where there is no water? A. The steam in the boiler ordinarily reduces the temperature of the products of combustion to a point where they will do no damage to the iron.

(76) E. C. asks: 1. Will a portable engine rated at 6 horse power do more work in a day than 6 horses? A. Yes. 2. Is an upright boiler as durable as a horizontal one? A. Ordinarily, yes.

How many revolutions should the cylinder of a thrashing machine make, the diameter being 13 and length 30 inches? A. This depends on the construction of the machine. You should address the manufacturer.

(77) B. A. W. says: Given a propeller with a 24 foot keel and 7½ feet beam, rather flat on the bottom at midship, with an upright boiler, with two inch tubes and shell 2 feet by 4 feet; which is best, an engine 3½ x 6 or 3½ x 5 inches? or is there a better size than either? A. Use one 3 x 5 inches. 2. What size and pitch of wheel, and how many blades are necessary? A. Use a propeller of 3 blades, 24 inches diameter, of 3 feet pitch. 3. Where should the boiler be placed to allow a cabin to be built in front, projecting at the sides on the guards 5 inches each side, the roof covering the whole boat? A. You do not send sufficient data to enable us to determine the position of the boiler; but probably it can be placed 12 or 14 feet from the bow. 4. What speed would such a boat make? A. Probably 6 miles an hour.

(78) S. L. S. says: I have a forebay or penstock to a mill; it is 8 by 10 feet, and the water is 6 feet deep. In the center of the forebay I wish to place a wheel, with a gate 17 by 18 inches. How many lbs. pressure of water will thus be on the gate at the bottom of the forebay? A. About 2½ lbs. per square inch, as we understand the question.

(79) G. W. R. says: A man is using a hydraulic pipe, with a 22 inch pipe at the head or penstock. He takes out the 22 inch pipe at the head, and puts in a 36 inch pipe. Will the pipe throw the water further from the nozzle, and will the pipe take more water than before? A. Your question is rather incomplete; but, as we understand it, the change will make no material difference in the discharge.

(80) A. W. F. asks: 1. How many lbs. of anthracite coal would an upright tubular boiler, measuring, say, 4 feet high by 34 inches diameter, with ordinary grate surface and draft, consume? Boiler carries from 30 to 110 lbs. steam, and engine runs at 300 revolutions per minute. A. Such a boiler would probably burn from 40 to 50 lbs. per hour. 2. What should be the proportionate depth of a steam yacht to its length, and how high should a boat of 30 feet long rise out of water at its bow, the boat being used where the water is oftentimes quite rough? A. Draft, from $\frac{1}{12}$ to $\frac{1}{15}$ length. The boat in question might rise from 24 to 30 inches at the bow.

(81) L. M. C. asks: How can I prepare color, such as red, blue, green, etc., to mix with a glue size, to be used on cotton cloth, which, when stretched on a frame and dry, will look clear and transparent, and be smooth and free from streaks on the flat surface? A. The aniline colors will give the best satisfaction. You can obtain them with instructions from almost any druggist. They are brilliant and economical. Some of the vegetable dyes would answer; but it would require too much space to give you the various methods for their extraction here.

(82) D. W. says: A very singular phenomena recently occurred in a mill, run by an eight horse power steam engine. The upper stone is stationary, the lower stone standing on a 1⅜ inch spindle, resting on a step. This step is movable, so as to gauge the rate of feed. The spindle is of hardened steel, resting immediately on a steel plate, ⅜ of an inch in thickness and 2 inches square, resting on a cast foot, in a square bed, secured against revolving. Above this bedplate is a loose collar of cast iron resting in the step plate surrounding the spindle in a manner to secure stability of motion to the spindle. The foot plate is of hardened steel, its upper surface being flat, and the point of the spindle resting on this plate is slightly oval. A few days ago, while the mill was running at its usual velocity with a full head of steam, the stones stopped instantly, the belt sliding in the pulley until steam was shut off. The miller supposed that something had got between the stones, and at once set to work to raise the upper stone from its bed, but only the ordinary amount of grain was found between the stones. The lower stone was then lifted from its bed, and the spindle was found firmly attached to the steel foot plate in the step. An attempt was made to drive this foot plate off, the corners projecting sufficient to give a full blow with a heavy hand hammer, such as blacksmiths usually use. The corners of this plate were bent down by repeated blows, without any effect on the attachment to the spindle. The spindle was then taken to a smith's forge, heated and cut off above the step plate, so as to leave a small portion of the spindle attached to the step plate. On close inspection, a small portion of the outer surface of the end of the spindle was found not attached to this step plate. Oil was found above the step plate and collar around the spindle, in sufficient quantity, and no evidence of heat or unusual friction could be found. And yet the spindle was firmly welded to the step plate. This process of welding must have been instantaneous, as no abatement of speed was noticed by those standing about. All the above facts can be verified by testimony. Can anyone explain this fact? A. We prefer to throw this open for general discussion. If our correspondent can conveniently forward the corroborative testimony of which he speaks, we would be glad to see it.

(83) W. H. says: 1. Why is it that, in winter or spring, when it is warm enough to cause slush ice to break up and follow the current of the streams, at night some of the lightest of this slush will sink to the bottom of the stream and freeze to rocks, etc.? A. Your account is not sufficiently detailed to enable us to answer your question. 2. A pump used for pumping water from a river often refuses to take water on account of this slush freezing to the strainer of the suction pipe, but it is only at night; and as soon as the sun rises we do nor have any trouble with it. A. Probably the trouble is caused by the manner in which the strainer is located. In general, stoppages of this kind are more influenced by atmospheric conditions than by the time of day.

(84) W. D. P. asks: If I were to put a piece of vulcanized rubber (such as combs are made of), 10 inches wide, 32 inches long, and ½ inch thick, into a hydraulic press (the box of the press fitting the rubber), how much pressure would it stand without breaking or altering its shape? A. It would probably stand several tons; but we have no data on this subject.

(85) A. L. E. asks: Do you know of any chemical compound or method by which the hair on the head can be turned permanently gray or white without injury to the scalp or skin? A. We do not know of anything of this nature that we care to recommend. All such agents are more or less injurious.

(86) R. L. D. asks: How can I harden the shell of a hen's egg without impairing the egg? A. We do not know of any practicable method of accomplishing this.

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

J. W. B.—They are small, well formed garnets.—C. C.—If the colors constituting the pattern of your carpet are not affected by the solvents, the green stain may be removed by means of a little warm alcohol and ammonia (aqua ammonia). Otherwise it is not advisable to attempt the removal of the stain.—W. H. H.—It is a sand consisting of iron pyrites. See p. 7, vol. 36.—W. L. W.—It is a small fragment of quartzose rock, containing bright specks of iron pyrites. See p. 7, vol. 36.—E. P. C.—No. 1 contains lime, magnesia, alumina, silica, sesquioxide of iron, and iron pyrites. The cubes of No. 2 are crystals of sulphide of iron—pyrites. See p. 7, vol. 36.

It has been our custom for thirty years past to devote a considerable space to the answering of questions by correspondents; so useful have these labors proved that the SCIENTIFIC AMERICAN office has become the factotum, or headquarters, to which everybody sends, who wants special information upon any particular subject. So large is the number of our correspondents, so wide the range of their inquiries, so desirous are we to meet their wants and supply correct information, that we are obliged to employ the constant assistance of a considerable staff of experienced writers, who have the requisite knowledge or access to the latest and best sources of information. For example, questions relating to steam engines, boilers, boats, locomotives, railways, etc., are considered and answered by a professional engineer of distinguished ability and extensive practical experience. Inquiries relating to electricity are answered by one of the most able and prominent practical electricians in this country. Astronomical queries by a practical astronomer. Chemical inquiries by one of our most eminent and experienced professors of chemistry; and so on through all the various departments. In this way we are enabled to answer the thousands of questions and furnish the large mass of information which these correspondence columns present. The large number of questions sent—they pour in upon us from all parts of the world—renders it impossible for us to publish all. The editor selects from the mass those that he thinks most likely to be of general interest to the readers of the SCIENTIFIC AMERICAN. These, with the replies, are printed; the remainder go into the waste basket. Many of the rejected questions are of a primitive or personal nature, which should be answered by mail; in fact, hundreds of correspondents desire a special reply by post, but very few of them are thoughtful enough to inclose so much as a postage stamp. We could in many cases send a brief reply by mail if the writer were to inclose a small fee, a dollar or more, according to the nature or importance of the case. When we cannot furnish the information, the money is promptly returned to the sender.

J. C. R. asks: What is the greatest depth ever attained by a diving bell?—G. G. asks: How can I mend a stiff hat with a tear in it?—B. A. F. asks: Can you give me information concerning the dark day said to have occurred in New England at the commencement of this century? It was not occasioned by an eclipse or any other explainable cause.

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 Demand for a New Business. By H. D. R.
On Patent Rights and Wrongs. By J. R. R.
On Diphtheria. By S. S. S.
On Perpetual Motion. By D. H. M.
On the Bourdon Gauge. By A. B. W.
On Cartesian Physics.
On Trisecting an Angle. By H. C.
On Theories of Light. By P. S.

Also inquiries and answers from the following:

M. C.—M. A. F.—S.—J. B.—A. C.—W. M. K.—H. P.—W. P. E.

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.

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: "Whose is the best generator, for the manufacture of vinegar? Whoare the largest steel mannfacturers in the United States? Who makes cast cast-steel? Who sells stamped tissue paper? Who makes machiues, actuated by weights or springs, for raising water? Who lays narrow gage railroads, and what is the cost per mile? Who sells electro-plating materials?" 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

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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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9,849.—STOVES.—C. H. Castle, Quincy, Ill.
9,850.—SPOONS, FORKS, ETC.—J. M. Culver, Wallingford, Conn.
9,851, 9,852.—CARPETS.—E. D. Daniels, Paris, France.
9,853.—CARPET.—T. J. Stearns, Boston, Mass.
9,854.—KNIFE HANDLE, ETC.—J. Seymour, Syracuse, N.Y.
9,855.—TRIMMING.—A. Sturm, New York city.
9,856.—TOWEL BORDER, ETC.—T. Webb, Randallstown, Ireland.

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