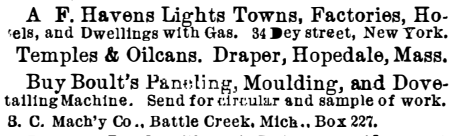

(1) J. M. says: We have attached to pipes laid in our streets for fire purposes, a steam pump, which takes water only on the upward stroke. The diameter of the water cylinder is 10 inches, and the length of stroke is 6 inches. The supply comes from a pond which is 430 feet distant, and the surface of the water is 15 feet below where the pump stands. The suction pipe is 6 inches in diameter and has three right angled turns in it. The pump works finely up to 100 revolutions per minute, but, if run faster, it pounds, and we do not get any more water. The makers say the suction pipe should be larger. I do not see it. In looking over the sizes of suction pipes used by different makers, I find none larger than 6 inches on a 10 inch water cylinder, and some use a 5 inch pipe. If the pumps need larger pipes, why do they not make the connections to them larger? I find by using a vacuum gage that this pump will create a vacuum equal to a column of water 25 feet high. Now take out the 15 feet the water has to rise in reaching the pump, and allow 8 feet to over come the friction of the pipe; we still have a head of 2 feet which (according to Box) would give an actual discharge of 662 gallons per minute, while all we get through the pump is 204 gallons per minute. There is no trouble in the pump, as the valve area and water passages are all greater than the area of a 6 inch pipe. I put a chamber on the pipe near the pump; this made it work better. We want to run the pump at least 200 revolutions, and get all the water such speed should give. There is no leak in the suction pipe. Would a pump that receives and discharges water at both strokes work any better on this pipe? A. The pump seems, from your account, to be performing very well. A larger pipe would, of course, help matters somewhat, by reducing the velocity with which the water flows through the pipe, and effecting a consequent reduction of the head. An ordinary double acting pump would probably draw more water through the present pipe. It seems as if you had taken too low an estimate of the friction of the pipe, since, if the pump is all right, the trouble must be in the pipe.

(2) J. M. asks: I have been trying to get some aldehyde ammonia (described in *Science Record* for 1872, in Liebig's process of silvering glass, as improved by R. Siemens). How is it made? A. Ammonia aldehyde is best obtained by the action of chromic acid upon alcohol. Equal weights of powdered bichromate of potash and strong alcohol are introduced into a glass flask provided with a safety tube, and placed in a sand bath; 1½ parts of sulphuric acid are gradually added by the safety tube. Much heat is produced by the mixture, and the distillation commences at once, but is continued by a gentle lamp heat under the sand bath. The vapor is conducted through the worm of a condenser, surrounded by ice water. The impure product is mixed with ether and saturated with ammonia, when ammonic aldehyde separates in fine crystals. The apparatus should be made entirely of glass.

(3) O. J. P. says: A person living three miles below Montreal wishes to draw water from the river St. Lawrence, by means of an ordinary brass pump 3 inches in diameter, with an iron pipe 1½ inches, and 200 feet long; but finding by past experience that, if he should run the pipes out into deep water, they are invariably broken every spring by the ice (which, in its yearly "shove," makes an immense pile resting on the river bottom, breaking the pipes and rising sometimes twenty feet above the water), I desire to know: 1. Could I, by placing a perforated barrel in an excavation, at a depth below low water mark, obtain water by its natural suction into the barrel? A. It would depend on the nature of the soil, and the easiest way to settle the matter would be to try the experiment. 2. For purposes of filtration, would it do to surround the barrel by a row of brick placed without mortar, then by another row of brick around and at about six inches from the former, and finally fill the space between the two rows of bricks with wood charcoal? Would there be any danger of the brick preventing the water from filtering through it, from the closing of its pores in the course of time? If, in making the excavation or hole, I should meet with a soapy kind of clay very usual on the northwestern shore of this river, and commonly called blue or red clay, might I expect that the water would filter through such clay? If it should so filter, would this water be pure and the same as the river water? If this plan would not do, would you be good enough to suggest another? A. It would not be necessary to have the brick wall. Use two barrels, putting the filtering material into one, and letting the water run into the other. The water would probably not filter through the clay. 3. How do you determine the right size of an eduction pipe of a force pump, say a common force pump of 3 inches bore with an induction iron pipe 1½ inches in diameter and 200 feet long, 20 feet above the water level, the reservoir in the house being at about 20 feet above the pump? Must I use 1¼ or 1½ inches for this eduction pipe? A. Use pipe suitable for connection on the pump. 4. I am to build a screw which will work under water by the force of the stream or current, which runs at the rate of about three miles an hour. This screw will be connected with two small submerged brass pumps, by means of gearing, to force up water for house or manufacturing purposes. The screw would be made of iron, 3 feet in diameter, making 5 revolutions to each stroke of the pump. The pump would be 2 inches diameter and 6 inches stroke, or 3 inches diameter and 6 inches stroke. Will this do? A. An undershot wheel would answer better. The plan is old, and not very efficient.

(4) L. L. asks: How can I determine accurately the strength of alcohol? A. Determining the purity of alcohol is what is known as alcoholometry. For the purpose of ascertaining the quantity of alcohol contained in a fluid which consists only of alcohol and water, the areometer is generally used. It is an instrument very similar to the hydrometer. The areometer of Tralle and that of Richter are most generally used. Stoppini's is similar to that of Richter. Both are centesimal alcoholometers and show, by the number of the degree to which they sink, the percentage of pure alcohol. The difference between these two instruments consists in that the areometer of Tralle indicates the percentage of volume, and Richter's by weight. The specific gravity of pure or absolute alcohol is 0·793, water being unity.

(5) J. L. C. asks: 1. How can I make a cheap and reliable rain gage or measure? A. The rain gage or pluviometer ordinarily consists of a cylindrical vessel closed at the top by a funnel-shaped lid, in which there is a small hole through which the rain falls. At the bottom of the vessel is a vertical glass tube, in which the water rises to the same hight as inside the rain gage, and is measured by a scale placed on the side of the vessel behind the tube. 2. Will a glass funnel inserted in a bottle or jar, placed in an open space, correctly indicate the amount of rain that falls? If the wind blows so that the rain falls slantingly, will it be a true criterion? A. Yes, to both questions; but not so accurate as the one just described.

(6). A. F. O. asks: 1. In the Leclanché battery, would not platinum or platinized silver be as good as the carbon plate? A. No; but copper might be used but for its greater cost. 2. What is the use of the peroxide of manganese? A. The manganese peroxide, if saturated with the solution, increases the resistance of the battery. 3. Why must the fluid extend from one half to two thirds the way up the jar and no farther? A. To aid in the oxidation of the carbon. 4. What is the light yellow efflorescence that appears around the top of the porous cup? A. It is due to impurities. 5 I keep a Leclanché element ready for occasional and irregular experiments. As it is perfectly convenient to remove the zinc when the battery is not in use, would it not be better to do so? Or is there absolutely no change or waste going on when the circuit is not closed, although the zinc is immersed in the fluid? A. The zinc rod should always be thoroughly amalgamated in which condition it suffers no alteration whatever. 6 What are the chemical reactions of the battery? A. The carbon is oxidized by the manganese, in which state it combines with the liberated ammonia to form a carbonate. 7. It is a general truth that electrical work in batteries is in proportion to the amount of zinc consumed. I have a Leclanché cell with a zinc exposure of but 5 square inches, that is doing more work than a Daniell of 50 square inches; and a similar disproportion between work and zinc seems to exist between the Leclanché and all other forms of battery. How is it accounted for? A. In batteries in which the zinc is the positive element, the work is proportioned to the zinc consumed; but in the Leclanché cell, the conditions are reversed, the carbon being positive and the zinc negative.

(7) W. H. McC. asks: How can I magnetize a compass needle? A. A steel needle may be readily magnetized by placing it in connection with one of the poles of a strong magnet for a short time. The finer the quality of steel, the stronger will be the resulting magnet

(8) A. S. G. says: In connection with answer No. 18 on p. 187 of your current volume, my experience with a small electric machine may not be uninteresting. When attending school, I made one with a homœopathic bottle, of which the rubbing surface was not quite 2 inches. The bottle was about ½ inch in diameter. The prime conductor was of wood, covered with tinfoil and insulated by a small bottle; the rubber was of silk, stuffed with cotton, not insulated. The Leyden jars were small bottles, about 1½ inches high covered with tinfoil, and filled with small pieces of lead This machine exhibited all the phenomena presented by larger ones, of course in degree proportioned to its size, but quite as distinctly. The jars gave a spark which was like the prick of a small pin, and the spark from the battery of four was too unpleasant to be often taken. I do not know that a smaller frictional machine than this has ever been made.

(9) A. O. W. asks: Is there anything that will make spelter flow easily on copper, to braze the copper easily? A. We do not know of any method other than the application of heat.

(10) G.W. asks: Why is it that the shadow of an object from the sun grows short faster in the morning than it does towards noon? A. In the morning the direction of the sun's motion is the same as the longest dimension of the object; in the meridian it is in the same direction as the smallest dimension. A pole would project its shadow as a long line in the morning, as a mere point when the sun stood directly overhead.

(11) J. W. D. says, in answer to J. H. A., who asks: What is the force of blow from a steam hammer with a 5 inch cylinder, driven by 100 lbs. pressure on the inch, working at full stroke, stroke being 1 foot and weight 300 lbs.: Velocity of a body falling 1 foot=802 feet. 802×300=2406 lbs. force of blow without pressure. Area of 5 inch cylinder=19·635 inches. 19·635×100=19·365 lbs.+2406=4369·5 lbs. This is regardless of any weight or friction of piston. [If you multiply weight and space together, the resulting product is expressed in foot pounds. The solution of the problem requires the amount of force that, acting by a quiet pressure or pull would produce the same effect as the moving weight.—EDS.]

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

F. J. W.—It is limonite. Its composition may be expressed as $2\,Fe_2O_3$, 3HO. It contains 59·9 per cent of iron.—T. T. R.—No. 3 is a quartz rock, lying upon a bed of dark sandstone containing scales of iron pyrites. No. 4 is iron pyrites, distributed through a gray quartz rock. No 5 is a rock containing felspar, iron pyrites, quartz and hornblende. No minerals were received marked 1 and 2.—D. H. D.—It is galena.

T. H. C. asks: When were rudders first used to vessels?—L. H. C. asks: What is the proper method of curing the leaf of the tobacco plant?—A.M. R. asks: 1. From the skins of what animals is the leather, used in the dry gas meters, made? 2. Is it made in the United States or in Europe? 3. What property in gas is it that hardens and contracts common leather?—J. M. asks; How can I make virgin platinum?—H. H. R. asks: 1. What pigments are used in calico printing, to make them fast or proof against water? 2. What will make water colors waterproof on paper?

COMMUNICATIONS RECEIVED.

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

On Taps and Tempering. By T. J. B.

On the South American Boxer. By T. H.

On Lunar Acceleration. By J. H.

On the Philosophy of the Steam Engine By W. M. H.

On a Small Steam Engine. By O. B. F.

On Spiritualism and Jugglery. By C. I.

On Molecular Conditions and Spectra. By J. C. D.

On the Scriptural Miracles. By ——.

On a Grain Binder. By C. H. D.

On a Negro Inventor. By. J. S. B.

Also enquiries and answers from the following:

M. M.—A. K. S.—J. H.—A. M. P.—D. G. K.—L. M. Q.—A. L. 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.

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 enquiries analogous to the following are sent: "Who makes steel bars as substitutes for church bells? Who makes machines for making brooms, and who sells broom corn? Who sells the best earth closet? Where can soluble glass be obtained? Where are oar turning lathes made? Whose is the best book on phonography? Who publishes a book on the manufacture of flax?" All such personal enquiries 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.