- (510) E. L. B. asks: How many ohms of resistance will one volt of E. M. F. overcome? I can read up all about one unit and all about the other unit, but cannot ascertain the relation between the two. If there were a unit for the friction of water in a pipe, it would be easy to say, so many pounds of pressure overcome so many units of friction; cannot the same be ascertained for volts and ohms? A. Any number of ohms resistance can be overcome by one volt E. M. F. The resistance simply reduces the amount of current that can be produced by a given E. M. F. through the circuit. Thus, taking your own simile, no amount of friction could completely overcome one pound of water pressure; it would only reduce the amount which that | 584, with full description, formula, etc. pressure could force through the pipe. Read Ohm's aw to ascertain the relation of E. M. F. to current It states that the current produced by a given E. M. F. is inversely proportional to the resistance of the circuit. Hence any E. M. F. must produce some current through any resistance short of infinity.
- (511) C. T. H. asks how to calculate the size of wire on armature and field magnets of electric motor with any given E.M. F. A. For a peripheral speed of armature of about 1,500 feet per minute, and as an approximation, for every yard of wire in its winding, one volt E. M. F. may be allowed for.
- (512) V. M. C. asks: How must I proceed to obtain a cast of solid metal, say of silver, of a bug, beetle, or similar insect? The idea is to embed the object in some plastic refractory material, then burn it out, and pour the molten metal through holes provided What material must I use, and how must I proceed 1/1/1. Make the moulds of finely ground plumbago 3 parts, potthe box and into the insect to hold it in position and for ventilation. Let some of the pins touch the legs, also for ventilation. When the insect is properly adjusted in the box, and a large pin or pouring gate is made to touch the body, and held in place by passing through the box, pour the thin mixture slowly into the box until it is filled, being careful to clear away any air bubbles that might hang in contact with the insect. Set the mould in a warm place to dry. As soon as it is set or hard enough to handle, pull out the pins and gate and take off the paper box and place in a warm place to thoroughly dry. Then place it in a small iron box, so as not to expose the mould to sudden heat, and slowly heat to a full red, and while at a red heat blow air through the mould to burn any carbon that may remain. See that the vent holes and gate are all clear, when the mould will be ready for pouring in the metal. Have the mould quite hot when you pour, to insure the metal filling every part. Soak the mould in water for a few hours, when it can be cut away with a knife.
- ble that has become stained so that it looks dirty can be whitened. A. Scrub it with ground pumice stone and water. For stains apply a paste of lime and washing soda and wash off after a few hours. Also try javelle water, or bleaching powder and water mixed to a
- (514) H. N. asks how table oil cloth may be made. A. Size it with weak glue solution and paint with best lead paint, mixed with a little varnish. It can be rubbed down between successive coats with ground pumice if a very fine finish is desired. Dammar varnish can be used.
- (515) A Subscriber asks why they don't use emery paper on an electric motor. A. Emery is a bad material to use on any frictional surfaces or bearings in any class of machinery, as it beds itself in the metal and cuts the journals, etc. Hence it is not used to brighten the commutators, as they would then destroy
- in separating same. Can you tell me what to use on the original so that they will admit of free separation? A. Oil the mould with olive or similar oil.
- (517) T. O. M. asks: Will the telephones described in SUPPLEMENT. No. 142, work a distance of ten miles? A. No; you will need a microphone transmitter. 2. Would I be permitted by Bell Telephone Company to use them? A. They are practically Bell telephones, and the Bell company can have you enjoined from using them.
- (518) N. W. H. writes: In your Scien TIFIC AMERICAN of February 18, 1888, you give the population of London, England, for 1888, 3,955,819. Swinton's geography gives the population of same city for 1880, 4,764,000. Has the city decreased in population, or have you made a mistake? A. Our figure was correct. The population of London may be variously stated, according to the districts in the suburbs which are included. Instating the population of New York as a center of population, Brooklyn, Jersey City, Hoboken, Long Island City, etc., should be included. London's population is; increasing with great rapidity.
- (519) E. H. J. asks: 1. Please give origin and history of three golden balls as a pawnbroker's sign. A. The coat of arms of Lombardy contained of the first of this class. 2. Is there a treatise on the Strengthen the Memory" is a popular treatise, which we can send free by mail for \$1.00.
- (520) J. S. writes: I have constructed

in the system of mains. This is called an air trap. to generate any current from it. The instructions given The high points in the system should have self-acting have been strictly followed. The machine runs well as valves or a service connection to let the air out, but a motor with four Grove cells. Will you please inform this will not obviate the tendency to air obstruction in me the reason, or suggest what is necessary to obtain mains that are too small for a distributing service. We the desired effects? A. Possibly you can obtain a curcould not point out your special trouble without a map | rent by shifting the wires of the field magnet so as to and elevation of the whole system of mains. Service | send the current through the field in the opposite sense pipes should always be tapped in to the top of the Or try the following: Connect the field and armature in series with a battery of four or five couples and start the dynamo. Have the wires insulated and the brushes set at the neutral point. The instant the belt seems to drag,indicating an excited field, cut the battery out and close the circuit. This must be done quickly or you may lose the excitement of the field. Do not touch the bare wires when executing the maneuver, or you will get a strong shock.

> (521) F. B. W. writes: Will you kindly inform me through your paper the process of making blue print paper-body white, lines blue? I have seen it in your paper, but cannot turn to it. A. For processes both of blue lines on white ground and black lines on white ground, we refer you to our Supplement, No.

> (522) J. G. W. writes: I am building an eight light dynamo as described in Supplement, No. 600. 1. I wish to use it for an arc light; which is the best winding for it—series or shunt? A. For arc lamp wind in series. 2. Could it be run by hand power with proper transmission for several hours? A. It would not be practicable. 3. Which is the best transmission A. Belting. 4. How can I make an arc lamp for that purpose? A. For arc lamps consult our Sur-PLEMENTS. We recommend also Atkinson, "Electric Lighting," which we can supply by mail for \$1.50.

(523) J. V. L. P. writes: Can you tell me what has been found efficacious for removing mildew from brickwork? A brick building near here deep one. has presented about 100 square feet of mildewed surface on one of its gable ends ever since it was built, some eighteen months since. The mildew is a clear white, and varies a little from time to time in extent, but is as bad now as ever. I have thought of using several liquids for removing it, but would be glad to learn what others ter's clay 1 part. Mix thoroughly with water, and thin enough to run. Make a small paper box open on one side, and impale the insect on large pins passed through the milder of the mild tar at the joints and necessitate repointing. How is it with boiling water, kerosene, lye, or ammonia? Will the application of any substance prevent the reformation of the mildew-boiled linseed oil, perhaps? A. Builder's acid (muriatic acid) is often used for removing white stains from brickwork. Its efficacy in the case of mildew would be doubtful, but the white stains you refer to may not be such. A coat of linseed oil on the perfectly dry brick would have a good preventive tendency. Melted paraffine applied hot and worked in with a paint burner would also be efficacious. Perhaps either of the last named applications would destroy the mildew or white stain also. Acid used by an experienced man would not injure the joints.

(524) A. L. K. writes: A shunt-wound in agrees with the pulse-beat, it is a coincidence only. andescent dynamo, voltage 1,200, current 5 amperes, furnishes light for 100 16 candle lamps, wired in series. Each lamp has 21/2 ohms R. and consumes 121/2 volts. An arc lamp is inserted in the circuit, in' series, requirwe hours, when it can be cut away with a knife. ing 50 volts and 5 amperes, and giving a nominal candle (513) M. C. J. and L. J. S. ask how mar-power of 1,000. It displaces four 16 candle lamps. I cannot understand why the same power furnishes 64 candle power in one case and 1.000 in the other. A. The 1,000 candle power rating is fictitious, and really is about 400 candles. The arc lamp is the most economical producer of light that is known, because of its high temperature. The ratio of obscure to luminous radiations is far more favorable than in the case of the incandescent lamps.

(525) "Reader" asks: Is not the field for invention nearly exhausted? Do you know of any opportunities still open for one with an inventive turn of mind? A. The opportunities are endless; the field is rather increasing than diminishing. We could not recapitulate a tithe of the most important. Thus we might suggest a light weight durable storage battery; a low resistance, compact, cheaply run primary battery; a high temperature heat engine; a practicable freight train brake; a coupling for attaching automatically ferryboats to their docks; a practicable system of navigation in fogs on the ocean. Every machine of import-(516) J. H. A. writes: I wish to take a ance can be made the basis for improvements. To be a plaster cast from a plaster ornament, but have trouble successful inventor you must see the need as well as the way of supplying it; the first is as essential to success as is the second.

> (526) P. V. M. asks whether common pine wood or any wood could be made to answer for cores in casting Babbitt or lead. If not ordinarily, could it be made good by any solution? A. Boil the wood for a few minutes in a strong solution of sulphate of iron dry, and whitewash with lime and again dry, for each

> (527) A. A. asks if there is any method drinking. A. Distillation is the only efficient method

> (528) B. & Co. ask for the best methods of quickly bleaching ivory. A. Treat with solution of binoxide of hydrogen. Exposure to the sun while immersed in spirits of turpentine is said to be efficacious.

(529) H. A. W. asks: Kindly state between what zodiacal constellations and the sun are the planets Saturn, Uranus, and Neptune when passing the perihelion point of their different orbits. A. The position of the perihelion of Saturn is in Cancer, of Uranus in Virgo, of Neptune in Taurus.

(530) E. J. K. writes: Will you give formula for adhesive plaster that is unaffected by moistthree spheres, and is said to have been the origin of the ure and is as inert, medicinally, as possible? What is pawnbroker's sign as Lombardy was the home of some wanted is something that will stick to the body well. improvement of memory? A. Holbrook's "How to pints; simmer together for four or five hours, adding water if necessary until the mass is of proper consis-

(531) F. H. S. writes: At any time an eight lamp (16 c. p., dynamo-electric machine, ac- during clear weather, when the temperature is below cording to instructions given in Scientific American the freezing point during the night, but not sufficiently

lower levels, the air always seeking the highest points SUPPLEMENY, No. 600, by G. M. Hopkins, but have failed low as to "freeze over" the water of a river or creek, at no time before sunrise can a particle of ice be seen upon the surface of the water, while in a short time after sunrise, the stream, as if by magic, is filled from shore to shore with floating particles of ice commonly called slush ice. Query Whence comes this ice? The fine ice we presume existed, but was invisible until the sun's rays fell upon it not too obliquely.

> (532) J. S. B. writes: To settle a dispute, will you please tell me, if you should pass an electric current through a chemically pure copper wire, would there be any difference in composition (i. e. would it still be chemically pure) or structure? I think that an electric current would not alter the composition or structure, unless the wire was so small as to cause heating. A. You are correct. No alteration in composition will be produced.

> (533) E. H. D. writes: Is there anything in benzine that will injure the teeth? If not, it is certainly a great cleanser. How can it be purified from its peculiar taste and smell? A. Benzine will not injure the teeth, but is not adapted for cleaning a wet surface, and its vapor, if inhaled, would tend to produce toxic symptoms. Treatment with bichromate of potash and sulphuric acid tends to destroy its odor.

> (534) G. S. D. asks: 1. Why is it that you can place your hand on the bottom of a boiling tea kettle and it will not burn you, only feeling warm to the naked hand? A. If the bottom of the kettle is coated with a non-conducting substance, such as lampblack, the heat will be prevented from reaching the hand in some measure. If the bottom is clean, it will feel hot. 2. How are lenses adjusted in instantaneous photograph cameras to focus themselves correctly at different distances? A. The lens is so constructed as to keep the emergent rays as nearly parallel as possible, so that the approximate focus is what is known as a

(535) H. B.—Condensation of natural gas to a liquid is impracticable on the large scale, and cannot be accomplished on the small scale without extreme reduction of temperature. Aluminum steel is ductile if properly annealed. Experiments with aluminum alloys for ordnance have yet to be made. The U. S. government has in contemplation experiments with submarine boats.

(536) S. H. M. writes: Please be kind enough to explain the following phenomena of the water hammer: 1. When friction is applied to the tube. the bulb at the upper end being full of water, all but a bubble, a sort of boiling takes place through the contracted tube immediately below the bulb? A singing noise accompanies it. 2. When the thumb is applied to the lower end of the tube where there is a slight bulge, the tube being inclined just sufficiently to allow a small bubble to remain in the bulge, the instrument seems to serve as an accurate pulse glass, and indicates the pulse beats. A. Both phenomena are du to heat produced by friction or contact. The pulse indication is, we believe, quite imaginary, and if the bubbling

(537) M. K. writes: Considerable annov ance is caused in our bleaching works by the soda imparting to the materials to be bleached a reddish tinge, which is very positive in its resistance to the bleaching agent—chloride of lime solution. Will you please say if there is anything in the soda that would be likely to produce this result, and if there is anything that will neutralize it? A. We presume the trouble is due to the presence of iron. Treatment of the goods with a weak acid bath might remedy it.

Books or other publications referred to above can, in most cases, be promptly obtained through the SCIENTIFIC AMERICAN office, Munn & Co., 361 Broadway, New York.

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