one of which is aptly termed the phantom lamp. It is commonly a strong solution of phosphorus in olive oil, half filling a small phial having a wide mouth for the admission of air when in use. A better plan is to have a piece of porous earthenware (biscuit) fastened to the lower portion of the stopper and dipping beneath the oil; and when it is desired to use the lamp, the stopper (cork) is reversed, when the whole surface will glow quite strongly with the characteristic phantom light.

(27) C. A. J.—Send us your address; we will be happy to accommodate you as to the Stevens Institute.

(28) B. H. S. asks: Would it be dangerous or unhealthy to sleep in a new bedstead painted with Paris green and varnished over? A. If the wood has been well varnished, we think not; but if the bed has not already been painted, we would advise you to employ some other variety of pigment, that does not contain arsenic.

(29) C. H. R.—We are not familiar with the particular gas machine you speak of. You should state concisely what the mode of operating the machine is, or send us illustrations or drawings of the same. Generally speaking, machines of this character, unless constructed and operated with the greatest care, are not safe.

(30) J. McD. asks: 1. What chemical change takes place in milk when it turns sour? A. When milk is allowed to stand for a short time it sours and curdles, that is, its casein changes from the dissolved to the solid state. This is brought about by a series of interesting changes, originating in the unceasing activity of atmospheric oxygen. Casein is insoluble in water, but in the milk it exists combined with soda, and this compound is soluble in water. When fresh milk is exposed to the air, its oxygen seizes upon a portion of its casein and causes it to ferment; this takes effect upon the milk sugar and converts it into lactic acid, which causes the sourness of the milk. 2. How can it be restored and made sweet again? A. When a sufficient quantity of lactic acid is formed, it seizes upon the soda, takes it away from the casein, and forms lactate of soda. The casein thus set free shrinks in bulk, and gathers into an insoluble curdy mass. This precipitated casein may be readily redissolved by the addition of a little soda; the milk, however, although it may still be palatable, will by no means recover its original flavor, owing to the partial decomposition of the milk sugar.

(31) R. E. D. asks: 1. Will a 6 horse engine do to run a circular saw or a good sized corn mill? A. An engine of the size you mention will run a circular saw from 48 to 50 inches in diameter, or your corn mill. 2. How large a sawmill will it run, and how much lumber will it cut per day? A. If your saw is run at the regular speed, say 9,000 feet per minute at the periphery, every ⅛ inch feed to every revolution will cut on an average 1,000 feet of lumber per day; ¼ inch feed will cut 2,000 feet: 6 inserted teeth in the saw will be plenty to saw this amount of good smooth lumber.—J. E. E., of Pa.

(32) W. A. W. asks: Why, if you make the bottom of a cistern concave, will it present a greater resistance to the action of the water than if it were flat? A. In some localities the water in the ground rises to within a few feet of the surface; and in such places, when a cistern is sunk to a good depth, the pressure from beneath on the bottom is considerable. The sides, being built in arched form, can withstand this outside pressure very well, but the bottom, when flat, has no power of resistance except what is given to it by its weight. When the cistern is filled with water the construction is firm enough, but when it becomes empty, as frequently happens, the upward pressure cracks the bottom, and a movement commences which eventually destroys the work. If, in a dry time, the water then lies lower in the ground, the cistern will leak and become useless. The answer referred to said "that, if the bottom were built concave, it would present a greater resistance to the action of the water beneath." We know of one instance, somewhat in point here, where it cost $1,000, spent in experiments, to protect the bottom of a vault from the upward pressure of water coming from a saturated under stratum.

(33) E. A. K. says: In villages it is possible to arrange, for water supply, a tank of boiler iron to receive the rain water from the roofs; but it is difficult to obviate rust, which discolors the water. To procure an easily working and durable faucet is also difficult. Can you help us to solve these difficulties? A. Cast iron tanks do not rust with the rapidity of wrought iron, and always keep tight. If you use what are called compression faucets, you would not be subject to the other annoyances complained of.

(34) S. F. S. asks: Can you give me a recipe for an ink that will be invisible when written, but which can be brought out by heating? A. Use a dilute solution of chloride of cobalt in water.

(35) W. C. asks: 1. When should timber be cut to give best results against rotting? Is it too late now (March) to cut timber here, where there are 2 feet of snow on the ground? A. Yes: it should be done before the sap begins to flow. 2. What is dry rot? In our mill the floors are constantly damp, our ceilings are (between the doors and ceiling) dripping wet from condensed steam that rises from the drying apparatus. One mill built six years ago is so rotten from foundation up that you can push your thumb into the timber. A. The rotting in your case is not dry rot, but decay of the wood from the constant absorption of water from the surface, and the consequent disintegration of the fibers. Dry rot manifests itself in cases where the material is closely encased in iron, brick, cement, etc., so as to be entirely excluded from the preservative influences of the atmosphere, and is most frequently found at the ends of timbers which have been let into a wall or encased in an iron shoe. A prominent instance of the latter occurred where the tie beams of the principal roof trusses of a church were discovered, from a slight settlement, to have been rotted off at the ends, where they were encased in a very large airtight iron shoe. The remedy in your case would seem to be to protect the wood from contact with the water, and at the same time to give it free access to currents of air; there should be sufficient change of air to carry off all the moisture without depositing it upon the surrounding surfaces of the room. 3. Would good sound and dry hemlock or chestnut, buried in hydraulic cement concrete, be proof against decay of any and every kind? A. No.

(36) J. A. asks: How can I build a filter on the side of a stream of water which is subject to sudden rises of from 2 to 8 feet, getting at such times very muddy? A. Several attempts have been made to filter large quantities of water from rivers without success; the filter beds were soon rendered useless by the great amount of filtered material deposited into them. The plan that has been adopted after the failure of the filter beds is that of a reservoir with a central dividing wall. One of the compartments thus formed is periodically filled, the water allowed to settle and then drawn off clear into the other, from which a constant distribution is made. The authorities at Poughkeepsie, N. Y., as also the Hudson River Hospital for the Insane, at the same place, have both passed through this experience.

(37) W. S. C. and others.—Wherever the waste water of a house can be conveyed away by a drain, it should be done, instead of letting it stand in a cesspool or suffering it to settle into the ground. Thirty-six feet of filtering material, as you mention, ought to purify the water as far as it can be satisfactorily done by mechanical and partially chemical means, but not wholly; a drain is better.

(38) J. C. asks: Does galvanizing cast iron tend to weaken the iron? A. We think not.

(39) F. P. asks: 1. Will a shaft or a spindle of a machine that is run at 2,000 revolutions per minute take more power than one run at 4,000 a minute. A. No. 2. Is not the balance wheel of an engine merely to govern the motion of the crank shaft? A. Yes. 3. Will a circular saw spring more from not having any set, or will it spring more from heating of the saw mandrel? A. From not having any set. 4. Is it a good plan to give a saw set enough, so that it does not bind on its sides? A. Yes 5. Is an engine which runs at 150, or one which runs at 200, revolutions a minute more economical? A. Quick piston speeds are the most economical.

(40) S. F. B asks: What are the comparative lasting qualities of upright tubular boilers and those of locomotive or horizontal tubulars? A. So far as we know, there is not a great deal of difference, if the boilers are well built.

(41) A. W. S. says: I have seen several references to cutting copper and other soft metals by means of a disk of iron running at high speed. We have to cut up a great deal of 2½ inch No. 16 gage seamless copper tubing into short lengths; and using a fine saw, we have considerable trouble with its running. Can we cut it in the former way? A. Yes. Use a disk running about 25,000 feet per minute, of about 10 inches diameter, made of best charcoal iron.

(42) W. F. R. asks: What is meant by the axis of a magnet? A. The straight line joining the poles.

(43) A. J. says: 1. I have a 12 x 20 inches engine which will run two planers, rip saw, and scroll saw, with 20 lbs. steam; yet it takes hard firing under a boiler 42 inches x 18 feet, with two 13 inch flues. The engine runs at 125 revolutions per minute. Would it not be better to speed the engine down? A. Yes, if the engine would still be powerful enough for this duty. 2. How should the valve be set to use steam most economically? A. If a common slide valve, set it to cut off at three fourths of the stroke. 3. What would be the proper shape of the furnace? We have a good draft. A. We cannot say, unless we know the description of your boiler.

(44) L. B. C. & S.—There is probably something wrong in the arrangement of your pipes or valves, as the ram ought to do very well under the given circumstances. We think the wheel you speak of will give plenty of power. It would be better to have a valve in the delivery pipe.

(45) F. W. B. asks: What are the objections to the use of clockwork as a motor, to run a churn? A. The principal objection is the labor required to wind the spring. There are numerous light spring motors in the market, and by corresponding with their manufacturers you can doubtless obtain information about details. It has occurred to us that spring motors, suitable for household operations might be devised, to be wound up by a steam engine at some central locality, and distributed where desired.

(46) T. H. asks: How is the water got to the working barrel of a pump? Is it by suction, or atmospheric pressure? A. By atmospheric pressure. See article on "Suction," p. 352, vol. 31.

(47) W. D. M. asks: The grist mill in this place is driven by a 10 x 16 inches horizontal engine. The exhaust comes out on the under side of cylinder into a 3½ inch tin pipe which runs horizontally for about 8 feet, then turns up 2½ feet, and enters the heater. They are troubled by the tin pipe collapsing. This always has happened when starting the engine. What is the cause? A. The steam condenses in the pipe, so that a vacuum is formed. Attach a vacuum valve on the upper part of the pipe near the place where it collapses, or use an ordinary cock, which can be opened on starting the engine.

(48) W. A. says: I am making some experiments with a machine in which I wish to light kerosene in a place inaccessible with a match: is there not some cheap magnetic machine by which I can accomplish it? A. Yes. Two or three cells of Bunsen battery will heat a short length of No. 36 platinum wire red hot, if the resistance of the circuit is not too great.

(49) J. H. S. asks: What is the best method of renewing a carbon plate used in an electrotype battery? A. Soak the carbon in warm water. If it is to be used in the porous cup of a bichromate battery, you will find it slightly advantageous to place it for a short time in nitric acid.

What is the proper proportion of zinc to muriatic acid in making a soldering solution? A. Add zinc until the acid is nearly exhausted.

(50) J. L. asks: 1. Must steel be tempered before being magnetized? A. Yes. 2. At what heat does steel lose its magnetism? A. At a red heat.

(51) J. H. says: 1. What is meant by the brass rim of the lens, which the pieces of looking glass are fitted into, in your description of a home-made microscope of October 30, 1875? A. Magnifying glasses are usually mounted in a brass or hard rubber ring. We presume such is the rim referred to. 2. Where can I procure the lenses required? A. At any optician's. 3. Would the same sized stand do for a microscope to magnify 1,000 to 1,500 times? A. Yes.

(52) H. S. T. says: In regard to propellers, I used a two-bladed, one of the ordinary kind, for two seasons, and the vibration was very unpleasant; but for the last two summers I have used a modification of Dr. Collis Browne's (illustrated in the SCIENTIFIC AMERICAN some time ago); with that, the speed was increased about one third and all vibration ceased, and she glides along with all the smoothness of a sail boat. I make my propellers with cast iron hubs, into which I screw wrought iron arms and rivet on sheet iron blades, making very cheap and efficient wheels.

(53) R. W. R. says, in answer to W. H.'s query as to the tension of a cotton rope: Midway between the two buildings is a post holding 2 idler pulleys, elevated 20 feet, over which the rope runs. The sag of the rope, which is about 3 feet out of a straight line on each side of the idlers, keeps up the tension when the rope stretches.

(54) H. S. T. says, in answer to many correspondents: I will give you my experience with a small boiler. I constructed a boiler for a steam carriage; it is 15 inches in diameter and 30 inches high. The firebox is 14 inches in diameter and 12 inches high, with 207 copper tubes ½ inch in diameter and 10 inches long. Plates are only $\frac{1}{16}$ inch thick, of the best steel. Total weight, including all fixtures, is 200 lbs. It made steam for 2 cylinders of 3½ inches bore by 10 inches stroke, and ran the carriage (weighing 550 lbs., complete) on a smooth road a mile in 4 minutes, with one person and fuel and water. I have the boiler now in a boat, 21 feet long and 5 feet wide; it drives two cylinders of 2¾ inches bore and 5 inches stroke. Propeller is 22 inches in diameter. It makes plenty of steam, and, with good dry wood, I have the furnace door open much of the time to keep down the steam. I usually run at 60 lbs., and at that pressure it runs the boat about 7 miles per hour with about a bushel of wood.

(55) L. L. L. says, in answer to E. P.'s query as to printing in gold and bronze: To print clearly, use the finest quality of powder and size: use as little size as possible, and distribute it well; roll it thoroughly on the type, use only two sheets of smooth paper on the platen (for blanket), place five or six thicknesses of soft paper beneath the form, pull a light and quick impression, apply the powder carefully, and dust off thoroughly with a camel's hair pencil.

(56) C. R. L. says, in reply to T. C. M., who states that, in a sheet copper vessel, the sulphate of copper solution, after being allowed to stand for a few weeks, has deposited a hard, greenish coat, which prevents the working of the battery of which it forms a part, and asks how it can be removed: This is by no means unusual where the copper salt is very impure or contains a considerable excess of sulphuric, nitric, or acetic acids. When a piece of sheet copper is placed in a solution of sulphate of copper, already saturated with the salt, and containing a free acid in excess, a thick scum of copper salts soon forms on the surface of the copper, which, if allowed to remain or accumulate long enough, not only very materially weakens the current (in case the copper plate is a negative element in a battery) but offers a nearly perfect protection to the copper, so much so that the addition of strong nitric acid is without action, or nearly so, upon it.

(57) J. C. V. says, in reply to W. A. F., who asks for a plan for straightening wire: Fix three collars on a frame, two on the same level and the third one above and between the others This last one can be moved up and down by screws. The lower ones should turn freely on their centers, but have no other motion. Grooves of different sizes are cut on the rollers, and the wire is passed between the rollers in the groove nearest to the exact size of the wire.

(58) L. S. W. says, in reply to J. C. W., who asks how large a cube can be cut out of a ball 12 inches in diameter: The largest cube has for one of its sides the side of a square inscribed in one of the large circles of the ball. If x is this unknown side, $x = R\sqrt{2} = 6\sqrt{2}$, that is, $x = 8{\cdot}485281$ inches. The volume of this cube is 610·4026 cubic inches.

(59) J. H. asks: What cement is the best to harden quickly and resist the action of dampness the longest, without losing its firmness? A. Portland cement.

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

G. G.—It is iron pyrites.—W. H. S.—It is lignite containing iron pyrites.—A. J.—One is quartz, and the other is iron pyrites in limestone.—A. W. S.—No. 1. The shining particles are scales of mica. No. 2 is crystallized carbonate of lime. No. 3 is quartz. No. 4 is impure limestone. No. 5 is gneiss rock.—C. M. D.—It consists of carbonates of soda and lime.—I. R.—It is a variety of brown ocher. It is of no particular value.—J. L. I.—They all consist of clay and sand cemented together by a small amount of oxide of iron. They are not iron ores.

J. J. W. asks: How are glass marbles of different colors made?—J. I. asks: How can I preserve speckled or brook trout in cans, etc.?

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 Raft in a Stream. By R. K. B.
On a Scroll Saw. By C. A. S.
On Barbecues. By C. S.
On Incubation. By G. N. S.
On Man in Limestone. By M.
On Small Engines. By J. S.
On Sailing Faster than the Wind. By J. G.
On Italy. By C. E.

Also inquiries and answers from the following:

C. B. H.—A. B.—W. K.—J. H. M.—W. S. G., Jr.—P. C. N.—H. B.—E. E. E.—M. B. H.—E. W. N.—R. C.—B. P. K.—L. & W. W.—E. F. W.—J. E. W.—R. G.—H. J. G.—J. C. W.—B. F. M.—S. M. G.—L. B. S.—T. S. L. G.—F. McD.—E. M. L.—A.—W. H. M.—W. H. S., Jr.—J. N. H.—J. D. G.—C. F.—E. B. R.—R. S., Jr.—J. M.—C. C. R.

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 inquiries analogous to the following are sent: "Who makes elevators, worked by hydraulic power? Who sells waterproof matches? Who sells cracker-making machinery? Who makes chilled iron or cast steel balls, turned up to a perfectly spherical shape?" 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.]

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[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specification 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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