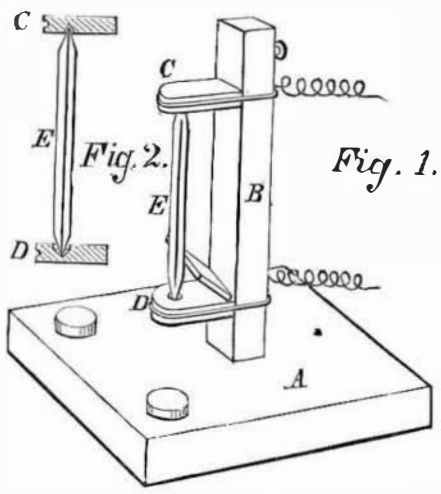
circuit, and if so, how many cells would be needed? A. The battery referred to will answer very well; but the Fuller battery, described in SUPPLEMENT, 159, would be much better for the purpose named.

(26) L asks whether an ice boat in any circumstances can sail faster than the wind which propels it, and if it can, why? A. For a full explanation of this subject you are referred to SUPPLEMENT, Nos. 54 and 61.

(27) G. M. G.—A Hughes microphone of simple construction is shown in the accompanying diagram. The box, A, which is six inches square and 1¼



inch deep, is made of pine, the sides being ¼ inch thick and the top ⅛ inch thick. It has no bottom. The post, B, also of pine, ⅝ inch square and 5 inches long, is secured to the middle of the top of the box by a screw passing upward from below. The carbon ears, C D, which hold the carbon pencil, E, are secured to the standard, B, by fine copper wires wound in the groove in the edge of the carbon and around the standard, B. These wires are connected with a battery and a telephone, or with a battery and the primary wire of an induction coil, the secondary wire of the coil being connected with a telephone. The cavity in which the lower end of the carbon pencil rests has a much wider angle than the end of the carbon pencil. The cavity whichreceives the upper end of the carbon pencil is nearly of the same form as the end of the pencil, fitting it loosely, however, so that it may be free to vibrate. The form of the carbon pencil and of the cavities in carbon ears may be seen in Fig. 2. The carbon pencil is 3 inches long and ¼ inch in diameter. It may be either round or square. Battery carbon answers well for this purpose. Between the carbon, E, and the standard, B, there is a piece of ordinary felt, which may be pressed down more or less tomodify the action of the microphone. Two disks of felt are glued to the box cover for receiving the ends of tuning forks. A pin projects from the back of the standard, B, to receive a small clock or watch. When it is desired to hear the tramp of insects they are placed in a paper pill box, which is secured to the top of the standard, B, by means of an ordinary pin.

(28) A. L. writes: I have every year a quantity of acid fruit which might be used in the manufacture of citric acid, but it is now allowed to waste. Can you give a simple process for making citric acid? A. Citric acid is generally manufactured from lemon juice, which is imported in a concentrated state, produced by evaporation by a gentle heat. It consists of citric acid 6 to 7 per cent, alcohol 5 to 6, and the remainder water, inorganic salts, etc. By some manufacturers it is allowed to partially ferment for the purpose of evaporating the clear liquor from the mucilage, or it may be clarified in the usual method by the use of albumen in the form of the white of an egg. Carbonate of lime in fine powder is then gradually added, and stirred in so long as effervescence continues. Citrate of lime forms, and after being separated by drawing off the watery liquor is well washed with warm water. It is then ultimately mixed with strong sulphuric acid diluted with 6 parts of water. After some hours the citrate is decomposed, the sulphuric acid having taken up the lime and formed an insoluble sulphate, setting the citric acid free. This, separated by decanting and filtering, is evaporated in leaden pans till it attains the specific gravity 1·13. The evaporation is afterward continued by a water or steam bath till the liquor begins to be sirupy, or to be covered with a thin pellicle. It is then removed from the fire, and put aside to crystallize, the mother liquor after a few days being evaporated as above, and again set to crystallize, and so on as long as clear crystals are obtained. To obtain pure citric acid, all the crystals should be redissolved and recrystallized, it may be several times, and the solution digested with bone black. A gallon of lemon juice should make about eight ounces of crystals. Limes and lemons constitute the source from which citric acid is generally made, yet it may be extracted from oranges, currants, gooseberries, raspberries, tamarinds, etc. The machinery and cost of manufacture will depend upon circumstances which any one about to go into the business can best judge.

(29) E. J. M. asks for directions for whitewashing. A. Well wash the ceiling by wetting it twice with water, laying on as much as can well be floated on, then rub the old color up with a stumpy brush and wipe off with a large sponge. When this is done, stop all the cracks with whiting and plaster of Paris. When dry, claircole with size and a little of the whitewash. If very much stained, when this is dry, paint those parts with turps, color, and, if necessary, claircole again. To make the whitewash, take a dozen lb. of whiting (in large balls), break them up in a pail, and cover with water to soak. During this time melt over a slow fire 4 lb. common size, and at the same time, with a palette knife or small trowel, rub up fine about a dessertspoonful of blue black with water to a fine paste; then pour the water off the top of the whiting, and with a stick stir in the black; when well mixed, stir in the melted size and strain. When cold it is fit for use. If the jelly is too stiff for use, beat it well up and add a little cold water. Commence whitewashing over the window, and so work from the light; lay off the work into that done, and not all in one direction as in painting. Distemper color of any tint may be made by using any other color instead of the blue black—as ocher, chrome, Dutch pink, raw sienna for yellows and buff; Venetian red, burnt sienna, Indian red, or purple brown for reds; celestial blue, ultramarine, indigo for blues; red and blue for purple, gray, or lavender; red lead and chrome for orange; Brunswick green for greens.

(30) W. H. L. asks (1) for directions for making an induction coil to produce a spark ⅛ inch long, or simply give the sizes and quantity of wire. A. On page 203, volume 39, SCIENTIFIC AMERICAN, directions are given for making a small induction coil. If to this coil is added a condenser, consisting of four or six square feet of tin foil, a spark ⅛ inch or more in length may be produced. 2. Will cotton covered wire do if each layer is thickly coated with shellac? A. Yes.

(31) C. A. W. asks: 1. What are the proportions of peroxide of manganese and carbon in the Leclanche porous cup? A. About equal parts. 2. What is the difference between the Prud'homme and the Leclanche batteries? A. The porous cell in the Prud'homme battery is filled with carbon only.

(32) G. M. B. sends us the following, clipped from the N. Y. *Evening Post*, and asks if the reply is correct:

"*To the Editors of the Evening Post:*

Will you tell me if an ice boat can possibly go faster than the wind? L. R. W.

School of Mines, Columbia College, New York, October 1, 1879.

[Yes, if it is carried upon a fast express train when the wind is not high. If you mean to ask whether or not an ice boat can sail faster than the wind which propels it, the answer is no, and a member of the School of Mines should be ready with a demonstration of the fact.—EDS. *Evening Post*.]"

A. The reply is incorrect. In all cases, excepting when the wind is directly astern, it is possible to sail faster than the wind. The fact is so well known that we wonder that it has escaped the notice of the editor of the *Evening Post*. By referring to SUPPLEMENTS 54 and 61 you will find a full explanation of this apparent anomaly.

(33) F. W. W. writes: A tree is 30 feet in length and of uniform thickness. Where should a lever be placed so that two men at the lever and one at the other end would carry equal parts? A friend says 7½, I say 10. Am I correct? A. Your friend is right: 7½ feet.

(34) E. N. asks: 1. Will 75 insulated telegraph wires, bound together and put underground, work as well as the same number on a single line of poles? A. Yes, if properly insulated and protected. Underground lines are in quite extensive use in England, but the wires are insulated with great care and protected by iron or stoneware pipes. 2. Will the telephone work well underground with a number of wires together? A. No, on account of the sensitiveness of the telephone to currents induced in one wire by that of another wire.

(35) M. & Co. write: We wish to correct you in one thing. We notice once in a while that you advise some one, from the pages of the SCIENTIFIC AMERICAN, to saw out the crack in a broken bell in order that the tone may be restored. The only remedy for a broken bell is in recasting; the plan above noted has been tried for years, and never with success.

(36) B. F. M. writes: In a description which I have of a microscope, it is said, "to easily resolve *Pleurosigma angulatum*." What is meant by the expression? A. *Pleurosigma angulatum* is a diatom whose silicious envelope is filled with minute hexagonal areolations.

(37) G. H. C. asks: How is the beautiful black stain and polish put on light-colored woods, as seen notably on French boxes, clock cases, etc? I do not see how the polish can be obtained without ever rubbing through to the wood underneath, even on the sharpest angles. A. Ebonize the wood according to the process given on p. 91, vol. 40, then polish it by applying a mixture of alcoholic shellac varnish 2 parts, boiled linseed oil 1 part. Shake well together and apply with a rubber made of woolen cloth. Put only a little of the polish at a time on the rubber, and rub briskly on the wooden surface until the varnish is bright and hard.

(38) H. B. asks (1) how to put an electric bell on a telegraph line he has got in use now. A. Use a single stroke bell, and place it in the line in the same way as you now have the sounder. 2. Also how to make the bell in the cheapest and best manner? A. Make it similar to a sounder using the armature lever to carry the bell hammer. 3. What preparation can I put on an earthen jar to make it suitable for a battery jar? I have some on my battery and they are too porous. A. If you employ them as outer jars, you can render them non-porous by applying asphaltum varnish, or by warming them and applying paraffine or wax.

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

E. N.—Nos. 1, 2, 3, and 5 are auriferous (gold bearing) quartz. No. 4 contains stephanite—a silver ore. An assay would be required to determine the value of the ores.—J. G.—It is the native alloy of platinum, indium, and osmium, the principal ore of platinum. If found in any considerable quantity, worth about $4 per ounce. —G. S.—1. It is a potash feldspar. The clear mineral is used to some extent in porcelain and pottery manufacture. 2. The mica is the variety known as muscovite; of little value unless in large plates. 3. Banded agate.—E. F. B.—1. The ore contains lead and a small amount of silver. It would be impossible to judge of the amount from the sample. 2. It is a variety of porphyry. 3. Jasper and hornblend. 4. Probably contains silver.—B.—It is composed chiefly of carbonate of and caustic lime, with a small quantity of aluminum silicate.

COMMUNICATIONS RECEIVED.

On Coming Transit of Venus. By L. G.

On the Explosion of the Alaska. By J. H. R.

[OFFICIAL.]

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Refrigerator, J. M. Dalton, Philadelphia, Pa.
Screw propeller, E. A. Heath, New York city.
Stone crusher, Blake Crusher Co., New Haven, Conn.
Strainers, making, E. P. Wood *et al.*, Lowell, Mass.