on the sensitizing bath for five minutes, is then hung up to dry, and should be kept dry or in a vessel containing chloride of calcium placed in a false bottom. In printing one-third longer time is required than with silver paper. The print, which is only slightly discernible, is next dexterously floated on hot oxalate bath heated from 120° to 140° Fah. The developing oxalate bath is made as follows:

Oxalic acid	25 parts.
Sodium chloro-platinite	2 "
Water	250 "

The picture quickly develops out according as it has been printed. It is then washed in dilute hydrochloric acid and water baths and dried. See also SCIENTIFIC AMERICAN SUPPLEMENT, No. 711, page 11360.

(3232) J. M. writes: Do you think from a sanitary standpoint it would be proper to discharge the sewage of a hotel into a dry well, twenty feet deep, the bottom of which is loose, porous sand? The well will be 300 feet from the building. And if there would be any danger of contaminating the water of a spring 1,600 feet from the well and which runs from the base of a hill opposite to the one on whose side the well will be located? It is the intention to use disinfectants and deodorizers in the well; and do you think quicklime sufficient? A. From a sanitary standpoint it would not be proper to discharge the sewage into the well. The better way would be to make a tight cistern of cement in the ground to receive the sewage, the contents of the cistern to be periodically removed and spread on the ground at a distance from habitations. The well, if used as a receiver of sewage as you propose, would be likely to contaminate the spring and other waters near or distant, below the level of the bottom of the well. Quicklime would be a poor disinfectant.

(3233) J. C. S. & Co. — The work on the specimen of etched glass received was done by means of hydrofluoric acid, either in the form of liquid or vapor. The entire glass, with the exception of the portion to be etched, is covered with a protective coating of varnish or wax. If liquid hydrofluoric acid is need, the glass is either dipped into it or a wax lip may be built up all around the plate and the acid poured on. The etching requires 5 or 6 minutes. After the acid is poured off, the glass must be thoroughly washed with water. According to another method, powdered fluorspar is placed in a lead trough and sulphuric acid is poured over it. The glass is laid over the trough face down, and the etching is effected by the vapors. Great care is required in the use of this acid to avoid inhaling the vapors or allowing it to touch the skin.

(3234) T. H. W. asks: Is there a colorless wash or varnish that can be applied to a bright metal surface that will not easily rub off and prevent rust? A. Mastic or very thin white copal varnish may be used for bright work.

(3235) J. M. S. says: 1. Will you please tell me how an amateur can take photographs in colors? I have tried a mirror back of the plate, without success. Also if plates are manufactured for photography in colors, if so, where can I buy them? A. The Lipmann process of photographing in colors is only an experiment and is confined to the solar spectrum. No practical process has been formulated. Try Cramer's isochromatic plates, which reproduce the color values to better advantage. 2. Please give me a formula for making blue print paper that will keep for a long while? A. For a blue printing formula see SCIENTIFIC AMERICAN SUPPLEMENT, No. 584.

(3236) R. P. P. writes: Please find inclosed sample of cement taken from a thermometer used by packers of canned goods and upon steam boilers, which stands heat and pressure of about 300 degrees. It is used to form a steam tight joint between the thermometer tube and the brass casing. Will you be kind enough to inform a yearly subscriber of your paper how to make and use this cement, also if it will stand brine? A. The cement appears to be composed of plaster of Paris mixed with a solution of silicate of soda or soluble glass. You can obtain the silicate through the drug trade. It may be plaster of Paris mixed with strong solution of alum, or oxide of zinc mixed with a solution of chloride of zinc 10 to 20 per cent. Either cement is applied like plaster of Paris, and will stand brine reasonably well, especially the latter.

(3237) R. H. W. writes: I herewith inclose you a box of matches, just as it was opened, except two matches taken out. Will you kindly explain, through the columns of your journal, how every match in the box could be charred in this way, the phosphorus all burned, and no greater combustion. The wood part of the match seems to be merely discolored. The box containing them shows no mark of violence, and is not burned. These matches were packed 1 dozen boxes in a paper which was sealed up nearly air tight. A. The composition on the end of the matches probably contained phosphorus mixed with some compound rich in oxygen. If the package was closely sealed, the combustion would for want of air be confined to the ends of the matches if these became ignited. Moisture, if present, would be of great effect in reducing the intensity of the combustion, and might by itself suffice to confine it to the tips. How the ignition occurred can only be a matter of surmise.

(3238) O. McK. writes: 1. I want to make a dynamo from which wires run to the motor which drives the machine. If you have a SUPPLEMENT telling how to make such a dynamo, please say what number it is. A. SUPPLEMENT No. 600 contains full information on the construction of an 8 light dynamo. 2. What is a laminated armature? A. A laminated armature is one in which the core is formed of thin iron plates separated by insulation. 3. What candle power lamp would this run? A. The dynamo above referred to runs eight 16 candle power lamps. 4. Does distance between dynamo and motor have any effect on the speed? A. The distance makes a great difference if not compensated for by an increased cross section of conductor. If the resistance is kept down, the distance is immaterial.

(3239) C. G. A. asks: Can you give me any preparation for softening the wings of butterflies and moths, after they have become brittle? Can you tell me of something that will take parasites off worms without killing them, and keep large beetles from becoming odorous? A. The wings of butterflies are softened by placing the insect on a piece of hot clean paper laid on wet sand contained in a jar. In the course of 2 to 5 hours the wings are sufficiently soft to permit of spreading the same. Parasites can be taken off caterpillars by means of a fine pair of pliers, but the results are usually not very satisfactory. Large beetles are best opened on the tail or belly and the inner organs removed to avoid rapid decay and smell. (See SUPPLEMENT catalogue.)

(3240) H. G. wants a formula for albumenizing and silvering paper for photographic printing, one that will make paper which will keep for some time if possible. A. You can purchase albumenized paper with less expense than will be required to make it. To sensitize albumenized paper that will keep for some time, prepare a nitrate of silver solution by dissolving sixty grains of silver to the ounce and do not let it get lower than 50 grains to the ounce, testing occasionally with the hydrometer. After solution of the silver, add citric acid drop by drop, until the slight precipitate of citrate of silver formed is just redissolved. Float the paper on the bath from three to five minutes, and on removing, place between sheets of clean blotting paper, which may be used over again. Paper thus prepared has been kept white and good for nine months and tones easily.

(3241) G. G. writes: I wish to ask if you know of any substance to cover large nickel plated wrought and cast iron work to stop corrosion during transmission to South American ports. From experience I know that brass instruments covered with lacquer, notwithstanding being carefully packed, turn black and have to be shipped in air tight tin boxes. A. A good protection for nickel plated goods for export is paraffin applied hot, and the goods then wrapped in paraffin or wax paper. Waxed paper bags make an excellent waterproof and air tight package.

(3242) T. B. asks for a formula for toning wood prints black, or the color of prints on albumen paper. A. Tone with a bath made of—

Chloride of gold	1 gr.
Pulverized borax	60 "
Water	4 oz.

See page 225 of SCIENTIFIC AMERICAN, April 13, 1889.

(3243) J. A. R. says: Please give me a good formula for making a preparation which will kill the bed bug and destroy its eggs. A. Use corrosive sublimate, to be had at drug stores. Druggist will tell you how to use it.

(3244) T. D. McC. writes: In your answer to query No. 3180, I notice what looks like a slight error. You say, "If you divide the voltage by the number of watts, you will have the current in amperes required." As W = C E, dividing the number of watts by the voltage will give the required current, which is 0·845 ampere. The resistance of motor should be 130 ohms.

(3245) D. McC. S. S. writes: 1. I notice in this week's issue of your valuable paper, you state in answer to query 3152, "What is the difference between a square foot and a foot square? A. There is no difference in area or quantity of surface, but there may be a great difference in shape," etc. Now it seems to me that though this answer is, when applied to one square foot, perfectly correct, it would be liable to be misleading when applied to more than one. Thus, for instance two feet square would be equal to $2^2 = 4$ square feet, and I therefore think that the number of square feet in a given area of feet square would be best expressed by the formula x F. sq. $= x^2$ sq. F. Please inform me whether this is not correct. A. This is right as far as it goes, but your formula only applies to squares, and does not take rectangular figures within its scope. 2. Also, could you inform me what is the value of ordinary carrier pigeons in this country, and would these be capable of carrying small packages of say 4 to 8 oz., or can they only carry very light letters? A. Carrier pigeons can only carry light letters. Their price varies with their age, breeding, and proved abilities. 3. Also what is the world's total output per annum of platinum, and what is the present and what the average price of such? A. We have no very recent figures. In 1887, the production of platinum in Russia was placed at 113,724 troy ounces; 2,000 or 3,000 ounces additional were produced elsewhere.

(3246) B. M. I. asks: 1. How is wood made into pulp, and how is wood pulp converted into paper? etc. A. For wood pulp we refer you to our SUPPLEMENT, Nos. 293, 299, 311, and 570. 2. What is "Frankford black" and how is it made? A. It is a kind of black, said to be made by burning grapevine twigs or cuttings, used in printer's ink.

(3247) H. H. W. asks: 1. What is the chemical formula for aurate of ammonium? A. It is of indefinite composition. A typical formula would be $Au_3O_4(NH_4)_3.3H_2O$. 2. How is it manufactured? A. By precipitating a solution of gold with ammonium hydrate and boiling in an excess of the same; or by digesting auric hydrate in a solution of ammonium sulphate. 3. What is its explosive power compared to nitroglycerine? A. Probably ⅓ that of nitroglycerine. 4. What is the highest explosive known? A. Of the commercial explosives, nitroglycerine. 5. Can fulminate of silver or mercury be exploded without drying or removing from the liquids from which it is produced? A. Safety is secured by keeping them immersed in water, yet explosion while so immersed is at least a possibility. 6. Will nitric acid and glycerine produce enough heat on uniting to explode itself? A. No.

(3248) L. M. asks: 1. I have some specimens of satin spar that have been cut into gems for setting. They are beautiful, but are very soft. Is there any way of hardening them, also can they be colored, and how? A. They cannot be hardened nor satisfactorily dyed. 2. What way is there of preserving natural colors, in dried and pressed flowers, etc.? A. Only by avoiding exposure to light. 3. I have specimens of quartz, clear and white crystals, etc., that have been naturally stained red and yellow by sulphur, iron and alum. What chemicals or receipt can I use that will clean them and remove the stains without injuring the specimens? A. You can boil in strong hydrochloric or sulphuric acid without effect on the quartz. 4. Where can I buy agate and jasper in the rough, in vicinity, and price per lb., also Mexican onyx that is used in New York, and any other semi-precious stones for ornamental and fancy work, in rough and polished? A. Address Tiffany & Co., or Eimer & Amend, of this city.

(3249) J. R. N. asks: What is the metal gallium? Where found? What are its uses? And how long has it been known? A. Gallium is an exceedingly rare metal, and hitherto only a chemical curiosity. It is found in zinc blende from the Pyrenees and other localities. It was found in 1875, by Boisbaudran.

(3250) G. A. D. asks: 1. What is an alum cell? What is an iodine cell, and how can I construct them? The above are mentioned in "Experimental Science," on page 189, under radiometer. A. An alum cell is a tank with plate glass sides filled with a strong solution of alum. It stops most of the heat rays while allowing the light rays to pass. For use in an ordinary lantern, the cell should be ¾ inch thick. An iodine cell may be made with glass sides, but rock salt is used when perfect results are required. The cell should be 2 inches thick. The solution is made by dissolving iodine in bisulphide of carbon. The solution should be a saturated one. This cell stops the light rays and allows the heat to pass. 2. Also a selenium cell, and how can it be made? A. Selenium is rubbed on a heated brass grating; the heat melts the selenium, and some of it enters the spaces in the grating. When the selenium has cooled and crystallized, the cell is ready for use. You will find a full description of the photophone in "The Telephone," by G. B. Prescott. 3. Is it possible to reduce the resistance in a vacuum tube for the passage of the electric current to an equivalent of, let us say, the resistance of dilute sulphuric acid? A. It would be impossible to reduce the resistance to that extent. The resistance of an ordinary vacuum tube is about as small as it can be. 4. How much are five degrees Fahrenheit expressed in heat units? A. A heat unit is the amount required to raise the temperature of one pound of cold water one degree Centigrade. The Centigrade scale can be converted into Fahrenheit according to the following formula:

$$\frac{\text{Centigrade} \times 9}{5} + 32 = \text{Fahrenheit.}$$

5. Where could I buy an air pump (piston pump) of good reliable make which would not be too expensive? A. You can buy air pumps from any of the dealers who advertise in our columns.

(3251) C. A. H. asks: In rewinding a small electric motor, say about one-eighth horse power, to adapt it to Edison 110 volt circuit, what should the resistance be in the fields and armature, and the best way to connect up shunt or series? A. The resistance of the machine should be such as to use the amount of current required for the power needed. An electrical horse power is 746 watts. A watt is one ampere multiplied into a volt. If you require one-eighth horse power, you will need about 93 watts. Your E. M. F. is 110 volts; therefore, if you divide the number of watts by the voltage, you will have the current in amperes required, which is 0·84 ampere. Now, to arrive at the total resistance of the machine, you will divide the voltage by the amperage, which will give you 130 ohms. Of this amount, if the machine is series wound, the resistance of the field magnet should be abont one-half that of the armature, while if it is shunt wound, the resistance of the field magnet should be about fourteen times that of the armature.

(3252) F. H. B. writes: I have been rewinding a small motor for 110 volts, and about the same time you answer question number (3180) C. A. H. I have been questioning its correctness in my own mind and would like to ask you if am not correct and your answer is wrong; 746 watts divided by ⅛ gives 93 watts required. Now, you say divide the voltage by the number of watts and gives 1·18 amperes; but I think to divide the watts by the voltage is correct, which gives 0·84 + ampere. Now divide the voltage by amperes and it gives 130·6 + ohms resistance of wire, instead of 92 ohms. I think this way is correct, because watt is voltage multiplied by amperes. Now, having the watts and voltage, the ampere must be the number of times the voltage is into the watts, instead of watts into voltage, as you state in that answer. A. You are correct in your conclusions in regard to determining the amperage and resistance of the motor. The reply referred to was erroneous, the same is corrected in this number of the paper.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

August 4, 1891,

AND EACH BEARING THAT DATE.

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

Air brakes, slack take-up for, A. P. Riggs 457,215
Alloy and producing it, H. Marbeau 457,206
Arm rest, J. W. Aldrich 456,929
Armature for dynamos or motors and winding the same, F. A. Wessel 457,065
Axle cutter, F. E. Beardsley 456,935
Axle lubricator, car, E. Best 457,023
Badge, society, J. L. Thornton 457,098
Bag. See Feed bag.
Bag handle, Eisenman & Van Bree 457,112
Bale tie, Reed & Turner 457,292
Baling press, C. T. Anderson 457,177
Baling press, W. G. Tuten 457,173
Bars, machine for moulding and condensing round, J. R. Jones 456,957
Battery. See Galvanic battery.
Beam end and protector, E. Grinnell 456,950
Bearing, ball, H. Howard 456,955
Bed and dressing case, combined folding, G. W. Sanor 456,965
Bed bottom, Bonnell & Lambing 457,041
Bed, folding, F. Ansley 456,932
Belt clamp, G. P. Kenehan 457,123
Belt coupler, N. H. Roberts 457,012
Belt fastener, H. Kerr 456,992
Belt fastener, J. A. Kerr 456,993
Bicycle, safety, A. L. Garford 457,080
Blast furnace, H. Kennedy 457,202
Blasting plug, R. J. Bolt 456,978
Board. See Bread board. Wash board.
Boats, foot rest for row, E. E. Trnscott 457,236
Boiler. See Steam boiler.
Book trimming machine, C. Seybold (r) 11,184
Boot or shoe last, E. O. & G. A. Krentler 456,994
Border cutter, W. J. Adams 456,928
Bottle filling machine, Smith & Marcey 457,229
Bottles, etc., apparatus for finishing necks of, S. C. Stancliffe 457,035
Box. See Letter box.
Box fastener, T. L. Firestone 457,311
Braiding machine, J. Thomas 457,170, 457,171
Brake. See Car brake. Wagon brake.
Bread board, A. S. E. Metcalf 457,052
Bridge, L. Pulliam 457,291
Bridge gate, C. R. Hanson 457,275
Broiler, vertical, J. Gibbons 457,316
Brush, tooth, F. M. Osborn 457,007
Buggy heater, E. Richards 457,214
Burner. See Gas burner.
Bustle, W. Townsend 457,172
Butter extractor, centrifugal, C. A. Johansson (r) 11,183
Button or stud, cuff, S. C. Scott 457,034
Button setting machine, W. M. Gerkey 457,208
Cane slicing machine, sugar, E. Schulze 457,221
Can ewith removable tobacco pipe tubes, etc., walking, H. Killenberger 457,160
Cap, I. Bash 457,069
Car brake, G. E. Johnson 456,958
Car brake, electric, C. R. Arnold 457,067
Car brake, electric, E. Verstraete 457,016
Car brakes, device for automatically operating, J. H. Fox 457,313
Car coupling, W. R. Anderson 456,930
Car coupling, A. Asbell 457,241
Car coupling, R. Clinton 457,108
Car coupling, C. F. Comstock 457,076
Car coupling, A. Fontayne, Sr 456,987
Car coupling, E. N. Gifford 457,154
Car coupling, J. Green 457,048
Car coupling, O. W. Stublefield 457,096
Car coupling, steam or air, J. Blattner 457,246
Car, hand, E. Courtright 456,982
Car label holder, self-locking freight, D. R. Proctor 457,031
Car propelled by electricity, S. H. Short 456,970
Car replacer, J. E. Norwood 457,326
Car spring, E. Cliff 457,074
Car wheel, G. W. Seylar 457,094
Car wheel lubricator, A. W. Ward 457,019
Cars, electric motor for street, Thomson & Rice, Jr 457,056
Cars, sanding device for street, N. Newman 457,325
Carding engine, C. L. Hildreth 457,319
Carpet fabric, ingrain, Patterson & Walker 457,288
Carriage, folding baby, T. Nesom 457,006
Carrier. See Cash carrier.
Cart, ash, D. M. Holmes 457,320
Cartridges, automatic pouch for, G. Minisini 457,053
Carving machine, S. F. Moore 457,165
Case. See Lock case. Ticket case. Watch case.
Cash carrier, J. M. Caille 456,980
Cash indicator and register, C. B. Hopkins 457,199
Cash register and indicator, I. D. Boyer 457,249
Ceilings, walls, etc., ornamental metal panel for, J. H. Ewing 457,310
Chair. See Dental chair. Swinging chair.
Chairs, spring attachment for base rocking, A. B. Stevens 457,137
Check, baggage, J. K. Lockhard 457,162
Chopper. See Cotton chopper.
Chrome yellow, making, F. W. Ihne 457,028
Cider mill, J. L. Robrer 457,277
Cigar fillers, machine for making, M. Van Gulpen 457,238
Cigar stand and holder, Vint & Goldberg 457,087
Cigarette machines, cigarette drawing band for, O. W. Allison 456,976
Clamp. See Belt clamp.
Cleaner. See Track cleaner.
Clock, electric, Menns & Dudley 457,030
Clocks, repeating mechanism for, G. H. Blakesley 457,024
Clothes drier, W. Glanser 457,114
Clothes pin, J. Kimmel 457,121
Cock, ball, J. McNeil 457,006
Commutator or contact brush, L. Paget 457,327
Compass, ship's, Knudsen & Norholm 457,161
Cooker and dish washer, combined steam, H. A. Shepard 457,224
Cooking vessel, S. H. Mitchell 457,208
Copying and recording apparatus, autographic, A. L. Peirce 457,289
Cores, device for supporting and centering, F. L. Badger 457,021
Cotton chopper, J. A. Baugh 457,040
Coupling. See Car coupling. Electric light shade coupling. Shaft coupling.
Crushing and grinding mill, T. C. Cadwgan 457,146
Cuff holder, H. D. Mugerditchyan 457,210
Cultivator, F. B. Harvey 457,198
Curbing, metallic, I. L. Landis 456,995
Curtain fixture, L. Kahn 457,119
Cutter. See Axle cutter. Border cutter. Meat cutter.
Cutter bar adjuster, G. Lake 457,051
Cutting apparatus, N. Clouse 457,045
Dental anodyne, G. I. Keener 457,201
Dental chair, D. Stuck 457,059, 457,060
Dish washing basket, C. A. Haskins 457,318
Dish washing machine, C. A. Haskins 457,317
Disks and washers, device for cutting, J. L. Sigsbee 457,227
Door check, pneumatic, A. Dudden 456,945
Door guard, F. Ludewig 456,998
Drawers, W. H. Paul 457,130
Dredging apparatus, R. H. Fraser 457,314
Drier. See Clothes drier.
Drill. See Grain drill. Rock drill. Stone drill.
Drill, W. N. Packer 457,009
Drum, heating, S. Loew 457,282
Electric conductor, E. M. Boynton 457,106
Electric conductor support, E. M. Boynton 457,105
Electric currents, system for conducting, E. Britt 456,979
Electric elevator, F. B. Perkins (r) 11,185
Electric light shade coupling, P. Levison 456,997
Electric machines, automatic brush shifter for dynamo, T. E. Adams 457,330
Electric machines, brush holder for dynamo, S. H. Short 457,226
Electric switch, W. C. Bryant 457,300
Electric switch, L. D. Castor 457,301
Electric systems, mechanical switch for, C. Daufenbach 457,110
Electric track signal, M. W. Parrish 457,058
Electro-magneto cut-out, S. H. Cobb 456,940
Elevator. See Electric elevator.
Elliptic spring, P. N. French 457,266
End gate, W. A. Hall 457,274
Engine. See Carding engine. Gas motor engine. Gas or vapor engine. Wind engine.
Engines, reheater for compound, F. W. Dean 457,078
Envelope holder, L. A. Farnsworth 456,947
Evaporating sirup, L. R. Tabor 457,097
Evaporator, M. Swenson 457,234
Extractor. See Butter extractor.
Eyeglasses, B. A. Capehart 457,253
Fabric. See Carpet fabric.
Fan, electric hand, W. B. Luce 457,127
Feed bag, F. S. Ketchum 457,086
Feed bag, G. W. Salter 457,032
Feed bag attachment, G. B. Schmidt 457,220
Feed water purifier, J. J. Hoppes 457,157
Fence, Duffey & Kitselman 457,044
Fence, flood, H. Huffman, Jr 456,991
Fence post, sheet metal, F. P. Rosback 457,133
Fence station device, electric, D. H. Wilson 457,296
Fence, wire, C. M. Kiler 457,158
Fence wire stringing implement, T. J. Thorp 457,138
Fertilizer distributer, J. D. Barron 456,933
Filter, E. Burhorn 457,025
Filter and purifier, water, V. Oster 457,008
Fire escape, C. J. Clark 456,939
Fire escape, M. Makely 457,285
Fireproof ventilator and heater, B. Suffron 457,233
Fish hook attachment, A. Angell 456,931
Fluid meter, J. A. Tilden 457,294
Fluid meter, rotary, J. A. Tilden 457,295
Food, etc., package for liquid, Bartley & Campbell 456,934
Foundations, strengthening and building, F. Baumann 457,144
Furnace. See Blast furnace. Hot air furnace.
Furnace, N. Brayer 457,250
Furnaces, apparatus for charging, G. R. Ward 457,093
Furniture, back and arm rest for, W. Liesenbein 457,125
Galvanic battery, J. R. Hard 457,116
Game apparatus, D. Walsh 457,018
Garment supporter, R. P. Sholl 456,989
Gas, apparatus for burning natural, C. D. Betts 457,245
Gas burner, L. H. Friedburg 457,153
Gas fire for heating and other purposes, O. F. Grant 457,081
Gas motor engine, H. Williams 457,320