of the lenses are as 1 to 3, and their distance apart is equal to half the sum of their focal distances. The lens of greatest focal length is the field glass. The diaphragm should be placed about midway between the lenses, and its aperture should be as small as possible without cutting down the field. Eye-pieces of different focal lengths may be used with the same objective.

(32) L. ●. asks what to apply to old plaster Paris busts, that have become dirty, that will make them look like new. Dust has settled in the pores and I can not remove it. A. Give them a dead coat of china white, or you may varnish them and apply a coating of silver, gold, or bronze colored bronze powder.

(33) W. D. S. writes: 1. I have a vertical boiler, 4 feet high, 27 inches diameter (including furnace, which is internal and 18 inches high); boiler has nineteen 2 inch flues; is made of five sixteenth iron; engine, 3 inch bore, 7 inch stroke, running 350. We have not enough power to run a small planer; we use from 60 to 80 lb. steam pressure. Could we with safety increase this pressure; the boiler has been in use only 2 years; or could we run a larger engine with the same boiler, say 4½x4½? A. If your boiler is five sixteenths inch thick, of good iron, and well made, you may carry 120 lb. without hesitation. 2. I noticed in a recent number of the SCIENTIFIC AMERICAN a correspondent wants to know if oil will stop priming. I frequently use the common black lubricating oil, feeding it with feed water with good effect. Will it injure the boiler? A. No.

(34) G. H. P. asks: 1. What is the expansion of glass between 32° and 212° Fah? A. Glass which at 32° F. is 1,000,000, at 212° becomes 1,000,861. 2. How to solder brass on to a valve seat of a steam cylinder. A. Clean the valve seat, coat it with solder by means of a heavy soldering iron. Tin the brass plate, heat it quite hot, and put its tinned side downward on the valve seat. If the brass plate has not sufficient thickness to admit of this treatment you may "sweat" it on.

(35) S. A. B. asks: 1. How can I put a very high polish on steel? A. The steps in the process are as follows: 1st, Coarse wet stone; 2d, fine wet stone; 3d, buffwheel having fine emery applied; 4th, crocus, different degrees of fineness. 2. On brass? A. Finish as finely as possible with files, then with Scotch gray stone, and finally, with the powder of Scotch gray stone and oil, or with rotten stone and oil. 3. How is the so-called "Florida sea bean" polished? A. After smoothing, use powdered pumice stone and water. Finish with rotten stone and water or oil.

(36) S. F. writes: I have an induction coil, of Ladd's make (London), of the following dimensions: Length of coil proper, 11½ inches; diameter of coil proper, 5 inches; diameter of core, 1½ inch; base board containing condenser, 19¾ by 9 inches; condenser plates, 19 by 8½; number of condenser sheets, unknown; length of primary wire, estimated, 75 feet; number of secondary wire, 3 miles (16,000 feet). This coil was sold promising to give a spark in air of 4 inches, but I never realized more than 3 inches, and then a feeble spark. The battery which I employed with this coil consists of four 1 gallon jars, in each of which there are immersed a zinc plate 6 by 8 inches between two carbon plates of the same size. The construction of the battery is that of Grenet; the solution in which the plates are immersed is saturated solution of bichromate of potash and sulphuric acid. Is the battery not strong enough to give the desired result, or can you suggest any other reason? A. Your battery seems to be ample. The coil may have been injured by an internal discharge, or it may be that the interrupter is not properly adjusted. If the spark from the primary coil is large it would be well to increase the surface of the condenser.

(37) C. H. M. asks: 1. For a method of producing brilliants resembling diamonds. A. Pure caustic potash, 16½ parts; white lead, 85; boracic acid, 4½; arsenious acid, 1-6; pure quartz sand, 50. These materials, carefully selected, are ground together, placed in small glass pots (the French clay pots will answer if the first charge is discarded after several hours firing) and heated to quiet fusion in a suitable furnace for about 24 hours; then cooled very gradually and cut. The art of imitating the diamond and other precious stones has attained to great perfection in Egypt and Greece, as well as in France. The following analysis by Sonault gives the composition of the colorless French *Pierres de Strass:* Silica, 38·1; alumina, 1·0; oxide of lead, 53·0; potash, 7·9; borax and arsenious acid, traces—100. 2. Give a simple method of qualitative test for the presence of silver in ores. A. Reduce the ore to an impalpable powder by grinding, gradually heat it to redness for half an hour or more, with constant stirring; boil with pure nitric acid; filter; evaporate the filtrate to small volume, and add a few drops of hydrochloric acid—a white precipitate which does not dissolve in boiling water, and blackens on exposure to sunlight indicates silver. Gold, if any, remains in the powdered ore. If the ore contains chlorides the silver may escape detection by this test. It is safer to proceed as follows: Mix the ore with 10 or 15 times its weight of finely granulated test lead—free from silver—and 2 or 3 pieces of borax glass the size of peas, in a small scorifier, and expose in a nearly white hot open muffle until the ore is fluxed and the fused metal disappears beneath the liquid slag of litharge. Then remove, cool, break, hammer, and clean the lead button; place it in a dry bone ash cupel of equal weight, and expose in the muffle until all the lead is slagged and absorbed by the porous bone ash, leaving the silver, together with the gold, if any, as a bright, clear molten button in the bottom of the cupel. Very small quantities of silver and gold in an ore may be thus detected.

(38) J. A. writes: In my last SCIENTIFIC AMERICAN, April 5, No. 14, I notice in answer to L. B., you say that 8 inch cylinder, 12 inch stroke, 150 revolutions per minute, 60 lbs. steam, 20 horse power; by my rule I only make 13·7 horse power. My figures are:

Piston 50·2656 square inch
60 lbs. steam.
3015·9360
h. p. 150 rev. perm.
33,000)452,390·4000
13·7 h. p.

If I am wrong, please tell me where I make my mistake. I am only an novice any way. A. 150 revolutions per minute is 300 feet; double your result and you will be then right, except that you have made no allowance for friction.

(39) W. A. J. asks: What chemical action takes place when sulphuric acid is applied to common salt? A.

$$\underset{2NaCl}{\text{Salt}} + \underset{H_2SO_4}{\text{Sulphuric acid}} = \left(\underset{NaHSO_4}{\text{Sodium bisulphate}} + \underset{NaCl}{\text{Salt}}\right) + \underset{HCl}{\text{Hydrochloric acid}}$$

When strongly heated on the hearth of a reverberatory furnace the reaction is completed, resulting in the formation of neutral sulphate of soda (Glauber salt, $NaSO_4$) and hydrochloric (muriatic) acid.

(40) H. S. asks how to arrange an earth battery for nickel plating. A. We could not advise the use of an earth battery for this purpose. You should use a Smee or a Daniell battery, or one of the forms of the gravity battery.

(41) A. E. asks how to make a drill point that will enable him to drill through glass, porcelain, or transparent china pictures. A. Make the drill of the finest quality of steel, heat it to a cherry red, plunge it in mercury, hold the extreme end in a pair of cold pliers, and draw down the temper except at the end protected by the pliers. Wet the glass or porcelain with turpentine to which a little gum camphor has been added.

(42) H. L. asks what size of engine and boiler to run a velocipede capable of carrying one person, at the rate of about 6 or 8 miles an hour. A. Perhaps some of our readers will furnish this information.

(43) S. R. E. asks whether or not honey will keep in glass cans. A. Yes, if the jars are well filled and sealed air tight. 2. What is the best noted cure for bee stings? A. Dissolve 3 parts of pure carbolic acid in 5 parts of good glycerine.

(44) J. M. asks: 1. How long will the carbon remain good in a Fuller bichromate battery? A. It will last for a number of years. 2. I am running a burglar alarm in my house, with a Fuller bichromate battery, 4 one gallon cells, and No. 32 wire. Please tell me how to make an electric light in my house with these 4 cells. 2. You cannot make an electric light with four Fuller cells.

(45) A. B. P. asks: Would it not be much better in making a Siemens hand power electric machine, illustrated in SUPPLEMENT No. 161, to make the electro-magnets of malleable iron, and have them permanent magnets, or can common cast iron be permanently magnetized as well? A. Neither cast nor malleable iron retains the magnetic charge to any very great extent. You will get the best results by using the electro-magnet.

(46) J. P. B. asks: If a telegraph line of No. 14 galvanized wire be used, how small a piece of boiler iron could be used in damp earth as a ground plate, to give the electricity as free a pass to the ground as over the line? A. Use a plate having a surface of 10 or 12 square feet. A thin copper plate would answer better than the boiler iron.

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

A.—It is a variety or syenite or hornblende schist—it has little commercial value.—G. S. A.—The ore contains traces of silver.—J. H. G.—It is mica schist—of no value.

COMMUNICATIONS RECEIVED.

On Binding. By E. C. M.
On Squaring the Circle. By C. P. K.
On a New Form of Telephone and Battery. By H. W. F.
Horse Shoeing. By C. S.
On Cleaning Lamp Chimneys. By S. B.
On a Rare Geological Specimen. By H. M.
On Animal Intelligence. By H. D. O.
Artificial Stone Foundations. By W. M.

[OFFICIAL.]

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FOR WHICH

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March 25, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city.

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