Will the two cells run motor in SUPPLEMENT, No. 641? If not, how many will it take? A. The two cells of batterry described by you will have a very small capacity, owing to the small number of plates. You should have 7 or 9 plates in each cell.

(4394) H. L. asks: 1. Is plaster of Paris, after being moulded and dried, porous, so as to allow air to penetrate it? A. Plaster of Paris is quite porous. 2. Is there a mixture (the nature of plaster of Paris) that after being dried no air can penetrate it? If there is, what is it? A. Probably the oxychloride of zinc cement would be very nearly if not absolutely impervious to air, but you can saturate the plaster with gelatine, shellac varnish or paraffine, thus rendering it non-porous. 3. Is a note collectable which reads: Ten days after death I promise to pay, etc., provided after death the estate is valued at or above the amount called for by the note? A. Yes.

(4395) J. T. D. writes: Please explain the action of the Bourdon tube, used by Trouve in his aviator, illustrated on page 105, current volume of the SCIENTIFIC AMERICAN. I cannot understand why its branches recede from or approach each other as the pressure of the contained gas is increased or decreased. A. The Bourdon tube has an elliptical cross section, so that pressure exerted within the tube causes it to tend to approach a figure of circular cross section; in so doing, the inner surface of the tube is forced inwardly toward the center of curvature. As the inner wall of the tube is confined in the direction of its length by the outer wall, the pressure which renders the inner wall more convex in a transverse direction reduces its convexity or curvature in a longitudinal direction and thus tends to straighten the tube.

(4396) G. M. V. asks: How many volts, amperes, and ohms an eight inch French Grenet battery has? A. The E. M. F. of a Grenet battery is 2 volts. Its resistance depends upon the solution and the condition of the battery, from ¼ of an ohm upward. The current depends upon the resistance of the battery and of the external circuit. It is calculated according to Ohm's law, which is $\frac{E}{R} = C$.

(4397) Amateur asks for directions for making a dry battery, and how to charge same, or if chemicals charge it. A. For information in regard to Gassner's dry battery we refer you to SUPPLEMENT, No. 792.

(4398) C. L. asks: Is it a fact that lightning rods have the power, to any extent, of protecting houses from injury by lightning? A. A lightning rod properly put up and grounded is undoubtedly a protection against lightning.

(4399) M. T. asks: If a surveyor was running an old line, that the call was north, and the time had been long enough to require two degrees variation here in Southwestern Virginia which should he run N. 2 W. or N. 2 E. to hit the old line? Out here in this portion of Virginia does the needle of a compass vary to the east or west, and about how many years would it take to make one degree variation? Where does the line of no variation, as it is called, run, and does the end of needle pointing north, if it is east of said line of no variation, tend to travel to the west, and if west of it does it tend to the east? A. The variation of the magnetic needle in Scott Co., Va., was about 2° east in 1870, and has been decreasing at the rate of about 3 minutes per annum since that time. The predicted variation for 1892 for your county was four-tenths of a degree east. As the variation of the needle travels west, the amount of variation known since a former line was run must be added to the east reading and subtracted from the west reading from the north end of the needle for tracing the old line on northern courses, and the reverse for southern courses. The north end of the needle always travels to the west by the amount of variation, whether you are to the west or east of the line of no variation, which is now in or near your county, its amount there being somewhat uncertain from local influence due to mountain regions.

(4400) G. F. C., Plaquemine, La., asks: What is meant by the figures, the river is 35 feet, a rise of 0·2 of a foot, and stands 1·7 feet below the flood line of 1890, or the gauge reads 16·6 feet, or the rise is 0·15 of a foot? I read this daily in the river news columns of our newspapers, and will be very glad if you will explain how it reads in parts of feet or inches, as there is a dispute about it. A. The datum of river gauges is at low-water mark. The published readings of the height of water are in feet and tenths above low-water mark. The variations are also in tenths or hundredths of a foot. Thus: 0·2 is 2 inches and 4 tenths of an inch, and 1·7 is 1 foot $8\frac{4}{10}$ inches. Also 0·15 is 1 inch and $\frac{8}{10}$ of an inch.

(4401) O. F. H. asks: 1. Which will do the most work according to weight, the steam engine or the electric motor, including with both all accessories? A. As the electric motor is not a prime motor, you will be obliged to include the weight of the prime mover in making your estimate. This being the case, of course a steam engine would weigh less than the electric motor with its prime mover. If the prime mover is disregarded, the electric motor would weigh much less than a steam engine of the same power. 2. Which will produce the most power in a given short time according to weight—the primary or the secondary battery? A. The secondary battery.

R. Bros. & Co. ask how to make ambergris extract.—C. T. L. asks for a receipt for rice soap.—R. N. C. wants to know the antidotes for the principal poisons.—H. W. J. asks how hair washes are made.—P. W. S. wants to know how to bend glass tubes.—E. C. W. asks how to make the powders for a gasogene.—B. D. L. asks how to renovate oil cloths.—F. U. G. asks how to make gelatine sheets.—J. C. O'B. wants to know how to repair books.—C. H. H. asks how to make the composition for carton pierre ornaments.—E. W. S. wants to know how to make resin for violin bows.—A. E. N. asks how to filter water for drinking purposes.—G. G. H. asks for information on core sand.—B. C. S. asks how sand blast engraving is done.

Answers to all of the above queries will be found in the "Scientific American Cyclopedia of Receipts, Notes and Queries," to which our correspondents are referred. The advertisement of this book is printed in another column.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

May 24, 1892.

AND EACH BEARING THAT DATE.

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

Acids, solidifying liquid, W. White ... 475,586
Advertising card rack, D. S. Foote ... 475,726
Alarm. See Heat alarm.
Amalgamator, J. M. Thompson ... 475,360
Andiron, E. F. Paschal ... 475,701
Aquarium, picture, E. G. Lochmann ... 475,404
Arch, floor, R. L. Stone ... 475,354
Armor plates, manufacture of, T. J. Tresidder ... 475,364
Atomizing or spraying liquids, device for, E. R. Keen ... 475,452
Autographic register, S. D. Cochran ... 475,487
Bank, trick savings, C. Tollner ... 475,525
Baseball apparatus, W. C. Blades ... 475,432
Battery. See Diffusion battery.
Bearing, adjustable, F. Hart ... 475,311
Bed, folding, W. P. Griffith ... 475,499
Beer cooler, W. W. Ferguson ... 475,548
Bicycle fork, F. Sweetland ... 475,633
Bicycle, safety, W. J. Edwards ... 475,444
Binder, shrub, H. O. Thomas ... 475,361
Binders, etc., grain conveyer for, G. Schubert ... 475,423
Bit. See Check bit.
Blacking case, E. G. Cameron ... 475,294
Block. See Pulley block.
Blower or engine, rotary, G. Growell ... 475,302
Blowers or engines, cylinder for rotary, G. Crowell ... 475,301
Board. See Drawing board. Game board. Wash board.
Boiler. See Heating boiler. Steam boiler.
Boiler furnace, S. J. Loughran ... 475,329
Boiler furnace, G. S. Strong ... 475,357
Bolt heading machine, W. H. Betts ... 475,657
Bolt holes, device for tapping stay, J. T. Connelly ... 475,672
Book, check, G. M. Breinig ... 475,661
Bookmark, S. L. & C. A. L. Saunders ... 475,348
Boot or shoe shaping device, J. E. Drake ... 475,679
Bottle alarm, J. A. Trottier ... 475,526
Bottle and stopper cap for the same, J. Gilberds ... 475,448
Bottle packing and shipping box, P. C. Leidich ... 475,456
Bottle stopper, J. A. Stukey ... 475,631
Box. See Bottle packing and shipping box. Letter box.
Box covering machine, Lafean & Devlin ... 475,324
Boxes, machine for stripping paste or straw board, J. Godfrey ... 475,552
Brick kiln, Boehncke & McLean ... 475,433
Broom holder, A. E. Johnson ... 475,569
Buckle, suspender, S. E. Cook ... 475,386
Burner. See Oil burner.
Button die, C. Wagenfohr ... 475,476
Cabinet for holding postage stamps, etc., M. P. Exline ... 475,685
Cable grip, G. F. Elliott ... 475,684
Cable hanger, J. J. Nate ... 475,600
Calendar, W. C. Hawkins ... 475,500 to 475,502
Can. See Ice can. Tin can.
Can testing machines, can holding frame for use with, C. H. Emery ... 475,446
Candle moulding machine, A. A. Royau ... 475,521
Car coupling, E. P. Eastwick, Jr ... 475,682, 475,683
Car coupling, J. Krehbiel ... 475,573
Car coupling, J. W. Latta ... 475,326
Car coupling, A. Mailman ... 475,331
Car coupling, W. A. Mayhall ... 475,696
Car coupling, S. Q. Saunders ... 475,706
Car coupling, Scott & Brasfield ... 475,707
Car door, grain, R. O. Hixson ... 475,449
Car door, grain, W. S. Schroeder ... 475,422
Car door, sliding, C. H. Dunham ... 475,680
Car draught guard, G. F. C. Rosenthal ... 475,611
Car, electric motor, W. H. Patton ... 475,702
Car lighting system, electric, J. F. McElroy ... 475,514
Car loading apparatus, Campbell & Whigham ... 475,293
Car safety catch, mining, C. R. Trew ... 475,639
Car signal, street, C. H. Smith ... 475,474
Car ventilator, H. A. Dirkes ... 475,389
Carpet sweeper, C. K. Stinson ... 475,626
Carrier. See Log carrier.
Cart, self-loading, C. Q. Hayes ... 475,687
Case. See Blacking case.
Cash register and indicator, R. Mills ... 475,408
Casting machine, type, H. S. Popp ... 475,517
Casting, mould, F. J. Wooster ... 475,652
Chain link, drive, A. J. Reynolds ... 475,705
Chair. See Rocking chair.
Change receiver, D. B. Conway ... 475,673
Check bit, L. C. Swift ... 475,634
Churn, Rolland & Francois ... 475,346
Cigar pressing and bundling machine, J. Broda ... 475,290
Cigarette machine, J. B. Pollard ... 475,341
Clamp. See Grapevine clamp.
Clay reducer, W. Burkman ... 475,483
Cleaner. See Flue cleaner.
Cleaning and scouring compound, Peterson & Ruge ... 475,413
Clothes line, D. F. Covert ... 475,675
Coal and wood cabinet, J. R. Egan ... 475,303
Cock or analogous valve, stop, P. Zimmermann, Jr ... 475,530
Coin controlled apparatus, G. F. W. Schultze ... 475,743
Coin handling facilitator, J. O. Boggs ... 475,600
Coin holder, H. E. Howe ... 475,563
Coin mailing grip, M. Hazzard ... 475,397
Collar, horse, C. F. Allen ... 475,430
Collar, horse, C. A. Pettie ... 475,606
Commutator brush, C. L. Coffin ... 475,668
Composition of matter and producing the same, C. C. Carroll ... 475,382
Compound engine, single cylinder, E. J. Woolf ... 475,427
Concrete, mortar, etc., mixing machine for, J. Skinner ... 475,618
Conductor, anti-inductive, B. H. Wesslau ... 475,648
Cooking apparatus, combined steam and hot air, C. H. Dexter ... 475,678
Cooking utensil, steam, C. F. Burnap ... 475,435
Cooler. See Beer cooler.
Corn popper, T. Clark ... 475,666
Corset, V. H. Oberly ... 475,337
Corset boning implement, J. A. House ... 475,562
Coupling. See Car coupling. Hose coupling. Thill coupling.
Creamer, milk, V. W. Blanchard ... 475,658
Crupper strap fastener, F. L. Armas ... 475,655
Crusher. See Ore crusher. Stone crusher.
Cup. See Oil cup.
Cutlery, die and machine for rolling, I. Hirsch ... 475,315
Cutlery, manufacturing, I. Hirsch ... 475,314
Cutter. See Plug cutter.
Cycle saddle, C. W. Saladee ... 475,613
Darning implement, A. Bocher ... 475,659
Deodorizing device, E. O. Ely ... 475,547
Diffusion battery, G. A. Messick ... 475,587
Digger. See Potato digger.
Disinfecting device, A. P. Beck ... 475,431
Door check, B. Deffenbaugh ... 475,388
Door check, F. E. Welch ... 475,368
Door, double, G. A. Anderson ... 475,531
Door spring, H. B. Straut ... 475,356
Door stop, A. Hauck ... 475,686
Dough divider, revolving, E. A. C. Petersen ... 475,607
Dowel, H. S. Marsh ... 475,407
Drawing board, R. G. Shiley ... 475,350
Drill. See Grain drill.
Drilling for minerals, G. R. Jarvis ... 475,319
Drying spent grain and the like, apparatus for, F. E. Otto ... 475,602
Dumping apparatus, P. Imig ... 475,565
Dye, induline, R. Senger ... 475,616
Earthenware pipes, etc., machine for moulding, E. B. Brooke ... 475,481
Electric lighting system, M. J. Cowgill ... 475,538
Electric meter, McKenna & Weed ... 475,411
Electrical apparatus, coin-controlled, H. Wickham ... 475,527
Electrical transmitting system, F. E. Now ... 475,468
Electrodes for secondary batteries, manufacture of, J. F. McLaughlin ... 475,335
Elevator, S. T. Teachout ... 475,524
Engine. See Compound engine. Steam engine. Traction engine.
Engine crosshead, W. Wright ... 475,428
Envelope gum moistener, N. Macphail ... 475,693
Evaporating apparatus, brine, T. R. Timby ... 475,637
Exercising apparatus, horizontal bar, F. Medart ... 475,697
Extractor. See Staple extractor.
Eyeglass and spectacle frame, J. E. Searing ... 475,615
Fabric. See Woven fabric.
Farm gate, C. C. Holter ... 475,316
Fastening device, C. Liebe ... 475,581
Fence wire, J. B. Cleaveland ... 475,718, 475,719
Fence stay, wire, J. H. Brower ... 475,717
Fifth wheel, Hinman & Bunnell ... 475,313
Firing apparatus for use with coal dust, C. Wegener ... 475,715
Flue cleaner, McNutt & Grimmesey ... 475,733
Flue cleaners, elastic scraper for, P. S. Kingsland ... 475,506
Fluid meter, proportional, D. McDonald ... 475,596
Flushing tank, periodical, T. C. Beaumont ... 475,533
Folding seat, M. H. & W. J. Hansen ... 475,310
Fruit grader, G. A. & C. F. Fleming ... 475,497
Furnace. See Boiler furnace. Metallurgical furnace. Smelting furnace.
Furnace, E. F. Paddon ... 475,603
Furnace door opener, C. H. Oliver ... 475,338
Furnace for iron working, W. Heckert *et al.* ... 475,398
Furnaces, hydrocarbon oil burner for, J. Wilson ... 475,478
Gag runner, Felsberg & Dill ... 475,392
Gauge. See Track gauge.
Game apparatus, W. F. Hood ... 475,561
Game apparatus, G. L. Reynolds ... 475,469
Game apparatus, C. Zimmerling ... 475,653
Game board, G. Stackhouse ... 475,624
Garments, adjusting strap for, J. A. Phillips ... 475,515
Gas, apparatus for charging magazines with liquefied, P. Giffard ... 475,728
Gas generator and burner, carbureted hydrogen, Blake & Sackett ... 475,381
Gas retorts, apparatus for discharging, A. Coze ... 475,540
Gate. See Farm gate.
Gate, Sellers & Schissel ... 475,708
Generator. See Gas generator.
Gin saw gummer, J. W. Smith ... 475,621
Governor for gas engines, speed, J. S. Connelly ... 475,385
Grain drill, J. L. Asburst ... 475,532
Grain elevating and moving apparatus, D. B. Taylor ... 475,635
Grain shocking machine, W. Russell ... 475,612
Grapevine clamp, W. H. Mills ... 475,589
Gravel, ore, etc., apparatus for cleaning and grading, N. Jewett ... 475,568
Grease, etc., from wool washings, recovering, R. B. Griffin ... 475,395
Gun rest, C. W. Unger ... 475,640
Gutter former, M. C. Hungerford ... 475,318
Hanger. See Cable hanger.
Harvester attachment, P. H. Botof ... 475,434
Harvester, corn or cane, R. B. Robbins ... 475,418
Harvester pitman rod connection, L. C. Sweet ... 475,358
Hat blocking and banding machine, G. E. Brush ... 475,662
Hay rake, horse, H. S. Powell ... 475,342
Hearth, fore, A. J. Schumacher ... 475,614
Heat alarm, automatic electric, Palmer & Desisle ... 475,340
Heating boiler, T. Meikle ... 475,459
Heel making machine, E. H. Taylor ... 475,714
Hinge, anti-friction, T. Corscaden ... 475,439
Hinge, blind, W. E. Mayo ... 475,332
Hinge, lock, L. Porter ... 475,415
Hoisting and conveying device, Spilsbury & Webber ... 475,710
Holder. See Broom holder. Coin holder. Newspaper holder. Paper holder. Temporary holder. Work holder.
Horse boot, C. L. Schoonmaker ... 475,421
Hose coupling, Balmore & Gold ... 475,738
Hose coupling, J. E. Louthian ... 475,406
Hose coupling, C. E. Petterson ... 475,704
Hose or tubing, flexible, J. Cockburn ... 475,384
Hubs, tool for cutting keyways in wheel, W. Smith *et al.* ... 475,352
Ice can, C. E. Struck ... 475,629
Ice cracking machine, J. E. Richard ... 475,518
Identity indicator, Houghton & Dick ... 475,400
Indicator. See Identity indicator. Station indicator.
Iron, steel, and other similar metals homogeneous, rendering, J. C. Fraley ... 475,498
Jacquard mechanism, G. W. Stafford ... 475,711
Jail corridors, safety door for, P. Hale ... 475,556
Kiln. See Brick kiln.
Kilns, system of pipes for heating lumber, A. T. Bemis ... 475,480
Knife. See Pocket knife.
Knit nether garment, S. T. Sutton ... 475,734
Lamp, electric arc, L. Brianne ... 475,289
Lamp, electric arc, R. S. Dobbie ... 475,544
Lamp, electric arc, J. E. Gaston ... 475,727
Lamp, incandescent electric, H. Green ... 475,394
Lamp, incandescent electric, H. B. Meech ... 475,698
Lamp socket, incandescent, C. A. B. Halvorson ... 475,555
Lamp socket, incandescent, F. C. Rockwell ... 475,345
Land roller attachment, Burr & Cummings ... 475,291
Lantern, F. L. Wells ... 475,646
Latch, gate, M. Haggar ... 475,554
Lathe, E. Conrady ... 475,671
Lathing, machine for making metal, G. A. Ohl ... 475,700
Leaf turner, A. C. Frankel ... 475,393
Letter box, J. W. Manlove ... 475,694
Letter box, house door, G. D. Sidman ... 475,473
Lifter. See Plate lifter.
Lightning arrester, Browne & Tidnam ... 475,482
Lightning arrester, A. G. Waterhouse ... 475,645
Line, plow, G. H. Jordan ... 475,570
Loads, hydraulic apparatus for moving, R. Middleton ... 475,588
Lock. See Nut lock. Permutation lock. Switch lock. Umbrella lock.
Lock for adjustable machine tables, W. A. Greaves ... 475,553
Locking rack for umbrellas, coats, hats, etc., E. J. Colby ... 475,720
Locomotive, electric, T. A. Edison ... 475,491 to 475,493
Log carrier, portable, D. S. Stombs ... 475,628
Loom let-off, W. H. Miley ... 475,690
Loom let-off mechanism, J. Morton ... 475,595
Loom shedding mechanism, G. W. Stafford, 475,625, 475,712
Loom shuttle binder, Baynes & Whalley ... 475,380
Looms, stop motion device for revolving box, T. F. Warrington ... 475,477
Lubricator. See Propeller shaft lubricator.
Lubricator, J. P. Kealy ... 475,690
Mail bag catcher, J. Gleason ... 475,307
Malting system, pneumatic, F. B. Giesler ... 475,550
Mat. See Wire mat.
Matte from slag, apparatus for separating, D. Sheedy ... 475,522
Mattes and ores, treating, H. L. Herrenschmidt ... 475,558
Measure reel, tape, J. Roe ... 475,470
Measuring reel, H. L. Stull ... 475,630
Mechanical motor, W. M. Lewis ... 475,580
Mechanical movement, W. H. Baker ... 475,379
Merry-go-round, A. Palmer ... 475,742
Metal planer, J. S. Detrick ... 475,542, 475,543
Metal rods, device for heating, A. D. Williamson ... 475,651
Metal wheel, J. R. Little ... 475,582, 475,583
Metal wheel, composite, J. L. Follett ... 475,305
Metal wheels, constructing, J. R. Little ... 475,584
Metals, tempering and hardening, J. S. Durning ... 475,725
Metallurgical furnace, C. Siemens ... 475,351
Meter. See Electric meter. Fluid meter.
Mill. See Sawmill.
Motion, electric mechanism for reciprocating, H. S. McKay ... 475,410
Motor. See Mechanical motor.
Mower, lawn, T. & W. H. Coldwell ... 475,669
Mower, lawn, C. Wiberg ... 475,649
Mowing machine, W. Scott ... 475,472
Microscope, compound, L. Thomas ... 475,362
Music leaf turner, C. H. Huff ... 475,317
Music leaf turner, J. S. & G. S. Knoweis ... 475,322
Music rack for musical instrument cases, J. A. Weser ... 475,369
Musical instrument, stringed, F. A. Cross ... 475,541
Musical instruments, tail pieces for stringed, C. J. Cook ... 475,674
Nailing machine, F. F. Raymond, 2d ... 475,417
Net, fly, W. J. Erdmann ... 475,496
Newspaper holder and door plate, combined, H. Metz ... 475,460
Numbering and marking machine, J. D. Humphrey ... 475,688
Nut lock, Terry & Maltby ... 475,636
Oil burner, Coates & Helton ... 475,297
Oil burner, W. R. Jeavons ... 475,401
Oil cup, J. M. Daugherty ... 475,387
Opera glass attachment, P. Moews ... 475,462, 475,463
Opera glass rental apparatus, J. W. Patterson ... 475,412
Ordnance, breech-loading, W. H. Driggs ... 475,545
Ore crusher, F. A. Ross ... 475,347
Ore sampling device, R. C. Hawley ... 475,557
Oven, baker's, W. Lenderoth ... 475,403
Pail and strainer, combined milk, F. & G. W. Ansley ... 475,375
Pail, scrubbing, J. E. Zeiser ... 475,429
Paper cutting device, Coram & Huntoon ... 475,722
Paper feeding device, Coram & Huntoon ... 475,723
Paper folder feeding attachment, C. N. Walls ... 475,644
Paper holder, G. S. Gray ... 475,308
Paper, etc., machine for applying adhesive material to the surface of, J. M. Carew ... 475,535
Paper tube making machine, Coram & Huntoon ... 475,721
Pavement, street, G. S. Curtis ... 475,724
Pencil holder, sharpener, and eraser, combined, C. B. Campbell ... 475,485
Perfumes, extracting, R. A. Chesebrough ... 475,437
Permutation lock, J. Roche ... 475,520
Pessary, E. Kirwin ... 475,453
Phonographic records, method of and means for duplicating, or transferring, L. F. Douglass ... 475,490
Photographic pictures, developing, M. Andresen ... 475,372
Photographic shutter, Albrecht & Ortmann ... 475,654
Pile fabrics, apparatus for cutting, J. H. Smith *et al.* ... 475,620
Pile fabrics, knife for cutting, J. H. Smith *et al.* ... 475,709
Pipe and manufacturing the same, coated metal, W. Lacy, Jr ... 475,454
Planter and fertilizer distributer, potato, J. S. Robbins ... 475,519
Planter, potato, F. Robinson ... 475,610
Plate lifter, J. H. Traylor ... 475,363
Plow, J. Du Shane ... 475,681
Plow, Jackson & Reiger ... 475,731
Plow, P. C. Pagett ... 475,604
Plow, sulky, C. E. Tower ... 475,638
Plow, sweep, A. M. Miller ... 475,461
Plug cutter, F. C. Heydenreich ... 475,559, 475,560
Pocket knife, R. H. Franklin ... 475,306
Potato digger, G. E. & M. J. Anderson ... 475,373
Power, etc., machine for utilizing ocean, R. L. Johansen ... 475,451
Press. See Printing press.
Printing and lithographic presses, sideguide for, F. C. Davis ... 475,677
Printing machine, check, C. Paine ... 475,605
Printing, means for surface, E. S. Boynton ... 475,534
Printing press, W. B. Lawrence ... 475,327
Propeller shaft lubricator, F. R. Cedervall ... 476,436
Puller. See Stump puller.
Pulley block, H. Loud ... 475,692
Pulverizing machine, A. Sablin ... 475,471
Pump, A. Carlson ... 475,536
Pump, C. Chamberlin ... 475,296
Pump, steam jet, J. A. Bills ... 475,716
Punch for cutting out shapes from sheets of plastic material, G. A. Firnstein ... 475,549
Purse safety attachment, H. W. Hock ... 475,503
Rack. See Advertising card rack. Locking rack. Music rack.
Railway, electric, T. A. Edison ... 475,494
Railway rail chair, M. E. Clemons ... 475,539
Railway switch, street, R. H. Snively ... 475,475
Railway trolley, electric, J. W. Newhouse ... 475,467
Rake. See Hay rake.
Recorder. See Time recorder.
Reel. See Measure reel. Measuring reel.
Refrigerator, M. S. Millard ... 475,591, 475,592
Refrigerator, water cooling, W. H. Pickett ... 475,414
Register. See Autographic register. Cash register.
Registering mechanisms, electric actuator for, C. F. Holt ... 475,399
Regulator. See Temperature regulator.
Rein support, S. J. Myers ... 475,465
Rheostat, C. Willms ... 475,528, 475,529
Rock, splitting, G. L. Weller ... 475,647
Rocking chair, reclining, J. G. Whittier ... 475,370
Rule, folding, J. Satter ... 475,419
Salt, C. F. Lawton *et al.* ... 475,577
Salt, apparatus for the manufacture of, C. F. Lawton *et al.* ... 475,575
Salt, manufacturing, C. F. Lawton *et al.* ... 475,576
Salt manufacturing apparatus, C. F. Lawton *et al.* ... 475,574
Sand box, electrically heated, L. E. Pease ... 475,703
Sand moulding machine, C. S. Snead ... 475,523
Sand moulds for pipes, etc., apparatus for forming, P. H. Sharp ... 475,349
Sash fastener, M. L. Dudley ... 475,739
Sash fastener, W. Keenen ... 475,572
Sausage guts, machine for filling, W. Wassermann ... 475,367
Sawmill, band, C. B. Long ... 475,328
Saw set, C. C. Taintor ... 475,359
Scaffold, L. Chalfant ... 475,665
Scale, automatic weighing, N. Lombard ... 475,405
Scale, pendulum, Chase & Smock ... 475,295
Screw cutting tool, W. Hutcheson ... 475,564
Sealing device, C. Cuttriss ... 475,442
Seam for sheet metal, C. E. Bertels ... 475,656
Seat. See Folding seat.
Sewage, purifying, F. R. Conder ... 475,670
Sewing machine embroidering attachment, R. W. Whitney ... 475,426
Sewing machine spool holder, L. A. Miller ... 475,511
Sheet metal articles, manufacturing, F. Vohringer ... 475,642
Sheet metal bending machine, C. J. Colling ... 475,299
Shelf, folding, H. Korell ... 475,323
Shelving, adjustable book, G. Stikeman ... 475,627
Signal. See Car signal.
Signaling apparatus, electric, W. C. Moore ... 475,334
Skate, U. Wierda ... 475,650
Smelting furnace, copper, B. Richords ... 475,609
Sole inking tool, Atwood & Orcutt ... 475,377
Sole trimming machine, J. H. Reed ... 475,608
Square and drawing board attachment, T-, A. T. Page ... 475,741
Square, bevel and try, S. C. Downey ... 475,390
Spark arrester and draught regulator, W. M. Letts ... 475,579
Speed changing mechanism, W. A. Wright ... 475,735
Spring. See Door spring.
Spindle stand, picker, Byrne & Lafferty ... 475,484
Stamp, perforating, dating, and receipting, Cummins & Stenwall, Jr ... 475,440
Staple extractor, T. M. Hunt ... 475,689
Station indicator, R. B. Ayres ... 475,378
Steam boiler, A. L. Bladholm ... 475,288
Steam boiler, W. J. McAleenan ... 475,409
Steam boiler, low pressure, H. Abel ... 475,479
Steam engine, H. Unzicker ... 475,365
Steaming clams, oysters, etc., apparatus for, J. H. Starin ... 475,353
Steering mechanism, boat, J. Savage ... 475,420
Stirrup, L. Anderson ... 475,374
Stone crusher, G. Lowry ... 475,330
Stopper. See Bottle stopper.
Stove grate, F. W. Collins ... 475,298
Stump puller, J. Milne ... 475,333
Suspension catch, detachable, B. Pickering ... 475,516
Switch. See Railway switch. Wire switch.
Switch lock, automatic, S. Grove ... 475,740
Syringe tube sinker, A. C. Eggers ... 475,495
Table and chair, combined, C. Hunzinger ... 475,505
Tack driving machine, G. W. Copeland ... 475,488
Tank. See Flushing tank.
Telegraphic relay, C. Cuttriss ... 475,441