

cations, etc., of a dynamo that will require one-half to two-thirds horse power to drive it? A. Our advertising columns carry the names of firms dealing in these articles.

(7312) W. J. K. asks: 1. How many ounces of tungstate of calcium would it take to cover a screen 6 by 8 inches square? A. Two ounces, if laid on with great uniformity. 2. I am wishing to make a "Tesla" transformer (similar to the one described in Dr. Morton's X ray) to transform a 2-inch spark of a small static machine to a 6-inch spark to excite an X ray tube. Could you give me any advice as to the way to make it? A. The Tesla coil is fully described in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 1057 and 1124, price ten cents each by mail. We do not think the spark of a small static machine can be transformed as you suggest. The original discharge is not powerful enough to be transformed to so high a voltage. 3. I have started to make a transformer similar to the above one. I took a pasteboard tube 3/8 inch outside diameter, 1/2 inch inside diameter and 7 inches long, and wound one layer (about 13 feet) rubber insulated wire around it, No. 18, and now I have started to wind on the secondary, No. 30, single cotton covered. How much wire will I need to produce the 6-inch spark? 4. Have I enough primary on? A. Follow the directions of the SUPPLEMENTS referred to above. 5. If I use oil insulation, what kind ought I to use, and where can I get it? A. Paraffine oil.

(7313) J. F. A. R. writes: I have built the eight light dynamo as described in SUPPLEMENT, No. 600. 1. I would like to wind a new armature so that I can use it as a motor on a 550 volt current. Now, what size wire shall I wind on armature, and what size on field, so that by changing armatures I can use it as a motor and a dynamo. 2. Can I make and wind an armature so as to get a 110 volt current with the field winding for the other two armatures; if so, what size and how much? Could I increase the number of commutator bars and coils, say, to 30? Cannot the field winding be arranged so as to increase or diminish the amperage at will? Have had the dynamo with its present winding connected with the 550 volt current, but had to disconnect all but one coil or layer on each leg, so as to prevent blowing out the 15 ampere fuses; with the one coil the ammeter still read 10 amperes. I would like to make the armature and field winding so that as a motor it will not read over 7 or 8 amperes, even less if possible. A. On account of the very high voltage it would not be advisable to use the machine for 550 volts as well as 60. To wind it for 550 volts as a motor, make the commutator with 48 sections instead of 24, slot the end of the bar and solder the wires in the slot, instead of using screws. Make the bore of the field 3 3/4 inches. Wind the armature with No. 26 wire, putting on 63 convolutions in each of the 48 sections, winding 3 layers deep, 21 turns per layer. For the fields use No. 28 wire, winding 50 layers on each leg. Connect the two stator series and use as a shunt circuit. As a starting box connect a bank of ten 50 volt lamps in series with the machine, cutting the lamps out one at a time as the machine comes up to speed. In winding insulate thoroughly, using best insulated wire. Do not allow more than one ampere to pass through machine. In a motor the current which it takes depends upon the amount of work which it is doing and not upon the field winding.

(7314) H. H. asks for instructions for making and setting up a sun dial for (approximately) 43° 40' N. latitude, 75° 20' E. longitude. As I am only an amateur, the easier the means the better. A. The construction of a sun dial is described with illustrations in SCIENTIFIC AMERICAN SUPPLEMENT, No. 873. Much information regarding them, with illustrations, may be found in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 631, 796, 810, 866, 933, price 10 cents each by mail. The edge of the vertical plate which casts the shadow must make an angle with the horizontal plate equal to the latitude of the place where the dial is to be used. In your case, this angle is 43° 40'. The longitude is not concerned.

(7315) J. O. K. asks: 1. When smoke ascends from chimneys in a straight line, is it a proof of rarity or density of the air? A. Smoke rises when it is lighter than the air. Of course, then the air is denser when the smoke rises than when it does not rise. 2. Should not the field magnets of motor, Edison style, be wound in different directions? A. These magnets are wound so that the pole piece on one side of the armature is +, and that on the other side -. 3. Is there any transformer made for street car currents? A. Yes. A rotary transformer. The current from the line runs the machine as a motor, and a winding in the armature gives a current of the voltage and character required, direct or alternating. 4. What is the meaning of two or three phase systems, etc.? A. A 3-phase system employs an alternating current which flows in three impulses, each 1/3 of an alternation behind the next. Similarly define a 2-phase system.

(7316) D. B. asks: Of what size, proportion, and what size of wire should an electro-magnet be made to produce the greatest amount (approximately) of magnetism from a Leclanche or a good dry cell contact to last 1 1/2 seconds every minute? Should one or two spools be used? A. Use a 3/4 inch soft iron rod, about 2 inches long, for the core of the magnet, and wind on No. 20 or 24 silk covered copper wire to a depth of 3/8 to 1/2 inch. Two spools will attract an armature much more strongly than one.

(7317) E. R. B. writes: Have a Baush & Lomb student's microscope, 3/4 inch eye piece and objectives 1 inch and 1 1/4 inch. Is there a possibility of rigging the instrument up so that I could project the subject on a screen of ground glass? Intend to use 50 candle power acetylene flame at close range. The mechanical part I can handle, but it is in optics that I am a little "shy." A. Take the eye piece out of the microscope and set the tube horizontal. Inclose the light in a box so that the room may be dark, and have an opening into the box against which the stage of the microscope should be placed. Adjust focus till image is distinct on screen. The size of image depends upon the distance of screen from microscope. Good books for you are "The Art of Projecting," A. E. Doherty, price \$2 by mail; and much that is in Hopkins' "Experimental Science," price \$4 by mail.

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INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted JANUARY 4, 1898, AND EACH BEARING THAT DATE.

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

Table listing inventions with names and patent numbers. Includes items like 'Adding machine, A. L. Platt', 'Air and inflammable vapor apparatus', 'Air apparatus for increasing efficiency of compressed air', 'Amalgamator, J. A. Hodgson', 'Amidons making, E. Tauber', 'Animal trap, T. H. Bradish', 'Assay furnace, W. Hoskins', 'Auger, post hole, J. A. Green', 'Automobile, F. G. Mather', 'Awl sewing, G. P. Summers', 'Axle, vehicle, J. A. McLaughlin', 'Back and shoulder brace, J. A. Bassett', 'Badge or pin, campaign, G. L. White', 'Bag, See Water bag', 'Ball and cover attachment, J. L. Clark', 'Bake pan, R. C. Snyder', 'Bale ties, machine for making wire, H. E. Schnabel', 'Barrel filling machine, J. E. J. Goodlett', 'Battery, See Voltaic battery', 'Bearing, ball, J. B. Kennell', 'Bearing, ball, J. B. Kennell', 'Bearing roller, T. J. Reid', 'Bed brace, R. K. Dent, Jr.', 'Bed folding couch, D. C. Storr', 'Bed slat, M. Pickett', 'Bedstead, O. S. Foster', 'Bell, bicycle, N. Hill', 'Belt fastener, W. H. Bristol', 'Bicycle, Cardell & Ostergren', 'Bicycle, W. Corliss', 'Bicycle, air propelled, D. A. Moore', 'Bicycle brake, H. Morrison', 'Bicycle crank and axle, F. L. Siglew', 'Bicycle crank axle and sprocket, T. Midgley', 'Bicycle gearing, C. A. Johnson', 'Bicycle handle bar, J. D. King', 'Bicycle luggage carrier, R. Spencer', 'Bicycle rim bending machine, A. A. Ferguson', 'Bicycle saddle clamp, A. L. Garford', 'Bicycle saddle post, A. L. Garford', 'Bicycle stand, G. B. Price', 'Bicycle supplemental seat, R. M. Olyphant, Jr.', 'Bicycle support, W. J. Hofer', 'Bicycle tire clip, S. Halligan', 'Bit stock, K. C. Head', 'Bituminous material, exploitation and conveyance of, A. F. L. Bell', 'Blowpipe and burner, combined gasoline, M. C. Park', 'Boat, foot propelled, J. & C. Quist', 'Boiler, See stationary boiler. Steam or hot water boiler', 'Boiler cleaning apparatus, steam, Burness & Richey', 'Boilers, smoke and gas returning apparatus for steam, P. Strauss', 'Boiler, sample exhibiting, S. Mulhauser', 'Boring machine, automatic overhead joint, J. C. Bennett', 'Boring machine, multiple, W. W. Green', 'Bottle, W. H. Fulcher', 'Bottle and closure, H. P. Grow', 'Bottle, machine, C. Dickerson', 'Bottle, non-refillable, E. M. Phelps', 'Bottle, non-refillable, L. M. Spitting', 'Bottle packing case, C. A. Rohdin', 'Bottles, device for preventing refilling of, C. Becker', 'Box, See Match and cigarette box. Packing box. Sand box', 'Brace, See Back and shoulder brace. Bed brace', 'Brake, See Bicycle brake. Car brake. Elevator compound brake. Magnet brake. Railway brake. Vehicle', 'Bridge, portable, H. H. Frick', 'Brooder, J. E. Bennett', 'Broom holder, M. A. Steppart', 'Broom or brush, sectional, J. C. Schmidt', 'Brush, J. F. Hoke, Jr.', 'Brush machine, W. C. Head', 'Burner, See Gas burner', 'Calcium acetate, apparatus for manufacturing, M. F. Quinn', 'Camera, kinetographic, Unger & Krug', 'Capsule holding machine, T. E. Irig', 'Car brake, J. C. Dickerson', 'Car coupling, F. Duplaisir', 'Car coupling, H. A. Hanna', 'Car, dumping, Cashin & Shaffer', 'Car fender, G. Hipwood', 'Car seat, S. Udstad', 'Car, venting, C. E. Foster', 'Carding machine attachment, J. P. Mezenigal', 'Carrage, baby, G. Eisenenger', 'Cash register, A. S. Wells', 'Casting apparatus, metal, W. E. May', 'Cellar construction, C. H. Schmidt', 'Centrifugal machine, Diefenthaler & Rehl', 'Chain, cycle driving, J. W. Deans et al.', 'Chain tightener, F. A. Redmon', 'Chair, See Dental chair', 'Chair and ladder, combined, J. F. Von Behren', 'Chair for apartment houses, waste, J. D. Thompson', 'Cigar branding machine, N. Du Brul', 'Cigar cutting machine, G. W. Tanner', 'Cigar or cigarette, M. Feder', 'Cigar wrapping cutting machine, C. A. Baker', 'Cigarette making machine, J. H. Schmidt', 'Cigarettes with coating material for mouthpieces, mechanism for providing one end of wrappers for, T. E. Allen', 'Clamp, See Bicycle saddle clamp. Picker staff clamp', 'Cleaner, See Gutter cleaner', 'Clock attachment, alarm, P. C. Howe', 'Clock, electric, F. Richard', 'Closure controlling apparatus, H. Rowntree', 'Cloth cutting machine, G. Castle', 'Clothes holder, L. W. Adelfen', 'Clutch mechanism, friction, G. S. Binckley', 'Coffee pot, D. J. Field', 'Cooking and desulfurizing bituminous coal apparatus for, J. W. Kenvel', 'Commutator air blast driving shaft, A. Wiedenbauer', 'Concrete conduits, apparatus for moulding, G. M. Peck', 'Condenser, A. Heberrecht', 'Condenser, distiller and feed water heater, H. W. Hand', 'Cooling cream, etc., apparatus for, A. D. Hill', 'Coop, feeding chicken, G. C. Speckard', 'Corn husking machine, Stevens & Swartz', 'Corn husking machine self feeder, L. D. Swart', 'Cornice for rolling shutters, J. G. Wilson', 'Counting machine, W. C. Porter', 'Coupling, See Car coupling. Pipe coupling. Thrill coupling', 'Coupling, T. Edwards', 'Crate, J. Heakerty', 'Crate, collapsible, J. H. Fowler', 'Crate, folding, W. A. Whitaker', 'Cream separator, centrifugal, C. Hohnsbehn', 'Cultivator, C. Russell', 'Cultivator shield, T. W. King', 'Currents, converter for monophase, Blondel & Sautter', 'Curtain fixture, R. R. McClellan', 'Curtain roller attachment, M. L. Kulberg', 'Cyanide and king, R. A. Doid', 'Dam, gate or weir, automatic, W. L. Marshall', 'Dam, water, J. Whitehead', 'Dampers for registers, automatic, S. B. Jungkurth', 'Dental chair, N. M. Reese'

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