ANSWERS TO CORRESPONDENTS

W. A. A. will find directions for molding rubber on p. 283, vol. 29.—R. T. T. will find full directions for lacquering on p. 362, vol. 30.—D. T. is informed that we have repeatedly cautioned our readers against being deceived by mineral rod men.—B. F. T. will find directions for enameling cooking utensils on p. 137, vol. 27.—D. S. Jr. will find a full description of an induction coil on p. 264, vol. 25.—W. U. L. will find an explanation of an ice boat sailing faster than the wind on p. 43, vol. 28.—J. M. will find rules for proportioning safety valves on p. 363, vol. 29.—G. W. B. will find directions for repairing meerschaum on p. 202, vol. 27.—J. McD., who asks as to fulminating powder, must send his address.—C. H. C. will find an answer as to transparent colors on p. 390 of this issue.—W. C. will find directions for cleaning brass on p. 102, vol. 25. For dyeing cotton goods, see p. 405, vol. 29.—J. O'C. on the circle squaring question is right, and the "Professor" wrong.—J. B. H. will find a recipe for grafting wax on p. 345, vol. 24.

J. A. L. says: I have an engine of 24 inches stroke, with a direct acting slide valve, which cuts off at 16 inches. I wish to change it so as to make it cut off at 20 inches or at full stroke. How can I do it? A. More data would be required to enable us to answer this question. Your best plan will be to refer the matter to an engineer.

H. G. D. asks: 1. Have tubular grates, carrying a current of water from the pump to boiler through them, ever been in use or been patented? A. Yes. 2. If a tube carries a current of water from the pump of an engine through the firebox to the boiler, and the current should cease by stopping the pump, would the water divide or be driven out of the tube by the great heat, the pressure of the boiler being on the tube to the check valve below the fire? A. The tubes would soon be filled with steam.

D. asks: Why does chloral hydrate decompose the cork of the bottle? A. We have kept a large quantity of chloral for several years in a glass-stoppered bottle, which is the proper plan. With cork, it forms by decomposition certain substitution products which gradually destroy the cork.

J. B. R. asks: 1. Is there any practical method of getting an electric light of even moderate intensity without using carbon points? If there be, will you tell me where I can find a description of it? A. See description of Mr. A. Ladiguin's electric lamp, p. 337, vol. 29. 2. Can frictional electricity be induced in sufficient quantity to create light? A. Yes, but only with considerable expense and complicated apparatus, and even then the experiment is not free from danger.

A. A. asks: 1. When a person is poisoned by arsenic, what parts of the body are first and most affected, and how does this poison operate? A. It first affects the stomach, producing nausea, pain, burnings, vomitings, etc. Besides these local effects, there are others of a general character, such as general suffering, heat, and effect upon the pulse and respiration. 2. Does arsenic operate on the body in the same way that quicksilver does? A. Quicksilver is not a poison at all. It was formerly frequently administered as a purge.

J. O. R. asks: Is there any mode of intensifying one pole of a battery in relation to the other? For example, I would like to increase the attraction of the negative pole, without changing the positive. A. This cannot be done.

Y. L. asks: How can I distil water for making sensitized paper with? A. The water derived from melted ice will be sufficiently pure if you filter it.

C. S. P. says: 1. I tried making ink as per formula on p. 160, vol. 27. A druggist tells me there is no such thing as sulphate of indigo: so I dissolved indigo with sulphuric acid. Although I have used much more indigo than recommended and as little acid as possible, my ink is very pale when first used. What can I do to bring up the color? A. Your mistake was in the character and amount of the acid which you employed. Rub up in a porcelain mortar 1 oz. of indigo with 6 ozs. of fuming oil of vitriol. Ordinary oil of vitriol may also be employed to dissolve indigo, but more than double the quantity of such acid is required, and it must be heated to 130° or 140°. If a sufficient amount of acid be employed, almost the whole of the indigo may be dissolved; and if the liquid be allowed to stand for a few hours, it will remain clear on being diluted. It is then filtered, and the filtrate will be an intense blue. 2 What is white copperas, as per p. 203, vol. 29? A. Copperas, when heated moderately, parts with six sevenths of its water of crystalization and becomes grayish white This is probably what you mean, and is the *ferrisulphas exsiccata* of the pharmacopœia.

R. L. asks: 1. What amount of water must I put in aquafortis for washing down brick walls? A Four gallons of water to one of aquafortis. 2. How can I color cement to make it black? A. Try lampblack. As to power of engine, see our recent issues.

J. E. B. says: I have a small stationary engine, 2x4 inches. The cylinder heads are ¼ inch thick, and the crank shaft is ⅝ and 1-16 inch in diameter. The steam chest and cover are held on by four ¼ inch bolts. The steam chest is about 2x3 inches, the cover being 3-16 inch thick. Would the above engine bear 120 lbs. steam and give power enough to drive a small road steamer by gearing from crank shaft to driving shaft? A. The engine is rather light for such work; but if it is well built, it might answer.

J. J. asks: Can two boilers of different size and style be set beside each other, connected by the water pipe and steam pipe, and have the water always at at the same level in each? For instance, take one boiler of 50 inches diameter with 80 three inch tubes, and one boiler 44 inches diameter with 2 ten inch flues. Will the boiler which generates steam most rapidly force the water from itself to the other? A. The arrangement might possibly be made by very careful management, but it would be very dangerous, and should on no account be permitted.

B. R. asks: How can I propel a boat for hunting wild geese (boat is 12 feet long) without causing disturbance enough to scare the geese before getting within gunshot? A. Use a propeller about 10 inches in diameter at least. It would be necessary to hang it under the boat, so as to get sufficient immersion. If you build such a boat, we are sure that our readers will be interested in hearing of the result.

S. H. P. says: 1. Two locomotives that will pull 20,000 lbs. each are hitched together and started in opposite directions. What is the strain on the shackle between them? A. 20,000 lbs. 2. Which engine will pull the greatest load, one with 4 drivers with 18 tuns on drivers, or one with the 18 tuns on 2 drivers? A. If the weight is properly distributed in each case, there will be no difference in the tractive force. 3. Will an engine weigh any more pulling than not pulling, providing she pulls on an exact level with her cylinders? A. No.

R. & W. T. asks: Is there any way to render paper permanently translucent or transparent without the use of grease or acid? A. We know of no way of doing this.

T. asks for a recipe for covering the inside of iron water pan in a house furnace. By the evaporation of water by heated air, oxidation is carried on very rapidly, and the pan becomes caked and filled with rust, which, if the water happens to be impure, emits a foul odor. A preparation that could be laid on the inside of the iron pan, and not be itself affected by the action of heat or water, would be of widespread benefit. A The lining which is generally used and answers these requirements is a lining of porcelain. See p. 187, vol. 27.

M. says: In your answer to R. J. H., No. 21, you say: "Electricity is a motion transmitted from particle to particle of the wire." This might seem probable where only an ordinary Morse circuit is worked, but when a wire is duplexed, that is, worked with Stearn's duplex instruments, in opposite directions at same time, how is it possible? A. Various theories have been advanced; but the fact of the matter is that until the exact nature of electricity is known, all such questions as yours will have to remain unanswered.

C. E. T. says: A mirror displayed one morning an unusual phenomenon. Its surface was embellished with a crystalization of some volatile substance, which was deposited on over half its area, and which resembled the frost on the window panes. There are no sinks or drains from which gases might arise in the room. Several rooms in the building contain similar mirrors, but only mine shows signs of the deposit. A. The surfaces of some specimens of glass are more hygroscopic than others, and it might have been due to the condensation upon such a surface, the form of the apparent crystalization having been determined by some structural peculiarity of the glass.

E. J. W. asks: 1. In your opinion how long would a plate of pure cast zinc, one fourth inch thick, last if exposed to the elements? A. Very many years. 2. Is the coating of oxide formed by the atmosphere a perfect protection from the elements? A. It is generally regarded as excellent, but we have no authority for stating that it is perfect. 3. Is the oxide soluble or insoluble in water? If insoluble, will it oxidize deeper after the coating has once formed? A. Some samples of oxide of zinc are sensibly soluble in water, others are not, according to the method of their production. However, water never dissolves more than a millionth part of its weight. 4. Has pure zinc ever been known to rust? A. It oxidizes when exposed to a moist atmosphere. 5. When exposed to the elements, which is the most enduring, silver or zinc? A. Silver is not oxidized at any temperature either in a dry or moist atmosphere; zinc is. 6. Will pure zinc ever change in color after it has become exposed to the atmosphere and become fully oxidized? A. It should not do so.

H. L. asks: What is indigo, chemically? A. Indigo consists of a number of substances: 1st, mineral matters of various percentages; 2d, indigo glue; 3d, indigo brown; 4th, indigo red; 5th, indigo blue, or indigotine, $C_{16}H_{10}N_2O_2$, the peculiar dye material for which the indigo is valued.

E. asks: What is the best battery for using on the animal organism, as in cases of poisoning? A. Batteries alone are not used for medical purposes. You had better use a small coil.

J. A. R. asks: Will the lye from wood ashes lose any of its soap-making properties if left several days before using? A. No, especially if not exposed to the air.

T. O. T. asks: Can you tell me of some simple method of exhausting the air in a small chamber 6 inches by 6, fitted with two airtight faucets, one on each side? How can I compress into the same chamber two or more atmospheres? A. There is no simpler method than that of using an exhausting and condensing air syringe.

W. P. B. asks: 1. Where can I send and get samples of the different woods? A. Not offered for sale; collected and prepared by private collectors. 2. Can you tell me a good work on fossils? A. Dana's "Manual of Geology" contains the best general account of fossils, and the volumes devoted to palæontology, of the various geological surveys of the States and Territories, the best particular descriptions. 3. Can you name any work on derivative woods? A. None having this title. 4. Can you give me the address of Dr. I. I. Hayes, the arctic explorer? A. We believe it is Philadelphia, Pa. 5. For what and how is gun cotton used? A. Gun cotton is advantageously used in blasting, being exploded by the electric spark. Also as a substitute in some cases for fulminating mercury in gun caps, when mixed with chlorate of potassa. 6. Was the steamship President, which was wrecked in 1841, an American or an English vessel? A. American. 7. Are the lumps and bogs in wet places the result of deposit? If not, what causes produce such formations? A. Deposition of silt, and the accumulation of vegetable growth in suitable places. 8. Can you name a work on the stuffing of birds and animals? A. See the instructions published by Smithsonian Institution. 9. In putting up alcoholic specimens, is pure alcohol used? A. Yes.

N. A. S. asks: How can I bleach wood tar? A. Wash repeatedly with caustic soda, water, and oil of vitriol.

M F. J. asks: Can you give me a recipe for dissolving copper wire in some kind of acid? A. Dissolve 1 lb. of copper in 2½ lbs. of strong nitric acid, which has been previously mixed with 3½ lbs. of water. On crystalizing out the resulting body, you should obtain nearly 3 lbs of nitrate of copper.

C. M. asks: Is there any substance which can be poured into a type metal mold, get hard, and have the same color as ivory? A. To liquid chloride of zinc of 50° to 60° Baumé, add 3 per cent of salammoniac then add zinc white until the mass is of proper consistence. This cement may be run into molds, and when hard becomes as firm as marble.

J. F. B. says: 1. I have contended with many friends in Nevada that the liability to frost at any time during summer, near the streams, is mainly due to the lands being saturated with snow water, and not unfrequently overflown. I find by experiment that the water flowing down these valleys always maintains its level from one side of the valley to the other, no matter how wide; and I also find that there are veins below the surface of the lowlands which convey the water from the streams or main channels to all points in the valleys, according to its level in the streams. If we dig for water, a half mile or more from the stream, we are always sure to find it when reaching the level with the main stream, and this water will rise and fall as the stream rises and falls; and these streams are exceedingly crooked, consequently the water passes off slowly, very frequently overflowing its banks. Now I argue that, if these streams are straightened, the water would pass off more rapidly and not fill their channels by four or five feet, thus leaving the lands high and dry, allowing them to become naturally warmed by the heat of the summer's sun; while the frosts, with the damp and chilly nights, would disappear, and the lands become more adapted to the cultivation of tender plants; but at present, these lands, rich with alluvium, are always during the summer months saturated to their surfaces with snow water; and farming is not a success in consequence of frosts. I am speaking more particularly of the valley of the Humboldt; and I also maintain that these lands, drained as aforesaid and warmed by the genial rays of the sun, would not be frozen by the influence of the surface irrigation. Are those ideas in accordance with scientific principles? A. Your ideas seem entirely reasonable. 2. In drinking anything hot, we naturally suck wind into the mouth and swallow; does this wind assist in filling the stomach? If so, then we cheat ourselves of half our meals. A. The wind goes into the trachea, not into the œsophagus. 3. If the dead were each incased in an airtight sarcophagus, and buried, would not the process meet the demands of those who are becoming alarmed at the present system of burial? A. No. 4. Is there any book or series of books published which contains the constitution and codes of all the different States in the Union? A. We know of no book of this kind.

B. L. asks: What ingredients shall I use with lime to color a new brick wall before tuckpointing it? I want the color of the best red brick, to retain its color and not wash off in a wet climate. Can such a composition be made without lime? A. Take a light colored cement and stain it with Spanish brown or Venetian red, or with a little of each, to produce a color to suit; if too dark, mix with lime to make it lighter, and apply as a wash. But this will give a rough application suitable for rear or side walls only, and hardly fine enough for front.

J. P. S. says: 1. I am running light machinery with rented power; the main shaft is driven by a 40 horse engine and makes two hundred revolutions per minute. I use a three inch belt from a 20 inch pulley on main shaft to a 15 inch on my countershaft, and I have plenty of power. What size of engine would I require to drive my countershaft? A. If you are using all the power transmitted by the belt, it would be well to put in at least a three horse engine; an answer of this kind must, however, be very indefinite, as an actual test is the only sure guide. 2 What is the new steam hammer at Woolwich, England, used for? A. For forging guns and armor plates 3. Is there any kind of acid that I could soak garden peas in to kill the bugs and not destroy the growth of the peas? A. We do not know of any. 4. How can I soften bone so as to cut it easily, and so that it will get hard again? A We do not think that it can be done with ordinary bones.

R. D. B. asks: 1. Is there a saving of steam by just opening the throttle valve enough to let the engine run at full speed, or is it better to open it wide? The engine has a governor. A. If the governor controls the speed of the engine just as well with the throttle wide open, there will be little, if any, difference. 2 How can I make a red or brown paint for steam pipes, that will not burn off? A. There is a very good material for such purposes called black varnish, made from petroleum, which can be purchased ready for use.

B. asks: What is the cost of building a first class Pullman palace car? Has a car already been built at a cost exceeding $50,000? A. We believe the average price ranges from $30,000 to $35,000. The most expensive car of which we have heard costs about $50 000.

W. J. R says: 1. I have always had a taste for machinery and mechanical engineering; I have studied several books pertaining directly to these subjects, as well as understanding geometry quite thoroughly, and algebra as far as cubic equations. I am now trying to get into a machine shop as an apprentice, believing that the theoretical knowledge I can gain from books, backed by the practical, obtained in the shop, will fit me much better for a mechanical engineer than the former alone. Would you advise me to do as I propose? If not, what course do you think I should pursue? A. We think that your plan is a very good one. 2. What are the best works to perfect me as a mechanical engineer? A. We can recommend all Bourne's works on the steam engine. You should also have a good work on physics, such as Ganot's or Deschanel's, and a reliable treatise on workshop practice, such as Knight's "Mechanician and Constructor," or the "Machinist's and Millwright's Assistant." You will also need a work on drawing.

T. H. C. asks: Can you give me the actual number of pounds of power which constitute a horse power? A. The horse power of an engine or a machine is a unit, originally adopted by James Watt, and now generally accepted by engineers. It is the amount of work required to raise 33,000 pounds one foot high in one minute, or, as it is commonly stated, a horsepower is 33,000 foot pounds. 2. Is there any given number of pounds, tested by dynamometer, that will equal the actual power of the horse? A. A. See p. 320, vol. 28.

G. D. R. asks: 1. Would there be a gain in power in making a three cylinder steam engine, by putting the three cylinders equidistant in a circle and attaching the piston rods to the same crank? A. Such an engine is manufactured in England, and has been described in our columns. See p. 291, vol. 29. 2. Is there any simple test for detecting adulteration of linseed oil? A. It should have a specific gravity of 0·9395, at 55° Fat.

V. says: Let there be given two boilers, A and B. A has two cylinders attached to it, the diameter of each of which is 6 inches. B has one, of which the diameter is 8·486 inches. All other things being the same, would a combination of the power of the steam that issues from the cylinders of boiler A be less, equal to, or greater than the power of the steam that issues from the cylinder of boiler B? The areas of the two cylinders of the boiler, A, taken together, are just equal to the area of the cylinder of boiler B. A. If you mean to ask which will use the most steam for a given power, the single or the double engine, we would say the latter.

B. F. W. says: A friend of mine built a mill with an overshot wheel 18½ feet in diameter; and instead of running the water over it in the ordinary way, it comes to the top of the wheel and makes a half turn, thus running backward or toward the flume instead of running from it. Is there not a loss of power in running it in this way, by suddenly changing the course of the water? If so, how much? A. There is a loss of power corresponding to the loss of velocity occasioned by the turn.

G. D. F. asks: How can I raise a quarter ounce weight half an inch high, by mercury or alcohol put in a bottle or a tube? A. We do not get a very clear idea of what you mean. If you intend to have the weight suspended by a cord over a pulley, some mercury or alcohol can be attached to the other end of the cord, to raise it. By means of a bent tube, the weight placed in one leg can be raised by the preponderance of mercury or alcohol in the other leg.

N. O. B. asks: 1. Has the magnet ever pointed due north? How much does it vary now? A. The variation differs, and is constantly changing at different points of the earth's surface. There are points in which there is no variation. 2. Is there any person who makes a business of making poetry, and where can I find him? A. We think that the editor of nearly any paper devoted to general literature can give you the address of a number of such persons. 3. Is there any pump that will pump water enough to drive itself? A. No.

W. D. S. sends an insect which has excited considerable curiosity, as to its origin and what it eventually turns into. It was first seen in a small stream of clear water, which runs only in wet seasons. The insect looked like bright red blood; but on close inspection it proved to be a small worm. The worms accumulated until there was a mass which sparkled and glistened in the sun. I cleaned out the stream, but the next day another mass had accumulated. They are constantly in motion in the water; and when out of it and left dry, they soon die. I send a sample in a bottle. A. The insect is a specimen of *canthocamptus*, a genus of *entomostraca*, of the order *copepoda*, and family *cyclopidæ*. Characteristics: Foot jaws small, simple; inferior antennæ, simple; ovary single. Four species, one aquatic, three marine. *Canthocamptus minutus:* Thorax and abdomen not distinctly separate, consisting of ten segments successively diminishing in size, the last terminating in two short lobes, from which issue two long filamente, slightly serrate on their edges; antennæ short, seven-jointed in the male, nine in the female; inferior antennæ simple, two-jointed, the first joint with a small lateral joint, terminated by four retæ; feet, five pairs. Common in ditches, color reddish, length about 0 66 inch. "Micographic Dictionary," Griffith & Henfrey. Dr. Parnell states that the Lock Leven trout owes its superior sweetness and richness of flavor to its food, which consists of small shellfish and *entomostraca*. These animals abound in both fresh and salt water. The ova are furnished with thick capsules, and imbedded in a dark opaque substance, presenting a minutely cellular appearance, and occupying the interspace between the body of the animal and the back of the shell. This is called the ephippium. The shell is often beautifully transparent, sometimes spotted with pigment; it consists of a substance known as chitine, impregnated with a variable amount of carbonate of lime, which produces a copious effervescence on addition of a small quantity of acid; and when boiled it turns red, like the lobster. Sometimes it consists of two valves united at the back, and resembling the bivalve shell of a mussel; others are simply folded at the back, so as to appear like a bivalve, but are really not so; or they consist of a number of rings or segments (*c. minutus*, for instance), All the *entomostraca* are best preserved in a solution of chloride of lime.—(Hogg's "Microscope," pp. 557, 558, 559.) Not useful for a coloring matter.

W. F. M. asks: Why is it that in some steam engines the eccentrics are set in such a manner that, when the full throw of one is up, that of the other is down; and in others again, when the throw of one is up, that of the other is half way? A. When the eccentrics are set with centers opposite, generally one is for moving the valve when the engine is going ahead, and the other is for the backing motion. When the center of the eccentric is 90° away from the other, the second eccentric ordinarily moves the cut-off valve.

J. H. asks: What are the objections to the caloric engine? A. It is too large and heavy, on account of the low pressure generally employed.

W. B. asks: What is used to fill and make cast iron smooth before painting? A. It is generally sufficient to give one or two coats of red lead.

R. F. B. says: I wish to build a sail boat for use on a small pond, where there are some spots of low water. Which will be the best, a centerboard or a keel boat, and of what dimensions shall I make it? I want it about 16 feet long and to be a swift runner. How shall it be rigged and of what shall it be built? A. We would recommend a center board boat, cat-rigged, from 6 to 7 feet beam.

J. L. K. asks: Which runs the easier, a wagon with 4 foot wheels or one with 3 foot wheels? A. The former.

C. W. K. asks: How can I calculate rolling friction, for instance, the resistance to the movement of a car wheel on the track? Is there any work which treats on this subject? A. It must be determined by experiment. See Morin's "Mechanics," Clarke's "Railway Practice," Pamborn's "Treatise on the Locomotive," Colburn's "Locomotive Engineering," and the scientific periodicals.

R. J. J.—You do not send sufficient data. The best waterwheels utilize about 75 per cent of the power applied by the water.

E. W. A. asks: Why is the name live oak applied to the tree of that name? A. The name of live oak was no doubt applied to this tree on account of its great durability, as the following quotation from Downing's "Landscape Gardening" (6th edition, p. 126) shows: "The live oak (*quercus v rens*). This fine species will not thrive north of Virginia. Its imperishable timber is the most valuable in our forests; and, at the South, it is a fine park tree, when cultivated growing about 40 feet high, with, however, a rather wide and low head. The thick oval leaves are evergreen, and it is much to be regretted that this noble tree will not bear our northern winters."

C. R. P. asks: What is the power of a steam engine with cylinder 16 inches in diameter and 24 inches stroke, with steam at 30 lbs. per square inch, slides cutting off at 9 inches, and running at 75 revolutions per minute? A. As we have frequently pointed out in former replies, questions of this nature cannot be answered with any degree of certainty, unless further data are given, that can only be determined by experiment. For instance, in the present case, although the pressure of steam in the boiler is 30 lbs., we can only guess at the initial pressure in the cylinder; and although the point of cutting-off is given, we cannot decide, except by experiment, whether wire-drawing also takes place. Lastly, we can only estimate the back pressure. If the case is of much importance, you had better call in an engineer.

T. J. says: I have a small bath boiler, 10 × 36 inches, to run an engine 1½x3 inches; the fire is below one end and the heat goes up around the boiler about half way. A coal fire will run the engine slowly, but a wood fire increases the speed to about double that of the coal. I would like to know how to fix it so as to run the engine with a coal fire. It can be done by bricking the boiler in and exposing almost all of the surface to the fire; but that is not practicable in this case, as the boiler is in the third story. The engine exhausts into the chimney and is about 5 feet from the boiler. A. We do not understand whether or not you are troubled about the draft. If not, it might be well to raise your grate. If the draft is bad, probably there is something wrong with the chimney, or the manner of connection.

P. S. asks: 1. What can I saturate or paint a cubic foot of 1¼ inch boards with, to make it much harder and durable for iron to rub against? A. Timber impregnated with corrosive sublimate, resinous matters, or creosote is said to be harder than before. 2. Will it do to have a cistern sunk in the cellar of a house for holding the water from the roof, without damaging the water? Of course, I will have a drain for the overplus. A. Such cisterns are very common. 3. Is the water from felt roofs fit for drinking and cooking purposes? A. Yes. 4. Which is the cheapest and best for a siphon to be used for water for drinking and cooking purposes? A. Galvanized iron will answer very well.

C. McC. says: I am running an engine in a mine; the boilers are 2,500 feet from the engine. We have lately covered our steam pipe from boilers to engine; it takes the same pressure at boilers to do the work as before we covered pipe. J. C. thinks I had ought to run with less steam on account of the pipe being covered. I claim that it makes no difference as to pressure, but that steam can be made and kept up with less fuel on account of less condensation. Which is right? A. You do not send enough details. As a general rule, the loss of pressure is less with covered pipes than in the case where they are exposed.

A. D. P. asks: Is there any compound for removing scale in boilers, which it will be prudent to use under any and all circumstances? We are obliged to use water from various localities, and the impurities with which we have to contend are, of course, constantly changing. A. We do not know of anything of so general a preventive character.

W. C. says: 1. I have a small boiler that leaks badly under the firebox. What would be the best remedy to stop it? The boiler is 6x6½ inches, and is connected with a small cylinder, 1x2½ inches stroke. A. A rivet or patch, if the sheet is cracked; caulking, if the joint leaks. 2. I have constructed a telescope like that described on p. 7, vol. 30, and I use a double convex lens for the eyepiece. Would a plano-convex lens magnify more? A. No.

W. S. W. asks: 1. What is the correct definition of sound? A. Sound is a peculiar sensation excited in the organ of hearing by the vibratory motion of bodies, when this motion is transmitted to the ear through an elastic medium. 2. If there were no ear, would there be any sound? A. Not as we understand it. 3. Is not sound produced only in the ear and nowhere else? A. Yes. 4. About what size are the pieces of skin which are grafted? A. See p. 312, vol. 30. 5. Is the function of the spleen known positively? A. We believe not.

W. T. W. asks: Which is the proper way to put a burr on a bolt, with the flat side towards the head, or the beveled edges toward the head? A. So that the convexity is toward the head.

W. P. S. asks: Can you tell me what course of study in mechanical engineering is necessary after leaving college, and on what terms are learners taken into machine shops and engineering works? What time is necessary to learn the trade? A. If you go into a machine shop, the pay will be merely nominal, say fifty cents a day. Many young men pursue this course with very good results.

S. P. B. asks: Upon what conditions are road steamers permitted to run on common roads, in the States where they are now being used? A. We believe that in general matters of this kind are settled by the township or county authorities.

J. H. O'K. says: A friend of mine has a 15 horse engine of about 3 feet 6 inches stroke and 6 inches bow; the engine itself runs well enough, but it "whoops" in the exhaust so much that it can be heard for nearly a mile. I contend that, if you reduce the exhaust pipe to one half its diameter and dispense with a bell which is on the top of pipe, it will avoid all "whooping." Am I right? If not, what will prevent it, as it annoys me and my neighbors very much? A. It seems probable that your plan would stop the noise, which, however, seems to give indications of a very perfect exhaust. It might increase the back pressure slightly, to make such a change as you propose.

F. D. says: 1. In the cab of a locomotive that had the vacuum brake, I saw something shaped like two long-neck squashes, joined together at the top. The fireman says that there is an arrangement inside such that, when steam is let on, it draws the air out and forms a vacuum. What is that arrangement, and is it patented? Is it as economical as a vacuum pump would be in the use of steam? A. It works on the principle of the ejector condenser, or the steam siphon. Probably it is not as economical as an ordinary pump, but it is more convenient. 2. Would not an engine fitted for steam run if the exhaust pipe were kept in a vacuum and the supply pipe opened into the air, without using steam? A. Yes.

P. W. D. asks: What kind of wire gauze is used for miners' lamps? A. Usually brass gauze, made of No. 20 wire, with 36 meshes to the inch.

F. H. D. asks: If it takes a certain amount of steam to drive a piston six inches, will it take as much again to drive it twelve inches, with the same pressure upon it? What is the proportion of steam between a long stroke and short stroke of piston with the same pressure upon each? A. If, as we understand your question, the full pressure of steam is admitted in each case, it will take as much more steam in the second case as the length of the second cylinder exceeds that of the first.

P. D. R. asks: 1. Why will a spoon in a glass jar or tumbler prevent its being cracked when hot water is poured in? A. Before we attempt to give an explanation, we desire to satisfy ourselves of the fact, whether or no a tumbler, that will break if hot water is poured into it when there is no spoon present, will not break when the spoon is in it. But in attempting to make the experiment we encountered the following dilemma: If the tumbler does not break without a spoon, when hot water is poured in, what use is there of trying the experiment with a spoon. If it does break, without the spoon, our tumbler is gone, and we cannot try what might have happened with the spoon. It is evident that one and the same tumbler must be used; it will not do to compare different tumblers. If our correspondent will get over this difficulty and prove the fact, we shall repeat the experiments and work out the explanation. 2. What metals transmit heat and cold the quickest? A. Silver, gold, and copper.

A. P., of Vienna, Austria, says, in reply to A. M., who asks how to find the weight of a person's head without cutting it off: I put the person (of course naked) on a balance and get the weight of the whole body. Call this P. Have a cask large enough for a person to sit in, still leaving space over the person's head within the basin. Have a perpendicular line drawn on one side of the basin, and mark it with a scale so that you can tell, by experiment, how many cubic feet of water you have in the cask. Put water into the cask up to half its hight, and mark the place on the scale. Let the person sit in the water so deep that his head will be just out of water; mark again the place on the scale, and the difference of the two places will show exactly the cubic volume of the body without head; let us call this v. Let the person plunge entirely into the water, so that the head also is under water, and mark again the place on the scale. The difference of the number marked the first time and this number will show the cubic volume of the entire person including the head; let us call this V. Now, of course, different volumes of the body being taken, their weights must be in proportion to their cubic volume, and therefore V : (V—v) : : P : x, where V is the cubic volume of entire person and v the cubic volume of person exclusive of the head; therefore, V—v = the cubic volume of the head, and P = the weight of the entire person: and therefore x, that is the weight of the head, is very easily found.

W. D. M. says that A. L. can make artificial honey as follows: To 10 lbs. sugar, add 3 lbs. water, 40 grains cream of tartar, 10 drops essence peppermint, and 3 lbs. strained honey. First dissolve the sugar in water, and take off the scum; then dissolve the cream of tartar in a little warm water, which you will add with some little stirring; then add the honey; heat to a boiling point, and stir for a few minutes.

C. C. G. says, in reply to J. W. T. S., whose chickens suffer from cholera: Put assafœtida into their drinking water, and I think you will have no further trouble with chicken cholera.

H. A. says: In explanation of the difficulty of blowing a disk of paper from a similar disk placed on the end of a tube as illustrated in a recent number of your journal, I send the following solution, suggested by an article in the *Popular Science Monthly*, entitled "The Atmosphere as an Anvil." In blowing through the tube, the force exerted on the paper disk is confined to the area of the internal diameter of the tube, the actual increase of power given by the breath being comparatively small. This column of air, in order to displace the paper, must move a column in front, and equal to the area of the paper. The disk of card is of use only to steady the paper, so as to keep it in a perpendicular position and to keep the forces exerted in parallel lines. The stronger and more sudden the blast through the tube, the closer will be the adherence of the paper to the card.

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

O. D. R.—It consists of carbonate of lime, carbonate of magnesia, carbonate of iron, and silica.—D. B.—It is sulphuret of iron.—M. S. No. 1 is black oxide of manganese. If this was found at the place where your letter was written, it is interesting as being the first found in Virginia, and showing another of the few localities in the United States where manganese is found. If there is a quantity of the ore you should have it fully analyzed and reported upon. No. 2 is galena or sulphuret of lead.—W. J. C.—Shall be glad to report on the character of the specimens you send, and, if truly valuable, to say so.—R. D.—They are garnets of different colors and varieties.—H. B. R.—Send on your specimens.—J. H. C.—It is galena or sulphuret of lead.—F. B.—No. 1 is hepatic pyrites. No. 2 is iron pyrites.—D. P. S.—The specimen contains some magnetic oxide of iron disseminated through a quartzose matrix, but no silver was found on assay.—J. M H. writes from New Iberia, La., and sends some specimens found on Petit Anse Island, where the Louisiana salt mines are situated. The topography and formation of the island is rather curious, being a succession of hills and valleys, rising suddenly from an endless salt marsh which surrounds it. The specimens were taken from a deep run through one of the hills. The lead-looking particles in the sandstone exist in considerable quantity. They have excited much curiosity. A. The bright crystals of black color and metallic luster are rhombohedral crystals of specular iron ore. Much of it is attractable by the magnet, and can be picked out from the sand by running a strong magnet through it. Some of it contains a certain percentage of titanium. The minute crystals are delicately tinted pink crystals of quartz.

C. H. F. asks: What is slater's cement composed of?—T. M. P. asks: How can I construct a simple and cheap dry house for drying fruit on a small scale?—O. J. T. asks: 1. How can I case-harden breech actions of breech loading guns, to give them the clouded appearance? 2. How can I color twist and laminated steel shot gun barrels to make them show the twist, as we see in imported ones?—S. H. R. asks; From whom did the negroes spring, and what causes their black color?—R. P. asks: How can I make paper impenetrable to linseed oil?—B. F. B. says: There is a problem which some one has found in a work published many years since which is as follows: "A man at the center of a circle 560 yards in diameter, starts in pursuit of a horse running around its circumference at the rate of one mile in two minutes; the man goes at the rate of one mile in six minutes, and runs directly towards the horse in whatever direction he may be. Required the distance each will run before the man catches the horse and what figure the man will describe." I hardly think it admits of a solution under the above conditions; but were they reversed, that is, if the man were running at the rate of one mile in two minutes, and the horse one mile in six minutes, what would the answer be?

COMMUNICATIONS RECEIVED.

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

On the Vienna Exposition. By A. D.

On the Sun's Attraction. By H. B. and by A. L. L.

On Light Freight Cars. By H. S. B.

On the Madstone. By R. D. S.

Also enquiries and answers from the following:

W. E. L.—J, T. W.—M. E.—G. W. H.—P. J. K.—E. G. B.

Correspondents in different parts of the country ask Who furnishes plans and machinery for steam laundries? Who supplies cotton seed hullers, decorticators, and oil presses? Where can a subscriber obtain a cider press? Who sells chestnut hoops for casks? Who makes wire sifters and baskets? Who makes the best metallic self-packing for pistons, with brass rings, etc? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

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.

Several correspondents request us to publish replies to their enquiries about the patentability of their inventions, etc. Such enquiries will only be answered by letter, and the parties should give their addresses.

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.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED IN THE WEEK ENDING

May 19, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Anvil, G. Hornby	151,028
Auger, hollow, J. D. Waite	151,178
Bail ear, G. Smith	151,168
Bale tie, F. L. Bates	151,000
Bale tie, J. J. Hagins	151,120
Balloon, J. Hartness	151,124
Bath, vapor, C. A. Munro	151,149
Bed bottom, J. V. Taylor	151,062
Bedstead, folding cot, W. Wright	150,993
Bedstead, wardrobe, Harrison *et al*	151,020
Beehive, W. T. Bush	150,955
Bee hives, moth trap for, I. Hobson	151,128
Bell, door, E. C. Barton	150,934
Blouse, workman's, S. Laskey	151,140
Boiler, wash, J. A. Jones	151,031
Bolt and rivet trimmer, R. Faucett	151,111
Brick machine, K. T. Barton	151,074
Bridge gate, draw, Gasser & Severin	150,949
Broom handles, painting, Kitzmiller & Smith	150,962
Brush, shoe, J. Ryan	150,978
Burner, vapor, J. F. Marsh	151,040
Buttons, machinery for polishing, R. H. Isbell	150,960
Buttons, polishing, R. H. Isbell	150,969
Can for cooling milk, G. W. Fluke	151,016
Candlestick for Christmas tree, G. W. Reessing	151,065
Cane and umbrella handle, G. Edme	150,945
Car brake, W. L. Belt	151,076
Car brake, A. F. Gue	151,118
Car coupling, L. W. Powls	150,974
Car, dumping, F. Peteler	151,156
Car replacer, E. Newcomb	150,971
Car starter, Carpenter & Bailey	150,936
Car starter, C. L. Praeger	151,052
Car starter, T. Scholey	151,164
Cars, reflector for railway, C. S. Buck	151,083