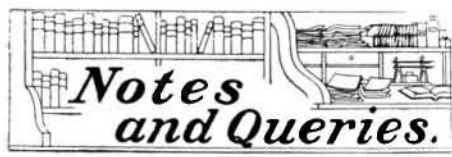


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READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. In every case it is necessary to give the number of the inquiry.

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Notes and Queries.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
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Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(8774) W. H. H. wants a receipt to obtain a red cherry color on pure copper, done by immersion in hot acid, not by battery or dynamo. What I want is not enameled, but colored, same as Tiffany or Whiting do large loving cups. Either cherry or mahogany color. A. A color of this kind in copper can be obtained by slowly heating in an air bath, with gradually rising temperature. Long heating at a comparatively low temperature or more rapid heating at a higher temperature will give the same effect. As soon as the desired color is obtained, cool rapidly by plunging into cold water. If lacquered after finishing, it will keep better.

(8775) F. M. H. asks: How many cubic feet of free air will it take to fill an air tank having a capacity of 100 cubic feet at a pressure of 200 pounds per square inch? And how long a time will this amount of compressed air run an engine doing actual work of 5 horse power? How many cubic feet of free air will it take to raise 5,000 gallons of water 50 feet being compressed; state what pressure, using the direct air lift system? A. It will require 1,400 cubic feet of free air to fill the tank of 100 cubic feet capacity at 200 pounds pressure. This amount of air will run a 5 horse power engine 2 1/3 hours. The amount of free air at an average of 100 pounds pressure for pumping 5,000 gallons of water 50 feet high may be from 600 to 800 cubic feet, depending upon the efficiency of the pumping system.

(8776) G. O. W. asks: 1. Please inform me how many ounces one cubic foot of hydrogen gas will lift. A. A cubic foot of hydrogen at 30 inches of the barometer, and at the freezing point, weighs 0.00562 pound. A cubic foot of air under the same conditions weighs 0.08071 pound. A cubic foot of hydrogen will balance in the air under normal conditions, as above, the difference of these two weights, and will lift a weight slightly less than this difference, or about 0.07 pound. This is the basis of the usual statement that 1,000 cubic feet of hydrogen will lift 70 pounds. It will do so when the barometer stands at 30 inches and the temperature is at freezing. 2. How to deposit platinum black on string or wire. A. To deposit platinum black on a string is not easy. We cannot suggest any better way than to mix the finely divided platinum with a gum or mucilage and coat the string with that mixture. For wire dip or cover with platinum chloride and heat in a Bunsen burner till the platinum is reduced to a black powder. The ammonium platinum chloride can be reduced better than the simple chloride.

(8777) T. E. M. asks: What is the freezing pressure of water? About what pressure does freezing exert on fence posts set in wet ground? A. The pressure exerted by water in the act of freezing is enormous; how great we have no means of knowing. Heavy steel tubes have been filled with water and screwed up. So, too, have bombshells. When the expansion of the water burst the shell, the water flashed into ice in the instant when the pressure was relieved. It is believed that water under great pressure will not freeze. This is because water has its freezing point lowered by pressure. A pressure of 15 pounds to the square inch lowers the freezing point 0.0175 deg. Fahr., and for other pressures in the same proportion. We doubt if the freezing of the wet earth around a post greatly increases the pressure upon the post, because the pressure is relieved by the rising of the earth around the post. This is easily observed, as also around stones. The reason why posts are more strongly fixed in the frozen earth is that the whole mass, earth and post, becomes one solid mass, and cannot be raised without breaking the mass open as a piece of ice or stone is broken.

(8778) W. F. G. says: I want to make a liquid blacking to apply with sponge lightly, and then with a few rubs with small cotton cloth produce a brilliant polish. A. Mix three pounds of fine lampblack with 1 quart of stale beer and 1/2 pint of sweet oil; then add 1 ounce molasses, 1/4 ounce copperas, and 1/4 ounce logwood extract. Copperas can be purchased from any dealer in chemicals and most druggists, and is worth only a few cents a

pound. Logwood extract can be bought from dealers in dyes or can be made by boiling logwood chips with water.

(8779) W. S. C. asks: 1. If the electric current enters a building from the street, is it proper to place switch first, or fuse block first? A. The rules of the Fire Underwriters require knife switches to be placed so that when open they cannot drop together, that is, they must not turn up when opened. There is no regulation given as to the position of the fuses with relation to the switch. They must be placed as near the point where the current enters the building as possible. 2. Please describe the mechanism and operation of the American Clock Company's clock of Chicago. A. We have no description at hand of the American Clock Company's clock. 3. Where and how is sal-ammoniac produced? A. The chief source of sal-ammoniac is the "ammonia water" of gas works. This is the water through which the gas is passed to remove the ammonia. By adding hydrochloric acid to this liquid, ammonium chloride is formed. 4. In wiring for electric bells, why is it proper to connect the carbon side of battery to the push button instead of to the bell? A. It seems to be a practice to connect the battery in a certain order to a circuit rather than that it is proper to do it in either way. The bell will operate as well either way. 5. In making a galvanic battery ground connection, why is it proper to connect the zinc pole to the ground? A. There is no reason to say it is proper to connect the zinc pole to the ground in grounding a battery. If, as in the telegraph, the battery is divided, one-half at one end and the other half at the other end of the line, the zinc must be grounded at one end and the carbon at the other end of the line. 6. About how many carbon cylinder battery cells are required for cautery work, such as done by doctors and dentists? A. The number of cells needed in cautery will depend upon the size of wire used, probably five or more. 7. How many ampere hours will an ordinary battery cell give? A. The number of ampere hours a cell will give depends upon its size. Dry cells and sal-ammoniac cells can hardly be said to have any ampere hours, since they cannot be used on closed circuits. Edison-Lalande cells have from 15 to 600 ampere hours according to type. 8. How much of an ampere is required for a 10-volt lamp? A. An incandescent lamp uses from two and one-half to four watts per candle. A 10 c. p. lamp will consume from 25 to 40 watts. 9. About how many years do carbon cylinder battery cells last when used for dwelling house purposes? A. The sal-ammoniac solution must be renewed in a carbon cylinder battery when the cell tests a volt or a little above one volt. The zincs will go till nearly worn through, and the carbons will not need renewing. Use a voltmeter for this purpose. 10. About how many watts are used to charge an electric auto when new? A. A storage battery is charged at 2 1/2 volts per cell, and at a maximum of 6 1/2 amperes per square foot of positive surface, reckoning both sides of the positive plates. 11. About what voltage does a spark coil give that is attached to an automatic gas-lighting burner? A. A spark of good volume, a thick spark of 1/8 inch, will ignite gas, but a coil giving a half-inch spark is commonly used. Several thousand volts are required to force a spark through a half-inch of dry air. 12. Are series or shunt-wound motors used on automobiles? A. Either series or shunt motors may be used on automobiles. 13. About how many miles will an electric auto run after being fully charged, and about how long does it take to charge them? A. It is stated that automobiles have run 100 miles or more on a charge, but about 20 is a fair run. 14. I noticed on the name plate of some generators is stamped five volts drop. What does this mean? A. Five volts drop on a machine means that that voltage is used in the machine itself and must be provided for. 15. Does the Atlantic cable consist of a positive and negative wire, or is the ground used for the return current? A. An Atlantic cable has a bundle of wire in the center for a conductor. There is no return wire. 16. Is the zinc that is used in battery cells pure zinc, or is the zinc alloyed, and what alloy is used? A. Open-circuit cells do not usually have the zincs amalgamated, though this may be done with advantage. Daniell's, Leclanche and gravity cells are used with unamalgamated zincs. Other cells have their zincs amalgamated. This is done by cleaning the zinc in acid and coating it with mercury.

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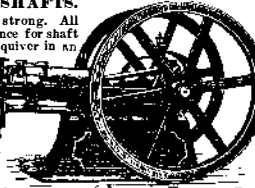
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Explosion motor, J. P. E. Liet.....	716,069
Eyeglass mounting, S. N. & F. W. Stone.....	715,864
Fare receipt slip, F. S. Borton.....	715,960
Fastener, W. P. Devine.....	716,002
Fat in granular form, preparing, Iveson & Wilson.....	716,235
Feed lubricator, choke, G. S. Webster.....	715,913
Fence guard, barb wire, J. A. Anderson.....	715,738
Ferris wheel, C. F. Fender.....	716,042
Fertilizer distributor and cultivator, combined, C. M. Huff.....	716,042
Fiber cleaner machine, S. B. & M. E. Allison.....	715,736
Fibrous or other material, apparatus for compressing, Lowry & Cowley.....	715,824
File, letter, F. W. Tobey.....	716,148
Firearm ejector mechanism, R. T. Torkelson.....	715,903
Firearm magazine, W. B. Farwell.....	715,773
Fire escape, W. Rupp.....	715,876
Fireplace, E. Waidinger.....	715,794
Fireproof blind or door, W. R. Kinneer.....	715,816
Fireproof door or blind, W. R. Kinneer.....	715,815
Fireproof window, Voigtmann & Pomeroy.....	716,151
Fishing net, C. F. Pike.....	716,097
Flood gate having movable closing body, M. Carstanjen.....	715,979
Form, sleeve, A. J. Day.....	716,199
Fruit pitting and stuffing machine, S. M. Brown.....	716,331
Furnace, F. W. Blau.....	715,952
Furnace charging mechanism, P. C. Patterson.....	715,852
Furnace draft and damper regulator, W. F. Wilmoth.....	715,919
Furnaces, working zinc and substances containing silicic acid in electric, A. Dorsemagen.....	716,008
Furniture, convertible article of, W. M. Boazman.....	715,953
Gage shears, F. H. Barnum.....	716,015
Game board, H. L. Haskell.....	715,794
Game piece, H. L. Haskell.....	715,795
Game, toy and advertising device, O. O. Stageberg.....	715,893
Garment holder, J. D. O'Brien, reissue.....	12,063
Garment supporter, I. Davis.....	716,198
Gas burner, A. Beler.....	716,176
Gas burner, acetylene, S. P. Watt.....	716,153
Gases, concentrating, H. A. Frasch.....	715,778
Gas cut off, automatic, A. M. Shough.....	716,119
Gas furnace, E. Reichenow.....	715,794
Gear, transforming, W. H. Brewster.....	716,150
Gearing, antifriction, J. B. Butler.....	715,973
Glass files and sheets, manufacture of, W. T. Nicholls.....	716,086
Golf ball, E. Kempshall.....	716,245
Golf ball, E. Schultz.....	716,291
Golf ball pocket, R. T. Crane.....	715,759
Governor, H. J. Bouvier.....	715,961
Governor, speed, H. H. Nightingale.....	715,845
Grain dump and elevator, combined, A. W. Koon.....	715,818
Grate, endless chain, W. J. Taylor.....	715,899
Gun, automatic, A. Burgess.....	715,971
Gun, discharge actuated breech loading, S. N. McClean.....	715,839
Gun sighting apparatus, Schneider & Canet.....	716,114
Hammer, power, H. Feldhus.....	716,019
Handle socket, adjustable, T. Merrin.....	716,077
Harness box and buckle device, J. M. Leebens.....	716,253
Harvester and shocker, corn, L. L. Freeman.....	716,023
Harvester, corn, Wideman & Wright.....	716,327
Harvesting implement, B. R. Huske.....	716,045
Hat block, pneumatic, Lamont & Weatherhead.....	716,251
Hay or fodder fork, F. Dailey.....	715,761
Head gate, H. W. Elder.....	716,012
Head rest, W. H. Elliott.....	716,209
Heel and skiving machine, J. H. Underwood.....	715,907
Hinge, gate, Rickel & Potter.....	715,869
Hobby horse, J. W. Smith.....	715,887
Hoisting apparatus, W. A. Bock.....	715,747
Hoisting bucket, O. & J. Johnson.....	716,239
Hoisting engine safety apparatus, Karlik & Witte.....	716,243
Hook. See Clothes hook.....	716,317
Hoop coiling machine, A. F. Ward.....	716,277
Horse overshoe, J. B. McClintock.....	716,072
Hose clamp, F. T. Lippincott.....	716,072
Hot air machine, A. Hell.....	716,036
Hub, vehicle, Morse & Lampman.....	715,835
Hydraulic engine, A. Legg.....	716,254
Hydrocarbon burner, J. M. & L. P. Beech.....	716,174
Ice plane, H. Bodenstein.....	715,955
Ice planing knife, H. Bodenstein.....	715,956
Illusion apparatus, Booraem & Howard.....	715,958
Index system, card, I. B. Hendrickson.....	715,959
Index systems, locking device for card, D. E. Hill.....	715,907
Inductance coil, F. Dolezalek.....	716,206
Ink well, W. S. Claypool.....	715,984
Insecticide distributor for planters, H. Swindler.....	716,142
Insole, H. & J. R. Campbell.....	715,754
Insulated rail joint, W. E. Karns.....	715,813
Insulating metallic surfaces or wires, J. A. Heany.....	715,798
Insulator, high potential, G. H. Rupley.....	715,875
Ionone, making, A. Ströbel.....	715,896
Jail or cage, portable, J. A. Youngblood.....	715,927
Key plate for use in the manufacture of tune plates or cylinders, F. Schippers.....	716,287
Key ring, J. L. Sommer.....	715,892
Ladder and scaffold, combined, M. Bauer.....	715,944
Ladder, folding, Labranche & Thiriot.....	716,057
Ladder, step, M. E. Trafton.....	716,149
Lamp, W. J. Smart.....	715,885
Lamp, M. S. Hufschmidt.....	716,043
Lamp, electric arc, J. A. Heany.....	715,797
Lamp, gas or vapor, O. C. Hoffmann.....	715,801
Lamp, incandescent spirit, R. E. Walther.....	716,316
Lamp, interchangeable direct and alternating current arc, M. H. Baker.....	715,741
Lantern, signal, A. C. Bunne.....	716,332
Lathe dog, T. C. Thompson.....	715,900
Lathes, feed mechanism for screw cutting, W. A. Wood.....	715,921
Laundry gloss, O. M. Nash.....	715,844
Lawn edge trimmer, W. W. McCallum.....	715,838
Leather, imitation, G. Youngwitz.....	715,928
Ledger, flat opening loose leaf, G. F. C. Houghton.....	716,232
Legging, S. W. Alvord.....	715,935
Lens, C. A. H. Harting.....	716,035
Level, spirit, L. Desmarais.....	716,001
Leveling rod, self computing, A. S. Doak.....	716,006
Level press, compound, S. J. Webb.....	716,319
Life preserver, J. E. Armstrong.....	715,938
Lifting jack, screw, T. Hampton.....	716,337

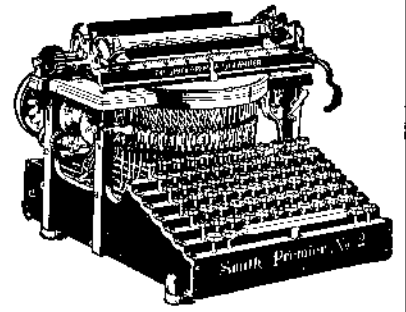
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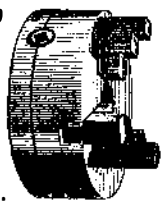
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The Scientific American SPECIAL Transportation Number

With this issue many subscriptions to the **Scientific American** will expire. It is not, therefore, amiss to call attention to the fact that unless subscriptions are renewed before the end of the year, the paper will be discontinued with this issue. In order to avoid any interruption in the sending of the paper, therefore, the subscription for 1903 should be re-mitted without delay.
 It may be of interest to our old subscribers to have placed before them a comparison of four Christmas or special issues which have been published within the last ten days. The following statistics may be of interest:

- Harper's Weekly Christmas Number** was a 96-page publication, price 50 cents.
 - Collier's Christmas Number** was a 40-page publication, price 25 cents.
 - Leslie's Christmas Number** was a 36-page publication, price 25 cents.
 - Scientific American Transportation Number** was a 52-page publication, price 10 cents.
- Had the **Scientific American** been published on a page the size of Harper's Weekly, it would have contained 78 pages instead of 52. From this comparison it may be seen that the publishers of the **Scientific American** endeavor to give their readers the full value of their subscription and a little more.
 The various commercial houses which have patronized our advertising columns during the past year may be pleased to note certain statistics with reference to the advertisements contained in these respective issues, inasmuch as the advertising pages of a high-class paper are a pretty fair index of the standing in which the journal is held by the commercial community which has tested its advertising value.

- Harper's Weekly** contained 11200 lines of advertising.
- Collier's Weekly** contained 13820 lines of advertising.
- Leslie's Weekly** contained 11500 lines of advertising.
- Scientific American** (including the ads on the covers) contained 18717 lines of advertising.

This certainly is a very gratifying showing and one of which the publishers of the last-named journal may well feel proud. This large volume of advertising, however, has not resulted in any sacrifice of the reading columns of the paper. As may be seen from the statistics given below:

- Harper's Weekly** contained 73 pages of reading matter.
- Collier's Weekly** contained 22 pages of reading matter.
- Leslie's Weekly** contained 23 pages of reading matter.
- Scientific American** contained 29 pages of reading matter.

Had the page of the **Scientific American** been printed the same size as that of Harper's Weekly, there would have been 43 pages of reading matter. A weekly journal of this size only becomes possible through the wonderful development of the mechanical art of printing. The typesetting machines and modern presses, together with the development and perfection of high-class colored art work, have made it possible to publish a weekly paper of enormous circulation, and of a size, quality and character at which the publishers of a generation ago would have truly marveled.

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Lithographic purposes, electrolytically preparing metals and alloys for, O. C. Strecker..... 716,306

Lock, J. O'Connor..... 716,270

Lock and latch, J. C. Alman..... 715,934

Locomotive engine, J. E. Robinson..... 715,107

Locomotive exhaust, F. Robinson..... 715,873

Log loader, J. R. McGiffert..... 715,840

Log raft, J. Ayres..... 715,939

Loom, W. E. Erskine..... 715,772

Loom for the manufacture of knotted carpets, Panitschek & Ahorn..... 716,092

Loom, pile fabric, F. Tonnar..... 716,352

Loom take up mechanism, C. F. Roper..... 716,282

Lumber gluing press, F. Schneider..... 716,288

Mail bag receiver and deliverer, W. T. Fulton et al..... 715,781

Mallet, G. F. Kenney..... 715,814

Mast arm fixture, swinging jointed, E. N. Davis..... 716,333

Match box, E. G. Nordblom..... 716,088

Matrices, producing, I. Kitsee..... 716,053

Mattress making machine, D. Wagner..... 716,354

Measuring instrument, electric, R. H. Read..... 716,103

Mechanical movement, L. D. Gibson..... 716,028

Mechanical movement, M. W. Hibbard..... 716,038

Metal finishing machine, strip, C. C. Webster..... 716,322

Metal to molds, apparatus for supplying molten, C. C. Webster..... 716,320

Meter. See Electric meter.

Micrometer gage, A. Rieffel..... 716,279

Milk or cream cooling apparatus, E. G. N. Salenius..... 716,112

Mining machine, coal, W. S. Bogle..... 716,181

Moistening device, H. M. Claude..... 716,151

Molding machine, Bradley & Gilbert..... 715,964

Mop, floor, J. M. Michaud..... 716,262

Mortising machine, W. E. Reasoner..... 715,864

Motor, E. V. Szabo..... 716,143

Motor control system, F. E. Case..... 716,189

Motor controller, Krause & Bolen, reissue..... 12,064

Motors, vibration equalizing support for, A. Bochet..... 715,954

Mower, lawn, C. Zickler..... 716,164

Multicircuit generators, regulating, H. H. Wait..... 716,355

Multicircuit generators, regulating mechanism for, H. H. Wait..... 716,356

Nail making machine, J. H. Goetsche..... 716,030

Nut lock, W. A. Somerby..... 715,891

Nut lock, O. Feher..... 716,018

Nut lock, W. H. Nelson..... 716,085

Nut lock, F. Peterson..... 716,095

Nut lock, A. A. & E. L. Golden..... 716,218

Oil burner, E. R. Waterman..... 715,912

Oil burner, C. W. Sievert..... 716,049

Oil burner, C. W. Sievert..... 716,121

Oil heater, S. E. Morss..... 715,836

Oils or the distillates or residuals thereof, treating mineral, Stewart-Wallace & Cowell..... 716,132

Oiling apparatus, windmill, S. W. Scott..... 716,292

Ore concentrating table, W. G. Doda..... 716,205

Outlet or junction box, M. F. Whiton..... 715,917

Oven, oil heated, C. H. Higgins..... 716,230

Oyster shucking or oyster opening knife, Cooley & Bishop..... 715,988

Packaging machine, W. H. Noble..... 716,007

Pail, milk, J. B. Locke..... 716,256

Paint, antifouling, T. H. Denney..... 715,763

Palette, W. A. Sussmlich..... 716,140

Paneled member for sheet metal structure, F. M. Wege..... 716,154

Paper box, W. G. Haas..... 715,789

Paper fastener, L. C. Cox..... 715,992

Paper feeding and stencil printing apparatus, automatic, A. B. Beck..... 715,764

Paper lifting mechanism, Tuck & Wassermann..... 715,905

Paper packing machine, C. J. Braubury..... 715,749

Peeling machine, fruit, L. F. Graham..... 715,783

Pen attachment, fountain, J. A. Hamilton..... 716,224

Pencil sharpener, D. F. Oliver..... 715,848

Photographic print washer, A. Van Hoorn..... 715,908

Photographic printing frame, W. G. Wood..... 715,923

Photographs or other card holder, W. R. Maguire..... 716,074

Piano, tremolo, P. Pomeroy..... 715,860

Pianos, combined touch regulating and mute attachment for, Harriss & Kendall..... 716,034

Pin clasp, H. T. Igelstrom..... 715,808

Pipe, apparatus for drawing butt weld, F. Patterson..... 715,857

Pipe coupling, A. G. Mersing..... 716,260

Pipe coupling, duplex, J. J. Reilly..... 716,104

Pipe, drawing butt weld, F. Patterson..... 715,856

Pipe hanger, J. Collins..... 716,192

Pipe stopper and tobacco tamper, J. S. Niede..... 716,269

Planter, Cotton, Brown & Livingston..... 716,185

Plants, poison distributor for growing, E. Zedlitz..... 715,929

Plaster, blister, E. W. McAllister..... 716,265

Plastic materials, machine for forming interior of, F. M. Locke..... 716,343

Plastic surfaces, means for ornamenting, E. F. Brand..... 715,965

Playing ball, F. H. Richards..... 716,347

Pliers, H. L. White..... 715,919

Flow, subsoil, N. E. Cash..... 715,981

Plumb, level and square, combined, A. M. Bennett..... 715,946

Pneumatic despatch tube carrier, E. A. Fordyce..... 716,213

Pneumatic despatch tube system, E. A. Fordyce..... 716,212

Pocket book, J. P. Jagodzinski..... 715,809

Powders, machine for feeding and wrapping, F. A. Robinson..... 716,281

Power controlling device, R. Wick..... 715,918

Press. See Embossing press.

Printer's quoin, H. P. Hamel..... 715,790

Printing and addressing machine, combined, Runyan & Levering..... 715,874

Printing machine inking mechanism, T. M. North..... 715,847

Printing machine inking mechanism, J. White..... 715,916

Printing machine inking mechanism, T. M. North..... 716,089

Printing machine, strip, H. C. Lavery..... 716,064

Protractor, bevel, C. H. Barnes..... 716,170

Pulley, split, C. H. Bialsky..... 715,950

Pulp engine, T. Bassler..... 716,172

Pump, C. G. Nyberg..... 716,090

Pump, centrifugal, S. W. Luitwieler..... 715,825

Pump or exhaust, vacuum, T. A. Rose et al..... 716,110

Pumping apparatus, water, G. J. Roberts..... 715,871

Punching bag apparatus, G. Y. Goergen..... 715,843

Puncture healing compound, Grant & Chester Racking device, Rhodes & Hamrick..... 716,346

Radiator, G. C. Hawkins..... 716,228

Rail joint, M. E. Streepy..... 716,307

Rail joint nut lock, E. B. Murray..... 716,079

Rails, device for preventing the creeping of, H. Dormmuller..... 716,207

Railway, electric, W. B. Potter..... 716,101

Railway, electric, E. A. Sperry..... 716,125

Railway frog heel riser, F. B. Bradley..... 715,759

Railway, logging, J. W. Boyer..... 715,963

Railway signaling system, H. Bezer..... 716,178

Railway track structure, C. B. Voynow..... 716,353

Ramrod, gun rest, and bayonet, combined, J. Wheeler..... 716,158

Reaping machine attachment, I. E. Shumaker..... 716,120

Refrigerator building, H. T. Myers..... 716,344

Rein holder, wheel operated, L. Huenke..... 716,233

Retort charging apparatus, J. De Brouwer..... 716,201

Rheostat, F. Mackintosh..... 715,827

Rheostat, J. L. Hall..... 716,222

Riveting machine, W. J. Whalen..... 716,156

Rock drill, F. Coyle..... 715,993

Rod coupling, P. Carolan..... 715,976

Rolling machine, car wheel, H. W. Fowler..... 715,777

Rolling machine, gear, W. L. Jones..... 716,241

Rolling mill guide, J. H. Mellors..... 716,259

Roof, H. N. Hansen..... 716,225

Rotary engine, J. A. Grove..... 715,758

Rotary engine, W. E. Proutman..... 715,904

Rotary engine, W. F. Allen..... 715,933

Rotary engine, S. E. Carothers..... 715,977

Rowing mechanism, bow facing, D. R. Sheen..... 715,882

Rule, measuring, J. A. & F. L. Fraut..... 716,150

Rule or straight edge, folding, J. Wurschmidt..... 715,925

(Continued on page 472)

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