coal and a coke fire for heating for tempering? A. Charcoal is preferable, as all coke contains more or less of sulphur, which is injurious to the integrity of the steel.

(39) J. S. C. asks: 1. Can molten brass be successfully run into iron moulds? If not, can you say the reason? A. The composition of brass—partly zinc, a volatile metal—precludes its successful casting in a cast iron mould, there being no adequate escape for the heated gases. 2. If that is impossible, is there any mixture which would do so, and take a silver plate by deposit or wash? A. Use a composition of which tinis the basis, and it will pour readily and plate easily.

(40) J. G. W. asks if there is an English translation of "Brehm's Animal Life"? A. "Brehm's Animal Life" is not yet translated into English.

(41) G. L. F. asks how to prevent his melted tin moulds from sticking to his sheet tin patterns when poured, the blacking of the pattern over a lamp proving futile? A. Use a blacking made of ordinary lampblack mixed with lard or sperm oil, and dust with powdered plumbago through a muslin bag.

(42) S. F. F. asks: Can malleable metals be compressed by pressure or hammering to one-half thickness, the edges being confined; or can the weight of metals be increased by pressure or condensing of the metal? A. No. All metals are subject to condensation by pressure, but none to the amount of one-half their bulk. No increase of weight is given to metals by condensation—the blank coin weighs the same as the finished coin. The only use of pressure of metals is making a better surface for finishing.

(43) A. C. G. says: 1. He has difficulty in procuring a fancy casting in an iron mould, using lead, solder, and a mixture of both, and heating the mould. The metals do not run. He asks what composition will do? A. Neither lead, nor lead and antimony—solder—will make a metal fluid enough for the purpose if the casting is thin. Use pure Banca tin, or tin 8, zinc 2, or a composition having tin for a base and no antimony. 2. He asks also how to make his ink black at the time of writing, or to become so afterward? A. We recommend you to examine article on inks in SCIENTIFIC AMERICAN SUPPLEMENT, 157.

(44) D. and T. ask: Can you inform us how light hardware, such as hat and coat hooks, curtain fixtures, etc., are bronzed? A. Dull bronze is given by a coating of bronze powder in white (bleached) shellac varnish—shellac dissolved in alcohol. A brilliant bronze is given by a coating of furniture polish left until "tacky," and then the bronze powder applied with chamois leather.

(45) S. R. R.—To sand wood: Paint the wood with a thick paint and dust the sand on through a sieve fixed to a small tin box in which the sand is placed.

(46) E. F. H. asks how Seidlitz powders are made? A. The following ingredients are mixed—in a blue paper: 40 grains soda bicarbonate, 120 grains Rochelle salts; and in white paper, 35 grains Rochelle salts.

(47) J. J. G. asks what is best compound to paint row boats with? A. Use zinc paint mixed with raw linseed oil.

(48) W. M. H. asks for a receipt for the liquid used to ebonize wood, and how to apply it? A. One gallon of vinegar, one-half pound of green copperas, one-quarter pound of China blue, two ounces nut galls, two pounds of extract of logwood. Boil over a slow fire, then add a pint of iron rust. Wash the wood with this. 2. Also, the receipt used by instrument makers for staining or lacquering brass that dark green seen on surveying instruments? A. Dissolve shellac in alcohol, strain, and add turmeric or gamboge in sufficient quantity to produce the desired shade.

(49) M. and W. ask how to boil soap water and kerosene, so that it would become a solid mass. What could be put in to make it become hard? Also, would it be dangerous to boil the kerosene? A. It is not possible to produce a solid mass in the way you suggest, for the reason that kerosene does not contain any fatty acid, and hence will not saponify. An emulsion can, however, be produced. Great care is necessary in boiling kerosene to prevent an explosion.

(50) W. S. M. asks: If coal oil, supposed to be 175°, should "flash" at a lower temperature at this altitude (10,200 feet), also the correct way to make the test? A. We do not know that the high altitude test for coal oil is known. We should judge that the "flash" temperature will be higher at the altitude you name. You may easily try it, by placing a thermometer in a small cup of the oil, and gently heating until by repeated trials of a lighted match passed over the cup about an inch above the oil a flash is produced; then note the temperature by the thermometer.

(51) J. B. H. writes: In the shop where I am employed there is an engine, 14 in. bore, 30 in. stroke, making 90 revolutions per minute; the steam pipe is 3½ in. gas pipe. The exhaust leads into a tight steam box, never in open air, about 60 feet away from engine; about one-half of the exhaust pipe is 4 in. gas pipe, balance 6 in. sheet iron pipe. question: is the exhaust sufficient? I have claimed that to take away the 4 in. gas pipe and to put in 6 or 8 in. escape pipe will improve it, inasmuch as the exhaust must be cramped at box. Is this so? A. You are right; if the box into which you exhaust is really tight, back pressure may be produced there, more than by the small exhaust pipe. Is there *any* escape for the exhaust steam from this box?

(52) A. J. asks: What to paint wood with, so that glued paper will not stick to the wood while the glue is drying? A. We would recommend you to coat the painted work with paraffine.

(53) S. L. asks: Which is the best wood for making violin tops? Norway pine and spruce are what we can get here. A. The body of the instrument is made by the best makers of straight grained deal, and the back of maple, sometimes of sycamore, and in very old instruments of pear wood.

(54) W. S. asks: Will one cell be sufficient to operate a small vibrating bell? If so, what kind of cell must it be? A. Use one cell of Leclanche or Fuller battery.

(55) C. F. J.—We cannot furnish you with the formula of soapine unless a chemical analysis were made to determine its ingredients. We are disposed to believe, however, that the essential constituent of the article is either the crude soda ash or pearl ash. The use of the name "Soapine" is, we believe, protected by law.

(56) D. E. X. asks how small steel springs can be blued to make a first class job? A. After the springs are hardened and tempered, run them through wheels of cotton, or rags of cotton, charged with rottenstone or any other abrading material which will leave them bright, and then heat them in hot sand to color, quenching instantly in cold water.

(57) A. F. L. asks how to make a sand blast, how to get or construct a bellows? A. You will require about one pound pressure for your sand blast. You will also need power for driving the bellows or blower. For a very small arrangement a circular bellows might do. A Root blower would do better, or you might make a gas holder after the principle of those at the gas company, or you might make a water jet from the city water works, like an injector with a siphon to carry off the water under the required pressure. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 416.

(58) C. G. C. asks: Can you inform me through your paper of a good process for casehardening cast iron? A. If the casting is too large to be conveniently packed in a box with cementing material—ground bone, rawhide, etc.—heat it to a red heat and sprinkle powdered prussiate of potash on it, and before it cools plunge it into a cold water bath.

(59) E. S. S. asks in what position the sounding post of the violin should be placed to get best effect? Also of what material it should be made? A. Make the pin of spruce, place it under the bridge step on the right hand side or under the E string.

(60) C. D. asks: 1. Can I use No. 36 cotton-covered wire in making induction coil described in SCIENTIFIC AMERICAN SUPPLEMENT? A. It can be used, but silk-covered is to be preferred. 2. How much would I require of both kinds, covered or uncovered, for both secondary and primary coils? A. Use the quantity mentioned in the SUPPLEMENT referred to.

(61) B. W. D. asks: What adherent force could a magnet be made to have, and what size would be necessary for a force of from 10 to 30 or 40 pounds, if such is possible? Can such be procured? Would it adhere to rubber as well as iron? A. A magnet has no appreciable effect on rubber. A compound, permanent magnet 10 inches long ought to sustain 40 pounds or more.

(62) N. P. B. asks: 1. Will an induction coil one-fourth the size of that described in SUPPLEMENT 160 charge a Leyden jar, said coil being run by one cell of Law's battery? A. It would charge a Leyden jar feebly. 2. How do the iron battery, and the battery composed of niter with iron and coke electrodes, work with an induction coil? A. Any battery with sufficient current will operate an induction coil. 3. Would common spirits of niter do for the latter battery? A. No. Use nitrate of potash. 4. What is the proper thing to fasten the tin foil to the outside of a Leyden jar? A. Use shellac varnish. 5. What makes the fixed stars twinkle? A. Atmospheric disturbances.

(63) A. K. writes: I claim that the vapor arising from gasoline will ascend, the same as any other vapor; M. claims that it will go down. A. It has been found that benzine vapors, which are frequently the cause of fires in paint factories, seek the lowest levels, which they follow for long distances; and it has been shown that a fire in a furnace, the grate of which was but a few inches above the ground or floor, has ignited benzine vapors that came from a tank 200 feet away, a thin stratum of gas following the line of the floor that distance.

(64) H. N. H. asks of what is phosphorus formed, how obtained, and is there any other substance as easily ignited, and how? A. A very full description of the properties and methods by which phosphorus is manufactured is given on page 1,029 of SCIENTIFIC AMERICAN SUPPLEMENT No. 65, and also on page 1,657 of SCIENTIFIC AMERICAN SUPPLEMENT 104. Phosphorus melts at about 99° to 100° F., but potassium becomes spontaneously ignited when exposed to the air.

(65) R. S. B.—Caustic soda is obtained by treating or decomposing dilute solutions of sodium carbonate by means of quick lime. Its manufacture will be found described very completely in "Dussauce's Treatise on the Manufacture of Soap," or in Geo. Lunge's work on the alkalies. Sufficient general information will be found in Spons' encyclopedia or Ure's dictionary.

(66) H. & B. ask what the ingredients are for making a white stain for shoe bottoms? A. Use a stain consisting of soft water one pint, oxalic acid two tablespoonfuls, or more if stronger be required, then dissolve and add a sufficient quantity of flake white. This we think will prove satisfactory.

(67) F. L. O. writes: 1. Will you please tell me where to put my water gauges in building a boiler of mercury flasks, as described in SUPPLEMENT 182? A. The water line should be about 3 inches below upper end of lower flasks. 2. And what amount of steam I can carry with safety? A. 150 pounds per square inch will be quite safe.

(68) G. S. L.—Tellurium is sold as a curiosity at about $72.00 per oz. It has no recognized market value, as there is no demand for it.

(69) B. F. B. asks: Is common salt good to mix with oil to prevent an explosion? A. We have never heard that salt mixed with oil would prevent explosions.

(70) G. S. M. asks what the thermostats are made of that are used for regulating purposes? A. Some thermostats consist simply of a rubber bar. Some of a compound bar of strips of brass and iron riveted together. Others are simply large thermometers.

71) R. W. J.—The principal use of tripoli is for polishing powders; it is, also, sometimes used to give body to soap. At one time it came largely into use in the manufacture of giant powder, but its use for this purpose is now supplanted by wood pulp. It is not bought. Those who sell it own their own mines, and, therefore, it has no market. Under the trade name of Electro Silicon it is largely sold by a company on John Street, New York, but they have more than they can dispose of.

(72) A. L. asks how to make dark resin clear, and how to clean resin that is full of dirt, leaves, and bark? A. Melt it and strain through a suitable filtering material, or else dissolve in turpentine, and filter.

(73) P. R. R. asks: With what white substance can I cover a draughting board that I may easily erase the black pencil lines after the drawing has been copied or used? A. For this purpose paint the board with three or four coats of white lead ground in Japan. Rub each coat down after it is thoroughly dry with powdered pumice stone and water.

(74) A. W. B.—You can put your push button, your bells, and battery all in one circuit, if you do not object to both bells ringing at the same time. If you want to ring the bells independently, you must divide your circuit just below the lower bell and run two wires to the top floor and place a push button on each. Both push buttons may be connected with the same return wire. Cost of bells, from $1.50 upward. Push buttons, 35 cents and upward. Battery, $1.25 to $1.50 per cell.

(75) J. D asks: 1. Is there any means of restoring the oxygen to worn out prisms of the Leclanche battery? A. No. 2. By making and breaking the line circuit of a telephone you hear a faint click in it; is that produced by atmospheric electricity accumulated on the line? A. Earth currents and atmospheric electricity. 3. The objects in my nickel bath sometimes turn black, what is the trouble? A. Possibly your current is too strong. 4. Can I gain time by warming my nickel bath? A. Yes. 5. In a high speed engine, the piston, piston rod, and part of connecting rod come so many more times from their state of rest to a higher velocity, and again to rest, than a low speed engine. Is there not a loss of energy on account of the inertia of piston and connections, and consequently a low speed or rotary engine more economical than an ordinary high speed engine? A. The inertia is counteracted by lead or cushion. There is no very marked difference in economy. The present tendency among engineers is to high pressure and high speed.

(76) A. K. asks: What preparation they put on silver leaf that makes it look like gold, such as that on cheap mouldings? A. You can purchase a gold lacquer from large paint houses that will accomplish your purpose. A pale gold lacquer of 1 gallon of methylated alcohol, 10 oz. of seed lac bruised, and half ounce of red saunders dissolved and strained is often used.

(77) J. G. W. asks for a recipe for red-edging or gilt-edging books? A. The book is very firmly clamped between the arms of a press, so that none of the coloring materials shall penetrate among the sheets. The edges are then coated by means of a camel's hair brush with a mixture of carmine and a suitable shade of aniline red with sufficient gum arabic to thicken the solution. The ingredients vary according to the shade desired. In the case of gilt-edging the leaves are first coated with a solution of white of egg, gold leaf is then put on, and finally burnished with a tool tipped with agate.

(78) C. G. D.—The usual process of nickel plating is described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 310, under the title of Electro-metallurgy. It is necessary to polish the plating, and for this purpose rouge and buffers are generally employed. We would recommend you to read some of the works on the subject, such as Wahl's "Galvanoplastic Manipulations," recently published. See page 109 of SCIENTIFIC AMERICAN, current volume.

(79) C. E. P.—Your general conjecture about the minerals is correct. As regards tin, from a rough qualitative test, traces of it appeared present. We would suggest that a larger quantity of the mineral be forwarded and sufficient money ($5.00) be included, so that an assay could be made, by means of which the working amount of the metal could be determined.

(80) C. H. L. asks: Can you give me any information of Cooper Institute, and the conditions on which students are admitted? And is it so fixed that a student can earn his board and clothes? A. There is no bar to any student of good character entering the classes of the Cooper Union. Only ladies can enter the classes in engraving. They can earn the value of their work for themselves. There is no other means of earning anything within the Union. You may obtain a situation at any employment in the city, and attend the evening classes.

(81) S. W. R. writes: 1. What is the matter with my plating bath? I prepared it by dissolving 4½ oz. of nickel ammonium sulphate in 3 pints of water, according to SCIENTIFIC AMERICAN SUPPLEMENT No. 310. It plates dark, and when polished looks like lead. It seems to take a good deal more battery power than does the silver bath, is very hard to polish at all, and I understand should look nearly like silver. A. You are probably using too much current. Try a weak battery. 2. What will an induction coil 2 x 1¼ do? A. It depends upon the construction of the coil and the amount of battery employed.

(82) F. K. asks: 1. What is the best conductor of heat, that is, what material will retain the most heat the longest? A. The best conductor of heat according to Despretz is gold, and according to Wiedemann and Franz, silver. 2. What is the best non-conductor of heat, or just the opposite of the other? A. The best non-conductors are asbestos, mineral wool, paper, soapstone, and animal wool and hair. 3. Will an electric machine, if made in the lightest practical form and material, lift more than its own weight, and if so, how many times its own weight would it lift? A. An electro motor will lift almost any weight by means of a windlass or equivalent device. Time is an element which you do not consider. A light dynamo should sustain several times its own weight when used in connection with a suitable electromagnet. Your query is hardly clear enough to enable us to give you a definite reply.

(83) B. H. writes: If a perpendicular pipe one inch square surface be connected with a horizontal pipe of the same size, at right angles, both filled with water, and the perpendicular pipe be brought under pressure of ten pounds, the pressure in the horizontal pipe will be the same, viz., ten pounds. If ten pipes of the same size should be similarly connected with the horizontal pipe, and the water in each pipe brought under a pressure of ten pounds, would the pressure in the horizontal pipe be 10 × 10 = 100 pounds, or only 10 pounds? A. If the ends of the pipes are closed the pressure in the horizontal pipe will also be ten pounds plus the hydrostatic pressure caused by the height of water in the upright tubes; which adds one pound for every twenty-seven inches in height. The number of pipes does not affect the question.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. H. G.—The specimen is pyrite or iron sulphide, in a coaly slate or shale. It is not likely to be of any value.—R. T. B.—The mineral sent is magnetite, or magnetic oxide of iron. It is one of the most valuable iron ores that is found.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

March 25, 1884,

AND EACH BEARING THAT DATE.

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

Advertising articles to cards, attaching, S. P. Mount 295,665
Air compressor, hydraulic, C. Pfanne 295,800
Alarm. See Fire alarm.
Animal trap, C. Hall 295,634
Antiseptic solution, J. F. Kennedy 295,876
Asphalt, machine for mixing, G. Winding 295,707
Bag. See Mail bag.
Bait, spoon, C. B. Hibbard 295,753
Baling press, J. D. Page 295,672
Ballot box, J. Klinger 295,560
Battery. See Galvanic battery.
Bee hive, J. Vanzandt 295,693
Bee hives, moth trap for, J. T. McElfresh 295,786
Belt stud, O. S. Turner 295,599
Blacking box, A. V. Sauford 295,677
Blasting barrel, G. A. Ingram 295,556
Block. See Saw mill head block.
Blotter, A. H. Frederick 295,625
Body protector, W. Gray 295,543
Boiler scraper, J. H. Beare 295,854
Bolting chest, Kohnle & Hamilton 265 561
Boot or shoe toe cap, F. H. Kennedy 295,877
Borer, hand, W. E. Clough 295,523
Boring machine, W. E. Clough 295,524
Bottle lips and necks, tool for forming, J. B. Wilson 295,848
Bottle stopper, A. H. Wirz 295,708
Bottles, cutter for wires and cords of, Bevins & Propst 295,721
Bottles, machine for wiring corks in, O. C. Carpenter 295,735
Bouquet and ticket holder, combined, W. H. Hogan 295,870
Box. See Mallot box. Blacking box. Fish box.
Bracket. See Toilet bracket.
Brake. See Vehicle brake.
Bran and feed packer, S. B. Ellithorp 295,868
Brick, A. Trochsler 295,692
Brick and tile kiln, W. A. Eudaly 295,744, 295,864
Brick and tile machine, A. Horrocks 295,871
Brick machine, P. H. Kells 295,558
Bridle and halter combined, H. Rorebeck 295,812
Broom band, J. Smith 295,685
Buckle, F. Armstrong 295,714
Bustle, J. B. Phillips 295,584
Button, P. Kalish 295,769
Button fastener, M. H. McNair 295,575
Button fastener, W. H. Wood 295,709
Button fastener staples, implement for setting, J. H. Goodfellow 295,539
Button hook or fastening, F. A. Smith, Jr 295,823
Button machine, G. R. Williams 295,705
Buttons, etc., attaching, J. F. Thayer 295,593
Cabinet maker's clamp, W. E. Sheldon, Jr 295,589
Camera. See Photographic camera. Solar camera.
Can. See Fruit, vegetable, and meat can.
Cane and cigar case, combined, D. Lee, Jr 295,654
Capstan bars, etc., rack for holding, Foster & Hanford 295,746
Car coupling, F. K. Adams 295,609
Car coupling, N. P. Cowell 295,618
Car coupling, Duffy & McIvor 295,860
Car coupling, Huber & Barnhart 295,763
Car coupling, S. D. Lee 295,773
Car coupling, J. Shanaman 295,588
Car coupling, L. E. Sloan 295,684
Car coupling, G. W. Smith 295,829
Car coupling, W. H. Ward 295,697
Car coupling, H. B. Williams 295,706
Car, safety railway, E. Henn 295,637
Car warmer, chemical, C. Mitchell 295,576
Car wheel, Melvin & Clute 295,790
Car window curtains, device for holding, F. Furness 295,535
Cars from one track to another, mechanism for guiding, J. A. Heyl 295,640
Carpet stretcher, W. A. Skinner 295,824
Carrier. See Cash carrier.
Cash carrier for stores, C. M. Johnson 295,645
Caster, E. T. Thomas 295,689
Caster, W. Zimmer 295,850
Chain link, ornamental, S. L. Lederer 295,772
Chain tip, watch, H. M. Herring 295,869
Chandelier, extension slide, J. P. Bonner 295,519
Chimney cowl, E. R. Stasch 295,687
Chuck, lathe, J. S. Gilmore 295,628
Churn, W. H. Dyer 295,862
Churn, A. Jackson 295,766
Churn motor, H. C. Sadler 295,587
Clamp. See Cabinet maker's clamp.
Clasp. See Rope or line clasp.
Claw bar, W. H. Lyman 295,571
Clay crushing machine, F. E. Frey 295,533
Cleaning textile fabrics, wooden and metallic surfaces, etc., composition for, F. S. Monroe 295,382
Clock, alarm, J. Ganss 295,627
Clocks, electric alarm for spring, E. Jungerman 295,873
Clover huller cylinder, Land & Campbell 295,771

Clutch guard, D. Tilton..... 295,595
Collar or tie readjuster, W. W. Deniston..... 295,526
Colors, machine for sifting, J. C. Matter..... 295,783
Converter, T. Griffiths 295,544, 295,545
Converter employed in the manufacfure of iron and steel, T. Griffiths..... 295,546
Conveyer, screw, F. C. Caldwell..... 295,731
Cork cutting machine, F. J. Nutting..... 295,884
Corn from the cob, machine for cutting green, D. B. Speer..... 295,831
Corn in the cob, machine for cutting, S. F. Savits. 295,819
Cot, folding, W. H. Wooldridge..... 295,606
Counting register, Jones & Cooper..... 295,768
Coupling. See Car coupling. Electric wire coupling. Whiffletree coupling.
Cultivator, B. C. Bradley..... 295,520
Cultivator, Long & McBeth..... 295,779
Cultivator, J. Woolridge..... 295,607
Cyclometer, G. H. Gould..... 295,632
Dental vulcanizer, F. W. Seabury..... 295,821
Door plate and mail receiver, combined, Pace & Wev..... 295,581
Doors, banging, C. W. Emerson..... 295,743
Dredge. R R. Osgood..... 295,580
Drier. See Grain drier.
Drill. See Ratchet drill. Rock drill.
Egg holder, W. Kearney..... 295,648
Ejector oil, Lawrence & McDonald..... 295,562
Electric implement, A. H. Kinder..... 295,652
Electric machines, apparatus for regulating and distributing currents from dynamo, W. Hochhausen..... 295,552
Electric machines, armature coil for dynamo, J. J. McTighe..... 295,589
Electric machines, driving gear for dynamo, J. W. Boothby..... 295,614
Electric wire coupling, G. L. Kitson..... 295,559
Electric wires, sidewalk curb and surface case for, R. Wylie..... 295,710
Electrode or element, battery, E. T. Starr..... 295,889
Elevator safety stop, E. Saunders..... 295,678
End gate, wagon, Gier & Fincke..... 295,750
Engine. See Gas engine. Rotary engine. Steam. Engine.
Engraving machine, I. R. Beam..... 295,853
Envelope, E. J. Trum..... 295,598
Excavating machine. T. Clark..... 295,522
Fare register, H. Marshall..... 295,781
Faucet screw, M. O'Connor..... 295,794
Feed water heater, B. Webster..... 295,891
Fence, F. Schmitz..... 295,679
Fence stretcher and splicer, wire, J. E. Pierce.... 295801
Fence wire fastening, E. S. Lenox.....295,565, 295,566
Fertilizers, apparatus for making, A. Von Podewils..... 295,695
File, paper, C. W. Sherwood..... 295,591
Fire alarm, automatic, J. Hill..... 295,760
Fire alarm, electric, J. Hill..... 295,759
Fire arm magazine, Lee & Diss..... 295,563
Fire arm. magazine, J. Leemann..... 295,564
Fire escape, V. W. Blanchard..... 295,723
Fire escape, R. E. Downie..... 295,527
Fire escape, L. J. Gott..... 295,631
Fire escape, A. W. Lozier..... 295,570
Fish box, C. A. Bergtold..... 295,517
Floor mat, S. Toffler..... 295,839
Folding table, W. W. Quigley..... 295,673
Forging hammers, die for, H. Hammond..... 295,547
Fruit and vegetable washer, J. Baker..... 295,715
Fruit, vegetable, and meat can, J. Baker..... 295,716
Furnace. See Puddling furnace. Reverberatory ore furnace.
Galvanic battery, C. Pabst..... 295,671
Galvanic battery cell, sealed, W. T. McGinnis..... 295,574
Gage. See Splitting gage.
Gas, apparatus for manufacturing illuminating, J. J. Shedlock..... 295,822
Gas engine, H. S. Maxim..... 295,784
Gas pressure regulator. Francis & Tibbs..... 295,532
Gas, process of and apparatus for manufacturing, J. L. Stewart..... 295,832
Gate. See End gate. Railway gate.
Gate, N. B. Huffman..... 295,641
Gate, H. H. Lockling..... 295,569
Gate, E. D. Rathbun..... 295,674
Gearing for changing speed, S. N. Gallup..... 295,536
Generator. See Steam generator.
Glass cutting apparatus, W. H. Walker..... 295,603
Gloves, gaiters, etc., fastener for, C. A. Pfenning. 295,583
Grain and fertilizer distributing apparatus, A. J. Martin..... 295,655
Grain binder, J. H. Anderson..... 295,711
Grain cutting machine, A. Wemple..... 295,699
Grain drier, R. S. Jennings..... 295,643
Grater, nutmeg, L. J. Church..... 295,736
Grinding mill, H. Hungerford..... 295,764
Guard. See Clutch guard.
Hanger. See Shafting hanger.
Hangers to ceilings, implement for attaching, P. Lorillard, Jr..... 295,880
Harness, G. H. Ingalls..... 295,642
Harrow or soil pulverizer, J. Schindler..... 295,820
Harvester, S. D. Locke..... 295,777
Harvester, corn, Wagner & Dryer..... 295,602
Harvester cutting apparatus, E. D. Roth..... 295,813
Harvester rake, S. Johnston..... 295,872
Hasp lock, D. Smith..... 295,827
Hat pouncing machine and lathe, Thompson & George..... 295,690
Hat shaping machine, J. R. Kelsey..... 295,650
Heater. See Feed water heater.
Heating apparatus and drying rack, combined, J. R. Moore..... 265,663
Hinge, brace, A. W. Sangster..... 295,818
Hinge, duplex brace. A. W. Sangster..... 295,871
Hoisting and conveying apparatus, M. W. Locke. 295,776
Hoisting and conveying machine, A. E. Brown.... 295,727
Hoisting gear, J. L. Booth..... 295,725
Hoisting machine, F. Brown..... 295,730
Holder. See Bouquet and ticket holder. Egg holder. Tag or label holder.
Hominy mill, T. Hudnut..... 295,554
Hook. See Snap hook.
Hoop nailing machine, A. C. Batcheller..... 295,516
Horse armor, J. H. Anderson..... 295,712
Horseshoe. M. Caspari..... 295,616
Horseshoe, G. A. Dean..... 295,620
Hot air furnace regulator, electric, F. M. Sparrow 295,686
Hub, wheel, A. M. Brown..... 295,728
Hydrant. B. C. Vanduzen..... 295,600
Ice plows, inserted tootb fastening for, J. G. Bodenstein..... 295,724
Inking apparatus, automatic registering. Jones & Cooper..... 295,767
Ink stand or receiver, J. B. Davids..... 295,739
Jack. See Screwjack.
Kiln. See Brick and tile kiln. Lumber kiln.
Knobs, handle for dial lock, T. L. Paine..... 295,582
Ladder, folding step, A. Bohman..... 295,518
Lamp, double carbon arc, E. Thomson..... 295,886
Lamp, electric, W. Morava..... 295,664
Lamp, hot air oil, C. H. Murray..... 295,666
Latch door, W. F. Oliver..... 295,795
Latch, gate, J. B. Hasenohr..... 295,753
Lathe dog, F. Armstrong..... 295,713
Leather, coloring and bronzing, L. Klöpfer..... 295,653
Leg, artificial, K. R. Collins..... 295,615
Leggin, J. N. Goldbacher..... 295,538
Light. See Marine signal light.
Lock. See Hasp lock. Seal lock.
Lock, F. W. Mix..... 295,660
Log turner, S. T. Haviland..... 295,549
Lubricating device for cutter bars, E. D. Roth.... 295,814
Lubricator, N. H. Heft..... 295,757
Lubricator, L. C. Nielsen..... 295,793
Lumber kiln, E. Myers..... 295,667
Magneto and dynamo electric machine, F. G. Frick..... 295,534
Mail bag, S. O. Campbell..... 295,733
Map stand, revolving, H. E. Hayes..... 295,636
Marine signal light, Baker & Roberts..... 295,717
Marker, land, A. W. Hitchcock..... 295,761
Mat. See Floor mat.
Mat, R. Martinez..... 295,782
Matrices, machine for making, R. L. Kimberly... 295,878
Measuring incompressible fluids, machine for, J. E. Crisp..... 295,858
Metal bending machine, H. A. Ainswor h..... 295,851
Metals from ores and metallurgical products, extracting, E. H. Russell..... 295,815
Metals from ores and metallurgical products, separating, E. H. Russell..... 295,887
Microscope, W. K. Kidder..... 295,770
Middlings, etc., bolt for purifying, O. P. Hurford. 295,555
Mill. See Hominy mill.
Mill feeding device, J. B. Allfree..... 295,852
Mines, winding apparatus for, A. Lindenberg..... 295,774
Moldings, machine for dressing, J. C. Brandon... 295,726
Motor. See Churn motor.
Musical instruments, water key for brass, J. Heald 295,756
Musical wagon, H. J. D. Miner..... 295,659
Nailing machine, E. F. Barton..... 295,515
Needle, shoe button, E. A. Bailey..... 295,612
Oil, removing oleine from linseed, T. H. Gray.. 295,633
Ores, purifying hyposulphite solutions used in leaching, E. H. Russell..... 295,886
Organ, reed, J. B. Hamilton..... 295,868
Overalls, W. A. Dawson..... 295,619
Oysters, machine for opening, L. A. Amouroux... 295,611
Packer for oil wells, gas and water, E. B. Frew... 295,747
Packing, asbestus joint, W. A. Fries..... 295,748
Packing, asbestus steam, W. A. Fries..... 295,749
Paint mills, cooling apparatus for, Fuller & Macauley..... 295,626
Paper, cloth, etc., manufacture of wood grain, G. F. & J. W. McIndoe.....295,657, 295,658
Paper folding machines, tension device for tapes of, J. H. Stonemetz..... 295,834
Paper from grain cuticles, manufacture of, W. L. Teter..... 295,835
Paper pulp, manufacture of, D. O. Francke..... 295,865
Parachinanisol, manufacture of, Z. H. Skraup..... 295,825
Parer, fruit, Keigwin & Talley..... 295,874
Pavement, wood, R. Albrecht..... 295,610
Pencil pointing device, H. G. Schramm..... 295,680
Photographic camera, A. Herzog..... 295,638
Photographic pictures, printing and mounting, J. D. Terreforte..... 295,688
Piano forte stringing device, J. R. Lomas..... 295,778
Piano hammer, E. R. Ober..... 295,670
Planter check rower, corn, J. P. Moos..... 295,883
Planter fertilizer distributer, seed, A. C. Evans... 295,528
Planter fertilizing attachment, seed, A. C. Evans. 295,529
Planter, hand seed, A. Hoag..... 295,762
Planter, potato, J. P. Wick..... 295,846
Planter, seed, W. L. Hutson..... 295,765
Plow, Wiard & Bullock..... 295,702
Plow, sulky, S. W. Barr..... 295,613
Plow, sulky, W. McNary..... 295,788
Pool rack, H. W. Collender..... 295,857
Power, device for transmitting, A. D. Whitton.. 295,701
Precious metals from ores, extracting, E. H. Russell..... 295,816
Press. See Baling press.
Press board finishing machine, F. L. Case..... 295,521
Printing plates, making lithographic, P. C. Möller 295,561
Projectile for carrying high explosives, F. H. Snyder..... 295,830
Puddling furnace, rotary, J. Hall, Jr..... 295,751
Puddling furnaces, water joint for rotary, Griffen & Hall, Jr..... 295,867
Pulley, F. C. Caldwell..... 295,732
Pulley, O. R. Olsen..... 295,796
Pulley, Waterous & Peel..... 295,698
Pulley, friction, V. W. Mason..... 295,656
Pulverizing apparatus, L. S. Chichester..... 295,856
Pulverizing machine, L. S. Chichester..... 295,617
Pump, L. G. Careaga y Saenz..... 295,734
Pump, air, G. Ross..... 295,676
Pump, hollow piston, J. F. Hess *et al*..... 295,639
Pump, rotary, F. S. Troutman..... 295,597
Pump, rotary, J. M. Wiles..... 295,704
Pumps, valve gear for hydraulic, G. W. Dickie... 295,622
Radiator, steam, E. T. Weymouth..... 295,700
Railway crossing, D. Lippy..... 295,568
Railway crossing, Wallack & Rohrer..... 295 844
Railway gate, L. C. Walsh..... 295,696
Rat trap for buildings, T. M. Beverage..... 295,720
Ratchet drill, J. H. Vinton..... 295,694
Ratchet wrench, A. E. Osborn..... 295,797
Razor strop, J. R. Torrey..... 295,840
Register. See Counting register. Fare register. Regulator. See Gas pressure regulator.
Reverberatory ore furnace, G. W. Jones..... 295,646
Rock, drill, Coe & Hoffnagle..... 295,737
Rock drill, H. C. Sergeant..... 295,682
Rolling threads on metal, machine for, Wilson & Haskins..... 295,605
Roofing composition, W. White..... 295,604
Rope or line clasp, A. L. Pitney.....295,802, 295,808
Rotary engine, J. T. Davis..... 295,859
Rubber waste for the recovery of the rubber or caoutchouc therefrom, treating fibrous, A. O. Bourn..... 295,615
Saddle board, J. A. Wilson..... 295,847
Saddle, riding, W. Frazier..... 295,623
Saddle tree, harness, L. A. Ringwalt..... 295,810
Sash balance, M. B. Gladman..... 295,630
Sash fastener, S. Farquhar..... 295,530
Saw guide, T. J. Neacy..... 295,792
Sawmill, D. F. & J. T. Milne..... 295,791
Saw mill head block, Martin & Metcalfe..... 295,572
Saw tooth, R. W. Kellen..... 295,649
Scaffolding, T. N. Subers..... 295,592
Scaffolding attachment, J. T. O'Brien..... 295,578
Scaffolding, interior and exterior, J. T. O'Brien... 295,579
Scale, coin and letter, C. Richtmann..... 295,809
Scale pan, folding, W. Maguire..... 295,785
Scissors and shears, W. J. Bayrer..... 295,718
Scraper runner, L. D. York..... 295,892
Screw jack, A. R. Tiffany 295,837, 295,838
Screw, wood, G. A. Stiles..... 295,833
Seal lock, A. B. Barnard..... 295,514
Seed drill feed, W. H. Julian..... 295,647
Sewer basin, W. Sievering..... 295,828
Sewing machine feeding mechanism, C. W. Healey 295,551
Shade roller, spring, D. E. Kempster..... 295,875
Shafting hanger, J. E. Hoppen..... 295,553
Shingle sawing machine, S. L. Bitting..... 295,722
Shingle shaving and rifting machine, A. Gould.... 295,541
Shoe, W. S. Freeman..... 295,624
Shoes, manufacture of, G. W. Sleeper..... 295,826
Skins, machine for putting out or stretching, B. McKeen..... 295,787
Sled propeller, C. Bernhard..... 295,719
Smoke, apparatus for and process of consuming, W. Vogel..... 295,842
Snap hook, J. H. Shaw..... 295,683
Solar camera, C. F. Adams..... 295,608
Soldering machine, can, D. M. Monroe..... 295,662
Soldering tool, W. M. Ryan..... 295,888
Speculum, G. W. Pagett..... 295,798
Spinning and twisting machine, C. A. Coggeshall. 295,738
Splitting gage, H. S. Ginther..... 295,629
Stamp, canceling, E. B. Brown..... 295,729
Stand. See Map stand.
Steam engine, G. F. Seiser..... 295,681
Steam generator, D. M. Graham..... 295,542
Steam generator, F. Livet..... 295,775
Steam trap, G. B. McCracken..... 295,573
Stereotype plate, F. K. Tracy..... 295,596
Sugar, manufacture of, K. Trobach..... 295,841
Swivel for watch chains, P. Nerney..... 295,577
Swivels, device for finishing chain, J. E. Walcott.. 295,843
Syringe, vaginal, J. A. Hawley..... 295,755
Table. See Folding table.
Tag, M. W. & J. D. Kase..... 295,557
Tag or label, W. P. Patton..... 295,799
Tag or labelholder, A. Hanvey..... 295,752
Telegraph, printing, A. F. Johnson..... 295,644
Telegraphic system, C. G. Burke..... 295,855
Telephone support, G. W. Fish..... 295,531
Telephone transmitter, D. Drawbaugh.....295,741, 295,742
Telephonic receiver, C. A. Randall..... 295,804
Telephonic transmitter. C. A. Randall...295,805 to 295,807
Thrashing machine grain separator, P. L. Nash... 295,668
Tobacco in licorice, apparatus for dipping, E. F. Maffrand..... 295,780
Toilet bracket, C. Lindner..... 295,567
Tongs, pipe, H. S. Pullman..... 295,885
Toy, J. A. Ward..... 295,845
Trap. See Animal trap. Rat trap. Steam trap.
Tricycle, D. E. Dutrow..... 295,861
Trunk, F. H. Ransom..... 295,808
Tuyere, F. W. Gordon..... 295,540
Tuyere, J. F. Harly..... 295,548
Umbrellas and cases, hand protecting attachment for, E. Ross..... 295,586
Valve, steam actuated, D. F. Nisbet..... 295,669
Valves, apparatus for testing safety, G. W. Richardson..... 295,585
Vapor burner safety attachment, R. S. Kelsey.... 295,651
Vaporizing hydrocarbon oils, process of and apparatus for, H. F. Hayden..... 295,550
Vehicle brake. J. T. Dillehay..... 295,740
Vehicle seat, G. B. Haskell..... 295,754
Vessel, tilting, W. Zimmer..... 295,849
Wagon, dumping, W. & J. H. Leonhardt..... 295,879
Wagon, spring board, J. C. F. Harris..... 295,635
Warping machine, G. S. Follansbee..... 295,745
Water closet valve, H. A. Tobey..... 295,691
Water, purifying, W. Tweeddale..... 295,890
Water wheel, turbine, I. Sherck..... 295,590
Waterproofing and preserving buildings, compound for, B. De Nise..... 295,525
Waterproofing composition, A. Mink..... 295,881
Weather strip, E. E. Gillett..... 295,537
Well boring and drilling machine, F. Dearmin.... 295,621
Wheel. See Car wheel. Water wheel.
Whiffletree, J. Graves..... 295,866
Whiffletree, H. Rorebeck..... 295,811
Whiffletree coupling, O. Vanorman..... 295,601
Window, safety, F. O. Thiem..... 295,594
Wire barbing machine, G. C. Baker..... 295,513
Wooden tubing, smoothing the inner surface of, M. F. Wilcox..... 295,703
Wrench. See Ratchet wrench.

DESIGNS.

Basque, lady's, C. O'Hara..... 14,917
Button, sleeve, F. F. & J. C. Bioren..... 14,897
Carpet, E. Fisher..... 14,898
Carpet, E. C. Frost..... 14,899
Carpet, H. Horan..... 14,903 to 14,909
Carpet, J. McMann..... 14,913
Carpet, H. North..... 14,914, 14,915
Carpet, L. W. Valentine..... 14,923
Costume, girl's, C. Shiels..... 14,921
Costume, miss's, S. J. Shiels..... 14,922
Ear ring pendant, J. B. Van Houten..... 14,924
Furniture back frame, F. Masset..... 14,912
Mitt, W. P. Jennings..... 14,910
Musical instrument case, M. Gally..... 14,900
Ornamentation of textile and other fabrics, Hirsch & Marx..... 14,902
Polonaise, lady's, J. Q. Reed..... 14,920
Shoe or slipper, C. B. Hatfield..... 14,901
Skirt, lady's, C. O'Hara..... 14,918
Spoon or fork handle, G. B. Kelley..... 14,911
Watch movement, G. Perregaux..... 14,919
Wrap, lady's, C. O'Hara..... 14,961

TRADE MARKS.

Brushes, hat, G. Bossange..... 11,029
Cigars and cigarettes, H. Segnitz & Co..... 11,034
Cigars, cigarettes, and smoking tobacco, Kaufmann Bros. & Bondy..... 11,032
Cough remedies. Kerry, Watson & Co..... 11,033
Food made from grain, article of, Glaser, Kohn & Co..... 11,046
Liquors and spirits, Cusenier Fils Aine & Co.11,035, 11,036
Soap, laundry, Procter & Gamble.....11,038 to 11,042
Steel and certain implements made therefrom, W. K. & K. K. Peace..... 11,037
Varnishes, japans, blacks, colors, paints, wood dings, and rough stuffs, Valentine & Company.. 11,047
Whisky, B. J. Semmes & Co..... 11,043, 11,044
Whisky, rye and bourbon, S. C. Herbst..... 11,030, 11,031
Whiting, prepared, A. Buel..... 11,045

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