P. C. C. says: 1. By what rule (if any) can I determine the power per square foot of a river current? 2. How large a paddle wheel do I need to place in a current running three miles per hour, to obtain 10 horse power? 3. Is there a better than the paddle wheel for use in a current? Answers: 1. The theoretical power per square foot of a river current is found by multiplying the discharge in pounds per square foot per minute by the velocity in feet per minute, and dividing by 33,000. 2. Make the wheel so that it will have at least two floats in the water at a time, exposing about 13 square feet of surface to the current. 3. We think not.

H. B. B. asks: 1. In driving electro-magnetic engines, is intensity of current, or quantity, required? 2. What is the most powerful electro-magnetic engine known, and on what principle is it constructed? 3. Has any electro-magnetic engine been constructed for driving small machinery economically? 4. What is the most constant cheap battery manufactured? 5. What is the chief difficulty in the general use of electro-magnetic engines? Answers: 1. Both intensity and quantity are required. 2 and 3. Professor Page, in 1850, constructed an electro-magnetic engine, of between 4 and 5 horse power, which was exhibited at the Smithsonian Institute. It worked upon the principle of the attraction of a helix upon a piece of soft iron suspended vertically in it. Other machines have been made upon the principle of the attraction and repulsion of electro-magnets upon armatures of soft iron, made to revolve in front of them. Such machines are made to drive sewing machines. 4. Daniell's is a good constant battery. 5. The difficulties are the limited distance within which the magnetic attraction is practically exerted and the cost of maintaining the battery current.

S. A. W. asks: 1. When were the first United States postal cards issued for general circulation? 2. A few months back you told of a sure cure for rats made by mixing plaster of Paris and some other substance together. I want to find what the other substance is. 3. If a rat should be killed by that method, and get in between the walls, what would remove the smell? Answers: 1. In the early part of May, 1873. 2. Wheat flour. A very good rat poison is made by putting some phosphorus into flour paste, adding some lard and spreading on bread. 3. Probably nothing, except removal of the rat.

A. K. says: Beavers are building a dam in a stream which we have to ford, and the dam has backed the water up until the ford is three feet deeper than it was before the dam was built. Now A contends that when the stream rises two feet, the stream at the ford will still be three feet deeper than it would if the dam was not there; I don't think it will. Which is right? The banks are, of course, supposed to be perpendicular. 2. What will cure the effects of poison ivy? It is very plentiful here, and some persons are affected so that their eyes swell till they are shut, and remain so for several days. 3. Is there any difference between poison ivy and poison oak? The kind that grows here is not a vine, but grows in dwarfish bushes six or eight inches high. 4. Is there any ink which will write jet black or bright blue, and, after a few days or weeks, disappear entirely? How can I make it? Answers: 1. As we understand the question, you are right. 2. The subnitrate of bismuth is said to effect a cure. 3. We think not. 4. We do not know of any.

J. B. says: 1. Suppose I have a vertical cylinder, something more than two feet high, open at the top and fitted with an airtight piston of one square inch area. Let the piston be supposed to be without weight and capable of moving in the cylinder without friction, and let the cylinder be impervious to and destitute of capacity for heat. Further, suppose the piston placed one foot from the bottom of the cylinder, and the air at both sides of the piston to be of the same temperature and pressure; now if the air underneath the piston has its temperature raised 273° C., the volume will be doubled and the piston will be raised one foot. Again, let the original conditions be resumed, and let the piston be prevented from rising; on heating the enclosed air 273° C., its elastic force will be doubled. Let any further supply of heat be now withheld, and let the piston be made free to rise with merely the weight of the atmosphere to keep it down; it is evident the elastic force of the enclosed air will cause the piston to rise, so long as there is an excess of pressure underneath it; heat will be consumed in this operation, and the temperature of the air will fall, no heat being supplied from without. To what hight will the piston rise, and what will be the temperature of the enclosed air? 2. Suppose I compress a quantity of air to a pressure of ten atmospheres, what would be its temperature? And after compression, if the air be cooled down to 183° C. and be then allowed to expand and perform work, what will be its temperature after expansion? Answers: 1. It would be necessary for us to know the original temperature of the air. You will find the whole question thoroughly treated in the late Professor Rankine's treatise on the "Steam Engine and other Prime Movers." 2. You do not say how much you propose to expand the air.

S. M. S. asks: What will kill roaches immediately? I have been feeding them with strychnia for a week, and their sanitary condition is greatly improving. Answer: If the poison alone is not sufficient for their extermination, you should try something more efficacious. Phosphorus paste is recommended.

S. J. J. says: There is a leak, under heavy pressure, at the lower end of the water column of a mining pump. Suppose the leaking to be $x$ gallons per minute; is the loss of power as great as though the same quantity escaped from the upper end of the column and fell back into the main? Answer: Yes, if the pressure under which the water escapes is the same as that of the water that is elevated.

C. M. N. says: The dates on worn coins can be read by heating to a dull red and dropping into cold water. The letters and figures will appear black, and the plain parts white. If they do not show brightly, try at a different redness. A piece of coin, hammered perfectly flat and smooth, will show plainly. I think the reason that a worn coin will show is that the coin is pressed, and of course the raised parts are softer; and the heating and sudden cooling has a different effect on the parts. Another reason is that coins do not wear perfectly flat; the raised parts are still slightly elevated, although they do not show.

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

J. H. M., of L. I., describes certain growths, asking what they are. Answer: Numbers 1, 2, 3, represent a very common fungus called *mucor mucedo*. It belongs to the same family of parasitic plants as *penicillium glaucum*, *puccina graminis*, *cephalo-sporium* and others. The fact that the rain water was filtered and placed in a tightly corked bottle does not prevent their growth; because the germs from which they originate are present in the air enclosed in the bottle and in the water itself. If the water were first boiled and then sealed up free from air, no fungus would grow. From the description given of No. 5, the object appears to be a crab which frequents fresh water pools, by name *macrura*, belonging to the general order *decapoda*. No. 4 is a bud of the sweet pepperbush or white alder, the *clethra alnifolia* of Linnæus. It is a shrub, from three to ten feet high, growing in wet copses, from Maine to Virginia, near the coast. In July and August, it is covered with handsome fragrant blossoms.

A. S.—Potter's clay, but not perfectly free from uncombined silica.

## COMMUNICATIONS RECEIVED.

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

On Butter. By J. A. V.

On Railway Religion. By J. P.

On Tracks in Sandstone. By A. M. B.

Also enquiries from the following:

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

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal" which is specially devoted to such enquiries.

Correspondents in different parts of the country ask: Where can I obtain a lead-burning apparatus? Which is the best college whereat to study architecture? Who makes heavy spiral springs? Where can I get headstocks for lathes? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

[OFFICIAL.]

# Index of Inventions

FOR WHICH

**Letters Patent of the United States**

WERE GRANTED FOR THE WEEK ENDING

## October 21, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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## APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

26,902.—PLANING MACHINE.—S. S. Gray, January 7.
26,906.—STITCHES.—A. F. Johnson. January 7.
26,914.—CLOTHES WRINGER.—R. O. Meldrum *et al.* Jan. 7.
26,919.—REPEATING FIREARM.—W. H. Morris *et al.* Jan. 7.
26,942.—CAR SEAT.—T. T. Woodruff. January 7.
26,948.—SEWING MACHINE.—A. F. Johnson. January 7.
27,008.—FINISHING BOOT HEELS.—H. Saloshinsky. Jan. 14.

## EXTENSIONS GRANTED.

25,874.—BRONZING MACHINE.—G. H. Babcock.

## DESIGNS PATENTED.

6,962.—GRAPE ARBOR.—C. H. Crump, Boston, Mass.
6,963.—CLOCK PENDULUM.—H. J. Davies, Brooklyn, N.Y.
6,964.—BREAST PIN, ETC.—G. W. Loomis *et al.*, N. Y. city
6,965.—COOKING STOVE.—E. Mingay, Boston, Mass.

## TRADE MARKS REGISTERED.

1,503.—SAUCES.—A. P. Agresta *et al.*, New York city.
1,504.—RAZORS.—H. Boker & Co., New York city.
1,505.—RUBBER GOODS.—M. A. Cately, New York city.
1,506.—CHAMPAGNE.—Chilling worth & Son, London, Eng.
1,507.—UMBRELLAS.—A. M. Davies *et al.*, New York city.
1,508.—CANNED FOOD.—Gordon & Dilworth, N. Y. city.
1,509.—OATMEAL.—J. McCann, Beamond Mills, Ireland.
1,510.—SNAP HOOKS.—New York Wire Snap Co., N. Y. city

## SCHEDULE OF PATENT FEES:

On each Caveat ..... **$10**
On each Trade-Mark ..... **$25**
On filing each application for a Patent (17 years) ... **$15**
On issuing each original Patent ..... **$20**
On appeal to Examiners-in-Chief ..... **$10**
On appeal to Commissioner of Patents ..... **$20**
On application for Reissue ..... **$30**
On application for Extension of Patent ..... **$50**
On granting the Extension ..... **$50**
On filing a Disclaimer ..... **$10**
On an application for Design (3½ years) ..... **$10**
On an application for Design (7 years) ..... **$15**
On an application for Design (14 years) ..... **$30**