C. H. B. is informed that liquid glass is silicate of soda, the preparation of which is described on p. 225, vol. 23.—J. L. H. will find directions for polishing black walnut on p. 315, vol. 30.—J. A. F. will find directions for cleansing cotton waste in No. 7, p. 202, vol. 31.—E. F. C. will find full particulars of induction coils on pp. 215, 218, 363, 378, 379, vol. 30.—D. C. R. will find instructions for destroying trunks of trees in answer No. 72, of this issue.—S. W. C. does not send sufficient data as to the cut-off of his engine.—J. C. D. can make a phosphorescent lamp by following the instructions on p. 203, vol. 31.—B. F. G. should consult an engineer who can inspect the engine which he desires to alter.—J. M. will find a recipe for dissolving rubber on p. 363, vol. 30.—E.B. S. will find directions for making malleable castings on p. 138, vol. 29.—W. T. H. will find directions for repairing rubber garments on p. 203, vol. 30, and for gilding picture frames on p. 90, vol. 30. Bookbinders use glue, sometimes tempered with a little molasses.—H. R. R.'s query as to the proportions of all the parts of a steam engine is too comprehensive to be answered in these columns. Working drawings of engines and boilers can be purchased.—A. will find information as to the use of the square in any work on stair building.—J. D. H. can polish his wooden handles by following the method described on p. 315, vol. 30.—A.P. W.'s difficulty can only be settled by experiment. The device he speaks of is patented.—W. A. should apply to the publishers who advertise in our columns, for catalogues.—C. W. will find directions for marbling in Spon's "Workshop Receipts." M.J. H. will find that bronzing is described in the same work.—An anonymous correspondent can produce a black finish on brass by following the methods described on p. 266, vol. 30.—W. M. B. will find directions for making pickles on p. 181, vol. 27.—P. C. H. can prevent paint from blistering by following the directions on p. 123, vol. 31.

(1) W. T. W. says: The water for use in my engine has failed to supply the boiler. There is a branch 800 yards off, which is 50 feet below the boiler. How can I get the water to the boiler more economically than by hauling it? A. You must use a pump, which might, perhaps, be worked by a windmill. You can obtain the tools you speak of at a ship chandler's store.

(2) J. H. E. says: I want to run a wire along the rails of a railroad, and make a connection between this wire and each rail. I propose to drill a hole in the flange of each rail and make the connection between wire and rail by fastening the wire to a brass plug and driving this plug through the hole drilled in the rail. Would the rail, where it is in contact with the plug, always keep bright, so as to make a good electric connection? If not, do you know of any metal that would answer better for this plug? A. You can easily make an airtight joint between the plug and the rail by brazing this connection.

(3) S. E. J. asks: Is it a common practice for machinists to put bits of tin, small pieces of iron, etc., under their turning tools when the tool post is not adjustable, or only partially so? A. It is a common practice, generally approved by good workmen.

Is it common for foremen and other superintendents of machine shops to determine first what kind of a tool a man shall use on a lathe or planer, provided it performs the work it was intended to do in a good and proper manner? A. It is not usual for a superintendent to give such orders when the men use tools that do good work. The right of the matter seems to be as follows: If the men are engaged on piecework, they can use such tools as they think proper, provided that their jobs are properly finished. If, on the other hand, the men are paid by the time they make, the superintendent can direct the manner in which work is to be performed, and the tools to be used. The propriety of exercising this arbitrary right over skilled workmen is, however, very doubtful.

(4) F. H. W. says: Suppose a red rubber balloon, such as we see children playing with, to be of equal texture and elasticity throughout; and the balloon to be inflated with the gas commonly used for balloon inflation, and the balloon set free. Would the balloon rise to a position where it would remain suspended, on account of the approximate densities of the gas and the extreme atmosphere, or would the gas expand until the internal pressure would cause the balloon to burst? Or would the balloon rise until the low temperature would cause moisture to condense upon the balloon and the balloon to fall, until it reached a point where it would begin to re-ascend? Please inform me, which, if any, of these results, would follow, and which, if any, of them is usual with the ordinary balloons, which are of unequal texture. A. If the gas in the balloon does not become heated, the tendency to burst by expansion will not be great. The balloon will rise until the external air becomes too light to carry it up further. If the gas is cooled, the balloon will sink again. Meanwhile, some of the gas will constantly be escaping, so that after a time the balloon will fall to the ground.

(5) H. W. S. says: As to the speed of the teeth of a large and a small saw, both being firmly fastened to the same shaft, I claim that the teeth of the large one go very much faster than those on the small saw, because they move in a larger circle and both saws must make a revolution in the same time. I believe this is a fair statement of the case, and I have but one comment to make: To deny this principle is to deny the principle of multiplying speed by large and small pulleys. D. E. W.'s version is this: If I have a saw arbor that turns 400 times in a minute, and I put on a saw that is 24 inches on one end of it, and a saw that is 12 inches on the other end, will the teeth in the 24 inch saw go any quicker than the teeth in the 12 inch saw? A. H. W. S. is right. A matter of this kind is easily settled by experiment. Secure a pencil to a tooth of each saw. Hold two boards so that one will bear against the pencil, and revolve the saw arbor once. Then measure the path described by each tooth, as traced on the boards, multiply each distance by 400, and the result will be the velocities of the teeth of the two saws.

When a wagon wheel rolls on the ground the top goes faster than the bottom, and the reason why is that the ground is the fulcrum, not of the wheel but of the wheel's motion. Is this so? A. Yes.

(6) C. F. says: I am somewhat at a loss to reconcile two statements, which appear on your p. 138, current volume, in answer to B.'s question concerning the asymptote. You say: "The straight line is continually dividing the distance between itself and the curve so that, between two successive equal lengths of the straight line, the distance between the curve and the straight line is only a fraction as great as it was before; but as there will always be some distance to divide, the two lines will never meet." And on p. 133, in an article on "Specific Heat:" "Experience teaches that every known substance is divisible, but it seems reasonable to suppose that, if the division be carried far enough, the ultimate particles will at last be reached, which cannot be subdivided without losing their properties as parts of the given substance." Now, as substance and distance are terms which denote actual and concrete quantities, I fail to comprehend why in the one case we may reach an ultimate division, and in the other we must fail so to do. A. There is no contradiction in the two statements. It is not difficult to conceive of the infinite subdivision of a quantity. The researches of chemists, however, lead them to believe that, in making this division in practice, a particle or molecule will at last be reached which, if again divided, will cause the substance to be resolved into its constituent elements. Thus, if the ultimate particle of water were reached, the drop, when again divided, would be resolved into hydrogen and oxygen, and the last division would give products which did not possess the properties of water.

(7) C. F. T. says: A saw file or three cornered file is sometimes called three square. I say that nothing with only three corners can be square. A. You are right.

What preparation is there that I can put on an opera glass to make it stronger and clearer? A. Good lenses.

How can I prevent ants from getting into cellars, etc.? A. By stopping up all cracks.

(8) F. A. McG. asks: What is the cause of a mill burr getting out of a true face? It was in true face and in true balance when last put down. What is the cause of a burr getting in wind? A. A mill burr will get out of true from various causes, the most common being that the hub is not a close fit to the shaft, or that the key does not bed properly, in which case driving up the key will throw the stone out of true. It will also wear out of true if there are unusually soft places in the stone. If the burr is properly fastened to the shaft and still gets out of wind, the cause probably arises from a defect in the bearings.

(9) J. H. says: In reply to S. F. you say that one of the earliest flying machines had four sheet copper balloons attached to the corners. 1. Was the air pumped out of them, or were they inflated with gas in the usual way? A. We believe that they were filled with hydrogen. 2. Which would produce the greatest degree of rarity, pumping out the air or inflation with gas? A. The former method. 3. Would it be possible to construct a balloon of any considerable size of thin sheet metal (corrugated or otherwise) that would not collapse when the air was exhausted? A. It would be too heavy to ascend.

(10) W. C. asks: Can an ice boat go faster than the wind that drives it? A. Yes. See explanations heretofore published by us.

(11) J.W. P.—There are several feed water heaters in the market that are said to remedy trouble from sedimentary deposits.

(12) T. G. asks: What are the principles involved in an injector on a steam boiler, and how does it overcome the pressure in the boiler? A. The steam enters the injector at a high velocity, and, being condensed on mingling with the water, imparts its momentum to the latter, so that it is forced into the boiler.

(13) W. C. A. asks: If a machine at 50 revolutions per minute requires 50 horse power, what power is required to run it 100 revolutions? A. It is impossible to answer a question expressed in such general terms; and in most cases the answer would have to be determined by experiment.

(14) L. H. P. asks: How can zinc be precipitated from its solution, or what is the simplest way of obtaining zinc flour? I know that evaporation is one way, but that takes too long. A. Metallic zinc has never been thrown down from its solution, because of its highly electro-positive character, for which property it heads the list. Its value as the positive element in galvanic batteries is due to this property.

(15) D. H. P. Jr. asks: What is the weight of cast iron? A. One cubic inch of cast iron weighs at 60° Fah. about 1767 2 grains.

How are magnets made? A. You do not state what kind of magnet is required. A simple way of magnetizing a bar consists in placing the bar on its side and bringing down, on one of its extremities, either of the ends of a bar magnet. If the north end be brought down on the steel bar, it must be drawn slowly along towards the extremity of the bar which it is intended shall possess south magnetic force; this operation must be repeated three or four times in the same direction.

(16) N. J. R. says: I propose making an electric machine, using a cylinder of wood covered with tin foil for a prime conductor, and a ball covered with same for the negative conductor, insulating the same by the use of common bottles. 1. How can I bore holes through the bottoms of bottles so as to use bolts for fastening them to the stand? A. Wet an ordinary drill with petroleum or benzine; turpentine will answer, but not so well; it will then bore common glass nearly as rapidly as steel. The sand blast is now used for this purpose. 2. What can I use to stick the tin foil to the cylinder and ball, which are made of wood? I intend driving plugs into the necks of the bottles by which to fasten on the conductors and journals for glass wheel; what kind of glue can be made to fasten these wooden plugs to the glass bottles so that they will hold? A. Try ordinary glue. 3. Can you tell me how to make a Leyden jar? How is the baked wood, used as a lid, obtained? A. The ordinary form of the Leyden jar consists of a bottle of thin glass, with a wide neck. A coating of tin foil is pasted upon both the inner and outer surfaces, to within 3 or 4 inches of the neck. A wire surmounted by a brass knob, and supported by a smooth plug of dry wood, serves to convey the charge to the inner coating, with which it is in contact. Any ordinary light wood will answer; but it must be perfectly dry.

(17) A. V. K.—The London Underground Railway tunnels are about 26 feet wide and 18 feet high. They run under the streets in all directions. Total length, 13 miles. The cars are operated by the heaviest class of steam locomotives. We have not the back numbers.

(18) J. W. D. E. asks: What is the cause of heat in a compressed atmosphere? Is it not owing to the heat contained in several atmospheres being condensed into the space of one, together with the heat generated by the piston of the air pump? A. It is due to the work of compression. 2. Is the amount of heat present in any given number of compressed atmospheres the same at all seasons? A. The temperature of compression varies with the initial temperature of the air. 3. How many compressed atmospheres would be required to boil water? A. Air at 60° Fah., compressed to 21 lbs. above atmospheric pressure without loss of heat, has a temperature of about 215°.

(19) B. C. & C. ask: What is there that can be put on polished iron that will not change the color, will dry quickly, and not be too expensive, to prevent rust? A. Use a transparent shellac varnish.

(20) A. M. C.—You cannot gain power by the use of a machine: but you may gain force or pressure at the expenditure of distance passed through by the force in a given time. If we understand your sketch rightly, you should have the same pressure at the rack as you apply to the lever, less the friction of the parts.

(21) M. & F. ask: What is the fastest time ever attained by any steamer in the United States? Has 25 miles per hour been made? A. We have seen it stated that the speed mentioned has been attained by steamers on the Hudson River.

(22) H. M. L. asks: I have a boiler, 26 feet long by 40 inches diameter, with two 12 inch flues. I take steam from a drum 18 inches from back end, and it is very wet and the power poor. What should I gain if I take steam from front end? The feed water goes in at back end. A. We could not answer this question without knowing further particulars. Possibly the steam drum is not large enough. We advise you to consult an engineer.

(23) A. B. C. asks: 1. Is not water raised in a siphon by means of atmospheric pressure? A. Yes. 2. Can water be raised in a siphon above 34 feet? A. No.

(24) J. E. P. says: I have a barn 100 feet long and about 40 feet high. In the rear, within 100 feet, rises a hill, the top of which is half the hight of the building. Can I protect the building from lightning by erecting an upright pole (on the top of the hill, higher than the building) and attaching thereto a lightning rod, having the rod terminate well in the ground at the base, in connection with a tun or two of iron buried beneath the surface, and thereby draw the effect rather from than to the building? A. The method you propose would not be likely to give you protection. The safer way will be to place conductors on the building, and connect them with the deposite of iron.

(25) J. McI. asks: What is the proper way of replacing a level glass on an old stock, so that it shall be correct? A. Place the new glass in adjustment as nearly as possible by the eye, put the level on a plane surface, and bring the bubble to the center of the tube, by raising or lowering one end of the surface. Then turn the level end for end, and if the bubble runs away from the center, bring it halfway back by moving the glass and the other half by raising or lowering one end of the surface. Continue this operation, turning the level end for end and adjusting, until the bubble will remain in the center of the tube.

(26) T. & D. ask: Please tell us the necessary thickness for boilers of 30 inches diameter, of steel and of best iron, drilled and double riveted, to stand with safety 6001bs. hydraulic pressure. A. The thickness of plate should be about ¼ of an inch, to have the boiler just strong enough to withstand the pressure. Using a factor of safety of 4, the thickness should be 1inch, of 6, 1½ inches, and so on.

Can you give me any account of the trial of steam boilers at Pittsburgh last year? A. See p. 97, vol. 30.

(27) H. W. J. asks: What is a lathe dog? A. A clamp, to make the work turn with the face plate.

What book shows how to use a lathe? A. "The Lathe and its Uses."

What kind of wood is used in making models for small castings? A. Mahogany is the best.

Would a small kitchen boiler, about 3 feet high, answer the purpose of boiler for a small engine with a cylinder 4 inches diameter by 6 inches stroke? A. It would not be large enough.

What are students in the German colleges examined in, for admittance and graduation in chemistry? A. You should write for catalogues.

(28) E. B. Jr. asks: Can the degree of "Master Mechanic" or "Mechanical Engineer" be acquired at any school or university, or is it necessary to have practical experience in the workshop, or both? A. There are several technical schools in the United States that confer the degree of "Mechanical Engineer" upon their graduates.

(29) T. F. says: A friend of mine recently contended that there is a gun in the United States which weighs 100 tuns, manufactured at the Fort Pitt works, Pittsburgh; while I contend that the 81 tun gun now in course of construction at Woolwich will be the largest in the world. We agree to abide by your decision. A. We think that T. F. is right.

(30) W. M. B. asks: How can I make sand paper and emery paper? A. The usual method is to coat the surface of the paper with glue, upon which the grade of sand or emery required is immediately sifted.

I have a supply of gutta percha buttons, too thin for my use. By boiling them in water they thicken a little, but very little. Will some one tell me how I can melt 3 or 4 of them in a solid mass, so they will remain sound and hard when cold, and ready to receive a high polish, as they are now? A. Your best method would be that of softening them by means of heat, and while in this state mold them to the required form.

Is there any process of making peach brandy? A. The peaches are mashed with pestles in a trough, the juice pressed out, collected, fermented, and distilled. The pomace still contains considerable juice; it is therefore covered with water, and, after fermentation, distilled.

(31) W. G. M. asks: What degree of heat is required to decompose water or steam? A. We believe that this has never been determined.

What degree of heat is caused by burning hydrogen? A. This depends wholly upon the supply of oxygen, also upon the amount of gas burned in a given time.

A lecturer heated a spoon; and while it remained at a high temperature, the water dropped upon it floated on a coat of steam; but upon being allowed to cool a little, the globules exploded with considerable noise. He also said it was a noted fact that in England boilers far more frequently burst on Monday, after having been idle on Sunday, than at any other time. I don't understand the explosion. A. What you speak of was an illustration of what is known as the spheroidal state. Not only does the water not boil, but its evaporation is only about one fifth as rapid as if it did boil. As the spoon cools, a point is reached at which it is not hot enough to keep the water in the spheroidal state; it is accordingly moistened by the liquid. When this happens the water, before quiet, bursts into steam with almost explosive violence. Many steam boiler explosions have been attributed to this cause.

(32) W. B. B. asks: How can I make grease and concentrated potash or lye unite, so as to make soap? Boiling them together will not do it. It always leaves so much grease in the soap as to make it unfit for use. A. Hard soaps are made by boiling oils or fats with a lye of caustic soda. In soft soaps, the lye is potash. Resin is used in yellow soaps, as it saves fat. Silicate of soda is now frequently used instead; it gives a white soap which has no offensive smell, and has not the stickiness of resin soap. Castle soap is made from olive oil, and is mottled by iron. We would recommend using a larger percentage of lye.

(33) G. L. H. asks: Can water be dissociated into hydrogen and oxygen at the rate of 100,000 cubic feet of hydrogen per minute? Will galvanic batteries do the work? A. It can be done by galvanic current, but the cost will prevent its being readily accomplished. We would recommend you to read some good elementary work on chemistry and chemical physics.

(34) G. R. P. asks: How is potassic sulpho-cyanate formed? A. If a mixture of dried prussiate of potassa is fused with sulphur and carbonate of potassa in a covered crucible, and the heat gradually raised to redness, until the mixture is in quiet fusion, there is obtained a mixture of sulpho-cyanate of potash and sulphuret of iron. The salt is dissolved out by boiling water, and crystalizes on cooling. The best proportions are 46 parts dried prussiate, 17 dry carbonate of potash, and 32 sulphur,

How can I preserve eggs from October to March? A. Various experiments have been made in France on the best method of preserving eggs, a subject of much importance there. Among the different processes, the best, and at the same time one of the simplest, was found to consist in rubbing vegetable oil (linseed especially) on the egg, thus preventing any alteration for a sufficient time, and proving much more satisfactory than any other plan hitherto recommended.

Can you give me a recipe for making a good quality of sewing machine oil? A. We think pure olive oil would answer your purpose best.

(35) J. W. P. asks: How should I make application for, and how far advanced ought I to be in mathematics to hold, a position as engineer in the navy? A. We think that those entering the engineer corps of the navy are oblige to commence as cadet engineers at the Naval Academy. You can obtain full information by addressing the Chief of the Bureau of Steam Engineering at Washington.

(36) N. B. G. says: As so many of your readers are endeavoring to navigate the air, would it not be well to spend a little time in perfecting the first model of an air ship, the hot air balloon of Mongolfier and De Rosier? It seems, being open at the bottom, to provide for a slow descent; and the heating apparatus provides for ascending and descending without the discharge of ballast. With the fuel used by the first experimenters, there was of course great danger; but with condensed fuel (petroleum, or some of the carbon oils, for instance) could not gas be made and used cheaply for heating purposes, and the apparatus be supported long enough for extended voyages? A. The plan is deserving of consideration, and we are glad to receive your letter. Perhaps our readers can suggest some further steps toward a practical result.

(37) E. A. D.—Venus' mean distance from the sun = 69,000,000 miles, and that of Jupiter = 496,000,000 miles. The two planets are therefore more than 427,000,000 miles apart.

(38) R. asks: 1. Is there any back pressure in the high pressure cylinder of a compound engine? A. The back pressure in the high pressure cylinder is generally a little more than the initial pressure in the low pressure cylinder. 2. What is the receiver, between the high and low pressure cylinders? A. It is the reservoir into which the high pressure cylinder exhausts. 3. Where can I get any information about compound engines? A. Consult modern works on the steam engine, and scientific periodicals.

(39) A. H. W. G. asks: What is the best wood to use in the construction of wheels for a wooden clock? A. We think that boxwood or dogwood will answer.

What is the meaning of the word "balloon framing," and what is the difference between it and common framing? A. A balloon frame is made of light studs, nailed instead of being framed in the old way, with mortise and tenon.

On a wire tramway, 2½ miles in length with large curves, what would be the least grade at which loaded cars descending on one side would raise empty ones on the other? A. You do not send the weights to be hauled and the weights available for hauling them; and the term "large curve" is very indefinite. Hence it is impossible for us to answer this question.

(40) J. J. H. asks: What will harden Babbitt metal? A. The addition of more antimony.

(41) B. B. B. B. asks. 1. What sized engine and boiler will propel a vessel of the following dimensions at 14 knots per hour: Hull 26 feet long and 6 feet wide, with 30 inches draft, and propeller 28 inches in diameter and 3 feet pitch? Would an engine with a cylinder 3½ inches in diameter, 5 inches stroke, 100 lbs. per square inch pressure, boiler 36 inches diameter and 46 high, with a heating surface of 90 square feet do for this boat? Would said vessel be obliged to be licensed and have a licensed engineer and pilot? A. The engine you describe would not be large enough; indeed, it is doubtful whether the boat could carry the machinery for such a speed. Every vessel propelled by steam must carry a licensed engineer and pilot.

(42) I. G. asks if small steamers for the owners' use only are required by law to carry licensed engineers and pilots (citing that we answered the question some time since to the effect that if the boat is used by the owner alone it is not necessary to employ a licensed engineer. But if passengers are carried or the boat is let to other parties, the case comes under the United States law). "I showed your decision to the government inspector, but he says that the SCIENTIFIC AMERICAN, which I consider such good authority, is mistaken. A. Our answer was based upon the practical working of the law in this district, at the time the question was asked. The laws are very precise in requiring all steamers to carry licensed engineers and pilots, and to be subject to government inspection, under heavy penalties for a violation. The Secretary of the Treasury, however, has power to remit all fines.

(43) T. T. G. asks: 1. I am building an engine of 1½ inches bore by 3 inches stroke, and would like to get a safe boiler for it; what kind would be best? A. A plain cylinder boiler will answer very well. 2. Would copper do for a boiler, or would galvanized iron be cheaper and as good? A. The iron would be cheaper, but not so durable. 3. You say in a previous issue that the burning of small boilers depends greatly upon the setting. How should it be done to make it last? A. It might be placed with the fire underneath, and a casing around it. 4. In testing a boiler by filling it with water and then heating it, how would it act if the pressure were raised higher than the boiler could stand? A. There would be a rupture of the weakest part of the boiler. 5. Can a boiler that leaks slightly not be tested that way? A. Not very conveniently. 6. How high should the pressure be raised in testing a boiler that blows off at 85 lbs., and is run at from 40 to 70 lbs. on the square inch? A. To about 100 lbs. per square inch.

(44) O. H. P. asks: How are ferrotype plates sensitized and developed? A. The plate is first perfectly freed from dust, coated with a thin film of collodion, and placed in the silver bath for a few minutes. It is then placed in the camera for a short time. It is then removed and flooded with a solution of sulphate of iron in water, until it is fully developed, when it is thoroughly washed and placed immediately in the bath of hyposulphite of soda for a few minutes. This latter operation is termed fixing. The picture is then washed, dried, and varnished. For further information we would refer you to one of the numerous works on photography.

(45) W. K. of Bork, Germany, asks: Is it better to run a turbine water wheel below the level of the backwater, or just above it? A. Above it.

(46) F. H. S. asks: I hear that the seeds of okra and gumbo (*hibiscus esculentus*) are used as a substitute for coffee. Are they roasted like coffee? Are they injurious to health? A. It is stated by Edward Dugdale, of Griffin, Ga., that a substance resembling coffee in appearance and taste may be made by separating the seeds from the pulp of persimmons, cleansing them, and afterward roasting and grinding in the same manner as coffee. Imitation coffee has also been obtained from grape seeds, but we have never heard of coffee from the source you speak of.

What is essence of petroleum, and how is it manufactured? A. It is a trade name; we can give you no information on the subject.

(47) T. J. S. asks: I saw in Paris coal bricks made of slack pressed into squares. How is it made? A. The Parisian ormolded charcoal, introduced about 15 years ago by Popélier Ducarré, is an artificial fuel composed of charcoal refuse with coal tar. The small lumps and dust of charcoal are mixed with 8 to 12 per cent of water, then ground to powder, and to 200 lbs. of the powder are added 33 to 40 quarts of coal tar. This magma is thoroughly incorporated, and next molded into cylinders. These are dried and finally carbonized in a muffle furnace. This fuel is far less fragile than charcoal, better fitted for transport, burns better than coke, and, even when slightly kindled, continues to burn in air, which is not the case with coke.

(48) J. F. L. asks: The following mortar for building furnace walls has been recommended: Leached wood ashes, 1-6, slacked lime 1-6, sand 4-6. I want your opinion on the above, and to know if you are aware of any better composition. A. There is very little difference between the mortar you name and common lime mortar. Furnace brick are set with fire clay, which is a well known article of commerce and may be ordered of any dealer in firebrick.

(49) J. L. says: I have driven a pipe well, of which the pipe is 1¼ inches, 49 feet from the surface, and I have 5 feet of water in the pipe. I dug down 16 feet, and put on an ordinary pump with no result. I then put on a force pump with no result. What is the reason? Any ordinary pump is said to lift 33 feet, but neither of these would lift 28 feet, and yet the valves are in good condition, and there is no leakage in any of the joints. A. Ordinary pumps do not lift more than from 24 to 26 feet, on account of imperfections. It is possible, also, that you may have some leaks in the connecting joints. By going down a few feet more with the pump, you will probably overcome the trouble.

(50) F. G. B. asks: Will a boiler 12x36 inches do to run a small engine (cylinder 2x3 inches) with, set into an ordinary stove instead of having an independent fireplace of its own? A. Yes. 2. How much power could I get from the engine? A. You might get half a horse power with such an arrangement.

(51) J. C. asks: As there are so many ways of calculating the power of a high pressure steam engine, you will greatly oblige me by telling me your mode of making the calculation. A. Multiply mean effective pressure on the piston in pounds by twice the length of stroke in feet, and by the number of revolutions per minute, and divide the product by 33,000.

(52) J. C. S. asks: Is there any invention by which I can find buried gold and silver? A. There is no such machine on record, except in ancient legends. If such an invention ever existed, its construction is certainly one of the lost arts.

(53) R. L. says: I have directions for making an achromatic astronomical telescope with an achromatic object glass of 30 inches focus and an Huyghenian eyepiece of half an inch focus, thus giving a magnifying power of 60. I wish to increase the magnifying power to 120. Would it be best and cheapest to do this by increasing the diameter and focus of the object glass, or the focus alone of the object glass, or by decreasing the focus of the eyepiece, or by doing all of these? A. A set of eyepieces made to fit a tube, one inch inside diameter, is most convenient. Either plan would do. High powers can only be used with good objectives to view double stars on the finest nights.

1. In what place is the best telescope in the world situated? A. At the Naval Observatory, Washington, D. C. It is of 26½ inches clear aperture. 2. What is its magnifying power? A. Perhaps 1,500, or more, in good weather.

(54) H. M. P.—The trouble was probably caused by the accumulation of air in a high point of the pipe.

(55) W. H. H. asks: How can I make crimson rocket stars? A. Take chlorate of potassa 29·7 parts, sulphur 17·2; charcoal 1·7; black sulphuret of antimony 5·7. According to MM. Designolles and Castelhaz, most brilliant colored flames are obtained from picrate of ammonia in the following proportions: For yellow, picrate of ammonia 50 parts, picrate of peroxide of iron 50 parts. For green, picrate of ammonia 48 parts, nitrate of baryta 52 parts. For red, picrate of ammonia 54 parts, nitrate of strontia 56 parts.

(56) S. A. N. says: Please give me a good recipe for sympathetic ink. A. Letters written with diluted prussiate of potash become visible when moistened with a solution of sulphate of iron. As to the power of your engine, you do not send sufficient data.

(57) J. F. McC. asks: 1. What kind and how much oil is there in 48 lbs. of unbolted white corn meal? A. According to late determinations, the average composition per cent of American corn meal is as follows: Water from 11·5 to 13·2, starch from 50·1 to 54·8, fat or fatty oils from 4·4 to 4·7, cellulose from 14·9 to 20·4, gum and sugar 2·3 to 2·9, nitrogenous substance 8·7 to 8·9, ash 1·6 to 1·8. 2. What are some of the harmless chemicals that will neutralize it while baking into bread? A. We do not understand this question.

(58) J. T. McK. asks: What force is required to exhaust the air from a vessel to which is attached a pipe ¾ inch in diameter, standing in water 10 feet below, and will it require more force if the water be 30 feet below, to cause the water to rise into the vessel? A. The work of raising the water will be that of lifting the weight through the hight. In a given time, of course, more power will be needed if more water is lifted, or if it is lifted higher. To this work must be added that used up in overcoming the friction of the water in the pipe, in giving the water velocity, and in overcoming the friction of the moving parts of the pump.

(59) C. B. asks: Which furnishes the lightest draft, the vehicle with wooden axles and thimble skeins, or the one with iron axles, all other things being equal? A. If all the other conditions were the same, there should be no difference of axle friction in the two cases, as friction is proportional to the pressure, and depends upon the nature of the rubbing surfaces. The work required to overcome friction, however, increases as the diameter of the axle is increased; and if the iron axles are the smallest, and are strong enough, there would be an advantage in their use.

(60) W. J. B. says: I have one 12 × 30 cylinder (geared two to one) on a small steamboat, and the boiler is 40 inches by 22 feet. It makes plenty of steam, but we want to dispense with the gearing and attach another 12x30 cylinder, direct. Will the boiler make steam enough for the two cylinders, running at half the speed? A. It will probably take a little more steam, after the change is made, but not a great deal more if the machinery is well designed.

(61) C. T. S. says: A mechanic of Cleveland, O., was trying to secure a better draft for a sluggish fire; and the thought occurred to him to try the effects of steam. A small pipe was made to conduct dry steam from the top of the boiler to the upper part of the furnace, where it entered in two small jets striking downward on the burning fuel. No soon was the steam injected into the furnace than the sluggish, smoky fire sprang up into a clear, bright, yellowish and intensely hot flame, filling the whole furnace with a loud roar. The man found he had not only secured a strong draft, but something much more important, a smokeless fire. What do you think of this plan? A. We have not much faith in it, and we think it probable that the application of the steam was made in some other way. Still, if any of our readers feel inclined to test the method, we hope they will communicate the results to us.

(62) J. B. F. asks: Is there anything that will kill the smell of pine tar without killing or destroying its essential properties? A. We know of no method of accomplishing the result without destroying the properties of the tar, as tar.

(63) J. H. B. asks: What acid will dissolve or burn iron quickly? A. If desired for analytical purposes, the iron should first be pulverized, and then dissolved in hydrochloric acid.

(64) J. P. asks: Can you give me the method of distilling essential oils (especially wintergreen) and how to separate the oil from the condensed steam? A. The quantity of volatile oil yielded will depend upon the part of the plant employed, the season and the period of growth. The dryer the season and the warmer the climate, the richer are the plants in oils. They should be gathered, as a general rule, immediately after blossoming, and distilled, if possible, while fresh. It is better to macerate the plant one day before distilling. Roots, barks, etc., should be coarsely powdered. Parts which yield no oil, as the stems of mint, sage, etc., should be detached. The larger the quantity acted upon the better; the quantity of water employed should be sufficient to thoroughly cover the plant; too much water causes loss by dissolving a portion of the oil. When the plants are abundant the distillate should be returned to a fresh portion of the plants in a retort. It is a good plan to use the water of a previous distillation for the same plant, as it is already saturated with the oil. If the oil is heavier than water, use a saturated solution of salt. If lighter, the Florentine receiver. The oil of sassafras is obtained from the sassafras root; 24 lbs. will yield 9 ozs. of the oil.

(65) C. A. G. asks: Is there a compound from which odorless matches can be made? A. We do not think there is a match that is absolutely inodorous.

(66) J. N. asks: Can a 1 horse engine and boiler turn a grindstone that requires two strong men to turn it, or can it do more? A. More.

(67) M. E. J. asks: What is the process or method of tempering anvils? A. The faces of anvils are hardened by heating and quenching, the metal being brought to a very low red and quenched in tepid saline water.

(68) G. W. M. asks: 1. What kind of fabric is best for waterproofing with paraffin, for making wearing apparel, such as capes, overcoats, leggings, etc.? A. Any kind of very close woven cloth will answer. 2. How is it applied to the cloth? A. There are various methods. The cloth may be prepared by steeping it in a strong solution of paraffin in naphtha. 3. Can coloring matter be mixed with it without impairing its waterproofing quality? A. Yes, it is possible to use several of the colors.

(69) G. C. D. asks: Can you give me a simple process of making bluing, used in washing clothes? A. A mixture of powdered starch and indigo (finely pulverized), in such proportion as to give the requisite color, is made into a stiff dough with starch paste formed into lumps or cakes, and dried.

How is stove polish made and how is it made into a cake? A. Use finely powdered graphite, which can be pressed into a solid mass.

(70) S. K. H. asks: How can I make oxygenized oil? A. We know of no oil by this name. A certain class of oils known as drying oils, of which linseed oil is a type, have, under certain circumstances, the property of absorbing oxygen from the air or becoming oxidized, which causes the siccative or drying properties of these oils. This property may be much increased by heating them with about one twentieth of their weight of litharge, which becomes completely dissolved by the oil. Oxide of manganese may be used for the production of a similar effect; linseed oil which has been thus treated, is technically known as "boiled oil."

(71) L. S. asks: What is the botanical name of witch hazel? A. The botanical name of witch hazel is *hamamelis virginica*.

What is biology? A. Biology is the science of life that part of physiology which treats of life in genera and the different forces of life.

(72) C. W. J. asks: 1. Suppose I were to put a 1½ inch auger hole into a pine stump, and put therein ½ pint of chemically pure sulphuric acid, and securely stop up the hole. What effect would the acid have on the wood? Some contend that the stump and every root thereof will be totally rotted. Is it true A. No; although a part of the stump would undoubtedly be destroyed. 2. Is there not an effectual method of getting stumps out of your way by means similar to the above? A. Try the following method: In the autumn bore a hole 1 to 2 inches in diameter, according to the girth of the stump, vertically in the center of the latter, and about 18 inches deep. Put into it from 1 to 2 ozs. saltpeter; fill the hole with water, and plug up close. In the ensuing spring, take out the plug, and pour in about ½ gill of kerosene oil and ignite it. The stump will smolder away, without blazing, to the very extremity of the roots, leaving nothing but ashes.

(73) X. L. R. says: An old man has informed me that he noticed that, when lightning struck trees in a forest that had been partly cleared, it almost always struck trees bordering on this clearing. Is there any scientific reason for such an action? A. We believe no such phenomenon has been before recorded.

(74) J. E. J. asks: Will any acid dissolve rosin without destroying its natural qualities? A. We know of nothing that will dissolve it without entering into chemical combination with it at the same time.

(75) C. H. C. asks: Is water from the bottom of a well (drawn by a chain pump, for instance) just as healthy to use as water taken from the top with a bucket? A. We think there is very little difference.

(76) G. W. S. asks: If glass is a non-conductor of electricity, would a bolt of lightning go through a glass house? A. Yes.

Have carrier pigeons ever been taught to carry messages both ways? A. This has never been accomplished.

What is the meaning of the word turbine, and whence is its origin? A. The turbine is a horizontal water wheel, and is similar to the hydraulic tourniquet. But instead of the horizontal tubes, there is a horizontal drum, containing curved vertical walls. From the Latin *turbo, turbinis*, that which whirls around like a top.

(77) J. L. D. asks: Some wine makers draw their wine into new casks in February, after the vintage. I think I have heard that it is a moot point whether to do that or let it remain on the lees till it is bottled I have some on the lees (vintage of 1872) and I think it is improving. Please give your views. A. The principal fermentation converts or separates the sugar of the must into alcohol and carbonic acid. Unless the temperature is considerably decreased, a fresh fermentation is likely to arise, known as the after fermentation. Should this continue too long, vinegar is formed. To prevent this the wine, after the disappearance of the bubbles of carbonic acid upon the conclusion of the principal fermentation, should at once be "spigotted off" from the lees into casks, the object being to cut off communication with the atmosphere as much as possible The casks at first should be nearly filled and loosely bunged, but after a few days they should be filled completely. Wines casked in December will often continue fermenting till February or March. Strong wines, rich in alcohol, can be kept in casks until they become quite clear; but weak wines must soon be bottled, as the oxygen of the air is liable to convert the hydrate of the oxide of ethyl or alcohol into trioxide of acetyl or vinegar.

Is it the best ground connection for a lightning rod to attach it to a railroad track? I have been told that lightning strokes are less numerous in the city of Berlin since a number of railroads center in it. A. No.

(78) L. F. says, in reply to I. S., who asked there were any instrument by which the correct distance of an object could be ascertained: I have a prismatic field glass (of French invention) with a fixed stadia, which gives the most accurate measurement of distance, when the hight of the object is known, or the hight of that object when the distance is known; the rule for calculation is: As 1 is to 100, so is hight to distance. This instrument was invented by a French army officer, and used during the Crimean war.

(79) B. W. says, in reply to R. G. R., concerning combustion: Tap the smoke stack twenty feet above the boiler, with an eight inch sheet iron pipe lead the pipe so that it will discharge under the fire grate; leave no sharp angles in it; insert a fan blower about six feet from the lower end. Give the fan 800 revolutions per minute, and it will consume the smoke save a large percentage of fuel, and give a good draft. [This plan is certainly a novel one, and we would be glad to hear something on practical experience with it. —EDS.]

(80) J. S. S. says, in reply to E. H. H., who asks: Is there any machinery for cutting files in use that is working successfully, and what has been the principal trouble with machine-cut files? There are several machines in use cutting files successfully. The principal trouble with machine-cut files is prejudice. I once called at a machine shop; and the conversation turned upon files, when I asked if they used a certain machine-made file. The answer was "No. We have tried them but have given them up. Machine-cut files are a failure; but we are using now a file which is the best we ever had in our shop." He handed me a half-dozen package of files, and I found that they were marked with the name of a firm whose files were cut by machinery in the very room that I was foreman of. You state that "machine-cut files are not equal to hand-cut either in regularity of cut or quality of the cutting edge of the teeth." I will cut a file by machinery that will compete with any hand-cut file in the world for regularity. As for the cutting edge of the tooth, that is determined by the shape of the chisel which cuts the file; and if the tooth is not sharp and of the right shape, it is the fault of the operator and not of the fact of its being machine-cut. A badly shaped chisel will make a bad file, whether in the hands of a skillful hand cutter or ina machine.

(81) S.T. says, in reply to G.H.M., who asks: What part of a horse power is an eight day clock spring? Find, by single pulley and cord, how many pounds your spring will raise one foot high in one minute. The number will be the numerator of a fraction whose denominator is 33,000 or 1 horse power. Any two springs of same size and workmanship will have different lifting forces, and therefore this question must be decided by the particular spring.

(82) J. S. G. says, in answer to several correspondents, who ask how to temper cast steel: Heat the piece of steel to be tempered to a bright red; throw it into a tub of clear cold water and let it cool; then take a loaf of hot bread of the required size to hold the tools thus cooled, stick them into the loaf, and let them cool; and you have one of the finest finished tempers that has yet been discovered.

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

F. X. L.—It contains no silver.—T. H. P.—It is marcasite, commonly called white iron pyrites. It is composed of iron 46 4, and sulphur 53·6, in 100 parts.—B.S.S.—It is talc, and is composed of silica 62 8, magnesia 33·5, and water 3·7.—W. E. H.—The amount of hardened clay sent is too small to enable us to decide by practical or other test whether it could be used for brick-making, etc.—J. A. G.—No. 1 is galena, a sulphuret of lead. No. 2 is iron pyrites, or sulphuret of iron.—W. W. B. Jr.—It is carbonate of iron. No chromium was detected in the sample sent.—J. S. K.—It is iron pyrites.

C. A. asks: How can I stain poplar wood the color of red cedar for the manufacture of cigar boxes?—H.K. asks: How is the word boiling or bubbling translated into the Winnebago (Indian) dialect?—J. S. McK. asks: When the sun and moon are both on the same side of the earth, what causes the tide on the opposite side?—F. A. McG. asks: Why does a belt run to the highest point?

COMMUNICATIONS RECEIVED.

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

On Electric Railway Signaling. By W. R.

On Small Printing Press Engines. By F. C. S.

On the Spiritual and the Material. By E.

Also enquiries and answers from the following:

J. E. M.—E. N.—A. G. F.—J. J. S.—G. W. E.—H. B.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

We have some queer correspondents: One writes to know if we will not be so good as to send a messenger to an address which he gives—distance two and a half miles from our office—to make certain inquiries for him. It would require one and a half hours' time to do the errand, and not a stamp inclosed. Another wants us to write a letter and tell him where to get a combined thermometer and barometer. Another: "Will you be good enough to give me the names and addresses of several of the makers of the best brick machines"; another wants water wheels; another threshing machines; each writer desires our written opinion as to which is the best device, with our reasons, and not one is thoughtful enough to inclose a fee, or to reflect that to answer his request will consume considerable of our time. Another party wishes us to write to him the recipe for making ornaments out of coal tar, where he can buy the mixture ready for use, and how much checkermen will sell for in the New York market. For this information he sends us the generous sum of three cents in postage stamp. Mr. C. wants us to tell him of some valuable invention, of which he can buy the patent cheap, that would be suitable for him to take to sell, on his travels out West, by towns, counties, etc., three cents inclosed. Others want us to put them in communication with some person who will purchase an interest in their inventions, or manufacture for them, or furnish this or that personal information, our reply to be printed in the SCIENTIFIC AMERICAN. We are at all times happy to serve our correspondents, and when they present enquiries which we consider of general interest to our readers, we give space for them in the above columns; but if replies to purely personal errands are expected, a small fee, say from one to five dollars, should be sent.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED IN THE WEEK ENDING

September 1, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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Wrench, B. F. Joslyn	154,680

APPLICATIONS FOR EXTENSION.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

30,802.—CLOTHES WRINGER.—G. J. Colby. Nov. 18.

30,850.—PHOTOGRAPHIC CAMERA.—S. Wing. Nov. 13.

31,001.—STRAW CUTTER.—W. Gale. Dec. 2.

EXTENSIONS GRANTED

30,023.—ROCK DRILLING MACHINE.—L. M. Gilmore.

39,030.—STEAM ENGINE.—W. Wells.

DISCLAIMER.

26,013.—GIRTH BUCKLE.—L. C. Chase.

DESIGNS PATENTED.

7,715 to 7,721.—CARPETS.—R. R. Campbell, Lowell, Mass.

7,722.—COOKING STOVE.—J. V. B. Carter, Detroit, Mich.

7,723.—SPICE MILL.—W. Haslam, Philadelphia, Pa.

7,724 to 7,726.—CARPETS.—W. Kerr, Philadelphia, Pa.

7,727 and 7,728.—CARPETS.—H. S. Kerr, Philadelphia, Pa.

7,729.—CARPET.—W. Kerr, Philadelphia, Pa.

7,730 to 7,732.—STOCKING FABRICS.—W. Martin, Phila, Pa.

7,733.—CARPET.—D. McNair, Lowell, Mass.

7,734 and 7,735.—OIL CLOTHS.—C.T. Meyer *et al.*, Bergen, N.J.

7,736.—STOVE.—J. V. B. Carter, Detroit, Mich.

7,737.—FIRE SHOVEL.—A. W. Hirschfeld, W. Meriden, Ct.

7,738 and 7,739.—CARPETS.—H.S. Kerr, Philadelphia, Pa.

TRADE MARKS REGISTERED.

1,950.—CARPET WARP.—E.W. Holbrook & Co., Troy, N.Y.

1,951.—PLOWS, ETC.—Lawrence *et al.*, Kalamazoo, Mich.

1,952.—FERTILIZERS.—W. W. Leman, Macon, Ga.

1,953.—WHISKY.—Shields & Co., Cincinnati, O.

1,954.—PAPER BAGS.—Chatfield *et al.*, Cincinnati, O.

1,955 to 1,957.—CLOCKS.—F. Kroeber, Hoboken, N. J.

1,958.—WHISKY.—B.M. May, Cincinnati, O.

1,959.—AMMONIA MANURE.—J. J. Turner & Co., Baltimore, Md.

1,960 & 1,961.—MEDICINES.—A. Vogeler & Co., Baltimore, Md

1,962.—PLASTER.—A. Vogeler & Co., Baltimore, Md.

SCHEDULE OF PATENT FEES.

On each Caveat	$10
On each Trade Mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (3½ years)	$10
On application for Design (7 years)	$15
On application for Design (14 years)	$30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA AUGUST 31 TO SEPT. 12, 1874.

3,800.—E. P. Hildebrand, Indiana, Indiana county, Pa. U. S. Improvements in coal stoves, called "Hildebrand's Improvements in Coal Stoves." Aug. 31, 1874.

3,801.—J. Brown, Brantford, Brant county, Ont. Improvements on a device to protect the person from the effects of the sun and rain, called "Brown's Excelsior Sun Shade." Aug. 31, 1874.

3,802.—G. M. Seymour and J. C. Haight, New York city, U. S. Improvements in horse powers, called "Seymour & Haight's Improved Horse Power." Aug. 31, 1874.

3,803.—J. Fowler, St. John, New Brunswick. Improvements on springs for carriages, wagons, coaches, cars, and other vehicles, called "Fowler's Patent Carriage Spring." Aug. 31, 1874.

3,804.—I. Abell, Woodbridge, York county, Ont. Safety cover for couplings of revelving shafts, called "Abell's Cover for Shafting Couplings." Aug. 31, 1874.

3,805.—F. Seegmiller, Seaforth, Huron county, Ont. Machine for drying grain, called "Seegmiller's Grain Dryer." Aug. 31, 1874.

3,806.—T. McBride, Philadelphia, Philadelphia county, Pa., U. S. Improvements on hydraulic railroad car brakes, called "The McBride Hydraulic Brake." Aug. 31, 1874.

3,807.—F. A. Balch, Hingham, Sheboygan county, Wis, U. S. Improvements on a machine for separating cockle from wheat, called "The Badger State Cockle Separator." Aug. 31, 1874.

3,808.—R. H. Earle, St. John's, Newfoundland. Improvements in ice creepers, called "Earle's Ice Creeper." Aug. 31, 1874.

3,809.—G. Dunning and C. B. George, Waukegan, Lake county, Ill., U. S. Improvements on horse shoes, called "Dunning's Horse Shoe." Aug. 31, 1874.

3,810.—W. D. Farrand, New York city, U. S. Improvement on spark arresters, called "Farrand's Spark Arrester." Aug. 31, 1874.

3,811.—P. Mutter and T. Evans, Hamilton, Wentworth county, Ont. Improvements on car couplings, called Mutter & Evans' Self Acting Shuttle Coupling." Aug. 31, 1874.

3,812.—J. B. Armstrong, Guelph, Wellington county Ont., assignee of J. McFarlane, Otterville, Oxford county, Ont. Reissue of No. 1,115, a new and useful carriage spring, called "The Improved Elliptic Solid Cast Steel Carriage Spring." Sept. 12, 1874.