(12) J. M. R. desires information how to make a liquid glue equal to Royal glue. A. Take a wide mouthed bottle, and dissolve in it 8 ounces best glue in ½ pint water, by setting it in a vessel of water, and heating until dissolved. Then add slowly 2½ ounces strong aqua fortis (nitric acid), 36° Baume, stirring all the while. Effervescence takes place under generation of nitrous acid. When all the acid has been added, the liquid is allowed to cool. Keep it well corked, and it will be ready for use at any moment.

(13) B. H. C. asks how to make acid phosphate. A. Acid phosphate of calcium ($CaH_4P_2O_8$) is formed by boiling bone earth with sulphuric acid. It is also formed by dissolving the di or tri calcic salt in aqueous phosphoric, nitric, or hydrochloric acid; it then crystallizes on evaporation in small laminæ or scales containing one atom of water.

(14) H.—Hard bronze or gun metal, made of copper 14 ounces, tin 2 ounces, is the strongest and best for both nuts and boxes for lathes. Babbitt and yellow brass are not reliable for wear or accuracy.

(15) L. M. F. asks which, in a pecuniary point of view, would be the better profession—mechanical or civil engineering, supposing a person had a considerable taste for mathematics as well as for mechanics. A. If you are equally well adapted to either profession, we think you should be governed entirely by your opportunities, as there is very little difference between the two in a pecuniary point of view. It is probable that there are more opportunities in civil engineering than in mechanical engineering.

(16) H. R. asks how to make an electric bell, such as is used for burglar alarms, etc. A. You will find in the back numbers of the SCIENTIFIC AMERICAN and SUPPLEMENT ample directions for making an electric bell. The common method is to place in front of a small electro magnet, of 8 or 10 ohms resistance, an armature supported by a flat spring at one end and carrying at the other end a bell hammer. Near the back of the armature is placed a spring carrying a contact screw, capable of touching a platinum point fixed in the back of the armature. The battery current is taken through the magnet to the spring of the armature through the contact screw, and the spring supporting it, back to the battery. When the current is sent through the coils of the magnet, the armature is attracted away from the contact screw, and made to strike the bell; but on leaving the contact screw the current is broken, and the spring of the armature returns the armature to its original position in contact with the screw; the current being again established, the armature is again attracted, and so on.

(17) E. R. M. writes: I have made the telephone described in the SCIENTIFIC AMERICAN SUPPLEMENT, using earth plates, and have set it up on a line of about 500 yards, and it will not work. I attached it to some of the Bell telephones here, and it worked well, but when on a line of its own it doesn't work at all. Could you suggest what might be wrong? I made the diaphragms larger than in the directions, which made it sound clearer than when I had the smaller ones. A. The trouble probably lies in your earth plates; to be of any service they should be buried in earth that is constantly moist, and they should have an area of at least 12 or 15 square feet.

(18) "Willie" writes: 1. The mouth of the Mississippi River is about 2⅛ miles farther from the center of the earth than its source. In this sense it is said to "run up hill." What causes this apparent opposition to the attraction of gravity? A. Nothing runs "up hill" that is subject to gravity for its moving force. The form of the earth is the resultant of the two forces derived from gravity and centrifugal motion. The sea (tides and waves excepted) represents its true form as a fluid body. The land (with a few exceptions) is above the sea level, and all water running toward and into the sea runs down hill. 2. Which is better for a small cannon—iron or brass? A. Good tough brass is the best for a small cannon.

(19) C. O. T.—Babbitt metal consists of 3·7 copper, 89· tin, 7·3 antimony, by weight. For hard boxes, 90 copper, 10 tin. You may also harden Babbitt metal by using less tin, for any requirement. Phosphor bronze with 10 per cent of tin is also used. Copper 60, zinc 44, iron 4, tin 2, also makes a good anti-friction bearing for hydraulic presses.

(20) A. H. D.—The running of a shaft 4 inches diameter 120 feet long is perfectly feasible and economical. The condensation in a steam pipe well laid and felted will not be great, but we presume that you will have to run another engine with the steam, which will not be economical, in lieu of the shaft.

(21) S. & F.—Steel stamps are cut with gravers, files, punches, and small chisels. It is the art of the engraver and die sinker. Steel stamp cutters make their own small tools. A bench vise, a hand vise, small hammer, gravers, and files you may obtain through your hardware dealers. A blacksmith can make the small chisels and punches.

(22) G. H. A. asks: 1. Will you please inform me why resin cannot be used instead of acid for tinning metals? A. It can, but is not as efficient. 2. What action has muriatic acid on metals? A. It dissolves the oxides on the surface, leaving a clean metallic surface. 3. What is the object of putting zinc in muriatic acid for tinning purposes? A. The zinc in the tinning acid is precipitated upon the metallic surface by galvanic action, thereby facilitating the metallic contact of the tin. 4. How much zinc is put in the acid for tinning? A. As much as the acid will take up. 5. Why is it that solder will not float nice without resin when you are using the soldering iron? A. Because the resin forms a flux that absorbs the oxide and makes a clean contact of the metals.

(23) C. B. G. desires a glue that will make woolen cloth stick firmly to iron rolls. A. Fuse together equal parts of gutta percha and pitch. Use hot. See other recipes given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(24) J. C.—Varnish may be removed by warming and applying methylated spirits or wash, with equal parts of turpentine and spirits of ammonia, then wash with soap suds.

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