

J. M. C. asks: What work gives the best information on the working and setting of slide valves so as to obtain the best results? A. Auchincloss on "Link and Valve Motions." We have never seen the other work you mention.

F. A. M. replies to J. H. M., who has difficulty in firing his boiler with sawdust: I have been firing under boilers, very similar to yours, but not so large, in a steam saw mill. I burned all the sawdust that was made. The chimney is sheet iron of 18 or 20 inches diameter, 60 feet high; the furnace was not intended for burning sawdust; but as the draft is very strong, it burns freely. In places where a strong draft cannot be had with a chimney of that height, 10 or 15 feet should be added, with about 1/2 more grate surface than for wood; and if the grate bars are cast in half cylinders of 6 inches diameter, fully of 1/2 or 3/4 inch holes, and the sawdust thrown in moderately, with no and then a piece of slab, I think you will find no difficulty in burning the sawdust. The furnace does not need to be any different in construction (otherwise than having more grate surface) from ordinarily built furnaces, unless the sawdust is so wet and the draft so poor that it would be necessary to use the wet tan furnace. 2. You say in answer to a correspondent that the S shape of a pipe between a steam governor and boiler is to hold water; is it absolutely necessary that it be bent at all? I see that the gage will work when there is nothing but steam in the pipe; but have not had time to experiment on it. A. 1. These remarks about burning sawdust will probably be very useful to many of our readers. 2. The object of having water in the pipe is to prevent the heating of the spring of the gage, which is apt to become injured if the steam is brought into direct contact with it.

M. H. says: I wish to place a fountain in front of my house, to throw a jet 3 or 4 feet high. How can it be worked? A. Probably your simplest plan will be to have a tank in an elevated position, such as the upper part of your house, to supply it.

P. & B. say: In a worm wheel and worm, the worm to be 8 1/2 inches on pitch line, and the wheel to be 30 inches diameter, with 4 inches face and 1 inch pitch. The tops of the teeth and bottom space are to be circled for worm to fit. Small sized wheels are made in this way, but we think it impossible to make so large a one as this. What do you think? A. It depends entirely upon your shop facilities.

L. C. D. asks: "What do you mean by the mean pressure in pounds per square inch, in calculating the power of steam engines? A. The steam pressure in a cylinder ordinarily varies at different parts of the stroke, and the mean pressure per square inch during the stroke is the mean of all these various pressures.

T. C. H. asks: 1. How can I explode four blasting charges, placed 3 feet apart, at a depth of 12 feet, simultaneously, using either powder or duallin? 2. Will you give me a recipe for making and using duallin for blasting rock? 3. How many tons of gold and silver quartz will four stampers crush per day of 10 hours? 4. Is copper found in any kind of granite rock? A. 1. If you use powder, you must arrange the trains or fuses so that they will all explode at the same time. If duallin is used, it can be exploded by electricity. 2. Duallin is made from paper stock, saturated with nitrate of potassium, and dried in a furnace, then ground and mixed with nitro-glycerin. 3. They are made of different sizes. By writing to a manufacturer, you can obtain full information as to capacity. 4. We think not.

F. W. H. asks: How should files be properly tempered? A. In tempering files, it is necessary to make some provision so that the delicate teeth shall not be injured by the heat. The following method is frequently employed: The files are covered with some sticky substance, and drawn through common salt. They are then heated, until the salt just begins to melt, when they are plunged into cold water. This is an operation requiring care and experience, as the file is apt to become bent. It is finally cooled in oil, to prevent rusting.

F. B. asks: Do you know of a standard work on windmills? Could I construct a small one to drive a circular saw about 14 inches diameter? A. You will find information on this subject in Fairbairn's "Mills and Mill Work," Professor Rankine's "Steam Engine and other Prime Movers," and Weisbach's "Mechanics and Engineering."

A. C. asks: What would be the value of a two carat diamond? A. It is difficult to give a general price for diamonds, as they vary much in quality. A good diamond weighing one carat, will cost, perhaps, two hundred dollars; one weighing two carats, from six to eight hundred dollars; three carats about one thousand dollars. We recently saw a very beautiful diamond, weighing nine and a half carats, which was valued at ten thousand dollars.

J. A. H. asks: How much engine power shall I require for a boat 28 feet long, 7 feet wide, to draw about 2 feet of water? I want to run it at 12 miles per hour. A. Probably from 25 to 30 horse power.

J. T. C. asks: What are the advantages or disadvantages connected with the use of superheated steam? A. Nearly any standard work on the steam engine treats of the subject. We could not discuss the matter intelligibly in this limited space.

J. R. asks: What would be a perpetual motion? Some say it is a machine that runs for ever without repairs, and others that it is a machine that creates its own power by itself, and starts itself. A. A perpetual motion machine, in the common acceptation of the term, is a contrivance that contains its motive power within itself. For instance, if a lathe, that was formerly driven by an engine, should suddenly start up without any assistance and continue to move, that would be a veritable case of perpetual motion.

J. B. B. asks: 1. What are the objections to using hydrocen, with or without oxygen, as a substitute for coal gas for illuminating purposes? 2. Does the gas produced by the decomposition of water by means of magneto-electricity contain an approximate equivalent of the power expended in producing it, in light, or potential power, if used in a gas engine? A. 1. We do not know of any objection to its use in connection with oxygen. Used by itself, it lacks illuminating power. 2. Yes.

W. L. B. asks: What will be the force be square inch upon a water pipe when the motion of the water is instantly stopped, the pipe being horizontal, 50 feet long and 2 feet in diameter, and filled with water under a pressure of 50 pounds per square inch, moving at the rate of 2 feet per second? What will be the force of the shock, if the water is instantly stopped, in pounds per square inch? A. Disregarding friction, the shock at the bottom of the pipe will be the same as that given by a trip hammer moving with the same velocity, and having a weight equal to the weight of water in the tube plus the weight due to the additional pressure of the water.

C. O. says: A friend has a mining operation in his control, which is now run by a twelve horse steam engine, which hoists a bucket of ore, weighing 600 lbs., 200 feet to the surface: it also works a lift pump rod 200 feet. He is going to sink the shaft 100 feet, making the total depth 300 feet. In discussing the feasibility of the 12 horse engine to perform the extra work, it was claimed by one of us that the extra work to be performed by the engine is merely the weight of the extra 100 feet of wire rope attached to the ore bucket and the extra weight of raising the 100 feet of water in the pipes, and that the engine would not feel any greater strain on its ability to do the work than it has at present. The other party claims that if it takes 12 horse power to raise 600 lbs. ore 200 feet, and to pump 200 feet water up through 200 feet of pipe, it will necessarily take 50 per cent more, or 18 horse power, to raise 600 lbs. of ore 300 feet, and to pump the water 300 feet. It was agreed to submit it to your decision, and to abide by it, the loser to pay one year's subscription to your journal. A. The very important question of time seems to have been lost sight of in this question. If 50 per cent more work is to be done in the same time, it will take 50 per cent more power, but if the work is to be increased 50 per cent, and the time is increased in the same proportion, the original power will suffice.

J. T. asks: 1. What is the best packing for a piston rod? The engine runs 120 revolutions per minute. 2. What makes a safety valve hang or stick, and prevents it blowing off? It is set to blow off at 100 lbs., but does not do it. If I push it up a little, it blows off right. A. 1. Probably an ordinary packing obtained from a reliable manufacturer will work satisfactorily. 2. From your statement, it would appear that the weight is not properly adjusted, since by raising the valve a little, you increase the area upon which the steam acts.

S. F. H. says: It is said that the same amount of water will drive a water wheel more powerfully in night time than in day time. Is it so? If so, why? A. We have never seen this statement verified.

J. S. P. asks: How can I season staves in a short time? A. There are quite a number of methods for seasoning timber rapidly, acting either on the principle of removing the sap, or forcing in some chemical that will coagulate the albumen. Creosote is used in England to a considerable extent.

J. E. B. asks: 1. Is it practicable to use the slide rest of a small lathe as a plane for light small work, brass and steel, by means of a tool set perpendicularly to the bed of the lathe? All motions of the lathe are given directly by hand. 2. Would such occasional use be apt to overstrain or rapidly wear out the feed screw, or the nut of the slide rest through which it passes? A. Such work is occasionally done on lathes, but it is apt to injure the slide rest.

R. M. R. says: I have an engine of 2 x 4 inches, set up to run a 10 inch swing lathe, and a grindstone. 1. Do you think the engine is large enough for the work? How many revolutions should it make per minute, and how heavy a pressure of steam will it require to do the work? 2. I have a boiler 10 x 20 inches with cast iron heads 3/4 inch thick, the shell being three sixteenths inch thick. I do not think it is large enough to run the engine, and the maker says that it would be unsafe to put tubes into the cast iron heads. Can you advise me what to do under the circumstances? A. 1. The engine might do the work, if run with a pressure of 50 or 60 lbs., at a speed of from 200 to 300 revolutions per minute. 2. Probably you cannot make the present boiler answer your purpose.

W. B. L.—To provide yourself with a mineral rod, cut a suitable forked sapling, and make it of weight and length to suit your hand. They are all alike, and are of no value.

C. M. asks: 1. What is the difference between chloride of lime and chloride of calcium? 2. What is the difference between washing soda and the soda used for making soda powders? 3. What is Spanish pepper? 4. How is gun cotton exploded? 5. What are the proportions of alcohol, ether and pyroxylin used in making collodion? 6. How is binoxide of manganese procured? 7. How can I make hypochloride of calcium? A. 1. Chloride of lime is a misnomer. It consists of a mixture of hypochlorite of lime, chloride of calcium and water. Chloride of calcium is a combination of chlorine and calcium only, without the hypochlorite of lime, which gives to chloride of lime or bleaching powder its peculiar properties. 2. Washing soda is a monocarbonate of soda, containing but one equivalent of carbonic acid, while the other, called the bicarbonate, contains twice as much carbonic acid. 3. You probably mean Molegnetta pepper, a name sometimes given to "grains of Paradise" or Guinea grains. 4. Gun cotton will explode at a heat of 300°. 5. Pyroxylin and rectified alcohol of each 1 part, rectified ether 19 parts. 6. It is an abundant mineral production, and is ground for use. 7. By passing the vapor of phosphorus over small fragments of lime, heated to redness in a porcelain tube. Use care.

T. D. McC. says: On page 385 of volume 29, you give a recipe for a fertilizer. How much should be applied per acre for potatoes; and how is it to be used, in the hill or broadcast? A. Either way, and the amount depends on the condition of your soil. Try a small quantity and increase as needed.

A. P. asks: 1. In the case of a book, what is protected by a copyright, the title or the whole mass of literary matter? 2. Must a book be completed as to printing, binding, etc., before being entered for copyright? 3. What are the conditions on which copyright protection is accorded to foreigners resident in the United States? A. 1. Copyright protects the printed matter as a whole. 2. No; only the title must be specified. 3. Authors of books, resident in the United States, can obtain copyright protection on the same conditions as citizens.

A. R. M. says that O. S., who enquired how to heat a house satisfactorily, should follow out carefully the plans and modification recommended by Rutlar in his work on ventilation. Proper heating is inseparably connected with proper ventilation. The "one large register over the furnace, which is in the cellar," should open into the hall; from the latter, transoms should be constructed so as to introduce the supply of heated air into the tops of adjacent rooms, while at the same time exhaustions should be provided below, either by means of open fire places (low down) into chimneys, or into a foul air duct running under the floors and leading to a common chimney. By this method an ample supply of pure, fresh and warm air may be obtained and a uniform temperature maintained. This plan has of late been very generally adopted in the West in new public and private buildings, and with most satisfactory results, both in an economical and sanative point of view.

W. J. asks: What are the methods of joining the rails at their ends on the best American and English railways? A. By rail joints and fish plates. Many kinds have been illustrated in our columns.

J. R. S. asks: What is the best way to smooth out engravings that have become wrinkled by being rolled and sent through the mill? A. Roll them the other way and then submit them to pressure.

W. W. says: I see you recommend your querists to use plaster of Paris for attaching the glasses of kerosene lamps to metal bases. For some years past I have used melted alum for this purpose. I put a piece of alum on to a fire shovel, lay the shovel on the fire till the alum is melted, and then apply with a thin piece of wood. It hardens in a few minutes and is far better than plaster of Paris, as kerosene will not loosen it.

G. writes to say that he has built several steam boats, and now owns one, which he considers to be nearer perfection than any he has yet seen. A description of it may answer the needs of some of our correspondents. She is built with double hull, or rather two half hulls, placed 3 feet apart and decked entirely over the space between the hulls, as well as over the hulls, on which are seats and a railing around the entire boat except the stern. The paddle wheel is between the hulls, towards the stern. The boat is very light and strong. The hulls are well fastened together, two inch beams running across both hulls, which are 35 feet long and of 3 feet beam. She is driven by a belt from a caloric engine, costing twenty cents per day to run it, and a boy 12 years old can fire up and run her. She carries, comfortably, 30 passengers; her speed is from 5 to 6 miles per hour. From this you will see that she possesses two desirable qualities in a pleasure yacht, economy and perfect safety.

M. D. asks: 1. If a cylinder 6 inches in diameter and 2 feet long (with an inch pipe attached to the bottom of the cylinder, passing thence down 20 feet below into water) be filled with steam and suddenly condensed, how full will the cylinder be of water? 2. How many cubic inches of water at 60° are required to condense a cubic foot of steam at 1 lb. pressure? 3. If a man covers an invention with a caveat and then manufactures and sells, and finds that he has a good thing, and a second party also sees that it is a good thing and manufactures and sells it, and then the first party gets it patented: Can the first party come down on the second party as soon as the patent is issued? 4. Can the first party claim that the second party infringed upon his rights, prior to the date of the patent? 5. Are small cast steel castings as strong and durable as wrought iron for trimming wood work? A. 1. We think it would be completely filled. 2. At least seven. 3. We think so. 4. No. 5. In general, no.

J. W. says: I am running two old boilers, and the steam from them enters into a boiler steam dome by means of 2 pipes. 1. I generally run them at 50 lbs. pressure by the gage on steam pipe to boiler, and my employer tells me there is only 25 lbs. on each boiler, because pipes from boiler to steam dome are double the area of steam pipe. Is he right? If a gage were placed on each boiler, would it not indicate 50 lbs.? 2. How would you fix 2 boilers so that the gage would indicate double the pressure on each boiler? 3. When my engine makes 100 revolutions per minute, with 2 feet stroke and 50 lbs. pressure, with no cut-off, how much water does she use, the cylinder being 10 inches diameter? A. 1. He is wrong. 2. You could make the gage indicate double the pressure by having a weak spring or by graduating it wrongly. 3. If the cylinder is 10 inches in diameter, and 2 feet stroke, its capacity in cubic feet, disregarding clearance, is about 1.09 cubic feet. A cubic foot of steam, at the given pressure, weighs about 0.15697 lbs. Hence, in each stroke, the engine uses about 109 x 2 x 0.15697 = 0.135 lbs. of water. This calculation does not take into account the steam required to fill the clearance spaces, and the losses from leakage, radiation and condensation.

M. says: In an inclined tunnel a full truck of wash dirt ascends while an empty truck descends. Sometimes the chain, which is attached to the whim and draws up the full truck, breaks, and consequently the truck dashes back and strikes against a stick of timber or some other obstacle underground. How can the loaded truck be prevented from running down the incline when the chain breaks? A. By having a stop arranged which will come into play when the chain breaks.

C. A. W. asks: How can I melt vulcanized rubber without injuring its qualities? A. This will have to be a matter of experiment. The vulcanized rubber can be exposed to heat in a suitable vessel without access of air. A safety tube should be attached to allow of the escape of any gas or vapor generated during the operation.

M. J. S. asks: 1. What is the proportion of mercury necessary to make a perfect zinc for a Bunsen battery? 2. What are the ingredients of hair dye? Is it injurious to the head? 3. There is a powder, sold under the name of kerosene oil rectifier, which is said to prevent the lamp from exploding or the chimney from breaking. Is it good for anything? A. 1. To amalgamate a zinc plate for a battery, wet with dilute sulphuric acid and then rub mercury over the surface till a bright coating is produced. 2. The numerous preparations sold as hair dye have generally a basis of lead or silver. Bismuth, pyrogallol acid and certain astringent vegetable juices are also sometimes used. When properly applied, we have never heard that they are particularly injurious to the hair. 3. Do not trust any powder sold for the purpose of rendering impure kerosene explosive. Buy only the best oil from the best makers. Good kerosene is not explosive and will not readily take fire. The only way to prevent lamp chimneys from breaking from heat is to see that they are properly annealed. This can be done by placing the chimney in cold water, which is to be gradually brought to the boiling point and then slowly allowed to cool, when the chimney is removed.

C. C. A. asks: 1. Are nickel five cent pieces specie? 2. Does the government issue the old fashioned five cent silver coin? 3. Of what power is the engine at the Chicago water works? A. 1. All solid coin that has passed through the mint is specie. 2. Not at present. 3. Probably over a thousand horse power.

L. F. J. asks: Are eye stones alive or not? My opponent claims that they are, because some will move while others will not, and I claim that they cannot be alive, for the reason that the treatment they undergo, being taken from the open air and corked in airtight vessels, is in opposition to every law of animal creation. The particular ones under discussion have been kept corked up in glass bottles for over thirty years. A. Eye stones are simply bits of smooth pebbles, and when placed in the eye, are made to move about by the involuntary motions of the eyeball. Any specks in the eye stick to the stone when they come in contact with it. There is no more life in the eye stone than in any other piece of rock.

C. W. H. asks: Suppose a section of exhaust pipe be made of alternate joints of charcoal iron and common iron will the charcoal last longer than the common iron? If so, why? A. Probably the charcoal iron, being more homogeneous, will last the longer.

X asks: How can I make a spectroscope? I have a double convex lens, a flint glass prism, and an achromatic telescope with a glass 1 1/2 inches in diameter. Will the lens and telescope answer? If so, how shall I arrange them with regard to the slit, etc.? A. You can make a spectroscope with one telescope, but it will not be a very efficient instrument. We advise you to look up the subject in some standard work, such as Ganot's "Physics."

D. N. B. asks: Is there a small water wheel built to use as little as 8 gallons water per minute? A. You can easily make one of tin.

O. C. H. asks: How can I gild letters on marble? A. Apply first a coating of size, and then several successive coats of size thickened with finely powdered whiting, until a good face is produced. Be sure to let each coat become dry, and rub it smooth with fine glass paper before applying the next. Then go over it thinly and evenly with gold size and apply the gold leaf, burnishing with an agate. Several coats of leaf will be necessary to give a good effect.

W. W. asks: When were the first iron vessels built? A. The first iron vessels were three steamers, built for the trade between Liverpool and Glasgow, by Mr. William Fairbairn, in 1830-31.

J. A. V. says, in reply to several correspondents who have asked about echoes in buildings: It has been mentioned in the SCIENTIFIC AMERICAN that echoes in rooms were prevented in England by stretching wires across the room, 6 inches apart. Our judiciary tried it in the county court room, but failed, as the distance between wires was at least 4 feet. It is very probable that, at 6 inches and in a horizontal zone, as you suggest, the vibration of the wire will stop the reverberation from the ceiling; but it will not prevent the horizontal reflection against side walls and the surfaces opposite and to the rear of the pulpit. The remedy in this case is to raise the seats gradually as in the parquets of theaters, and have the rear seat at least as high as the mouth of the speaker. A simple remedy, for a plain meeting room, is to canvas the walls and ceilings on half inch strips of wood, and paper them in imitation of fresco. The window glass opposite the speaker should be covered with shades or blinds.

H. G. C. says that C. M. A. will find that one great cause of the unsteady flame in his German study lamp will be that burned particles of wick adhere to the edge of the metallic rim which surrounds the flame and the one which is inside the wick. These particles flame up and go out with great rapidity and often make the light useless. The rims must be cleaned frequently. Another reason is that sometimes the waste oil fills up the cup at the bottom, cutting off the supply of air. Good chimney, clean lamp, and evenly trimmed wick will give good light if the lamp is all right.

J. H. P. says that J. F. W., who asked how to straighten vulcanite squares, should warm them carefully and place them between two perfectly smooth surfaces, applying considerable pressure, and leave them till cold. If the surfaces be true, the squares will be true also.

C. H. H. says that J. K. W., who has difficulty in using sawdust as fuel, should build his furnaces after the following plan: Space for cold air to enter each furnace, 20 x 28 inches. Space between boilers and bridge wall, 10 inches. Size of smoke stack for each boiler, 22 inches x 36 feet. Do not fill up the chamber behind the bridge wall.

J. B. says, in reply to C. R., who asked as to a race between the Niagara and the Agamemnon: Such a race took place the morning after the first Atlantic cable parted. The accident occurred about 3 A. M., a little after sunrise. "We all started back to England; at 12 M. we could just see the Agamemnon's topsail yards above the horizon astern."

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

C. C. A.—The mineral enclosed is iron pyrites or sulphide of iron; of no value unless found in large quantities. Pyrites is so called from a Greek word meaning fire, because it will strike fire with steel.

C. R.—This mineral is a mixture of two ores of copper. The green colored portion is the carbonate of copper, and the dark bronze parts the sulphuret of copper. We cannot give its relative value without particulars as to location and accessibility.

O. D. asks: What is the doubleroyal cubit of the Temple of Karnak?—T. G. asks: Can you inform me how the chocolate colored stain is produced on Swiss wood ornaments?—E. L. A. asks: How can I reduce bone to a plastic state, and what will bleach it so that it will look like ivory?—A. R. asks: Is there anything that will make cotton goods take dye as readily as silk and wool do?—J. A. F. asks: How can I whiten piano keys?

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 Sore Throat Remedy. By S. C. E.
- On Mysterious Rappings. By A. F. C.
- On Ignition by Compressed Air. By C. C. A.
- On Red Ants. By A. S.
- On Ventilating the Senate House. By W. McK.
- On Animal Electricity and Magnetism. By J. H.
- On Friction Gears. By B. N. O.

Also enquiries from the following: A. C.—T. G. V.—T. B. W.—T. W.—W. M. D.—J. C. C.—T.—N. L.—H. H. T.—J. M.—O. R.—G. W. K.—W. H.—J. H. C.—J. M. F.—C. S. N.—C. H.—G. W. M.

Correspondents in different parts of the country ask: Who makes metal mail boxes, to put on gate posts, etc.? Where can pin-making machines be obtained? Who makes the cheapest and most durable local telegraph battery? Where can I obtain a small printing press for amateur use? Who makes machinery for blocking tin and galvanized iron, for cornices and other ornamental work? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

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.