(55) T. L. R. asks for a flux to use in aluminum. A. Clean the surfaces well, and use paraffine, stearine, or balsam copaiba.

(56) D. S. asks for a description of the king snake, or house snake, and the superstitious reason why the Germans and Swedes keep them in their houses. A. The snake you refer to is probably the one generally called the "milk snake" in this country. It is described on page 38 of vol. iii. of the Natural History of New York. Its food consists principally of mice, insects, and other house vermin, and hence the probable reason of its being called "house snake." It is not poisonous, and therefore its presence around the dwelling would be quite desirable without any superstitious reason.

(57) P. C.—To soften the surface of steel for engaving, put the piece in a wrought iron box with clean iron filings, covering the surface to be engraved; fill up the box with clean white sand or ashes to keep out the air, and heat red hot for two to three hours, allowing to cool slowly. For hardening files, rub a little hard soap across the teeth to keep from scaling. Heat to a cherry red, and dip endwise in salt water. Then dip in hot fresh water to remove any salt on the teeth, dry over the fire, and slightly wet with linseed oil on a rag. To recover floating gold from the surface of water, gather in a fine muslin net or on a filler of blotting paper.

(58) R. W. B. asks: 1. Is it best to coat new leather belts with castor oil or any other oil? A. New belts should have enough dressing in them to last several months, unless they are getting very hard treatment. 2. The weight a beam would support, and the formula for finding the weight; length of beam 47 feet between the walls; size of beam 14 inches deep, 12 inches thick, with a post in center, and a corbel 8 feet long on the post under the beam. A. A safe load at the center of each span, with a deflection of one-thirtieth of an inch to a foot, is 5,724 pounds for oak, varying a little for different kinds of wood. For distributed load, 60 per cent more. Formula is as follows:

$$\text{Safe load} = \frac{\text{Breadth} \times \text{cube of depth} \times E}{\text{Square of the length}}$$

E is coefficient for a deflection one-thirtieth inch per foot. For yellow pine, E=137; for white oak, E=95. For distributed load add 60 per cent to answer as by above formula.

(59) J. F.—As we have before answered in this column, a boat of considerable draught will float down stream faster than the surface current, because the middle of the current has been found to be moving faster than top, bottom, or sides. Friction of bottom and sides is one assigned cause, and unequal pressure due to depth is another; probably both together cover the whole phenomena. Ice boats in certain positions sail faster than the wind; see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 54 and 61, for a graphic description.

(60) K. W. G. asks: What liquid or combination of liquids is the most sensitive to heat and cold, or which will expand the most when subjected to heat? A. Use alcohol, and color it by adding a little aniline if it is desired to use as a thermometer.

(61) J. L. G. asks the best method for preserving split or sawed oak-shingles, when used for roofing? If solution is to be used, the simplest means of using it, with a view to economy. A. The dipping of the shingles in preserving fluids is the simplest plan to adopt. Various fluids are used, and we would refer you to the recent report on the "Preservation of Timber," published in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 512, 513, 514, and 517, as giving the latest and best information on the subject.

(62) M. A. writes: Where sulphur is used as a bleaching medium, what will remove its smell and taste? A. The bleaching is done entirely by burning sulphur, and allowing the fumes to go up through the evaporator. Only a small quantity of sulphur is used, and by care any contaminating taste or odor is prevented. No other means are taken.

(63) G. L. asks: What kind of white paint to use for bird cages. A. White zinc ground in oil.

(64) J. G. writes: I have a quantity of cider which is through fermentation. I wish to bottle it, but it is not clear. Is there anything I can put in it to clarify it? A. To clear impure cider generally, take 2 quarts of ground horseradish and 1 pound of thick gray filtering paper to the barrel, and either shake or stir until the paper has separated into small shreds, and let it stand for twenty-four hours, when the cider may be drawn off by means of a siphon or a stop cock.

(65) J. S. desires some information of the new method of constructing artificial dentures that will hold firmly in the mouth without a plate at the palate. A. By a patented invention consisting of a thin metallic form, upon which may be made an upper or lower denture of any kind, size, or shape. The surface of the form has minute papilliform prominences, which, by displacement of mucus at the points of gum contact, effect surface cohesion as if the denture were glued to the gums, yet cause no irritation, and leave no marked indentations. By this device strong cohesion may be had with a narrow plate, and thus the sense of taste be left unimpaired. For vulcanite work proceed as usual until the flask is parted and rubber packed in the tooth part. Then cut a form to size and shape. Coat the cast with rubber cement.

(66) J. H. asks how to make safety matches. A. Dip the splints in a paste composed of chlorate of potash 6 parts, sulphate of antimony 2 to 3, glue, weighed dry, 1. The paste for the rubbing surface is amorphous phosphorus 10 parts, oxide of manganese or sulphide of antimony 8, glue 3 to 6, weighed dry. The ingredients must be thoroughly mixed, and care must be taken not to mix the chlorate of potash in the dry state with the other materials; it should be mixed first with glue dissolved in warm water. The paste for the rubbing surface may be spread with a brush or spatula on the side of the box. 2. How to make rye whisky? A. To 40 gallons proof spirit add 2 gallons peach flavoring, 1 pint white vinegar, and 12 drops oil of cognac in 95 per cent alcohol. Color with caramel.

(67) W. N. McA. writes: I have a steam launch 32 feet long, 6 feet 3 inches wide, and 30 inches draught of water. I have a 5 by 6 engine of first class make, and an upright boiler 30 by 50 inches. I am using 24 inch 2 flange wheel, made by the New York Safety Steam Power Company. I can make 250 revolutions per minute with 30 pounds of steam. This is of course no pressure for a boiler of that size, but with the wheel I have it is all the pressure I need for 250 revolutions, which I suppose is as high speed as is prudent. The hull is of white cedar and a most excellent model for speed, having been built for use in the navy to be pulled with oars. At 250 revolutions I make about 7 miles an hour. 1. Is it prudent to turn my 24 inch wheel over 250 revolutions, or had I better get a larger wheel, and one with more flanges, and would a 3 flange be better than a 2 or 4, and what pitch should I use in either case? A. You may increase your speed slightly by increasing the speed of the wheel to 300, but you will do better by using a 3 flange wheel of 26 or 28 inches diameter, with a pitch of 3 times the diameter, at the speed named. As you do not give the pitch of your wheel, we cannot decide as to its economy, only that a 3 blade of the same size would do better service. We do not recommend 4 flanges on wheel. 2. I am using salt water part of the time: can I use anything to prevent its injury to the boiler, and is it better to blow out while not in use, or had I better leave water in boiler? A. Leave the salt water in boiler, with as low salinometer indication as possible. When you lie up, blow out and pump up, so as to leave the water as fresh as possible while steam is on. This discharges the air from the water and lessens oxidation. 3. What is best application for outside of boiler to prevent rust? A. Rub the outside of the boiler often with oily waste. In a short time it will have an oil coat baked on, or paint with linseed oil and blacklead. 4. I wish to make hull 18 inches wider; can I "sponsel" it without danger of dry rot, and would you advise that method of getting more beam? A. Would not recommend you to widen or sponsel hull; you cannot better the lines, and may make a very clumsy, slow boat. 5. Which would give greater speed, a wheel of extra high pitch or one of a lighter pitch, provided both were turned same number of revolutions? A. There is a medium pitch, best suited to the ordinary form of launches. A high pitch is suitable for very slim, light boats designed for high speed only. A low pitch is better for boats of burden having full lines. If the size and pitch of wheel were conformable to the practical requirement for midship section and displacement in both cases, the high pitch wheel will give the best speed.

(68) O. W. asks the distance traveled by a column of mercury weighing one pound, contained in a tube one inch in diameter, between 0° (zero) and 90° Fah. A. By expansion a column 1 inch in length at zero becomes 1·008 inches, at 90° Fah.

(69) "Several Students."—In the table of saturated steam on page 708 of Haswell, you will find 14·7 as the atmospheric pressure corresponding with 212° temperature. To this add 15·3, the pressure above the atmosphere, giving you 30 pounds absolute pressure, opposite to which you will find in the table 250·4°, the next figure in the equation, which is the temperature at 15·3 pounds pressure by gauge. 100° means the temperature of feed. We think this will set you right in your problem. We have no information of the action of molasses on boiler scale, any further than the possible chemical interchange of elements as between the vegetable acid of the molasses and the carbonates in the scale. If this is true, the lime will be disengaged as a powdered hydrate. Any other vegetable acid would be an equivalent.

(70) F. A. writes: With an alloy of tin and aluminum for the purpose of soldering aluminum, what flux should be used? One that will prevent oxidation of the aluminum. A. With soft aluminum solders, alloy of tin and bismuth, to be used with a soldering iron, or at a heat of from 300° to 400° Fah., use paraffine, stearine, Canada balsam, or vaseline. For the blowpipe solders of the alloys of silver, aluminum, and tin, use common salt in the same manner as jewelers use borax rubbed up on a slate.

(71) H. G. V. writes: I am running an engine 10x20 inches, 80 revolutions per minute, 75 pounds steam pressure. How much more steam will the engine require to run 160 revolutions per minute and do the same work? A. For increased friction and waste in clearance, probably 25 percent.

(72) A. E. asks information as to the prospects of a machinist getting work in South America. A. There has lately been started a machine shop for repairing of river and ocean steamers at Para, Brazil; otherwise, Chili is the only State in South America that appreciates mechanics. Write to the Chilian minister at Washington.

(73) G. C. wants to know whether there is more weight on a brick at the bottom of a wall than there is on one half way up? A. Yes; every brick lends its weight to the one below it.

(74) T. H. B. writes: I want to raise stumps straight out of the ground by hitching a span of mules to end of rope passing over pulleys. How many and what size pulleys are needed to raise an oak stump 15 inches in diameter, and what size rope? A. Rope 1 inch diameter in a pair of 4 and 5 pulley blocks.

(75) W. L. C. asks: Will a wheel of 3 feet in diameter traverse an inclined plane in less time than one 1 foot in diameter? A. There should be no difference, except as from the friction of air or unequal density and surface exposed. The law of falling bodies covers this case.

(76) F. C. D. writes: I have a boiler two feet in diameter, four feet six inches high, with 39 1¼ inch tubes, and carrying about 80 pounds of steam; keep fire night and day, and use soft water well filtered. How often ought it to be blown off, and is blowing off sufficient to clean it, as it has no hand hole? I blow it a little every two days, and allow it to cool off and blow it every two weeks. A. The boiler should have two hand holes, near bottom; you do right to blow off often. Drawing the water off when the boiler is cold does not clear out the sediment. Better draw out the fire entirely when steam is up, and then blow out all the water as soon as possible. This tends to stir up the sediment and carry it out.

(77) G. A. M.—For brass bath: Dissolve together, in 2 gallons of water, 8 ounces sulphate of copper and 8 to 10 ounces of sulphate of zinc, to which add 30 ounces carbonate of soda and 15 ounces bisulphite of soda in solution of water. Stir with a glass rod and add cyanide of potassium until the liquor is clear. Settle and decant. Then add an excess of cyanide, 1 ounce, to improve conductibility of bath. For copper coating on embossed cards for matrix: Saturate the card with paraffine or beeswax, and cover the surface with blacklead, using a fine brush.

(78) E.—There are patented anti-friction boxes which are claimed to run dry at very high speeds. They are liable to become clogged with dust and abraded metal, when they lose their anti-friction qualities. Better use hard metal boxes with good oil, which is well tried and reliable.

(79) T. McM. asks: What is the largest engine in the world, for pumping purposes, and its capacity? A. Probably the one at the Lehigh zinc works, Friedensville, Pa. Its cylinder is 110¼ inches in diameter, with 10 foot stroke. It has raised 19,000 gallons of water a minute from a depth of 350 feet.

(80) J. W. H.—The best form of chimney is round, and about 20 times the diameter in height for large chimneys, and from 30 to 40 times the diameter for small chimneys. Chimneys should be adapted in size and height to correspond with the volume of heated products of combustion. There is a little work by Armstrong that will give you the figures, "Chimneys for Furnaces, Fireplaces, and Steam Boilers," 50 cents, which we can furnish.

(81) D. H. W.—We have answered similar questions many times. All parts of the periphery of a wagon wheel move with the same velocity around the axle. The top moves over the ground twice as fast as the axle; the bottom does not move. You may make it look rational by close inspection with both eyes and mind.

(82) W. D. P. writes: Given a locomotive traveling, does her piston head move backward as well as forward? A. Only in relation to the locomotive and its parts. Never goes backward in relation to the track, except when the wheels slip.

(83) O. B. desires some simple way to change the voice temporarily at a mask party. A. We know of no means other than practice. Sometimes removal of teeth or keeping something in the mouth will effect a slight change.

(84) G. S. B.—The pressure of gravity is the supposed cause of the condensation of the elements of planetary matter. In this gradual process the latent heat of the original gaseous and liquid matters is supposed to be developed and gradually radiated away into space. In mechanics, compression develops latent heat into sensible heat. This may be due to both decrease of bulk and molecular change.

(85) S. R. W. desires a receipt for dandruff on the head. A. Use a lotion consisting of two drachms borax dissolved in a pint of camphor water. Use once or twice a week. A solution of two drachms salts of tartar dissolved in a pint of tepid water is likewise recommended.

(86) W. B. J. asks how to make a canvas strop such as used by the barbers. A. Take levigated oxide of tin, prepared putty powder, 1 ounce, powdered oxalic acid ¼ ounce, powdered gum 20 grains; make into a stiff paste with water, and evenly and thinly spread it over the strop. Another method consists of mixing fine emery intimately with fat and wax until the proper consistence is obtained in the parts, and then rub it well into the rubber strap.

(87) W. S. asks the best means to dissolve gum copal and amber to a varnish. And is there any vermilion made that is permanent in color? A. Fuse the desired proportions of the two gums until perfectly fluid, then pour in hot oil; let it boil until it will string very strong, and in about 15 minutes add turpentine. The best vermilion is the quicksilver vermilion, which can be procured from any dealer in dry colors.

(88) J. D. McC. asks if there is anything which will prevent a strong solution of potash alum from crystallizing. A. Dilute by the addition of water.

(89) L. M. K. writes: I made a pickle or brine in which I placed a quantity of well selected butter of splendid flavor, and covered the same in earthen vessels, leaving the brine at least 2 inches over all the butter. The brine I made as follows: Of clean water, Ashton salt, and a small quantity of saltpeter and white sugar; and on taking out the butter, it has a noxious, bitter taste. Will you be so kind as to tell me the cause, also the preventive? A. The bitter taste is due to the addition of saltpeter and sugar, which were not necessary. They can probably be washed out by the process described in answer to query 33, in SCIENTIFIC AMERICAN for September 12, 1885.

(90) L. W.—You may save from 5 to 10 per cent of the fuel in your heating arrangements by thoroughly protecting boiler and pipes with felt. Your self-feeder having taper sides allows the coal to wedge and form an arch. A straight magazine is better. A damper in the stove pipe is proper and safe if it has a hole in it, or is cut away on the outer edge so as not to shut tight and discharge gas into the house. The check door is also in common use, with automatic regulator, and is considered good.

(91) W. E. D.—Milk weighs so very little more than water that it requires a careful measurement to judge it by weighing a quart. It seldom weighs as much as 35-1000 more than water.

(92) C. F. S. writes: I have two Reis telephones, but can't make them work. A. To make the Reis telephone operate successfully, you will need a heavy battery and a very careful adjustment. By substituting the point or block of platinum for the carbon, you will be able to succeed better with your telephone.

(93) J. A. G. writes: 1. Is it true that moist air is lighter than dry air at all temperatures? A. Moist air is always heavier than dry air at the same temperature. 2. Is not moist air that is cooled to the dew point heavier than unsaturated air at the same temperature? A. Yes.

(94) T. F. T. asks: In improvements in electro magnets, what is the object of having hollow tube? Why is there more power than a solid core? A. The principal object in making electro magnets hollow is to avoid the Foucault currents. We doubt if a magnet with a hollow core has more power than a properly constructed magnet with a solid core.

(95) O. W. asks: Will you please inform me how to make a cheap electric battery? I have three glass jars about seven inches high and the same number of inches in width. A. Consult SUPPLEMENT, 157, 158, and 159, for information on the construction of batteries.

(96) H. E. H. asks: 1. Can a spring motor like those described in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 142, 146, 147, 148, and 150, be made to propel a small boat (a Barnegat sneak boat, about 10 or 12 feet long)? A. Probably a spring motor could be arranged to drive a small boat for a short distance; but we think it would be easier to row the boat than to wind the motor. 2. Can you give me the address of any one that could make the motor for me? We do not know of any one regularly engaged in the manufacture of spring motors. 3. Do you think the motor advertised by the Electro Dynamic Co., of Philadelphia, in SCIENTIFIC AMERICAN EXPORT EDITION for September, 1885, page 206, would do? I want to use this boat for fishing and hunting. A. It is hardly large enough for your purpose, but possibly the same company can provide you with an electric motor which would answer.

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

F. H.—The specimen sent has the appearance of being a piece of clay iron ore, whose surface has been worn by glacial action in past geological ages.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

February 23, 1886,

AND EACH BEARING THAT DATE.

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

Abrasive or polishing disk, flexible, J. W. Byers.. 336,695
Amalgamating pans, attachment for, J. A. Bidwell.. 336,692
Ammeter, J. A. Barrett.. 336,688
Auger, B. Forstner.. 336,709
Axle box, car, H. K. Austin.. 336,685
Axle box, car, K. S. Austin.. 336,831
Axle nut, M. S. Freeman.. 336,710
Baking machine, C. Witzig.. 336,681
Balance, analytical, E. Becker.. 336,546
Band stretcher, J. A. Lawrence.. 336,571
Barrel leveling and trussing machine, G. H. W. Simmon.. 336,760
Barrels, follower for packing, C. T. Bellamy.. 336,690
Bathtub, F. P. Day.. 336,797
Bathing apparatus, V. A. Harder.. 336,642
Bed bottom, C. L. Ames.. 336,616
Bedstead or cot, H. Williams.. 336,679
Bedstead, wardrobe, W. A. Morrison.. 336,818
Bell, door, W. A. Milligan.. 336,864
Blacking box, G. Ridgeway.. 336,748
Blacking machine, boot and shoe, R. T. Roberts.. 336,592
Blast furnace appliance, W. Rotthoff.. 336,749
Blind slat tenoning machine, Bugbee & Danner.. 336,835
Blind, window, A. H. Hill (r).. 10,692
Board. See Ironing board.
Book for binding, machine for gathering the folded sheets or signatures of a, F. Wood.. 336,878
Boot, felt, S. G. Alexander.. 336,542
Boot or shoe. W. H. Wetmore.. 336,775
Boot or shoe soles and uppers, uniting, E. C. Bennett.. 336,548
Bottle stopper, A. E. Fraser.. 336,848
Box. See Axle box. Blacking box.
Box loop, F. A. Neider.. 336,735
Bracket. See Shingling bracket.
Brick hack, portable, Walker & Miner (r).. 10,694
Bricks, implement for edging or turning, A. G. Osman.. 336,820
Bricks, picking up and carrying, A. G. Osman.. 336,737
Bridge gate, U. Dood.. 336,843
Brush, rotary, R. J. Curtin.. 336,842
Bung, W. Taylor.. 336,766
Bungs, machine for making compressed, E. D. Mackintosh.. 336,652
Burial caskets, furniture, etc., plastic compound to be used in the manufacture of, T. Law.. 336,726
Bustle, W. F. Russell.. 336,870
Button fastener packing case, F. H. Richards.. 336,589
Button setting instrument, Bairstow & Keavy.. 336,832
Button setting instrument, T. E. Keavy.. 336,859
Buttoner and cigar cutter combined, Prahar & Shepard.. 336,867
Cake, jumble, and snap machine, M. De Tamble (r).. 10,691
Can. See Oil can.
Can fastener, fruit, G. W. Coddington.. 336,796
Can handle, F. W. Coleman.. 336,699
Candy manufacturing machine, G. S. Collum.. 336,839
Car coupling, N. H. Broun.. 336,791
Car coupling, C. Halpin.. 336,806
Car coupling, D. O'Rourke.. 336,736
Car coupling, Storms & Arnold.. 336,871
Car coupling, J. A. Turley.. 336,875
Car coupling, J. T. Wilson.. 336,778
Car, stock, J. W. Street.. 336,872
Car, stock, J. H. Wickes.. 336,776
Cars, device for controlling the motive power and brakes of power driven, E. Samuel.. 336,751
Cars, device for moving, E. P. Weaver.. 336,609
Cars with gas, apparatus for heating railway, J. Pintsch.. 336,585

Carding machine, W. H. Rankin..... 336,587
Carriages, umbrella for children's, J. Wright..... 336,879
Cartridge loading machine, O. F. Belcher..... 336,689
Cartridge loading machine, L. H. Van Syckle..... 336,676
Case. See Type case.
Chain, drive, C. E. Alden..... 336,779
Chair. See Reclining chair.
Chimney cap, T. Edwards..... 336,707
Chip breaker, Dumontier & Plourde..... 336,845
Chopper. See Cotton chopper.
Clamp. See Wheelwright's clamp.
Clasp. See Spring clasp.
Cleaner. See Lamp chimney cleaner. Lawn cleaner. Slate cleaner.
Cloth sponging machine, R. Schmitt..... 336,752
Clothes line, A. G. P. Dorsey..... 336,705
Cockle separator, McCollom & Forder..... 336,655
Collar, horse, Ruge & Evertz..... 336,869
Copying press, H. Griffin..... 336,564
Cordage, composition for treating, Horner & Hyde..... 336,718
Corn knife and shield, G. H. Sawyer (r)..... 10,693
Corset, A. H. Traver..... 336,768
Corset stiffener, H. M. Van Etten..... 336,606
Cotton chopper and cultivator, combined, J. L. Murray..... 336,865
Cotton scraper attachment, T. Felps..... 336,803
Countersinking tool, F. Happersberger..... 336,566
Coupling. See Car coupling. Hame coupling. Pump rod coupling. Spring coupling. Thill coupling.
Crimping machine, radial, McCreary & Smith..... 336,656
Curtain fixture, J. Gamble..... 336,851
Curtain fixture, L. Weber..... 336,610
Cut-off valve for steam engines, M. N. Lynn..... 336,562
Cutter. See Stalk cutter.
Dental appliance, C. E. Brooks..... 336,790
Dental instrument rubber cover, C. K. Barlow..... 336,781
Dental plunger, R. S. Williams..... 336,777
Diamond or carbon points in tools, inserting, T. A. Jackson..... 336,568
Digger. See Potato digger.
Disinfecting mat, W. Edson..... 336,557
Dividers, G. M. Pratt..... 336,868
Doubling and spinning silk, etc., stop motion mechanism for machines for, W. R. Landfear. 336,570
Draught equalizer, G. C. Flagg..... 336,708
Drawer, exhibition, A. L. Adams..... 336,615
Dredging apparatus, G. F. Badger..... 336,619
Drier. See Laundry drier.
Drill press, O. Smith..... 336,598
Drill press tool, O. Smith..... 336,762
Drilling machine, W. Frech..... 336,849
Edger, gang, E. H. Barnes..... 336,782
Electric lights, rheostat for incandescent, S. A. Hill..... 336,716
Electric machine, dynamo, R. E. Ball..... 336,780
Electric machine, dynamo, J. M. A. Gerard-Lescuyer..... 336,636
Electric machine regulator, dynamo, J. E. Watson..... 336,608
Electric motor, L. Daft..... 336,629
Electrical call or signaling apparatus, A. G. Holcombe..... 336,643
Electrical communicating system for hotels, A. G. Holcombe..... 336,809
Elevator. See Grain elevator. Register elevator.
Elevator, J. McQuaide..... 336,581
Elevators, etc., register for, D. Segur..... 336,756
Embroidery fabric, woven, J. G. Kuhn..... 336,861
Engine. See Single-acting engine. Steam engine.
Eyeglass frame, H. E. Kristein..... 336,722
Fabric. See Embroidery fabric. Filtering fabric.
Fan attachment, P. Murray, Jr..... 336,866
Faucet and filler, E. Kells..... 336,721
Feed water heater, T. Fairbanks..... 336,802
Feeding stock on cars, apparatus for, J. W. Street..... 336,873
Fence, W. W. Gage..... 336,634
Fence stretcher, C. D. Shellaberger..... 336,669
Fertilizer distributer, J. B. Denton..... 336,798
File holder, O. C. Mackenzie..... 336,577
Filter, A. Breuer..... 336,621
Filtering fabric, S. G. Derham..... 336,799
Fire escape, O. Hansen..... 336,713
Fire extinguisher, hand, D. M. Monroe..... 336,658
Fireplace, J. W. Wolfe..... 336,682
Fishing reel, A. F. Meisselbach..... 336,657
Folding table, S. C. Hopkins..... 336,717
Forging press, hydraulic, R. H. Tweddell *et al*..... 336,604
Frame. See Eyeglass frame.
Frog and switch, safety, C. Buhrer..... 336,549
Fruit jar, W. P. Coldren..... 336,552
Fruit jar, E. A. De Steiger..... 336,800
Fruit wrapping machine, W. E. Rice..... 336,823
Furnace, J. Springer..... 336,765
Gauge. See Glass cutting gauge. Machine table gauge.
Gauge, H. Plante..... 336,742
Gaslight, incandescent, C. M. Lungren..... 336,576
Gas service conduits, attachment for, Leede & Lawshe..... 336,573
Gate. See Bridge gate. Sliding gate.
Glass, apparatus for flattening window, L. Houze. 336,855
Glass cutting gauge, E. O. Boyle..... 336,834
Glassware, shaping, D. C. Ripley..... 336,666
Glycerine from fatty substances, extracting, J. H. Clinton..... 336,795
Governor, steam engine, N. F. Burnham..... 336,836
Governor, steam engine, J. Richards..... 336,747
Grab hook for chains, M. Barr..... 336,687
Grader, road, F. M. Pennock..... 336,821
Grain adjusting device, H. Curtis..... 336,553
Grain elevator, M. F. Seeley..... 336,755
Grain separators, fan for, J. Hawk..... 336,567
Grass hooks, manufacture of, G. Nolin..... 336,819
Guard. See Keyhole guard.
Gun, breech-loading, H. M. Quackenbush..... 336,586
Hame coupling, Smith & Hughes..... 336,763
Handle. See Can handle.
Harness loop and bar, J. W. Ropp..... 336,594
Harrow and pulverizer, combined, R. Cleary..... 336,794
Harvester cutting apparatus, D. Shields..... 336,670
Hay stacker, Warner & Cook..... 336,771
Hay tedder, F. E. Kohler..... 336,723
Head screen, H. Garst..... 336,712
Heater. See Feed water heater. Sad iron heater.
Hoisting machine, B. P. Darling..... 336,630
Holder. See File holder. Pen holder. Towel holder. Type and space holder.
Hook. See Grab hook. Meat hook.
Hoop. See Wire hoop.
Horseshoe, W. S. McGowan, Jr..... 336,863
Indicator. See Pressure indicator. Scale indicator.
Insulator, C. L. Travis..... 336,828
Ironing board, W. I. Clous..... 336,698
Jack. See Lifting jack.
Jar. See Fruit jar.
Jar cover, W. F. McFarland..... 336,730
Key. See Telegraph key.
Key fastener, C. W. Bradford..... 336,788
Keyhole guard, W. W. Broga..... 336,789
Kiln for burning bricks, etc., W. Jones..... 336,720
Knitting machine, G. A. White..... 336,611
Lamp, automatic carbureting, J. Leede..... 336,572, 336,574
Lamp chimney cleaner, A. S. Reisor..... 336,746
Lamp, electric arc, J. M. A. Gerard-Lescuyer..... 336,635
Lamp, extension, D. W. Parker..... 336,738
Lamp, incandescent electric, J. M. A. Gerard-Lescuyer..... 336,637
Lamp, incandescent electric, W. Main..... 336,729
Lantern, B. Scarles..... 336,596
Latch. See Gate latch.
Latch door, J. A. Hollenberger..... 336,810
Latch, gate, H. Harrington..... 336,714
Latch, sliding door, Gordon & Hamilton..... 336,638
Lathe for turning irregular forms, O. Kromer..... 336,815
Laundry drier, O. M. Shannon..... 336,758
Lawn cleaner, W. H. Mack..... 336,728
Lemon squeezer, J. J. Sturla..... 336,672
Lifting jack, T. L. Chapman..... 336,793
Light. See Gaslight.
Lithographic stones, machine for surfacing, C. N. Morris..... 336,582, 336,583
Loom shedding mechanism, H. Wyman..... 336,683
Loom shuttle, Taylor & Tirrell..... 356,599
Looping-in switch, E. T. Gilliland..... 336,563
Lubricating steam engines, N. F. Burnham..... 336,838
Lubricator, S. M. Main..... 336,578
Machine table gauge, C. M. Letz..... 336,814
Mail, vehicle for delivering, H. B. Sortor..... 336,764
Mat. See Disinfecting mat.
Matrix, D. J. Riker..... 336,824
Meat hook, B. A. Stevens..... 336,671
Mechanical movement, Crompton & Wyman, 336,623 to 336,627
Metal, granulating molten, D. J. Riker..... 336,590
Meter. See Water meter.
Motor. See Electric motor.
Mower, lawn, H. A. Groux..... 336,639
Nitro-cellulose, manufacturing, F. V. Pool..... 336,822
Nose bag, G. W. Scovill..... 336,597
Nozzle, jet and spray, E. R. Tomlinson..... 336,602
Nut, prop, H. Higgin..... 336,808
Oil can, safety, D. Steeneken..... 336,826
Oils, purifying and crystallizing essential, C. L. Coffin..... 336,622
Ore grinding pan, J. A. Bidwell..... 336,691
Oven, baker's, E. A. C. Petersen..... 336,741
Oven, baker's, W. H. Thompson..... 336,767
Oven, portable baking, A. Chappee..... 336,550
Padlock, permutation, J. H. Julian..... 336,858
Pan. See Ore grinding pan.
Paper, apparatus for winding and rewinding, E. W. Ayer..... 336,686
Paper sizing composition, J. Jordan..... 336,569
Pegs, machine for forming and driving compound, E. C. Bennett..... 336,547
Pen holder, C. Hollowede..... 336,644
Pen holder, M. J. Hughes..... 336,856
Photographic camera stand, Lewis & Barker..... 336,815
Pianoforte, Guild & Burnham..... 336,565
Pianos and organs, music sheet and book supporter for, H. Worrall..... 336,613
Plane, J. A. Traut..... 336,674
Planing machines, presser bar for, D. C. Krum..... 336,860
Planter, corn, W. L. Rucker..... 336,750
Planter, corn, L. E. Waterman..... 336,772
Pliers, C. F. Hill..... 336,715
Plow, Needles & Fisher..... 336,734
Potato digger, R. T. Roberts..... 336,667
Precious metals from speiss, separating, S. T. Bryan..... 336,792
Press. See Copying press. Drill press. Forging press. Seal press.
Press, B. A. Beardsley..... 336,545
Pressure indicator and recorder, A. Shedlock..... 336,668
Pressure regulator, G. F. Ott..... 336,584
Pressure regulator, fluid, S. Strunz..... 336,874
Printing machine, G. F. Taylor..... 336,673
Projectile, R. B. Douglas..... 336,556
Propelling attachment for boats, F. Zschiegner..... 336,684
Propelling boats, device for, J. H. Bowers..... 336,787
Pruning implement, W. H. Brown..... 336,694
Pump, J. Humphreys, Jr..... 336,857
Pump, W. F. Mattes..... 336,654
Pump, centrifugal, E. J. Hawley..... 336,807
Pump, chain, J. N. Morrison..... 336,817
Pump, measuring, A. B. Simonds..... 336,761
Pump rod coupling, C. M. Bartholomew..... 336,783
Punching machine table, H. Warden..... 336,677
Purse, bag, etc., G. B. Adams..... 336,541
Railway, cable, R. Gillham..... 336,561
Railway switch and signal interlocking, H. F. Cox..... 336,702
Railway switch and signal interlocking apparatus, H. F. Cox..... 336,701
Reclining chair, G. K. Phillips..... 336,662
Reel. See Fishing reel.
Regulator. See Pressure regulator.
Rolling mill attachment, rod, A. J. Day..... 336,703
Ruler, F. A. Combes..... 336,700
Sad iron heater, J. Ringen..... 336,591
Saw, G. N. Clemson..... 336,697
Saw, J. J. Parker..... 336,739
Saw hanging, T. W. Peck..... 336,661
Sawmill head blocks, nose guard for, C. Esplin..... 336,631
Sawing machine, band, J. J. Bowen..... 336,693
Scale indicator, J. H. Rosecrans..... 336,595
Scale, weighing, D. Hallock..... 336,641
Screen. See Head screen.
Screwdriver, J. S. Fray..... 336,560
Seal press, C. L. Pond..... 336,663
Seeder, disk, Galt & Tracy..... 336,711
Separator. See Cockle separator.
Sewer invert blocks, composition for making, S. A. Miller..... 336,732
Sewing machine, W. H. Waterman..... 336,607
Sewing machine driving mechanism, C. T. Jones..... 336,648
Sewing machine feed mechanism, G. W. Birchall. 336,786
Sewing machine tension, R. H. St. John..... 336,827
Sewing on buttons, machine for, J. Mathison, 336,880, 336,881
Sewing or embroidering machines, feed motion for, E. Cornely..... 336,554
Shingle, metallic, A. N. Montrose..... 336,733
Shingling bracket, Leggett & Sanders..... 336,727
Shot concentrator, Winans & Wooden..... 336,680
Signaling apparatus, electric, E. T. Gilliland..... 336,562
Single-acting engine, twin cylinder, F. Plumb..... 336,743
Skate, roller, J. F. Mains..... 336,579
Skate, roller, W. R. Morris..... 336,816
Skate, velocipede, T. Tennent..... 336,600
Skates, safety wheel for roller, R. I. Towle..... 336,603
Slate cleaner, F. Wittram..... 336,612
Sled, bob, W. Fisher..... 336,632
Sleigh knee, A. Doll..... 336,555
Sliding gate, Thuston & Chase..... 336,601
Snow plow, C. D. Batchelor..... 336,833
Soldering machine, can, D. M. Monroe..... 336,559
Spinning machine, J. S. Funk..... 336,850
Spring. See Window spring.
Spring, J. L. Wells..... 336,774
Spring clasp, J. J. Unbehend..... 336,769
Spring coupling, elastic, F. O. Rogers..... 336,593
Stalk cutter, J. H. Jones..... 336,811
Steam engine, N. F. Burnham..... 336,837
Steam engine indicator diagrams, instrument for measuring the mean height of, Kimmel & Claussen..... 336,812
Steam trap, N. Curtis..... 336,628
Stench trap, J. P. Gallagher..... 336,805
Stereotype matrix impressions, machine for making, F. Schreiner..... 336,754
Stone, producing imitation, H. S. Utley..... 336,675
Stone sawing machines, feed mechanism for, F. H. Cook..... 336,840
Stopper. See Bottle stopper.
Stove hood or heat collector, J. G. W. F. Fleeming..... 336,559
Stoves, vaporizer and burner for gasoline and oil, B. Rein..... 336,745
Strap. See Trunk strap.
Surgical splint, H. Partrick..... 336,740
Swing, vertical rotary, L. M. Campi..... 336,696
Table. See Folding table.
Tableleaf support, W. Seng..... 336,757
Tag and envelope, combined, H. M. Crouse..... 336,841
Telegraph key, convertible, Maloney & Johnson..... 336,653
Telephone, C. A. Randall..... 336,744
Telephone, mechanical, A. W. Hall..... 336,640
Telephone, mechanical, R. O. Middleton..... 336,731
Telephone transmitter, W. C. Turnbull..... 336,876, 336,877
Thill coupling, J. G. Stair..... 336,825
Thrashing machines, sacking attachment for, C. F. Prentiss *et al*..... 336,665
Tobacco package, Evans & Turner..... 336,801
Toboggan, J. R. McLaren, Jr..... 336,882
Tongue support, A. D. Tyler..... 336,605
Towel holder, C. H. Delanoy, Jr..... 336,704
Towing and securing bawsers or lines of vessels, apparatus for, H. Winter..... 336,829
Towing vessels, H. Winter..... 336,830
Traction wheel, Kelly & Dieter..... 336,649, 336,650
Trap. See Steam trap. Stench trap.
Tricycles, clutch for, D. H. Rice..... 336,588
Triturator, A. Babendreier..... 336,618
Truck, barrel, J. M. Bennett..... 336,620
Trunk strap, F. M. Masse..... 336,580
Tub. See Bathtub.
Tubes, machine for forming and punching polygonal, C. P. Higgins..... 336,852, 336,853
Tubes, machine for forming serpentine, C. P. Higgins..... 336,854
Type and space holder, compositor's, Johnson & Low..... 336,719
Type case, compositor's, L. K. Johnson..... 336,646, 336,647
Type case for stereotype matrix making machines, F. Schreiner..... 336,753
Type distributing apparatus, Johnson & Low..... 336,645
Type writers, copy holder for, W. H. Clarkson..... 336,551
Type writing machine, G. W. N. Yost..... 336,614
Type writing machines, locking device for keyboards of, G. H. Lasar..... 336,725
Umbrella retainer, J. B. Durand..... 336,846
Valve, hydraulic, G. B. Lamb..... 336,724
Valve, link motion, for working, A. D. B. Douglas..... 336,844
Vehicle sand band, W. M. Farr..... 336,558
Vehicle spring, G. Banister..... 336,543
Vehicle spring, M. Barry..... 336,544
Vehicles, auxiliary seat for, S. M. B. Millard..... 336,785
Wagon stake, E. M. Foreman..... 336,847
Washing machine, L. I. Arthur..... 336,617
Water meter, piston, H. B. Whittaker..... 336,678
Water overflow, alarm for detecting, L. Weil..... 336,773
Wheel. See Traction wheel.
Wheelwright's clamp, L. W. Free..... 336,633
Whip socket, A. Vester..... 336,770
Windmill, J. G. Benster..... 336,784
Window spring and weather strip, combined, G. W. Lewin..... 336,575
Wind wheel gearing, L. U. Loomis..... 336,651
Wire, barbed, J. Potter..... 336,664
Wire hoop, J. C. Durling..... 336,706
Wood, machine for bundling kindling, Shaw & Ellinger..... 336,759
Wool, machine for feeding, opening, and mixing, S. R. Parkhurst..... 336,660

DESIGNS.

Badge, H. Elleau..... 16,544
Bottle, F. Pfahl..... 16,549
Bracket, W. I. Bunker..... 16,541
Carriages, gear for children's, S. F. Boylston..... 16,539
Curtain loop, B. Dreyfus..... 16,543
Gimp, J. H. Thorp..... 16,551
Lamp pendant, B. B. Schneider..... 16,550
Panorama or map case, W. Bruce..... 16,540
Paper fastener, G. W. McGill..... 16,548
Pitcher, etc., H. Berry..... 16,538
Rug, H. Finck..... 16,545
Stovepipe, P. J. Grinberg..... 16,547
Table vessel, G. W. Fry..... 16,546
Vase, M. W. Carr..... 16,542
Washboard, J. T. Arnold..... 16,537

TRADE MARKS.

Artists' and draughtsmen's materials, certain named, E. G. Soltmann..... 13,056
Beer, lager, P. Schoenhofen Brewing Company..... 13,055
Blood balm, botanic, Blood Balm Company..... 13,045
Chamois skins for polishing metal, prepared, Blakeslee & Darby..... 13,044
Cough sirup, J. W. Newburne & Co..... 13,053
Fruit preserves, lime juice, fruit sirups, canned fish, oysters, and turtles, G. S. Valls..... 13,051
Glass cutters, S. G. Monce..... 13,052
Hats, boys', P. R. J. Coughlin..... 13,047
Leather, shoe and gloove, Booth & Kent..... 13,046
Lumber, doors, and sash, E. Stevens & Sons..... 13,059
Milk, condensed, New York Condensed Milk Company..... 13,054
Pocketknives, shears, scissors, and razors, Flagg Cutlery Company..... 13,050
Soaps, laundry and other, Empire Soap Company, 13,048, 13,049
Type writers, C. Spiro..... 13,057, 13,058

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