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A. B. L. can cement emery to wood by using the best glue.-R. B. K. is informed that French polish is generally used on planofortes. See p. 11, vol. 32.-W. D. will find a recipe for a gold lacquer on p. 362, vol. 30.-H. C. Y. can purify his garments by burying them for a while in the ground.-H. T. D. and many others are informed that Mr. Seth Green's address is Rochester, N. Y.-A. D. should keep his preparation for preserving hides, etc., covered with a thin layer of glycerin in a well corked bottle.-L. V. R. ought to know better than to try to construct a perpetual motion.-J. C. should consult a physician.-Mrs. S. C. Jr. and J. M. S. will find a description of a fountain on p. 406, vol. 29.-E. C. C. will find an exposure of the motor in question on p. 273, vol. 30.-E. R. T. will find a recipe for treating moles on p. 331, vol. 32.-F. T. W. can blue steel by the process described on p. 123, vol. 32.-J. H. P. will find a good recipe for baking powder on p. 123, vol. 32.-P. D. and others who inquire about the cultivation of sumac should address the Commissioner of Agriculture, Washington, D. C.-S. B. can dress buffalo skins by the method described on p. 266, vol. 26.-C. B. F. will find a recipe for indelible ink on p. 112, vol. 27. Solder for silver is described on p. 251, vol. 28.—C. L. V. can make a rubber varnish by the process given on p. 11, vol. 32.-F. P. will find directions on p. 388, vol. 29, for keeping moths out of clothes.-W. R. M. can cement leather to rubber by using the preparation given on p. 119. vol. 28.-J. W. will find directions for browning gun barrels on p. 11, vol. 32.-G. F. will find instructions for vulcanizing rubber on p. 378, vol. 28.-G. R. D. can etch steel saw blades by the process described on p. 250, vol. 27.-J. M. McC. will find a recipe for diamond cement (cementing whalebone, etc.) on p. 90, vol. 30.-D. F. (diameter of pipes), H. W. G. (dividing a board), J. E. S. (steam pipes). and H. L. L. (boilers and engines), do not send suf-

What size of boiler would be necessary to run the engine for one or two hours daily, or would a hor-Piano and Organ Wire Work of all kinds, Valve izontal or upright be best? A. A boiler such as and Key Pins, Iron and Brass Finishing Nails, &c. &c. is used in connection with a water back will an-The Hendev Machine Co., Wolcottville. Conn. swer very well, and you can get all necessary inswer very well, and you can get all necessary in-A New Thing !- I will furnish any Machine, and formation from a plumber. 3. How much press-Driving Power, or a complete set of Machinery for any use would be best? A. Carry a pressure of 15 or ure would be best? A. Carry a pressure of 15 or 20 lbs.

(5) B.C. & Co. ask: How can we separate silver from tin and lead? A. Cupel the alloy. (6) I. H. F., of Flekkefjord, Norway, asks

Are oak bark ashes (from under the boiler in a tannery) considered as good as wood ashes for fertilizing purposes? A. Yes.

(7) E. H. asks: What is the cause of what is called the sun's "drawing water?" It is an appearance of lines running from the sun to the horizon. A. The sun's rays passing through the interspaces of clouds. When reflected, the rays sometimes converge.

(8) G. F. P. S. asks: 1. Is the plane of the moon's orbit always parallel to itself? A. No. 2. When does the line formed by the intersection of the moon's and earth's orbits point to the sun? A. When the new or full moon is at one of its nodes. 3. Does not the moon have the greatest altitude at night in winter when passing the meridian? A. No. Greatest meridian altitude of the moon is 77° 18', at summer solstice. Least, 20° 6', occurs at winter solstice.

(9) N. P. asks: Will the lenses of a magic antern answer for a small telescope for night use? A. Not well. To try any two lenses as a spyglass, the one of longest focus is to be placed in one end of a paper tube as objective, the other is placed in a paper tube which slides within the first. Separate the two lenses the sum of their focal lengths, then contract the aperture by cardboard stops until you get some kind of definition.

(10) J. P. asks: Has the earth two or three motions? A. An infinite number of perturbing forces vary the earth's motion. Each periodic movement in the solar system communicates its rhythmicoscillation to all its members, whethersun, planet, or meteorite.

(11) R. R. D. says: I wish to make a trans-lucent covering for hotbeds, of cloth instead of glass. One man recommends covering with 2 ozs. lime water, 4 ozs. linseed oil, 3 ozs. fresh eggs. Another recommends 1 quart linseed oil, 1 oz. pulverized sugar of lead, 4 ozs. pulverized rosin. These are to make the cloth waterproof and airtight. Which is the best of the two? A. The latter.

(12) K. asks: How many books did Euclid write? A. There were 13 of the original books written or arranged by Euclid. Most modern works on geometry contain the substance of the original work.

How arose the inequality in the number of days in the different months? A. It has been taken from the reckoning of the Romans, by whom it wasfixed in the time of Julius Cæsar.

Would it be necessary to steam the planks for building a boat 17 feet long by 4 feet wide, of cypress, 16 inch thick? A. No.

(13) C. B. H. says: 1. The journals of the rollers in rolling mills are usually keptwet by a constant stream of water running upon them. A kind of oil or roll grease is used on such journals. and it is capable of withstanding the action of the water. What is its composition? A. It must be $136\frac{1}{2}^\circ$, that is, to double the volume attained by resome kind of grease, such as tallow, that is solid ducing the temperature. A. It is true that some at ordinary temperatures. 2. I have a well which produces the best quality of lubricating oil; can I use this oil to produce the above roll grease for wet journals? A. It is doubtful if you can.

My well produces an abundance of gas, which, when confined, gives 30 or 40 lbs. pressure; can I utilize this gas in running an engine, using the gas instead of steam? A. An ordinary steam engine will answer if it is well made. If, however, the gaswhen mixed with air forms an explosive compound, we advise you not to try the experiment.

(14) C. H. S. asks: How fast can cut cog gearing be run? A. The sudden acceleration and retardation of the wheel make trouble with these gears. It is not possible to definitely answer your question.

(15) C. B. W. savs: 1. We have a 1 inch pipe, 1,800 feet long, through which we get water. We have about 80 feet head, and lift the water 15 feet with a siphon, 400 feet of the pipe forming the siphon. If the 400 feet of the pipe forming the siphon were larger, would we get any more water delivered through the 1 inch pipe in the same time? (1) D. F. D. asks: 1. Would a common changing the pipe. 2. How much pressure would this head of water give? A. A head of 80 feet corresponds to a pressure of nearly 35 the sector will be better to make the cylinder of here.

(16) J. O'C. asks: What is the use in ma kingtheface of a pulley crowned? Are not pulleys frequently made flat? When two shafts with their pulleys are properly ranged with each other. belt run evenly on them, and no more to one side propelling force and does nothing but churn the than the other? If the faces are crowned, and the water into a foam, and the speed is not so good as

in order that it may become thoroughly impregnated by absorption of the liquid. 3. Can I paint over it? A. Yes.

(20) M. B. L. asks: 1. I have a 12 inch 4 ply belt, driving a shaft 35 feet distant. I have o sion frequently to reverse, and I find that often. when it is working true, the belt has a strong tendency to run off on reversing. How can I correct this? A. It is probable that the belt is crooked, or the shaftsare not in line. 2. What is the best plan of putting alarge belt together where it has to be uncoupled frequently, saving of time and an effectual joint being the objects? A. We do not know of any fastening that will answer all of these questions. 3. What would you suggest as the best means of conveying power from a saw mandrel, 30 to 35 feet, to drive a propelling wheel of a boat, speed of mandrel being 360 or 400 and of wheel 30 or 40? A. A chain running over suitable pulleys would be the best.

(21) A. B. savs: 1. We have a new boiler and cistern beneath the door of our engine house, built of brick and coated with water lime. Beside furnishing steam for heating our factory, the boiler supplies steam for running the engine, and the exhaust steam from the cylinder passes up through the factory (by a system of pipes separate from that used for heating direct from the boiler) and thence into the cistern beneath the level of the water. By this arrangement little of the heat is lost except what passes out of the smoke stack. As no water is wasted, it is used over and over, and will become practically as pure as distilled water, and so leave no sediment or incrustation on the boiler. The water in the cistern is now quite hard by reason of the fresh lime, and this will for a time cause a deposit of lime in the boiler. What will soften the water or cause the precipitation of the lime before the water is pumpedinto the boiler? A. Mechanical means, such as a heater with sediment collector, would probably be the best. If, however, your cistern is arranged to be supplied by drainage from the roof when it rains, introduce a little soda with the feed into the boiler, and blow off frequently, until the cistern becomes filled with soft water. 2. What gases are produced by an explosion of gun cotton, and are they of a nature to injure a metallic surface? A. The pro-ducts of the explosion vary greatly according to circumstances, but they are not ordinarily injurious to a metallic surface.

(22) C. W. N. says: Please explain your reply to Z. as to the expansion of gases by heat. If the gas increases its volume $\frac{1}{278}$ part for each degree C. of the rise in the temperature, it would double the volume existing at zero at a less temperature than 273°, on the principle of compound interest. If at 273° below zero, the gas is all gone, what will be the result when you heat up again? Supposing you reduce the temperature to $-136\frac{1}{2}$ in accordance to your answer to Z. you will have half the volume that you commence with. Now you must (according to Z.) increase the temperature 273° to recover the half you lost by reducing contradiction is involved in the statement generally given in text books on physics. It is only within finite limits that it is correct to say that the volume is increased or diminished $\frac{1}{273}$ for such change of temperature of 1° C. A more correct method of stating the law is as follows: If the product of the pressure and volume of a gas at 0° C. is given, the product of these two elements will be increased by $\frac{1}{273}$ of the amount at zero, for each increase of temperature of 1° C., and will be diminished in like proportion for each diminution in temperature of 1°. It will be observed that the increase or decrease is referred to the pressure ard volume of the gas at a temperature of 0° C. Below is given the analytical statement of the law: p=pressure of the gas in pounds per square inch, at a temperature of 0° C. P=pressure at temperature $T^{\circ}C$. v=volume of a given weight of the gas in cubic feet, at a temperature of 0° C. V =volume of same weight, at temperature of 0° C. V $P \times V = p \times v : \frac{T^{\circ}}{273} \times p \times v$. Now if $T^{\circ} = 273^{\circ}$, $P \times V = 0$,

a condition that does not involve the annihilation

of matter, and merely expresses that the gas no longer exists asgas. (This also answers J.J. T.)

(23) C. W. N. says: 1. You advise H. M. to use a 2 feet diameter wheel with a 3 feet lead for 300 revolutions per minute. We are using a 28 inch wheel with 55 inches lead (4 buckets) on a boat 36 feet long and of 6 feet6 inches beam. Our cylinder is 6x5, and with 90 lbs. of steam we have run our wheel at over 310 revolutions per minute. We find, however, that this is a great waste of the faces of the pulleys being flat, will not the power, as the wheel appears to lose most of its

 (2) J. G. asks: What proportion of heat
 belt even on the pulleys.
 A. The object of crown-it is our intention to put on a three bucket wheel.

it is our intention to put on a three bucket wheel, same diameter, with 6 footlead, which we think we can turn up faster (as it will take all the water that comes to it, through larger openings between the buckets) and will drive the boat faster. Let us have your opinion on the subject. A. This will be an improvement. 2. Where should we cut off steam on this engine, and how much should it be open after the center is past? A. At from \$6 to $\frac{1}{16}$ of the stroke, with a lead about $\frac{1}{16}$ inch on each end. Is the pressure on a steam boiler alike all over? A. It is greatest at the lowest point. Is an injector practicable on a marine boiler? A. Yes. (24) F. C. G. asks: Is taking the tin off tin scraps a successful business? A. During the past ten years; we have had the history of more than a dozen attempts, aided by ample money capital, to make a business out of tin scrap, which resulted disastrously. Last summer there were in this neighborhood five independent tin scrap establishments; now there is but one, and its proprietors are

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one fifth as much.

(3) J. W. F. says: P. M. B. says that a boat screw,4 feet in diameter and of 6 feet pitch, run at 120 revolutions, makes 9 knots, thus showing a ne gative slip of 91 per cent. What kind of a screw does he use to give this result? A. Probably he is in error, either as to speed of boat or pitch of screw. What is called 9 miles an hour is sometimes only a guess.

(4) F.C.says: I am working a vacuum engine close to a boiler, with % inch pipe, giving ample steam. I wish to remove the engine to a distance of about 600 feet. The pipe will have to be run partly in the open air, partly through a long shed, and partly under a street, and I would like to know the best description of covering, size of pipe, etc., and if it will be necessary to put a steam trap near the engine. A. Use a pipe about 1 inch in diameter, well felted, and attach a trap near the engine. Avoid as much as possible abrupt changes in the direction of the pipe.

will a pound of iron, completely burnt, yield com- ing pulleys is to correct slight inaccuracies in linpared with a pound of anthracite coal? A. About ing the shafting, and those arising from the belt being crooked. It is true, however, that there are very many places in which flat pulleys are used with good satisfaction.

> (17) K. asks: 1. What size, pattern, and pitch should a propeller be for a 6x6 engine in a boat 30 feet long x 8 feet beam of good model, drawing 21/2 feet astern? A. Three bladed, 30 to 32 inches diameter, 40 to 42 inches pitch. 2. What number of revolutions of such an engine, well constructed, would give the best result? A.About 300. 3. What speed ought I to get in smooth water? A. From 8 to 9 miles an hour.

(18) G. F. asks: What is the amount of moisture contained in a cubic foot of air on a warm damp day? A. About 0.0599 of 1 lb.

(19) B. E. E. asks: 1. Can the solution described on p. 55 of vol. 32 be used to preserve the hull of a yacht? A. Yes. 2. Can it be put on after the yacht is built? A. No, as the wood requires to be steeped for some time in the solution reticent. tissue paper occasionally take fire from the blaze ly, whether it is so or not, is to try it. of the alcohol. How can the lower part of the balloon be made fireproof? A. Try steeping the paper in a solution of tungstate of soda. See article on p. 55, vol. 32.

tin to a liquid condition? A. We do not know of any method better than melting it. 2. How can I \mid tank answer best? A. Yes. powder tin? A. Tin may be very finely granulated by first heating to bright redness and immediately pouring from some hight into a vessel of cold water through a wet broom or sieve.

(27) M. V. O. says: In your reply to C. W. yoù say that the water in the drive well rises by the pressure due to a higher source of supply. If | nozzle? A. It will depend upon the way the pipe this is true, what need is there of any pump at all, and why does not the water flow over the top of the pipe? A. Your view is correct: but our correspondent's question referred to the cause of the water rising up to the level from which it was taken by the pump.

(28) O. C. asks: 1. What is the difference between the composition of gunpowder and blasting powder? A. There is no essential difference. 2. Which wood makes the best charcoal for powder, balm of Gilead, cedar, soft maple, or willow? A. Willow

Is ivory black anything but burnt bones? A.No.

(29) W. M. G. asks: Will water or any other liquid boil away faster in the night than in the daytime? A. Not if the other conditions are the same.

What is meant by the multiplication of the cube? A. Give an example to illustrate your meaning.

1. I saw it stated that the cylinders of the Great Eastern were 14 fect in length; should it not be 4 feet? A. No. Fourteen feet is correct. 2. Was there ever an engine with 14 feet stroke? A.There have been quite a number.

Will a water wheel run with more force in the night than in the daytime? A. No.

(30) A. B. D. asks: If a tank has a pipe, ‡ inch, running in, and a siphon, % inch, running out, the tank being empty, when the pipe running in was opened, when would the water begin to run out? A. As soon as the water level was up to the highest point in the siphon.

I am making a small steam engine, 3 inches stroke by 1½ inches bore. Would a boiler 28 inches high and 13 inches in diameter do, and of what thickness and metal should it be? A. Make it about twice as large, of $\frac{1}{16}$ copper. How an I remove Indian ink marks from my

arm? A. We are not sure that there is any safe method. See p. 331, vol. 30.

How can I bronze a gun barrel? A. Rust the surface with chloride of antimony, or dilute muriatic acid. Then clean it polish with wax, and apply shellac varnish.

(31) L. B. C. asks: 1 Would at 10 horse power engine raise enough water to run an overshot wheel that would give 30 horse power? A. No. 2. Would a 3 inch stream on a 10 foot over shot wheel force an inch stream up a hill 100 feet? A. No.

(32) H. S. asks: What is the shortest cor rectrule for getting the amount of 1 inch lumber in a log, given the diameter and the length? A. We doubt whether any general rule can be given. Of course it is easy to find how much can be cut from the log after it is squared, but frequently there are several slab boards taken off in squaring. Lumbermen, however, by a little observation, can readily construct tables, by which to estimate the contents of any log.

(33) J. C. B. asks: In driving a pipe for a well, how do you determine when you have arrived at water? A. By applying a pump, or sounding. Will sulphur answer as well as lead to secure iron to rock? A. Yes.

(34) D. H. W. asks: 1. To what class of mechanical powerdoes the wagon wheel belong? A. It is a lever as in the case of a locomotive. 2. Which runs the lightest, an iron axled or a thimbleskeined wagon? The iron axle is 1½ inches in di-ameter, and the thimble-skeined axle 3 inches. ' A. Probably the question cannot be answered in a general manner, as it depends upon the friction between the wheel and the axle, and consequently from within, as a locomotive, the axle is the fulcrum. If it is moved by the application of a force from without, and the wheels revolve, the ground may be regarded as the fulcrum. It is evident, in this case, that the wagon could be moved without revolving the wheels.

(35) M. G. asks: Which will resist most logas pipe, or solid rod

(39) J. H. S. asks: 1. Would a cast iron tank of 1 cubic foot capacity or less, to be heated over a forge, do for melting zinc for galvanizing? A. Yes. 2. What should be used to keep the zinc (26) E. B. McG. asks: 1. How can I bring from oxidizing and vaporizing? A. Use sal am-n to a liquid condition? A. We do not know of moniac with the zinc. 3. Would a hemispherical

> (40) J. F. G. says: Our water reservoir is 2 miles distant, and 160 feet above our mill. What size of pipe must be laid from the reservoir to the mill, so that the natural pressure of water (at the mill) will throw a stream of water 100 feet high by the use of 50 feet of 21/2 inch hose and a 11/4 inch is laid. If it is generally straight and free from abrupt changes of direction, it should be from 5 to 6 inches in diameter.

(41) F. L. K. asks: What wood makes the best patterns for light castings? A. Pine, covered with shellac, answers very well. Mahogany can be used for very nice work.

If small copper tubes be fixed in a mold, and melted brass be poured upon them, will the tubes melt or collapse? A. They would be very apt to melt.

Is there an injector that uses the exhaust steam? A. We do not know of any.

1. What are the holes through the side of the firebox of a locomotive for? A. To admit air into the combustion chamber. 2. How can small leaks at seams and stays be stopped? A. By caulking. It is well to attend to smallleaks promptly. 3.Would not the electric light be used as a head light for locomotives? A. It would not be desirable, but it might be done. 4. How much coal will a 40 tun engine burn (on a level) to the mile, pulling a train of 20 cars weighing 10 tuns each, the diameters of the drivers being 4 or 5 feet? A. From 40 to 50 lbs. 5. Why is zero on the Fahrenheit scale 32° below the freezing point of water? A. Because Fahrenheit considered the zero of his scale to be the greatest cold that could be produced.

(42) R. A. I. says: I read that steam at high pressure will not scald. Is this true? A. The statement is to be taken with considerable allow-ance; but the steam issuing from a tea kettle is farmore likely to scald than the same quantity coming from a high pressure boiler.

(43) J. A. V. says: In your answer to W. C. R. (who asks whether, if he should take a cylinder of air with 100 lbs. pressure to the square inch, place it on a small boat, and let the air escape, the air on theoutside traveling in the same direction and at the same speed as that coming out of the cylinder, it would move the boat or not) you say that the boat would move. What would make it do so? A. The unbalanced pressure opposite the place of discharge.

(44) W. M. C. asks: 1. The cylinder of my engine is of 234 inches bore and 4 inches stroke. By pansion of gases and vapors, or on the electrical carrying 80 lbs. steam, making 150 revolutions per minute, how large a yacht can be propelled? A. Maketheboatfrom 20 to 25 feet long. 2. How large ascrewought to be used? A. From 2 to 21/4 feet in diameter. 3. Ought the boiler to be verticalor horizontal? A. Vertical.

(45) H. W. asks: Can I ascertain the power of a locomotive from the diameter of cylinder, length of stroke, diameter of driving wheel, num-ber of wheels connected, and weight of engine? A. No. The weight on the drivers must be given. If you suppose, however, that the adhesion is greater than the tractive force, the solution is very simple. We give the rule by which you can make thenecessary calculations. The tractive force in pounds is found by multiplying together the square of the diameter of the piston in inches, the length of stroke in inches, and the pressure of steam in lbs. per square inch, and dividing the product by the diameter of the driving wheel in inches.

(46) H. L. N.-You cannot restore the peculiar finish to aknife unless you employ the original mechanism by which it was produced, namely, an emery grinding wheel and a walrus leather polishingwheel.-W.

(47) J. N. P. says: 1. I am making a small engine, of which the dimensions are as follows: Diameter of cylinder 3 inches, stroke 4 inches, with cut-off at crank angle of 135°, with lead. Exupon the fit. 3. Which is the fulcrum, the axle or haust closes at crank angle of 1575°, and opens at the ground? A. In the case of a wagon propelled extremity of the stroke. Ratio of crank to connecting rod is 1 to 51%. I propose to use steam at 50 lbs. pressure; what would be the proper dimensions and style of a boiler for the engine, to make steam quick and use the minimum of coal? A. You should have a boiler with from 60 to 70 square feet of efficient heating surface. 2. What do you think of the dimensions of the engine? A. They are well proportioned. 3. I have discarded the the combustion of one pound of carbon, sufficient slide valve, and am going to have two cylinders heat is produced to increase the temperature of save a greater part of the steam lost in the long ways incident to the slide valve, and avoid the enormous friction of the same. It has probably never occurred to many that, in order to move an

mode of conducting each stage of the process, but layer of this liquid quite hot upon the wood with especially the fermentation. If the first fermenta- a soft brush, which will give it a violet color. tion be stopped at an early stage, the beer will contain a considerable quantity of sugar and compar-atively little alcohol; it will be mild, and if bottled will acquire the property of effervescing strongly when the bottle is opened. If, on the other hand, the fermentation be allowed to go on in the vats or casks tillnearly all the sugar is converted into al-

cohol, and the carbonic acid escapes, the beer becomes more alcoholic. For these reasons, lager beer varies in its amount of alcohol from 2 to 10 per cent. 2. Can a grown person drink a pint of alcoholwithout being hurt? A. It would probably cause death.

(49) W. M. R. asks: Will strong sulphuric acidinjure leather? A. Yes.

(50) H. J. S. says: Wells, in his "Philosophy," defines sound as produced by impressions made on the tympanum or drum of the ear by the vibrations of the air. If a cannon be fired far out of the hearing of any animal with the sense of hearing, would there be any sound therefrom? A. Certainly not, under the above definition of sound.

(51) O. W. B. asks: 1. Does soaking a flute in olive oil benefit it in any respect? A. We think it might possibly prevent the wood from becoming dry and cracking or warping. 2. Why are flutes with ivory heads and blow joints better than those with wood? A.The ivory prevents the instrument from getting out of tune by preserving the blow and key holes at a constant diameter. The common wooden instruments, in many cases, in a short time become utterly useless from the contraction and expansion of the wood.

(52) S. L. M. asks: What is the amount of expansion of an iron rod 11/4 inches in diameter and 35 feet long, when the thermometer rises from 10° to 75° Fah.? A. About $\frac{1}{5}$ of an inch.

(53) L.V. R. asks: How can I ascertain the number of degrees of heat required to reduce a certain metal to fusion? A. One method is the use of the pyrometer. As mercury boils at about 660°, we cannot use the mercurial thermometer for higher temperatures. The pyrometer consists of a hollow case of black lead or plumbago, into which is dropped a bar of platinum, secured to its place by a strap of platinum and a wedge of porcelain. The whole is then heated, as, for instance, by placing it in a pot of molten silver, whose temperature we wish to ascertain. The metal bar expands much more than the case of black lead, and, being confined from moving in any but an upward direction, drives forward the arm of a lever over a graduated arc. on which we read the degrees of Fahrenheit's scale. There are several forms of pyrometer, but their use for delicate work is not cus-tomary now. The arrangements now used for the determination of high melting points with the greatest accuracy are either based upon the exproperties of bodies. For details, consult Ganot's " Physics."

(54) S. P. asks: Will petroleum gas ar-sweras well as coal gas in forming a lime light? A. Yes.

(55) J. S. asks: 1. What coloring is put into spirits of wine for use in thermometers? A. The coloring made use of generally for this purpose is, we believe, annatto. 2. How can I makean alcohol thermometer? A. Obtain a glass tube having a very small even bore, and having a coil at its lower end. Fill the coil and a portion of the stem of the thermometer with the colored liquid, and boil until the air is completely expelled from the tube, which should then be hermetically sealed with the blowpipe. These thermometers are usually graduated by placing them in baths of different temperatures together with a standard mercurial thermometer, and marking on the alcohol thermometer the temperature indicated by the mercurial thermometer.

How can I mend rubber shoes? A. See p. 203, vol. 30.

(56) C. G. M. asks: 1. To whom should I apply for a license to run a steam engine? A. If it is for a license to manage a steamboat engine, you should apply to the United States Inspector. If it is for a stationary engine, there is probably a State or city inspector in your city. The customs vary in different States. 2. What are the usual questions asked by the examiner? A. The questions ordinarily refer to the applicant's previous experience, and his knowledge of the construction and management of engines and boilers.

(57) J. C. asks: What is the standard of comparison in the determination of the calorific navigation expired and was settled over a year value of fuel, and upon whose investigations is it ago. No offer of reward now exists that we based? In different books I find it stated that, by know of. the combustion of one pound of carbon, sufficient

(25) J. W. H. says: Fire balloons made of idea seems good. The only way to settle definite- and quantity of the malt and hops used, and the added, the color will be more beautiful. Spread a When it is dry, spread on it another layer; dry it again and give it a third; then boil verdigris at discretion in its own vinegar, and spread a layer of it on the wood; when it is dry rub it with a brush and then with oiled chamois skin. This gives a fine black, and imitates perfectly the color of ebony.

> (59) J. H. M. says: I have a small boat 48 inches from stern to bow, and 8 inches wide. How large an engine would it take to propelit? A. An engine with cylinder of one inch diameter will anwer.

> (60) E. M. asks: What will remove grease stains from marble? A. Try chloroform.

> What will remove a beard from the face without using soap or razor? A. A depilatory will destroy the beard so that no future growth will take place. See p. 229, vol. 28.

> (61) B. F. W. asks: 1. What is the reaction by which hydrogen is evolved when metallic zing is boiled with KOH, and what chemical compounds are formed? A. By the action of a boiling solu-tion of potash on zinc, hydrogen is liberated, while oxide of zinc is formed and dissolved in the alkaline solution. 2. What effect does the presence of an arsenious compound (As_2O_3) have on the reaction and the resulting compounds? A. The arsenious acid would speedily be absorbed by the potash to form arsenite of potash.

> (62) C. M. F. asks: What is a good recipe for boot blacking? A.Ivory black and molasses each 3 ozs., spermaceti oil 1 oz., white wine vinegar, 1 pint. Mix.

> Can I obtain back volumes of the Science Record? A. Yes.

(63) S. A. E. asks: How are artesian wells bored? A. For a full description of the method of boring these wells we must refer you to some work on the subject. The instruments used for this purpose principally consist of long augers, chisels, gouges, etc., each one being about 7 feet long. As the hole deepens, fresh lengths are screwed on until the desired stream is reached. The most remarkable example of an artesian well is that recently formed at Grenelle, a suburb at the southwest of Paris, France, which cost eight years of difficult labor to perforate. The depth reached was about 1.800 feet. The waterrose to the surface, and discharged itself at the rate of 600,000 gallons per hour. The artesian wells of Elbeuf and Tours, which were formed many years ago, overflow in never-varying streams; and the ancient artesian well at Lillers, in the Pas de Calais, has for seven centuries furnished a constant and equable supply.

How is salt obtained from brine? A. Evaporating pans are constructed of well riveted boiler plate, the shape being rectangular, the length about 30 feet, the width about 20 feet, and the depth 2 feet. These pans are supported by masonry, which also serves to separate the flues by which the pans are heated. Professor Cook's analysis of Onondaga brine gives the following percentage of dry impure salt in the brine: Syracuse 18:54, Salina 14:85, Liverpool 15:86, an average of about 16:41 per cent.

(64) G. W. S. asks: 1. How can I make a cheap paint as nearly like white lead as possible? A. Use white oxide of zinc; this may be readily obtained by burning zinc with a full supply of air. 2. How can I bring it to a flesh color? A.Use carmine or vermilion.

(65) G. E. W. says: I cut to pieces a 2 cent piece and tried to melt it between two pieces of charcoal with a blowpipe and alcohol lamp, and failed. I tried borax with it and failed again. How can I melt it? A. If you use some filings of the coin and mix it with four times its weight of carbonate of soda, you should, if you are a good blowpipist, succeed with an alcohol lamp.

How can I make putty powder? A. It is readily obtained by treating metallic tin with nitric acid ; violent action, attended with the extrication of nitrous fumes, occurs, and the tin is converted into a white, crystaline, insoluble mass, which is hydrated metastannic acid; after washing it with cold water, the acid, when dried and ignited, becomes anhydrous, and of a pale buff color; in this form it possesses the properties of the native oxide, and constitutes the putty powder employed for polishing plate, etc. It is also largely used for giving whiteness and opacity to enamels.

(66) G. W. W.-The reward offered by the State of New York for improved means of canal

(67) R. D. A. says, in reply to J. G. S. who asked for a cheap paste for putting up paper exposed out of doors: Take 1 lb. white glue, soak in 1 pint water for 12 hours, white chalk 2 ozs.,common resin 1 oz., white lead 2 ozs., all thoroughly pulverized and mixed. After the glue has stood the required time, dissolve it by gentle heat, then rub into it, in a mortar, the other ingredients, using only water enough to make a thick paste, in order to facilitate their union. Then add 1 pint more of water and let it boil for 10 minutes: after which add water to bring the paste to the required consistence for use. It will require to be kept warm while using.

The solid rod, if the material were of the same quality in each, because the section to resist rupture would be greater.

(36) G. P. asks: What causes a lathe to chatter? A. The springing of the tool or of the bar. It may be that the lathe is too light for the work.

(37) W. H. H. G. asks: Will a four-ply rubber belt be suitable for a fish elevator, the belt coming into contact with salt water and fish slime? A. We think not.

What is the process of deodorizing kerosene with chloride of lime? A. The oil is mixed with lime and heated, then treated with sulphuric acid. and washed with water.

(38) J. N. M. says: Some years ago, experiments were tried in running horse cars by means of compressed air, which was supplied in a strong reservoir at the beginning of the route. Why might not the power of a windmill be applied to condensing air into a large receiver, and the sup-

lbs. pressure, it would require two draft horses doing their be t, if attached directly to the valve stem, with no lubricant under the valve. A. We ingwith 2% parts of oxygen to form carbonic acid, think this idea is in general very good. 4. I want to

instruction as to their use? A. You can probably learn how to apply and use them by practice, and by studying the theory of their action. 5. How

many revolutions will the engine make with 501bs. pressure and no load except the friction of the engine? A. The engine might make 500 or 600 revolutions a minute.

(48) R. T. M. asks: 1. How much per cent

side by side, and use two pistons in the smaller to from 13,000 lbs. to nearly 20,000 lbs. of water 1° take the place of the slide valve; I thereby will Fah. By some authors it is stated at 8,000°, 8,080°, etc., C. What is the present acknowledged stand-ard? A. The unit usually employed is that first used by Rumford, who estimated the calorific power by the number of parts, by weight, of waordinary slide value 8 by 10 inches with steam at 80 ter which one part, by weight, of the body would, on perfect combustion, raise 1° in temperature. Thus one part, by weight, of charcoal, in combinwill evolve heat sufficient to raise the temperature use an injector and indicator; can these instruments of 8,080 parts, by weight, of water 1° C. Estimates be used on so small an engine, and do I need verbal, of this character are also made by what is known as Berthier's and Stromeyer's reduction methods. These processes consist in determining the quantity of either cupric or plumbic oxides reduced by agiven quantity of the fuel.

> (58) J. A. S. J. asks: How can I stain pine a little alum has been dissolved, then put a handful

C. H. S. asks: At what velocity must a cannonball leave the earth so as never to return to it ?-E. F. W. asks: How can I make carbons for electric lights?-J. H. asks: How can I blue lamp chimneys?-J. R. G. asks: How can I construct a coffins black, to dry quickly? A. Steep the wood cheap oxyhydrogen blowpipe ?-O. F. asks: What for two or three days in lukewarm water, in which for mula is used to find the power of a wedge, having the width of the head, length of one side, and stant motor for light or heavy machinery? A.The strength of beer varies according to the quality boil down to less than ½ pint. If a little indigo is the composition of percan marble?