

(5) C. A. asks: 1. How do the so-called fire eaters perform their feats, or what chemicals do they use to keep the fire from burning them? A. Dilutes sulphuric acid, strong alum, and hard soap are the principal substances used. 2. What article which, when mixed with coal oil, will keep it from exploding? A. The explosive properties of coal oil cannot be removed except by so transforming it that it can no longer be used for burning purposes.

(6) F. J. E. desires information as to the value and process of manufacture of dissolved bone, a fertilizer used on wheat fields. A. Messrs. H. J. Baker and Bro., of 215 Pearl Street, New York, are the manufacturers of the fertilizer known as dissolved bone. It is excellent for wheat lands. As manufactured by a New York firm, it contains about 17 per cent of phosphoric acid, and is made by treating the bone with sulphuric acid in the proportion of 0.64 per cent of concentrated acid to each pound of bone.

(7) A. D. S.—Kerosene can be mixed with lard oil in small quantities with good effect for lamps. The kerosene should be 150° test. The quantity used must be determined by a trial as to the smoke-producing results. The browning of a gun barrel will not prevent rusting unless the barrel is oiled or varnished. Inside of barrel should also be oiled. No useful alloys of silver and steel can be made that will not rust.

(8) Student asks how he may obtain transfers or offsets from printed matter upon white paper—plate, litho, and type. A. The following process is given for the purpose of transferring engravings to paper: Place the engraving a few seconds over the vapor of iodine. Dip a slip of white paper in a weak solution of starch, and when dry in a weak solution of oil of vitriol. When again dry, lay a slip upon the engraving, and place both for a few minutes under a press. The engraving will be reproduced in all its delicacy and finish. Lithographs and printed matter cannot so be transferred with equal success.

(9) J. H. I. asks what size return tubular boiler it will take to run two engines, cylinders 2x3, revolutions 250, boiler pressure 100 pounds; and what horse power; cylinders or crank at right angles; and what size boat they would drive at about six or seven miles per hour? A. Your engines are 3 horse power, and will require a boiler of 40 square feet heating surface. With a 15 inch screw in an 18 foot boat you accomplish six to seven miles per hour.

(10) A. P. asks: What is the difference between coal oil and insurance oil? Also, what is black oil? A. By coal oil, we infer you mean the ordinary burning fluid, or kerosene. This is one of the distillates of crude petroleum, which is probably the "black oil" referred to by you. The "insurance oil" is a high grade of kerosene, having a greater density than the common article and a higher flashing point; in other words, an oil with a lesser tendency to explode than the common article.

(11) E. O. M. asks how to cut a pinion of 21 teeth on planer centers that are only divided with the numbers 16, 20, 36. A. By using the 20 index, and slotting the index catch so as to retrograde the index by one-twentieth for each tooth cut. The side of the index catch may be divided so that the length of one index notch represents 20 divisions arranged like a vernier; add one more division for the 21st tooth. Then, by drawing back the catch one division for each index division, the 20 index will produce 21 teeth. Make a trial, marking to see if the arrangement is working correctly before cutting the pinion.

(12) A. M. D.—There is no practical way of destroying the odors of melted tallow or soap boiling except by fire. You may put a close hood over the kettles, and carry the odors in a large pipe of tin or sheet iron to the boiler furnace or to the furnace that heats the kettles. Close all air inlets to the fire except from over the kettles. The only machinery for this purpose in use in this city is a sealed kettle boiled by steam, with a vent pipe extending under a fire, either under the boiler or separated. Such apparatus is used for rendering offal and dead animals for their fat.

(13) W. O. asks: 1. What is the difference between cast iron and malleable cast iron? A. Cast iron is iron that is melted and cast in moulds and used without further treatment. Malleable cast iron is iron that has been cast in moulds, and afterward annealed in annealing ovens for a considerable time to render it malleable. 2. What is meant by volts and ohms, used as terms in electricity? A. A volt is the unit of electromotive force. An ordinary or Daniell or gravity battery produces a current of about one volt. A machine which produces a current equivalent to that of one of Daniell battery will produce about one volt. The ohm is the unit of resistance. It is about equal to 350 feet of No. 9 telegraph wire. 3. What is the power of a chrome battery (bichromate of potash battery) aside of the Grenet? If they will run a 6 candle power incandescent light, how many? A. The bichromate of potash battery produces a current of about 2 volts. To run a 6 candle power of incandescent light will require about 4 to 5 cells of bichromate of potash battery. 4. I noticed, early one foggy morning, in looking at an arc light (Brush), that it had a full purple-pink cast. In looking at the same light on a clear morning through a frosted window (that was from the cold), it made the colors of a rainbow on the window. Is this spectacle natural with the light? A. The purple color of the arc lamp observed by you was probably due to the temporary elongation of the arc, the light produced by the long arc always having a violet tinge. It is not uncommon to see the colors of the spectrum in frost crystals. 5. Have you a book for sale called "Catechism of the Locomotive"? If so, what is the price? A. Yes. The price is \$2.50.

(14) D. McP. writes: There is one man maintains that it does not take any more power on the pump to test a boiler that holds 5,000 gallons of water than one that only contains 50 gallons. I say, the more water, the more power on the pump (both boilers being perfectly tight). Will you be so kind as to decide the argument? A. It takes no more pressure on the pump

piston to test a large boiler, than it does to test a small one, but in testing the large boiler more water will be required to bring it up to the necessary pressure, and consequently more power will be consumed in testing the larger boiler.

(15) J. R.—You are making your magneto electrical machine too small to be of much service. It would not be much more expensive to make it much larger, and the labor of winding the armature would be less. Probably, with so small a machine, 6 sections, each wound with four layers of No. 32 wire, will secure the best results.

(16) C. A. B. writes: In making an electric machine, I used common green glass bottles for supports for the conductor, and the machine worked all right. I tried to better the appearance, and used flint glass rods for supports, and the machine would not work at all, under the same atmospheric conditions. I made two Leyden jars out of green glass and succeeded, and tried several out of good white glass and failed. A. The white glass contains a certain amount of lead, which renders it to some extent a conductor of electricity. The green glass which you used contained no lead and was therefore a better insulator.

(17) R. L. D. asks: 1. What size of wire and cores, and how many layers, will make the strongest electro magnet, using one cell of gravity battery in a circuit not to exceed 40 feet (besides spoils)? A. Make the cores of your magnets 2 inches long and 1/2 of an inch in diameter; wind them with ten or twelve layers of No. 24 wire. 2. Why would not vulcanite plates answer in the place of glass ones in a Wimshurst electric machine? A. Vulcanite will undoubtedly answer, but on account of the oxidation of its surface it is not so durable and reliable as glass. 3. Take a copper tube which weighs one ounce per foot and a copper wire of exactly the same weight per foot—which will have the greatest resistance to the electric current? A. There will be no difference. 4. Which would melt first under a heavy shock of lightning? A. There might be a very slight difference in favor of the tube, on account of its surface being extended, so as to radiate more heat than the wire, but we think the difference will be inappreciable.

(18) G. A. C. writes: 1. The SCIENTIFIC AMERICAN SUPPLEMENT contains a description of an electric machine which, say, for instance, were it four times as large, would be sufficient for an arc light. Now, how can I calculate what size machine and wire to put on it if it would operate two lamps, and also how to calculate the wire for using about 30 incandescent lights at different times? A. We believe there is no rule which will enable you to calculate all of the dimensions of a dynamo electric machine so as to enable you to construct a machine to develop a given current; it is largely a matter of experiment. Much depends upon the quality of the iron used in the field magnet and in the armature, in the quality of the copper used for the conductor, and in the relative position of the various parts. 2. Why the United States incandescent machine is self-regulating? A. We believe the automatic regulation is effected by compound winding. For information on the construction of dynamos, consult Thompson's "Dynamo Electric Machines," Gordon's "Electric Illumination," and Dredge's "Electric Illumination." As you fail to give your P. O. address, we are unable to send the SUPPLEMENT desired.

(19) U. O. C.—Follow the instructions for making an induction coil given in SUPPLEMENT, No. 160, omitting the condenser, and making the iron core removable, to vary the strength of the secondary current. A short piece of iron should be left in one end of the core to operate the interrupter; or, if desirable, you may make the interrupter entirely separate from the coil, winding it with coarse wire and placing it in the battery circuit.

(20) J. C. T. asks: What kind of an instrument is used for registering the degrees of heat in a forge or furnace, and where could I obtain a good description of a simple one? A. The instrument for measuring high temperatures is called a pyrometer. You will find different forms of pyrometers described in SUPPLEMENT, Nos. 198, 33, 228, 358, 172, and 256.

(21) L. O. W. asks: 1. What must be the diameter of a lens to reflect a picture 4 inches square to a size of 8 feet at a distance of 12 feet from the screen? A. A lens of 6 inches focus and 2 inches diameter. 2. Are there two lenses used in a polyopticon, or only one? A. Two lenses are used in a polyopticon, arranged on the same principle as the magic lantern, the light being placed on the side of the lens tube, so as to illuminate the picture.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted December 15, 1885, AND EACH BEARING THAT DATE.

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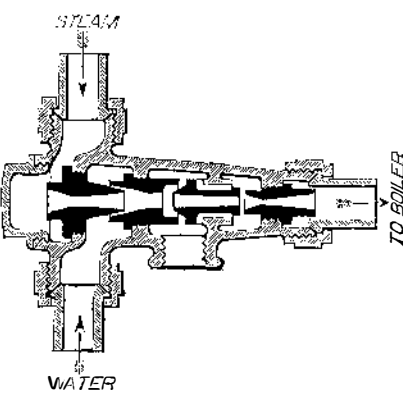
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