the selection of his tools by the particular work in hand, and practice will bring new suggestions as to tools and the manner of using them.

The materials generally used in spinning are brass, copper, zinc, britannia metal and lead. All of these may be worked on the foot lathe, but perhaps the amateur will derive the most satisfaction at first by using britannia metal, as it works easily and does not require annealing. Articles in this metal also present a handsome appearance when done, whether simply polished or plated. Zinc must be spun quite hot. Articles of brass, if of considerable depth, must be annealed when partly done.

The form on which the metal is spun may be either hard or soft wood or metal. A good close-grained pine answers as well as anything for most purposes, and is very readily turned to the required form. It may be attached to the face plate, B, and the disk to be spun may be held against it at first by a hard wood or metal piece, C, as shown in Figs. 6 and 7, which is forced against the disk by the tail center. After the spinning is a little advanced, a cup-shaped holder is applied, as shown in dotted lines in Fig. 7. Sometimes the holder is secured by a bolt that runs through both it and the form or mould, as shown at D, Fig. 8. In some cases a little rosin is applied to the form to increase the friction, but this is rarely necessary. The motion of the lathe should be quite rapid, and the disk should receive a coating of grease (lard or heavy oil) before applying the burnishes. A very strong solution of soap may be used instead of oil. The position of the workman and the manner of holding the tool may be seen in Fig. 1. It will be noticed that the pin in the tool rest serves as a fulcrum for the tool, which must be brought with considerable pressure against the surface of the disk. This pin is moved forward from time to time as the work advances. The movement of the tool may be seen in Figs. 9 and 10, and the shape taken by the metal in front of the tool will also be seen. In swinging the tool towards the form it is moved in the direction of the arrow as shown in Fig. 9, and it is carried back as shown in Fig. 10. This last operation is very essential to the proper fitting of the mould, and it also thickens the metal. Too much should not be attempted at a time. A succession of quick movements, as indicated in Figs. 9 and 10, under a moderate pressure, is much better than to do a great deal of execution at a single stroke. Should the metal tend to vibrate or buckle, a piece of wood may be applied to the back with the left hand as shown in Fig. 8.

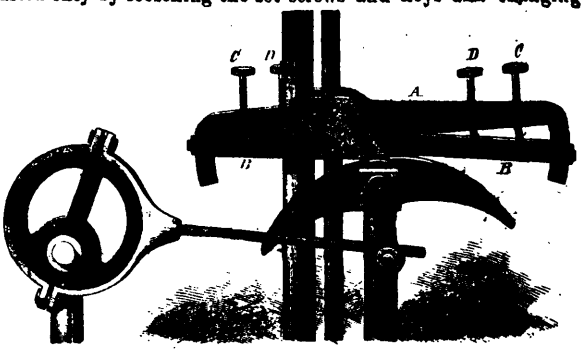
The method of spinning a cup or pot without a form is illustrated in Fig. 11. Here the metal is supported by a plain cylindrical mandrel, and is first spun into the form indicated by the dotted lines, and then bringing the burnisher on the return stroke only to the shoulder which forms the larger part of the vessel. For small work on the foot lathe the handles of the tools need not be as long as represented in Fig. 1. The length commonly employed for wood turning tools will answer.

To spin a ring a mandrel like that shown in Fig. 12 will be required. A plain flat ring placed between the shoulders of the mandrel is pressed upon by the roller seen above the mandrel until the ring assumes the desired form. Napkin rings are made in this way. Fig. 13 shows a concave reflector. Fig. 14 represents a single cup formed of two pieces. Fig. 15 represents a small vase made of three pieces, the smaller end of the upper or conical part and the upper portion of the base piece being soldered in a spherical connecting piece. The two halves of the ball Fig. 16 are made upon the same form. The edges are beveled and soldered together. The pitcher, Fig. 17, is made of five spun pieces, a short cast and turned piece that unites it to its base, and a handle made of square wire. The card receiver, Fig. 18, has a spun top and base, and a cast standard. The vase, Fig. 19, consists of four spun pieces and three legs of square wire, uniting the body with the base. Fig. 20 shows a base for a magnetic needle or other small apparatus. Fig. 21 represents a vase composed of seven spun pieces and two handles of square wire. More complex examples of work done by the process of spinning might be furnished. The ones given are undoubtedly sufficient to enable the amateur to get an idea of the endless variety of articles that may be made by this simple and easily acquired art.—*Scientific American.*

NEW CUT-OFF.

The accompanying engraving represents an improved cut-off for steam engines recently patented by Mr. Thomas E. L. Collins, of Fall River, Mass. The improvement, although especially designed for beam engines, is not confined to this use. The lifters are made in two parts. The fixed portion, A, being attached to the valve rod in the usual way, the adjustable portion, B, is pivoted to the heel of the fixed portion, and is guided and supported by a curved arm that projects downward from the toe to the lifter Two screws, C D, pass through the lifter, the screw, C, being swiveled in the adjustable part of the lifter. The screw, D, merely presses against the back of the adjustable portion, giving an additional bearing.

The ordinary cut-off lifters of beam engines are secured to the valve rods by means of set screws and keys; and they can be adjusted only by loosening the set screws and keys and changing



COLLINS' CUT-OFF FOR BEAM ENGINES.

the position of the lifters. This operation involves a great deal of labor and requires considerable time, and the engine must be at rest.

The advantages of the improvement above described are apparent. The lifters can be adjusted with great accuracy even while the engine is in full operation, by simply turning the screws, C, D, and the application of the improvement to engines already in use involves no change except in the lifters.

THE TELEPHONE AS A LIGHTNING INDICATOR.—Mr. George M. Hopkins, of Brooklyn, N. Y., during a recent thunder storm connected the gas and water pipe of his dwelling with an ordinary Bell telephone, and discovered that the electrical discharges were plainly indicated, either by a sharp crack or by a succession of taps. This occurred when the discharge was so distant that the thunder was inaudible. The sound also seemed to be perceived by the ear before the lightning could be seen. There was a marked difference in the character of the discharges, some that appeared single to the eye were really multiple. Often the discharges would consist of a series, beginning and ending with discharges larger than the rest, thus: ___ - - - - - ___ sometimes it would be thus: ___ - - - - -, sometimes the reverse, and often a single crack. The gas and water pipes were used, being the most convenient and at the same time the safest conductors for the purpose. Special apparatus might be devised, having a good ground, and a series of points for gathering the electricity from the air, but in using apparatus of this kind there is always more or less danger.—*Scientific American.*

PRESERVATIVE WRAPPING AND PACKING PAPER.—Mr. John F. Rodgers, of Philadelphia, claims to have discovered a preservative wrapping and packing paper for protecting cloths, furs, etc., from mildew and ravages of moths and other insects. The patent bears the date January 9th, 1878. The paper used is made from woolen and cotton rags and manila rope or manila paper. This paper is saturated with a mixture of 70 parts, by measure, of the oil remaining from the distillation of coal tar naptha by live steam with five parts crude carbolic acid, containing at least 50% of phenols, 20 parts of thin coal tar, heated to about 160° Fah., and five parts of refined petroleum. After saturating the paper it is passed through squeezers and over hot rollers for the purpose of drying. When cool it is cut into sheets as desired, and the drying completed in the atmosphere. The paper thus treated is used for packing woolen clothing, cloths, furs, carpets, and all material likely to be injured by moths, mice, or vermin, and will also to a great extent, he states, prevent cotton material from mildew.

FLAX VS. SILK.—Considerable excitement has been caused in Lyons, France, by a discovery which purports to give to flax all the qualities and appearance of silk. It has long been known that silk is soluble, not only in powerful acids, but also in soda and chloride of zinc; and it is said that these qualities are made use of in the new process. A company is being formed, with a capital of $6,000,000, for the manufacture of the new textile.—*Iron Age.*