Notes & Queries

L. S. asks: Photographs can be taken on paper which has been dipped in a solution of bichromate of potash, but the shades are not dark enough. How can I make them darker?

J. H. C. says: I have an eye stone (as described by Mr. J. Stauffer on page 131, current volume), 3½ inches in circumference. Where could it have come from?

J. H. P. asks how small brass castings, such as keys, are made, and is it possible to cast more than one key in the same mold? If so, how is it best done?

J. C. P. asks: How is gold leaf put on books, leather, etc.?

D. U. B. says: I have varnished (copal varnish) and polished some tiles made from Portland cement. About 20 days after finishing, there came out on the surface a great many small blisters. Can any one suggest the cause and the remedy?

A. G. S. asks: How can an oval cylinder be bored on a lathe, if the shaft be in the center of the cylinder?

Answers to Correspondents

O. B. will find a recipe for a cement for mending leather shoes on p. 129, vol. 28.—E. E. T. can cast brass by following the directions on p. 231, vol. 26.—N. D. can weld iron and steel by the method described on p. 381, vol. 26.—T. G. S. should follow the directions on p. 41, vol. 28, for gilding names on china.—F. H. B. will find a system of filtering described on p. 241, vol. 27.

L. S. asks: 1. Will a bar of iron, suspended by the middle, sustain less or more weight if we groove it the whole length, so as to make the sectional area of a ∩ shape? 2. If it is made of cast iron, and malleableized, will it sustain as much weight as when made of wrought iron? Answers: 1. Less. 2. No.

W. P. asks: Which is the preferable way to heat a medium sized greenhouse (where coal averages from five to six dollars a tun), steam, hot water or simply by carrying the smoke along the floor in a brick flue? I care more for the good of the flowers than the first cost, although that is also an object. Answer: The best plan is to heat by means of hot water pipes. The cheapest method is to conduct the fire through a flue, along the floor. The portion of the flue nearest the fire, say for 30 feet, should be of fire brick; the remainder may be made of drain pipe.

J. W. says: I am told that a pipe ½ inch in diameter and 20 feet long, the end of which is inserted in the bung hole of a barrel, if filled with water will burst the barrel. Suppose that the pipe were 2 inches diameter, and 10 feet long, if filled with water; would it have the same effect? Answer: The pressure on the barrel would be only half as much, in the second case.

W. S. C. says: I am running a 12 horse power threshing machine, in which the power is connected to the drum by means of the ordinary coupling rods. Can I gain any power by applying a belt in the place of the coupling rods, allowing the power the same distance from drum and giving the drum the same speed? Answer: We think not, but would be pleased to hear from any of our readers who have tried the experiment.

H. S. H. says: An oscillating engine has two cylinders one inch in diameter x two inches stroke. How large and how thick should a boiler be to carry a working pressure of 100 lbs. and run at 350 per minute? Answer: Allow from 10 to 12 square feet of heating surface; and if the boiler is cylindrical, with riveted joints, and made of copper, the thickness in inches may be found by multiplying the diameter in inches by 0·002917. If the boiler be made of wrought iron, multiply the diameter in inches by 0·00i786.

J. A. H. asks: In the exhibition of Pepper's "ghost," do the rays of light forming the ghost's image come from the front surface of the glass plate (according to the laws governing all rays having an incidence of 30 degrees or less) or do they come from the back surface of the glass according to the laws of total reflection or refraction? Answer: The rays come from the front of the glass, in reality, but apparently from behind.

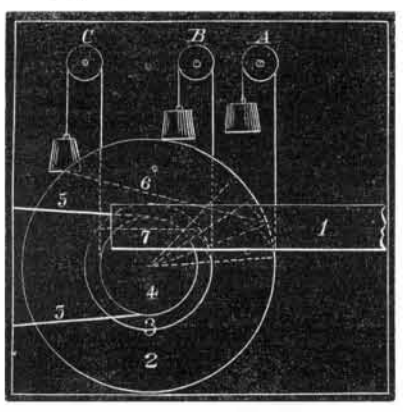
W. K. asks: What is the cause of tubes in a boiler blistering? I am running two tubular boilers they became red hot last summer and scaled off to a depth of ¾ inch. I used an anti-incrustation powder, and now the old scale is coming off and the tubes show blister. Is it on account of overheating? Answer: The tubes were in all probability blistered from overheat, the scale preventing contact with the water.

D. C. asks: 1. What is the most intense heat that can be got from a blacksmith's fire, fitted with a blower, in degrees Fahrenheit? Which is the most powerful mechanical power? Answers: 1. About 3,800°. 2. In practice, you can probably increase pressure to the greatest extent with the screw.

J. W. S. says: On page 66 current volume, in speaking of the lecture of Dr. Thomas before the Nautical School in New York, he is reported as having said as follows: "The Lapland, which sailed from England one day after the City of Washington, carried such an instrument (the palinurus), which showed that, during the appearance of the aurora borealis, her compass deviated 1½°. This deviation, occurring, as it must have done on the City of Washington, at the beginning of her voyage, would cause her to diverge 20 miles from her course in every hundred," etc. Is there not a mistake in the Doctor's statement concerning the deviation and divergence? Would not the divergence at 1½° deviation of compass be but about 2·62 miles in 100 instead of 20 in 100; or would it not require about 11°28′ of deviation of compass to cause 20 miles of divergence in 100? Answer: On the principle of plane sailing: Departure = distance × sine of course, which will make your calculations about correct.

J. B. asks: Why does gas in a stove explode, making a report like a musket and blowing the dust over the room and filling the house with gas? Sometimes a flame will flash out, two or three feet from the bottom door, and people are sometimes badly burnt. These explosions take place when the fire is first built or immediately after fresh coal has been put on. They are more common when red ash or Franklin coal is used, but will take place with the hardest coal. Answers: The cause of the explosions alluded to is the combustion of carbonic oxide, a compound of carbon and oxygen. The blue flame over the surface of newly made coal fires is due to the combustion of this gas, which is always formed when hard coal burns with a limited supply of oxygen, or when carbonic acid, formed by the combustion of the red hot coal below, comes in contact with the hot coal above in an ordinary close stove. Reversing the draft, that is, carrying it from above down through the feed coal and out at the bottom of the grate, would probably prevent any explosion.

J. E. E., of Pa., says: As A. W. I. differs with me in my reply to H. B. as to the relative power required to drive two circular saws, one just large enough to cut through the timber and one larger, I give the following explanation, admitting that certain conditions may favor his theory. The accompanying diagram shows two saws, respectively 30 and 60 inches diameter. The teeth in the 30 inch saw will be only half the distance from point to point of those in the large saw; and the teeth in each saw being of the same size, pitch, and length, the small saw will have only one half of the space between the teeth that the large saw has. In case the feed is very heavy, so that, in the small saw, there is not space between the teeth sufficient to contain the sawdust without clogging, then the large saw would have a decided advantage, as the dust room would be twice as large. The track cut by the small saw is greater than that cut by the large one, and more cutting points are in the timber at the same time, cutting more lengthwise of the grain than the large saw; while the teeth of the large saw are running at greater velocity at the expense of power. If, for example, we run a 12 inch saw 1,000 revolutions per minute, by a 6 inch pulley, and saw through a 4 inch cut, and we put a saw 5 feet in diameter on to the same mandrel at the same speed, and with the same number of teeth, a very wide difference in favor of the small saw will be observed at once; as we bring the saws nearer to each other, in size, the difference in the power is not proportionately as great; still there must be and is evidently a difference. There is more or less friction of the timber against each saw, which is



Scale 1¼ inch to the foot. 1, stick of timber 12 inches through. 2, circular saw 60 inches in diameter. 3, circular saw 30 inches in diameter. 4, 24 inch pulley. 5, 5, driving belt. 6, pitch line drawn to ¼ the diameter of saw. 7, pitch line drawn to ¼ the diameter of saw.

evidently in favor of the smaller one. It will be observed on reference to the above diagram, that with the same pitch of teeth (and I have drawn each to a one fourth pitch) the teeth of the two saws are presented to the wood quite differently. The large saw presents the teeth with more hook than the small one. A represents a weight, attached by a cord to the edge of the large saw, B a weight attached to the edge of the small saw, C a weight attached to the pulley face, or one foot from the center of rotation. Now supposing the weight C to weigh 1,000 lbs., a 500 lbs. weight at A would raise it, while it would require about 800 lbs. at B. Now detach the weight A and B and apply the teeth of each saw one inch into a 12 inch stick at one turn; which saw will require the most weight, provided in each case that the points of the teeth only come in contact with the timber? I hold that the smaller saw will require the lighter weight. There may also be conditions when a larger number of teeth will require less power than a less number; on very heavy feed, where each tooth would be overloaded so that it would require a great amount of power to crowd it through the timber, if each tooth in a circular saw cuts one twelfth of an inch of timber (which is an average for a board circular saw) it certainly will require more power to cut each chip. A saw may be too coarse or too fine toothed for the work required. Practice directs the carpenter how to set the cutting tool of his plow or jack plane in order to accomplish the most with his muscle; and it will do so with the saw.

R. F. H. asks: How can I make Javelle water? Answer: Put 4 lbs. bicarbonate of soda in a kettle, add 1 gallon water, and boil for 15 minutes; then stir in 1 lb. chloride of lime, free from lumps. Use cold.

W. E. asks: With small turbines running under a head of 30 feet or more, do the buckets ever become heated by the action of the water upon them? If so, why? Answer: It will depend upon the construction of the wheel, whether the water has a free exit or not. A simple experiment (taking the temperature of water before and after discharging) would settle the matter for any particular case.

C. H. M. asks: If I multiply the number of square inches in a boiler by the pressure, shall I get the aggregate pressure in same? To illustrate: A boiler is 40 inches diameter x 10 feet long inside, and the pressure is 70 lbs. shown by steam gage. What would the total pressure be? Answer: If you mean the pressure tending to produce rupture, it may be calculated in the following manner: Area on which pressure acts = 40 × 10 × 12 = 4,800 square inches. Total rupturing pressure = 4,800 × 70 = 296,000 pounds.

G. B. M. asks: 1. Why is it that with all the iron and coal that there is in this country that so much of our railroad iron and machinery comes from England? Is it because it is cheaper there, or are they better workmen than we are? 2. Please name some of the works on electricity and electrical apparatus. Answers: 1. Because it is cheaper. Wages are much less in Europe than in this country, but we do not think that the workmen abroad are any better than our own. 2. We can recommend Noad's "Text Book of Electricity."

S. D. P. Jr. asks: 1. I would ask your opinion in regard to a boiler which I am using, making steam for boiling stock and drying paper. Said boiler is about 25 years old, never has been patched, is 52 inches by 10 feet, with 70 (I think), 3 inch copper flues. I usually carry about 25 pounds to the inch, it blows off at that. A short time ago, I tested it by the force pump, pumping in warm water until the gage showed 42 pounds. Now although this boiler has been long in use, and, it is to be presumed, has become worn thin in places, would it be advisable to substitute a new one? It is perfectly tight and makes steam freely. On account of the copper flues, I think I get more steam from the fuel than I would from an iron flue boiler. 2. I have heard experienced engineers and boiler makers contend that, when a boiler gives out simply from the natural pressure of the steam on some weak spot, there will be no general destruction of the boiler but merely a "blowing out" at that particular place, and that destructive boiler explosions occur from low water or some other unknown cause, and that, under such circumstances, the stronger the boiler the more destructive the explosion. Is this so? Answer: 1. If you have a careful engineer, we would advise you to continue the use of the boiler since from your statements, it would seem to be unusually well constructed. 2. We believe that all boiler explosions occur from what you call the natural pressure of steam. As to the destructive effects of such ruptures, witness the explosion of the boiler of the steamer Westfield, under what is considered a very low pressure of steam. On page 192 of volume XXVIII of SCIENTIFIC AMERICAN, you will find an article giving our views on explosions from low water.

J. T. M. says: In Dick's "Practical Astronomer" there is a description of a new achromatic telescope, in which a small compound lens is made to correct the chromatic aberration of a large crown lens, by which the necessity for a large flint lens is done away with. The inventor, I believe, was a Mr. Rogers. The compound lens was to be made of crown and flint, so as to lengthen the focus for violet rays and shorten that for red. Now the large object lens would bring the violet to a shorter focus than the red, but, melting the compound glass, the first is lengthened and the second shortened so as to come to a focus together. The proper adjustment of the compound lens for this correction is effected, not by regulating its radii, but by placing it nearer or farther from the object glass. I would like to know: What is the defect in this combination, that it has not been adopted in the construction of achromatic telescopes, since it is far less expensive than the common arrangement? 2. How high a power would a three inch crown object glass, with a 1½ inch compound lens, bear? 3. Would a small achromatic lens do for the compound lens; and if not, how is this lens to be constructed? 4. Would you advise me to attempt the manufacture of such a telescope for my private use? Would it be worth the trouble? Answers: 1. Large flint disks for lenses are now sold at the same price as those of crown glass. The contrivance you mention does not properly correct the spherical aberration; the small lens being one quarter the size of the crown objective, must be four times as accurately figured. 2. About 200. 3. No. The late Mr. Fitz made thorough trial of the Barlow fluid lens, of bisulphide of carbon between meniscus cheeks of glass. 4. No. A glass reflector, silvered, then nickel plated and polished, costs little and is the only telescope which can be cheaply made by an amateur. See our remarks to C. M. P. on page 43.

L. S. asks if landscape painters do not use a mirror which reduces the object to the size required. Answer: They sometimes do use a mirror. A sheet of glass blackened on one side makes a good reflector for this purpose. But a still better device is a *camera oscura*, which consists of a lens set in a box, something like a photo camera. In this instrument a reduced image of the landscape is thrown upon ground glass or upon tracing paper, and a drawing of the view may be readily made.

W. J. W. asks: What is the process of bleaching india rubber? Answer: One process consists in heating the rubber with ammonia and phosphate of lime. Another consists in treating the rubber with chlorine and washing it with hot water, then hardening by means of phosphate of lime.

W. H. T. asks: 1. When a locomotive is rounding a curve, which rail sustains the greatest weight, the outside or inside? 2. Which of the wheels slips, or how is the difference in length of rail overcome? Answers: 1. If the outer rail is elevated, the inner sustains the greatest weight. 2. If the wheels are coned, neither may slip; but if not, the one that describes the longer curve will slip.

M. W. asks: 1. What causes type metal to be porous, or to have small holes on the face? 2. At what heat will antimony fuse? Answers: 1. The cause of your type metal having a porous face is probably imperfect casting. 2. Antimony melts at 842° Fahr.

C. S. asks: Is there any ingredient that can be mixed with pine tar so as to give it a yellow color when tarring any dark fiberous material? Answer: You can try yellow ocher.

C. D. S. asks: What is the philosophy of the gyroscope, and what is that instrument used for? What keeps it in a horizontal position? Answer: The weight is sustained by reason of its inertia, or by virtue of the principle that rotating bodies tend to preserve their planes of rotation. This is the best explanation that can be given without the aid of a mathematical investigation. The gyroscope is a philosophical toy, and its principal use is to illustrate astronomical phenomena.

J. P. G. says: I wish to know to what uses soapstone can be applied. I understand that it is used (1) as a lining for furnaces, stoves, etc.; (2) when ground to powder, as a facing for molds for fine castings; (3) as a fertilizer. Answers: Steatite or soapstone is used for a variety of purposes, chiefly (as far as we know at present) those that you have mentioned, except as a fertilizer. A line or two in our "Business and Personal" column will introduce you to the buyers of it.

J. H. S. says: There are in this place several engines that are mysteries to me. The trouble is a creaking noise in the feed pipe, in some between the pump and boiler, in others just back of the pump. The clicking noise is so bad at times as to cause fears of the pipe breaking. Can you tell me the cause of the noise? Our pump is connected to the cross head and runs at 110 strokes per minute. I stopped the noise on one pipe by putting in a piece of rubber hose. Answer: Without seeing the pumps and pipes, we can only give a general reply. This creaking noise is frequently caused by leaks in the pipes, and engineers know very well that noises around machinery generally originate in very different places than those from which they seem to proceed. It is easy to see how putting in a piece of rubber hose would prevent the noise, since you have replaced a good conductor of sound by a bad one.