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W. H. H. will find on p. 74, vol. 28, full directions for laying out the sides of a hopper.-O. E. D. will find a description of a speed indicator for railway trains on p. 271, vol. 33.-R. M. can make Pharoab's serpents by following the directions on p. 315, vol. -F. M. can find out the quantity of water which can be delivered by a pipe of any particular size by using the formula on p. 48, vol. 29. Area of a circle=diameter²×0.7854. This also answers P.Q. Sixty feet head of water=13/4+atmospheres =261/2 lbs. on the square inch, nearly .- E. T. is informed that vulcanite, as used for jewelry, ornaments, etc., is a patent material. He can clean his printing press blankets by washing them with potash lye.—P. H. G. can glaze his shirt bosoms by following the process described on p. 203, vol. 31. T. M. D. is informed that full directions for molding in various materials are published on p. 58 vol. 24.-M. M. I. will find full descriptions of the principal forms of the perpetual motion nonsense in vols. 23 and 24.-H. W. H. will find answers as to his questions on the friction and passage of waterin pipes on p. 48, vol. 29.-W.K. N. will find directions for tempering rock drills on p. 202, vol. 31. -R. H. H. will find directions for testing the purityof water on pp. 187, 281, vol. 33. This also an swers C. L. M.-A. S. will find that greasy cotton waste is very liable to spontaneous combustion. See p. 26, vol. 33.-J. M. P. will find formulæ for calculating the strength of boilers on pp. 116, 165, vol. 28.-W. T. P. will find a description of a calcium light on p. 219, vol. 30 .- H. C. will find directions for making friction matches on p. 75, vol. 29. -T. W. can attach glass letters to windows by using the cement described on p. 47, vol. 33.-L. J. T. will find a recipe for black ink on p. 92, vol. 33, for purple ink on p. 315, vol. 33, and for blacking on this or the following page. -E. D. D. M. should read the SCIENTIFIC AMERICAN, and he will then be aware of the impossibility of perpetual motion machines.—S. W. M. will find directions for hardening millpicks on p. 170, vol. 25.-J. G. A. is informed that the plaster composed of gypsum (plaster of Paris) and marshmallow root does not pos the virtues claimed for it.-G. P. A. can nickel plate his iron castings by following the directions on p. 235, vol. 33.—S. L. J. can clean marble by folving the directions on p. 330, vol. 32.-G. A. M. can fasten rubber to wood with good glue - A.W should put a tablespoonful of brown sugarinto a quart of flour paste, and use it to fasten paper labels on tin cans.-C. S. R. will find a good recipe forsealing wax on p. 251, vol. 28.-T. H H. will find a description of the manufacture of vinegar on p. 106, xol. 32.-E. J. S. will find full directions for making plaster molds on p. 58, vol. 24.-A. M. D. S. will find directions for silver plating without a battery on p. 408, vol. 32.

(1) L. E. McK. & J. W. K. ask: Is it healthy to keep plants in a sleeping room? A. Plants in a sleeping apartment are not considered as conducing to health, and some of the medical authorities claim that they are very injurious.

(2) M. E. D. W. asks: By what means can I detect petroleum or cotton seed oil in so-called linseed oil? A. Petroleum may be detected by its property of imparting a fluorescence to animal or vegetable oils, and by its aromatic odor on burning. An oleometer may be used to distinguish cotton seed oil from linseed oil.

(3) J. H. T., of Flekkefjord, Norway, asks: Am I running any risk in using tubs made of old petroleum barrels for washing underclothes in,or can I in any way make them fit for such use? A. In a short space of time, by the use of soap, the barrels will become deodorized and will suit your purpose perfectly.

1. What is the cause of a person's finger nails becoming concave, warping, cracking, and splitting? A. It shows an impoverished condition of the blood. Dr. Bean claims that certain diseases can be foretold by the condition of the nails. 2. Is there any remedy? A. Consult Wilson "On Skin Diseases."

(4) B. says: It is claimed that if a small quantity of common salt be put into a kerosene oil lamp, the danger of an explosion is lessened, and the illuminating power of the oil is increased. Is this so? A. The statement is entirely without foundation.

(5) N. M. A. asks: What is damp, newly precipitated alumina? In the manufacture of certain commodities, I am recommended to use oxalate of alumina, prepared by dissolving damp, newly precipitated alumina in a concentrated solution of oxalic acid. A. In one vessel prepare a strong solution of alum in water, and at the same time, in another vessel, dissolve a quantity of chloride of ammonium (sal ammoniac) in equal parts of water and strong aqua ammonia. Add the latter solution to the former and stir well for a few moments. Then allow to settle for a short time. Decant the liquid, wash the precipitate in clean water, and digest with hot solution of oxalic acid until solution of the precipitate is effected.

(8) A. A. H. says: I bought a bottle o clock oil: and having a small perfumery bottle with a ground glass stopper, I poured the oil into it. I suppose the bottle was not washed clean, for it turned the oil to the color of soapsuds. What can I do to the oil to purify it? A. This was probably due to the ammonia usually present in these perfumes. Treat with a little oil of vitriol, decant off the oil, and then wash with clean water.

(9) F. F. asks: 1. What is the best method of raising the poppy, and how is the opium extracted from it? A. Opium is the dried juice obtained from the unripe capsules of the white poppj (*papaver somniferum*). For properties, etc., see Pereira's "Materia Medica," also an extensive article by Dr. Eatwell in *Pharmaceutical Journal*, 1852, London, England. 2. Will it flourish in Central Illinois? A. We consider it very doubtful.

(10) B. C. S. asks: How can an oval cylinder beturned in a common iron lathe? A. By putting on a cam to move the slide rest in and out at every revolution of the lathe.

(11) J. says: I am building a sheet iron circular tank about 8 feet in diameter and 5 feet deep, and I wish to know how great is the tensile strain that tends to tear apart any portion of the lowest l2 inches of the sides. If there is no question of resolution of forces, I make out that this strip 12 inches wide has to bear a tensile strain of 3 to 4 tuns, which seems high. A. The pressure will be 36 times the weight of a cubic foot of the liquid in the tank.

(12) E. F. says: I am very much troubled with my hands becoming very rough from constant use of copperas water. Can you suggest a remedy? A. You may avoid this by wearing a pair of india rubbergloves, so as to avoid contact with the iron solution. Use a little good glycerin or glycerin soap as a remedy.

(13) A. F. O. asks. 1. What book must I consult in order to obtain the most exhaustive information concerning the practical details for compensating the pendulun? A. You will find the principal forms of compensating pendulums described in any good text book of physics. We do not know of any special treatise on the subject. 2. In a recent publication a pendulum is described in the following words: "A wooden rod, dried and varnished, carrying at its lower end (by way of bob) a hollow leaden cylinder. If the rod be about 46 inches long, and the cylinder 14 inches, it will vibrate nearly in seconds." Do you call that a good pendulum? A. It would answer for ordinary purposes. 3. What should be the diameter and weight of the leaden cylinder? A. The cylinder should weigh from 8 to 10 lbs.

(14) C. M. B. asks: At what speed should an ordinary wood-turning lather un? A. At about 700 feet a minute.

(15) J. P. says: We wish to run a shaft at &C revolutions per minute. On the shaft is a cam that strikes a plunger, which can be driven forward only by great force. We have on same shaft also a balance wheel weighing 2,100 lbs., with a diameter of 52 inches and face of 634 inches. We belt from a 24 inch pulley on a counter to this balance wheel, the balance wheel being the driver. Can we gain more power or momentum by putting a 30 inch pulley on the shaft at the side of the balance wheel, and belting on to the 30 inch pulley instead of the balance wheel? In either case, the speed of the balance wheel? In either case, the uch advantage would result from the change.

(16) C. B. H. says: A friend and myself are discussing how to give a locomotive herfullspeed. I claim that, to do so, it would be necessary to throw her lever back to the farthest notch and open her throttle in the same proportion; but he says we ought to place her lever on the first notch off the center, and leave the throttle open. Which is right? A. You are.

(17) C. R. says: In your issue of October 20, you say: "Experiment has shown that the velocity of the shell whenit leaves the mouth of the cannon is about 1,300 feet per second. The hight from which the projectile would have to fall to acquire this velocity is 26,600 feet. Consequently the work actually done by the powder is equal to 219,000 foot pounds. Will you give the formula by which this result is attained? A. It is the product of the weight of the ball multiplied by the hight due to the velocity.

What pressure per square inch is necessary to press separate pieces of ice into one homogeneous mass, which shall display no joints? A. At ordinary temperatures, a very considerable pressure, more than can be applied without special apparatus, is necessary.

What is a colour? A It is the emount of heat

tion of certain woods in contact with air. The ash is to be placed on the glass and briskly rubbed over it with a flat plece of wood. Are the cutting particles crystallized carbon, and can they be utilized? A. When plants, etc., are burned, a portion of the silicic acid (sand) and soda, lime, or potash become fluxed together by the heat to form minute particles of hard glass.

(22) S. G. P. asks: Does a feed tank to a steam boiler need stay bolts in the heads, to carry with safety 100 lbs. to the square inch? It is made of $\frac{1}{2}$ inch iron, and is $\frac{2}{2}$ inches in diameter and 40 inches long, singly riveted. A. It would be better to stay the heads.

(23) T. H. asks: Should a pulley with curved arms be so put on the shaft that the working strain tends to straighten the arms, or the reverse? A. The former. 2. When the arms have two curves, should the pulley be put on so that the working strain tends to straighten the part of the arm next the hub or that next the rim? A. The former is best.

I want to make a model that will require a considerable number of very small, thin castings. Can you tell me of a composition that will flow quite freely at a not very high temperature, will be about as strong as ordinary brass, and will file, drill, tap, etc., comfortably? A. You describe the properties of good brass.

Can you tell me of any easily got and easily applied solvent for borax, to clean it off work where it has been used as a flux for brazing? A. It is best to scrape or file the joint.

(24) J. S. asks: What thickness of cast iron should a hollow globe of 18 inches diameter be, to sustain a steam pressure of 120 lbs. to the square inch? A. About 1/4 inch.

(25) S. & H. G. P. say: We are using a 40 horse power tubular boiler, for the purpose of pumping oil wells. Four wells are worked by the boiler. One steam line (11/2 inch pipe) extends up a hill to a well 1,150 feet from the boiler. Another line (2 inch pipe) extends in another direction, on almostlevel groupd, to a well 1.078 feetfrom the boiler. Another well is 300 feet from the boiler on the 2 incn pipe, both engines taking steam from the same line. The fourth well is near the boiler house, and the engine (in the boiler house) supplies the boiler with water. We use about 2,700 gallons of water every 24 hours. We carry 100 lbs. steam pressure, and run our engines 55 revolutions per minute. Our steam pipes are laid in 8 inch square boxes, packed with sawdust, and are tight. The connections with the engines and the safety valve are also tight, so that there is no escape of steam except through the several engines, which are in ordinary good working order. We use for fuel principally natural gas from the wells; but attimes the flow of gas is not sufficient, and we have to use some bituminous coal. Now W. W. S. claims that, if we reduce the pressure in the boiler to 40 lbs., it would not take so much water nor so much fuel to do the same amount of work. I claim that it would take more water (because we would not work our steam so dry as at present) and consequently more fuel, as we should have an increased amount of water to heat. Which is right? A. Your consumption of steam and of water will, in proportion to the work done, be more economical at the higher pressure.

(26) C. R. says: There is a pipe, 2 inches in diameter inside and about 800 feet long, with 4 or 5 feet fall. The water will run for 4 or 5 days and then stop There is no leak in the pipe. What is the cause? Is it not the friction on the inside of the pipe? A. Probably air collects at a high point.

(27) J. C. P. H. says, in reply to a correspondent who asked if there was again in powerin having the area of the sails of a windmill equal to the whole area of the circle, over the old style of 4 sails: You answered: No. In a technical point of view you are correct; but I hardly think you mean to state that the full leverage area of any given diameter does not contain more power than the same diameter or area, only half or quarter filled with leverage area or wind surface. Do you o mean, and upon what principle is the statement based? A. If a windmill could utilize all the power in a cylinder of wind with a diameter equal to that of the sails, of course it would be well to give the sails the greatest area possible. As this is not practicable, however, it is easy to see that therewill be an area which is best for any given case. This area might possibly be determined by analysis; but it is generally fixed by experiment.

(28) M. A. asks: 1. When was power first obtained from electricity? A. Page's magnetoelectric engine, described in Silliman's Journal, vol. XX, 1831, was probably one of the first constructed in this country. 2. Which is the best direction in which to cover magnets with wire? A. Dr. Joule's very powerful electro-magnets were wound in the direction of their length.

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J. O. will find directions for removing moles from the skin on p. 347, vol. 32.—J. F. H. can increase the draft in his boiler furnace and economize fuel by inserting a jet of steam in his shaft. See answer No. 45, p. 396, vol. 33.—Mrs. J. can prevent rust on the bright parts of her sewing machine by following the directions on p. 169, vol.33.

(6) W. V. J. asks: By what process can I transfer decalcomanie pictures to paraffin wax? A. We do not think it probable that you will succeed in employing paraffin in the way you propose. Try softening the paraffin on the surface by the aid of heat, and when ready, press the picture tightly against the surface until the paraffin has hardened again.

(7) J. W. R. says: In your issue for October 9 are directions for making a weather glass. I have followed them with great care and nicety (being well used to chemical manipulations) and succeed only in obtaining a colorless and limpid liquid, which remains entirely unaffected by the most sudden and severe atmospheric changes. Can you give any probable solution for my failure? A. You have employed either too much of the solvents or else your alcohol was not of the desired strength. We have constructed several of these instruments according to the recipe given, and have had no difficulty.

What is a calory? A. It is the amount of heat required to raise the temperature of 2^o2 lbs. of distilled water from 39^o2^o to 41^o Fab.

(18) J. E. asks: Is there a process for uniting wrought iron with cast iron? A. We know of none.

(19) J. E. S. says: 1. We are building a steamer, 22 feet long, 5 feet wide, and 3 feet deep. Will an engine with a cylinder 6x3 inches have power enough torun it? A. The engine will answer very well. 2. What size of upright boiler will it take? A. Make a vertical boiler 30 inches in diameter and 4 feet bigh. 3. Will a three foot wheel, placed in the middle of the boat and having a six inch dip, be large enough? A. Yes. 4. At what speed could we run her? A. Probably 4 or 5 miles per hour. 5. What pressure would the boiler stand? A. About 120 lbs.

(20) H. P. M. asks: What is the best method of hardening malleable iron? A.See "Wrinkles and Recipes," published by H. N. Munn, at this office.

(21) C. R. C. says: A pane of window glass If the soil is dry, you will need a large an may be cut into pieces by being rubbed by a small conducting material placed underground portion of the white ash obtained from the igni- nection with the rod. See p. 400, yol. 33.

(29) W. L. P. asks: Is there any difference between one inch square and one square inch? A. No.

(30) M. A. G. says: We desire to put a lightning rod upon a church spire, 120 feet high. About 12 feet of the top is a galvanized iron finial, which terminates in a point covered with gold leaf. Would you advise us to carry the rod above the finial, or would it be better attached to it, so that the finial will constitute a part of the rod? If the latter is the best plan, how would you attach the rod to the galvanized iron? Would it be well to simply put the rod around one of the waits of the finial? A. The rod should be attached to the base of the finial by a firmly soldered and riveted joint, so as practically to make an unbroken connection. All joints in the rod should be firmly soldered and secured against separation. If the soil is dry, you will need a large amount of conducting material placed underground in connection with the rod. See p. 400, Vol. 33.

JANUARY 8, 1876.]

(31) J. W. P. asks: Is there anything that may be added to collodion for ferrotype plates that will make it hard enough to stand a brush after the picture is taken? A. There is no foreign matter that can be added before the picture is made: but a collodion made of long fiber cotton with an excess of ether, will usually answer best If this will not do, flow the plate while wet (after the picture is taken) with dilute albumen or gum arabic.

(32) I. O. A. says : I am straining my eyes by working in white wood and reading by lamp-light. I want to use spectacles, but I am told that if I once use them I must always use them. Is this so? A. Spectacles of the proper kind may be used to assist the eyes to see indistinct objects; but if there is not light enough to see well without them, their use would certainly be injurious.

(33) A. E. asks: How can I make a good washing fluid? A. Make a strong solution of wash ing soda, and render it caustic by the addition of quicklime.

(34) W. C. asks: How can I cement emery together? A. Use the best glue.

(35) L. J. T. asks: How can I make a good baking powder? A. Take tartaric acid 5 parts. sesquicarbonate of soda 8 parts, and potato flour 16 parts. Dry them perfectly, mix, pass through a sieve, and keep free from moisture.

(36) J. E. J. asks: Has it ever been explained how the common turkey buzzard is able to mount up without flapping his wings? A. We think not. See p.292, vol. 32.

1. When will Saturn and Mars be in conjunction again? A. About 4 o'clock A. M., July 28, 1877. 2. Would an achromatic spyglass of 50 powers be of any use for astronomical observation? Would it enablea novice to discern Jupiter's moons and Saturn's rings? Would it show the globular form of any of the planets? A. If you have a spyglass which will give you good definition with a power of 50, you can see all you speak of and a good deal more.

1. What is the proper name of the gas generated by burning bituminous coal? A. The larger part is carburetted hydrogen; carbonic oxide and car bonicacid gas are also present. 2. Is it poisonous A. Yes, slightly.

(37) J. H. asks: 1. How do engravers lay the design on the plate before they commence the operation of engraving? A. They coat the plate with a thin layer of whitening in water, and then use a red transfer paper, tracing the design with a steel point. 2. In drawing the engraving tool over the face of a copper plate, will it not leave a rough or feather edge? A, Not if the copper is of the right quality, and the tool is sharp and in the hand of a qualified operator.

(38) J. R. C. asks: Can you give me the meaning and derivation of the word terra cotta? A. Terra cotta (Italian) means "baked earth," and is the name for ware made of a paste of white clay, fine sand, and pulverized broken crockery. slowly dried, and baked to hardness.

(39) T. T. Y. asks: 1. What are quaternions? A. "A quaternion is the quotient of two divided right lines in space, considered as depending on a system of four geometrical elements, and as expressible by an algebraical symbol of quadrinomial form."-Sir William R. Hamilton. 2. Where can I find analysis of them? A. See three admirable letters of the above-named author. You may find them in Nichol's "Cyclopædia of the Physical Sciences." We do not know the publication you mention.

(40) J. G. S. asks: Can you give a good cure for cracks in the skin of hands? The points of my fingers and thumbs are badly cracked, and although kept as clean as possible, glycerin being applied, they will not heal. A. Try spermacet ointment.

(41) W. H. H. asks: Please give me a recipe for making oil paste shoe blacking for shoes A. Take ivory black 16 parts, treacle 8 parts, oil of vitriol 4 parts, diluted with water 2 parts, oil 2 parts, gnm arabic 1 part, soft water (for final dilution) 64 parts. Mix well.

(42) Z. Q. Z. asks: What substance is best to use on the back of postagestamps, edges of envelopes, etc., to make them adhesive? A. Try a solution of gum dextrin (see p. 251, vol. 29) with a little refined sugar in it to prevent the paper from curling up when dry.

(43) K. says: When throwing the spectrum of vaporized metals on the screen, is it usual or best to use the condenser, as in the magic lantern, besides the focussing or condensing

oke, after which the metalpartition is withdrawn and a thin layer of sand spread over all. The exciting fluid is contained in an inverted jar over the battery; another jar beneath catches the liquid after it has passed through the sand and coke Take 15 parts, by weight, of water, 1 of bichromate of potash, 1/2 of sulphide of mercury, and 2 of sulphuric acid, to form the solution.

(44) K. asks: 1. What is the best sized cell to use for a battery to produce the electric light? A. With an equal number of cells, the larger of two sizes gives the most heat and light. 2. In amalgamating zincs with mercury, will it do to immerse the zincs in mercury, or would this give them too much mercury? A. It is usual, after the zincs have been properly cleaned, to place them in a shallow dish and pour the mercury over them with a spoon. They should be carefully brushed afterwards to remove the excess of mercury. 3. How long should the nitric acid last in the Grove battery? Why does the current become so weak when the nitric acid becomes weak? A. That depends upon the intensity of chemical action. With a given quantity of acid, anc, etc., a certain definite quantity of electricity will be evolved. This we may obtain in a longer or shorter time by making the resistance of the circuit large or small; if it is very small the battery becomes perceptibly weakened in a very short time. 4. Does not the current depend entirely upon the decomposition of the zinc? A. The current is the resultant of all the chemical actions which take place in the battery. 5. As platinum is a very poor conductor, is not the current weakened when passing through the platinum strips from the nitric acid to the zinc? Sometimes the strips become so hot as to almost boil the acid in the battery. A. Anything that adds resistance to the circuit necessarily reduces the current proportionately.

(45) P D. S. asks: Is there anything that will destroy the attraction of a magnet when placed between it and steel? A. No; but the attraction may be partially neutralized by interpos ing a heavy piece of iron.

(46) N. S. asks: 1. Should all spirals, for lifting electromagnets, induction machines, mag-neto-electric machines, relays, and sounders, be insulated and wound on bobbins? A. All wires for electro-magnets, etc., should be insulated; especial care must be taken in this particular for secondary coils of induction machines. When the electro-magnet is small, it is often covered with paper, and the wire then wound on the core itself. 2. If I should wind flat spira's by commencing at one end of the bobbin, and wind a single flat spiral of the requisite diameter, then drop down to the shaft of the bobbin, the wire remain ing unbroken, and then wind another flat spiral, and so on till the bobbin is filled, will I have good secondary for an induction coil, if I insulate properly between the coils? Or if I take a piece of insulated wire, commence at its middle, and wind both ways with opposite ends, and so wind e flat spirals, and continue each way from center of bobbin toward the ends till filled, will this be equally good? Which is the best of these two? A. For medium sized coils, it is better to divide the bobbin in two parts. Then place it in a lathe, put one end of the wire through the dividing disk, and wind back and forth continuously until one end of the bobbin is full. Turn the bobbin end for end. connect with the finished coil by the wire passing through the dividing disk, and wind as before (or the second coil.

(47) A. S. F. asks: 1. Does it make any difference in the power or the wear of a horizontal engine whether it runs over or under? A. No. 2. Is a speed of 125 revolutions per minute too fast for an engine of 14 inches diameter of cylinder, and 24 inches stroke of piston, said engine being well and carefully constructed with a view to such speed? Band wheel is 8 feet in diameter and of 18 inches face, and weighs about 3,600 lbs. A. No. 3. Is it entirely safe to runa line shaft, of 21/2 or 2¾ inches diameter and 140 feet long, receiving the power of a 70 horse power engine at one end. and carryingpulleys as large as 42 inches diame ter and of 16 ic ches face, at a speed of 300 revolutions per minute, such shaft being first class in all respects and carefully put up? A. Yes. 4.Would it be safe to use 20 horse power from such shaft, at the farther end from the engine? A. Yes, if its bearings are not too far apart.

(48) J. C. says: There is a pump in a well 85 feet deep; the pump is situated 65 feet below the surface (20 feet from the bottom of the well). The pipe above the cylinder is 65 feet long and 11/4 nches in diameter, and the length of the stroke he plunger is 6 inches. The pump will pump er, but it is very hard to work it. The plunger makes 40 strokes a minute and is worked by a crank. Is the pipe containing the pump rod large enough to take the quantity of water as fast as it is pumped? A friend says the pipe is large enough but that the plunger should make a larger number of strokes; and if it does this, he thinks it will work more easily. A. Your pipes, especially the suction pipe, would enable the pump to work more easily if they were a little larger in diameter.

site side, containing the carbon, with pounded | minals of each coil connected as shown. Now, if if we connect one pole of the battery at -, and the other at +, the current will divide, one half pass ing through each coil in the same direction, pro-



connections of the battery, reversing the current both cores at a a will become south poles, and in both cases B will be a consequent point. Fig. 2 epresents similar cores, but so coiled in one continuous line that the current shall flow around both cores in the same direction. When connected with the poles of the battery as shown, both poles will be of similar name, say north; and if the connections are changed, both poles will be alike but opposite to those last named, and in both cases B' will be a consequent point. Fig. 3 repreents similar cores, but so coiled that the current shall flow around each core in opposite directions This will produce one north and one south pole, and a neutral point at B". Fig. 4 represents a straight bar magnet with each end coiled in opposite directions; when connected with the poles of the battery, both ends of the cores will show similar polarity, while the center will be a consequent point. In order to understand how these effects are produced. I think it is only necessary to refer to the electric force circulating around a wire through which a current is passing, and to state that the direction of this force or influence is due to the direction of the current in the wire. To showthis in the most simple form, place a galvanometer needle over a wire through which an electric current is passing, and the needle will be deflected in one definite direction; now place the needle under the wire, and it will be deflected in the opposite direction. Now confine the needle in the direction opposite to that in which the current deflects it, and its polarity will soon be reversed by the action of the current.

ducing at a a two north poles. If we change the

(51) A. S C. says: W F. C. deserves credit for coming forward to support the theory which allows an ice boat to travel faster than the wind which drives it, but his diagram carries a confutation upon its face. He says that, with the sail set to an angle of 45°, the bolt, which represents the di-rection of the wind but not its force, if pushed through an interval of 1 inch, will cause the vessel to move forward a like amount. True; but then again he says: Make the angle of the sail $22\frac{1}{3}^{\circ}$ instead of 45°, and the space passed through by the boat will be double that passed through by the bolt or wind. This result would be equally true with the first, had he not neglected to state that four times the speed or force of the wind was neessary for its accomplishment in the same time. Does he suppose that the wind, at a known pressure, after doing its full duty in driving the vessel at a certain rate, can be made to double that duty by increasing its resistance twofold, which he does by lessening the angle of the sail one half? If that were true, what is to prevent his attaining, by diminishing the angle sufficiently, a speed infinitely greater than the wind? This theory of a boat's traveling faster than the wind should, like its twin sister "negative slip," be relegated to the

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN ac knowledges, with much pleasure, the receipt of original papers and contributions upon the follow ng subjects:

- On the Etheric Force. By W. E S.
- On the Yellows in Peaches. By P. H. F. On a Hydro-Pneumatic Puzzle. By C. K.

On Diphtheria. By J. P. On a Boiler Explosion. By T. E. K. On the SCIENTIFIC AMERICAN. By S. S. B.

- On the Laws of Proportion. By I. H. H.& S.
- On Carbonic Acid as a Preservative. By C.W.S On Heating Cars. By G. W. P.

On Laying Outa Square. By J. M. D. On Gravity and Matter. By W. I. L.

Viso inquiries and answers from the following : P. G. G. N.-A. M. J.-S. D. S.-F. E. B.-W. C.-J. A.-W. E. D.-N. E.-C. T. W.-J. B. E.-R. P.-G. B. R.-J. G. S.-W. C.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fall to appear shouldrepeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be oublished here. All such questions, when initials mly 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 inquiries analogous to the following are sent : "Who sells Portland cement? Whose is the best shingle-splitting machine? Who sells collections of minerals? Who sells machinery for makingschool slates? Who makes papier maché? Why do not the makers of the sand blast apparatus advertise in the SCIENTIFIC A MERICAN? Whose is the best tile-making machine? Who sells the best photographic lenses?" All such personal in-quirlesare 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 in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH Letters Patent of the United States were Granted in the Week Ending

December 7, 1875.

AND EACH BEARING THAT DATE. [Those marked (r) are reissued patents.]

Adding machine, D. L. R. Butt	170,708
Alarm, burglar, A. A. Budd	170,705
Alarm. burglar, H. A. Sherman	170,905
Animals in giving birth, aiding, W. Dulin	170,827
Auger. earth, M. and T. R. Way	170,790
Bag, knitted, J. D. Culp (r)	6,779
Baggage seal, J. S. Crary	170,822
Barrel, L. E. Sunderland	170,914
Barrel-polishing machine, H. S. Smith	170,908
Barrel-shaping machine, H. S. Smith	170,909
Basket, Meinikheim and Chase	170,755
Bath tub seat. J. W. Nye	170,765
Bath waste valve, W. S. Carr	170,709
Battery, galvanic, R. M. Lockwood	170,864
Bearings, lining for machine, Lathrop and Weber	170,74
Bed bottom, spring, E. Barton	170,80
Bed lounge, D. J. Powers	170,68
Bedstead, invalid, J. Crosby (r)	6,79
Bedstead, sofa, G. J. Henkels	170,85
Bedstead, sofa, G. N. Seidler	170,77
Bee hive, E Armstrong	170,69
Bird cage, G. Gunther	170 84
Bird cage, C. F. Holden	170,67
Bird cage, hanging, G. W. Fuller	170,84
Boat-detaching apparatus, J. Patterson	. 170,89
Boiler injector, steam, W. T. Messinger	170,75
Boot-polishing machine, Place and Cunningham.	170,76
Boot rubber, J. Pienovi	170,76
Boxes, machine for making, E. James	. 170,85
Boxes, making cushions for, B. S. Dennison (r)	. 6,78
Brace, back and shoulder, H. R. Allen	. 170,65
Brace, hip and thigh, H. R. Allen	170,65
Brick dryer, E. F. Andrews	170,92
Brick machine, Mitchell and Kennedy	. 170,87
Brick machine, A. Morand	. 170,76
Buckle, A. Dyke	. 170,89
Bung funnel, J. Buck (r)	7,78
Bustle, A. Carter	. 170,71
Butter carrier, B. F. Roberts	. 170,77
Can, paint, M. Bray	. 170,70
Can-seaming machine, W. J. Gordon	. 170,72
Can spout, oil, D. G. Dustin	. 170,71
Cane gun C Malava	170 69

enson the stand just before the prisms? A. I es.	
Place the condensing lens between the lantern	2¼ io
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and product	

1. Will there be any disadvantage in making up a battery of 12 one gallon Bunsen cup and 40 one quart Grove cups? Is there any loss of tension or quantity by uniting Bunsen's and Grove's in the same circuit? A. No, unless the resistance of the circuit outside of the battery is very small. In the latter case the 12 one gallon cups alone will give the stronger current. If the external resistance of the circuit is of any considerable magnitude, the best effect will be obtained by uniting all the cells in series. The latter com bination always gives the highest tension or potential. 2. Please give full justructions for setting up the Chutaux battery; mentioned in your pape of May 22, 1875. A. There are several modifica tions of the Chutaux battery, one form is made as follows: A glass or stoneware jar is perforated at the bottom, and an inverted saucer placed over the hole. Single plates of zinc and carbon are then arranged on opposite sides of the jar, and a sheet of tin or other thin metal placed in the middle (between the zinc and carbon). The side conaining the zinc plate is filled with sand, the oppo-

(49) T. J. S. says: How can I quarter the driving wheels of a locomotive? A. What sort of quartering do you mean?

(50) J. B. F. says: In a recent issue, you state to a correspondent that you know no way of producing simultaneously in an electromagnet two north or two south poles. I send you herewith a sketch, showing several waysin which this may be done, as it may interest those of your readers who are experimenting in electro-magnetism. Fig.1 represents the cores of an ordinary electro-magnet, coiled in the usual manner, but with the ter-

shade

(52) E. D. C. says, in answer to a query as to why the railway gage of 4 feet 81/2 inches was adopted : My book of referencesays that the gage was originally 5 feet, and the flange of the wheel was on the outside. That not working satisfac-torily, the flange was changed to the inside, which makes the measurement 4 feet 81% inches.

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

E. W. P.-They are scales of mica.-C. W. D. Both contain pyrites. By exposure to the air. some of the pyrites has been convertedinto sulnhate of iron.-W. J. S.-The glistening powder is sulphuretof iron; the black is hornblende. Neither is valuable.-J. K. S.-It is fibrous steatite or soapstone.-G. P.-No. 1 is quartzite. No. 6 is ferruginous quartz. We do not find the other specimens spoken of in your letter.-T. H. A.-The amount of substance was too small for chemical examination. Try aniline red, or madder red, or red lead.

Cane gun, C. Melsye 17	10,684
Car axle box washer, C, H. Brown 17	10,811
Car axle washer, W. H. Fitz Gerald 17	10,858
Car coupling, J. T. A. Lewis 17	10,748
Car for one rail railroads, R. Stone 17	0,69
Car ventilation, G. H. Storey 17	10,78
Car wheels, casting, W. Wilmington 17	10,92
Carding engine feed, J. G. Freeman 17	10,84
Carding machine feed, J. J. Dewey 17	10,82
Carriage axles, collars on, J. Kritch 17	10,744
Carriage bows, setting, J. H. McClymonds 17	70,87
Carriage wheel, S. W. Ludlow	10,866
Cartridge primer, W. S. Smoot 17	10,780
Cartridge shells, heading, Salisbury and Wells 1'	70,77
Chandelier, J. Matthews 17	10,87
Churn, reciprocating, W. McKinley 17	70,877
Cigar, M. Rosenthal i'	70,90
Cigarette mouth piece, D. Marquis 17	10,75
Clay pulverizing machine, J. N. Kerper 1'	70,74
Cleaning compound, McGugin et al 1'	10,68
Clevis, J. G. Miller 17	70,75
Clothes dryer, H. J. Brown 1'	70,81
Clothes line prop, C. C. Schwaner 1'	70,77
Coal chute, portable, R. R. Hoopes 17	10,850
Coal oil motor, F. Bürger 1'	70,81
Cooking utensil, A. Viehmeyer 1'	70,92
Coolers, etc., stand for water, W. L. McDowell. 17	10,870
Corn drill, J. R. S. B. and G. W. Rude 1	10,90%
Corn sheller feed belt etc., W. R. Quarto 1	70,89