(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 lamplight. 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 washing 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 enable a 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 carbonic acid 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 spermaceti 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, gum 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 postage stamps, 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 lens on the stand just before the prisms? A. Yes. Place the condensing lens between the lantern and prisms.

1. Will there be any disadvantage in making up a battery of 12 one gallon Bunsen cups 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 combination always gives the highest tension or potential. 2. Please give full instructions for setting up the Chutaux battery; mentioned in your paper of May 22, 1875. A. There are several modifications 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 containing the zinc plate is filled with sand, the opposite side, containing the carbon, with pounded coke, after which the metal partition 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, ½ 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, zinc, 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 interposing a heavy piece of iron.

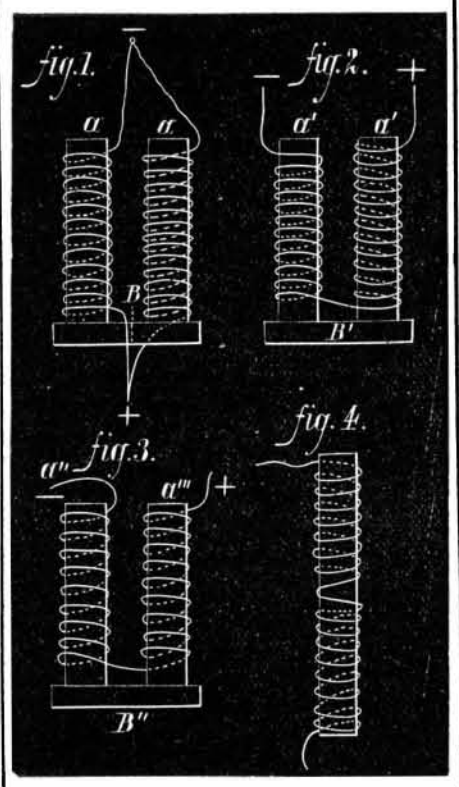
(46) N. S. asks: 1. Should all spirals, for lifting electromagnets, induction machines, magneto-electric machines, relays, and sounders, be insulated and wound on bobbins? A. All wires for electro-magnets, etc., should be insulated; especial care must be taken in this particular for secondary coils of 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 spirals 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 remaining unbroken, and then wind another flat spiral, and so on till the bobbin is filled, will I have a 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 the 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 for 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 run a line shaft, of 2½ or 2¾ inches diameter and 140 feet long, receiving the power of a 70 horse power engine at one end, and carrying pulleys as large as 42 inches diameter and of 16 inches 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 1¼ inches in diameter. The cylinder of the pump is 2¼ inches in diameter, and the length of the stroke of the plunger is 6 inches. The pump will pump water, 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.

(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 ways in 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 terminals 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 passing through each coil in the same direction, producing at *a a* two north poles. If we change the 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 represents 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 represents 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 show this 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.



(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 direction 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 22½° 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 necessary 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 shades.

(52) E. D. C. says, in answer to a query as to why the railway gage of 4 feet 8½ inches was adopted: My book of reference says that the gage was originally 5 feet, and the flange of the wheel was on the outside. That not working satisfactorily, the flange was changed to the inside, which makes the measurement 4 feet 8½ 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 converted into sulphate of iron.—W. J. S.—The glistening powder is sulphuret of 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.

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 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 Out a Square. By J. M. D.
On Gravity and Matter. By W. I. L.

Also 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 fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of 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 making school slates? Who makes *papier maché*? Why do not the makers of the sand blast apparatus advertise in the SCIENTIFIC AMERICAN? Whose is the best tile-making machine? Who sells the best photographic lenses?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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Wood, etc., press for drying, S. Swartz..... 170,915
Wrench, B. F. Joslyn..... 170,860
Zinc from its ores, distilling, G. E. Moore..... 170,760

DESIGNS PATENTED.

8,820.—MONEY BOX.—J. G. Baker, Philadelphia, Pa.
8,821.—CASSIMERE.—C. Clarke, Rockville, Conn.
8,822.—STOCKING.—M. Landenberger, Jr., Phila. Pa.
8,823.—TRIMMING.—C. Lindenthal, New York city.
8,824.—GLASSWARE.—F. S. Shirley, New Bedford, Mass.
8,825,8,826.—EMBROIDERY.—W. Steinhaus, New York city.
8,827.—GLASS DISHES.—J. S. Atterbury, Pittsburgh, Pa.
8,828,8,829.—EMBROIDERY.—E. Crisand, New Haven, Ct.
8,830.—INKSTANDS —E. FINNEY, Philadelphia, Pa.
8,831.—INKSTANDS.—G. E. Hatch, East Cambridge, Mass.
8,832.—TOY CHARIOT.—E. R. Ives, Bridgeport, Conn.
8,833.—INKSTANDS.—H. S. Kerr, Philadelphia, Pa.
8,834.—FRAME CORNER.—C. P. Poinier, Boston, Mass.
8,835.—SHIRT FRONTS.—V. H. Rothschild, New York city.

SCHEDULE OF PATENT FEES.

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On an application for Design (3½ years)..... **$10**
On application for Design (7 years)..... **$15**
On application or Design (14 years)..... **$30**

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA,

December 1 to December 4, 1875.

5,444.—J. M. Cooley, Hamilton, Ont. Side plaiter. Dec. 1, 1875.
5,445.—T. Webb, Elyria, Ohio, U. S. Feed cutter. Dec. 1, 1875.
5,446.—C. C. Robertson, Hamilton, Ont. Combined corset, shoulder brace, etc. Dec. 1, 1875.
5,447.—L. N. Fontaine, Ottawa, Ont. Liniment for rheumatism. Dec. 1, 1875.
5,448.—A. Chambers, Marylebone Road, London, Eng. Pneumatic signal. Dec. 1, 1875.
5,449.—W. L. Scott, Montreal, P. Q. Stamping with rubber type, etc. Dec. 1, 1875.
5,450.—I. H. Culp *et al.*, Clifford, Ont. Carriage. Dec. 1, 1875.
5,451.—W. P. Plant *et al.*, London, Ont. Gang plow. Dec. 1, 1875.
5,452.—J. H. Holland, Aurora, Miss., U. S. Land roller and seeding machine. Dec. 1, 1875.
5,453.—F. L. Blakely, Clinton, Iowa, U. S. Lap robe. Dec. 4, 1875.
5,454.—J. H. Morrell, New York city, U. S. Water supply and ventilation of buildings, etc. Dec. 4, 1875.
5,455.—S. H. Ghent, Hamilton, Ont. Drum heater. Dec. 4, 1875.
5,456.—A. D. Cable *et al.*, Montreal, P. Q. Apparatus for rendering doors and gates self-closing. Dec. 4, 1875.
5,457.—B. Temple, Hamilton, Ont. Combined tube kettle and cooking apparatus. Dec. 4, 1875.
5,458.—H. E. Van Benschoten, Hillsdale, N. Y., U. S. Boot sole and heel protector, etc. Dec. 4, 1875.
5,459.—J. C. Schoomaker, Geddes, N. Y., U. S. Lightning rod standard. Dec. 4, 1875.
5,460.—H. Bailey, New York city, U. S. Tubular flues for steam boilers. Dec. 4, 1875.
5,461.—C. A. Scadding, Toronto, Ont. Printer's galley. Dec. 4, 1875.
5,462.—J. B. Relyea, Hicksville, Ohio, U. S. Neck yoke leather, Dec. 4, 1875.