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For Solid Wrought-iron Beams, etc., see adver-discrement. Address Union Iron Mills, Pittsburgh, Pa., for ithograph, &c.



L. D. will find a recipe for polishing furniture on p. 11, vol. 31.—C. T. R. will find directions for coating iron with black enamel on p. 208, vol. 26.-W. H. and O. R. should consult a physician. D. can utilise the tin on tinned plate scrap by the process described on p. 319, vol. 31.—A. M. C. can temper gun springs by the method detailed on p. 10, vol. 25.—C. P. McE. will find a recipe for japanning on tin on p. 75, vol. 32.-W. D. G. will find a recipe for bronze on iron on p. 283, vol. 31.-C. H. S. can whiten ivory by the process detailed on p. 10, vol. 32. The theory of power by the crank is explained on p. 112, vol. 31.-W. S. will find an explanation of two lines approaching each other and never meeting on p. 138, vol. 31.—H. W. M. can make composition molds by following the directions on p. 58, vol. 24. Cement for cracks in cast iron is described on p. 409, vol. 31.—B. will find a directions for stuffing animals on p. 350, vol. 30. W. H. will find directions for silvering glass by Draper's process on p. 267, vol. 31.-C. A. G. will find an explanation of sailing faster than the wind on p. 132, vol. 29.-J. C. C. will find directions for putting a black finish on gun work on p. 208, vol. 26.—C. E. D. G. will find a description of a gaslight machine on p. 379, vol. 30.-W. N. H. will find a recipe for a cement for rubber on p. 203, vol. 30.—W. H. S. will find a formula for a red indelible ink on ρ. 129, vol. 28, and for a black, on p. 112, vol. 27.-Q. R. N. will find directions for etching on glass on p. 409, vol. 31.-J. H. will find directions for bronzing cast iron on p. 283, vol. 41.

(1) O. S. asks: Will sawdust, placed under a printing press or other machinery, absorb the waste oil, produce combustion? A. There will be some danger of such a result; but the occurrence is not very frequent, and can be prevented by ordinary care.

(2) J. W. W. asks: Does the hydraulic or water ram waste more water with a fall of three or four feet than it will elevate to a hight of 12 A. Generally, yes.

1. Can the blaze from a kerosene, alcohol, or common oil lamp exist in a receiver of compressed air of 30 lbs. per square inch, the air escaping and fresh air being supplied all the time? A. Yes. 2. How much will air expand by heating? A. About  $\frac{1}{493}$  of its volume at 32° Fah. for each degree Fah. that its temperature is increased.

the coal that is called sometimes candle coal and sometimes canal coal? A. The coal was originally Every Metal Worker should have a Universal Hand called candle coal, and cannel coal and canal coal Planer. Address J. E. Suitterlin, 60 Duane St., New York. has obtained such general currency that it would Northumberland County, ra. References: Sunbury (Pa.) be thought singular to speak of candle coal, and Gas Light Co.; Mahanoy City (Pa.) Gas Light Co.; Ash-yet that this is the proper name is evident from the yet that this is the proper name is evident from the fact that it was first so called because the coal burnt with a clear, long. yellow flame, like a candle. It is a very compact coal, with an even texture and a smooth, clean, and nearly dull surface and con-Engines, 2 to 8 H.P. N. Twiss, New Haven, Ct. | choidal fracture. The dull luster gives it the as- on is always large, generally 200 cwts., to cause Baltimore Steel Hoe Works, Manufacturers of pect often of being impure, when not so. The protection of the cooling to proceed slowly. 2. Is the method as he "Lockwood Hoe." Send for Sample and Price List. portion of bitumen is large, as may be seen from practised at Swansea in Wales a secret, or is it Peck's Patent Drop Press. Still the best in use. the following analyses: The cannel coal of Bog-Address Milo Peck. New Haven, Conn.
For small size Screw Cutting Engine Lathes and Drill Lathes, address Star Tool Co., Providence, R. I.

13 per cent fixed carbon, and 3 per cent ash. That Brecken Milos Ky, base from 56 to 72 per cent. of Breckenridge, Ky., has from 56 to 72 per cent bituminous matters, 28 to 44 per cent fixed carbon, and 7 to 12 per cent ash. Ultimate analyses, to determine the proportion of the elements, the ashes excluded, have given, for the Boghead cannel coal, carbon 8049 per cent, hydrogen 1124 per cent, oxygen 6.73 per cent, nitrogen 0.87 per cent; for the Breckenridge, carbon 82.36, hydrogen 7.84, oxygen 7:05, and nitrogen 2:75 per cent

> (4) R. H. H. says: I am building a jig saw to run by foot power. Can I use a cylinder with a piston and piston head above the saw to lift it, using air for a spring in the cylinder? I want to run the saw at 600 116 inch strokes per minute. A. You can run it in the way you propose. It is doubtful whether you will be able to attain that A. Physicians frequently recommend the left side, being mixed with water? A. Use a strong solution speed by force applied to a treadle. We shall be glad to hear from you again when you have completed the machine.

The "Scientific American" Office, New York, is varies from 15 to 200, according to the kind of entted with the Miniature Electric Telegraph. By touching gine. 2. Would thick glass be strong enough to gine. 2. Would thick glass be strong enough to make a small steam cylinder, to see how it oper ates? A. Yes.

(6) B. H. R. asks: Is there any difficulty in putting a circular one horse power upon the ground, and running into a second story to turn a printing press? A. Ordinarily, no.

(7) W. F. S. says: I use steam heating and water pipes. My boiler has not been running or had a tire under it for some two or three weeks, and the shop has had no fire in it for several days of severe cold weather. The water in the pipes was frozen, but did not burst a pipe or start a leak anywhere until I had steam around the shop long enough to materially affect the temperature. Why should the pipes not burst till the room became warm? I supposed that I square inch of water, if it were frozen, would require considerably more room. Is this so? A. This is a very common occurrence. There is often air in the pipe, that allows the water to expand in freezing. When heat is applied, however, some of the ice melts, and the water, expanding rapidly as its temperature is raised, encounters resistance from the ice, and so bursts the pipe. More frequently, however, the pipes do burst during the cold weather, and are held together, or prevented from leaking, by the ice that is formed. When the latter melts, however, the leaks are at once disclosed.

(8) J. H. W. asks: 1. What is your opinion in regard to blast pipes under boiler furnaces? Do they materially affect the burning out of the boilers? A. No. 2. Would their use result in a saving of fuel? A. Generally, no; except that, by the useof the blast, an inferior quality of coal can often be employed.

(9) W. H. asks: How can I remove dirt and rease from my hands without injuring the flesh? A. Oil answers in many cases, supplemented by a vigorous application of soap and water, and, in some cases, sand or corn meal; but there are doubtless peculiarities of tiesh that render it impossible to give a method which is generally applicable. We do not doubt, however, that we have many readers who can furnish valuable information or this subject, and we hope to hear from them.

(10) J. W. F. says: I am thinking of building a boat 63 feet long with 15 feet beam, to draw from 5 feetlight to 61/2 feet loaded. I was thinking of putting in an engine 18 inches diameter by 15 inches stroke, with a screw of 66 inches diameter description of the manufacture of sulphurous and 11 feet pitch. Boiler (locomotive) is to be 4 feet acid on p. 111. vol. 29.—B. McD. will find a recipe 6 inches diameter, with a fire box 4 feet 4 inches by for indelible ink on p. 129, vol. 28.—F. J. H. will find 3 feet 10 inches, with 55 tubes, 3 inches diameter and 10 feet long, using steam at 80 lbs. The boat's lines are pretty line. What speed will this engine drive her? A. If the boiler steams well, the boat should go from 15 to 16 miles an hour. For a speed of 10 or 12 miles an hour, use an engine 12x12.

> (11) T. D. savs: I have a steam pump with a hole cut in the piston rod a quarter of an inch deep; the hole was cut in by the cataract. The rod is of brass. When that hole passes through the stuffing box, the steam comes out Can you tell me what I can fill the hole up with? A. Screw in a plug, and finish off the surface.

> (12) F. H. D. asks: 1. Why is it that small drive wheels are used for climbing steep grades or drawing heavy loads, and what advantage has a small wheel over a large one? A. With a small wheel the tractile force is greater, for the same pressure on the piston; but the locomotive does not move as fast for same piston speed as the one with larger driving wheels. 2. Is a wheel more liable to slip when the crank goes under the axle than when it goes over the axle. A. No.

(13) W. H. S. asks: In your reply to W. B.C. you say "the silver being extracted from the pig lead and not from the ore." By what process is this accomplished without burning the lead, as some do, since both have very nearly the same specific gravity? A. This method essentially consists in a concentration process, based upon the phenomenon that, when a certain quantity of lead that contains silver is melted in iron cauldrons, (3) C. asks: 1. Which is the right name for and the fluid is allowed to cool uniformly, there ensues a formation of small octahedral crystals, which are a great deal poorer in silver than the metal originally taken; while the portion of the metal remaining fluid is found to contain an increased quantity of silver. It is clear, therefore, that, if the crystals first obtained are again melted and cooled uniformly, another concentration will be obtained, and that the operation can be repeated until a lead is obtained rich enough in silver to admit of undergoing a refining process. In all cases, however, the quantity of lead operated upadopted in this country? with the process you speak of.

(14) G. W. B. says: In our coal stoves, there is a hard substance adhering to the firebrick, apparently the result of impurities in the coals. What is this substance, and can it be removed by any better method than by the use of the cold chisel? A. No doubt you are right as to its being composed of impurities. By cleaning it killed? A. Yes. 2. How long will the tooth last out at short intervals, so that the quantity will not be great at a time, it can readily be removed

(15) L. E. F. asks: What colors take best in photography? A. Blue takes very light, in some cases appearing as if, in the original object, the blue portions were really white. Yellows, reds, orange, and various shades of green take dark.

What is the best position to lie in during sleep? as the position in which the organs of the body of alum instead of pure water. are least liable to cause discomfort by pressure upon one another.

(5) E. M. asks: 1. How many pounds of steam will it take to make one horse power? A.It wood or satinwood often renders it difficult to and steel must first be electroplated with copper (16) M. T. says: The natural oil in rose-

unite them with glue. Cannot a strong acid or alkali, being first applied to the wood or united with the glue, be made to destroy the effect of the oil and cause the wood to unite more readily? Try the action of a warm solution of potash, applied for a short time and carefully wiped off.

The water in my well has a singular effect on tea, causing it to turn to a wine red color shortly after steeping. It first turns in streaks or clouds of red: and before the meal is finished the beverage "giveth its color in the cup" and causes a lack of relishfor it. Our pump has a cucumber wood pipe. Can you gratify our curiosity by an explanation? A. We cannot give you any satisfactory answer without having first made an examination of the water. Send us a quantity of your water and a sample of the tea, and we will endeavor to solve the problem for you.

(17) E. L. asks: What do licenses for steam boats and their engineers cost, and how long do they last? A. The license for the boat costs \$25, license for engineer \$5; they are renewable

(18) M. T. K. asks: How can I make petroseum and gas tar unite? A. Try dissolving the tar in the petroleum with the aid of benzole and moderate heating.

(19) H. A. S. asks: 1. At what speed should a  $\frac{1}{2}$ 4 inch band saw on 16 inch pulleys run, using two horse power?  $\Lambda$ . It is quite common to run such saws at a speed of 5,000 feet a minute. 2 Would it be safe to run this saw on such small pulleys? A. Your pulleys are too small.

(20) A. R. asks: Is mica, as used for stove lights, found in its natural state in sheets? A. Mica is found in large crystals, made up of a great number of fine sheets. The stove mica is made by simply dividing the crystals so as to obtain the sheets of the required thickness.

(21) W. J. C. asks: 1. Will a properly contructed thermometer inserted in the steam dome of a boiler indicate whether the steam is dry? The vapor evolved from a fluid being always of the emperature of the fluid itself, so long as it remains in contact with it, I am led to doubt whether a thermometer would show any difference between steam dry and steam containing particles of water in mechanical suspension. A. The thermometer would not show any difference unless the steam were superheated. 2. If the dryness of steam cannot be thus indicated, how can it be determined? A. For a method of determining the amount of water in the steam, see p. 257, vol. 31.

(22) J.P.E. asks: LCan a silver plate be set in a man's skull where there is a hole broken in it: A. Yes. 2. Can a silver bridge be put in a man's broken nose? A. Yes

(23) A. M. asks: 1. Where is ice formed, at bottom or on top of water? A. On top. 2. Will ice under any natural circumstances sink to bottom, in water? A. No.

(24) J. E. H. says: We have a double steam pump of the following dimensions: 7 inch plunger, 12 inch stroke, and 12 inch steam cylinders. It is used to pump water through a 4 inch pipe into a reservoir about 50 feet above the level of the pump. If a stopcock were put in the pipe near the reservoir, and near the stopcock a fire plug. would the pump force water through 1.000 feet of hose with sufficient force and to a sufficient hight to extinguish fires, part of our town being 100 feet above the level of the pump? A. It would probably be necessary to increase the steam pressure.

(25) C. C. W. says: 1. I understand that there is a train run from London to Liverpool, the card time of which is an average of 47 miles per hour, including stops. Is this practicable? A. It may be practicable, but we do not think that it is done. 2. I understand that an English locomotive has made the extraordinary time of 82 miles per hour, drawing 5 coaches. Is that possible?  $\Lambda$ . There is such a report, but it is not well authenticated. 3. What is the best hour's run ever made by a locomotive? A. The best of which we have knowledge was about 63 miles an hour.

(26) W. McB. asks: 1. How many cubic feet of hydrogen gas (manufactured from zine and acid or vitriol) are required to raise a weight of 1 lb. to a higat of 10 feet? A. You must first state whether you wish to know the ascensional force of a bulk of hydrogen, sufficient to raise the weight mentioned, or the mechanical force equivalent to the heat given out in burning a certain number of cubic feet. 2. What are the proportions of zine and acid to make gas with, and what is the best way of generating the gas? A. The zinc is used in any quantity that is convenient, and a mixture of oil of vitriol 4 parts, water 4 parts. poured upon it, in a suitable bottle provided with a cork and an exit tube.

(27) J. H. P. asks: I have air siaked lini and pure carbolic acid. How can I impregnate the lime with the acid so as to make an effective insect-repelling mixture for garden vegetables?  $\Lambda$ . This compound may be obtained by digesting your lime in the acid. It is a very unstable salt, easily decomposed.

(28) N.Y.asks: 1.Can the nerve of a tooth be after the nerve is destroyed?  $\Lambda$ . If the tooth is properly filled after the operation, it will last in most cases, a very long time.

(29) J. McL. asks: What acid will eat zinc the quickest and bite the sharpest? A. Sulphuric acid, diluted with from 3 to 5 pints of water.

(30) L. K. D. asks: Is there anything that will make plaster harder than it is when dry after

(31) H. B. P. asks: How can I plate with gold, silver, and nickel upon steel and nickel silver without first using a coppering solution? A. Iron

(32) C. W. asks: Will you please tell me how to detect impurities and adulterations in linseed oil? A. The purity of the fixed oils may be determined approximately, and the admixture of core of soft iron. cheaper oils detected, (1) by observing the peculiar odor of the oil when gently heated by a spirit lamp in a small porcelain or platinum capsule. The odor evolved will resemble that of the plant or animal from which it is obtained. In this way linseed oil, whale oil, train oil, or rape oil may be detected even when used to adulterate another oil (2) By mixing concentrated sulphuric acid with oil d or 2 parts acid to 100 oil) the temperature rises and the mixture becomes colored. If a plate of white glass be placed on a sheet of white paper and 10 or 15 drops of oil be placed on the glass and a small drop of acid be added, a color will be pro duced which varies with the oil employed. With rape oil a greenish blue ring forms at a certain dis tance from the acid, while towards the center light yellow brown streaks may be observed. Olive oil instantly becomes pale yellow, and afterwards yellowish green. In linseed oil, a beautiful dark brownish red web is formed, gradually changing into brownish black. Tallow oil or oleic acid becomesbrown. Itseldom occurs that a better oil is used to adulterate an inferior one. Oil of alteration, for instance, for train oil, which occurs most frequently, it is only necessary to place from 10 to 15 drops of rape oil, the purity of which is undoubted, together with as much train oil, and an equal quantity of the oil whose purity is suspected, and add to each of them a drop of sulphuric acid. From the color produced an inference may be formed of the purity of the oil; and by the different tinges of color the extent of adulteration may oe detected. (3) By the oleometer, indicating the specific gravity of oil in such a way that pure rape seed oil is indicated by 37° to 38°, hemp oil from 30° to  $31^{\circ}$ . There are various other tests; that by the capillarimeter indicates the quantity of the oil which falls from a certain sized point under given circumstances, etc.

(33) G. M. R. says: A daily journal gives the following test to be applied to quartz, to de-termine its auriferous character: "After being well ground and calcined, it should be treated with a bath of iodine or bromine water, and allowed to digest in it for some time. Then a piece of filter paper should be soaked in the solution, dried, and burned to ashes in a mutile. If gold is present, the ash is purple. One pennyweight of gold to the tun may thus be detected." Please give me details of the preparation of the iodine or bromine water. A. The solution of iodine or bromine is readily obtained by placing a small quantity of either iodine or bromine in a bottle with a quantity of pure water, and shaking. The color of solution, if bromine has been used, will be orange yellow. The bromine is more soluble in water than the iodine, which is very slightly soluble. Both the solutions dissolve gold, to form either iodide or bromide of gold. These are readily decomposed upon application of heat, and give the char acteristic color mentioned in the test.

(34) T. H. W. asks: 1. How can I keep my zinc in a lead and zinc battery from getting covered with a black substance? A. You cannot help its turning black, except by covering it with mer cury. 2. Does the substance have any effect on the strength of the battery? A. No.

(35) G.S.P. asks: How can I arrange a magneto-electric machine that is used in medical purposes so as to have a negative and a positive pole? . One pole is negative and the other positive. You cannot have a current with both poles positive.

(36) J. E. G. asks: What size of copper wire will do to convey the same amount of electricity as the common telegraph wire?  $\Lambda$ . Copper is six times as good a conductor as iron, and therefore a copper wire one sixth as large would conduct as much electricity as the iron wire now used.

(37) W. C. C. asks: How can I construct a safe and cheap kerosene lamp for blowpipe soldering purposes? A. For this purpose a small lamp of glass is best. Thetop should be composed of a small brass disk (about  $\frac{1}{2}$  inch in diameter) through which the wick tube passes. The disk should be supported by a metal frame, into which it fits loosely, in such a manner that, while in its normal position, it prevents the air from entering the lamp: t also acts as a safety valve, making it impossible for an explosion of any kind to occur. The lamp should be furnished with a brass cup which screws over the top, thus rendering it portable, prevents the spilling of the liquid in case the lamp is overturned, and also deters evaporation when not in use. This, we believe, is the simplest and best form of lamp for this purpose.

in an induction coil, which way the wires of the coarse helix run, in respect to the fine helix? Should the two helices be wound in the same direction, or in different directions? A. It makes no difference, which way you wind them.

(39) W. T. B. asks: How can I dissolve sulphur in water, so as to make a strong permanent solution? A. Free sulphur is insoluble in water under any condition. Many of its compounds. however, are soluble, some extremely so. The affinity existing between sulphuric acid (which is a compound of sulphur with oxygen) and water is so great that, by its absorption of the aqueous vapor from the air, when freely exposed, it soon doubles its own volume. The ordinary "sulphur water." as obtained from what are known as sulphur springs, is simply a solution in water of gaseous sulphuretted hydrogen, which, as its name denotes, is a compound of sulphur with hydrogen. This gas may be artificially obtained, cheaply and in large quantities, by the action of dilute oil of vitriol on sulphide of iron. A solution of the gas is easily obtained by passing it through water.

nagnet of a small telegraph be constructed? A. Wind copper wire, insulated with silk, around a

(41) F. H. M. asks: 1. Is there any way in hich silver can be applied to plastered molding other than as leaf? A. We do not know of any other method. 2. What is the best mixture for lacquering silver to make it like gold? A. Amber 8 ozs., gum lac 2 ozs., drying linseed oil 8 ozs.,essence of turpentine 16 ozs. Dissolve separately the gum lac, and then add the amber, prepared and pulverized, with the linseed oil and essence, very warm When the whole has lost a part of its heat, mix in relative proportions tincture of annatto, of terra merita, gum guttæ, and dragon's blood. This varnish, when applied to white metals, gives them beautiful gold color. 3. Can bronze be burnished? A. No. 4. Can leaf be applied on a French polished surface? A. No. 5. Which plaster is best for moldings? A. What kind of moldings?

(42) H. E. N. says: I have a galvanic belt, varranted to cure neuralgia, etc., and I want to find out what the actual electric or galvanic intensity is, if it has any. How can I arrive at it? A. Attach its two poles to a tangent galvanometer monds, olive, and codfish oil will, therefore, never and note the deflection. Then connect the cell of be used to adulterate rape oil, but probably train, a Daniell battery to the same galvanometer. The or perhaps linseed, and sometimes poppy oil. If i deflection of the galvanic belt will be to the dewe are led, therefore, by the odorto infer an adul- flection of a Daniell cell as its intensity is to that of a Daniell cell,

> (43) W. E. P. asks: 1. What are the properties of crude petroleum? A .The name petroleum (rock oil) is applied to certain bituminous fluids found in the earth. Solid bitumen or asphalt differs but little in chemical composition from petroleum, both being compounds of hydrogen and carbon Many varieties of petroleum, and perhaps all, become thick by exposure to the air, and finally solid, resembling asphaltum. The fluid petroleum has been collected in Burmah for at least fifteen centuries. It is used by the inhabitants for light and fuel. In this country petroleum is not, as many suppose, a new discovery. Years ago springs of it were known in many localities, but its use was very limited. No method for purifying it was known, so that it was looked upon as valueless, and several wells bored for salt water were abandoned on account of the oil rendering the water impure. In 1861 it was purified, and introduced extensively as an illuminating oil, to take the place of burning fluids (camphine and alcohol), the price of which was greatly enhanced, and which, by the explosive qualities of their vapors, were causing many severe accidents. The trade increased, new wells were bored; and some of them yielded several hundred barrels per day, making possessors at once wealthy. Petroleum was probably formed by a slow decomposition of organic substances under the earth's surface. Some geologists suppose petroleum to be due to the subterraneous distillation of remains of sea plants and marine animals, and that the petroleum is forced upwards by water, always present in the bored wells. It is found in cavities and in crevices, and through the substance of the rock. Petroleum is much lighter than water, of a green or black color, with a peculiar and, to most persons, unpleasant odor. It is commercially divided into two kinds, the heavy or lubricating oil, and the light oil; the former is more dense, and sometimes of the consistence of thin molasses. It is used, without preparation, for lubricating ma chinery, for which it is admirably suited. The light oil, before it can be used, is submitted to several purifying processes, the most impor nt of which is distillation. 2. What is the simplest method of ascertaining the degree of fire test of refined petro leum? A. Burning oil is sometimes adulterated with benzine or heavy oil. To detect the former, pour a few ounces into a small tin cup, and put it on a stove or over a lamp, placing the bulb of a thermometer in the oil. Then as the temperature rises, try with a lighted taper when the oil gives off inflammable vapor; if this be below 100° or 110° Fah. the oil is dangerous to use, as its vapor, becoming mixed with air in the lamp, may take fire and explode. The adulteration with heavy oil is shown by the dimness of the flame after having burned for some time, accompanied by the charring of the wick. 3. Can kerosene oil be adultera-How are the adulterations to be detected: A. Yes; it is largely adulterated with the lighter oils, such as benzine, etc., which may be readily detected by the process as described above

(44) R. R. B. asks: 1. What are the cheapest and best ingredients for making paste in large quantities, for paperhangers' and paper bag manufacturers' use? I want a paste free from lumps and as adhesive as possible; how should the ingredients be mixed, what quantity of each should be used in each barrel, and what should be its consistence before and after cooking? A. The folowing has been highly recommended; for besides (38) F. asks: Does it make any difference, possessing the merit of cheapness, it has the advantage of preventing the paper from separating or peeling off. It may be prepared by first softening 18 lbs. of finely powdered bole in water, and then draining off the surplus water from the mass. One and a quarter pounds of glue are next to be boiled intoglue water; and the bole and two pounds of gypsum are then stirred in, and the whole mass forced through a sieve by means of a brush. This is afterward diluted with water to the condition of a thin paste or dressing, when it is ready for use. This paste is not only much cheaper than ordinary flour paste, but it has the advantage of adhering better to whitewashed surfaces, especially to walls that have been coated over several times. and from which the coating has not been care fully removed. In some cases, it is advisable, when putting fine paper on old walls, to coat them by means of this paste with a ground paper, and to apply the paperhanging itself to this with ordinary paste.

> (45) A. B. H. asks: 1. Is hot air lighter than cold A. Yes. 2. Are noxious gases lighter, or dry. Why is this? A. The water contains iron in heavier than pure air? A. Some are lighter, some solution, existing probably as bicarbonate of iron.

(40) C. A. M. asks: How should the electro- are heavier than air. For the most part, however, they are heavier.

1. Does coal slack by exposure to air in a damp place, and does slacking injure it? A. By exposure to the air and damp, the coal loses some of its valuable ingredients, and is injured. 2. Does freezing coal injure it? A. It is also somewhat disintegrated and injured by freezing weather.

(46) **4.** B. says: I have been trying to electrotype according to the directions given to C.A. C. in your issue of February 6, but my deposit is so brittle that I can hardly get it off the wax whole, and there are minute holes in the work What is the trouble? A. Too much battery.

(47) W. A. B. asks: Does the zinc rod in the Leclanché battery require to be amalgamated?

(48) A. W. M. says: In Baker's work on the steam engine, p. 35, I find the following formula for the graduation of the lever of the safety valve:

 $\frac{\pi r^2 l P' - \frac{1}{2} l w}{\pi r^2}$   $\pi r^2$ =area of valve.l=distance of

the center of valve to fulcrum, P'=the pressure of steam on boiler, L=length of lever, w=weight of lever, W = weight of ball. I have just put in a set of new boilers. The area of the valve is 541189 inches,  $l=3\cdot125$ , P'=80 lbs., length of lever 29 inches, weight of lever 81/2 lbs., and weight of ball 83 lbs. D  $\frac{\pi r^4 P' - \frac{1}{2} L L v}{-\frac{5 \cdot 41189 \times 3 \cdot 125 \times 80 - 14 \cdot 5 \times 8 \cdot 5}{-\frac{1}{2} \times 8 \cdot 5}}$ 

=14 $\frac{\pi}{10}$ . D=14 $\frac{\pi}{10}$  inches from fulcrum to place where the weight should be placed on lever to carry 80 lbs. steam. But when we fired up, we were surprised to find that, instead of placing the weight at  $14^{-8}_{-10}$  inches from the fulcrum, we had to place it 19 inches; we therefore conclude that the formula is incorrect. Can you explain this? A. The formula is approximately correct, and answers pretty well for ordinary cases. We think it likely that you have made a mistake in estimating the area of the valve, or that your steam gage is incorrect. You will find an experimen 1 method described on p. 273, vol. 31.

(49) W. L. L. says: I wish to make a telecope with a 15 inch objective, hollow, to be tilled with liquid. What is the best filling? A. Only two kinds of objectives repay the labor bestowed on making them, the achromatic objective and the silvered glass reflector, mounted either according to Newton's or to Cassegrain's form

(50) W. H. S. asks: What is the proporion between the object and diagonal reflectors in the Newtonian telescope, the focus being six times the diameter? A. Minor axis of elliptical plane mirror is one fifth the aperture of the speculum. The focus should be nearly twelve times the aper-

(51) R. W. K. says: You state that a generally useful application of paraffin is for the lining of casks and wooden vessels, to prevent absorption of their contents by the wood, or their escape through the pores. The diminishing evaporation being of great importance to the vineyard districts of Virginia, I applied at some of the largest establishments in Philadelphia, and found that such an application of paraffin was an entire novelty to Would it not be expensive? A. It is suc cessfully used in coating smaller vessels; its application to larger is a matter only of expense and proper appliances.

(52) J. F. D. asks: What is the best method of bleaching rosin? A. We do not know of any such process.

(53) E. F. asks: Can any simple ingredient be used to throw down the foreign matter in very hard water? A. This may be accomplished either by boiling the water before using, or by the addition of the proper quantity of lime water, which will precipitate or carry down withit the excess of carbonate of lime.

(54) U. H. asks: 1. Can I gold plate steel pens with the Tom Thumb battery? A. Yes. 2. Must I plate the pens with copper first? A. It is not necessary.

How can I mend rubber hose? A. See p. 203,

What is the freezing point of mercury? A.Mercurv solidifies at -39° Fah., and is then soft and malleable; but if reduced to a much lower temperature, it becomes brittle. It boils at about 662° Fah., and slowly volatilizes at all temperatures

(55) W. L. B. says: Rain water 6 ozs., carmine24 grains, aqua ammonia 240 drops, and gum smaller proportion of ammonia.

You give a recipe for white gunpowder. Are

(56) W. C. R. asks: I. If I take a glass tube, say 6 inches long and  $\frac{1}{2}$  inch in diameter, and fill it about half full of the heads of the old sulphur (blue headed) matches, with half an inch of stick to each head, and then seal the two ends of the tube over a blowpipe without igniting the matches, after which I heat the body of the tube hot enough to consume the wood: What gases will I have in the tube? A. The gases will be vapor of sulphur, a small amount of sulphurous acid, water, and pyroligneous acid arising from the destructive distillation of the wood. 2. Will they be of disagreeable odor, or injurious when inhaled? A. They will be both disagreeable and injurious.

(57) M. J. S. says: We have a well forty feet deep, consisting of a three inch pipe driven into the earth, through which the water is drawn. The soil at the bottom of the well is a white sand, and the water drawn therefrom is clear as crystal; ble with the valve, but your article on "Practical but on being heated it becomes red, and precipi Mechanism," by Joshua Rose (a couple of weeks tates a red sediment, which retains its color when ago) corrected the mistake. I now run with steam dry. Why is this? A. The water contains iron in 20 lbs, pressure at the rate of about 800 revolutions

Upon boiling, the carbonic acid is driven off and the iron precipitated as red oxide, which remains as an insoluble body

(58) J. G. asks: What impurities does sheet zinc contain, and how may they be removed so as to leave it comparatively pure? A. Commercial zinc is always more or less contaminated with arsenic, cadmium, lead, iron, and carbon. The black residue remaining when zinc is dissolved in acid (oftenmistaken for a carburet of zinc) is a mixture in various proportions of iron, lead, and carbon. The more impure the zinc, the more readily it is dissolved in acids; but by careful distillation zinc may be almost entirely freed from any foreign metals.

In a Leclanché cell (1 quart), how often do the contents of the porous cup and of the outer jar require changing? A. This depends altogether upon the use that is made of it, or in other words, the number of times daily or monthly it is brought into requisition. The outer solution simply needs to be kept saturated with sal ammoniac, and water to replenish that lost by evaporation. This battery cannot be used on closed circuit, because of its rapid polarization.

(59) L. W. R. asks: 1. What is the difference in the combination of a portrait and a landscape lens for photography? A. The portrait lens is constructed to work rapidly; the front pair consists of a crown double convex and flint plano-concave, the back pair a ffint negative meniscus and crown double convex, of longer focus than the frontpair. Theview tube is a singlepair, a double convex crown and a double concave flint. 2. Why are two sets of lenses used in a camera tube? A. For wider angle of aperture. 3. Can good landscape and portrait photography be done with an achromatic object glass of a telescope? A. No. For experiment, put a view tube its own focallength inside focus of objective. 4. Does a lens of short or long focal length make any difference for either kind of work? A. A lens works the slower the longer its focus is. 5. How is a telescope fixed for viewing the sun? A. Claret and apple green sextant glasses are superposed inside the eyepiece cap, or the image is received on a Bristol board.

(60) J. E. N. asks: 1. What is the best comosition for covering the insulated wires for an induction coil? A. Cover both wires with silk. 2. Is a bobbin 6 inches long by 21/2 inches in diameter, with a ½ inch cylinder (for the wire rods), a well proportioned one? A. Yes. 3. Which gives the best results with a weak battery, a coil of two wires (of the same size) wound side by side, or a coil of fine over a coarser wire? A. Use No. 40 for the secondary and No. 16 for the primary. Are the induced and the inducing coils wound in the same direction (in the coil of one wire over the other)? A. Yes. 5. In what proportion of each can the induced be increased without increasing the inducing coil? A.Almost any extent. 6.About what quantity of each (by weight) of wire will be required for the above sized bobbin? A. Use a few turns of the coarse wire and a thousand turns of the fine wire. 7. Can iron covered wire be used in place of copper in anypart? A. Not to good advantage. 8. What work on electricity is recommended? A. De la Rive, Wood, Jenkins, Harris, Ferguson, and Thomson are all good.

(61) W. R. H. asks: 1. How can I best sol der platinum foil to brass and make a good electrical connection? A. Use pulverized rosin and good solder. 2. Will powdered peroxide of manganese act as well as the coarsely pulverized for the Leclanché battery? A. Use the coarse in preference.

(62) F. B. S. says: 1. I have a small battery made on the Daniell principle, using zinc and sulphate of copper, but it is not constant. What can I do to keep it more uniform? A. Probably the water needs changing in the porous cups. When it becomes supersaturated with sulphate of zinc, crystals form on the zinc and stop the action. You can use nitrate of copper instead of sulphate if you wish, but sulphate is cheaper and better. 2. Howcan I make an induction coil? A. An induction coil is made by winding a helix of coarse insulated copper wire, and surrounding it by a helix of fine insulated copper wire. The battery is connected with the coarse wire coil and the shocks are obtained from the fine wire coil, when the circuit of the coarse wire coil, which is called the primary circuit, is broken and closed. The fine wire coil is called the secondary circuit, and receives its electrical effects by induction from the primary

(63) W. E. D. asks: How can I make a battery suitable for plating, and how one that will run arabic water 30 drops make red ink which has an a small telegraph instrument? I have a glass jar offensive smell. What will remove the smell of that will hold about 2 quarts, and wish to make it the ammonia without spoiling the ink? A. Use a into as powerful a battery as I can. A. Put a plate of copper in the bottom of your jar and attach a copper wire to it which is insulated above he junction with gutta pounds of sulphate of copper (blue vitriol) on the copper plate. Suspend a disk of zinc in the jar near the top and fill the jar with water. Connect the upper end of the copper wire with the zinc disk, and leave it so for 48 hours, and your battery will then be ready for use. If you need more power, make a second cell in the same way and connect the copper plate of one with the zinc disk of the other. One cell of this kind has a force of one volt, two cells two volts, and so on. This is called the gravity or Callaud battery, and is one of thebest and most constant in use.

> (64) W. S. S. asks: Is there a chemical process by which steel can be case-hardened without heating or springing it? A. We do not know of

(65) J. H. B. says: I have a little engine of 1 inch bore by 21/2 inches stroke. I had some trou-

(66) E. B. K. says, in reply to J. C. M., who making machines? Who deals in fossils? Who | R had trouble with pipes connected to his boiler in makes pocket door locks? Who buys old coins? under side: The trouble was that there was no connection with the steam. If one end of the pipe were connected with the steam, the steam generated would escape to the boiler and form a vacuum, and the water would follow. The size of the pipe makes no difference. It will not do to in this way be expeditiously obtained. pump through such pipes.

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

C. H. W. Jr .-- It is a fragment of a small hexagonal crystal of rock crystal or quartz.-G. H. M. -It is a decomposed muscovite, which is a variety of mica, and consists of a hydrated silicate of alumina, with a small percentage of oxide of iron and about 10 per cent of alkali. Numerous specimens of this mineral have been forwarded of late, probably on the supposition that the bright yellow scales owe their color to the presence of gold. This mistake was made with sad consequences by the first settlers at Jamestown, Va., who, instead of devoting themselves to cutting down the forest, collected a shipload of similar material and sent it to England, where it was pronounced worthless.-D.K. -No. 1 is bornite or variegated copper ore, composed of sulphur 25 per cent, copper 63 per cent and iron 12 per cent. No. 2 is epidote, and consists of 37 per cent of silica, 23 per cent of alumina, 14 per cent of oxide of iron, 23 per cent of magnesia, and 3 per cent of water.—T. M. T.—It is a mixture of augite, epidote, and quartz. If it contains any tin ore, it is not perceptible to the eye, and a piece much larger than the microscopic fragment you send would be necessary to determine this fact. has no value, apparently, as an ore.—N. H. S.—We have tried your specimen for manganese, and find it present, although in what quantity we cannot say from a preliminary examination. The cost of an assay is \$10; and if there is a deposit of the mineral, it is worth the assay.—G. McI.—The pill is probably a proprietary article; it has all the indications of being for sweetening the breath only.-J. K.-No. 1 is marcasite, and is composed of 46 per cent of iron and 54 of sulphur. It is not valuable as an iron ore. No. 2 is a clay slate, containing oxide of iron, but not in sufficient quantity to render it valuable. No. 3 is an impure steatite or soapstone. In large blocks, it is used in lining the interior of blast furnaces. No. 4 is a yellow oxide of iron, mixed with clay and a large amount of silex. It is an inferior iron ore.-Y. and K.-'The specimen contains gold, of the variety known in works on mineralogy as "fool's gold," or iron pyrites. It is full of cubical crystals—slightly de-composed—of iron pyrites, which is a compound of sulphur and iron.-P. C.-The white particles are not sulphur, but sulphate of iron arising from the decomposition of pyrites. The vitriol has probably been made in the same manner, and a larger specimen would be needed for analysis.—An unlabeled mineral of a bright metallic luster, slight yellow tint, broken on the side with a fibrous fracture, and having an appearance at the ends of having undergone fusion, has been received. It is

J. & J. T. ask: What is the proper speed for the periphery of a bolting reel?—J. H. asks; How can I dye skins of muskrat, fox, etc., black -R. M. asks: How can Iprepare Prussian blue for stenciling, to be used, moistened with water, with -R. S. asks: What is a hit and miss valve?—J. C. C. asks: 1. How can ginger ale with a round, full, aromatic body be made? 2. What are the component parts of the Belfast ginger ale -T. W. B. asks: If four men can pack a bale of cottonweighing 500 lbs. on an iron screw 4 inches In diameter and 11/2 inches pitch in the thread to the round, with levers 15 feet long, how much can four men pack with a wood screw 22 inches diameter and 7 inches pitch in the thread to the round, with lever, 20 feet long? The incline on the woodscrew is as 7 to 60.9, and the incline on the iron screw is as 11/2 to 121/2, that is, the incline on both is nearly the same, but the r'se on one is 7 inches to the round, and on the other 11/2 inches to the round.

## COMMUNICATIONS RECEIVED.

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

On Boiler Explosions. By W. H. On a Mysterious Fire. By J. B. G.

On a Magnetic Engine. By H. L. C.

On Lubricating Cylinders. By J. H. S., and by

sulphuret of iron.

On an Optical Phenomenon. By C. E. F.

On Nitro-Glycerin as a Motor. By C. T.

On Amalgam Fillings. By F. H. H.

On a Man-Eating Tree. By K. L. On Ants. By J. S.

Also enquiries and answers from the following:

D. O.-M. P. C.-J. B. E.-J. E. B.-W. C. T.-A. F. A. F. O.-O. C. S.-H. C. L.-J. S. B.-J. W.-R.-J. D.-J. F. F.-B. C. & Co.-D. F. S.-W. B. R.-E. E. E. -S. A. H.--P. E. V. H.--J. M. R.--W. H. S. --H. L. F. M.--B. J. J.--C. H. B.--W. M. H.-+R. G.S.

## 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 al-

Enquiries relating to patents, or to the patenta bility 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.

Hundreds of enquiries analogous to the following are sent: "Who sells eccentric grinding mills? Who sells a gold plating liquid? Who sells match- Jewe er's lathe, N. W. Holt.....

All such personal enquiries are printed, as will be observed, in the column of "Business and Personal." which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can

[OFFICIAL.]

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## DESIGNS PATENTED.

8,019.—Clock Frame, etc.—H. J. Davies, Brooklyn, N. Y 8,020.—Cook Stove.—L. W. Harwood et al., Troy, N. Y 8,021 to 8,024.—OIL CLOTHS.—C.T. Meyer et al., Bergen, N.J. 8,025, 8,026.—COOK RANGES.—N.S. Vedder et al., Troy, N.Y. 8,027 to 8,033.—Carpets.—J. T. Webster, Philadelphia, Pa. 8,034.—Boas.—G. H. Prindle, Philadelphia, Pa 159.180 8.035.-COOKSTOVE,-N.S. Vedder et al., Troy, N. T

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#### TRADE MARKS REGISTERED.

2,195.-Washing Soda.-Fischer & Co., New York city. 2,186.—DRUGS.—E. Fougera & Co., New York city. 2,187.—Carpet Tacks.—F. F. McNair, Nunda, N. Y. 2,188.—Jeans.—Naumkeng Cotton Co., Salem, Mass. 2,189.—HAMS.—C. D. Sabin, New York city. 2,190.—Wool.—J. H. Smith, Philadelphia, Pa 2,191.-MINERAL WATERS.-H. A. Benjamin, San Fran

2,192.-BRAIDS.-H. N. Daggett, Attleborough, Mass 2,193.-SILKS, ETC.-Passavant& Co., New York city. 2,194.—Soaps.—Strunz et al., Pittsburgh, Pa. 2,195.—SPRING BEDS.—Tucker Man. Co., Boston, Mass. 2,196.—KNITTED GOODS.—Troy Hosiery Co., Troy, N. Y.

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On filing a Disclaimer	\$10
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Un application for Design (14 years)	

## CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA,

JANUARY 25 to JANUARY 28, 1874.

4,307.-H. H. Rhodes, San José, Santa Clara coun-Cal., U. S. Improvements in railroad car axles, called "Rhodes' Railroad Car Axle." Jan. 25, 1875.

4,308.-W. Gooding. Detroit City, C. Spalding and A Winchester, Windsor, Essex county, Ont. Improve ments on apparatus forelevating and conveying coal, called "The Shipping Coal Elevator." Jan. 25, 1875

4,309.—A. J. O'Day, Elk Rapids, Antrim county, Mich., U. S. Improvements in ore crushing and rock breaking machines, called "O'Day's Improved Ore Crush er." Jan. 25, 1875. 4,310.—G. M. Holmes, Gardener, Kennebee county, Me.,

U.S. Improvements •n mechanism for planing the cogs of bevel gear wheels, called "Holmes" Gear Wheel." Jan. 25, 1875.

4,311.-Wm. Hamilton. Fallsburg, Sullivan county, N.Y., U. S. Improvements in machine for making animal shoes, called "Hamilton's Machine for Making Ani mal Shoes." Jan. 25, 1875.

4,312.—J. Prince, Rock Island, Stanstead county, P. Q. Improvements on an apparatus for cooling milk, called "Prince's Improved Milk Vat Pan." Jan. 25, 1875. 4,313.-D. Allard, St. Albans, Franklin county, Vt., U.S.

Improvements on smoke stacks, called "Allard's Smoke Stack." Jan. 25, 1875. 4,314.-C. E. Moyer, Berlin, Waterloo county, Ont. Im-

provements on shoe lasts, called "Moyer's Improved Patent Felt Shoe Last." Jan. 26, 1875. 4,315.-J. K. Feick, Berlin, Waterloo county, Ont. 1st extension of No. 2,234,on "Feick's Patent Last." Jan.

4,316.-J. K. Fetck, Berlin, Waterloo county, Ont. 2d ex-tension of No. 2,234, on "Fetck's Patent Last." Jan

d, 317.-H. Sappe, New York city, N. Y., U. S. Improve ments on faucets, called "Sappe's Self Closing Faucet. Jan. 26, 1875.

4,318.—Wm. Crich, Tuckersmith township, Huron county, Ont. Improvement on spring bed bottom, called "Crich's Improved Spring Bed." Jan. 26, 1875.
4.319.—L. Dion and A. Dion, St. Thomas, Montgomery

county, P. Q. Unattelage de wagon de chemins de fer, dit "Attelage de Wagon de Dion & Fils." Improvements in railway car couplers.

-J. F. Webster, Hamilton, Wentworth county, Ont. A leaf supporter for sewing machines, called "Webster's Leaf Supporter." Jan. 25, 1875. 4,321.—R. Sylvester, Enniskillen, Durham county, Ont.

Improvements in spring hoe seeding machine, called "Sylvester's Improved Spring Hoe." Jan. 26, 1875.
4.322.—E. C. Searlett, Adolphustown, Lennox county Ont. Improvements in the manner of coupling and uncoupling railroad cars, called "Scarlett's Car Coup-

ling." Jan. 26, 1875 4,223.-S. J. Wright, Madrid, and A. H. Wood, Ogdens burgh, St. Lawrence county, N. Y., U. S. Impovement on watchman's patrol register, called "Wright &

Wood's Watchman's Permanent Control Clock." Jan 4.324.-R. H. Atwell, Baltimore, Ma., C. S. Improve ments on motors or engines to be driven by either wa ter or steam, called "Atwell's Motor for Steam or Wa-

ter.'' Jan. 28, 1875. 4,325.-G. A. Jasper, Boston, Suffolkcounty, Mass., U.S. Improvements in methods for promoting the combustion of fuel in furnaces, called "The JasperFurnace."

Jan. 28, 1875. 4,326.-J. Conrad and J. H. Fahringer, Montoursville. Lycoming county, Pa., U. S. Improvements on appa ratus for elevating building materials called "Con-rad's and Fahringer's Apparatus for Elevating Building Material." Jan. 28, 1875.

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