wood, a steam engine or an electrical machine? One horse power will be sufficient. A. A steam engine is more economical than an electric engine.

Which is the best oilstone, Arkansas or Turkey? A. It is a disputed point as to which is the best. Of Arkansas stones, the most transparent are usually the best.

(35) H. H. P. says: I am manufacturing solid cast steel cultivator shovels, and want the best recipe or preparation to harden them in so as to not warp and crack them, and to harden at as low a heat as possible? A. In tempering, all depends upon the nature of the steel. You will probably find brine at about 100° Fah. answer your purpose. The brine may be made of ½ lb. salt per gallon of water. Dip slowly edgewise and deep, and then hold the shovels still in the water.

(36) A. T. says: I have a small steam pump and have cracked one of the steam ports, which is of cast iron. Can I stop that crack so that it will not leak? A. Fill the crack with fine cast iron filings well wetted with water and sufficient sal ammoniac (powdered) to just cause the mixture to heat. If the crack is large, caulk the mixture in; if not, a thin sheet plate may be screwed on in addition to using the mixture.

(37) C. R. H. says: 1. I have a casting of brittle type metal to which I wish to give a light brown color. Is there any acid or pickle in which I could dip it? A. Try a strong solution of sulphide of soda or potassa in hot water. 2. Can you give me a good recipe for copperplating type metal? A. Clean the type perfectly, attach it by means of a copper wire to the negative or zinc pole of a strong battery, and immerse the type in a strong solution of sulphate of copper in water. Place a small sheet of clean copper in the sulphate of copper bath with the type (they must not touch), and connect this by means of a copper wire with the other pole of the battery. Under the above conditions, the type will speedily become covered with a film of metallic copper. Great care is necessary in cleaning the type to remove every trace of oil and rust, otherwise the deposition will be unequal or will drop off.

(38) P. L. D. asks: 1. Which size of locomotive cylinder is best for passenger traffic, everything else being equal, a cylinder 17 inches in diameter and of 22 inches stroke, or 16 inches in diameter and of 24 inches stroke? A. The 16 x 24 is generally considered preferable. 2. Which is the best for both freight and passenger traffic, everything else being equal, 16 inches diameter of cylinder, 24 inches stroke, and 5 feet diameter of driver, or 17 inches diameter of cylinder, 24 inches stroke, and 5½ feet diameter of driver? A. The 16 x 24 inch cylinders with 5 feet driving wheels.

(39) J. R. McN. says: I have read your article headed "Bell Metal." How are the metals melted and mixed? A. Use a blacklead crucible and a small crucible furnace with a good draught. Fuse the copper first, then add the nickel in small grains, and proceed as directed in the recipe. Stir the fused alloy from time to time with a stick of green wood.

(40) H. A. W. asks: 1. How fast is an iron turning lathe required to run when turning 1 inch wrought iron? A. At about 130 revolutions per minute? 2. How fast should a wood turning lathe run when turning 2 inch hard wood? A. It may run at speeds varying from 200 to 4,000 revolutions per minute, but about 1,000 is usual on an ordinary lathe.

(41) J. G. says: We have been making a few board rules for our own use, What is the best stuff to blacken the figures with? A. Use black japan varnish. It is usually applied with a stencil and brush.

(42) J. B. C. asks: What is the best method of testing the value of precious stones? A. Precious stones are usually recognized by color, shape, hardness, specific gravity, etc.

(43) S. & R. ask: Which would be the simplest and most durable way to raise a column of water, 1 foot in diameter, to the height of about 40 feet, and how much power would it take? A. We think a pump would be the cheapest and simplest device. The power will depend upon the amount of water lifted. The pressure per square inch will be about 17·5 lbs., exclusive of friction.

(44) E. H. says: I am about to build a boat on the following plan: She is to be a double ender propeller, with 40 feet keel, of 13 feet beam and 5 feet hold, with a shaft running through the whole length and a wheel on each end, to be used as a ferryboat. Her draught is not to exceed 4 feet. Do you think a boat on that plan and those dimensions will succeed? Will she steer well, and will the engines work all right, the shaft running the whole length of the boat? A. We do not see any impracticable features in the plan, although we are not sure that it is the best that could be devised.

(45) M. B. says: 1. We have a well 10 feet deep and 106 feet from the house; we want to draw the water from this well by a cast iron cistern pump and a 1¼ inch lead pipe; this lead pipe has to make a bend upward under the house of 10 feet to connect with pump. Can we draw water such a distance by said pump? A. With a good pump the plan is practicable. 2. Would a lead pipe of the above size collapse? A. Make the bends with as large radii as possible, and be careful to straighten the pipe before laying it. It will, of course, be desirable to use heavy pipe.

(46) E. R. says: We are building a steam yacht 40 feet long and of 8 feet beam, for which we have a double engine with cylinders of 5 inches bore and 6 inches stroke. We would like to know the size and form of boiler best adapted for the engine. A. You can use a vertical boiler, 40 inches in diameter, and 6 feet high.

(47) J. S. says: Since the Ashtabula bridge disaster, there is a great deal said about iron becoming crystallized from repeated vibration, caused by jars, strains, etc. In that sense, is the term "crystallized" used correctly? Is not iron in all conditions crystallized? As I understand it, the strength of iron depends on the perfect cohesion of the crystals which compose it. By jar, vibration, strain, and constant use, the cohesion of the crystals becomes impaired, and the strength weakened; and in that condition I think it wrong to call it crystallized. A. The term is correct as describing the appearance of the iron. Good iron when broken looks fibrous, or somewhat as if it were made up of very fine wires.

(48) J. L. N. says: We have an engine with cylinder 28 inches in diameter and of 6 feet stroke, running 28 revolutions per minute, geared (with cog gearing) into a countershaft running 56 revolutions per minute. We increase the speed of our engine to 46 revolutions per minute, allowing the countershaft to remain at the same speed (56 revolutions), shall we consume more or less fuel? A. Without knowing more particulars, we cannot answer this question positively; but the chances are greatly in favor of a less consumption of fuel, if the change is made.

(49) W. D. C. says: I have a waterfall of 75 feet of a constant stream of water that will fill the space of 1½ inches square. Is there any kind of arrangement by which I can get power from said waterfall, and how much? A. Probably a water wheel will be the most convenient machine for utilizing the power of the water. You will find the advertisements of reputable manufacturers in our columns.

(50) D. H. says: On p. 241, vol. 32, you give 6 angles for slats of a windmill, and there are but 5 sails or slats on each arm of the mill. Please explain. A. You cannot have examined the article very carefully, as the figure shows 6 slats or arms, and the proper angle for each is given below.

(51) W. F. W. asks: What is the correct definition of the word compound, as applied to steam engines? Does it include simply that class in which the exhaust steam from one cylinder is utilized in a second, or would two high pressure engines, connected with a common shaft, and whose cranks were keyed at right angles with each other, also come under this head? A. Your first definition is the one commonly applied to compound or two-cylinder engines. The other describes what are usually called double engines.

(52) R. E. McC. says: Some mechanics and I have disputed about a dead center in a revolving shaft. I claim that there is no such a point in existence; but we cannot agree on it, so I appeal to you for an answer. A. If you speak of the ordinary piston and crank connection, it is well known that there are several points called dead centers, for the reason that at these points a pressure applied to the piston produces no effect on the revolution of the shaft.

(53) C. E. H. says: In small yacht engines, running as high as 300 revolutions per minute, can the feed pumps be advantageously worked from the crosshead as in slower moving engines, or is it necessary to work them slower by means of intermediate gearing? A. The pump can be worked at this speed, but it generally requires larger connections.

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

J. E. S.—It is sandstone, containing crystals of millerite, a sulphide of nickel.—T. D. H.—It is a poor variety of fireclay, containing much sand and iron. It is probably worth about $3.00 per ton in New York.—J. R. B.—It is an impure clay, silicate of alumina.—D. A.—It contains mica and sesquioxide of iron.—F. E. S.—The soft argillaceous material contains clay, carbonate of lime, and magnesia, colored with sesquioxide of iron and chromium, and mixed with sand. The other is Niagara limestone, and may be employed for building purposes or as a source of lime.—F. A. S.—It is a piece of red jasper containing a small quantity of gold. It would require a quantitative analysis to determine the percentage of metal in the ore.—W. R. L.—It is graphite of good quality; graphite and plumbago are different names for the same substance.—J.—Your specimen contains manganese and iron.—C. J.—It is sesquioxide of iron with clay.

A. B. asks: How is the cut which runs around the tops and backs of violins made, and how is the wooden thread inserted in the same? How is the deep staining varnish put on, so that the grain of the wood may be seen?—H. A. asks: Please give a recipe for making paste for whitening leather military belts?—C. F. S. asks: How can I keep goats from peeling the trunks of apple trees?—W. S. G. asks: How can I press hay into small blocks, to burn in a stove?

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Electrical Experiments. By J. D. W.

On the Steam Engine of the Future. By J. C. S.

On Materialism and Spiritualism. By J. T.

Also inquiries and answers from the following:

I.—C. H., Jr.—M. C.—C. Y. G.—C. C. D.—W. C. F.—R. B.—J. T. S.—C. H. W.—R. K.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who sells plumbago, for stove polish? Who sells a steam engine, small enough to run a single sewing machine? Who rolls weldless steel tyres? Who makes earth-boring tools? Who makes paper barrels? Who sells small water wheels for running sewing machines, and who sells electric motors for a similar purpose? Who exhibited dental suction disks at the Centennial? Who sells small engines, suitable for pleasure boats? Who sells electric batteries, for plating?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

OFFICIAL.

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

February 27, 1877,

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.

Air compressor, G. H. Reynolds 187,906
Alkalies, recovering, J. W. Dixon 187,751
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