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Patent Chemical Metallic Paint—All shades ground in oil, and all mixed ready for use. Put up in cans, barrels, and half barrels. Price, 50c., $1, and $1.50 per gal. Send for card of colors. New York City Oil Company, Sole Agents, 116 Maiden Lane, New York.

Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Mercurial Steam Blast & Hydraulic Gauges of all pressures, very accurate. T. Shaw, 913 Ridge av., Phil.

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For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

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For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 470 Grand Street, New York.

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Notes & Queries

W. E. says: I have a painting on the back of glass. It must be fifty years old, and the colors are getting loose from the glass. How can I fasten them t the glass again?

J. A. asks: How can I make artificial meerschaum, ivory, buckhorn, and coral?

W. B. C. asks: What is the best method of hardening soft soap, and molding it into cakes?

J. N. C. asks: Is it practicable to have a kind of a fender attached above the cowcatcher of a locomotive to prevent injuring cattle thrown off the track?

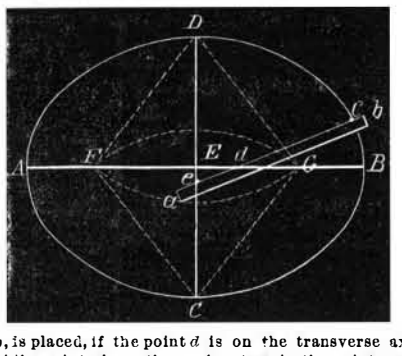
J. N. Q. says: Not long since I saw in a scientific paper the following process for taking leaf photographs: "Put ten cents worth of the bichromate of potash in a two ounce vial of soft water. After as much of this substance as possible has dissolved, pour some of the solution into a shallow dish and place in it a piece of white letter paper. When thoroughly saturated, take it out and carry it into a dark room, and fan it about until nearly dry, when it will be of a bright yellow color. Next, place upon it the leaf to be photographed, and under it put a piece of black cloth, and below this several pieces of newspaper. Place all these between two pieces of window glass of equal size, and fasten together with spring clothes pins. Expose this now to the sun, so that the rays will fall perpendicularly upon the leaf. The paper will soon turn brown; and, in from half an hour to several hours, there will be a perfect print. Next, wash the paper in clear water, which renew every few moments until the paper is nearly or perfectly white." This photograph will resemble a dead leaf. I want to get a picture that is green. Is there any solution, as cheap and simple as the above, by which a green picture can be obtained? Or is there any way of converting the picture obtained as above into a green color by pouring some solution over it, or otherwise? Can we obtain, similarly, a red leaf?

Answers to Correspondents

H. B. C. will find the process of nickel plating described on p. 266, vol. 29.—J. S. will find a recipe for lemon sirup on p. 266, vol 29. You can make copying ink by dissolving sugar in common ink.—J. C. N. will find rules for calculating the dimensions of fly wheels on p. 288. vol. 28.—J. B. W. can waterproof canvas by the process described on p. 122, vol. 27.—J. can temper gun and other springs by following the directions on p. 314, vol. 28.—C. E. C. will find directions for French polishing on p. 266, vol. 29.—C. F. P. will find a recipe for a blackboard composition on p. 299, vol. 28.

S. says: It is asserted and believed by many people that, if a man be stretched at full length, say upon stools, and six persons gather about him (opposite, two and two) and place the forefinger of each hand under him, he can be raised with ease into the air by the joint strength of the six, exerted in this manner, provided that all seven of them inhale and retain air to the full capacity of their lungs. All stress is laid upon the inhalation. Is there any virtue in this? For a body to take in any amount of the fluid in which it is bathed does not increase its buoyancy; nor does a full and retained breath assist vital power so well as sustained and regular breathing. The only way in which I can imagine its assisting is by its giving the upper part of the body greater rigidity through the increased arch of the chest. This would make the distribution of power uniform over the body of the lifted, and give a better brace to the lifters. There is no trouble about averaging a lift of thirteen pounds to each finger, but it is the mysterious and all potent full breath which excites my curiosity. The believers in this, I have no doubt, experience an additional buoyancy equivalent to the weight of a volume of air equal to their cranial capacity. Answer: We have often made the experiment you speak of; and our idea is that the effect of the inhalation by the lifted is to give rigidity to his body. As for the lifters, the inhalation probably strengthens the muscles: how, it might be difficult to explain.

R. says: Is the method of drawing an ellipse, described on page 84 of the pamphlet published by you and called "The United States Patent Law, etc.," a correct one? If so, please explain the principle by which the figure is thus drawn. It seems to me that the method is incorrect, and that no part of the curve of a circle can coincide for any appreciable distance with the peculiar curve of an ellipse. I have proved, satisfactorily to myself, that the figure is not an ellipse. My plan is to compare the area of an ellipse of given axes, drawn with regard to its foci (the method of drawing generally given in scientific works) and to compare this area with the area of a figure, having the same axes, called an ellipse by you, but composed of the arcs of four circles whose centers are the four angles of the enclosed square. The difference is so large that it must be the difference in shape between the two areas. Answer: Your statement is correct. The method given in our pamphlet for laying down an ellipse is approximate in its results. We present herewith another method, strictly accurate and quite as convenient. Mark on a ruler, or strip of paper, $a\ b$, a distance, $c\ d$, equal to the semi-conjugate axis, or half the short diameter, and a distance, $c\ e$, equal to the semi-transverse axis, or half the long diameter. Then, in whatever position the strip,



$a\ b$, is placed, if the point d is on the transverse axis and the point e is on the conjugate axis, the point c will be on the curve. Hence, any desired number of points can readily be obtained. It is easy to make an instrument which shall fulfil these conditions; and by placing a pencil at c, a continuous curve can be described. Most of our readers know that if a string, the length of the transverse axis, has its ends secured to the foci of the ellipse, the curve can be traced by a pencil held in the bight of the string. To find the foci, F G, of an ellipse when the axes, A B and C D, are given: from C or D as a center, with a radius equal to A B divided by 2, describe the arc of a circle. The points, F G, in which it cuts $a\ b$, will be the foci.

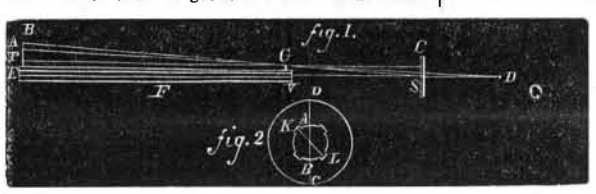
D. A. B.—Extract of hemlock bark is in common use for tanning purposes.

H. A. J.—Minors can obtain patents. Read our advertisement about patents.

E. T. C. says: I saw, a few days ago, in the Louisville Exposition, a number of models from the Patent Office. They were scattered over a couple of tables, and seemed to receive no care and very little attention. I should like to know how they came to be there, and why there seemed to be no care taken to prevent their being destroyed or carried away. Answer: Probably they were old models of rejected cases, which were sold some time ago at auction by the Patent Office.

F. E. S. says: A fellow workman claims that wood cannot be set on fire by coming in contact with a steam pipe. I claim that it can. Who is right? Answer: The heat of ordinary steam pipes is not sufficient to set wood on fire. But some kinds of wood, enclosed in a certain way and subjected for a sufficient length of time to the heat of steam pipes, will after a long while become charred. It is known that charcoal made from certain kinds of wood, and warmed to a certain temperature within a suitable enclosure, will absorb oxygen so rapidly from the atmosphere as to inflame spontaneously. This is one way in which steam pipes may indirectly be the cause of fire. Again, some kinds of wood, if long subjected to moderate heat, treated with oil, and suitably enclosed, will inflame spontaneously. Thus the interior of a wooden jacket of an engine cylinder, so situated that in oiling the valves small quantities of oil became incorporated with the wood, has been known to take fire. But such examples are rare. The practice is to set steam pipes an inch or two apart from the wood, not because they will directly burn the wood, but to prevent the accumulation, near the pipes, of materials and conditions which favor what is termed spontaneous combustion.

G. M. A. says: In your answer to C. M. B., page 345, volume XXVIII, as to thickness of the barrel of a rifle, you say that the thickness of the barrel at the breech should be twice the diameter of the bore. 1. What is the thickness of a barrel? Is it the thickness of the metal as B C, Fig. 2, or is it DA × BC? 2. What is decarbonized steel? How does it differ from the best wrought iron? Why is not cast steel as good? 3. What is the diameter of the bore? Is it the diameter inside the grooves, or is it the line K L, Fig. 2? 4. How are the sights of a rifle arranged? Are they parallel to the bore? 5. In Fig. 1, let F be the barrel of a rifle, E D the path of a ball, C S a target, and P, G. the sights parallel to the bore. Now if C was aimed at, I should think that the ball would strike at S. Is it not always necessary, therefore, to have one of the sights movable, for instance P? And would it not be necessary to have it as high as B for the distance ▼ S, and as high as A for the distance ▼ D? 6. If a man standing on a level plain holds a gun of any kind perfectly horizontal, does not the ball, if unobstructed, reach the ground as soon after leaving the gun as if it had been dropped from the muzzle? Must not the ball reach the mark so soon after leaving the gun that it has not time to fall any appreciable distance? 7. Do the grooves in a rifle tend to make



the ball go swifter, as it offers more resistance to the powder, and so the powder has time to exert its full force on the ball? 8. Will a good rifle, if held immovably in a vise or other support, send a ball into exactly the same place every time, at 100 yards? Answers: 1. B C is the thickness. 2. You probably refer to what is commonly known as blistered steel. It is stronger and less malleable than wrought iron, and is capable of being tempered. Cast steel is the most perfect kind of steel. 3. We think that the generally received definition of the bore of a rifle is AB plus the depth of the groove; we would be glad to hear from sportsmen on this matter. 4 and 5. It is impossible to give definite rules for arranging the sights of a rifle, as so much depends on the weight of the charge of powder, and the weight of the ball. Hence one of the sights is made movable, and the experience of the marksman teaches him how to adjust it. 6. Yes. The amount the ball falls is allowed for by the adjustment of the sights. 7. We think that the principal object of the grooves is to impart a rotary motion to the ball. 8. Yes, if all the conditions are the same, at each trial. In practice, it is generally impossible to avoid slight differences in the weights of charges, and it is also far from an easy matter to hold a rifle immovably in a vise.

E. D. W. asks: 1. How can I prevent the oiled silk lining of a dressing case from sticking together in the hot weather? 2. If a magnet that will lift two pounds be suspended from one that will lift a quarter of a pound, do both gain in strength, and does the smaller one gain as much as it would if a piece of iron were suspended from it? Answers: 1. We do not believe you can remedy the trouble in any way, except by placing a piece of tissue paper over the oiled silk, before rolling up the case. 2. The magnets do not gain in strength under such circumstances.

R. H. asks: What materials are used in grinding lenses for optical instruments? I can make a very good lens, but have some difficulty in getting the excellent polish necessary. Answer: First, use quartz sand, with the lead grinder, then coarse emery. Second, washed or elutriate demeries of increasing fineness, with the iron grinder. Third, rouge, with the pitch polisher. Rouge is obtained by calcining copperas in a covered crucible.

C. W. G. says: I have a steam boiler about 3 feet in diameter and 7 feet high, of which 5 feet is the length of the flues. My engine has a cylinder 4½ x 12 inches. What power ought I to obtain from it? Answer: It would be impossible to answer this question without receiving more data. In any case, only an approximate estimate could be made, without an actual trial.

D. B. K. sends a paragraph about the performance of the new Corliss pumping engine now working on the city water works, Providence, R. I., but fails to give any particulars as to size or construction of the machine.

E. W. G. asks: Will water which has a highly mineral quality, indicating iron (a red deposit as it flows along from the source), be injurious to a steam boiler? Answer: We do not think this water will injure your boiler, if you blow it out frequently.

J. M. S.—We know nothing about the concern you speak of. Stockholders, we presume, are liable for debts. Brass expands under the influence of heat about twice as much as glass. For each degree of heat, up to a certain point, a bar of brass one thousand feet long will expand an eighth of an inch. A bar of glass, two thousand three hundred feet long, expands an eighth of an inch for each degree of heat.

C. A. C. asks: I. How can I make a solution so that, by dipping anything into it, I can silver plate it? 2. How can I make colored lights? 3. What is the best material for making a small air balloon? Answers: 1. You can silver brass or copper, previously well cleaned, by rubbing them with the following: chloride of silver 1 part, pearlash 3 parts, common salt 1½ parts, whiting 1 part; rub with a piece of soft leather or cork, moistened with water and dipped into the mixture. Then wash in hot water containing a little soda, and wipe dry 2. Colored flames can be produced by the combustion of alcohol upon certain salts in fine powder. For green, moisten chloride of copper with alcohol and inflame. For red, use nitrate of strontia. For yellow, nitrate of soda. For violet, potash and its salts. 3. The best material for small air balloons is thin tissue paper.

R. H. B. says: 1. I recently heard two men discussing patent laws. One said that the inventor of a process for making gas from petroleum could prevent any one else from making an improvement on the same for ten years. 2. Can a patentee prevent the purchaser of his article from lending it to a friend? 3. Is dynamite a fluid, and how is it made? Is there any fluid as powerful as nitro-glycerin? Answers: There is no process of law or letters patent by which an inventor can prevent another from continuing to improve an art or process. 2. There is no law to prevent one who has bought a patented article lending it to another for temporary use. 3. Dynamite is a solid substance, made by saturating siliceous earth with nitro-glycerin. There is no known fluid substance with the explosive power of nitro-glycerin.

W. A. G. asks: How can I plate iron wire with brass without using a battery? Answer: A method invented in France is thus described: Clean the wire and place it in the sulphate of copper. When it is coated with copper, remove it, and cover it with a paste made of pure oxide of zinc. Then heat it to a temperature sufficient to melt the copper. Great care must be used in this operation to avoid volatilizing the zinc.

H. B. M. asks: If I compress a cubic foot of air so as to obtain a pressure of 40 lbs. per square inch, what space will it occupy? Answer: If the temperature remains constant during compression, the volume, at a pressure of 40 lbs. per square inch, will be about 0·367 of a cubic foot. But if no heat is lost during the compression, the volume will depend on the original temperature of the air. Suppose, for instance, that the air, before compression, is at 70° Fah.; when it has a pressure of 40 lbs. per square inch, its temperature will be about 249°, and its volume about 0·491 of a cubic foot.

G. B. M. says: 1. We have a well 20 feet deep with 10 feet of water in it. We wish to conduct the water (from 2 to 3 barrels a day) to a point 20 rods distant and at the same level as the bottom of the well. We have a lot of half inch lead pipe which we propose to lay as a siphon. Should we have to use a pump or air chamber, or both, and at what place should they be applied? 2. In our dwelling we keep, in cool weather three coal fires for heating purposes only. At a distance of 100 feet, we have a 5 horse engine and a 6 horse upright tubular boiler. These are in use on Mondays, Wednesday and Fridays. Would it be practicable to heat the house by steam from this boiler, and if so, would it be economical? We could dispense with the three fires in the house, and instead of firing up the boiler every other day with cold water, we could start the engine any time without much delay. Answers: 1. It would be necessary to use a pump, and it could be used either to draw or force the water. If an air vessel is added, it should be placed beyond the delivery valve. 2. Properly managed, it would probably be more economical to use steam for heating purposes, in the case you mention.

C. D. H. asks: 1. How can I transfer surplus power from an engine to one near by which is overloaded? 2. Can I run an engine with the exhaust steam of another engine? 3. Is there a well authenticated case of fire originating from steam pipes in a dry house? How can such danger be prevented? Answers: You might carry a steam pipe from the large boiler to the small engine. 2. This is done in the compound engine, but it would hardly be advisable in your case. 3. Insurance companies are divided in opinion on this question. Where ordinary precautions are observed, we do not think there is any danger.

J. A. M. says: I recently undertook to make an engine of about one horse power. I got along well, excepting in the valve in the steam chest on the cylinder; and I wish to get some information on the position of the piston head and slide valve. Answer: Consult Auchincloss on "Link and Valve Motions."

B. F. M. says, in reply to J. D.'s assertion about tumbling rods for separators: I have been running a 10 horse separator for nearly two seasons; I used a belt the first two months, and tumbling rods ever since; and I assert that I can do more threshing with the rods than with belt. I have coupled to the engine, right to fly wheel end of crank shaft, my tumbling shafts, consisting mostly of gas pipe of 2 inches diameter and 15 feet length; but one or two are each but ⅝ inch diameter, and 6 or 7 feet long, of solid wrought iron. These latter are intended to spring somewhat, and also to twist off in case of accident. The gearing at machine is bevel, 6½ to 1, and this gives us the proper motion; it is also furnished with a clutch, so that the engine can be stopped and machine run ahead. With the above we thresh from 300 to 500 bushels wheat, and twice that amount of oats, per day, which is more than any one of three other machines does, though we have the lightest engine of the four. They use belts and we use tumbling rods. Answer: This is an interesting statement, though not conclusive as to the greater efficiency of tumbling rods, in the absence of a test with dynamometer. We shall be glad to hear from others on this matter.

C. H. D. says: I have an upright boiler which is required to carry 40 lbs. pressure. Every time the water is supplied, the pressure is reduced to 35 lbs. as the water is heated but imperfectly by the exhaust steam. I propose to lead the water to top of boiler, let it go down one of the flues, return by another and then enter the boiler as before. Will the water evaporate from the pipes, after working hours, when the pressure leaves the boiler, and will the pipes receive injury from the action of the fire when steam is again being made? Answer: Your plan will probably work very well, as many heaters are in use, constructed on substantially the same principle.

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