How may each be obtained separately? A. If there is nothing else in solution with these, the following method may be employed: concentrate the solution and precipitate together the alkaloid quinia and the iron as ferrous oxide, by the addition of a sufficient quantity of solution of caustic soda, and filter. Wash the precipitate with spirit of wine in which the alkaloid and adhering alkali (soda) are both soluble. Dry the oxide of iron thus freed from the quinia, dissolve it in the least quantity of dilute sulphuric acid, with the aid of heat, and crystallize out the sulphate by evaporation. Evaporate the alcoholic solution carefully to dryness, and wash out the soda quickly with a little cold water, in which the quinia is scarcely soluble. Dissolve the purified quinia in a small quantity of sufficiently dilute sulphuric acid, and crystallize out the sulphate by evaporation. Add to the solution containing the phosphoric acid as ortho-phosphate of soda together with sulphate of soda, solution of barium chloride, until no further precipitate forms. Filter, wash the precipitate with plenty of water, digest it for a short time with a little strong, warm nitric acid to dissolve out the basic phosphate, and filter from the accompanying insoluble basic sulphate. Then stir into the solution, a drop at a time, strong sulphuric acid until a precipitate no longer forms. Filter the solution and crystallize out the phosphoric acid by evaporation.

(26) J. C. says: I have an engine of 2 inches bore and 4 inches stroke, the boiler of which is 40 inches high and 20 inches in diameter, with twelve 1 inch tubes. Boiler is bolted to a cast iron firebox, 20x20 inches. Could I use said engine on a boat 15 feet long and of 4 feet beam, with a three-bladed propeller 30 inches in diameter, and attain the speed of six miles an hour, the engine running at 200 revolutions a minute? A. The machinery will probably answer; but we think it might be better to use a smaller screw.

(27) E. O. asks: What is meant by a balanced valve of a steam engine? A. A valve that is relieved of the excess of pressure in its back.

(28) L. S. C. says: 1. I have an oscillating engine, cylinder 2½x4 inches, steam pressure 100 lbs., revolutions 325; and also a boat 18 feet 6 inches long, drawing 22 inches water when loaded light. Can I use a screw of small pitch, and couple direct from engine, or must I reduce speed by gearing? A. You can couple directly to the screw. 2. If coupled direct, what should the pitch be? A. Pitch from 2½ to 3 feet.

(29) E. A. C. asks: What is the proper proportion of length to breadth in the American flag? A. Flag makers say that it should be as 3 to 5. A flag 10 feet long should be 6 feet wide. There should be 13 stripes (7 red and 6 white) and 38 stars. The blue ground should extend down to the sixth stripe, and in length should be proportioned to that of the flag.

(30) J. T. says: Please give the proper angle that a groove in a pulley should have to be suitable for a round band? A. It is considered good practice to make the groove with a curved section, having greater depth than width, so that the belt will not bottom as it wears.

(31) N. S. says: We are told that, when a top is spinning in an inclined position, it is its centrifugal force which holds it up and keeps it from falling. Please explain this: In a perfect top, one in which the quantity of matter is equally distributed on all sides of its axis, is not the centrifugal force on all sides equal? Hence, does not the centrifugal force operate just as much in favor of gravitation as against it? Where, then, is there any balance of centrifugal force to counteract the attraction of gravitation? A. Quackenbos says, in his "Natural Philosophy": "The center of gravity is not over the point of support all the time the top is spinning, but is constantly moving round the axis of motion, and, before the top can fall, in consequence of its being on one side of the axis, it reaches the other side, and thus counteracts the previous impulse. Hence, the faster the top revolves, the steadier it is; as its motion slackens, it gradually reels more and more, and finally falls."

(32) W. T. says: I have a steam yacht of the following dimensions: Keel 18 feet 6 inches long, breadth 6 feet 3 inches, least depth 2 feet 5 inches. The engine is 3¼x4½ inches, and the propeller is of 22 inches diameter and 3 feet 6 inches pitch. With 75 lbs. steam, the speed of the boat is satisfactory; but the engine runs at a speed so high that I fear it will wear out fast. Could not I put on a larger propeller and obtain the same or a greater speed of the boat? If so, what style and diameter had I better try? There is sufficient clearance to put in a 24 inch propeller without altering anything about the boat. A. The data sent are so incomplete that we do not feel able to offer you much advice. We see no particular objection, however, to the use of a screw 24 inches in diameter, with a slight increase in pitch.

(33) W. J. M. says: Our water reservoir is located about 1 mile from my office at an elevation of about 140 feet. I want to locate a gauge in my office which will show the depth of water in the reservoir. I arranged a column of mercury 11½ feet long; but when the water was turned on the mercury was forced out in a jet a foot above the top. I estimated that 140 feet would give a pressure of about 61½ lbs., which would sustain a column of mercury only about 123 inches. What is wrong about it? A. If you have estimated the height correctly, we imagine the trouble was caused by opening the cock suddenly, or perhaps you did not have enough mercury in the tube. It seems to be high enough under the conditions stated.

(34) B. & W. ask: How can we deodorize benzine? A. Properly speaking, benzine cannot be deodorized. Much, however, of the disagreeable odor of commercial benzine may be removed by redistilling it with a quantity of good lime, and rejecting the first and last portions of the distillates.

(35) F. B. S. says: I have a refrigerator with wooden shelves, which, by standing in a damp cellar during the winter, has become tainted to such an extent that it affects food placed in it. How can I cleanse it? A. Rub the parts over well with a strong solution of chloride of lime (calcium hypochlorite); and after letting stand a short time, rinse first with water containing a little carbonate of soda, and then with plenty of clean water. Dry, and expose to the air and sunlight, if possible.

(36) J. K. asks: 1. How many years will wrought iron water pipe, plain, with ¾ inch internal diameter and ⅛ inch shell, last if buried underground in clay say 20 inches deep? A. If the water is pure, it may last from 10 to 15 years. 2. Is galvanized iron pipe as good as tin lined lead pipe as far as health is concerned for conveying water for general house use? A. No. See p. 244, vol. 36.

(37) V. says: A. asserts that, by placing the large wheels in front and the small ones behind on a carriage, it will be running up hill. B. says it will not. What is the difference? A. As the axles are generally arranged, the disposition of the wheels would make the front of the wagon the highest, but it would not necessarily act as when running up hill.

COMMUNICATIONS RECEIVED.

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

On Blue Glass. By J. M.
On Locusts. By H. J. L.
On Accidents to Mechanics. By G. S. W.
On a Nervo-Mental Force. By J. R. D.
On the Carolina Lizard. By C. F. S.
On Canceling Postage Stamps. By W. K. P.
On a Torpedo Feeler. By F.
On the Occult Sciences. By J. B.

Also inquiries and answers from the following:

W. E.—S. R. H.—D. W. W.—D. S. F.—H. F.—H. M.—C. F. S.—J. K. B.—J. F. L.—P. J. W.—C. B. J.—F. B.—C. R.—N. T. W.—A. K.

HINTS TO CORRESPONDENTS.

Correspondents whose inquries 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.

Inquiries 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 inquiries analogous to the following are sent: "Who sells the best filter for domestic use? Whose is the best oil stove? Who makes a three-way machine for cutting threads on wrought iron pipe? Who makes malleable iron castings? Who sells the best screw-cutting tools? Whose is the best steam pressure gauge? Who makes the best steam whistles?" All such personal inquiries 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

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A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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