SCIENTIFIC AMERICAN SUPPLEMENT, No. 241, for geology of the coal region of Pennsylvania, also No. 173, geology of coal; also an interesting article by Prof. Newberry, in No. 383; also Dana's Geology. The humming of a locomotive is caused by the vibration of the spring safety valve, which produces a synchronous resonance of both air and earth through the medium of the escaping steam.

(47) N. asks: 1. Would an ordinary Babcock fire extinguisher, 10 x 24 in., with a guarantee of a 220-pound water test, be safe for a steam pressure of say 100 pounds? It is brazed, not riveted. How as to its capacity to supply a cylinder of say 1½ x 1½ in. by casing it in a fire box for ⅔ its surface? A. The extinguisher is large enough for the engine as stated. We would not recommend you to risk more than 50 pounds pressure. 2. Is there a flexible tubing is the market, rubber or otherwise, that would be suitable for steam at 75 to 100 pounds pressure, say ¼ in. inside? A. The flexible tubing or "steam hose" is made by large rubber houses for this use.

(48) P. C. asks: The safe transmitting horse power of a 14 in. double leather belt. Pulley on engine crank shaft, 5 ft. diameter; 80 revolutions; pulley on main shaft, 3 ft. diameter; distance between centers of crank shaft and main shaft, 25 ft. Elevation of main shaft above crank shaft, 15 ft. Sag or droop of belt on top line of belt; also the rule of size for belt for given horse power. A. Your belt will transmit from 18 to 20 horse power. The size of belt for given horse power is very variable, according to strain, speed, and size of pulleys, and also the lap on the pulleys. You will find interesting articles and tables of belts and their power in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 39, 331, and 236.

(49) G. W. S. writes: I have an engine, the cylinder of which is 3 in. diameter, having a stroke of 5 in., and running at from 250 to 300 revolutions per minute, which I wish to furnish with steam by pumping hot water into a coil of copper tubing after it has been heated. How much tubing would be required, and what size would be best? I wish to take up as little room as possible. With such a coil for a boiler are water gauges, steam gauges, or safety valves required? A. With 50 pounds pressure your engine will develop about 2½ horse power, and will require about 35 square feet of heating surface in the boiler. If made of 1¼ copper tubing outside diameter, you will require 100 ft. in length. For a serviceable boiler, this amount of pipe should be made into several coils terminating in headers at top and bottom, with an outside connection for water gauge, gauge cocks, and safety valve. We do not recommend this form of boiler to the inexperienced.

(50) W. J., Jr., writes: I am very anxious to learn to play the violin, but there is no teacher here that I know of. Could such music be taught by mail? And if so, will you give the address of some one that teaches it? A. It is doubtful whether playing on the violin can be taught by mail. However, if you correspond with either the New York Conservatory of Music or else the College of Music, full information will be given you.

(51) Reader.—The finest wool is said to be that from Silesia, a province of the German Empire near Austria. The wool obtained from the Angora *goat*, not *sheep*, is the whitest wool known, but we do not think that it equals that obtained from the Australian merino sheep in fineness. See the article on Wool in Appleton's American Encyclopedia.

(52) J. Z.—Powdered charcoal is the best filling for a refrigerator, as its antiseptic properties are very essential. Mineral wool is also good, and better if mixed with charcoal. Ashes are too dense, and will not prevent mustiness.

(53) J. D. W.—Iron is strongest at about 500° temperature. A boiler is probably a little stronger with 200 pounds steam pressure than with 200 pounds water pressure.

(54) H. S. B. asks the reason for so many oil paintings cracking—often those by the best artists, who, it is to be supposed, would use only the best materials. A. The cracking of paints is due to the oxidation of the oils, etc., with which the paints are mixed, causing the canvas to shrink and ultimately to crack. The only remedy is varnishing, which must be performed from time to time by those who desire to preserve their pictures.

(55) W. F. W.—An analysis of French bottle glass gave the following results: Silica 53·55, potash 5·48, lime 29·22, alumina 6·01, oxide of iron 5·74, parts in 100.

(56) C. E. M. asks: Can you tell us what will toughen stearine? It is too brittle for small candles. Beeswax we have tried, and it will not work. A. Paraffine is used to stiffen candles.

(57) A Subscriber asks a reliable recipe for canning asparagus in self-sealing glass jars. A. The asparagus is generally cooked in the jars, and then sealed when deemed sufficiently cooked. The manipulation is one that can only be acquired by experience, and it is therefore impossible to give you any receipt, by following which successful results will ensue.

(58) C. P. M., Jr., asks how many mints there are, and where, in the United States. A. Under the coinage act of 1873, the following mints and assay offices are in operation: The mints of Philadelphia, Pa., San Francisco, Cal., Carson City, Nev., and Denver, Col.; and the assay offices of New York, N. Y., Charlotte, N. C., and Boise City, Idaho.

(59) C. F. M. asks how to make a silent gunpowder, to shoot birds for stuffing. A. We do not know of any silent gunpowder. A light charge with small shot or else an air gun can be used to kill birds so as not to injure their skins.

(60) C. F.—To enlarge a card photo without a camera for photo crayon work, first soak the photograph in warm water until the albumen paper separates from the card mount. Now dry the albumen print and lay it in a printing frame, picture side up, and then put in on top, film side down, an ordinary gelatine dry plate. This should be done by a red light. Make the exposure to white light for one or two seconds, and develop the image in the ordinary way. When fixed, you have a clear negative of the card photograph. By placing the negative in an enlarging apparatus, as described in the SCIENTIFIC AMERICAN of February 9, 1884, and using sensitive gelatine silver paper, any size enlarged image can be obtained. A positive may be made from the glass negative by contact, and enlarged up by means of a camera. Sketches can be easily made while it is thrown up.

(61) M. C. G.—To make photo developing trays water tight, whether made of wood or metal, coat them three or four times, after each application is dry, with a diluted solution of Syrian asphaltum dissolved in oil of turpentine. Pasteboard used for the same purpose should first be coated with linseed oil varnish.

(62) H. K.—There is no better way to put a high gloss upon the canvas enlargement than by the method of wax and turpentine; we think the proportions you have used were too strong; instead of equal parts of wax and turpentine, try the following formula:

White wax in shreds ..... 1 oz.
Oil of turpentine. ..... 5 oz.

On page 626, October 3, 1884, issue of the *Photographic News*, you will find useful information on this subject. The usual sizing given to cotton cloth is imparted to the thread before it is woven; the glaze is made by passing the cloth through heated calender rolls under pressure.

(63) I. A. W. asks how to prepare a a rapid photo printing paper which shall exceed in rapidity the ordinary blue process, and be capable of being affected by light passing through an ordinary 3 ply sheet of Bristol board. A. By means of gelatino-bromide of silver emulsions, rapid printing paper can be successfully made, but its manufacture is attended with considerable bother; and as it will keep well, it is advisable for the beginner to purchase it ready prepared from dealers in photographic materials. One method of preparing the paper is, first, to make a sensitive emulsion as given by Henderson on page 293 of the November 8, 1884, issue of the SCIENTIFIC AMERICAN, and then to coat a sheet of plain Saxe paper with it, by laying the moistened sheet upon a level plate of glass, and bending the edges up by strips of wood, to form a paper dish. The emulsion while warm is now poured on the center of the sheet until a pool is formed large enough to permit it to be spread equally over the sheet by a glass rod. It is then allowed to cool, and when sufficiently set the sheet of paper is hung up to dry. It may now be exposed, film side away from the face of the thick card board drawing, in an ordinary printing frame for two or three seconds to diffused daylight, or for a minute and a half to the light from a large kerosene lamp. The image is then developed by immersing the exposed sheet in a solution of ferrous oxalate of potash composed of saturated solution of neutral oxalate potash acidified with a solution of oxalic acid sufficient to turn blue litmus paper red, 6 ounces, saturated solution of sulphate of iron, 1 ounce. The iron must be poured into the oxalate. Half a dozen exposed sheets may be developed one after the other, in the same solution. The sheet is next washed by soaking in a pan of water for four or five minutes, removed, and immersed in a solution of

Hyposulphite soda..... 1 oz.
Water..... 6 oz.

for eight minutes, which fixes the print; the latter must now be washed for two or three hours in several changes of cold water, when it may be hung up to dry, which it must do spontaneously, as the application of heat will melt the gelatine film. Examination of the print will show the lines and figures non-reversed as in the original drawing, because the sensitive sheet was laid on film side away from the drawing. The operation of preparing and developing the paper must be carried on in a dark room lighted only by a deep ruby red non-actinic lamp.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

February 24, 1885,

AND EACH BEARING THAT DATE.

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

Alarm. See Till alarm.
Alumina by paper mill sludge, manufacture of, C. V. Petraeus 312,894
Awning frame, J. Read 312,898
Axle skein, J. R. Sandage 312,765
Axle truss, wagon, F. Ulrich 312,676
Bale and package tie, I. N. Hopkins 312,637
Bale band, adjustable, G. Nicholson 313,014
Bale band tightener, S. L. Carpinter 312,704
Bale tie machine, L. Cook 312,821
Baling press, G. W. Smith 312,915
Banjo modulator, J. B. Howe 312,638
Barrel, A. C. Carey 312,967
Barrel filling and heading apparatus, A. C. Carey 312,988
Battery. See Secondary battery.
Bearing, anti-friction, D. J. Powers 313,022
Bed, folding, T. P. Glody 312,625
Bed, sofa, C. Streit 312,927
Belt shifter, W. G. Vernon 313,035
Belt tightener, J. T. Fertig 312,989
Belt tightener, H. H. Sawtelle 312,659
Bicycle, C. G. Thayer 312,930
Bicycle fork, Knous & Wallace 312,732
Block. See Hoisting block. Paving block.
Bluing holder, J. C. Nobles 313,015
Boat detaching apparatus, H. E. Foster 312,714
Boiler. See Paper pulp boiler. Steam boiler.
Bolting reel, A. J. Terry 312,672
Book holder and carrier, Pott, Jr., & Gorham 312,021
Books, binding, Brehmer & Brown 312,606
Books, machine for binding, Brown & Brehmer 312,609
Boot and shoe cleaner, S. J. & M. G. Rhoads 312,764
Boot or shoe, J. B. Turner 312,675
Box. See Fire alarm signal box. Jewel box. Paper box.
Box, J. Flynn 312,713
Bracelet, A. Vester 313,036
Bracelet, chain, F. F. Heilborn 312,994
Brake. See Steam and air brake.
Brake shoe, J. J. Lappin 312,734
Brush handles, detachable, S. C. Collins 312,611
Burial apparatus, M. Chastain 312,816
Burner. See Gas burner. Hydrocarbon burner.
Button, J. P. Noyes 313,017
Button, T. W. F. Smitten 312,770
Button, J. H. Walker 312,936
Button, T. J. Winans 312,943
Button attaching machine, L. V. Moulton, 312,748, 312,749
Button fastener, E. O. Ely 312,986
Buttonhole cutting attachment, Ulmer & Collins 312,932
Button hook, L. W. Fairchild 312,622
Button setting machine, E. O. Ely 312,987
Buttons to fabrics, apparatus for attaching, Wilkins & Miller 312,688
Cable hanger, W. R. Patterson 312,755
Cables, repeater for submarine, M. G. Farmer 312,831
Can watering machine, A. R. Merrell 312,648
Car coupling, M. Joo 312,861
Car coupling, D. L. Richards 312,657
Car coupling, E. Rye 313,026
Car cover, R. H. Wyman 312,786
Car cover, railway, R. H. Wyman 312,785
Car covers, guard for freight, R. H. Wyman 312,787
Cars, grip attachment for railway, J. J. Endres 312,711
Carburetor, E. J. Frost 312,836
Carburetor, E. J. Vaughan 312,774
Carriage standard, C. C. Egerton 312,618
Carrier. See Hay carrier.
Cartridge, pneumatic, W. T. Chamberlain 312,706
Cartridges, implement for packing, P. Butler 312,809
Case. See Cigar and cigarette case. Watch case.
Cash register, W. C. McGill 312,740
Caster, W. Koch 312,733
Caster, D. J. Powers 313,023
Casting, sand moulding machine for running riddled sand into moulds for, W. Doyle 312,983
Castings, machinery for making moulds for, M. R. Moore (r) 10,562
Castings, truing, O. J. Ziegler 312,693
Chimney cap, T. J. Steen 312,918
Chimney cowl, T. Cruger 312,978
Chuck, centering, C. W. Glover 312,839
Chuck, lathe, C. W. Glover 312,838
Churn, W. H. Tambling 312,671
Cigar and cigarette case, G. L. Preston 312,656
Cigar lighter and cutter, A. Peschel 312,654
Cipher machine, combination, D. R. Smith 312,665
Clamp. See Harness loop clamp.
Clamping device, J. F. Packer 313,019
Clay, machine for preparing, J. S. Smith 312,667
Clay, machine for treating, J. S. Smith 312,666
Clay reducer and disintegrator, W. Burkman 312,808
Cleaner. See Boot and shoe cleaner. Peanut cleaner.
Clock bell, H. W. Barnes 312,792
Clock bell hammer, C. H. Norton 313,016
Clutch and brake, combined, A. N. Simmerly 312,911
Cock and bottle stopper, siphon stop, I. M. Abbott 312,600
Cocks, attachment for water supply, H. S. Lord 312,872
Coffee hulling machine, J. Schultz 312,767
Confectionery, article of, W. Reinhardt 312,761
Conveyer, endless or pan, F. I. Pearce 312,891
Corn popper, G. T. Copeland 312,612
Corrugating rolls, tool for, T. H. Stevenson 312,922
Corset, G. Schilling 312,905
Cotton and other fibers, machine for opening and cleaning, Clarke & Perham 312,815
Cotton gin feeder, G. Winship 313,038
Cotton picker stem, C. T. Mason, Jr 312,647
Coupling. See Car coupling. Thill coupling.
Cover for chamber pails, etc., A. Judson 312,998
Cover for varnish kettles, D. R. Hostetter 312,854
Crank or eccentric, variable, W. H. De Valin 312,709
Cultivator, tongueless, P. P. Mast *et al* 312,738
Cupola furnace, J. J. Johnston 312,727
Curtain fixture, J. M. Nickel 312,886
Cylinder lubricator, S. Townsend 313,033
Damper, R. Hillson 312,635
Damper mechanism, time, Lakin & Emerson, Jr 313,003
Decorticating machine, G. Gibson 312,837
Dental plugger, J. F. Clement 312,818
Designs in relief, making ornamental and other, M. Suess 313,029
Ditching machine, J. C. Harker 312,629, 312,631
Ditching machine, W. Pulver 312,758
Door check, D. Jennings 312,859
Door hanger, J. A. Carr 312,969
Door spring and bell, combined, Bruen & Wall 312,806
Drawer pull, E. J. Blackham 312,798
Driving wheels, shipper device for bevel friction, F. I. Pearce 312,890
Drum cover, G. W. Brown 312,804
Dust collector, J. M. Sprinkel 313,028
Ejector or vacuum brakes, J. Gresham 312,991
Electric apparatus, automatic cut-out for, J. Du Shane 312,985
Electric conductor, W. R. Patterson (r) 10,563
Electric lighting by secondary batteries, system of, A. H. Bauer 312,698
Electric machine, dynamo, W. M. Mordey 312,745
Electric machines, armature for dynamo, C. F. Brush 312,807
Electrical conducting material, C. S. Bradley 312,803
Electrical conductor, Thompson & Eberle 312,673
Elevators, machinery for opening and closing automatically safety-covers for, A. J. Blaikie 312,699
Engine. See Oscillating engine. Steam engine. Traction engine.
Extracts from cereals, preparing, H. Lehrenkrauss 312,869
Feed water heater, J. A. Grant 312,716
Fence machine, barb, L. Cook 312,820
Fence post, A. E. Stephenson 312,919
Fencing, die for making barbed, A. P. Thayer 313,031
Fencing, metallic, I. Kinney 312,864
Fender. See Fire fender.
Fifth wheel heads, die for, N. Eccles 312,828
Filtering device, W. E. Lindsley 312,735
Fire alarm signal box, J. Young 313,040
Fire engine system, electric, S. S. Wheeler 312,939
Fire escape, Z. Ludwig 312,874
Fire escape, G. W. Putnam 313,024
Fire escape, F. Shickle ..... 312,908 to 312,910
Fire escape, H. Wettstein 312,683, 312,684
Fire escape ladder, J. Barnett 312,793
Fire extinguishing apparatus, W. A. Reid 312,899
Fire fender, J. W. Ells 312,620
Flour bolt, Smith & Cochrane 312,914
Flue welding device, Rademacher & Lemon 312,895
Fork forming machine, P. D. Dupont 312,984
Fountains, floating apparatus for producing illuminated, F. J. Bolton 312,958
Frame. See Awning frame.
Fruit jars, machine for holding and handling, B. F. Jones 312,642
Furnace. See Cupola furnace.
Furnace for manufacturing iron and steel, J. Henderson 312,632
Furnace for reducing zinc and other metals, J. Quaglio 312,759
Furnace for the combustion of bituminous coal, Pratt & Palmer 312,655
Game counter, N. M. Beach 312,794
Gas, apparatus for manufacturing, J. J. Johnston 312,729
Gas burner, safety, G. W. Browne 312,805
Gas burner, safety, M. L. Pence 312,892
Gas, composition of matter for the manufacture of, J. J. Johnston 312,728
Gas conveying and distributing system, A. W. Cadman 312,811
Gas engine gas governor, E. Schrabetz 312,906
Gas mains, carrying off leakage from, G. Westinghouse, Jr 312,777
Gas, manufacturing, J. J. Johnston 312,730
Gate, C. W. Estelle 312,621
Gate, H. A. Filley 312,832
Gear, friction, S. Wilcox 312,780
Generator. See Steam generator.
Gold, silver, and lead from ores, extracting, W. E. Harris 312,847
Governor, steam engine, T. N. Perrine 312,893
Grain binder knotting mechanism, J. F. Appleby 312,790
Grain drill agitator, J. B. Cottom 312,975
Grain screen, D. D. Mook 312,744
Grain separators, etc., blast regulator for, J. Grube 312,992
Grain winnower, A. Strott 312,929
Grate bar, J. B. Crawley 312,614
Guns, safety lock for concealed hammer, F. F. Knous 313,001
Hame, L. Latshaw 312,868
Hammer, power, M. Deering 312,826
Hammock, M. R. Ewing 312,988
Hammock and cradle stand, S. Kops 313,002
Handle. See Brush handle. Stove door handle.
Hanger. See Cable hanger. Shaft hanger.
Harness loop clamp, J. Wagner 312,679
Harness rack, G. F. Walter 312,938
Harrow, wheel, E. F. Stoddard 312,772
Harvester, grain binding, J. S. Davis 312,824
Harvester wheel, Mertz & Lorton 312,883
Hat forming machine, D. Almond 312,602
Hatch, elevator, P. M. Wilson 312,782
Hay rake and tedder, combined, J. E. Offutt 312,650
Heater. See Feed water heater.
Hinge, trunk, E. Andrews 312,947
Hoisting apparatus, Maddock & Michaels 312,737
Hoisting block, F. Shickle 312,663
Holder. See Bluing holder. Book holder. Merchandise holder. Pen and pencil holder. Soap holder. Whip and rein holder.
Hopper tube for keeping clean saloon hoppers in railway cars, etc., saloon, J. Martin 312,876
Horse blanket, A. G. McPherson 312,880
Horse rake, J. M. Long 312,645
Hydrant, P. White 312,686
Hydrocarbon burner, J. A. Cowles 312,976
Ice elevator mechanism, J. R. Eccles 312,616
Inhaler, G. B. Snow 312,771
Invalid supporter, S. J. & M. G. Rhoads 312,763
Iron. See Tuyere iron.
Iron, manufacture of, J. J. Johnston 312,641
Jack. See Lifting jack. Wagon jack.
Jewel box, W. Schott 312,766
Jewelry manufacture, T. W. Foster 312,833
Journal bearing, F. W. Johnstone 312,860
Ladder and fire escape, extension, J. P. T. Davis 312,979
Lamp, F. Rhind 312,762
Lamp attachment, Bynon & Stewart, Jr 312,810
Lamp controlling mechanism, E. H. Amet 312,944
Lamp, electric arc, M. N. Lynn 313,006
Lamp for locomotives, electric, M. N. Lynn 313,009
Lamp shade holder, T. D. Cashin 312,813
Lamp support, electric, F. U. Adams 312,789
Lamps, focusing electric arc, L. G. Woolley 313,039
Lasting machine, M. Brock 312,962
Latch and hasp, combined lock, H. C. Stouffer 312,926
Latch, reversible, W. E. Sparks 312,916, 312,917
Lathe, Cullen & See 312,615
Lathe, car wheel, J. J. Brewis 312,961
Lathe for turning spirals, E. D. Mackintosh 312,736
Leather cutting machine, D. Knox 312,643
Lift, hydraulic, J. S. Stevens *et al* 312,921
Lifting jack, T. Maxon 312,878
Lifting jack, lever, wrench, and oil holder, combined, W. K. Mottram 312,747
Light. See Signal light.
Lock. See Nut lock. Time lock.
Lock, E. J. Colby 312,819
Lock, T. Donahue *et al* 312,827
Loom let-off mechanism, J. D. Cottrell 312,708
Loom shuttle motion, T. A. Weber 312,680
Lubricator. See Cylinder lubricator. Shaft lubricator.
Lubricator, S. Townsend 313,034
Lubricator for locomotive or other engines, J. W. Cloud 312,973
Meats, preserving, G. Holgate 312,995
Mechanical movement, W. H. Rankin 312,760
Medical compound, R. Baumann 312,953
Merchandise holder, H. Meinhardt 312,742
Metals by means of electrolysis, apparatus for treating, H. R. Cassel 312,814
Milking cows, device for, G. S. Frazey 312,834
Mill. See Roller mill. Stamp mill. Windmill.
Mitten, A. B. Perlinsky 312,653
Mortising machine, door, F. W. Stevens 312,669
Motion, device for converting, J. Stubbe 312,773
Motor. See Spring motor. Water motor.
Motor, J. H. Forister 312,990
Musical instrument, mechanical, M. Hock 312,636
Nail machine, W. J. Hutchins 312,996
Nail plate feeder, G. W. McKim 313,010
Necktie fastening, J. Weil 312,681
Nut lock, A. C. Vaughan 312,677
Oil, eliminating the smell of coal, L. Blumenthal 312,605
Oil, treating oleaginous seeds for the extraction of, A. E. Thornton 312,674
Ore concentrator, A. A. Kent 312,863
Ores, etc., reducing and discharging, H. Bolthoff 312,957
Oscillating engine, J. A. Powers 312,757
Paint, mixed, J. B. Wood 312,784
Pants, attachment for, J. J. Neubert 312,884
Paper box, J. Heron 312,851
Paper holder or file, T. F. Bourne 312,702
Papermaking making machines, screen plate or pulp strainer for, F. Williams 313,037
Paper or leatheroid, manufacture of parchment, E. Andrews 312,945
Paper pulp boiler, J. F. Marshall 312,875
Paper stock boilers, screen or strainer for the blow-off of, B. F. Mullin 313,011
Pavement, concrete, C. F. Rapp 312,897
Paving and other blocks, mould box for, J. Eisenhower 312,829
Paving blocks for streets, F. J. Hoyt 312,639
Pawl and ratchet mechanism, stop and lock for, J. N. Williams 312,942
Peanut cleaner, L. R. Edwards 312,617

Pen and pencil holder, A. Carter..... 312,812
Pessary, S. Simpson *et al*..... 312,664
Phosphatic slag, treating, C. Scheibler..... 312,904
Photographers, portable dark room for, W. W. Walker..... 312,736
Pianoforte damper, O. Wessell *et al*..... 312,776
Pinions, machine for polishing, Hunter & Leman. 312,855
Piston, T. Barber..... 312,950
Planter check rower attachment, corn, J. C. Barlow..... 312,695
Planter check rower, corn, N. E. Crothers..... 312,977
Planter check rowing attachment, corn, J. A. Withrow..... 312,783
Planter, corn, Hornor & Crotchett..... 312,853
Planter, corn, C. Thompson..... 312,931
Planter, potato, W. F. Newbold..... 312,885
Planter, seed, F. T. Williams..... 312,689
Plow, T. M. Bissell..... 312,797
Plow, S. H. Clanton..... 312,817
Plow, reversible, C. Myers..... 312,649
Post. See Fence post.
Press. See Baling press.
Presses, strain indicator for screw, R. E. Boschert..... 312,800
Printer's quoin, J. N. O. Hankinson..... 312,845
Printer's quoin, W. Hendrickson..... 312,850
Printing machine, chromatic, W. Scott..... 312,769
Projectile, pneumatic, W. T. Chamberlain, 312,971, 312,972
Propeller, J. J. Williams..... 312,781
Pulley, P. Werum..... 312,682
Pulley lubricator, loose, W. J. Ormsby..... 312,887
Pulley sheave, W. H. Snelson..... 312,668
Pulverizer, land, Bates & Bryant..... 312,697
Pump, G. H. Holt..... 312,852
Pump, A. H. Hutchinson..... 312,997
Pump and engine, A. Johnston..... 312,726
Pump, centrifugal, G. Yellott..... 312,788
Pump, vacuum, R. F. Barnes..... 312,951
Pump, vacuum, A. Kux..... 312,644
Punch, conductor's, B. C. Smith..... 313,027
Punch or press, hand, A. B. Barnard..... 312,696
Rack. See Harness rack.
Railway, cable, J. P. Hunt..... 312,721
Railway, endless rope, W. H. H. Sisum..... 312,913
Railway frog, N. W. Boyd..... 312,801
Railway frog and switch combined, adjustable, J. W. & F. N. Eldridge..... 312,619
Railway signaling apparatus, W. Hadden..... 312,627
Railway tie, E. N. Higley..... 312,717
Railway tie, W. McVey..... 312,881
Railway tracks, apparatus for laying, C. R. Goodman..... 312,626
Railways, carrying pulley for cable, R. Gillham... 312,624
Rake. See Hay rake. Horse rake.
Razor strop, B. F. Badger..... 312,603
Reamer, G. R. Stetson..... 312,920
Reel. See Bolting reel.
Reeling silk, machine for, C. H. Knapp..... 312,865
Refrigerator car, Ely & Cloud..... 312,830
Register. See Cash register.
Rings, show tray for, A. Friedenthal..... 312,835
Roller mill, F. Ferrier..... 312,623
Rolling mill feeding attachment, R. W. Hunt..... 312,640
Roofing, sheet metal, L. L. Sagendorph..... 312,658
Saw fastenings, device for adjusting, Linton & Stewart..... 312,870
Saw gummer, H. Van Nostrand..... 312,735
Sawing machine, band, J. V. Rowlett..... 313,025
Scale beam and poise, M. H. Wierner..... 312,779
Scales, indicating poise for lever, L. C. Irvine..... 312,857
Screen. See Grain screen. Window screen.
Screen and storm door, combined, G. F. Barber... 312,949
Seal, E. J. Brooks..... 312,963
Seat. See Spring seat.
Secondary battery, C. S. Bradley..... 312,802
Seeding machine, W. D. Arnett..... 312,791
Seeding machine, Myers & Cottom..... 313,013
Seeding machines, spring hoe for, J. B. Cottom... 312,974
Seeders, drill tooth regulator and compressor for, R. P. Ludwig..... 312,873
Sewing machine, J. Kayser..... 312,862
Sewing machine darning attachment, F. W. Stewart..... 312,923
Shaft hanger, V. Knecht..... 312,866
Shaft lubricator, W. Dame..... 312,822
Sheet and plate metal, removing swells in, J. W. Britton..... 312,606
Sheet metal straightening apparatus, J. W. Britton..... 312,607
Sheet metal trunk covering and ornamenting the same, W. B. Gould..... 312,715
Shell, explosive, W. T. Chamberlain..... 313,705
Shoe fastener, F. Jacob..... 312,723
Signal light, C. Watts (r)..... 10,565
Silverware, preventing tarnishing in, Blain & Rardon..... 312,954
Single tree straps, die for, I. K. Campbell..... 312,966
Sink, sideboard, etc., combined, A. H. Junod..... 312,999
Skate, roller, E. H. Barney..... 312,952
Sled, A. Delkescamp..... 312,980
Sled, coasting, G. W. Martin..... 312,646
Sled, iron, W. L. Brown..... 312,964
Smokestack, H. C. Simpson..... 312,912
Soap holder, G. H. Allen..... 312,601
Sockets, machine for making tapered threaded, M. Blakey..... 312,700
Soldering iron, G. W. Wilkinson..... 312,941
Spark arrester, G. D. Hunter..... 312,722
Spark arrester, J. S. Park..... 312,889
Spike blank, H. Greer..... 312,840
Spirits and spirituous liquors by electricity, apparatus for rectifying, T. E. Atkinson..... 312,948
Spooling machine bobbin supporter, G. W. Dickerson..... 312,710
Spring. See Door spring. Vehicle spring. Vehicle side spring.
Spring motor, P. Byrne..... 312,703
Spring seat, R. Walker..... 312,775
Square, bevel, and level, combined, B. B. Merrill.. 312,743
Stamp, hand, L. Myers..... 313,012
Stamp mill, H. Bolthoff..... 312,956
Stationery package, E. S. Peck..... 312,756
Stave and cask, A. C. Blount..... 312,955
Steam and air brake, C. Phillips (r)..... 10,564
Steam boiler, H. C. Hoffmeister..... 312,718
Steam engine, M. N. Lynn..... 313,005, 313,008
Steam engine, superheated, Boulton & Perrett.... 312,959
Steam generator, W. H. Page..... 312,652
Store service apparatus, E. P. Osgood..... 312,752, 312,753
Stove, J. W. Owen *et al*..... 312,651
Stove, J. Shaaber..... 312,662
Stove door handle, J. G. Whitlock..... 312,940
Stove foot bar, H. A. Matthews..... 312,877
Stove hood, M. C. Fisher..... 312,712
Stove, hot blast, W. Rotthoff..... 312,902
Stovepipe hanger and fastener, adjustable, J. Stewart..... 312,924
Stove platform, I. Van Hagen..... 312,933
Stove platforms, heater for the crystallization of, I. Van Hagen..... 312,934
Stoves, feeding chute for, W. D. Mayfield..... 312,739
Stoves for heating air, attachment to, G. A. Vaughan..... 312,678
Table, N. & D. Kies..... 312,731
Table slide, Pleukharp & Shilling..... 313,020
Tack strip, Woodward & Copeland..... 312,691
Target, flying, J. L. Barker..... 312,604
Telegraphic relay and telephone, combined, H. C. Strong..... 312,670
Telephone, W. Hadden..... 312,841, 311,842
Telephone, battery, T. D. Lockwood..... 312,871
Telephone switch, W. Hadden..... 312,843
Telephonic apparatus, C. A. Randall..... 312,896
Therapeutic apparatus, galvanic, T. Schmauser... 312,660
Thill coupling, Danner & Billing..... 312,823
Thrashing machine straw carrier, C. A. Schoen... 312,661
Tie. See Bale and package tie. Railway tie.
Till alarm, G. A. Colton..... 312,707
Time lock, E. Stockwell..... 312,925
Timepiece, J. Pallweber..... 312,754
Tinner's and plumber's furnace, Z. Davis..... 312,825
Tire tightener, T. Rodes..... 312,900
Tobacco, machine for dressing fine-cut, W. H. Benson..... 312,796
Toboggan, J. R. McLaren, Jr..... 312,879
Tonguing and grooving machine, F. B. Kearney.. 313,000
Torpedo net, W. M. Bullivant..... 312,965
Toys, faucet for, W. Newman..... 312,750
Traction engine, J. C. Harker..... 312,630
Traction engine, J. Hershberger..... 312,633
Tricycle steering device, Overman & Hadley..... 313,018
Truck, car, M. G. Hubbard..... 312,720
Truck, car, Strong & Mitchell..... 312,928
Trunk, E. Andrews..... 312,946
Tug, harness, L. A. Blood..... 312,799
Tuyere iron, J. Hadley..... 312,628
Tympan sheet and compound for same, J. P. Babington..... 312,994
Type writing machine, M. C. Dodge..... 312,381
Valve, W. S. Jarboe..... 312,725
Valve, balanced slide, A. Jackson..... 312,858
Valve for boilers, signal, R. A. McLane..... 312,741
Valve gear, steam engine, M. N. Lynn..... 313,007
Valve, safety, W. S. Jarboe..... 312,724
Vehicle, road, W. J. Brewer..... 312,960
Vehicle side spring, C. Haendle..... 312,844
Vehicle spring, J. Hanser..... 312,846
Vehicle spring, F. L. Whartenby..... 312,778
Vehicle, two-wheeled, O. Willson..... 312,690
Vehicle wheel, J. L. Yost..... 312,692
Velocipede, S. B. Hill..... 312,634
Ventilator, L. Schanck..... 312,903
Vessels, leak stopper for, J. B. Corey..... 312,613
Wagon jack, Mote & Brewster..... 312,746
Washing machine, J. Donald..... 312,982
Watch, H. W. Hayden..... 312,848
Watch stem winding and hand setting attachment, G. Hunter..... 312,856
Watch case, C. Schuetz..... 312,907
Water closet valve, P. White..... 312,687
Water hammer preventive, F. L. Mentel..... 312,882
Water motor, J. F. Sullivan..... 313,030
Weather strip, G. W. Chinn..... 312,610
Wells, coupling device for sand points in drive, Lang & Stafford..... 312,867
Wheel. See Harvester wheel. Vehicle wheel.
Wheels, manufacture of metal, J. R. Little..... 313,004
Whip, J. Holding..... 312,719
Whip and rein holder, J. J. Rose..... 312,901
Whip socket, E. W. Scott..... 312,768
Whip socket fastener, J. W. Tillyer..... 313,032
Windmill, J. Benoit..... 312,795
Window screen, M. L. Whitcomb..... 312,685
Wire, spool for barb, G. Case..... 312,970
Wire work, W. R. Boerner..... 312,701
Wood ornamentation, L. S. Hayes..... 312,849
Yoke, neck, J. H. Osborne..... 312,888

DESIGNS.

Badge, O. Wettstein..... 15,880
Candy, stick, T. E. Copelin..... 15,851
Carpet, J. L. Folsom..... 15,853 to 15,858
Carpet, O. Heinigke..... 15,859
Carpet, H. Hunt..... 158,860 to 15,865
Carpet, W. L. Jacobs..... 15,866 to 15,876
Chain, watch, R. F. Simmons..... 15,879
Curtain fabric, E. G. Nuffer..... 15,877
Fan, N. Plympton..... 15,878
Lamp chimney, H. Dietrich..... 15,852
Plaque frame, W. H. Brownell..... 15,850

TRADE MARKS.

Alloys used for coating metal articles, E. C. Converse..... 11,965
Bats, Indian clubs, and dumb-bells, baseball, Prior & Hilgenberg..... 11,977
Cigars, Burk, Rich & Co..... 11,964
Cigars, M. R. Pearsall..... 11,976
Cigars and cigarettes, Loud, Claridge & Co..... 11,981
Flour, Landes, Beall & Co..... 11,970, 11,971
Food for poultry, egg, S. S. Myers..... 11,975
Medicine, certain proprietary, Healy & Bigelow.... 11,967
Perfumery and toilet soaps, Eastman & Brother... 11,966
Preserve jars, Synnott & Macqueen..... 11,979
Salve, Healy & Bigelow..... 11,968
Spectacles and eyeglasses, A. Schweizer..... 11,978
Tobacco, cigars, and cigarettes, plug and twist chewing and smoking, W. A. Whitaker..... 11,980
Tobacco, leaf, Loeb & Block..... 11,972
Toilet powders, pomades, washes, and perfumes, F. La Manna..... 11,973
Toilet water, F. La Manna..... 11,969
Watch cases, filled, H. Muhr's Sons..... 11,974

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