rel lots. A. The addition of a slight quantity of carbolic acid to the paste will prevent it from decomposing during the warm weather. No special machinery is necessary for the preparation of paste. A large caldron and suitable arrangements for heating, a steam pipe being preferable, are all that is essential.

(53) R. S. asks whether the plant Caltha palustris, grows here in the United States. A. It does; and its proper name according to Gray's Manual is marsh marigold, although frequently designated simply as cowslip. 2. Also a recipe of a good indelible ink—a simple recipe. A. Use the following: 2 parts silver nitrate, 4 parts distilled water, 2½ parts gum arabic, 3 parts soda carbonate crystals, 5 parts liquid ammonia. Dissolve the silver salts in the ammonia, and the gum arabic and soda in the distilled water. The two solutions are then mixed together and slightly warmed, when the whole mixture becomes brown.

(54) J. H. D. writes: 1. Are the Brush form of armature and arrangement of magnets and commutators equal to the Siemens? They seem more simple. A. The Brush form of machine is very economical and efficient. 2. Why do you not advise small Brush machines to be made by amateurs? Is the armature too hard to make? A. It is a little more difficult to construct. Brush has patented an armature similar to the one suggested by you. It would undoubtedly hold together. 3. Is the Gulcher form of pole piece better than the Brush? A. We think not. 4. Please give law and formulæ of magnetic saturation. A. The maximum current that should be used is a current but little in excess of that for which the magnetism is nearly proportional to the current. 5. Please give formulæ for constructing armatures, so I can tell (at certain speed) what quantity and intensity of current it will give in a proper magnetic field. A. There is no formula for this. 6. What No. of wire should be wound on Trouve's electric motor shown in SUPPLEMENT, No 259, on field magnet and armature? A. It depends entirely on the kind of current you propose using. 7. Is there any advantage of placing field magnets in shunt circuit? If so, what proportion should shunt resistance bear to current? A. A shut wound dynamo is not liable to injury by short circuiting. The resistance of the shunt bears a certain relation to the resistance of the external circuit, and is generally determined by experiment. 8. In what number of the SUPPLEMENT do you publish a description of Siemens' later machines? A. In several numbers. See catalogue.

(55) E. N.—The problem of which you ask solution is an old "catch" question for beginners in algebra, and can only be done by "substitution." We have not room to give the work, but $x=3$ and $y=2$.

(56) A. A. S. asks: 1. Should a telegraph wire one mile long be inclosed in a heavy glass tube? Would it have any effect on the wire in the transmission of messages? A. It might prevent a very slight escape of electricity to the air, and it would probably increase the static charge in the line. 2. If a plate of glass, say 1 inch thick, 4x3 feet, be placed three feet underground, will extreme cold or warm weather affect it in any way? A. At that distance, yes. To reach a stratum of uniform temperature you would be obliged to go much deeper than three feet.

(57) E. R.—We do not think that the English police are all supplied with electric dark lanterns. It is possible that some of them are provided with such lanterns. The lantern is the invention of M. Grouve. We believe it is not for sale in this country.

(58) M. E. asks the cheapest way to bring water to factory from well three-fourths of a mile distant; the water is sometimes four and sometimes eight feet from top of ground; the factory is probably six feet below the top of the well; steam power at factory, none at well. Can we not lay iron pipe, and draw the water to us with an air chamber pump? How much water can we draw this way through an inch diameter (inside) pipe, also inch and a half pipe? A. 1 inch pipe will be useless for a suction pipe for so great a distance; 1½ inch pipe would yield about 1 cubic foot or 7½ gallons per minute, on a 4,000 foot suction with pump at factory; 2 inch pipe would double the volume.

(59) A. J. H. & Co. write: We are using a compound of white glue, refined glycerine, acetic acid, with gamboge for coloring, to form a material for "tableting" stationery and paper. Though very flexible at first it gradually dries hard, and loses its elasticity. Please give us a recipe that will retain elasticity. We do not wish a rubber compound, on account of danger, cost, or objectionable smell of the rubber solvents. A. The makers of the most widely used compound for this purpose keep secret the details of its preparation. We should think your compound a good one, and that possibly you might overcome your trouble by using a trifle more glycerine, or a slightly different kind or treatment of glue.

(60) B. B. writes: The citizens of our town wish to run water pipes, to be used in case of fire, from one end of the town to the other, about three-eighths of a mile. At each end of town is a mill with about a fifty horse power boiler each, and we have thought at said places to have a pump connected with pipe running through streets, with valves and hose connections at proper places. Is the plan a feasible one? If so, please be so kind as to tell us what size pump, pipe, etc. Will use salt water, and have to draw it about one hundred feet. A. For your fire apparatus use a 6 inch cast iron main pipe with hydrants at convenient places. A fire pump with steam cylinder 14x16, costing about $550. A pump at each mill would be worth its cost as an additional means of safety.

(61) A. L. M. writes: I have a engine 2¼ inches by 4 inches. How much power would such engine develop at 400 revolutions per minute, with 80 pounds of steam? What size vertical boiler will it take to supply the above engine? What diameter, height, number of flues, and size of flues? What thickness will shell and flue sheet be? How many feet of heating surface in such boiler? A. Your engine will develop 2¼ horse power. You will require 30 square feet effective heating surface in boiler. Boiler 2 feet diameter, 3½ feet high. Fire box 20 inches diameter, 15 inches high, 32 tubes 1¼, shell ¼ inch, heads five-sixteenths.

(62) D. W. B. writes: I want to cover my roof with copper or tin. Which will be the cheapest and best? A. There is a large difference in cost in favor of tin. Cistern water from a copper roof is not fit for drinking or cooking; otherwise copper will last 50 to 100 years.

(63) G. D. writes: I have different articles of zinc which are to be colored through dipping in a solution. So far I have tried chloride of antimony; it produces a nice black coating on zinc, but the solution soon becomes weak, and too expensive for the purpose. Have also used a solution of anvil dust, sulphur, arsenic, and muriatic acid; this makes a nice brownish bronze color, is cheap, and will do very well, but as I do not know the proportions of the different ingredients, find it difficult to get the same color, and to work well every time. A. We know of no cheaper way for making good work than the chloride of antimony process that you name. By making a record of the exact proportions by weight of your own cheap process, you may always secure the same color. Haphazard work never gives uniform results in chemical operations as well as in business operations.

(64) J. D. G.—For the breaking stress of white pine timber and joist: Rule.—Multiply the square of the depth by the breadth in inches; and this product by the coefficient 10,840. Divide the last product by the length between bearings in feet multiplied by the depth in inches. The quotient is the breaking weight in pounds.

For the	3″x12″x13 ft. beam	30,018 lb.
" "	4″x14″x13 ft. "	46,690 "
" "	8″x 8″x13 ft. "	53,366 "
" "	10″x10″x13 ft. "	83,384 "
" "	12″x12″x13 ft. "	120,073 "

etc. Safe load about one-tenth of the above.

(65) E. C. desires the best receipt for preserving asparagus; if possible, the method used by the German (Erfurst and Lubeck) canning establishments. A. Cook the vegetables in the usual way in a glass jar if convenient, and when sufficiently cooked hermetically seal in precisely the same way as ordinary preserved fruit, etc., is treated.

(66) J. R. writes: I have 50 gallons grape wine made last fall that is imperfectly fermented. It worked all right for about two weeks, then became still and remains cloudy. What shall I do to induce fermentation? A. If keeping the temperature between 70° and 80° Fah. is not sufficient to induce complete fermentation, add a small quantity of yeast, previously well mixed with some of the liquor, and gently stir in.

(67) L. C. P. asks a formula for a plating (electro) solution, using phosphor-bronze for anodes. A. We do not understand how it can be possible to electrolytically deposit phosphor-bronze. The result of the action of the current would be the decomposition of the alloy.

(68) W. E. H.—We think you could not do not better than to study what has been done in the line of your inquiry. You will find in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 54, 380, 425, 437, very interesting illustrated articles on incubators.

(69) G. B.—The simplest galvanic battery consists of a plate of copper and a plate of zinc immersed in dilute sulphuric acid, one part of acid to ten of water. It would be well to amalgamate the zinc by rubbing on it a little mercury after it has been plunged in the acidulated water. For description of other forms of battery consult SUPPLEMENT Nos. 157, 158, 159.

(70) W. J. K.—The medical induction coil does not differ materially from any other. You will find a full description of the induction coil in SUPPLEMENT, No. 160. For medical purposes you should make the coil about three inches in length, an inch and a quarter in diameter, using four layers of No. 24 wire for the primary and about ten or twelve layers of No. 36 wire for the secondary. You will need no condenser. By arranging the bundle of wires so that they may be withdrawn from the coil or inserted therein, you will be able to regulate the secondary current.

(71) C. A. A. writes: Supposing we have a dynamo and circuit complete, with fifteen arc lights in the circuit, now I contend that the last lamp in the circuit produces light at the same instant that the first one does. Am I correct or not? A. The current is supposed to be equal throughout all parts of the circuit, and if the lamps are adjusted exactly alike and the carbons are all under the same conditions, the lamps should all produce a light at the same instant.

(72) M. H.—To succeed in making music by rubbing the rims of partly filled goblets, try wetting your fingers with a little turpentine occasionally.

(73) J. F. R. says: I have some nuts for carriage axles to polish; they are plated with brass to imitate gold; how are those finished, and what is used, They have a smooth, shiny appearance and not show any scratches from the buff wheel. There are felt wheels in the market. Are they any good, or are they no better than a wooden wheel covered with leather? A. Use a felt buff and crocus; or if a fine polish is required, finish with a cotton wheel and rouge.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

May 5, 1885,

AND EACH BEARING THAT DATE.

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

Advertising device, M. Jacobs.... 317,365
Advertising device, automatic, D. J. Stephenson.. 317,240
Agricultural implement, combined, D. L. Aspinwall.... 317,276
Alkaline silicates, treating, C. S. Lockwood.... 317,389
Alkaline silicates, etc., treating, Lockwood & Hyatt.... 317,387
Arches, support for centers of masonry, C. H. Ackerson.... 317,072
Ax making machine, Yerkes & Denn.... 317,320
Axle, carriage, P. Cool.... 317,305
Axle, vehicle, C. Huehn.... 316,974
Bag holder, A. R. Hill.... 317,356
Bar. See Splice bar.
Barrel stand, Heilbronner & Rosback.... 317,133
Basket, W. M. Hamilton.... 317,454, 317,455
Battery fluid, I. L. Roberts.... 317,206
Bedbug trap and caster, combined, H. S. Dosh.... 317,322
Bed, folding, Horn & Hopf.... 317,361
Bedstead, Kirby & Littlejohn.... 317,376
Beehive, H. S. Gideon.... 317,112
Beer cooler, J. Irlbacker.... 317,134
Belt shifter and brake, combined, Otto & Metcalf. 317,411
Bench. See Wash bench.
Beton or concrete, construction and repair with, J. C. Goodridge, Jr.... 317,338
Beton or concrete, repairing with, J. C. Goodridge, Jr.... 317,337
Bending tool, hand, G. A. Ohl.... 317,002
Bicycle social attachment, J. A. Kirk.... 317,377
Billiard table cushion, J. Rivoire.... 317,017
Bit. See Bridle bit.
Bit stock, J. T. Pedersen.... 317,187
Block. See Brake block. Paving block. Sidewalk and paving block.
Blower, S. Barrow.... 317,436
Blower for stoves and fireplaces, L. A. Miller.... 317,404
Boards, etc., device for adjusting, D. S. Brown.... 316,941
Boat, J. W. Rough.... 317,020
Bobbin and spool, J. L. Cheney.... 316,944
Boiler. See Locomotive boiler. Steam boiler.
Boiler furnace, F. E. Wilson.... 317,261
Bolt. See Flour bolt.
Bolt, W. F. Morgan.... 317,170
Bookcase, revolving, G. V. Nauerth.... 317,175
Book clasp, A. C. Hafely.... 317,122
Boot or shoe, A. Van Wagenen.... 317,477
Boot or shoe brace, J. C. Awalt.... 316,930
Boot or shoe heel plate, W. E. Quiggle.... 317,014
Boot tree, A. D. Tyler, Jr.... 317,476
Boots or shoes for buttons and buttonholes, machine for marking the quarters of, A. F. Preston.... 317,416
Box. See Garbage box. Machine box.
Box fastener, H. Krog, Sr.... 317,146
Brace. See Boot or shoe brace. Vehicle spring brace.
Bracket. See Clothes bracket. Shelf bracket.
Brake. See Car brake. Vehicle brake.
Brake block, H. C. Newton.... 317,177
Brick kiln, T. S. Hawkins.... 317,351
Brick press, J. R. Bowers.... 316,939
Bridle bit, J. Stanley.... 317,034
Broiling, toasting, etc., apparatus for, T. Allen.... 317,431
Bucket, portable water, R. A. Williams.... 317,059
Buckle, J. R. Pollock.... 317,415
Buckle, lever, J. F. Molloy.... 317,168
Buckles, apparatus for bending the hinge ends of, G. R. Kelsey.... 317,376
Buildings, artificial facing block for, H. G. Fiske.. 317,107
Burner. See Petroleum burner.
Button, G. L. Robinson.... 317,018
Button and fastening, G. W. Prentice.... 317,012
Button and necktie holder, collar, E. J. Stellwagen.... 317,239
Button hook holder for shoes, M. F. Frey.... 317,451
Button lathe, S. L. Otis.... 317,183
Buttons, manufacture of, A. J. Shipley.... 317,226
Calculator, tabular, F. W. Child (r).... 10,592
Camera stand, J. H. Smith.... 317,230
Can. See Oil can.
Cap, S. Simonson.... 317,031
Car brake, G. P. Campbell.... 317,088
Car brake, A. J. Cromwell.... 317,315
Car coupling, H. T. Beam.... 317,284
Car coupling, J. C. Boyle.... 317,082
Car coupling, A. A. Dailey.... 317,316
Car coupling, H. Graham.... 317,120
Car coupling, J. L. Griffin.... 317,342
Car coupling, J. W. Hughes.... 317,363
Car coupling, H. A. Niehaus.... 317,178
Car coupling, J. Osford.... 317,182
Car coupling, J. T. Rainey.... 317,196
Car coupling, T. Smith.... 317,232
Car, dumping, D. H. Valentine.... 317,429
Car, freight, J. M. Garverick.... 317,111
Car, hand, D. H. Beach.... 317,437
Car platform dust guard, L. B. Wood.... 317,266
Car, railway, C. F. Crockett.... 317,314
Car seat, sleeping, A. L. Kean.... 317,142
Car starter, J. Lowbridge.... 317,394
Car wheel, W. Joslin.... 316,977
Car wheel, self-oiling, E. T. Thayer.... 317,243
Cards, etc., holder for, F. L. Cutter.... 316,948
Carpet fastener, G. M. Condit, Jr.... 317,304
Carpet stretcher, W. H. Carter.... 317,296
Carriage top, C. C. Lawrence.... 316,983
Carrier. See Cash carrier.
Cart, road, I. Barber.... 316,934
Cart, self-loading, B. J. Morris.... 317,467
Cartridge, W. Sublett.... 317,041
Cartridge for electric firearms, E. A. Monfort.... 317,409
Cartridge implement, W. A. Davis.... 317,318
Cartridge shells, device for feeding, W. Mason.... 317,396
Case. See Book case. Coffin case. Ticket case.
Cash carrier, C. Baltzell.... 317,281
Casting apparatus, C. Wittenstrom.... 317,063
Casting metal pipe, apparatus for forming moulds for, J. K. Dimmick.... 317,101
Casting metal, facing or moulding material for moulds for, C. Wittenstrom.... 317,062
Castings, metal mould for, C. Wittenstrom.... 317,064
Cell package for fruit, etc., S. H. Smith.... 317,033
Chain, drive, W. A. Draves.... 317,103
Chain link, drive, E. Y. Moore.... 316,992
Chair. See Convertible chair. Folding chair. Nursery chair. Swinging chair.
Chair, A. S. Carter.... 317,295
Chair, G. W. Morstatt.... 317,468
Chair seat and chair, F. Latulip.... 317,382
Check rower, Willett & Fitzgerald.... 317,257
Chicken brooder, F. Rosebrook.... 317,210
Chime, orchestra, J. R. Lomas.... 317,391
Chimney cap, C. W. Carll.... 317,294
Chopper. See Cotton chopper.
Chuck, drill, A. B. Landis.... 317,148
Chuck, lathe, E. B. Bailey.... 316,931
Churn, J. & J. C. Matson.... 316,988
Churn, W. J. Rogers.... 317,019
Churn dasher, J. F. Hale.... 317,124
Cider mill and press, B. F. Criley.... 317,313
Cigar perforator, F. Tuecke.... 317,247
Clasp. See Book clasp. Spring clasp.
Clasp for purses, etc., E. P. Hinkel.... 317,358
Clock and lamp regulating mechanism, combined alarm, J. M. Crawford.... 317,312
Clock, illuminated, J. M. Crawford.... 317,086
Clock movement, F. A. Lane.... 317,380
Cloth, ornamentation of, C. J. Cox.... 317,310
Cloth pressing machine, R. Patrick, Jr.... 317,185
Clothes drier, Martin & Head.... 316,987
Clothes line fastener, G. C. H. Hasskarl.... 317,350
Clothes line frame, C. L. Williams.... 317,258
Clothes rack, Spross & Meeker.... 317,236
Clutch, friction, J. H. Cooper.... 317,306
Clutching device, C. P. White.... 317,056
Cock, siphon, F. W. Lyman.... 317,465
Cockle separator, L. & J. M. Morgan.... 317,169
Coffin case, I. C. Shuler.... 317,029
Colors, grinding, J. C. Jessup.... 317,367
Column, architectural, G. J. Weber.... 317,053
Comb. See Curry comb.
Compressor cylinder, W. H. Worthen.... 317, 8
Condensing engines, safety apparatus for, C. C. Worthington.... 317,069
Converters, appliance for regulating the blast pressure of, J. P. Witherow.... 317,263
Converters, blast appliance for, J. F. Wilcox.... 317,478
Converters, regulating the blast pressure of, J. P. Witherow.... 317,264
Convertible chair, B. C. Odell.... 317,000, 317,001
Cooler. See Beer cooler.
Cooling buildings, etc., apparatus for, H. C. Johnson.... 316,976
Core arbor, A. J. Doane.... 317,102
Corkscrew, E. P. Haff.... 317,123
Corkscrew, H. Strait.... 317,038
Corset, T. S. Gilbert.... 317,335
Corset and shoulder brace, combined, I. Strouse.. 317,473
Cot, C. P. Nash.... 317,174
Cotton chopper, W. Price.... 317,195
Counting attachment for machines, A. M. Burnham.... 317,438
Coupling. See Car coupling. Pipe coupling. Rail coupling. Thill coupling.
Cow milkers, protector for, H. A. Thompson.... 317,045
Crank lubricator, G. A. Porter.... 317,191
Cultivator, J. T. Atterbury.... 317,277
Cultivator, D. Brunson.... 316,942
Cultivator, M. T. McGee.... 317,400
Cultivator attachment, R. R. Lomax.... 317,392
Cup. See Oil cup.
Curry comb, J. W. Gridley.... 317,341
Curtain pole joint, R. S. Gould.... 317,339
Cushion. See Billiard table cushion.
Cuspidor, D. M. Ireland.... 317,364
Cuspidor, H. Strait.... 317,039
Cuspidor, J. J. Walton.... 317,251
Cut-off valve gear, W. C. Champlain.... 317,299
Cutlery handles, forming, W. Lorenz.... 317,393
Damper, stovepipe, H. B. Todd.... 317,046
Desk, W. H. Wetmore.... 317,253
Desk, folding reading, D. D. Bowman.... 317,288
Digger. See Potato digger.
Ditching machine, J. W. Zeis.... 317,481
Door and gate spring, Headington & Malin.... 317,132
Door check, J. Krumscheid.... 317,147
Door holder, sliding, W. E. Haycox.... 317,352
Doubletree protecter, T. Feyen.... 317,105
Draught equalizer, J. N. Bowyer.... 317,081
Drain pipe, straight-edge for laying, H. C. Lowrie 317,158
Drawing and spinning hemp, etc., machine for, J. Good.... 317,115
Drawing and spinning hemp, machine for, J. Good.... 317,117
Drier. See Clothes drier. Offal drier.
Drier, A. Munzinger.... 317,172
Drill, J. M. Glenn.... 317,336
Drills, machine for making, W. Y. A. Boardman.. 317,287
Dust pan, E. C. Atwood.... 317,433
Eaves trough trap, W. B. Porter.... 317,011
Eccentric lubricator, E. Kay.... 317,572
Egg tester, W. Kirkpatrick.... 317,462
Electric lines, support for underground, S. J. Fague.... 317,326
Electro-magnetic reciprocating engine, C. J. Van Depoele.... 317,249
Elevator. See Grain elevator. Hay elevator.
Elevator bucket, W. M. Babbott *et al.*.... 317,278
Elevator safety device, M. L. Wright.... 317,268
Elevators, controlling the operation of, G. H. Reynolds.... 317,202
Embalmer's table, H. B. Knowles.... 316,980
Engine. See Wind engine.
Evaporating pan, salt, G. H. Smith.... 317,229
Extension table, Copeland & Durgin.... 316,946
Extractor. See Spike extractor. Stump extractor.
Fan, M. Rubin.... 317,211
Fanning mill, B. S. Constant.... 317,094
Fanning mill and cockle separator, combined, E. Phelps.... 317,412
Farm gate, C. Walker.... 317,048
Faucet and vent, combined, H. B. Lytle.... 317,466
Fence, G. T. Hammond.... 317,344
Fertilizer, phosphate, W. S. Pierce.... 317,010
File, letter, A. Dom.... 316,951
Filters, apparatus for cleaning the filtering media of, Hodgkin & Perrett.... 317,457
Firearm, magazine, H. S. Maxim.... 317,162
Fire escape, W. F. High.... 316,969
Fire escape platform, R. Hammill.... 316,960
Fire extinguisher, chemical hand, E. H. Lewis.... 317,152
Fish into layers, machine for cutting blocks of, Moses & Andrews.... 317,469
Flooring, etc., wooden tongue for joining, I. H. Spelman.... 317,233
Flour bolt, centrifugal, A. Heine.... 316,968
Flower stand, P. J. Cunningham.... 317,443
Flushing apparatus, automatic, B. J. Healy.... 316,966
Folding chair, Merritt & Muller.... 317,402
Folding table, J. Danner.... 317,097
Food for calves, S. Sanborn.... 317,021
Forges, detachable lever for, J. F. Winchell (r).... 10,593
Fork. See Hay fork.
Frame. See Clothes line frame.
Fruit picking stand, adjustable, T. Elliott.... 317,325
Furnace. See Boiler furnace. Hot air furnace. Metal heating furnace.
Furnace grate, L. Passmore.... 317,184
Furnace grate bar, J. Burrell.... 317,439
Furniture, household, A. Herig.... 317,355
Gauge. See Liquid gauge. Steam and water gauge.
Garbage box, W. C. Groff, Sr.... 317,452
Garment hook, G. R. Grimes.... 317,343
Gas, apparatus for generating illuminating and heating, J. W. Mitchell.... 317,407
Gas, apparatus for manufacturing, R. B. Strapp.... 317,423
Gas conductors, joint for natural, J. N. Pew.... 317,009
Gas for illuminating and heating purposes, manufacturing, J. W. Mitchell.... 317,406
Gas from mains, preventing leakage of, H. Moeser.... 317,408
Gas from wood, apparatus for manufacturing, G. Ramsdell.... 317,194
Gas governor, automatic, J. S. Connelly.... 316,945
Gas mains, safety shield for, R. Heber.... 316,967
Gas under pressure, conduit for the conveyance of, H. Bartley.... 317,283
Gate. See Farm gate.
Gate, S. E. Miller.... 317,405
Gate, S. G. Wilkerson.... 317,058
Gelatine when combined with tannic acid, etc., treating, C. S. Lockwood *et al.*.... 317,390
Generator. See Steam generator.

Glass bottles, etc., finishing the mouths of, G. W. Yost ... 317,269
Globe, tellurian, T. H. Costello ... 317,307
Gold from its chlorides, apparatus for the electro-deposition of, E. P. Thompson ... 317,246
Gold from its ores by electro-chlorination and deposition, apparatus for the separation of, E. P. Thompson ... 317,245
Governor engine, D. P. Davis ... 317,098
Governor, steam engine, R. M. Beck ... 317,285
Grain binder, R. Brown ... 317,292
Grain elevator, C. Hayes ... 317,353
Grain shovels, device for operating power, J. Bradford ... 317,083
Grate and heater, combined open, W. W. Patton ... 317,006
Grinding mill, J. & W. L. Beall ... 316,936
Gun, machine, H. S. Maxim ... 317,161
Hair curling pin, J. Schwiebert ... 317,216
Hammock, invalid, A. Leslie ... 317,383
Hammock spreader, W. E. Brock ... 317,291
Handle. See Satchel handle. Satchel or bag handle.
Harness, R. J. Clark ... 317,301
Harness back band, W. Hardy ... 317,346
Harness pad or lining, H. C. Babcock ... 317,073
Harrow, cutting and pulverizing, T. McClelland ... 317,399
Harvester, corn, J. D. Burlie ... 316,943
Harvester, grain binding, L. Miller ... 316,991
Harvester platform, J. Garrard ... 316,957
Harvester reel, F. Laqua ... 317,150
Hat brim curls, machine for trimming, J. Bigelow ... 317,286
Hat brims, machine for planing the folded or curled edges of, R. Eickemeyer ... 317,324
Hat block chuck, R. Eickemeyer ... 317,104
Hat curling, finishing, or trimming machine, Tweedy & Yule ... 317,425
Hat machine tool coupler, Tweedy & Yule ... 317,426
Hay elevator, J. M. Foote ... 317,109
Hay fork, horse, T. D. McKinney ... 317,165
Hay press, I. N. Cauthorn ... 317,297
Hedge trimmer, hand, B. F. Bell ... 316,937
Heel machine, A. J. Langelier ... 317,149
Heel nailing machine, F. F. Raymond, 2d ... 317,199
Hinge, spring, S. S. Niles ... 317,410
Hitching device for vehicles, D. S. Munger ... 316,996
Hog cholera remedy, C. P. Smith ... 317,228
Hoisting cage or elevator unloader, automatic, D. Jenkins ... 317,136
Holder. See Bag holder. Door holder. Label holder. Necktie holder. Paper holder. Pen and pencil holder. Photographic film holder. Pillow sham holder. Sash holder. Wagon stake holder.
Holster for pistols, O. M. Hanscom ... 317,128
Hook. See Garment hook.
Hoof parer and evener, A. Knapp ... 316,978
Hop trellis, J. Lipe ... 317,385
Horseshoe, W. F. Raymond ... 317,200
Hot air furnace, L. Patric ... 317,005
Hub attaching device, G. A. Keene ... 317,144
Hub, vehicle, J. Maris ... 317,159
Hubbing machine, W. R. Hartigan ... 317,131
Hydrocarbons, apparatus for burning volatilizable, De Bay & De Rossetti ... 317,444
Hydrometer, H. Guth ... 317,453
Ice, apparatus for eliminating foreign substances from water for obtaining clear and pure, F. Jaeger ... 317,366
Ice cream freezer, J. H. Dunbar ... 317,446
Incandescents, apparatus for carbonizing, O. A. Moses ... 316,983
Injector condenser, T. Foulds ... 317,110
Insulator for electric wires, W. H. Wright ... 317,479
Jack. See Shoe finishing jack.
Joint. See Rod joint.
Journal bearing, R. W. Hardie ... 317,345
Kiln. See Brick kiln.
Knife. See Pocket knife.
Label holder, W. A. Amberg ... 316,929
Lace reel, G. E. Fox ... 316,955
Ladder, H. H. Schumann ... 317,024
Ladder, sectional, P. T. Gates ... 316,958
Lamp, M. Matthews ... 317,160
Lamp bracket, G. S. Stauffacher ... 317,237
Lamp extinguisher, H. D. Richardson ... 317,203
Lamp, incandescent electric, C. H. F. Muller ... 317,171
Lamp, street, H. G. Schuette ... 317,115
Lantern, N. P. Towne ... 317,047
Lasting machine, P. A. Coupal ... 317,309
Lathe, L. C. Rodier ... 317,209
Lathe feed mechanism, J. Flather ... 317,449
Leather cutting machine, D. Knox ... 317,463
Leg fastening and clamping attachment, removable, G. W. Zeigler ... 317,270
Level, J. Walsh *et al.* ... 317,250
Lifter. See Transom lifter.
Liquid gauge and alarm, electric, J. C. Boyle ... 317,289
Lock. See Seal lock.
Lock, A. L. Becht ... 317,076
Lock, P. Mathes ... 317,398
Locomotive boiler, C. B. Coventry ... 316,947
Lubricator. See Crank lubricator. Eccentric lubricator.
Machine box, J. G. Buzzell ... 317,087
Manhole cover for sewers, street vaults, etc., self-locking, H. C. Lowrie ... 317,153
Mechanical power, G. E. Saunders ... 317,023
Medallions, etc., manufacture and ornamentation of, J. G. Kearsing ... 317,143
Medical rubbing apparatus, M. G. Farmer ... 317,327
Metal heating furnace, W. Harty ... 316,963
Mill. See Cider mill. Fanning mill. Quartz mill. Windmill.
Mosaic of glass and lead glazing, H. F. Belcher ... 317,077
Motor. See Sewing machine hand motor. Siphon motor. Spring motor.
Motor, H. W. Teal ... 317,044
Movement cure apparatus, M. G. Farmer ... 317,328
Nail driver, S. Perry ... 317,189
Nail machine, wire, F. H. Hardman ... 317,130
Necktie holder, E. K. Haynes ... 317,354
Nursery chair, B. C. Odell ... 317,180
Offal drier, F. G. Wiselogel ... 317,061
Oil can, pocket, G. A. Payson ... 317,007
Oil cup, E. Lunkenheimer ... 317,464
Oil press cloth, G. Oliver ... 317,003
Ore separator, J. C. Porter ... 317,192
Overalls, G. Gaston ... 317,334
Overshoe, J. S. Hopkins ... 317,360
Pad. See Harness pad.
Paint, mixed, W. F. D. Pascoe *et al.* ... 317,004
Pan. See Dust pan. Evaporating pan.
Paper holder, ornamental and fly, V. G. Tansey ... 317,241
Paper lifter, adhesive, A. Spitzli ... 317,234
Paper pails, machine for pressing the bodies of, Leonard & Stevens ... 316,985
Paper pulp pails, etc., calendering machine for, Leonard & Stevens ... 316,984
Paper pulp screen, F. X. Black ... 316,938
Paraffine from oils, apparatus for extracting, Williams & Bragg ... 317,060
Paving block, H. G. Fiske ... 317,108
Peanut and coffee roaster, G. W. Harris ... 317,348
Pen and pencil holder, pocket, F. G. Davison ... 317,319
Pencils, sponge holder for slate, W. H. Shaw ... 317,026
Petroleum burner, E. B. De la Matyr ... 316,950
Photographic film holder, Eastman & Walker ... 316,952
Photographic films, roller holder for, W. A. & L. H. Bannister ... 316,933
Photographic films, roller holder for, Walker & Eastman ... 317,049, 317,050
Pianos, repetition action for upright, C. P. Rasmussen ... 317,198
Picture frames, fastening for the backs of, T. C. Vail ... 317,248
Pillow and bolster with attachments, ventilated, B. F. Nicholas ... 316,999
Pillow sham holder, J. H. Ward ... 317,052
Pin. See Hair curling pin.
Pin sticking machine, J. W. Naramore ... 317,173
Pipe. See Waste pipe.
Pipe and bolt threading apparatus, A. Saunders ... 317,022
Pipe coupling, T. Siddall ... 317,030
Plane, G. A. Clifford ... 317,092
Planing machines, roller and bonnet attachment for, D. Lane ... 317,379
Planter, check row, W. C. Woods ... 317,067
Planter, check row corn, D. M. Culver ... 317,441
Planter, corn, W. M. Ammerman ... 317,275
Planter, corn, J. C. Barlow ... 317,075
Planter, corn, T. Craven ... 317,311
Platform spring, W. Crago ... 317,095
Plaster casts, treating, Joy & Lewen ... 317,369
Plasters, composition for, W. N. Baker ... 316,932
Pliers, punching and cutting, H. F. Osborne ... 317,181
Plow, S. B. Williams ... 317,260
Plow attachment, J. R. Gregory ... 317,340
Plow, sulky, S. Gesley ... 316,959
Pocket knife, W. F. Rockwell ... 317,208
Points and signals, mechanism for actuating and interlocking, H. A. Johnson ... 317,137
Potato digger, N. K. De Laflame ... 316,949
Power. See Mechanical power.
Power press, E. Barrath ... 316,935
Power press, A. H. Merriman ... 316,989
Press. See Brick press. Hay press. Power press. Sheet metal flanging press.
Printing machine, E. Prouty ... 317,470
Printing machine delivery apparatus, W. Scott ... 317,218
Printing machine, lithographic, C. Potter, Jr. ... 317,194
Printing press sheet flier, G. P. Fenner ... 317,329
Protector. See Doubletree protector.
Pulverizer, A. Skinner ... 317,227
Pump, A. Reis ... 317,015
Pump, ale and beer, E. Schlimbach ... 317,214
Pump, double-acting force, G. E. Sprinkle ... 317,422
Pump attachment, dredge, C. H. Booth ... 317,080
Push button, T. C. Frenyear ... 317,450
Quartz mill, C. J. Hodge ... 317,359
Rack. See Clothes rack.
Rail coupling, J. B. Witty ... 317,065
Rail joint, A. W. Agin ... 317,272
Railway, cable, G. B. Bryant ... 317,085
Railway, cable, J. H. Pendleton ... 317,008
Railway cross tie, H. Thielsen ... 317,244
Railway, electric, F. J. Sprague ... 317,235
Railway girder rail and rail joint, A. J. Moxham ... 316,994
Railway, gravity, C. H. Alcoke ... 317,273
Railway grip, cable, G. B. Bryant ... 317,086
Railway mechanism, cable, T. L. Johnson ... 317,139
Railway rail joint, M. F. Buch ... 317,283
Railway rail joint, S. Stewart ... 317,037
Railway station, train time signal for, C. M. Sexton ... 317,225
Railway switch, A. Ayres ... 317,434
Railway switch chair, D. Sullivan ... 317,042
Railway switch, street, O. Bangs ... 317,282
Railway system, cable, T. L. Johnson ... 317,140
Railway trains, pneumatic time signal for, C. M. Sexton ... 317,224
Railways, rolled or forged metal chair for, A. J. Moxham ... 316,995
Railways, subway or conduit for cable or electric, T. C. Clarke ... 317,302
Reclining chair, G. A. Horn ... 316,973
Reel. See Harvester reel. Lace reel.
Refrigerating apparatus for the transportation of meat, etc., H. C. Johnson ... 316,975
Refrigerator, W. I. Hall ... 317,126
Retort, D. Jarves ... 317,135
Revolving drop-leaf table, W. H. & D. Johnston ... 317,141
Revolving rake, J. H. M. Forck ... 316,954
Roaster. See Peanut and coffee roaster.
Rock drills, friction clutch for, G. M. Githens ... 317,113
Rod. See Sounding rod.
Rod joint or coupling, H. C. Lowrie ... 317,154, 317,155
Rods, flexible coupling or joint for wooden, H. C. Lowrie ... 317,157
Roof tiles, device for fastening, F. Plumb ... 317,414
Roller roughing machine, A. Mitchell ... 317,167
Rolling machine, metal, J. Beavis (r) ... 10,594
Roofing compound, Hawes & Green, 2d ... 316,964
Roofing, iron, W. C. Langenau ... 317,381
Roofs and walls, metallic plate for covering, G. A. Nebeling ... 317,176
Rowlock for racing boats, etc., E. F. Ward ... 317,430
Rudder connection for boats, E. D. Joyner ... 317,468
Rule, dress cutting, A. M. Freeman ... 317,332
Ruler, O. Pederson ... 317,188
Ruling machine, E. W. Blackhall ... 317,078
Ruling machine, Metzger & Cooper ... 316,990
Safe spindles, coupling device for, H. Pund ... 317,471
Sash balance, W. F. Winship ... 317,262
Sash fastener, P. J. Donohue ... 317,321
Sash fastener, J. Walsh ... 317,051
Sash holder, G. A. Grenville ... 317,121
Satchel handle, A. Goertz ... 317,114
Satchel or bag handle, sheet metal, R. W. Chapman ... 317,300
Saw jointing, gauging, and setting device, V. T. Cummings ... 317,442
Sawmill set works, D. Lane ... 317,378
Sawmill set works, B. E. Sergeant ... 317,221
Sawmill set works, T. S. Wilkin ... 317,256
Scales, etc., roller or wheel for platform, H. F. Krueger ... 316,981
Scraper, wheeled, Bailey & Rebholz ... 317,279, 317,280
Screen. See Paper pulp screen. Window screen.
Screw threading machine, C. E. Coe ... 317,303
Screws and bolts, expansion fastening for, F. H. Evans ... 317,448
Seal lock for car doors, F. H. Meyers ... 317,403
Semaphore, S. H. Harrington ... 317,347
Separator. See Cockle separator. Ore separator.
Sewer cleaning apparatus, H. C. Lowrie ... 317,156
Sewer trap, J. Demarest ... 317,098
Sewers, water pipes, etc., apparatus for flushing, J. Scott ... 317,025
Sewing machine feed mechanism, R. W. Whitney ... 317,255
Sewing machine for flossing, House & Dimond ... 317,362
Seeding machine, force feed, J. L. Riter ... 317,204
Sewing machine hand motor, J. F. White ... 317,057
Sewing machine tension device, J. W. Post ... 317,193
Sewing machine trimming attachment, Roberts & Forbes ... 317,205
Sewing machine trimming mechanism, T. C. Robinson ... 317,419
Shafts from heat, protecting, A. T. Ballentine ... 317,435
Sharpening tool, N. S. Stowell ... 317,424
Shawl strap, M. Rubin ... 317,212
Sheet metal flanging press, R. H. Tweddell *et al.* ... 317,427
Shelf bracket, B. F. Tatem ... 317,242
Shell, B. B. Hill ... 316,970
Shipping and transferring coal, salt, etc., apparatus for, A. R. Large ... 316,982
Shirt bosom, Price & Wallach ... 317,417
Shoe, W. D. Hall ... 317,127
Shoe finishing jack, J. F. Child ... 317,091
Shoe lasting machine, A. S. Libby ... 317,384
Shoulder brace, I. Strouse ... 317,474
Shovel mechanism, automatic, C. J. Rinderkneeht ... 317,016
Sidewalk and paving block, H. G. Fiske ... 317,106
Silk from the cocoon, device for reeling, E. W. Serrell, Jr. ... 317,222
Silk threads, method of and device for testing the size of, E. W. Serrell, Jr. ... 317,223
Sink valve, C. M. Tack ... 317,043
Siphon motor, hydraulic, Baloche & Krahnass ... 317,074
Snow plow, railway, G. W. Hopkins ... 316,972
Soda in combination with zinc oxide, etc., treating silicate of, Lockwood & Hyatt ... 317,388
Sounding rod, H. Case ... 317,089
Sower, seed, J. Price ... 317,013
Spark arrester, H. E. Bradley ... 317,290
Spike extractor, A. W. McCaslin ... 317,163
Spikes, roll for making, H. W. Fowler ... 317,330
Spindle and flier for spinning hemp, etc., J. Good ... 317,118
Spindle and flier for spinning rope yarn, J. Good ... 317,116
Spinning machine, A. B. Edmands ... 317,323
Spinning mule, E. C. A. Masson ... 317,397
Splice bar and car replacer comb'd, H. H. Littell ... 317,386
Spring. See Door and gate spring. Platform spring.
Spring clasp, E. S. Smith ... 317,032
Spring motor, G. Jiencke ... 317,368
Stand. See Barrel stand. Camera stand. Flower stand. Fruit picking stand.
Staple driving and clinching implement, W. Young ... 317,480
Steam and water gauge, safety, Nelson & Landerholm ... 316,998
Steam boiler, G. A. Porter ... 317,190
Steam boiler heads, machine for flanging, F. L. Kollberg ... 317,145
Steam generator, sectional, T. C. Joy ... 317,370
Steamer, culinary, G. F. Seavey ... 317,219
Steaming grain, apparatus for, W. H. Justus ... 317,461
Stool for tables, counters, etc., J. Whipple ... 317,254
Stove grate, H. W. Merritt ... 317,166
Strap. See Shawl strap.
Stump extractor, K. S. Hunt ... 317,458
Suspender end loop, J. W. Smith ... 317,231
Swinging chair, J. H. Shields ... 317,027, 317,028
Syringe, vaginal, T. Kern ... 317,375
Table. See Embalmer's table. Extension table. Folding table. Revolving drop-leaf table.
Tables, revolving waiter for dining, W. M. Knoeller ... 316,979
Tack driving machine, A. S. Libby ... 316,986
Tack, lasting, W. M. Cave *et al.* ... 317,090
Telegraphic relay, G. W. Gardanier ... 316,956
Telephone, portable, O. H. Saxton ... 317,213
Telephone stand, revolving, E. F. Weaver ... 317,252
Telephone transmitter, G. W. Drawbaugh ... 317,445
Thill coupling, A. G. Brandt ... 317,084
Thill coupling, R. Hart ... 317,349
Thill coupling, J. A. Robison ... 317,207
Thill coupling, G. W. Simons ... 317,421
Thill coupling, C. C. Wright ... 317,070
Thrashing machine, A. J. Redman ... 317,201
Thrashing machine band cutter and feeder, McHenry & O'Donnell ... 317,401
Ticket case, conductor's, S. Engel ... 317,447
Tile for furnace lining, perforated, W. Huston ... 317,459
Tire setter, G. J. Weber ... 317,054
Tooth, artificial, M. W. Williams ... 317,259
Torpedo placer, J. O. Boggs ... 317,079
Toy spring gun, F. W. Goodyear ... 317,119
Tracing the outline of the human foot, instrument for, A. W. Cox ... 317,309
Transom lifter, C. E. Steller ... 317,036
Trap. See Bedbug trap. Eaves trough trap. Sewer trap.
Trimmer. See Hedge trimmer.
Tub. See Wash and bath tub.
Tuck marker, E. C. Reese ... 317,418
Type writing machine, J. A. Kaley ... 317,371
Upholstery trimming and making the same, H. C. Lees ... 317,151
Valve gear, J. B. Sutherland ... 317,475
Valve gear, engine, Abrams & Nilson ... 317,071
Valve, hydraulic, R. H. Tweddell *et al.* ... 317,428
Valve operating mechanism, L. T. Scofield ... 317,217
Valve, regulating, E. Hill ... 317,357
Vehicle brake, J. L. McIntosh *et al.* ... 317,164
Vehicle seat attachment, F. A. Mackie ... 317,395
Vehicle spring brace, E. J. Strong ... 317,040
Vehicle, two-wheeled, C. D. Adams ... 317,271
Vehicle, two-wheeled, T. O'Brien ... 317,179
Vehicle, two-wheeled, W. C. Pitner ... 317,413
Vehicle, two-wheeled, R. G. Wood ... 317,066
Vessels, floating sunken, A. Amiro ... 317,274
Wagon, buckboard, D. Stebbins ... 317,035
Wagon, salvage corps, C. T. Holloway ... 316,971
Wagon stake holder, H. Johnson ... 317,138
Warping chock, H. L. Murch ... 316,997
Warping machine, J. Ryle ... 317,472
Wash and bath tub, combined, J. B. French ... 317,323
Wash bench and wringer, combined, J. Dennis ... 317,100
Waste pipe for wash basins, bath tubs, etc., O. H. Keep ... 317,373
Waste pipe trap and valve, P. Harvey ... 316,962
Watch barrel, J. Hay ... 316,965
Watch case springs, fitting for, Fitz Gerald & Smith ... 319,953
Waterclosets, etc., supply valve for the flushing tanks of, H. C. Weeden ... 317,055
Water pipes, anti-freezing attachment for, W. G. Frederick ... 317,331
Weighing and recording device, electric, E. H. Amet ... 317,432
Weighing apparatus, automatic grain, C. Seessle ... 317,220
Wheel. See Car wheel.
Wind engine, H. B. Colman ... 317,093
Windmill, J. Challberg ... 317,298
Windmill, G. H. Pattison ... 317,186
Window glass fastener, Braun & Bohn ... 316,940
Window screen, A. H. Hill ... 317,456
Window shade and awning, D. R. Stedman ... 317,238
Windows, preventing the formation of ice on show, E. A. Wood ... 317,265
Wire tension apparatus, W. E. Woodbridge ... 317,267
Wood, apparatus for creosoting, Hansen & Smith ... 316,961
Wood, cutting and packing kindling, J. L. Seymour ... 317,420
Wood filler, H. Hales ... 317,125
Wood, etc., ornamenting the surfaces of, D. L. Daran ... 317,317
Wood, preserving, J. P. Card ... 317,440
Wood, preserving, Hansen & Smith ... 317,129

DESIGNS.

Bottle or jar, R. Crooks ... 16,069
Card receiver, W. Harris ... 16,072
Cards, ace of spades for, H. M. Rosenbaum ... 16,075
Carpet, N. Komori ... 16,074
Cruet, M. Ams ... 16,066
Gimp, H. Wynkoop ... 16,076
Lamp body, G. C. Thomas ... 16,078
Pendant, B. Dreyfus ... 16,070
Shot case, sample, A. Euston ... 16,071
Stove or range, W. H. Swanton ... 16,077
Tea set, E. Haviland ... 16,073
Ten-pin, R. B. Cooley ... 16,068
Type, H. Brehmer ... 16,067

TRADE MARKS.

Boots and shoes for misses and children, P. Cox Shoe Manufacturing Company ... 12,203
Brushes, toilet, C. Loonen ... 12,214
Chewing gums, Danheiser Bros. & Co. ... 12,204
Cotton goods, bleached, Fall River Bleachery ... 12,207
Fish, boneless preparation of salted, J. O. Procter, Jr. ... 12,220
Gloves, kid, Roman Bros. ... 12,222
Gold for dentists' use, preparations of, S. S. White Dental Manufacturing Company ... 12,225
Hams and cured meats, smoked, Rohe & Brother ... 12,221
Medicinal confections, F. A. Uhlich ... 12,224
Medicine in capsules, E. Jeserich ... 12,213
Mineral spring water, natural, Bullard & Foster ... 12,202
Mineral water, certain natural, Forbes & Plaisted ... 12,209
Mineral water, certain natural, L. W. McConnell ... 12,217
Nails, Plume & Atwood Manufacturing Company ... 12,219
Preparations for the laundry, certain named, A. M. Ross & Co. ... 12,223
Remedy for pulmonary diseases, M. F. Eagar ... 12,205
Soap for laundry and toilet use, L. & J. Oakley ... 12,218
Soap, laundry, N. K. Fairbank & Co. ... 12,208
Soap, toilet, bath, and laundry, Gowans & Stover ... 12,210
Soaps, laundry and other, Empire Soap Company ... 12,206
Tea, mixed, J. Babillion ... 12,199, 12,200
Tobacco, chewing, P. H. Hanes & Co. ... 12,211
Tobacco, cigars, and cigarettes, fine-cut chewing, granulated, and other kinds of smoking, Hull, Boesger & Co. ... 12,212
Tobacco, cigars, and cigarettes, smoking and chewing, H. W. Meyer ... 12,215, 12,216
Wire netting for fencing, cages, etc., Brockner & Evans ... 12,201

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