P. E. McK. will find a recipe for cement for china on p. 346, vol. 24.—H. H. R. can dissolve rubber by the process described on p. 363, vol. 3C.—H. E. M. and C. W. will find a recipe for blacking on p. 73, vol. 26.—W. B. M., C. D. A., and others who ask as to books on technical subjects should address the booksellers who advertise in our columns, for catalogues.—M. D. will find directions for tinning brass on p. 60, vol. 29.—W. J. can lacquer brass by following the directions on p. 409, vol. 30.—W. G. B. will find that the calcination of plaster is described on p. 399, vol. 29.—E. H. will find excellent directions for making sidewalks on p. 353, vol. 24.—J. L. B. and others are informed that the tunnage of the Great Eastern is 27,000 tuns.—G. W. C.'s question as to firing a moving gun has often been discussed in our columns.—J. W. should consult a manufacturer of turbines.—E. H. S. can polish stones by following the directions on p. 138, vol. 30.—B. F. G. does not state what the trouble is with his engine, and should consult an engineer.—J. W. H. will find on reference that we have frequently given rules for the areas of steam ports, which have been determined by extensive practice.—W. R. will find a description of the process of enameling iron vessels on p. 149, vol. 28.—W. T. H. will find a recipe for ink on p. 106, vol. 27.—L. N. E. will find directions for making a cheap telescope on p. 7, vol. 30.—F. B., who asks as to backing a train up an incline, does not give his name and address.—A. D. will find a recipe for making root beer on p. 138, vol. 31.

(1) W. H. S. asks: Is there any material other than plaster of Paris that will receive the fine lines of shading in electrotypes and retain them, to cast metal in, or is there any way of preparing plaster of Paris so that it will be hard and smooth enough for that purpose? A. We do not think of anything that will answer your purpose as well as plaster of Paris, which is commonly used. Try solution of alum in place of water.

(2) F. W. asks: 1. How can I measure the pitch of a propeller wheel? A. See p. 240, of this issue. 2. What size of wheel is suitable for an engine 12x12, for a tug boat, and what size of boat would be best for such an engine? A. Wheel 4 or 4½ feet in diameter, with a 6 to 7 foot pitch. The boat should be about 70 feet long.

(3) H. C. W. says: I recently saw a luminous fountain, light being reflected through the water. How was it constructed, and does it need the electric light to produce the effect? A. The apparatus is what is known as a vertical lantern, and may be constructed as follows: Into a small metallic box, open at one side, is placed a mirror at an angle of exactly 45°. The mirror should exactly fit the case, slanting from the upper left hand side to the lower right hand side, and facing the open side of the box. Into the top of the box is fitted a plano-convex condensing lens. The lantern is placed in the fountain, and the light from outside is thrown upon the mirror, which reflects it up through the condenser and so illumines the fountain. It is not necessary to use the electric light, as the lime light will fully answer the purpose; though the illumination will not be quite so brilliant, still it will be much more steady.

(4) J. B. G. asks: How can I make music by rubbing the fingers on the top edges of goblets? Will common glass do it? A. To produce the sounds you describe, select a large goblet, uniform in thickness and as thin as possible. Fill it, say, one third full of pure water. The glass and finger must be perfectly clean and free from grease. Dip the second finger in the water and immediately apply the under surface of the last joint to the upper edge of the glass, moving slowly around or to and fro with a somewhat firm pressure; to keep the finger and glass wet is essential to the success of the experiment. The vibrations produce a continuous monotonous sound, which may be varied by increasing or diminishing the quantity of water in the goblet.

(5) L. B. says: The entrance door of my dwelling is flanked by two cast iron columns 13 feet high and of 1 foot diameter; and finding that my two compasses and my galvanometer were inaccurate, I approached these columns with the compass and immediately the compass turned in such a way that it verified Oersted's law, showing the columns to be north at the base and south at the top. Then I found that the three hinges inside of the door were permanent magnets, and also that the large iron stove in the middle of the room (with the vertical pipes) was a magnet. Would it be possible to use the large magnets for experiments, and would they be strengthened by connecting them with a battery? A. The pillars, standing perpendicular to the earth, become polarized by its inductive influence. Their magnetism, however, is extremely feeble, in comparison with their dimensions. The cases cited are not an exception. We would not recommend the use of a battery in connection with the pillars, for the reason that such pillars (cast iron) when once magnetized could not be readily demagnetized, retaining for a time sufficient residual magnetism to endanger delicate pieces of mechanism (such as watches, etc.) by inductive influence.

I have made a magnet of nine plates of sheet iron 6 inches long and ½ inch broad, bent in the form of a horse shoe. The plates are covered with a thick wire. This magnet has only half the power of a solid magnet. How could I make it more powerful? A. By the passage of the current through the wires, every plate is converted into an individual magnet; and, as in this case, like poles are opposed to each other, the effect, if the plates were exact duplicates, would be *nil*, or nearly so.

(6) S. J. C. asks: What is your opinion in regard to bone dust and superphosphates for raising fruit, particularly berries, on sandy soil? I have muck and land plaster. Would it be advisable to compost the bone dust with either or both of these articles, or would superphosphate be better? A. If you use muck and land plaster, it would be better to use with them superphozphate instead of bone dust. The muck should be drawn out in the fall and allowed to stand in a heap one winter before using. The proportion of superphosphate used is optional, depending upon the soil, the time of year, etc. A good work to consult is "Agricultural Chemistry," by Johnson.

(7) J. B. T. says: A friend received an eagle that had been winged. The bird at time of reception answered fully the naturalist's description of the gray eagle. The next year, one white feather appeared where beak and feathers unite. The white has continued to increase each year, and for several years the bird was an unmistakable American or bald eagle. The time of transformation occupied perhaps eight or nine years, during which I frequently called attention to the subject. Are naturalists not a little at sea in this matter? A. The grey eagle (*haliætus albicilla*) is an inhabitant of Greenland, and (according to Baird) has never been found in any more southern locality on this continent. Your specimen is undoubtedly the bald eagle (*haliætus leucocephalus*) which, when young, has its entire plumage (including head and tail) dark brown; which changes to white as to head, tail, and upper and under coverts.

(8) A. S. D. says. In theory a hundred horse power engine would raise 3,300,000 lbs. of water one foot in a minute of time. Will you be kind enough to inform me what is the best result accomplished in practice with piston engines and pumps, and whether a greater percentage is obtained by rotary engines or not? A. The best results obtained with direct acting steam pumps, at a test made at the American Institute Fair in 1867, was an efficiency of a little more than 52 per cent of the power applied. A test of centrifugal pumps at the same place, in 1872, gave, as the best result, an efficiency of 68½ per cent. The tests of the two kinds of pumps, however, were conducted in such a manner that they are not strictly comparable.

(9) J. H. B. asks: Is there any known preparation that will effectually remove freckles without injury to the skin? A. There are several varieties of freckles. Your best plan would be to consult a physician, who can determine what is the best method and the best lotions to use.

(10) W. J. D. says: On p. 138, vol. 31, I find it asserted by V. A. that a supposititious ball dropped down through a conjectural hole to the earth's center would "oscillate for ever from end to end of a diameter of the earth, provided that frictional or retarding media, such as air, etc., be excluded." A friend, with whom V. A. interchanged speculation, contended that "the ball, on arriving at the earth's center and losing its weight, also loses its momentum, and will come to rest without passing the earth's center." You "incline to V. A.'s opinion." If we suppose the earth to be a hollow sphere, and admit V. A.'s conjecture that the ball's momentum will carry it beyond the earth's center, the ball would be acted on by two forces, namely, its weight, or disposition to return to the earth's center, and its inertia, or tendency to keep on moving from it. Having passed the earth's center, a point might be reached where the two forces are equal, and the result then would be the rotation of the ball about its axis and its revolution around the earth's center; in other words, the law of the centrifugal and centripetal forces, which keeps the planets in their appointed orbits, would operate on the ball. We know that the tendency of the earth to fall toward the sun is counteracted by its rotation, which is the tendency to fly from the sun. Is it not analogical to suppose that the disposition of the ball to fly from the earth's center, checked by the inclination to return to it, would practically operate to produce rotation and revolution? A. The velocity acquired by the body in falling to the center of the earth, under the supposed conditions, would be just sufficient to carry it through to the other side, overcoming the attraction towards the center. When it reached the other side, it would come to rest, and then the attraction would cause it to return to the center. This is not an analogous case to that of the motions of the planets in their orbits.

(11) F. D. X. asks: In a cellar under a house there is a well about 16 feet deep, situated about 4 feet from the corner of the house. I want to conduct the water from the well to back part of house, to a pump. Pump is about 40 feet from well. How can it be done? A. Use a good house pump, with pipe suitable for its connections, and be careful to make all the joints of the suction pipe tight, and lay it with as few bends as possible.

(12) W. C. asks: Is the forward eccentric of a locomotive placed in an opposite position to that in which the back eccentric is placed? A. No.

Is the cylinder of a Baxter engine placed within the smoke box or within the boiler? A. In the boiler.

Can I enter a machine shop as a machinist after two or three years' study at Cornell University? A. Probably you would have to accept a subordinate position at first.

(13) C. H. M. asks: What composition is used in metallic cartridges, to make them take fire when struck? A. A mixture of equal parts by weight black sulphuret of antimony and chlorate potassa is used for the purpose of discharging ordnance by means of a percussion tube placed in the touch hole of the gun. For this purpose also a mixture of amorphous phosphorus and chlorate of potassa is used. The needle gun cartridge contains a mixture of chlorate of potassa and black sulphuret of antimony, or a compound containing fulminate of mercury. The following is a good preparation: 16 parts of chlorate potassa, 8 black sulphuret of antimony, 4 flowers of sulphur, 1 charcoal powder, are moistened with either gum or sugar water and about 3 drops nitric acid are added. In this country either the above or a mixture of chlorate of potassa and amorphous phosphorus are used.

(14) G. M. says: 1. In looking over the sizes of the Birmingham wire gage, I find that there is no common difference between the various numbers of that gage. How were these different sizes obtained originally? Were they just fixed on by haphazard, or is there a formula given, by which, if any one size be known, any or all the other sizes may be obtained? A. The gages appear to have been fixed at random, as you suggest, and the extensive use of the English gage in this country is no doubt due to its earlier introduction 2. Would it not be better to have a wire gage with a common difference between the numbers, say the 100th part of an inch, or some such number that any ordinary mechanic could comprehend? With the gages now in use, there are few men who know exactly what any number on the gage corresponds to on the foot rule. A. There would be many advantages from the use of a regular system, such as you mention. One such plan is already adopted by many of the manufacturers in this country, who use vernier callipers, and measure their work by inches and decimals, frequently working to thousandths of an inch.

(15) N. L. asks: Which runs with the least power, a large or a small journal of equal length? Does the friction double if the size of the bearing is increased to twice the diameter? Two of us have a little dispute; one claims that if the size of the journal is increased, the friction is also increased; the other says this is not so, and quotes your article (extracted from the *National Car Builder*) on p. 258, vol. 30, being a test of car axles, one having 3¼ inches bearing, the other bearing being 3⅛. The one with the largest bearing took the least power to propel. A. If the pressure on the two bearings is the same, and is not excessive in either case, and both are equally well lubricated and run at the same speed, the work of friction of the larger journal will be twice that of the other. In the experiment referred to, it is not improbable that, with the larger journal, the lubrication was so much more complete that the coefficient of friction was much less than in the case of the 3¼ journal.

(16) A. B. W. asks: How can asthma be relieved or cured? A. Consult the best regular physician in your vicinity. There is nothing in the treatment of asthma that is not known to the entire profession.

(17) E. C. B. says: It was lately stated, in a daily paper, that a goblet, perfectly sound in appearance, full of water, was placed on a table about two feet under a gas burner, by a girl who came in to light the gas. With one hand still resting on the goblet, she turned the stopcock with the other, allowing the gas to escape for an instant. Then, touching the match, the gas flashed, and the goblet instantly flew to pieces. Can such an accident be possible? A. The tale bears evidence of being more wondrous than true.

(18) F. W. M. asks: In bringing water from a spring where the descent will be gradual for the entire distance, would anything be gained by starting from the spring and running a few rods with a larger pipe than would be used in the remainder of the distance? Would any more water come through a half inch pipe if the first few rods were ¾ inch pipe, than would come through if the entire course were only ½ inch? A. There would be a slightly increased delivery by the adoption of the larger pipe; but it would probably be very slight.

(19) F. S. C. asks: Is water compressible at 35° Fah.? A. Slightly.

Are there any jig saws which move the board being sawn, automatically, to cut out the patterns? A. No.

Are there any engines with more than two cylinders? A. Yes.

Of what is tobacco composed? A. Some of its constituents are: Nicotine, nicotianine, resin, albumen, gluten, gum, nitrates, salts of potassium, woody fiber, water, and ashes.

What is the size of the largest engine in the world? A. Cylinder about 108 inches by 14 feet stroke.

(20) S. H. R. says: I have some old gold, taken off a cane head; and inside, the gold is covered with soft solder. What will take it off? A. Hold it over a hot gas or alcohol flame, sufficient to melt the soft solder but not to affect the gold. When the solder is about melted, give the head of the cane a quick jerk, when the solder will all drop out.

(21) T. O. Z. asks: Is the gas from a gasoline machine more unhealthy to burn than city or coal gas? A. It would be necessary to have the gases analyzed, and see which contained the greatest amount of incombustible matter, before this question could be answered.

(22) F. E. says: In your patent law book it is stated: "When the air is exhausted from a pump tub (usually done by means of a piston), the pressure the atmosphere will cause the water to rise in the tube to a hight of 30 feet." 1. Would another arrangement, something like a blacksmith's bellows, fixed on the top of the tube, withdraw the air out of the tube and consequently raise the water? If so, what should be the size of the bellows in proportion to the tube? A. Yes. Proportion of bellows to pipe should be about the same as that of a common pump. 2. What force (given in pounds) would be required to withdraw the air out of the tube in this way, in proportion to the weight of water thus raised? A. The work would be the same as that required to lift the weight of water in the pipe to the required hight. 3. Does the water rise as quickly as the air is exhausted? A. Yes. 4. Would there be any difference in regard to the size of the pump tubes? A. It would take longer, with the same apparatus, to exhaust the larger of two tubes.

(23) B. says: I have a cloth awning which has been in use two years. This summer, small black spots began to appear on it and holes appeared in the center of each one, making the awning look as if a lot of scattering shot had been put through it. The spots seem to be caused by a rotting of the cloth, which breaks away easily. How can I stop it? A. If not too late to save it, try the plan of soaking it in strong brine.

(24) U. H. says: I want to make a collection of insects. How must I prepare them? Must the box I put them in be airtight? A. The necessary information required by you can be obtained by consulting "Packer's Guide to the Study of Insects," or J. G. Wood's "Insects at Home."

(25) E. H. M. says: Spirits, such as Holland gin and Scotch and Irish whiskey, if allowed to remain in the original cask for 6 or 12 months, becomes tinged or colored from the wood, which deteriorates the market value, perfectly white being the desirable hue. What, if anything, will remove the objectionable color without deteriorating its value? A. The color is an amber tint obtained from the cask, which we were not before aware affected the value of the spirits. The astringent properties are also increased by the same means, but we know of no method to make the liquor colorless, except re-distillation.

(26) M. F. M. asks: Is there any instrument wherein the magnetic needle is replaced by other means, equally effective and not subject to local attraction? A. No.

(27) J. J. S. asks: Can I use a portable engine, of a small size, for heating a store room 30 feet square by steam, and also run the engine for half an hour per day? A. The boiler of a portable engine is not usually very efficient, except with the forced draft due to the blast. A boiler made especially for heating purposes would probably answer better. Subscriptions to the SCIENTIFIC AMERICAN are received every day in the year.

(28) I. T. H. asks: Will the United States government register foreign built iron or wooden ships? Are there any lines of ships (trading to England) built in England, owned in America by Americans, and registered in America? A. No foreign built vessel can be registered in the United States. There are some steamship lines that are largely owned in this country, but the vessels sail under a foreign flag.

(29) J. asks: How can I build an ice house to hold eight tuns of ice? A. Erect a building above ground 17 feet square on the exterior; make an interior compartment in the center of the same 6 feet square on the inside thereof; make both the interior and exterior walls 12 inches thick, by setting up 2 by 10 inch studs, about 2 feet apart in the interior walls and 3 feet apart in those of the exterior, and then cover the exterior and interior of each wall with one inch boards with tight joints, if tongued and grooved so much the better. The outside frame will require a foundation 3 feet deep in the ground; therefore excavate the interior and make the floor of the ice house say 2½ feet below the surface of the ground. Make the hight on the interior 8 feet in the clear above said floor, and construct a strong level ceiling of boards secured to proper crossbearers. Then fill in the two frames with dry saw dust between the interior and exterior boarding, and lay similar filling upon the ceiling boards to a hight of 12 inches. Pave the floor with cement concrete graded lowest at the center, and provide a good drain to carry off the water. Put a high pitched ordinary roof over the ceiling, and provide a tube from ceiling to exterior of roof for ventilation of interior of ice room. Make exterior and interior doors in these walls, lined with canvas and filled with sawdust. Fill the interior chamber with the ice, laid upon a few rails to keep it from the bottom, packing close in very cold weather, and throw water upon it occasionally to freeze it together. You will then have a cube of ice of 7 feet, which will contain something more than 8 tuns, and which will have the protection of a 3 feet air chamber or passage all around it. This 3 feet chamber will be your cold closet, in which you can preserve your meats etc., in summer, care being taken to have the door to it opened as little as possible. This also answers E. S.

(30) J. A. H. asks: What will save clothing from moths better than gum camphor or cedar wood? A. There is nothing better.

What will remove (without injury to the skin) the small worms or black heads in a person's face? A. "The treatment requires the employment of such means as are calculated to stimulate the skin gently, and excite it to the due performance of its proper functions. The parts affected should be saturated with soap and thoroughly washed; they should then be rubbed briskly with a rough towel, until the skin be felt to glow, and this should be repeated twice in the day. The immediate effect of this treatment may possibly be a red and patchy state of the skin, which will speedily pass away It would be well also to extend the ablutions and frictions to the entire body, for the appearance of the disease in one part is indicative of a generally torpid action of the skin. Cold bathing and sea bathing are beneficial. In severe cases, bichloride of mercury in an emulsion of bitter almonds has been used.—*Wilson "On Skin Diseases."*

(31) A. L. D. asks: Is chronic nasal catarrh curable? A. Sometimes it is cured. Consult Niemeyer's "Practical Medicine," vol. 1, pp. 286—282.

(32) A. P. asks: How can I look at the sun with a common spy glass without hurting the eye? A. Place a disk of dark or smoked glass between two paper rings inside the eyepiece cap.

(33) C. A. S. asks: What kind of machine shop should I go into in order to become a master mechanic? Ought I to go to college first? A. Go to the one that does the greatest variety of work. Very few master mechanics, we imagine, have been through college.

(34) V. A. asks: Is the moon's orbit round the earth in the same plane as the orbit of the earth round the sun; and if not, what is its greatest divergence, expressed in degrees? A. The moon's orbit is inclined to the ecliptic 5° 8′ 48″. 2. I have heard it asserted that the moon shines with great brilliancy during the arctic winters, but fail to account for it otherwise than by a departure of at least twenty degrees in the lunar orbit from the plane of that of the earth. A. The moon's greatest distance is 253,263 miles, least 221,436, mean 233,885. The polar winter alternates with a fortnight of moonlight and a fortnight of darkness for six months.

(35) J. C. H. asks: What is the best non-conductor for filling the walls of a refrigerator? A. Air, probably.

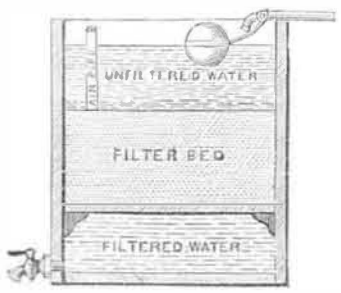
(36) E. L. M. asks: How is spermaceti purified? A. This substance occurs mixed with oil, filling large cavities in the head of the sperm whale. The oil is removed by pressure, and finally by washing in a dilute solution of potassa, and the spermaceti is obtained as a white solid, which fuses at 120° and crystalizes on cooling, in beautiful, broad, pearly plates.

(37) J. M. asks: What do actual and nominal horse power of a steam engine mean? A. Nominal horse power is calculated from assumed conditions, generally very different from the real conditions, upon which the actual horse power depends.

(38) A. B. C. asks: Is there a book that gives instructions on casting toys, figures, etc., in plaster of Paris? A. We do not know of any such work.

What is Parian marble? A. Parian marble is an unglazed statuary porcelain, similar to English porcelain, but more difficultly fusible, containing less flux and more silica. The color is a very slight yellow; the surface is waxlike.

(39) G. T. O. says: I ask your opinion in regard to the construction of a water filter, and would like to know the best possible form. I want one that will hold about 3 gallons. What shall I put in it, and how shall I place it? A. The engraving represents a very good filtering apparatus, manufactured in England; you can have one like this made of any desirable size. The best material for the box would be soapstone; the next best material, iron. Mott's cast iron tank plates come of a convenient size—18x18 inches and 9x18 inches—these may be galvanized or coated with slate paint. But Passaic water cannot be purified by filtering alone; the following (which we wrote in 1866 in answer to a correspondent in reference to the water supplied to Philadelphia) will also apply in this case: "If our correspondent is willing to take the trouble, he may obtain pure water by distilling, filtering, and aerating. Get a simple still to set on a cooking stove, and distil all the water intended for drinking, then filter it through freshly burned charcoal to remove the volatile odors that come over, and finally agitate it in the atmosphere so that it may reabsorb its supply of air to make it sparkling and palatable. A simpler process for obtaining pure water is to melt ice. This process is employed by some of the most eminent physicians in this city for their own families, to avoid the danger of lead poison from their water pipes."



(40) J. S. B. asks: Can nitric acid of a specific gravity of 1·94 be made, and would it be anything short of anhydrous nitric acid? Books of reference place the specific gravity, obtained by evaporating the acid to its greatest density, at 1·521. A. To our knowledge there is no nitric acid of so high a specific gravity used either in the arts or the laboratory.

(41) B. A. S. says: I wish to make a telescope of four joints. How long should each joint be, and what sized lens shall I put in, to see at the distance of 15 or 17 miles? What kind of material should it be made of? My object lens will be about 2½ inches. A. You will need a foot lathe with traversing mandrel, in order to chase screw threads properly in thin brass tubes. See previous answers to correspondents for construction of eyepieces.

(42) A. D. C. B. says: 1. A friend of mine says that whisky can be made without being distilled? Is this so? A. Yes. 2. Is it more unwholesome than the other sorts? A. No. All are equally deleterious.

(43) D. McD. says: I send you a plan for the multiplication of the effects of two or more air-pumps, founded on the theory that if an air pump that will exhaust a receiver to 1-100 of the density of common air be placed under a receiver, already similarly exhausted, the smaller receiver will equal 1-10,000 the density of the common air. A. We do not see that any advantage is obtained by this multiplicity of pumps.

(44) S. says: A segmental brick arched bridge of 27 feet span by 8½ feet rise is about to be erected over a creek at Poughkeepsie, N. Y.; it crosses the same at an angle of 52° 10′, making the distance on the skew about 34 feet. Do you know of any brick or stone bridges placed at or near the above angle to be built in horizontal courses or as you would build a rectangular bridge? Is it possible to build one in horizontal courses at that angle with any certainty of the arch sustaining itself for an indefinite period? A. We do not know of any skew bridges built in horizontal courses, nor is it desirable to so build them, as such construction is unscientific and without guaranty of permanence. Edward Dobson, C. E., in his "Treatise on Masonry and Stone Cutting," published by Weale, has exemplified fully the nature of the twist required in such arches. A brick arch, when oblique, as you require, would be best built by laying the courses at right angles to the sides of the centering, depending upon the latter entirely for the shape of the soffit; the strains would then be properly received upon the abutments, and the bridge would be secure.

(45) J. P. & Co. ask: What cement will do to fill a corn burr? A. Try a mixture of dust from powdered French burr stone, alum, and water. Back up the stone with plaster of Paris. Your cheapest plan, however, may be to send the stone to a manufacturer to be repaired.

(46) A. R. asks: Will coal tar applied to fence posts before setting render them much more durable? A. Yes. It will render them insect and damp proof. It should be laid on hot.

(47) L. M. says: I have a hop vine which climbs around the pole from east to west; and near by are pole beans which turn from west to east. What is the cause of the difference? A. It is a principle of plant life for plants to wind themselves upon the first means of support, the manner of which is dependent upon no known law.

Is there anything that I can use to get coal marks off my face? A. We know of no preparation especially adapted for that purpose.

What do the terms "specific gravity" and "equivalent" mean? A. Look in Webster's "Dictionary."

(48) A. F. C. says: I have a 3 inch achromatic object glass of 48 inches focus, and am desirous of constructing a celestial eyepiece of as high a power as it will stand for use in a telescope. How must I arrange it? A. Rule for Huyghenian eyepiece of any power: Divide the focal length of object glass by the power required. Quotient doubled = focus of field lens. One third of focus of field lens = focus of eye lens. The two lenses are separated two thirds the focus of field lens. Both should be plano-convex, with curved side toward objective. Eye lens should be about half the diameter of field lens. A diaphragm is placed at the focus of the eye lens. Your previous enquiry was answered on August 1.

(49) H. B. C. asks: What food gives the most nutriment to the brain? A. No one material can be considered best; that suiting at one time may not at another. That food is best for the brain which is best for the body, producing *mens sana in corpore sano*.

If heavy cannonading causes rainfall, what is the operation of it? A. It has been proved an absurdity.

Is the expression "the cold is too great for snow" true or not? A. The expression is not true, some of the heaviest snowstorms in this latitude having taken place in the very coldest weather.

(50) W. G. L. says: We are building a press; the crank shaft is 6 inches in diameter, with crank in the middle of it of 4 iuches throw. Our foreman says the key seat for the driving wheel or pinion on the shaft should be upon the same side of the shaft with the crank, as it would give advantage of leverage and less stress upon the key. I think it makes no difference. Who is right? A. It makes no difference where the key is. The key seat, however, is generally cut in such position as is most convenient to chuck the shaft to cut the key seat.

(51) J. J. S. asks: What book would you recommend for the use of a machinist, possessing an ordinary common school education? I wish to study the use of steam, especially applied to marine engines. A. Get Bourne's "Catechism" and "Recent Improvements of the Steam Engine," and Wilson's "Treatise on Boilers."

(52) G. B. Q. says: I append the principal dimensions of two pairs of compound surface condensing engines, which I will call No. 1 and No. 2. Engine No. 1 is rightly proportioned, and engine No 2 is to be built in the same proportions, with a reduction of 3 inches in diameter of high pressure cylinder, and a reduction of 6 inches in low pressure cylinder, and of 4 inches in the stroke; but it is to carry higher steam. Should all the parts of No. 2 be reduced in proportion as the cylinders are reduced, and do you consider the surface condenser for No. 2 sufficient in proportion to No. 1, the steam being condensed on outside of tubes in condenser of No. 1, and on inside of tubes in condenser of No. 2? No. 1 has the advantage of sea water at a much lower temperature, while No. 2 has river water for condenser, the difference being about 8° higher in the river.

	Engine No. 1.	Engine No. 2.
Diam. of high pressure cylinder	33 inches	30 inches
Diam. of low pressure cylinder	66 "	60 "
Length of stroke	36 "	32 "
Revolutions	56	60½
Tubes in surface condenser	3,200	1,500
Length of each tube in surface condenser	5 ft. 6 in.	7 ft.
Diameter of tubes outside ⅝ inch, inside ½ inch.		
Pressure of steam per square inch	60 lbs.	90 lbs.
Steam cut-off at	25 inches	25 inches

A. From simple examination, we should say that the proportions of No. 2 condenser are rather small, if No. 1 is just right. We think, however, that the proportions of No. 1 engine could be improved. Of course, if you think of building an engine of this size, you should entrust the design to a competent engineer.

(53) W. S. asks: What will best cement glass, so as to stand blood heat? A. Try diamond cement.

(54) H. C. N. F. and F. G. H. call attention to an error in our answer No. 28, p. 202, current volume. The speed of the boat down stream should of course be 16 miles per hour.

(55) C. I. asks: Why is not the power of air utilized? Is it not preferable to steam, cheaper, and safer? A. Air engines of any considerable power, as at present constructed, are very bulky.

Why is not electricity used as a motor? A. It is too expensive to compete with steam, on a large scale.

What has become of the one rail project for railroads? A. The inventor is, by last advices, trying to introduce this system in the South.

(56) A. F. L. W. asks: 1. How can I tell a high from a low pressure engine? A. As these terms are ordinarily used, a low pressure engine has a condenser, and a high pressure engine exhausts into the air. 2. How can I tell the horse power of any engine? A. It can only be ascertained with perfect accuracy by means of experiments. We have frequently given rules for its approximate determination.

(57) C. F. T. asks: How hot can water be heated? A. When the barometer indicates 30 inches, boiling point of water is 212° Fah. But as the pressure decreases, the boiling point of water is proportionately lower, and *vice versa*.

Which will freeze in the shortest time, hot or cold water, when both have been boiled? A. Cold water.

(58) W. L. asks: A friend and I had a dispute on the cause of the different seasons. He says that they are caused by an eccentric motion of the earth, and I claim that they are caused by the axis of the earth being inclined 23½° out of perpendicular. Who is right? A. You are right.

(59) E. B. W. asks: Into how many orders are the various curves divided, and upon what principle is the division made? Do the conic sections constitute a distinct order? What curves belong to each of the various orders? A. You will find this matter discussed in any good text book of analytical geometry. It would occupy too much space, and is too strictly mathematical to justify its consideration in these columns.

(60) R. O. B. asks: Who saved the Great Eastern during her first outward voyage? A. Mr. Hamilton E. Towle recovered a claim against the company for his exertions on the occasion of the disaster to the Great Eastern.

What is the best work on geometrica drawings? Is Rheim's book a good one? A. Professor Warren's and Minifie's books are good.

Can one of ordinary ability acquire sufficient knowledge of drawing in 6 months to be able to enter a drafting room? A. Yes, in an humble position at first.

Is there a rule by which a person can find the radius when the arc and chord are given? A. We know of none.

(61) A. R. asks: What machinery is needed to propel a boat by electro-magnetic action? A. There is no such machinery in the market. If you write to a maker of philosophical apparatus, or advertise, you may possibly be able to have a machine constructed.

(62) J. P. P. asks: Where can I get drawings of engines, low and high pressure and compound, with the details in full? A. N. P. Bergh's work on the marine engine, with appendix on compound engines, gives details of many English engines. Weissenborn's works give details of American engines, condensing and non-condensing, but not of compound engines.

(63) J. S. P. asks: What is the best mode or manner of improving the acoustics of public buildings, checking the echoes, etc.? Are wires the best remedy? If so, of what size, and how far apart should they be, in a room 79x50 feet, with a ceiling 19 feet overhead. There are 21 feet of rising seats and no pulpit; the speaker stands upon the floor., The sound of his voice echoes and reverberates to that extent that it is extremely difficult to understand a word he says. What is the scientific remedy? A. Try the wires on the vertical wall opposite the speaker; place them to run horizontally 6 inches out from the wall and 6 inches apart. If this does not sufficiently break the force of the echo, place a similar series in the two side walls extending from the back of the church where the speaker stands to the center of the depth of the building. Your ceiling is entirely too low for so large a room.

(64) W. C. says: I have a cistern in which the water smells so badly that it is impossible to wash with it or to use it in any way. My house is surrounded by water maple and horse chestnut trees. The cistern has lately been thoroughly cleaned, and has also had a bushel of charcoal put into it. A flat stone has usually covered the mouth of it, making it airtight to a certain extent; I have had the stone removed entirely, but still the water is unfit for use. Can you give me any remedy for the trouble? A. Are you sure that there is no drain that runs near it or leaks into it, or a defective cover or crown that admits of the drainage of surface water into it? Are your roofs clean and covered with the usual material? Is there an overflow pipe, and may not surface water enter by some break and obstruction in that? These points you ought to be sure of; because, if you have a clean, tight cistern properly ventilated, you ought to have good water.

(65) J. A. C. asks: In a steam hammer, what would be the diameter and stroke of cylinder, and the weight of hammer on end of piston rod, for ordinary ship work? Could I elevate the hammer by a spring pole, and use steam on top only? A. Cylinder 4 inches diameter and 12 inches stroke. Weight of hammer, 250 lbs. It would be best to raise the hammer by steam.

(66) C. W. McC.—Try a weak solution of ammonia.

(67) P. F. D. asks: How is the dull black, used for optical instruments, made? A. Dissolve a drachm bichloride of platinum in one ounce of water and add a grain nitrate of silver. Clean, polish, and warm the brass. Apply the solution with cotton wool rubbing until dry.

(68) G. W. C. says: I would like to ask H. L. M. how he could straighten a rifle barrel from the outside if the bore was not in the center? Rifle barrels are usually welded up from a flat bar with a small hole in the center, or as near the center as can be but never exactly in it. After a barrel is forged, bored, and polished, it is straightened from the inside (not outside) then a circle is struck on each end, and it is finished from those circles from end to end. Before a barrel is straightened the bore has many short crooks, some not over 3 inches long, and perhaps some less. Those crooks cannot be taken out with the wooden blocks and vise that H. L. M. tells I. G. N. to use. A rifle barrel, to shoot correctly, must be perfect for a foot at the muzzle, but it is not so important for the balance of the way. It is not absolutely necessary to have a shot gun barrel perfectly straight to make a good shooter. There is more difficulty to make a good shot gun than a good rifle. The best of gunsmiths cannot make a good shot gun every time, and they cannot tell what the trouble is

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

A. K.—No mineral has been received under this name —C. I.—Only one parasite was found in the box. By use of the microscope, it was found to resemble a common red scale bug, devoid of legs; but whether these were wanting naturally or were broken off, we cannot say. No description could be found to agree with it, and possibly it is unknown. The contents of the box were in a very poor condition when received. When Kansas and the adjacent States and Territories become as thickly settled as the Eastern States, there will be no more danger of locusts there than here.—W. A. S.—The plant or vine sent by you is the climbing wild hemp (*mikania scandens*), very common in the middle portion of the Southern States. We know of no law or rule for the direction of the spiral of a climbing plant.

N. S. asks: How can I put solder up in small bars, the size of a knitting needle, without molds? —A. D. asks: How can I make soda water?—O. C. H. says: I have a lot of shingles, with sap that turns blue, black, and green after a little exposure to the weather. How can I prevent this?—F. S. asks: How can I make black ink powder?

COMMUNICATIONS RECEIVED.

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

On Aniline Black. By M. B. C. G.
On the Texan Stinging Lizard. By T.L.W
On Type Setting Machines. By ——
On the Recent Rifle Match. By ——
On a Nut for Mr. Darwin. By J. B. H.
On Cross Cut Saws. By A. H. I.

Also enquiries and answers from the following:

J. W.—F. L. Y.—W. S.—J. S. H.—R. L.—H. H.—C. B. A.—C. D. Q.

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 the writer's address is given.