B. H. can answer his query as to the size of pipe to convey water a long distance by referring to p. 48, vol. 29.—A. Y. McD will find the directions on p. 59, vol. 24, for galvanizing iron pipes sufficiently explicit.—E. F. G. will find directions for making rancid butter sweet on p. 119, vol. 30.—G. A. B. will find a recipe for birdlime on p. 347, vol. 28.—T. D. H. will find recipes for fulminating powders on p. 96, vol. 31.—L. G. D. will find ample instructions for building an ice house on p. 251, vol. 30.—C. E. E. P. can polish stones by the process described on p. 138, vol. 30. A recipe for cement for aquaria is given on p. 274, vol. 30.—G. W. H. and G. P. will find answers to their questions as to suction and siphons on the editorial pages of this issue.—C. J. C. C. should consult a physician.—F. J. B. can bronze iron pipes by following the directions on p. 107, vol. 30.—B. M. & Co. will find a recipe for preserving harness on p. 264, vol. 30.

(1) W. J. R. asks: Is there a flexible pipe made that will stand the heat and pressure of steam, say from 50 to 125 lbs.? I want it to be limber, so that a little power will bend it to any angle when the pressure is on. A. Yes. It is not very flexible; but by giving it sufficient length, it can readily be turned in any desired direction.

(2) J. F. K. asks: What is it that eats away the ends of the enclosed glass tube of a water gage? The tube was packed with rubber, and had been in about one year, under a steam pressure of 50 lbs. A. The tube presents the appearance of having been cut by sand or grit.

(3) J. E. B. asks: I am running a blast engine at a furnace. Four cylindrical boilers, 60 feet long by 30 inches in diameter, in batteries of two boilers each, furnish the steam. There is a steam dome on each set, the domes being connected by the main steam pipe that goes to the engine. One of the batteries became charged with electricity. I opened a brass drip cock that was in the pipe upon the boilers, and left it open until I got the steam turned on. When I went to shut it, I felt a prickling sensation in my fingers, and opened it again. When I placed my finger within ⅛ of an inch of the cock, I could feel it very plainly. Can you explain it? A. It probably occurred from the friction of the water, contained in the steam, against the sides of the orifice.

(4) J. B. S. says: Our safety valve is 4¼ inches diameter; it weighs 5 lbs., lever weighs 5 lbs., and the weight is 75 lbs.; the distance from valve stem to weight is 11⅓ times the distance from valve stem to fulcrum. At what pressure should it blow off? A. If it works freely, it should blow off at about 67 pounds. 2. The engine is double, the cylinders being 12x24 inches, with a spur wheel (on crank shaft) of 2 feet diameter, geared to a wheel of 8 feet diameter. How many revolutions to the minute should this engine run without injury, working at 75 lbs. steam to the square inch? A. From 60 to 70. 3. We have two boilers set side by side, with 2 inch feed pipe, with check valve at the muddrum of each. Our steam connections are 4 inches in diameter, with a large valve on each boiler for disconnection. We have an equalizer of 4 inch pipe for water connection, with a stop valve in center. We never have any trouble with more pressure in one boiler than the other from unequal firing, when we try the water gages in one boiler, we are sure as to where it is in the other. We feed with either cold or warm, or nearly boiling water. I think if all boilers were connected in this way there would not be so many terrible explosions. A. This is a very good arrangement, and we are much obliged to you for the description. As to strength of boilers, see 193, vol. 29.

(5) G. H. A. asks: Will Babbitt metal make a good piston, if melted and run in a brass cylinder? A. Not very. Your other questions have been repeatedly answered in these columns.

(6) J. B. H. asks: How is the fine wire, of which a mile weighs only a grain, drawn? A. It is enclosed in a mass of other material, and the two are drawn together into wire, after which the casing is dissolved by a chemical preparation.

(7) H. A. T. says: I have an engine 12½x36 inches stroke. I run it without a balance wheel. It has a direct connection of valve stem to eccentric. What lead should it have, and at what point should the cut-off be? A. Give the valve ¼ of an inch lead, when cold. The point of cut-off will generally be regulated by the pressure of steam and the work to be done.

My railroad has a curve in it, about 10 feet in 100, 100 feet long, and then there is 100 feet of straight line. What is the best mode of running on the track so as to get the car round the curve? A. The tracks of street railroads have many such curves, and special appliances are used, which you can obtain from a manufacturer.

(8) C. J. B. asks: What is the process of gumming the parts of a newspaper together, to make it into book form? A. It is done by a machine which folds the paper and at the same time applies paste at the back of the leaves.

(9) E. T. C. says: I wish to put up a lathe for turning hard wood, such as oak and ash, of from 3 to 12 inches in diameter. I am thinking of having two pulleys on the mandrel. Of what diameter, and how broad on the face should they be? A. You can make one pulley 6 inches, and the other 4 inches in diameter. The face of each should be 2 inches. 2. What width of rubber belt should I use? A. Two inches. 3. How many revolutions per minute should the work make? A. From 500 to 800 revolutions per minute. 4. Would pulleys built up of pieces of wood, so as to present the end of the grain to the belt, give good results? A. The pulleys will do better if turned from solid pieces of wood, or lagged and turned off after being built up. 5. How large should a steel or iron mandrel be? A. Diameter of mandrel should be ⅜ inch. 6. What horse power would it take on 9 inch work? A. From ½ to ¾ of a horse power.

(10) H. P. asks: What would be the probable bursting pressure of a cylindrical boiler 28 inches in diameter, of plates ¼ inch thick, with a single row of rivets? A. See p. 193, vol. 29.

Does sharpening cotton gin saws aid in the cleaning of the seed, or does it only increase the speed of the gin? A. Speed is the more important item. The saws do not require to be very sharp.

(11) F. R. M. asks: Will you please give directions and formulæ for designing a good turbine water wheel of the vortex or central discharge kind? A. There have been volumes written on this subject. You will find it ably treated in Rankine's, Fairbairn's, and Weisbach's works. It is entirely too comprehensive for our columns. Moreover, if the best proportions were definitely fixed, there would be no more competition between water wheel manufacturers.

(12) D. asks: Can a band of steel, ½ inch broad and of sufficient thickness to sustain a strain of 150 lbs., be used as a belt on pulleys 4 inches in diameter? A. A piece of the best saw steel, about 1-40 of an inch thick, might answer, but it would be liable to break.

(13) D. M. says: I want to build a small furnace for melting iron. Of what size should it be to work properly? Would a furnace of 12 inches inside diameter and 36 inches high be large enough to make good sound castings? A. The above dimensions will probably give good results. 2. I have read that melting iron on a small scale is never successful. What is the trouble? A. Very small masses of iron are apt to oxidize quickly, which causes the difficulty. 3. What sized of fan blower, with 4 fans, running about 2,500 revolutions per minute, would be required for the above mentioned furnace? A. A blower 9 inches in diameter will do, if properly constructed.

(14) E. D. P. asks: How can I tin gray iron? A. Clean the pieces thoroughly, cover them with a solution of sal ammoniac, and dip them into melted tin.

(15) J. W. S. asks: 1. How many strokes does the sickle or knife make to one revolution of the ground wheels of an ordinary mowing machine? The one which I am planning makes 128 strokes to one revolution of the ground wheels, and works the gear wheels by a screw. A. The speed of the knives is proportioned, in a good mowing machine, to the speed with which the machine advances. 2. Is the machine that makes the most strokes of the knife generally the best? A. Not necessarily.

(16) J. L. G. asks: 1. A saw mill is drawn by a portable engine of 25 horse power. The flues in the boiler leak badly on some days, and on others they will not leak at all. Sometimes the water will stand in the ash pit in a considerable quantity. Is such a boiler safe? A. We would like to have further particulars in regard to this case, such as kind of feed water used, and whether the tubes leak by fits and starts, or after blowing down or cleaning the boiler. 2. How often can the flues in a boiler be upset with safety? A. The tubes can be upset as long as there is enough material left, and sometimes a ferrule can be forced into the end with advantage. 3. The boiler is calculated to carry 100 lbs. steam: is it dangerous to run with 50 or 60 lbs. of steam on? A. If you have a good pump, and are careful, the boiler is not particularly dangerous on account of the leaky tubes, nor would it be unsafe to run the engine as suggested.

(17) W. asks: Why is it that, if you take two musket balls (both alike) and two similar charges of powder, and load them into two guns, one rifled and the other a smooth bore, the ball from the rifled barrel is thrown with so much more force and precision than the ball from the other? A. The greater precision of the ball from the rifle is due to the rotary motion which is imparted to it, and its greater force is probably due to the decrease of windage, and the greater pressure exerted by the exploding powder upon it.

(18) M. B. asks: How can I dye wood black? A. Boil ½ lb. chip logwood in 2 quarts water, add 1 oz. pearlash, and apply hot with a brush. Then take ½ lb. logwood, boil in 2 quarts water, and add ½ oz. verdigris and ½ oz. copperas; strain, and put in ½ lb. rusty steel filings, and with this go over the work a second time.

(19) C. E. E. P. asks: How are carbon plates made for galvanic batteries? A. The carbons for Bunsen's battery are made as follows: The fine dust of coke and caking coal is put into a close iron mold of the shape required for the carbon, and exposed to the heat of a furnace. When taken out, the burned mass is porous and unfit for use; but by repeatedly soaking it in thick sirup, or gas tar, and reheating it, it at length acquires the necessary solidity and conducting power. The carbon that forms on the roof of gas retorts is harder and better than the carbon thus made but it is difficult to work, and the supply of it is limited.

(20) A. B. C. asks: Can more than one wire be supplied from an intermediate battery, all the wires being through wires? For instance, two or more wires work from New York to Philadelphia, with a main battery at Trenton; can both or more lines be supplied without dividing the battery? A. They cannot. An intermediate battery constitutes a portion of the main circuit, and connecting in another wire would have the same effect as crossing the wires.

(21) S. W. says: A few days ago, on examining one of our fire alarm boxes, I found lumps, or solid crystals, of sulphate of copper adhering to the kerite insulation of the wire inside the box. The box is some four or five squares from the office. I am positive the crystals were not on the wire when it was put in the box. The question is: How came the sulphate there? A. It was probably placed there at some subsequent time by some one having access to the box, for the purpose, perhaps, of exciting your curiosity.

(22) J. O'C. and others.—Belts will move towards that part of the pulley where the radius is the greatest.

(23) J. E. H. asks: How can I silver plate a watch case or other articles? A. Place the articles in a bath consisting of two grains of cyanide of silver and two grains of cyanide of potassium in every two hundred grains of water. Connect the zinc poles of a battery of three or four cells to the article to be plated and the copper pole to a piece of silver, which is also plunged into the bath. The passage of the current decomposes the salt, deposits silver on the object, and causes the dissolution of an equal quantity of metal from the silver electrode. The time required for the operation depends on the thickness of coating required.

(24) J. F. A. asks: How many feet of silk covered wire, and of what size, is required for the secondary coil of an induction apparatus capable of producing an inch spark? What is the length of the primary coil? Will the ordinary soft iron of commerce do for the core? A. An induction coil of that capacity would require about 40,000 feet of silk-covered copper wire of 0·0055 inch diameter, or No. 26 Birmingham gage, for the secondary coil. The primary coil consists of two layers of copper wire of 0·1 of an inch diameter or No. 12 Birmingham gage. Ordinary soft iron of commerce will answer very well for the core, but Norway iron is the best for this purpose.

(25) F. C. B. asks: How is an induction coil arranged so that the drawing out of the core increases the strength? How is a coil arranged so that a tube enclosing the coil regulates the current, drawing it out increasing, and pushing it in decreasing, its strength? A. There is no arrangement whereby the withdrawal of the core can increase the inductive effect of a coil. A primary coil when enclosed in a brass tube loses its inductive effect upon the secondary coil, because the induction currents circulate within the tube instead of passing into the secondary coil. By drawing the tube out, and leaving the primary coil within the secondary, the currents circulate in the latter, and thus the inductive effect is increased in proportion as the tube is removed.

(26) C. D. C. asks: What are the characteristics of the Leclanché battery? Is it as intense as the Grove? A. The Leclanché element consists of a zinc rod in a solution of ordinary commercial sal ammoniac; the negative pole is a prism of carbon, tightly packed into a porous vessel with a mixture of peroxide of manganese and carbon, in the form of a coarse powder. The zinc unites with chlorine, forming chloride of zinc, while ammonia is set free at the negative electrode. Its electromotive force is 1·48 volts, while that of a Grove is 1·9 volts. There is no waste of material when the Leclanché battery is not in action; and if the evaporation of the liquid is prevented, it may be allowed to remain untouched for months without losing power. It is, therefore, admirably adapted for working telegraph wires where the open circuit is used, and where the telegraph is not in constant use, as well as for electric bells. When placed in short circuit, it polarizes very quickly, and is therefore not adapted for working local circuits, or for working ordinary main line telegraph circuits on the American closed circuit system.

(27) L. V. R. asks: How can ivory be made ductile, or be reduced to the consistence of putty, so that it could be worked into any desired form? A. Soak it in a solution of pure phosphoric acid, and it will become flexible. Exposure to the atmosphere will harden it, but it may be made again pliable by immersion in hot water.

(28) R. N. asks: Does the 11 seconds of lunar acceleration, per century, mean a total acceleration of 11 seconds in that period, or that the lunar month is now 11 seconds shorter than it was a century ago? A. The total secular acceleration of the moon's mean motion amounts to between ten and eleven seconds per century. See Herschel's "Outlines of Astronomy," pp. 412-419. Lunar perturbations are almost numberless, and are compensated. The retarding influence of the ether of space must be immeasurably small.

(29) C. S. O. says: I have some photographs, the faces of which are somewhat marred; they look as if they had been piled together before the varnish had dried, and then pulled apart. How am I to make them appear all right? They are perfectly new. A. For restoring the surface to photographs, etc., if the scratches do not go through the albumen, wax them. Formula: Dissolve 1 oz. white wax in 2 ozs. turpentine by a hot water bath. Add a few drops oil of lavender which facilitates the solution of the wax, and neutralizes the odor of the turpentine. This has the consistence of butter. On an imperial sized photograph, take a lump the size of a pea, and, with cotton flannel, rub it over the print. Burnish with a clean piece of flannel. This gives a high polish.

(30) N. S. asks: What is put inside casks to prevent alcohol from soaking into the heads and staves? A. Dissolve in a water bath 1 lb. leather scraps and 1 oz. oxalic acid in 2 lbs. water, and dilute gradually with 3 lbs. warm water. Apply this solution to the inside of the barrel, where (by oxidation) it will as