ing evaporated as above, and again set to crystalize, and so on as long as clear crystals are obtained. To obtain pure citric acid, all the crystals should be redissolved and recrystalized, it may be several times, and the solution digested with bone black. A gallon of lemon juice should make about eight ounces of crystals. Limes and lemons constitute the source from which citric acid is generally made, yet it may be extracted from oranges, currants, gooseberries, raspberries, tamarinds, etc. The machinery and cost of manufacture will depend upon circumstances which anyone about to go into the business can best judge.

(38) D. B. K.—Your inquiry was answered last week. To clean moss from trees, wash them with lye made by leaching wood ashes. To clean marble, wash with quicklime, clean, rub with fine putty powder and olive oil.

(39) Constant Reader is informed that there are many works on steam boilers and their management. He had better select those he considers best adapted to his wants.

(40) W. F. B. asks for a book that describes the locomotive. He had better procure Forney's "Catechism of the Locomotive."

(41) R. S. N. asks how to thin down printers' ink which will answer to print stencils made by a sharp needle, such, for instance, as the stencils made by an electric pen? A. You can thin ordinary printing ink with linseed oil or with kerosene.

(42) G. A. S. asks: How much water is contained in 1 cubic foot of steam at 30 lbs. pressure? A. Weight of a cubic foot of steam, at 30 lbs. pressure by gauge, about 0·1079 lbs.

(43) M. M. McP. asks: Can a dirt road engine be made to run in our Texas land successfully? If you know of any, please give me the address. A. Insert a notice in our "Business and Personal" column, which is especially designed for such inquiries.

(44) I. T. W. says: I am making an engine, the cylinder being 2½ inches in diameter, and 5 inches long. I have a smaller one ⅛ inch diameter and 5 inches long. I have a larger one 4 inches in diameter and 7 inches long. Please let me know what horse power each engine will be, and what sized boilers will be required? A. See pp. 33, 225, vol. 33.

(45) W. B. B. says: Suppose two rifles are so charged that they will send their bullets exactly the same distance, all things being equal, which of the two would send its ball to a given point the quickest, if one man remains stationary and the other man fires from a rail car going at the rate of 60 miles an hour, both rifles fired simultaneously and of course at an equal distance from the mark, and fired in the direction the rail car is travelling? A. The one on the car.

(46) I. T. C. says: I am running an 11 x 20 inch stationary engine, with one 40 inch two flue boiler 14 feet long. The boiler is good but not large enough for the engine. I have a good 14 inch flue. If I connect it to my boiler lengthways on top, and use it as a steam drum, would it not add considerably to my boiler power? A. As we understand the proposed mode of connection. we do not think it would increase the steaming capacity of the boiler.

(47) A. M. H. asks: Can I use an engine as large as 60 inches in diameter and 12 feet stroke, and condense the steam with an inside condenser of Lighthall's or some other good make, and whether I can make as much vacuum as I could form with a jet, also if a jet condenser works well with water that is muddy like our western rivers? A. Generally, surface condensers do not make quite as good a vacuum as jet condensers. If the water is very muddy, there might be some trouble in keeping the plunger of the air pump tight.

(48) L. E. N. asks: Would water, if deep enough, be so compressed that an iron ball would cease to sink? A. No. See p. 208, vol. 33.

(49) H. M. W. asks: 1. Why is the moon said to be viewed at an angle of ½ degree? A. On account of refraction.

Please give me the names of the metals as regards their expansibility with heat, heading with the most expansible? A. The principal metals are arranged, in the order of expansibility, as follows; Platinum, palladium, tempered steel, antimony, iron, bismuth, gold, copper, brass, silver, tin, lead, zinc.

Would a peg driven horizontally in an upright post at the equater, throw the same length shadow at noon as at 6 o'clock A.M. and P.M.? A. Yes.

What would be the relative time of the passing of a railroad train a point, say the edge of a building situated 300 feet from the point of observation, the train being a mile away, and that point being any other distance? A. Please send a sketch, to make your meaning plainer.

(50) D. F. H. says: M. says that the proper way to set carriage axles is to set them forward. I claim that an axle to run easy should be set straight, so there will be no friction against nut or washer. Who is right? A. You have the right idea, as we understand your question.

(51) B. says: In an argument with a friend on the subject of "Revolutions of a Wheel," he claims that the hub goes faster than the rim or outward part of the wheel, on the ground that the hub receives the first of the power of motion. On the other hand, I claim that there is no distinction, that when one part moves or receives motion, the whole does. A. It is a question of terms. As the outer portion of the wheel makes as many revolutions as the hub, it necessarily goes through a greater distance in a given time.

(52) A. Y. asks: What is meant by a circular inch? Is it 1 inch in diameter? Why divide by the decimal 0·7854 to get the area? How is this decimal got? What is the area of a valve that is 2 inches square? A. You should consult some elementary work on geometry.

(53) Southern Subscriber asks: What must tobacco leaf be sprinkled with before being cut, and what process is necessary, after cut, to obtain a good acceptable flavor? A The flavoring ingredients are a matter of taste. Molasses, glycerin, cascarilla bark, and anise seed are some of the materials employed.

(54) W. H. C. says: Can you tell me what will kill weeds, such as plantain, that grow around a well where it is wet and marshy? A. Perhaps the best plan would be to drain the land around the well, and fill in with stones or cement.

(55) I. W. W. asks: What pressure or resistance does mercury offer at 100°, 200°, or 300°, etc., per square inch? A. The pressure of the mercury vapor at the different temperatures is approximately as follows; 100°, 0·0015; 200°, 0·0114; 300°, 0·08 lbs. per square inch.

(56) R. H. McN. says: R. B. G. asks what the pressure against the collar of a horse is, traveling at the rate of 3 miles an hour, to raise 33,000 lbs. a foot high per minute? (I should have said pulling at the end of a lever.) It makes no difference what lever he pulls at, as the rate of travel is given, and the amount of resistance. The rate of speed is 3 miles per hour = 15,840 feet, to raise 33,000 lbs. at the rate of 1 foot per minute = 1,980,000 foot lbs. per hour, which if divided by 15,840 feet (the speed of the horse) gives 125 los. of resistance or pressure against the collar. A. We accept the correction with thanks.

J. Y. says: "If all the measures, length, surface, and capacity in the world, and all the weights, were lost, by what means could new ones be obtained to correspond exactly with those we now have?" The standard yard of the State of New York is a brass rod, which bears to a pendulum beating seconds in vacuo, in Columbia College, the relation of 1,000,000 to 1,086,141 at a temperature of 32° Fah. One third of a yard square of pure water at 60° Fah. weighs 62½ lbs. We could therefore get our weights and measures perfectly. A. The restoration of the British standard of length, that is, the reproduction of the one that was burnt, was found to be impossible. Scientific men generally agree that, if a standard and all copies of it are lost, it cannot be exactly reproduced. The weight of a definite volume of pure water has never been exactly determined, that is, the weights used as standards by different nations, when referred to water, do not exactly agree.

(57) S. R. H. asks: What can I use for filling for walnut before using shellac? A. Almost any cheap varnish will do. Scrape clean and thoroughly dry. The object is to fill the pores of the wood.

(58) J. W. G. asks for a solder to solder backs to stereotypes. A. Use common plumber's solder. and applymuriate of zinc as a flux.

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

A. R. McC.—It appears to be calamine—silicate of zinc.—W. A. N.—No. 1 is a limestone. No. 2 is clay slate. No. 3 is bitumen mixed with clay and sand. If distilled in a close retort it will yield rich illuminating gas and various oils. It may be used also as a fuel. No. 4 is crystalized carbonate of lime—calcite.—G. S. M. It is pyrites. See p. 7, vol. 36.—K. R. F.—It contains iron, lime, magnesia, and silica—it is called augite.—Package marked Newburyport contains a piece of cinder and a small fragment of mica schist.—W. W. —No. 1 does not contain copper. No. 2 is jamesonite—sulphide of antimony and lead. No. 3 is crystalized lime carbonate. No. 4 is quartz crystals. No. 5 contains only a trace of lead and no silver. No. 6 contains bismuth sulphide—bismuthine, also copper. No. 7.—Neither rock nor flux contains silver—the bright specks are mica. No. 8.—The rock may contain silver; the sample does not. No. 9. The metal-like particles in the rock are iron pyrites. No. 10 is gray ore of antimony. —G. N.—There seems to be no patent on rose-leaf beads —the ones sent were nearly inodorous after a week.—F. A. D.—Please send more of the ore.—I. R. B.—The fragment contains fluorspar.—The contents of paper box marked F. G. seem to be a mixture of chalk and magnesia, with flour and other organic matters.—J. M. F.—It is a variety of bituminous coal, yielding considerable ash. You should have sent a specimen of more recent mining.—D J. M.—It is an impure clay. It might be used for brick making, pottery, and similar purposes.—I. W. D.—It is arragonite—a pure lime carbonate. If in large quantities it might be used as a source of carbonic acid and lime.

## 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 Safe Filling. By C. W.
On the Telegraph. By T. G. G.
On a Mathematical Problem. By R. A.
On Solutions of Indeterminate Problems. By H. M.
On the Questions of Bacterial Origin. By S. L. N. F.
On the Great Strike, etc. By I. S. C.
On a Mechanic's Incog. By W. P. T.

Also inquiries and answers from the following:

W. A. D.—B. J. H.—G. W.—G. W. P.—J. S. A. B.

### HINTS TO CORRESPONDENTS.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

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.

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 publishes books on bricklayers, etc.? Who publishes books suitable for amateur mechanics? Who makes a small, good, portable steam engine? Where can spring levels be obtained? Who makes and sells egg incubators?" 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

FOR WHICH

**Letters Patent of the United States were Granted in the Week Ending**

**July 10, 1877,**

**AND EACH BEARING THAT DATE.**

[Those marked (r) are reissued patents.]

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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## DESIGNS PATENTED.

10,091.—CASSIMERES.—O. F. Chase, Thompson, Conn.
10,092.—PARLOR TABLES.—P. P. Kuehborth, Buffalo, N. Y.
10,093.—CUFF.—E. A. Litchfield, Somerville, Mass.
10,094.—CLOCK CASES.—H. J. Muller, New York city.

[A copy of any one of the above patents may be had by remitting one dollar to MUNN & Co., 37 Park Row, New York city.]