H. K. will find a recipe for cement for grindstones on p. 251, vol. 31.—J. H. B. will find a recipe for hard cement on p. 9, vol. 379, and a description of porcelain on p. 3, vol. 30.—F. W. D. will find an explanation of the shirt polish mystery on p. 203, vol. 31.—F. H. M. will find a recipe for a silver plating solution on p. 299, vol. 31.—J. F. will find that a process of tempering mill picks is detailed on p. 202, vol. 31.—G. R. L. C. will find directions for mounting chromos on p. 91, vol. 31.—C. H. F. will find directions for preserving iron from rust on p. 299, vol. 31; for painting brick walls on p. 346, vol. 31.—W. H. M. can clean chamois skins by the process detailed on p. 91, vol. 31.—W. H. K. will find a description of the cultivation of the castor bean on p. 335, vol. 31.

(1) J. S. S. says: I contend that if two casks are put on an equal level, and a one inch pipe is fastened airtight in the head of one end, and a 12 inch pipe similarly in the other, each pipe being 50 feet high and filled with water, the pressure will be as much in one disk as the other. Is this so? A. The pressure on equal and similar areas in the two casks will be the same.

(2) J. C. asks: Can you tell what to put on albumenized paper to remove the gloss, so that water colors can remain on the surface? A. Try gentle steaming.

(3) G. V. says: I intend to pump water for irrigation. I have to carry the water 600 feet in an open tank or trough, the amount of water to be pumped being 1,000 gallons per minute. I can afford to give it a fall of 3 inches in the whole. What should be the dimensions of the trunk? A. Give the trunk from 1½ to 2 times the cross section of the discharge pipe of the pump. 2. Would pine lumber 1 inch thick be heavy enough? A. Yes.

(4) D. J. T. asks: 1. What percentage of boiler pressure is the mean effective pressure on piston in an ordinary slide valve engine with throttle valve wide open? A. From 75 to 80 per cent. 2. I have been running for eighteen months an engine with 10x16 inches cylinder, and I notice that some of the bolts that hold the face plate to steam chest, also to cylinder head and piston head cap, are being cut away as if by acid; some of them are reduced to about one half their original size. The part affected is that which passes through the steam chest plate, the piston head cap, and the cylinder head. It is not rust, for the parts have been kept perfectly well lubricated. Can you tell me the cause and a remedy? A. Probably caused by water carried over with the steam, in which case the use of dry steam will be a preventive.

How can I make a first class Babbitt metal? A. You will have to experiment to get the metal right. See p. 364, vol. 29.

(5) E. P. asks: What process is used in casting steel or iron into ingots, so as to prevent blow holes on the outer surface? The process I have used is casting through a sprue into bottom of mold, causing metal to flow upward. This process is not satisfactory, and I wish to know how it can be remedied. A. Make your mold with a long neck, into which the air may rise and leave the blowholes in the top part of the casting, which is to be cut off.

(6) J. A. T. asks: I desire to construct a reflector telescope. 1. Can ground specula be procured in this country, 4½ or 6½ inches in diameter? A. Yes. 2. What would be the probable cost of a 4½ or 6½ inch speculum? A. For silvered glass mirrors, parabolized, $10 for each square decimeter (4 inches) of surface. The focus is six times the diameter, and the highest power equals twice the aperture expressed in millimeters (fifty per inch). 3. Could you give me a full explanation of the construction of small sized reflectors? A. The English have devoted much talent and money to the construction of reflectors without adequate results. The diagonal plane of the Newtonian obstructs the best part of the mirror, and its supports add diffraction wings to the image of a star. All the silvered mirror costs but one fifth, and its power is nearly five sixths of that of the achromatic of like aperture.

(7) C. asks: Does a fence over a hill contain exactly as many pickets as a fence on level ground, between the same points, the pickets being the same distance apart? A. Yes.

(8) M. asks: What do opticians mean by immersion lenses? A. An immersion lens is a microscopic objective which has its front and back combinations so adjusted that a film of water, joining the front surface and the thin glass cover of the object, completes the correction for spherical aberration, which correction depends in a dry objective upon the thickness of the front lens. Objectives of 1-10 inch and shorter focus are made to work either dry or with immersion by a screw collar adjustment.

(9) Z. T. K. asks: What is the horse power of an undershot or current water wheel 30 feet in diameter, of 15 feet face and 3 feet deep, running in a current which moves 3 miles an hour? A. Multiply 0·384 times the square of the velocity of the water in feet per second, and divide by 35,420. As to your other query, see article on friction of water in pipes, p. 48, vol. 29.

(10) T. C. W says: I melted 1 lb. resin and 1 lb. pitch together, in an iron vessel; then, while hot, I poured the contents of the vessel into a wooden mold, in the shape of a brick. But I found after the mixture got cold and hard, that I could not get it out of the mold; it adhered to the wood. Please to tell me how to construct a mold so that the substance will readily come out when cold and not adhere to the mold. A. Try coating the mold with paraffin.

(11) M. H. P. says: We use in our kerosene lamps a powder which prevents breaking of chimneys. It is said to destroy the naphtha. Can you inform me of any ingredients that will answer the above purpose? A. You do not state the mode of applying the powder in question. If you will send us a sample of the powder and a description of the mode of application, we will endeavor to answer your question.

Is there a cement for mending cracks in iron pots? A. Try glycerin and litharge.

(12) E. C. H. asks: What ingredient in soap is it that, when coming in contact with the eyes or an abrasion of the skin, causes it to smart? A. The alkali it contains. 2. Can there be manufactured an effective article of soap that will not cause such pain? A. No.

Which would be the most serviceable application for ordinary New Jersey yellow pine weather boarding, lime, whitewash, or coal tar, and which would be the coolest in hot weather? A. The whitewash.

(13) S. H. T. asks: What is the mode of etching engravings, etc., on glass? A. See our answer to P. M., No. 4, p. 298, vol. 31. The printing ink protects the glass with which it is in contact from the corroding action of the acid. Mr. Napier, the patentee, prefers to have the glass ground enameled or veneered beforehand, when the objects stand out in relief. If the veneer or enamel is colored, of course the picture remains colored, while the body of the glass is white. This also answers J. G. G.

(14) J. H. asks: How much more power, if any, will be required to turn a wheel one foot in diameter four times around than to turn a wheel 4 feet in diameter once round in the same time? A. Multiply the resistance by the distance through which it is overcome in each case, which will give you measures of the power exerted in turning the two wheels.

(15) J. C. D. says: I wish to run my sewing machine by water power, and propose the following plan: A water wheel 15 inches in diameter, inclosed in a watertight case, to be adjusted under the table of the machine, with a tank, resting 20 feet above the floor and 30 feet on a horizontal line. The tank to hold about 200 gallons, with a pipe leading to the wheel 1¼ inches in diameter. The jet from this pipe to be ¼ inch in diameter, and strike the water wheel at about 45° below the line of the shaft; a discharge pipe to be adjusted at the bottom of the wheel case. Will this run the machine for ordinary domestic sewing? A. This plan will doubtless answer well.

(16) W. H. G. asks: If a loaded ship, afloat, were elevated one half the number of feet which it draws, would it capsize? A. Generally it would; but the load might be so disposed that the ship would remain upright.

(17) A. M. asks: By what process are raisins manufactured? Can the grapes grown in this part of the world be used for this purpose? B. The grapes are dried, either in the sun or in ovens. We do not think it likely that raisins made from the grapes of this country would compare very favorably with those that are imported. We cannot refer you to any work especially devoted to this subject.

(18) J. N. & S. say: We want to drive a shaft at a right angle to our line shaft, and wish to know if we can do it with friction pulleys. The speed of line shaft is 300 per minute. Of what material and how should the pulleys be constructed? A. You can do it with friction pulleys, made of cast iron, if you have sufficient surface.

(19) M. F. D. asks: 1. How shall I make a dry rose madder suitable for painting on wax for flowers? A. Inclose 2 ozs. troy of the finest Dutch madder in a bag of fine and strong calico, large enough to hold three or four times as much. Put it into a marble or porcelain mortar, and pour onto it a pint of clear soft cold water. Press the bag in every direction, and pound and rub it about with the pestle, as much as can be done without tearing it, and when the water is loaded with color pour it off. Repeat the process until the water comes off but slightly tinged, for which about 5 pints will be sufficient. Heat all the liquor in an earthen vessel till it is near boiling, and then pour it into a large basin, into which place 1 oz. of pulverized alum; stir the mixture for a short time, and while stirring pour in gently about 1½ ozs. of a saturated solution of subcarbonate of potash; let it stand till cold, to settle; pour off the clear yellow liquor, add to the precipitate a quart of boiling water, stirring it well; and when cold separate by filtration the lake, which should weigh ½ an oz. Fresh madder root is superior to the dry. 2. How shall I make cadmium yellow for the same purpose? A. Cadmium yellow (sulphide of cadmium) is a compound of sulphur and cadmium. It is obtained by precipitation from a salt of cadmium by a current of sulphuretted hydrogen gas, or by an alkaline carbonate.

(20) J. N. P. says: The copper mines in the mountains of East Tennessee are second to very few in the country. I recently observed a precipitating process which interested me very much. Two shafts have been sunk to a depth of fifty or sixty feet, and a stream of so-called "copper water" has been struck. Pumps are inserted, and this water is pumped into a very long trough, running nearly level. Into this trough is put a lot of old scrap iron. Every twenty or thirty feet along the trough are pits, about two feet deep, into which the precipitated copper is swept. It is then shoveled out and is ready for the refinery. 1. Of what does this water consist? What is the proper name of it? A. A solution of sulphate of copper in water, and probably proceeds from the oxidation of copper pyrites (sulphide of copper). This solution is commonly called blue vitriol. 2. If the residue is the copper precipitated from the water, what becomes of the iron? A. The iron takes the place of the copper in solution. 3. What is the proper name of the water after the copper is taken out? A. The solution of sulphate of iron is called green vitriol.

In certain parts of the country adjacent to the mines, there prevails among the cattle a disease which the natives call milk sickness; they say the cattle never have it unless they have been feeding in dark caves or places in the mountains where the sun seldom shines. To what is it attributable? A. Probably to some poisonous substance contained in the water, which could be determined by an analysis.

(21) W. S. B. asks: 1. Has science ever given a decided answer as to the cause of the Gulf Stream? A. It is due to the flow of the heated waters of the torrid zone towards the poles, the direction of the flow being influenced by the earth's rotation and the forms of the continents. 2. How swiftly does it flow, and how wide is its current? A. The maximum velocity of the Gulf Stream is five miles an hour, and the average less than one and a half.

(22) J. W. asks: 1. Does lead contain sulphuric vapors and oxygen vapors? A. No. 2. When lead melts, does it expand and force the vapors off? A. No. 3. When the lead is cooling, does it reabsorb these vapors from the air? A. No.

1. Is there such a thing as malleable glass? A. No. 2. Fluorhydric acid corrodes glass. Is the glass converted into a vapor or into silicic acid? A. It attacks the silicic acid in the glass, combining with it to form hydrofluo-silicic acid. 3. Can the glass be obtained by evaporating the fluorhydric acid? A. No.

Do potassium and magnesium combine together A. No.

If four grains of arsenic and two grains of potassium were combined together, would the combination be green? A. No.

(23) P. E. V., of Paris, France, asks: 1. Will you please give more precise details for preparing the waterproof paper described on p. 146, vol. 31? I have tried the process, but failed. A. A concentrated solution of borax in warm water should be made, to which is added the shellac in a fine powder. The paper, after saturation in the solution, may be pressed between rubber rollers and dried. 2. What is aqueous solution of shellac in borax? A. Shellac is the purified resin which exudes from the branches of several trees in tropical climates, and in particular from the *ficus indica*, *ficus religiosa*, and *rhamnus jujuba*. It is soluble in an aqueous solution of borax, by which it may be distinguished from most common resins.

(24) C. B. F. asks: What is the thickness of the earth's outer crust? A. Nothing is definitely known as to this. Some philosophers fix 60 miles as the thickness of the earth's crust, and others imagine it to be 125.

Should cream be allowed to sour before churning? A. No.

1. Is silver better than brass or German silver for a cornet? A. There is some difference of opinion on this subject, but the general belief is that there is no particular advantage in employing silver. 2. What is German silver composed of? A. Copper, zinc, and nickel.

Is gold the heaviest metal? A. No.

Is the centennial tower progressing? A. You should apply to the projectors for information. We have heard nothing of it, late.

(25) C. E. W. asks: What is the rule for finding the mean of the thermometer when part of the observation are above and a part below zero? A. Add all the negative readings together, and subtract the sum from the sum of the positive readings. Divide the difference by the whole number of readings.

(26) S. K. H. asks: What is oxygenized oil, used for testing olive oil? A. Several oils have the property of absorbing oxygen under certain conditions, among which is boiled linseed oil. This latter may be possibly the oil in question; but no mention can be found, in scientific works, of any oil specifically named oxygenized.

(27) E. S. asks: What is the gas or smell proceeding from newly baked bread? My dwelling is connected with a bake house, and the smell from a large quantity is penetrating, and very disagreeable. Is it unhealthy? A. The smell is due to the escape of the gases and volatile compounds generated from the breadstuff during the process of fermentation, and expelled by the heat. We know of no case where it has proved unwholesome to a marked degree.

How can I determine whether water is poisoned by passing through lead pipe? A. Render the water acid with dilute oil of vitriol, and add sulphuretted hydrogen to it. A black coloration indicates the presence of lead.

When plaster of Paris has been used to fasten the parts of a lamp together, what will soften it so that the parts can be separated? A. Dilute muriatic acid.

(28) N. E. L. says, in reply to Y. M., who has trouble in sucking water with his pump at 200 revolutions: I am using a small engine, and I was told I could not suck water from a well about 20 feet deep with ¾ inch pipe. I put in the pipe; and near the pump in the suction pipe, I put a T joint with about 1 foot of ¾ pipe, with the end soldered up. This serves as a water or air chamber. I have no trouble in running 200 revolutions per minute. J. M. should put in an air chamber about five times the capacity of his pump. A T joint and a piece of pipe may do, but an air chamber, with the water drawn from the bottom and the supply pipe coming in a few inches above, so that, while it is pumping, it will not prevent a steady flow of water into the chamber, will be better. The pump now has to start the water in the whole length of the supply pipe; and in fact, the pump will form a vacuum before the momentum of the water is overcome. With an air chamber, it has only the water from the pump to the air chamber to start,

and the water flows into the air chamber in a steady stream. J. M. may not be able to run at 200, but I think he can go over that. I think the supply pipe is large enough. I hope J. M. will tell through your paper how he succeeds. A. Your hints are practical, and will be of great value to some readers. The air chamber in the supply pipe, however, is not the universal panacea for sulky pumps that you seem to consider it. Still, no one who puts in such an air chamber will have cause to rerget it.

(29) E. L. F. says, in reply to F. S. M. & Co.'s query as to sesquioxide of manganese: The sesquioxide of manganese is found in its anhydrous state as braunite, and in an hydrated state as manganite. It may be obtained by passing chlorine through manganous carbonate, placed in water, and afterwards applying diluted nitric acid to remove the excess of the carbonate.

(30) E. L. F. says, in reply to W. H. R., who asked how to make the muriatic salts of nickel: Pure nickel has a great similarity to iron, both in its external appearance and its combinations, and is regarded as a tetrad, although it forms but one chloride, in which it is bivalent. Nickel chloride ($Ni Cl_2$) may be prepared by dissolving the oxide or carbonate of nickel in hydrochloric acid. By a simple process, the nickel carbonate may be prepared from the crude *speiss*. Any good work on chemistry explains the method.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Vegetable Fibers. By J. W.
On Hydrocarbons of Iron and Steel. By L. P.
On Solids Floating on Liquids. By A. R.
On Popular Dental Science. By C. S. S.
On a Flying Machine. By C. H. C.
On Boiler Explosions. By R. B.
On Oyster Culture. By O. C.
On Suet Butter. By J. L.
On a New Projectile. By W. L. A.

Also enquiries and answers from the following:

J. G. G.—S. W. R.—E. W. H.—G. A. P.—X. Y. Z.—L. N. K.—W. J. R.—J. W. D.—W. D. D.—F. R. D.—M. L. W.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of enquiries analogous to the following are sent: "Who erects wire tramways? Who buys broken window glass? Who builds engines and boilers for small boats? Where can spectroscopic apparatus be bought? Who sells photographic chemicals that can be relied on for quick work?" All such personal enquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week ending

November 24, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Alarm, grist, Hashon & Wright 157,174
Alphabet case, Baade & Sangster 157,118
Bale tie, S. J. Leach 157,206
Bale tie, J. L. Reese 157,223
Bee hive, P. O. Peterson 157,108
Beer faucet ventilator, H. Gnosill 157,172
Beer with gas, charging, J. C. Kennedy 157,181
Bitstock, J. S. Mitchell 157,212
Blind, folding, A. Le Roy 157,075
Boiler, J. R. Lamb 157,184
Boiler, steam, S. Bickerstaff 157,114
Boilers, injector for steam, W. Randall 157,105
Boiler water circulator, N. Wiard 157,256
Bolting machine, Martin & Lytle 157,209
Brick mold, J. Treadway 157,247
Broom hanger, G. Yinger 157,263
Brush, A. Thomson 157,244
Brush, shoe, C. O. & I. N. Kelly 157,180
Brush trimming machine, J. Pickering 157,104
Buggy seat, J. B. Wells 157,144
Bullet, patched, F. O. Scholze 157,227
Bung and faucet, closing, Darozir *et al* 157,092
Butter salting scales, A. A. Skinner 157,233
Can, sprinkling, J. W. Gesaman 157,170
Car brake, hydraulic, W. M. Henderson 157,175
Car coupling, H. C. Chapman 157,193
Car coupling, D. W. Deal 157,093
Car coupling, L. Dill 157,066
Car coupling, B. R. Webber 157,253
Car, safety, H. B. Myer 157,077
Carriage top support, Z. C. Brown 157,151
Chair, adjustable reclining, A. Rapp 157,081
Chopper, meat, Edwards & Morlan 157,164
Chopper, meat, A. Nittinger, Jr 157,213
Clock keys, manufacture of, G. D. Clark 157,064
Clocks, spring barrel for, G. H. Blakesley 157,088
Clothes mangle, W. Tinsley 157,245
Clothes wringing machine, M. & F. Way 157,252
Clutch, friction, Burwell & Bates 157,063
Coffee, cooling, J. Burns (r) 6,144
Cooler, milk, R. Smith 157,138
Copies, producing facsimile, E. De Zuccato 157,161
Corn coverer and cultivator, J. Copeland 157,196
Corset, J. Bowers (r) 6,143
Cradle, L. H. Stellmann 157,141
Cranberry picker, W. Crowell 157,158
Cross head gib, W. A. Rideout 157,136
Cultivator, Graham & Wallace 157,125
Dental amalgam, S. S. Southworth 157,140
Derrick, C. Lidren 157,207
Dividers, W. Smith 157,137
Door, sash, L. W. Tatum 157,085
Doors, rail for sliding, J. D. Skeer 157,235
Draw frame stop, D. W. Hayden (r) 6,147
Draw frame stop, A. A. Sweet 157,142
Dredging machine, R. R. Osgood 157,101
Drill for drilling metal, hand, D. D. Mackay 157,099
Drill, rock, C. S. Pattison 157,133
Elevator, H. H. Blake 157,061
Elevator, bucket, H. Port 157,135
Elevator, hydraulic, A. Granville 157,126
Engine crank, W. M. Boggs 157,147
Envelope, A. C. Fletcher 157,167
Explosive compound, C. W. Volney 157,143
Faucet, tool for finishing, H. Soffe 157,139
Feather renovator, J. C. West 157,255
Fence, portable, J. M. Overpeck 157,214
Fence, wire, J. F. Glidden 157,124
Fire escape, J. B. De Boucherville 157,065
Fire extinguisher, T. D. Pennington 157,217
Fire extinguisher, chemical, Holzner & Lauer 157,177
Food, preserving, D. Snedeker 157,107
Fork, hook, shovel, and hoe, G. H. Perkins 157,219
Fruit protector, A. S. Dykman 157,499
Fulling machine, C. Ackerman 157,086
Game apparatus, W. C. Wingfield 157,259
Glassware, stemmed, J. Oesterling (r) 6,151
Grain drill, W. Henigst 157,072
Grate bar, A. F. Crowell 157,091
Halter, pastern, J. C. Ford 157,122
Harness, A. W. Lawton 157,074
Harness attachment, J. D. Truss 157,248
Harness saddle, F. W. Maldeis 157,208
Harvester, A. Gray 157,127
Harvester cutter, G. Sweet 157,243
Harvester knives, grinding, E. W. Phelps 157,079
Harvesterrake, Peckenpaugh & Miller 157,216
Heel shave, M. A. Tyler 157,110
Hemp brake, T. Jones 157,096
Hook, detaching, Stone and Mansfield 157,084
Horseshoe, J. Jorey 157,179
Indexing wheel, H. H. Edwards 157,163
Indicator, low water, R. R. Carpenter 157,219
Ironing board, A. H. Swain 157,242
Jack, lifting, D. T. Welch 157,254
Kiln, brick, W. S. Colwell 157,090
Ladder, step, Brown & Sweet 157,138
Ladder, step, T. F. Kiff 157,183
Lamp lighting apparatus, M. A. Lynch 157,098
Latch, locking, J. W. Williamson 157,257
Leather, scrubbing and cleaning, S. Branaugh 157,149
Lines, taking up slack of, H. Douglas 157,197
Liquid measure, S. C. Redgrave 157,222
Locomotive exhaust mechanism, A. O. Denio 157,160
Lubricating compound, W. C. Tilton 157,108
Lubricating cup, J. E. Lonergan 157,076
Lubricator, spindle, Stauts & Rigby 157,240
Mills, conductor for rolling, J. Gearing (r) 6,149
Nozzle, exhaust, G. Sewell 157,231
Nozzle for steam cylinders, G. Sewell 157,230
Packing of condenser tube, etc., W. A. Lighthall 157,097
Padlock, permutation, J. L. Willbur 157,253
Paint, fireproof, J. C. Smith 157,083
Paper pulp, filling fiber in, H. Duemling 157,198
Paper with emery, etc., coating, R. J. Edwards 157,068
Pawl and ratchet, J. Corbett (r) 6,146
Peg cutter, A. Whittemore 157,145
Pen and pencil case, C. H. Downes 157,067
Philosophical estimator, F. M. Stapff 157,239
Pianoforte metal frame, J. E. Atwood 157,187
Pipe, water, J. A. Calantarients 157,190
Plane, bench, Duncan & Talbot 157,162
Plane handle, F. Goodnow 157,069
Planter, corn, S. Wright 157,262
Plow, A. B. Kellogg 157,204
Plow, A. Smith 157,234
Plow, side hill, M. Ellis 157,200
Plow, side hill, L. L. Iverson 157,130
Plow, sulky, E. Derwent, Jr 157,119
Polishing machine, W. S. Wood 157,261
Pottery spring punch, A. H. Hews 157,129
Press, H. K. Burnett 157,089
Press, cotton, W. Koehl 157,205
Press, cotton, J. C. Stokes 157,241
Press, cotton, W. H. Walker 157,251
Pulley, expanding, C. A. Brand 157,150
Pump bucket, chain, S. C. Hamlin 157,173
Pump, plenum and vacuum, D. L. Cameron 157,191
Punch, registering ticket, J. Corbett (r) 6,145
Purifier, middlings, A. Fulton 157,169
Raft, life, C. Parker 157,215
Railroad crossing gate, O. Gassett 157,123
Railroad, elevated, J. M. Hannahs (r) 6,150
Railroad gage, J. T. Ketchledge 157,182
Railroad rail joint, Bryson & Pugh 157,152
Rake, horse hay, J. D. Jones 6,154
Regulator, exhaust, C. C. Gregory 157,201
Retort cap cover, P. Munzinger 157,100
Rivet, M. Bray 157,116
Rolling iron straps, machine for, J. Jensen 157,131
Roof truss, U. G. Spofford 157,238
Roofs, metallic cap for, P. B. Laidlaw 157,132
Sash dovetailing machine, Pennell & Zimmer 157,134
Sash fastener, W. C. Alden 157,186
Saw mill dog, G. W. Baker 157,146
Saw mill dog, J. A. Fordon 157,168
Saw mill dog, L. P. Gilbert 157,171
Saw mill dog, N. Hunt 157,202
Saw tooth swage, A. G. Rouse 157,225
Scaffold clamp, W. Smith 157,236
Screw driver, I. Allard 157,087
Screw driver, W. F. Patterson 157,102
Seeder, plaster sower, and harrow, L. Dague 157,159
Seeding machine, A. C. Evans 157,166
Separator, ore, Campfield & Hornbeck 157,192
Sewing machine attachment holder, J. H. Bean 157,059
Sewing machine ruffler, L. Schultz 157,228
Sewing machine table, E. R. Adams 157,185
Sheep shearing devices, E. Chaquette 157,156, 157,157
Shutter and window fastener, J. C. Ryckman 157,226
Sieve, metallic, C. B. Porter 157,220
Sleeve adjuster, A. Perego 157,218
Snow plow, hand, C. A. and G. R. Parker 157,078
Soap frame, J. H. Keller 157,203
Soda water cooler, M. S. Andrews 157,068
Spittoon lifter and holder, N. K. Ellsworth 157,165
Stove, base heating, V. Vermilye 157,249
Stove, heating, J. W. Elliot 157,121
Stove, reservoir cooking, J. F. Quimby (r) 6,152
Stoves, oven door for cooking, E. W. Harvey 157,128
Street sweeping machine, R. A. Smith (r) 6,153
Stripping, peeling, and splitting, S. Kuh 157,073
Switch, J. A. Duggan 157,120
Table for undertakers, C. B. Simmons 157,232
Thimble skeins, setting, E. F. Edwards 157,094
Tinner's machine clamp, W. H. Burnett 157,189
Tobacco cutter, S. Rodgers 157,106
Toy, G. W. Hawk 157,095
Toy pistol, S. Tomlinson 157,246
Toy pistol, J. T. Trowbridge 157,109
Trace fastener, R. Whiting 157,111
Umbrella, A. and I. Herzberg 157,176
Umbrella and parasol, W. M. Henderson 157,071
Valve, globe, J. Arthur 157,112
Valve, globe, J. Broughton 157,117
Vehicle wheel, W. Beers 157,060
Vehicle wheel, H. C. Hubbell 157,178
Velocipede, J. F. McClure 157,210
Ventilator, T. W. Bracher 157,148
Vessels, construction of iron, D. W. Zantzinger 157,264
Vessels, propelling, E. Raynale 157,221
Wagon brake, G. Seeger 157,229
Washing machine, I. D. Buck 157,062
Washing machine, A. Cook 157,095
Washing machine, Spangler & Reich 157,137
Watch balance, E. Chapin 157,154
Watch barrel, E. Chapin 157,155
Watch guard attachment, A. S. Potter 157,080
Watch plate, E. Chapin 157,153
Water closet apparatus, A. McGilchrist 157,211
Water wheel, M. E. Washburn 157,250
Water wheel, turbine, C. Healy 157,070
Whip socket, W. W. Richardson (r) 6,148
Windmill, H. J. Wolcott 157,260
Window blind, screen. J. P. Clark, Jr 157,194
Window casing, W. J. Ross 157,224
Wrench, H. D. Rouse 157,082
Wrench ratchet, J. Bowers 157,115

APPLICATIONS FOR EXTENSION.

Applications have been duly filed and are now pending for the extension of the following letters patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

31,443.—FELLY MACHINE.—C. H. Denison. Feb. 3.
31,445.—LIME KILN.—R. Donaldson. Feb. 3.
31,502.—COAL BREAKER.—R. A. Wilder. Feb. 3.
31,533.—WEIGHING APPARATUS.—A. B. Davis. Feb. 10.
31,534.—SCALE BEAM.—A. B. Davis. Feb. 10.
31,566,—DRYING TUNNELS.—F. H. Smith. Feb. 10.
31,579.—CORN PLANTER.—F. B. Preston. Feb. 10.

EXTENSIONS GRANTED.

30,633.—FIRE ESCAPE.—E. B. Larcher.
30,651.—HARVESTER.—S. W. Tyler.
30,685.—SEED DRILL.—H. Moore.
30,691.—CASTING PLOWSHARES.—F. F. Smith.
30,691.—PLOW.—F. F. Smith.
30,719.—PAPER FOLDER.—C. Chambers, Jr.
30,745.—CULTIVATOR.—N. Messenger.

DISCLAIMERS FILED.

102,462.—COOK STOVE.—J. B. Wilkinson, Troy, N. Y.
155,534.—DRESS PROTECTOR.—H. M. Macdonald, Lowell, Ms.

DESIGNS PATENTED.

7,855 to 7,858.—CARPETS.—R. Allan, Yonkers, N. Y.
7,859 to 7,862.—CUTLERY.—J. D. Frary, New Britain, Conn.
7,863.—COOKING STOVE.—G. G. Richmond, Providence, R. I.
7,864.—BOTTLE.—S. C. Upham, Philadelphia, Pa.
7,865 to 7,869.—SILVER WARE.—G. Wilkinson, Pr'dence, R. I.
7,870.—WINDOW SCREEN.—G. Shatswell, Waukegan, Ill.
7,871.—INKSTAND COVER.—H. C. Wilcox, W. Meriden, Ct
7,872.—MONUMENT.—H. C. Borgner, Lebanon, Pa.
7,873.—ORGAN CASE.—G. E. Carhart *et al*, Washington, D. C.
7,874 to 7,876.—CARPETS.—F. W. Green, Orange, N. J.
7,877 to 7, 884.—CARPETS.—H. Horan, East Orange, N. J.
7,885.—PARLOR HEATER.—A. T. Jones, Stamford, Conn.
7,886.—HOT CLOSET RANGE.—A. T. Jones, Stamford, Ct.
7,887.—CARPET.—L. G. Malkin, New York city.
7,888.—WRITING PAPER.—C. D. Myers *et al*., N. Y. city.
7,889.—CARPET.—H. Nordmann, New York city.
7,890 & 7,891.—BUTTONS.—H. E. Bostwick, New Milford, Ct.
7,892 to 7,901.—EMBROIDERY.—E. Crisand, New Haven, Ct.
7,902.—FORK HANDLE.—C. Osborne, N. Attleborough, Ms.
7,903.—STATUETTE.—T. J. Pairpoint, Providence, R. I.
7,904.—OILCLOTH.—C. T. & V. E. Meyer, Bergen, N. J.

TRADE MARKS REGISTERED.

2,072.—CHEWING TOBACCO,—Allan *et al*., Cincinnati, O.
2,073.—STOVE POLISH.—H. A. Bartlett & Co., Phila, Pa.
2,074.—STOVE DRESSING.—B. F. Brown & Co., Boston, Ms.
2,075.—GROCERY.—Harris Bros., New York city.
2,076.—SHORTINGS.—Naumkeag Steam Co., Salem, Mass.
2,077.—COOK STOVE, ETC.—G. G. Richmond, Pr'dence, R. I.
2,078.—HEALING SALVE.—Stapleton & Co., Springfield, Ms.
2,079.—MEDICINE.—G. Steloft, Cincinnati, O.
2,080.—PERFUMERY, ETC.—J. & E. Atkinson, London, Eng
2,081 & 2,082.—CORSETS.—L. Coleman & Co., Boston, Mass
2,083.—CORSET.—Ottenheimer & Co., New York city.
2,084.—SOAP.—Reed & Co., Pittsburgh, Pa.
2,085 to 2,088.—SALT.—Union Pacific Salt Co., S. F'cisco, Cal.
2,089.—TOBACCO.—Frishmuth & Co., Philadelphia, Pa.
2,090.—PILE REMEDY.—C. Mayne, New York city.
2,091.—MEDICINE.—Dr. J. Simms & Son, Wilmington, Del.
2,092.—PICKLES, ETC.—C. G. Summers & Co., Baltimore, Md.
2,093.—SALERATUS.—J. M. Taylor, New York city.
2,094.—SUGAR, ETC.—DeCastro & Donner Co., N. Y. city.
2,095 to 2,097.—WOOLEN GOODS.—Wash. Mills, Lawrence, Ms.
2,098.—GROCERIES.—N. W. Burchell, Washington, D. C.

SCHEDULE OF PATENT FEES.

On each Caveat **$10**
On each Trade mark **$25**
On filing each application for a Patent (17 years) **$15**
On issuing each original Patent **$20**
On appeal to Examiners-in-Chief **$10**
On appeal to Commissioner of Patents **$20**
On application for Reissue **$30**
On filing a Disclaimer **$10**
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INDEX

ILLUSTRATIONS.