Useful Recipes for the Shop, the Household, and the Farm.

The grindstone is a self-sharpening tool; and after having been turned in one direction for some time (if a hard stone), the motion should be reversed. Sand of the right grit applied occasionally to a hard stone will improve it.

To remove rust from small hollow castings, dip in dilute sulphuric acid (1 part commercial acid to 10 of water). Wash in hot lime water and dry in a tumbler in dry sawdust.

To remove chuck cement from lathe work, warm the object over a spirit lamp and tap lightly with a stiff brush: the wax will adhere to the latter. If in a hurry, a few seconds' boiling in alcohol will remove the remainder of the wax.

Exhaust steam should never be discharged into a brick chimney. It is liable to disintegrate the mortar and thus to render the entire structure unstable.

A mortar celebrated for its durability is composed of well slaked lime mingled with finely sifted sand. To this is added one quarter as much fine unslaked lime as there has been sand used. While it is being mixed,the mass heats,and the mortar should then be immediately used. The substance is waterproof and becomes excessively hard.

Salmon skin makes a leather of about the thickness of dogskin and as tough as wash leather. The scale marks leave a neat pattern.

The finest glass enamels are generally prepared by fusing (at a high temperature) silica, oxide of tin,and oxide of lead, and spreading the mixture over a sheet of copper, of gold,or of platinum. A much more economical and as efficient a compound consists of arsenic 30 parts by weight; saltpeter 30 parts; silica 90 parts; litharge 250 parts. This is spread on plates of glass of the required shape and size, care being taken, however, that the kind of glass employed be not less fusible than the enamel. Enameled gears thus prepared may be drawn or written upon as readily as paper, and in less than one minute the writing may be rendered indelible by simply heating the plate in a small open furnace or muffle.

Hydraulic cement mixed with oil is recommended as a paint for concrete brick walls. The same is a good waterproof paint for roofs and walls of cisterns.

The French (St. Gobain) glass,used for lighthouses,is composed of silicic acid 72·1 parts: soda, 12·2 parts: lime, 15·7 parts; alumina and oxide of iron, traces. Birmingham glass is made of French sand 5 cwts.: carbonate of soda,1 cwt., 3 quarters, 7 lbs.: lime 2 quarters, 7 lbs.: nitrate of soda, 1 quarter: arsenious acid, 3 lbs. The best qualities of this glass are at present produced in the Siemens furnace.

The following are good colored glazings for potter's use; White. Massicot 4 parts: tin ashes 2 parts: fragments of crystal glass 3 parts: sea salt ½ part. Melt in earthenware vessels, when the liquid flux may be used. Yellow: Equal parts of massicot, red lead, and sulphuret of antimony. Calcine the mixture and reduce it again to powder; add then pure sand 2 parts and salt ½ part. Melt the whole. Green: Sand, 2 parts: massicot, 3 parts: salt 1 part, and copper scales according to the shade to be produced. The mixture is melted as directed above. Violet: Massicot 1 part; sand, 3 parts: smalt 1 part: black oxide of manganese ⅛ part. Blue: white sand and massicot, equal parts: blue smalt ⅛ part. Black: Black oxide of manganese, 2 parts: smalt 1 part: burned quartz 1½ parts: massicot 2½ parts. Brown: Fragments of green bottle glass, 1 part: manganese 1 part: lead glass 2 parts.

It has been observed that old charcoal burns more energetically than recent, because the former has absorbed oxygen from the air, a circumstance which has been practically utilized with advantage in refining crude iron.

New linen may be embroidered more easily by rubbing it over with fine white soap. It prevents the threads from cracking.

The Southern States Agricultural and Industrial Exposition.

The attention of the reader is directed to the announcement of the Southern States Agricultural and Industrial Exposition, which appears on our advertising pages. This fair opens in New Orleans on February 26, 1876, and continues for ten days. Competition for very attractive premiums is asked from all parts of the United States, Mexico, and Central America, and special prizes are to be awarded for strictly southern products.

The industries of the south are now rapidly advancing, and that section of the country now offers a valuable field for the sale of improved machines and inventions of every description. To manufacturers of agricultural implements, cotton presses, machinery and apparatus for making cotton seed oil, and improved devices for tobacco and sugar culture and preparation, we have no doubt but that the above exposition will prove very profitable. The same may be said as regards builders of steam engines, and particularly small motors, portable and otherwise, for plantation and factory use. It will be observed that the display is to take place during a period when no similar exhibitions are in progress, and between the closing of the fall fairs and the opening of the Centennial, so that those who have contributed to the former, and who intend exhibiting at the latter, might easily send their articles to New Orleans during the intervening time.

Poisoning by Arsenical Wall Paper.

Cases of arsenical poisoning occasioned by living in rooms, the walls of which are covered with paper colored green by arsenite of copper, have frequently been recorded. Lately, a case of arsenical poisoning has come under my notice," writes Professor Cameron, "caused by inhaling the dust from paper not colored green. The family of a gentleman, Mr. Jones, residing at New Ross, suffered so severely from symptoms usually produced by arsenic that he was induced to get the wall paper of his house examined. Out of seven kinds of paper six were found to contain arsenic. No. 1, an olive green paper, with deep green flowers and gold-like lines, contained an immense amount of arsenic in the two green colors and the gold. No. 2, a faint lavender watered paper, contained arsenic in large amount. No. 3, a white paper with gray flowers, contained a very large amount of arsenic. No. 4, a paper with red and green flowers on a gray ground, was highly arsenical. No. 5, a dark olive-colored paper, with gilding, did not contain much arsenic. No. 6, a pale green and white paper, also contained only a small amount of arsenic, much less than was put on the lavender paper. Mr. Jones's family had not suffered from the symptoms of arsenical poisoning until shortly after the house was papered with the above, and the symptoms disappeared shortly after they left the house preparatory to the removal of the paper."—*Medical Press and Circular.*

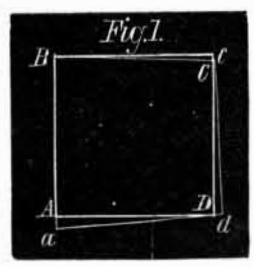
LAYING OFF A SQUARE.

In a letter recently received, a correspondent asks an explanation of the following difficulty:

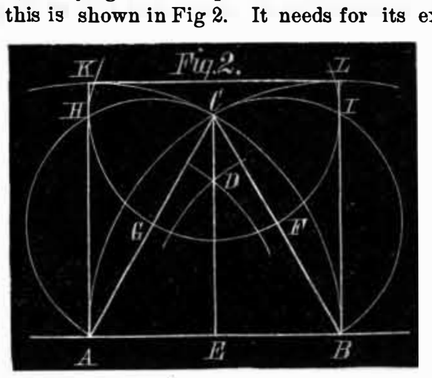
He wants to get out a square board, 6 inches on a side. He first dresses one edge of the stuff true; and having proved his try square, he applies it to this edge, lays off one corner, and works it to the line; then he makes the new edge 6 inches long, applies his try square, and lays off a second right angle, and so proceeds. When he reaches the starting point, he finds that the last angle is not a right angle,and he wishes to be told the reason of this.

Many a young mechanic, on his promotion to the vise bench, is confronted with this difficulty, on trying to square up a nut with the aid of a try square; but not many, it is probable, know the reason, so perhaps a few remarks on the subject may not be out of place.

It must be evident to any one that, if the first three corners of a piece of stuff are square with absolute precision, the last corner must necessarily be square also, but it may not be so obvious that a slight error in each of the first three corners will be greatly magnified in the fourth. This can be made plain, however,by a little study of Fig. 1. Suppose the workman starts on a straight edge, A B, and applies his square at B, laying off what he thinks to be a right angle; but partly from the error in the line, and partly from want of accuracy in working to the line,he actually makes the angle at the corner, B, A B *c*, which exceeds a right angle by the angle, *c* B C. Proceeding to the corner, *c*, he works out a second angle, B *c* which is as much in excess of a right angle as the first, but about twice as much in excess of the true angle of the corner, B C D. At the third corner, the angle, *c d a*, is worked out, only exceeding a right angle by the angle C *b c*, as in the first case, but having about three times this excess over the true angle of the third corner, C D A. This shows where the difficulty lies: the three corners, B, *c*, *d*, are each only a little out of square but the corner, *a*, has three times the error, and any error, however small, if multiplied considerably, becomes very noticeable. In the figure the error is purposely made quite large for the sake of clearly illustrating the point; but even in this aggravated case, the errors in the corners, B, *c*, *d*, seem trifling in comparison with that of the corner, *a*.



Having shown the error that is likely to arise from the use of the try square for cases of this kind, it is perhaps only fair to point out a more excellent way. Since the trouble is caused by the multiplication of errors from corner to corner, and since experience shows that work of absolute precision is rarely accomplished with ordinary tools, it will be better to divide the errors equally among all the corners, if possible, in laying out the square. One method of accomplishing this is shown in Fig 2. It needs for its execution



a straight edge, a pair of dividers with well sharpened points, and a fine scriber. Having worked one edge true or drawn a straight line, lay off on it a distance, A B, equal to one side of the proposed square. With A and B as centers, and with A B as a radius, describe two arcs, intersecting at the point, C. With the same points, A and B, as centers and with a radius less than A B, describe two arcs, intersecting at the point,D. Draw a straight line through the points, C and D, cutting the line, A B, at the point, E. E is the center point of the line, A B. Join the points, A and C, by the straight line, A C, and the points, B and C, by the straight line, B C. With C as a center, and with a radius equal to A E or E B, describe an arc, cutting the lines, A C and B C, in the points, G and F, respectively. With F as a center, and A E or E B as a radius, draw an arc, cutting the former circle in the point, I; and with G as a center, and the same radius, describe an arc, cutting this circle in the point, H. Draw a straight line through the points, B and I, cutting the arc drawn from B, in the point, L; draw also a straight line through the points, A and H, cutting the arc drawn from A, in the point K. Join the points, K and L, by a straight line, and the square will be complete; and any errors of construction will probably be evenly divided among the four corners, if care is used in drawing the lines. It is possible, also, to check the accuracy of the construction at different stages. Thus, the straight line drawn through the points, C and D, should bisect the line, A B, and this can readily be tested with the dividers. Also the circle drawn with C, as a center, and with a radius, A E or E B, should cut the lines, A C and B C, at their middle points.

Specific Heat.

Suppose we take two vessels, the one containing 1 lb. of water and the other 10 lbs. of water, and expose them to such a source of heat that equal amounts of heat will enter each vessel at equal intervals of time, we shall find that, when the temperature of the 1 lb. of water has risen to 10°, that of the 10 lb. will have risen only 1°. Now as ten units of heat have entered each vessel, it follows that it requires ten times as much heat to raise 10 lbs. of water 1°, as it does to raise 1 lb. of water the same amount; and as similar results are obtained with other substances, we may conclude that the amount of heat, required to raise different weights of the same substance 1°, must be proportional to these weights. Now suppose we take four vessels, containing respectively 1 lb. of water, 1 lb. of mercury, 1 lb. of silver, and 1 lb. of iron, and, as before, expose them to such a source of heat that each substance in the same intervals of time will receive the same amount of heat. Having placed a thermometer in each vessel, upon observation we shall find that, when the water has risen 1°, or, in other words, when it has received one unit of heat, the other substances will indicate a much higher temperature, as shown in the following table. We there find that one unit of heat will raise a pound of mercury 30°; consequently, it will only require $\frac{1}{30}$ or 0·033 of a unit to raise it 1°. In this manner, by taking water as unity, we can determine the fractional part of this unit required to raise equal weights of any other substances 1°. This fractional part, which is shown in the third column, is called the specific heat of the substance.

Name of Substance.	Temperature, with Application of one Unit of Heat.	Specific Heat.
Water............	1·0°	$1{\cdot}000=\frac{1}{1}$
Iron..............	8·8°	$0{\cdot}114=\frac{1}{8{\cdot}8}$
Silver............	17·5°	$0{\cdot}057=\frac{1}{17{\cdot}5}$
Mercury..........	30·0°	$0{\cdot}033=\frac{1}{30}$

From the above table we also learn that, at the same temperature, water contains 8·8 times as much heat as the same weight of iron; 17·5 times as much as the same weight of silver; or 30 times as much as the same weight of mercury. If we were to examine a more extended table of specific heats, we should find that water, at the same temperature and at equal weights, contains more heat than any other known substance; and for this reason, the specific heat of different substances is always expressed by the fraction obtained by comparing the amount of heat required to raise 1 lb. of the substance 1° to that required to raise 1 lb. of water 1°.—*Engineering.*

Long Rails.

During the recent celebration at Darlington of the fiftieth anniversary of the opening of the first passenger railway, the Britannia Iron Works Company, at their works at the neighboring town of Middlesborough, rolled for the inspection of visitors some rails of unprecedented length, and it is proposed to place one of them, 130 feet long, near the first locomotive engine, opposite the Darlington station, as a memorial of the jubilee. During the same week this company rolled in one mill, 1,350 tuns of rails 40 lbs. per yard, a quantity which it is believed has never been even approached in any other mill in the same space of time. The rails were for the New Zealand Government Railways.

Substitute for the Liquid Prism.

A new method of determining rapidly the index of refraction of liquids is given by MM. Terquem and Tannin in a recent number of the *Journal de Physique*. It is based on the fact that when a sheet of air, enclosed between two plates of glass, is placed in a liquid, parallel luminous rays striking this sheet obliquely are totally reflected at the limited angle of the liquid with reference to the air. It is sufficient then measure this angle, and one has all the necessary data for calculation of the index. The authors describe two different arrangements of the apparatus, and compare some of their results obtained by it with those of Fraunhofer and of Messrs. Dale and Gladstone, showing close correspondence. The method is quicker than that of the liquid prism; the cleaning of the small vessel is very easy; one has not to be preoccupied with the angle of a prism and the exact verticality of its surfaces; and lastly, the temperature of the liquid is more easily determined.

WE understand that Mr. Hughes, of Cincinnati, O., formerly of the firm of Hughes & Foster, is now making for use of the Defence Association a model of a planing machine with yielding pressure bars, such as were used in 1843, three years before the Woodbury Company date their claim to the invention.