in mind that if the chuck is removed from the lathe it must always *be carefully re-centered* when re-placed, no matter how true it may seem to run.

In centering a chuck the greatest care must be observed. The centre should be accurately caught with a fine pointed graver while the lathe is in motion, which should be braced on the T rest brought up to just about on a line with the centre of chuck and directly across the face of the chuck. A very small dot is all that is really required, but a very small centre is at times difficult to find. I make a centre of rather a shallow V shape, always making sure that the *bottom* is *absolutely* central so that it will hold the finest pivot. A glance at Fig. 1 will show pretty clearly what is meant. These finely centered chucks are only necessary when centering the pivoted end of a finished or partly finished staff.

To centre a blank staff, to begin with, I am not so particular, as I do not care whether the blank runs absolutely true or not, but at the same time I get it to run as truly as possible, and I can usually use the same chuck without re-centering it after removing and replacing. The chuck for the blank staff should be centered in the same manner as the finer one, but the centre should be a little broader and deeper.

In regard to a cement most suitable for such work, I have tried sealing wax, black wax, shellac and two or three other compositions, and an experience of twelve years has taught me that nothing equals shellac. It holds very firmly, is easily manipulated by using a very slight degree of heat, and is very easily removed from the article cemented, by boiling in alcohol, or it may be removed by allowing the piece to remain in cold alcohol until dissolved. The shellac should be prepared in sticks so as to be handled conveniently. In preparing, I take a tin or other vessel filled with hot water and throw in the loose shellac which will fall to the bottom; heat over a flame or fire for a few moments, stirring briskly with a stick or anything convenient, to keep the shellac from adhering to the vessel as it melts, and as it is melting keep it together as much as possible, forming a ball in the bottom, and then remove and roll into sticks while warm.

A word in regard to gravers would not, I think, be out of place here. In the first place, have plenty of them—a good assortment of shapes and sizes, and above all, the best quality obtainable. In sharpening or grinding, be sure and get the face flat, and if you have never been able to accomplish the latter feat, take an old graver and practice an hour or so, for you will never be able to do any kind of good work unless a properly ground graver is used.

Another thing. No matter how much of a hurry you may be in, never grind off the edge of a graver simply for the sake of getting a point on it quickly. It looks bad, and you will only have to grind off twice the usual amount when you require a proper point. Keep to oil stones, a coarse and a fine one, and do all the grinding on the coarse stone and finish on the fine one, and always be sure you have a point on the graver by examining it with a glass or trying it on the nail. After the face has been properly ground the edges may have just a rub or two on the fine stone to take off any burr that may be produced in grinding the face, and be sure to grind the face well back at a very acute angle.

If all these directions are strictly adhered to, no trouble will be found in cutting, unless the trouble would be in the manner in which the graver is held, or by the rest being too high or too low. Judgment is required in all things, and it is just here where you will require judgment to obtain the best results in turning. The graver must be made to *cut* and not burnish, glaze or scrape away the metal.

The other tools and materials required are polishers and polishing materials. The polishers for square pivots and shoulders consist of a strip of soft steel or iron about six inches long and about three-sixteenths square and the end curved as in Fig. 2, and the edge that faces the shoulder should be filed back at a very slight angle as A, Fig. 2. A similar strip of bell metal will also be required. They should both be filed into shape with a medium coarse file drawn crosswise so that the grain made by the file will serve to hold the polishing material. The edge should also be very sharp and clean cut, so that a sharp corner may be well polished. They should be refiled as often as they become worn smooth.

For conical pivots similar polishers are required with the edges left straight and the corners rounded so as to exactly conform to the shape of the pivot, and they should be made so that either can follow the other without any perceptible difference.

To produce rounded corners exactly similar on both steel and bell metal polishers, I use two little tools shaped like Fig. 3. They are made of steel and well hardened, the edge of one being knife-edged and the other rather square. The polishers are drawn lengthwise across the knife-edged tool first and afterward across the square-faced tool which will remove any deep ridges or cuts caused by the first operation.

If these simple little tools are well made they will save a great deal of trouble and annoyance at times, caused by unequally rounded polishers.

The polishing materials are oil-stone dust, crocus-antimony and diamantine. The oil-stone dust should be well mixed with refined sperm oil, as should also the crocus-antimony. The diamantine should also be well beaten up and mixed in a similar manner onglass, and with a glass beater, but it must be used with as little oil as possible. One thing must be borne in mind, however, in regard to any polishing material, it must be absolutely free from all dust or grit, or good results will be impossible.

I keep polishing materials ready mixed in small, round wooden boxes, which I procured at the druggists and fitted them inside with thick flat glasses.

There is some question among watch repairers as to the best methods of polishing, and some, mostly English workmen, use medium coarse rouge after the oil-stone dust, and finish with very fine rouge instead of diamantine, and others prefer sappharine or rubytine. I have tried them all, and find diamantine will produce a better gloss and is more satisfactory in all respects. Rouge is very slow and not so good, and while sapphatine and rubytine are quicker, the polish or gloss is inferior.

We are now ready to place a blank staff in the lathe and proceed to fit and finish it. We will suppose it to be a medium grade Swiss staff, for I suppose nearly all workmen prefer to use the finished American staff when having occasion to replace one of that style, although I prefer to make my own American staffs, and always make my own American jewel settings or se a new one in the old setting, if possible.

The first thing to be done is to examine upper and lower