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W. B. C. will find directions for painting outdoor work on p. 27, vol. 25.—H. W. C. Jr. cancels wood to glass by following the directions for aquarium cement on p. 90, vol. 30.—A. R. is informed that polishing shirt bosoms is described on p. 27, vol. 30.—Q. V. will find directions for making gold ink on pp. 43, 58, vol. 30.—J. R. will find instructions for repairing rubber garments on p. 208, vol. 30.—W. B. F. will find the process of japanning castings described on p. 128, vol. 29.—R. E. should apply to a pump manufacturer.—A. F. F. will find simple tests for sirup detailed on p. 171, vol. 30. There is little or no foundation for many of the sensational stories about the manufacture of this article.—A. B. D. will find a recipe for aquarrium cement on p. 90, vol. 30. As to blow pipe manipulation, see p. 156, vol. 25.—A. H. M. will find directions for finishing walnut furniture on p. 218, vol. 26.—P. J. H. can tin small castings by following the directions on p. 91, vol. 26.—J. S. P. will find a description of making lamp black (carbon) on p. 21, vol. 28.—M. can use hard tallow for lubricating his paper cutting knives. J. K. asks: What is coffee, chemically? Are there not chemicals that could be substituted for coffee, that would have the same taste and be cheaper? A. Raw coffee has been analyzed with the following result, in 100 parts: Woody fiber 84, fat and volatile oil 10 to 13, glucose, dextrin, and vegetable acid 15.5, free caffeine 0.8, ash 6.7. The caffeine acid, modified by roasting, is supposed by chemists to afford the greater portion of the flavor and peculiar properties of coffee. There are many so-called substitutes for coffee, but nothing like the genuine article. J. K. asks: 1. Is there a stone that will draw the poison from the bite of a mad dog, and thus cure or prevent hydrophobia? A. No. 2. What is the medicinal virtue of the so-called bloodstone (Lapis he-matilis)? A. An unfounded superstition. 3. What are the principal differences between the austral and boreal poles of a compass needle, and how can the peculiar properties of each pole be made manifest? A. The principal difference is that they are attracted by the poles of the earth which have the opposite polarities. C. D. F. asks: Why is it that, to a magnet which has become weakened, weights may be added until full power is reached? A. It is probably due to the molecules becoming more highly polarized under the influence of the directive force. E. G. A. asks: 1. What is the color of gold dust, as discovered in the sand of a river? A. Yellow. 2. What is the color of platinum when discovered in sand? A. Silver white. 3. What is the most simple and effectual way of separating gold from sand? A. By washing away the sand and earth in a pan. The fine particles of gold settle at the bottom. 4. Is the valley of the Allegheny river considered as a part of the coal regions of Pennsylvania? A. It is considered as belonging to the lower coal series. C. R. asks: 1. Can the alkali of the great beds of Nevada and California be used as a fertilizer to advantage? A. Some of these deposits might be experimented on with advantage. 2. How can I get a small quantity forwarded to New York? A. Apply to Agricultural Bureau, Washington, D. C.

E. C. T. asks: 1. How can I construct a battery (Smee's pattern) of zinc and carbon? A. Smee's battery consists of a thin plate of platinum silver, suspended between two plates, or one plate bent double, of amalgamated zinc, and the whole immersed in dilute sulphuric acid. Bunsen's battery consists of a cylinder of compact coke immersed in strong nitric acid, contained in a porous vessel, and another cylinder of amalgamated zinc immersed in dilute sulphuric acid, exterior to the porous vessel, and the whole contained in a strong glass vessel. 2. Will a 2 inch object glass of 58 inches focus show the colors on the planet Mars? A. It probably would, but you could not use the full aperture unless the glass were achromatic. 3. What are the distances between object glasses and eye pieces from twenty-four inches focus up to eighty inches? A. The distance of the eye piece from the object glass is equal to the sum of the focal distances of the two. 4. What is the value of a pound in English money compared with currency of the United States? A. About \$58. 5. What are the duties on scientific instruments, such as microscopes, etc.? A. It depends upon the materials of which they are constructed. F. G. N. asks: What is the best kind of varnish for covering the inside of a silver plating vat? A. Use copal varnish dissolved in turpentine. J. W. asks: 1. How are porous cells made? A. Porous cells are made of unglazed earthenware. 2. How is the thing that you pull out of an electric machine for giving shocks, to regulate it, constructed? A. By two rods running to a point at one end and terminated by balls at the other. They slide through holes in brass caps, which are fastened on the tops of insulating columns, the caps being provided with clamping screws to fix the rods at any desired distance. W. H. S. asks: What acids are said to mix with water and linseed oil, so that they will not separate? A. Probably muriatic and nitric acids. We cannot tell the quantities unless we know for what this mixture is used. M. S. J. asks: How is carmine made? What is the meaning of the numbers No. 12, No. 20, No. 40, by which the quality is known? Is there any better than No. 40, or poorer than No. 12? Where are they made? A. Carmine is a beautiful red pigment prepared from the cochineal insect. The insects are found upon the cactuses of Mexico and Africa, and when matured are brushed off the plants and dried by artificial heat. There are many processes for the preparation of carmine, but success principally depends upon the use of the purest materials and the exercise of care, skill, and patience. The following is an English process: Cochineal 1 lb. and carbonate of potash ¼ oz. are boiled in 7 gallons of water for 15 minutes. The vessel is then removed from the fire and 1 oz. powdered alum added. The liquor is then well agitated and allowed to settle for 15 minutes. The clear liquor is then decanted into a clean vessel and being glass ¼ oz. dissolved in water 1 pint (and strained) added. As soon as a coagulum forms on the surface the heat is removed, the liquor strongly agitated with a bone or silver spatula, and then allowed to repose for 20 or 30 minutes. The deposited carmine must be drained and dried. Carmine is made in Europe. The numbers refer to the different qualities, from the best or that of the richest and brightest hue to those of inferior shades. J. E. G. asks: How can I separate very fine float gold from quicksilver without using a retort? A. You can remove the mercury after amalgamation by digesting it in an excess of cold dilute nitric acid. The gold will remain unaffected. The mercury, however, will be lost. N. N. asks: 1. What kinds of wood are used in the manufacture of paper? Can pine, spruce, hemlock, oak, chestnut, and white wood be used? A. All soft woods are used for paper making, such as the trembling poplar, linden, aspen, fir, etc.; the pine is of too resinous a nature to be of much value. 2. What is the process of reducing the wood to pulp? A. See p. 272, vol. 20. 3. Can it be made into white paper? A. The finest woods are used for writing paper. 4. If so, what is the process of bleaching? A. A jet of chlorine water under pressure. S. H. B. asks: How can a polish be given to Iceland spar or selenite, perfect enough for optical purposes? A. With oxide of tin used wet, on a bed of white wax. C. R. A. asks: Is the bismuth of commerce a metal much used? A. It is largely used for type and stereotype metal. Newton's fusible alloy, which is used as a soft solder by pewterers, consists of bismuth 2 parts, lead 1 part, and tin 1 part. R. J. H. asks: 1. Does electricity occupy space? A. It does not occupy space. 2. Is lightning fire produced by electricity, or is it electricity itself? A. It is the particles of the air rendered luminous by the passage of the electric fluid. 3. Does it take a smaller charge of electricity to send a dispatch across the Atlantic cable than it would to send one 25 miles on land? A. No. 4. Would a battery of six guns send the noise any farther than one gun? A. There would be a greater probability of the noise being unquenched by obstacles and disturbing causes in the case of six guns. 5. Does the noise travel any faster from the six guns than it does from one? A. No. 6. Will not a too heavy charge of electricity going through the cable generate a gas and cause it to burst? A. No. 7. Is electricity a gas, or do vibrations of the wire send the message? A. It is a motion transmitted from particle to particle of the wire. H. C. H. asks: Can you give me a rule for finding the velocity with which water will flow through a hole in a vessel submerged to any given depth? A. See article on "Friction of Water in Pipes," p. 48, vol. 29. The effective head will be the difference between the height of water above the orifice, within and with out the discharging vessel. P. D. R. asks: 1. What are three or four of the best conductors and non-conductors of heat? What metal will transmit heat and cold the quickest? A. Silver will conduct most readily, and then gold, copper, zinc, iron, and tin, in the order mentioned. Feathers, powdered charcoal, sawdust, woolen goods, sulphur, are among the best non-conductors. 2. Why is it that a spoon in a glass jar or tumbler prevents its being cracked or broken when hot water is poured therein? A. Any effect it might exert is due to the rapid absorbing and conducting power for heat, which would diminish the amount of heat which could operate upon the containing vessel. F. asks: How can I clean very hot brass? I have some brass pipes (with live steam in them) that have to be polished. What is the best way to clean brass, warm or cold, so that it will keep its polish for some time? A. It will be difficult to clean the brass work in such a manner that it will continue bright for any length of time, unless it is covered with a lacker.

E. E. M. asks: Can you give me a recipe for making a wash that will kill sheep ticks in lambs and not be injurious to the lambs? A. Try powdered sulphur. S. J. asks: I have a few gallons of lubricating oil. What can I mix with it to make axle grease? A. Try adding tallow or lard to it, until it thickens sufficiently for use. E. T. H. asks: What alkali and acid (used to inflate the bags for raising wrecks) is spoken of in "Scientific and Practical Information," in No. 16? A. Carbonate of soda and muriatic acid. 2. What is glass etching, and how is it done? A. By mixing powdered fluor spar and strong oil of vitriol to a thick paste in a leaden vessel, and allowing the vapor arising from the mixture to come in contact with the glass where it is left unprotected by a thin coating of bees wax. C. B. L. asks: 1. What causes the report of a gun? One friend says that it is the air rushing back into the gun barrel after the discharge, and another says that, when the gun is fired off, the force of the powder cleaves the air, and, coming together with the great force which it possesses, causes the report. A. Sound being propagated by waves, any cause which puts the air in vibration gives rise to a sound, more or less loud according to the intensity of the disturbing force. The report of a gun is due to concussion, a sudden striking of the air, as it were, and the propagation of sound waves. 2. What causes thunder? A. Thunder is the report from a flash of lightning, and is accounted for in the same way as above. Your specimen seems to be a thin film of oxydized oil or gelatin colored with Prussian blue. C. K. asks: Is not a car wheel by which the difficulty of running on curves may be obviated a desideratum? A. If you mean a wheel so constructed that the train will experience no greater resistance on a curve than on a straight track, we answer: Yes. W. J. E. asks: 1. What is the best method of keeping steam boilers clean and preventing scale within the boiler? A. See p. 116, vol. 30. 2. Will the cut-off valve, cutting off the steam at ¼ stroke, afford the same power as the flat valve engine, the dimensions of both engines being the same? A. For that point of cut-off, it is hardly necessary to have a separate cut-off valve. H. C. asks: 1. What should be the diameter, width of blade, and pitch of a three bladed propeller for a boat 25 feet long and of 6 feet beam, to get a speed of 6 miles an hour? The engine is of 2 horse power. A. The engine is not large enough for that speed. 2. Can a propeller be made of boiler iron? A. Yes. R. C. M. asks: I have a 2 horse power vertical boiler, of which I want to take out the flues and clean out the shell; how can I do it without damaging them? A. If you mean without spilling them for use in the same boiler, we do not think that it can be done. N. L. asks: 1. Does wood shrink endwise? A friend says that boards on a fence, if put on green, would shrink endwise so as to draw them off the posts. A. The shrinkage, if any, is exceedingly slight. 2. How should a pulley be turned to keep the belt straight, with an angular or a curved face? A. Make the axes of the two pulleys parallel. 3. I lately had occasion to repair a cupola fan with four half diamond paddles. After it was done, we tried it, closed up the holes so that no air could pass out of the fan, gave it the regular speed, and opened the pipe so that the fan threw out the wind. To our surprise, the speed decreased nearly one half. Why was it? A. It had more work to do in the latter case. I. asks: 1. Please give a brief description of the Gunther's scale (2 feet long), and tell the significance of the legends "Lea," "Rum," "Cho," "Sin," "Tan," "St," etc. A. On one side is a scale of 24 inches, divided into tenths of an inch. Below this, on the left, is a scale of inches and half inches, divided into hundredths. On the right are scales for laying out a vessel's track by departure and distance. They are used with small quadrants, which can be drawn by the navigator, with a radius of two or three inches. The scales for these quadrants are in the middle. On the left is the scale for the 2 inch quadrant, which has the rhumbs (or chords for the compass divided into parts of 11 ¼° each), chords, sines, tangents, and semi tangents. On the right is a scale for the 3 inch quadrant, with leagues (20 to an inch) rhumbs, middle latitudes, and chords. On the other side are logarithmic scales for the sines and tangents of rhumbs; numbers, sines, versed sines, and tangents of degrees; and lastly, scales of meridional and even parts, for a chart on Mercator's projection. The use of the scale is described very fully in Bowditch's "Navigation." 2. In a globe or sphere revolving on its axis, is there not a line of particles, however minute, that is in itself immovable, while all the other particles revolve around it? A. Yes, if you can conceive the line of particles to have a single dimension. 3. Would a railroad bridge across the Atlantic be possible and practicable? A. It has been proposed by some engineers. Past experience would not justify a positive opinion for or against the project. W. F. McD. asks: Should the bed of a vertical drill stand perfectly level? If the drill stands at an angle of 15°, will it make as true a hole as if it were level? Does the rule applying to the vertical drill also apply to the horizontal drill, lathe, and planer? A. If all the moving parts are truly fitted, the tools may stand in any position. L. D. B. asks: With what sort of tools are screws made on the softer woods? I have no trouble in chasing a screw by hand on boxwood, but a many-toothed chaser does not do for soft woods. A. Try an ordinary tool and use with high speed. L. D. H. asks: 1. I have heard that salt water will not freeze, and that ice in salt water is perfectly fresh. A. It will freeze if the water is motionless and the cold is sufficiently intense. 2. How does the salt separate? A. In freezing, water crystallizes; and the crystals of ice, in forming, reject the particles of dirt and impurities. As to transmission of power by belts, see p. 389, vol. 28. D. H. W. asks: 1. Is there any process by which I can plate steel springs without removing the blue coloring? A. Try rubbing with weak muriatic acid, and then wiping clean with water and drying. 2. What is the best way of taking the coloring off? Is there any way of covering them with copper (without a battery), so that I can plate them with silver? A. Immerse the steel springs, after being freshly cleaned as above, in a bath of solution of blue vitriol. D. P. W. asks: Does ice sink in the spring? Pilots on the Mississippi say that it does not break up and float away, but that it sinks out of sight. I think that water forms or falls on the surface of the ice, thus making it appear to sink. A. Your explanation is correct.

P. H. C. says: It is a popular belief among the mass of farmers that the influence of the moon has an important bearing upon various young plants as they happen to come forth either in her light, as full moon, etc., or in her wane.

E. L. S. asks: How can I construct a blow-pipe? Illuminating gas is not to be used, and the atmospheric air is to be supplied by some arrangement worked with the foot.

Y. M. C. A. asks: What are the chemical ingredients and proportions of the same in what is known as slag, the kind that runs from a wrought iron puddling or heating furnace?

W. H. N. asks: 1. What is type metal composed of, and what are the proportions? A. Type metal is composed of lead with 1/4 or 1/2 of its weight of antimony, or lead 2 parts, tin 1 part, antimony 1 part, or lead 15 parts, tin 1 part, antimony 4 parts.

B. & J. say: In trying to make a zinc casting in a plaster mold, on pouring in the zinc it spluttered so that it would not stay in the mold. Then we tried a wooden mold, but found it to be full of air holes.

J. A. W. says: In running printing power presses on highly calendered, dry paper, we are at times very much troubled, by the paper becoming charged with electricity in its passage through the press.

H. B. S. asks: Why does ice form upon the bottoms of rivers, where the water passes at three or four miles per hour? The ice seems to form in clear cold weather, and can be seen to rise during the day, bringing with it gravel stones of considerable size.

W. T. R. asks: 1. What are the acids used in Daniell's battery, and what is the proportion of acid and water? A. Saturate as much water as will fill the cells with powdered blue vitriol, and add one eighth, of the bulk of this liquid, of oil of vitriol.

T. A. says: 1. I read of a new material called Parkesine (from the inventor, Mr. Parkes), composed chiefly of collodion, castor oil, and chloride of sulphur. Was this material patented?

E. R. asks: 1. How is the double sulphate of nickel and ammonia used for a bath? A. See p. 91, vol. 29. 2. Are the two salts mixed with distilled water? Will the nickel dissolve in the bath?

J. D. M. says: Professor Silliman, in his "Principles of Philosophy," p. 392, gives Faraday's third law of electrolysis as follows: "The oxidation of an atom of zinc in the battery generates exactly so much electricity as is required to resolve an atom of water into its elements."

In the electrolysis of water with a Grove's oxygen and hydrogen gas battery, of 10 cells, are the quantities of oxygen and hydrogen liberated by the current equal to the respective amounts absorbed by the act of combination in each cell of the battery, or are they equal to the whole amount absorbed in the 10 cells collectively?

W. D. S. asks: Will ripe fruit keep in a vacuum or partial vacuum, such as can be obtained with an air pump, without preparation of the fruit or putting anything in to preserve it?

S. G. N. asks: 1. Will it be cheaper for me to make my own pure silver anodes for silver plating from coin silver, or to buy them from a silversmith? A. It will probably be cheaper to purchase it.

J. F. W. asks: What will remove champagne stains and grease spots from a black velvet coat? A. Rub the stains first with ammonia and afterwards with benzine.

J. H. P. says: My hydrogen lamp does not quite meet my expectation. The gas has no effect upon the sponge till I blow upon it with my mouth, when in a second or two the sponge turns red and ignites the gas.

A. S. B. says: Please give me the process of calcining gypsum, and state the required heat. A. Gypsum is calcined in an oven or kiln. It is built of walls of strong masonry, spanned by a flat arch.

S. T. W. says, in reply to correspondents who ask how to season wood and to prevent its warping: Strip off bark, and bury about one foot deep in the spring, leaving in the ground for six months, and you will find no difficulty.

W. R. A. R. says, in reply to W. W., who asked for a recipe for gilding without a battery: Dissolve 20 grains chloride of gold in a solution of cyanide of potassium, 1 oz. to 1 pint pure water.

D. M. says, in reply to C. L. C.'s enquiry for a cheap instrument to foretell a storm by pressure: The baroscope of Babinet will answer your needs; it may be constructed thus: Take any bottle; pour colored water into it, about one fourth of the quantity the bottle will hold.

G. H. M. says, in reply to several correspondents who ask how to cut glass jars: Fill the jar with lard oil to where you want to cut the jar; then heat an iron rod or bar to red heat, immerse it in the oil; the unequal expansion will check the jar all round at the surface of the oil, and you can lift off the top part.

J. A. O. says: Allow me to add to the list of railway bridges across the Mississippi river, given by you on p. 252 in reply to J. M., the following: Louisiana, Mo., St. Paul, St. Cloud, and Brainard, Minn., making a total of fifteen.

C. B. L. says, in reply to several correspondents who asked how to remove tattoo marks from the skin: Blister the part with a plaster a little larger than the mark; then keep the place open for a week with an ointment; finally, dress it to get well.

S. P. N. says, in explanation of the excessiveness on the plank, and the means by which it was produced: "I am a farmer, and sometimes have occasion for a tight trough. In making it, I joint up the plank and then, with a wide punch, set down a groove about 1-16 inch deep the whole length; then take of two or three shavings more, and put the trough together.

M. S. T. says, in answer to M. B. A., who asks how to remove tallow and white lead that has been applied to polished parts of machinery to prevent rust: Try a concentrated solution of caustic potash, scrubbing with an old scrubbing brush.

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

Y. N.—It is yellow hematite, and contains about 85 per cent of oxide of iron. E. G. A.—The grains are mica, and the rock is granite. J. E.—Both are pyrites, and are not valuable.

A. L. asks: Can you give me a recipe for making artificial honey?—J. T. asks: What kind of paint should I apply to terra cotta window caps, etc., to protect them from the weather?—W. D. M. asks: How can I harden the brains and other organs of animals, so that I can take plaster casts of them?

COMMUNICATIONS RECEIVED.

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

On a Column for Boys. By D. W. H. On the Mississippi Overflow. By H. S. Also enquiries and answers from the following: P. H. B.—M. J. T.—S. M. Correspondents whose inquiries fail to appear should repeat them.

INDEX OF INVENTIONS FOR WHICH Letters Patent of the United States WERE GRANTED IN THE WEEK ENDING April 21, 1874, AND EACH BEARING THAT DATE. [Those marked (r) are reissued patents.] Acid, making sulphuric, H. Sprengel..... 150,096 Air in cotton factories, moistening, H. Bone..... 149,980 Alarm, burglar, G. A. Beaver..... 149,910 Alarm, electric fire, etc., G. S. Sbutte..... 150,080 Alarm, electric steam boiler, W. C. Baker..... 149,907 Annealing box, C. A. McNish..... 149,875 Augers bits, twisting, W. Tueker..... 150,107 Augers, earth, W. W. Jilz..... 150,051, 150,052 Auger, hollow, M. C. Buffington..... 149,985

Auricle, Dimock & Wetherill..... 149,844 Bale tie, cotton, A. J. Nellis..... 149,849 Bale tie, cotton, E. H. Stafford..... 150,096 Bath, vapor, Miller & Cole..... 149,915 Beehive, J. and W. Barnes..... 149,973 Beehive, C. D. Riggs..... 149,882 Binder, temporary, A. A. Goldsmith..... 150,026 Bit stock, J. Uhl..... 150,108 Blind sash holder, I. H. Smith..... 150,092 Boat, life, A. G. and A. T. Sterling..... 149,831 Boats, sliding seat for row, J. Blakey..... 149,913 Boiler, agricultural, H. G. Bulkley..... 149,915 Boiler attachment, wash, J. Haskins..... 149,858 Boiler cleaner, G. Hicks..... 150,038 Boilers, deflector for flue, Harwood et al..... 150,035 Bolt, V. Latham..... 150,010 Boot and shoe burnisher, S. W. Chamberlin..... 149,989 Boot heels, burnishing, O. G. Critchet..... 149,922 Boot last, J. H. Livingston..... 149,871 Boot lasts, head block for, H. Rose..... 149,883 Bracelets, Baker et al..... 149,823, 149,824, 149,825 Bracelet, Murphy & Poolman..... 149,879 Brick machine, A. H. Keay..... 149,866 Brick machine, H. Martin..... 150,065 Brick mold, tile, J. Shreffler..... 149,957 Bridges, girder for iron, C. W. Wheeler..... 149,965 Bronzing machine, D. Heaton..... 150,037 Brush, whitewash, E. D. Van Horn..... 150,110 Brushes, manufacture of, E. Clinton..... 149,992 Buckle, L. Messer..... 150,071 Buckle, E. F. Russell..... 150,084 Burner, revolving gas, J. O. Belknap..... 149,976 Butter, curb for packing, S. F. Spaulding..... 149,890 Can and box, fruit, etc., E. Teyssonneau..... 149,893 Can, oil, G. Dryden..... 150,006 Car brake, M. G. Pickett..... 149,831 Car brake, G. Westinghouse, Jr..... 149,902 Car coupling, W. H. Hammond..... 150,091 Car coupling, M. A. Keller..... 149,934 Car coupling, J. Leith..... 149,937 Car coupling, J. McMurtry..... 150,069 Car coupling, L. Recht..... 150,080 Car, freight, R. Eaton..... 150,009 Car, propelling street, G. S. Grier..... 150,026 Car spring, W. Palmer..... 149,951 Car spring, J. C. Pickles..... 150,077 Car starter, E. G. Goddard..... 150,023 Car starter, E. Günther..... 150,029 Car wheel, N. Thomas..... 149,891 Car cylinder fender, D. E. Dutrow..... 149,846 Cars, flexible pipe for, W. S. Deeds..... 149,842 Carpets, etc., matching, J. Short..... 149,956 Carriage axle, Noyes & Stratton..... 149,950 Carriage, child's, J. L. Cortelyou..... 149,888 Carriage, child's, P. Gondron..... 150,022 Carriages, lighting and heating, S. Edwards..... 150,010 Carriage running gear, Seeley & Brownlow..... 150,089 Casting metal, J. L. Jackson..... 150,049 Cattle, gangway for transferring, E. L. Foreman..... 150,014 Chair, dentist's or barber's, F. J. Coats..... 149,919 Chair, folding, A. W. Stewart..... 150,099 Cigar mouthpiece, J. D. Dale..... 150,000 Clapboard machine, Johnson & Ansell..... 149,864 Clothes pounder, Bailey & Dean..... 149,970 Clutch, friction, E. D. Hubbard..... 150,041 Clutch, friction, T. Symonds..... 150,108 Coating fabrics with fluids, A. Man..... 149,874 Coffin plate, G. Brabrook..... 149,982 Coke from ovens, drawing, J. H. Connelly..... 149,836 Combing machine, Mirfield & Scott..... 150,073 Compass, solar, H. O. Cook..... 149,887 Cooler, beer, C. Reif..... 150,082 Cooler, water, K. Goddard..... 149,852 Copy holder, J. B. Harper..... 150,028 Cotton scraper and thinner, C. T. Dollahan..... 149,923 Corkscrew, J. A. Bragaw..... 149,988 Cow milker, C. W. Thompson..... 150,106 Cultivator, S. Luney..... 149,938 Currycomb, C. B. Bristol (r)..... 5,840 Curtain cord retainer, H. Holcroft..... 149,861 Cut-off, rain water, G. Straszer..... 150,101 Dentist's gold foil, R. S. Williams (r)..... 5,846 Doll heads, etc., hollow, W. E. Brock..... 149,831 Door hanger, J. Collins..... 149,894 Dough kneader and cutter, F. Möckel..... 149,946 Dress elevator, M. H. Bergen..... 149,911 Drill chuck, W. Knight..... 149,893 Druggist's measure, W. Vom Hofe..... 150,113 Earth boring machine, Blair & Paul..... 149,927 Elevators, driving gear for, F. P. Canfield..... 149,835 Engine, rotary, A. C. Gallahue..... 150,019 Equalizer, draft, Terry et al..... 150,105 Fare box, J. T. Moses..... 149,947 Fence, iron, W. C. Groff..... 150,028 Fence, iron, T. Rogers..... 150,083 Fence, portable, J. L. Griffin..... 149,927 Fertilizer distributor, M. Hockman..... 149,860 Fire arm, magazine, Swingle et al..... 150,102 Fire arm, revolving, B. H. Williams..... 150,120 Fire extinguisher, H. L. McAvoy..... 150,066 Fire kindler, W. Laramy..... 150,061 Fish scales for art use, E. and J. Huebner..... 150,043 Flour, manufacturing, W. F. Cochrane (r)..... 5,841 Flower stand, J. C. Kelley..... 150,055 Flue cap, R. N. Harlan..... 150,082 Furnace, etc., petroleum, C. Hilbert..... 149,831 Furnace bottom, E. W. Wolfe..... 149,905 Gage, pressure, F. Hugon..... 150,045 Gas, illuminating, L. Bois, file..... 149,978 Gas machine, A. C. Rand..... 150,078 Gas retort, closing, A. Thomson..... 149,895 Gas into oxygen, atmospheric, C. M. T. Du Motay..... 150,007 Gate, automatic, G. R. Mease..... 150,070 Gate, farm, D. Kaufman..... 150,054 Grain binder, C. Jewell..... 150,060 Grain dryer, W. J. Demuth..... 150,002 Grate, G. W. Gardner..... 150,020 Grates, blower for fire, W. D. Guseman..... 141,854 Grinding wheel, J. T. Henry..... 149,929 Hammer, C. Bilharz..... 149,912 Harness saddle, J. Maclure..... 149,873 Harvester, Webster et al..... 150,114 Heating drum, E. R. Weston..... 149,903 Hide for belting, H. Royer..... 149,954 Hinge, butt, R. Hoadley (r)..... 5,843 Hoe, B. D. Sanders..... 149,895 Horse power, H. W. Barlow..... 149,971 Horses, hoof boot for, J. B. Higgins..... 149,930 Horse shoe, D. L. Corbin..... 149,998 Horseshoe blanks, roll for rolling, J. Russell..... 150,085 Insect bellows, E. Cook..... 149,895 Iron, refining, W. W. Hubbell..... 150,042 Jack, lifting, J. T. Guthrie..... 149,855 Journal bearing, J. McCaffrey..... 150,017 Knife and pepper box, R. W. Brown et al..... 149,883 Knitting machine, A. Angst..... 149,968 Ladder, folding, J. B. Johnson..... 150,053 Ladder, step, C. F. Barnard..... 149,809 Lamp trimmer and extinguisher, W. Walton..... 149,964 Lamp wick, W. C. Pettijohn..... 149,880 Lantern, W. Burns..... 149,916 Lantern, signal, J. O. Belknap..... 149,826