

H. P. M. asks: 1. In building a chimney 75 feet in height, which would create the most draft, one started at 2 feet square on the inside at the base, and spreading out to 3 1/2 or 4 feet at the top, or one 2 feet square all the way up? What is the theory? 2. What is the best method of brightening up small castings in a mill? Answers: 1. Probably it would do better if made of the same size all the way up. 2. The castings may be dipped into sulphuric acid, and then placed in a revolving cylinder, or polished on a wheel.

W. S. asks: Which will sustain the greater weight, a solid stick of timber sawn 10 inches square and 30 feet long, with the ends resting upon blocks without any other support, or the same amount of timber in three separate pieces, each of 3 1/2 inches in thickness, set up edgewise, side by side? If there is any difference, please give the principle. Answer: If all the sticks are of the same quality, the same amount of weight can be sustained in both cases.

F. E. P. says: In electroplating sewing machine attachments, I find it very difficult to deposit the silver on the solder at the joints. I have tried several dipping compounds, but with poor success. I have tried copper plating; but the copper will not stick firmly enough. Can you give me any information on the subject? Answer: To prepare your articles for plating: first boil them in a solution of caustic potash to free them from grease. Then dip quickly in red nitrous acid to remove any oxide from the surface, and afterwards wash well to remove every trace of acid. Then dip into a solution of mercury cyanide of potassium (not too long), and afterwards wash in water as before. The amalgamation of the surface effected promotes the adhesion of the film of silver.

M. A. P. asks: What can I use to cement the joints of vitrified pipe for conveying strong acetic acid? Answer: Mix equal parts of pitch, resin, and well dried plaster of Paris. This is used for the masonry of chlorine chambers and vitriol works.

H. F. asks: Are there three rails used on the track of the Big railway? Answer: Yes, and the central rail is a rack into which a toothed wheel of the locomotive gears.

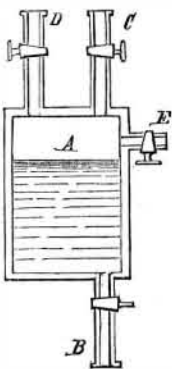
T. H. asks: What is an anemometer? Answer: The usual instrument for measuring the velocity of the wind is formed of two wires crossing at right angles, at each end of which is a cup-shaped vane, placed with its concave side to receive the current. A counter is employed to register the number of its rotations; and it must be nearly free from friction, or its indications will be valueless.

J. H. M. asks: Can you give me a recipe for staining butternut wood in imitation of black walnut? Answer: The following is highly recommended: Water 1 quart, washing soda 1 1/2 ozs., Vandyke brown 2 1/2 ozs., bichromate of potash 1/4 oz. Boil for 10 minutes and apply with a brush.

L. C. asks: 1. What book contains the most accurate tables of the number of bricks required for walls and cisterns; the quantity of lime and sand for a certain number of bricks; the day's work for bricklayer; and the cubic yards to be excavated for a cistern, tank or cellar? 2. How is puddling for bottom of water reservoir made, and how thick should it be? Answer: We know of no book that can be relied on to give you this information. Consult a good mason, or builder. 2. Read our article on page 240, current volume.

U. T. K. asks: Can a low pressure single cylinder marine beam engine be worked with one cylinder head broken out? If it can, what course can be taken to form a vacuum in the condenser? Would it be necessary to take any buckets off the wheels? Answer: In King's work on the steam engine, page 98, this matter is referred to as follows: "Disconnect the steam and exhaust valves from the damaged end of the cylinder, if the engine be fitted with poppet valves, and let the atmospheric pressure force the piston in one direction, the steam being used for the opposite direction. Should the engine be fitted with a slide valve, close up the opening into the damaged end of the cylinder by fitting in, steam tight and in a substantial manner, a block of soft wood." In such a case, it would probably be necessary to remove some of the paddle floats, or to reef them.

T. L. B. says: In answer to my inquiry as to how I could supply a small boiler with water, you say: By the direct pressure of the steam, using an arrangement like an equilibrium oil cup. Will you please give a more definite description of the article? Answer: The appended sketch will probably enable you to understand the arrangement. A is a vessel of suitable size, connected by a pipe, B, to the check valve of the boiler, by C to the steam space, and by D to the water supply—each of these pipes having a cock or valve, so that it can be closed at pleasure. E is an escape pipe and valve, opening into the air. The operation is as follows: Close valves in pipes B and C, and open those in pipes D and E. The water will then run into



the vessel A. When it is full, close valves in pipes D and E, and open valves in pipes B and C. The vessel A, being above the boiler, the water will run into the boiler, as the steam pressure on top of the water in A is the same as the pressure on top of the water in the boiler.

H. C. P. asks: What weight will a flat bottomed boat, with perpendicular sides, 16 feet long x 3 feet wide x 14 inches, carry? The weight of the boat is 200 lbs. How much weight will it carry when drawing 6, 8 and 10 inches of water respectively? Can you give me a formula for it? Answer: You do not send enough dimensions to enable us to make the calculations, but we will give you the method and you can apply it. Find the area of the bottom of the boat, in square feet. Suppose that it is A square feet. Then the boat, when drawing 6, 8 and 10 inches of water, respectively, will carry the following loads: When drawing 6 inches, A x 1/2 x 62.5 = 200. When drawing 8 inches, A x 2/3 x 62.5 = 200. When drawing 10 inches, A x 3/4 x 62.5 = 200.

G. S. T. asks: Will sulphur water affect a boiler injuriously, and to what extent? Is there any way of counteracting its effect, or of purifying the water? Answer: We do not think the sulphur water will injure your boiler; and we do not know of any method you can employ, to purify the water, that is sufficiently practicable for general use.

A. B. asks: How can I dissolve rubber so as to mold it into any required form? Answer: Immerse the rubber in a mixture of bisulphuret of carbon-96 parts, and rectified spirit 5 parts, until it swells into a pasty mass. It may then be molded into any desired form.

H. J. W. says: 1. Are the fumes from hot aniline dyes injurious? 2. Where can I find some account of the manner of preparing aniline colors? 3. I want small steel wire in the coil, cut into lengths of three inches; what is an ordinary and cheap process for straightening the latter? Answers: 1. We think not. 2. Reimann's work on "Aniline and its Derivatives," will give you the desired information. 3. Draw the pieces through an opening in which they bear at three points. Such an arrangement can readily be made with three nails.

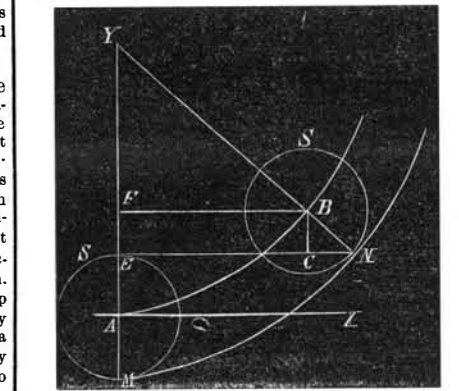
E. A. P. asks: 1. Is there any known law by which to determine the amount of pressure per square inch required to compress common atmosphere to any desired volume: that is, to reduce two volumes to one, three to one, etc.? Answer: Mariottes law is: The temperature remaining the same, the volume of a given quantity of gas is inversely as the pressure which it bears. Therefore a pressure of two atmospheres will reduce the volume to one half, of three to one third, etc.

J. M. B. says, in reply to R. A. C., page 27, current volume: "I have made an entire destruction of willow swamps by chopping the trees around at any convenient height, and stripping the bark to the ground and letting it remain; when the sap is in flow, in July or August, is as good time as any. Do not chop them down for a year or two. 4. A certain cure for nose bleeding is to extend the arm perpendicularly against a wall or post or any convenient object for a support. The arm on the side from which the blood proceeds is the one to elevate."

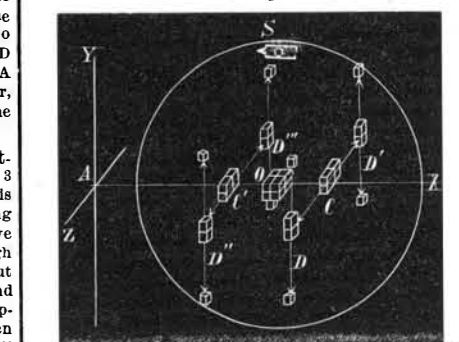
C. A. D. says: C. M. N. can precipitate nitrate of silver and sal ammoniac by adding to a solution of the former salt a solution of chloride of sodium or hydrochloric acid, which immediately precipitates the silver as a white flocculent precipitate, the new compound being, in the language of the chemist, AgCl (chloride of silver). Sal ammoniac can be precipitated by bichloride of platinum; the precipitate is of a light yellow color. These are also characteristic tests for the above named salts.

J. B. W. says: C. H. A. (page 87 of your current volume) can find the solution of his problem in Smith's "Mechanics." Of course the surface of the revolved fluid may be replaced by a rigid paraboloid, and a material particle without friction will remain at rest upon any part of the surface. The case of a ball rolling on a surface is, however, different. I will assume (and afterwards prove) that the centrifugal force generated by a revolving ball is the same as if the mass were concentrated at the center of the ball. This true, the ball will be at rest when its center is confined to a parabola, whose equation, referred to the axis of revolution and a tangent at the vertex, as the axis of x and y, is x^2 = 2gy, where g = force of gravity = 32 +, w = no. of feet per second passed over by a point on foot from the axis, x = the abscissa and y the ordinate of the curve: Proposition: If the center of the sphere S is confined to the parabola AB

by means of the curve MN, on which the sphere rolls, the curve MN is not a parabola. Let F be the focus of the parabola and draw FB its semi-principal parameter. Draw also NBY, a normal. From the nature of the parabola, we shall there have: FB = 2FA and angle NYM = 45°. When the sphere has its center at B, the resultant pressure of the centrifugal force and gravity is in the direction BN; BN is therefore a normal not only to the parabola but also to the curve MN. But the curve at N being perpendicular to the normal, it makes an angle of 45° with YM, . . . if it is a parabola, NE, perpendicular to YM, must be its semi-principal parameter, and E, its focus; and we must have EN = 2EM. But EN = EC + CN = EC + 1/2 BN = FB + 1/2 1/2 AM, and 2EM = 2(FA - FE + AM) = 2(FA - 1/2 1/2 AM + AM) = 2FA + 2AM - 1/2 AM. . . FB + 1/2 1/2 AM = 2FA + 2AM - 1/2 AM. But FB = 2FA. Substituting, 1/2 1/2 AM = 2AM - 1/2 AM. Dividing by 1/2 1/2 AM, we have 1/2 = 4 - 1, or 1 1/2 = 1/2, which is not true. . . MN is not a parabola. Proposition: The centrifugal pressure of a revolved sphere is the same as if its mass were concentrated at its center. Let S be a sphere revolved around AX,

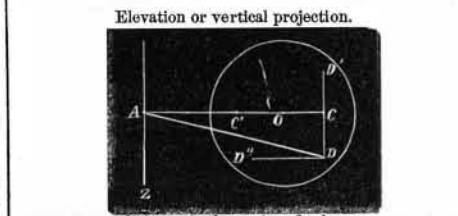


and consider 8 particles at its center. Let OA be the distance to the axis. Remove 4 of the particles to C and 4 to C', so that AC = AO = AO = AC'. Then place 2 each at DD' and DD'', equally distant in front and behind AX. Finally separate each pair by raising one particle and lowering the other a certain distance. We have now taken the 8 particles from the center and placed them in correct position in the sphere, and as this figure is symmetrical with respect to a line parallel to AY through its center, all the particles, supposed to be concentrated at the center, may be removed

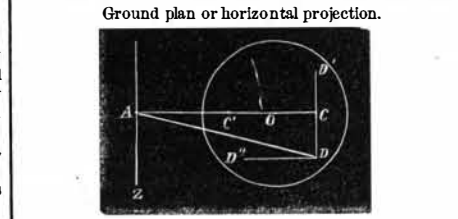


by 8s and placed in position to make a homogeneous sphere. We will now show that such a change produces no change in the centrifugal pressure. Let a be the weight of a particle, a = b, the distance to the center of sphere. c = c' = c, the distance of removal. Then centrifugal pressure of 8 particles at the center will be 8w^2 * a/g, of 4 at c it will be 4w^2 * (b + c)^2/g, and of 4 at c' it will be 4w^2 * (b - c)^2/g. Adding these, we have, for the 8 particles after removal Centrifugal pressure = P_c = 4w^2 * a/g * (b + c + b - c) = 8w^2 * a/g, the same as when they were at the center. Taking now a ground plan and letting cd = cd' = d, also ad = e, we have,

for the centrifugal pressure of 2 particles at d: P'_c = 2w^2 * e^2/a, but this pressure is in the direction ad, and we must resolve it into 2 parts, one in the direction cd, which will be destroyed by the opposite component of the pressure produced by the 2 particles at d', and the other in the direction d'd, which, combined with the corresponding component of d', will result in a pressure in the direction ac, the same as if the particles were at c. Resolving, we have for the pressure in d/d' P''_c = 2w^2 * e^2/a * cos. cad = 2w^2 * e^2/a * b/(b + c) = 2w^2 * (b + c)^2/a; and as there are 2 pairs of particles the whole pressure is P'''_c = 4a^2 * (p + c)^2/a, the same as if the 4 particles were at c. Lastly, it is evident that there can be no change of centrifugal pressure produced by moving the particles parallel to the axis, and therefore the pairs may be separated in this manner. Therefore the particles being moved from the center of the sphere into position in its body, no change is produced in centrifugal pressure.



Ground plan or horizontal projection.



P. K. D. says, in answer to C. C.'s query as to press power: I would suggest that to give the amount of pressure exerted against W, it will be necessary to know the distance from B to the center of track roller. If the power was applied at the center of the track roller, then the amount would be obtained thus: Divide the length of lever E (measuring from center) by the distance from center of track roller c to a perpendicular line drawn from the point of lever attachment (to W) to the track. Multiply this by 8 (the power obtained by the line) and the result thus obtained by the 1600 lbs. This will give about 75024 lbs. Now to solve the problem given: Diminish this result in proportion to the distance that B is moved up, the lever from center of track roller.

F. A. W. says, in reply to P. T.'s query as to the consumption of water by engines in cold as compared with that in hot weather: A few years ago three boilers were situated on the higher floor of a building, and were heated by gas that would otherwise escape. This gas was admitted to the boilers and regulated by means of sliding gates. The speed of the blowing cylinders was governed of course by the velocity of the engine, and the latter by an ordinary governor; but this not being sufficiently accurate, it was necessary to throttle the engine to drive it at the required number of revolutions per minute. Much practice enabled us to admit just sufficient gas to the boilers to maintain a pressure of 60 lbs. with hardly the variation of a pound in a week, and sometimes in a longer period. Nearly a year of such experience showed us that, in cold, damp weather, it was necessary to admit more gas, and in warm, pleasant weather to admit less. Of course, difference in charging would make a change in the quantity and quality of the gas, and perhaps augment the resistance of the air that was being forced into the furnace; but a long continued series of experiments, such as we were obliged to make, eventually established the fact. The boilers were supplied with a constant stream of water, regulated arbitrarily by a cock, and so accurately as not to require moving sometimes for days together. "I do not apprehend that the cold damp weather had any appreciable effect in requiring the admission of more heat to the boilers, except by the increased condensation of steam, which was not more than in ordinary engines. This same condensation will undoubtedly account for the difference, if there is any, between the effect of steam and air in a locomotive."

D. M. says, in answer to the question proposed by C. H. A. (page 187, vol. XXIX): Let there be a system of rectangular axes, having c for their origin, b being the axis of X. Since the number of revolutions of the ball is constant, a line equal to its distance from the axis of X and perpendicular to the same axis, may be taken to represent the centrifugal force, the force of gravitation being represented by a constant line parallel to the same axis, and which I denominate by g. Therefore at any point, x' y', of the curve, the resultant of the two forces will pass through the point, x' y', and also through a point whose equations are x = x' - g, and y = 2y'. Therefore the equation to the resultant is y - y' = -g/(x - x') which is evidently the equation to the normal of a parabola having 2g for its parameter. (See Davies' "Analytical Geometry.")

G. W. says, in reply to H. H. J., who asked as to making a combined reaper and thresher: It cannot be done. At the time grain ought to be cut, it is not dry enough to thresh; and if left standing until it is dry enough to thresh, it will shatter out so as to lose half the crop, especially if the grain be oats. It was this which made useless a harvester in the western states. It cut the heads off and left the straw standing; the heads were to be stored in cribs or bins, like corn. But the heads proved to contain so much moisture as to cause mold and rot.

W. W. H. says, in answer to T. M. Jr., who asks how to preserve grapes in the bunch, fresh as when taken from the vines: When the grapes are fully ripe, clip the bunches from the vines carefully, and get a water tight keg or box. Place in the bottom of the box a layer of dried grape leaves, half an inch thick, then layers of grapes and leaves alternately until the vessel is filled; nail a board on top, and bury the vessel in the ground, where water will not stand, out of reach of frost. Grapes put up in this way will keep fresh and sound until April.

J. W. H. says, in reply to C. P. T., who wants a heavy foam on a tonic beer: Use the whites of a dozen or more eggs in a 10 gallon keg.

J. M. B. says: "I think the blistering of varnished cement tiles, which U. B. complains of on page 171, current volume, is caused by the expansion of the moisture contained in them when varnished. A remedy would be to drive the moisture out."

COMMUNICATIONS RECEIVED. The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects: On the Million Dollar Telescope. By W. M. R. On Canal Navigation. By T. K. On Hatching Eggs. By B. F. S. On Spectroscopic Manipulation. By C. A. D. On Perpetual Motion Seekers. By F. On Financial Science. By J. E. E.

Also enquires from the following: H. C. B. - C. G. T. - M. W. K. - A. V. L. - J. N. P. - G. M. - J. W. S. - W. H. B.

Correspondents in different parts of the country ask Where can I get a cross-cut saw for getting out trunks of large trees? Where can I obtain cotton seed oil machinery? Who makes shoe peg machinery, and what does it cost? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.] Index of Inventions FOR WHICH Letters Patent of the United States WERE GRANTED FOR THE WEEK ENDING September 30, 1873, AND EACH BEARING THAT DATE. (Those marked (r) are reissued patents.)

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