plate. They dispense entirely with recording readings, and to a great extent with reading the numbers at all. Being always ready for use, gauges may be secured with accuracy to ·001in. at one reading, whether on the outside or inside of the work, or at the bottom of a deep bore; and the tool can always be replaced with the greatest certainty after withdrawing for the purposes of fitting or gauging. They are invaluable for finishing out cuts to exact gauge in sharp corners, or securing exactly the same gauge when the tool has to pass over swells or flanges on the work. In short, to describe all the cases where the adjustable index is sure to be used, if once on the slide-rest handle, would be to describe nearly every operation of accuracy that can be done in the lathe.

Referring now to the illustration, Fig. 1 is a section of the side elevation, showing the several parts. Figs. 2 and 4 are, respectively, front and back views, giving so much as is necessary to explain Fig. 1, from which they are both projected. In the same way Fig. 3 is a plan view, projected from Fig. 2. In every case the same letters are used to denote the same parts, and these are connected by dotted lines. The scale is ¾in. size from the fitting on the traversing or parallel slide of my own rest. Fig. 5 shows a substitute for the ordinary form of handle, which is rather more convenient for this slide in a case like my own, where the overhead is always in use if there be only an inch of work to slide. Fig. 6 shows so much of the fitting for the surfacing, or transverse slide, as proved necessary in my case; where the end of the slide-rest screw was so short, and so much overlapped by the slide-plate when brought out to the full extent of its traverse, that the index and pulley could not have been attached as shown in Fig. 1, without sacrificing nearly an inch of range. A, in each figure is the flanged bush of cast iron, brass, or gun metal. This must be bored to fit the round part of the slide-rest screw very accurately at B, the flange end of the bore. The outside of the barrel end is screwed as far as shown, to take the nut E, which binds all together. The thread should be about 1-12in. pitch, as only two or three strong threads are wanted, and these should run easy, so that the nut may be at all times loosened or tightened by the fingers alone. As it is desirable to keep everything as close as possible on the handle side of the fitting, the set-screws (two shown in Fig. 1, and the ends of all four in Fig. 4) are tapped through the thread on the end of the bush, being of course sunk clear of the bottom of the thread. The set screws may be of ¼in. or 5-16in. diameter. The way in which two of the square panes of the slide-rest screw, and the two corresponding parts at the end of the barrel may be marked, is suggested in Figs. 1, 3, and 6 by the dots on these parts. It is, of course, necessary to provide a stop of some kind so that the bush may always set up to the same spot on the slide-rest screw-shank, and bring the two indices to the right distance from each other. Where the shank of the slide-rest screw admits of it, the squaring of the four faces and the set-screws will provide the necessary stop in the simplest way. Otherwise there should be a little ring or collar fastened to the round part of the slide-rest screw-shank at B. The inside face of the flange must be rebated out as shown, to take the flat brass ring, F F, which carries the adjustable index. It must revolve easily but firmly in the groove formed by this rebate and the pulley behind it. However the ring may be made, it should fit (laterally) rather too easy than otherwise at first, when the ring is flat and dead true. A very slight cast with the fingers will secure the right stiffness for working; but if the (lateral) fit were made too true the ring might box. The nattiest way of making the ring is to have a casting made with a bead, which can be afterwards milled, as suggested by the little piece on the right of the index at F in Fig. 2. But an equally efficient ring may be made with less trouble and expense from sheet brass (about 1-32in. thick), turned out to fit and revolve accurately on the axle, supplied by the rebate in the flange. A tongue can be cut down out of the edge of this, turned over and finished up into the pointer, as shown at H, Figs. 2 and 3; and to supply the place of the milled bead, little ears can be thrown up for the finger to catch when turning the ring round to adjust the index. The simplest way of doing this is to drill small holes at the required distances, and having cut down with a fret saw *to one side of them* (see Fig. 2., F 1), then turn up the ear and finish off with file, as at 2, 3, and 4, in the same figure. Of course, the tongue for the index (at H, Figs. 2 and 3) could be cut out and turned down without breaking the continuity of the edge of the ring, and I did this at first. But, in sliding into close quarters with the overhead, I found it safer to look at the index as it revolved on the pulley than at the tool itself, as the guide for pulling the striking gear. It was, therefore, well to mark the place of the index as distinctly as possible; so I purposely cut away the edge, as shown at H, and blackened it and the index. I now find I can slide with safety to within ·01 of a shoulder before using the striking gear, which leaves a mere trifle to take out by hand.

The pulley, G, is a plain disc of wood, bored to fit the barrel of A accurately, and drilled for the pin, D, which acts as dog for it and for the handle-plate, C. The flange of the groove furthest from the hand should be rather higher than that nearest, as the band can then be thrown in mechanically, without even looking at the pulley. Where accurate time is an object the pulley-groove should on no account be V-shaped, but half round, and the working contact should not be deeper than is sufficient to take the band up to half its diameter. Of course, any desired size or form of pulley can be taken by this arrangement, and the shift made in a moment by unscrewing the single nut, E. But it is well to adopt a standard thickness for the pulleys, and ½in. will be found convenient for gut band of ¼in. diameter. The handle-plate, C (Figs. 1 and 4), is conveniently made from coach hoop-iron of the right width (which may be a trifle less than the diameter of the nut E). I have found a thickness of ⅛in. or 3-16in. amply strong enough for all a 5in. centre back-geared lathe can do. The nut, E, may be made of iron or brass, and the edge milled. The fitting for the fixed index is a matter of considerable latitude; but the plan shown at H, in Figs. 1, 2, and 3, is neat and compact. The upright part, H H, carrying the pointer, is made from sheet brass 1-16in. thick, turned out to pass over the slide-rest screw-shank, and finished off to shape outside, as shown in Fig. 2. There is often a little lump just under the middle of the rest, and where there is, it forms a very convenient fixing for the arm carrying the upright which carries the index (see J, Fig. 2). 1, 2, and 3, Fig. 5, are different views of a finger-knob which is rather more convenient than the ordinary handle where the overhead is always at work, as in my case. There was only one case in which I found the handle in the way when casting the cord on or off—viz., in boring, when the pulley happened to stand just over the bed of the lathe, and the handle happened to stop at the very bottom of the pulley. It was not a very serious inconvenience, but as it chanced to happen several times running one day, I fitted another handle-plate, C^2, Fig. 5, and after trying knobs of several shapes, found that that given proved the handiest. Since then it has quite superseded the ordinary handle on the parallel slide at all times and for all work, except when the mandrel is being driven (through the overhead) by the slide-rest handle, while the fly-wheel is driving the cutters independently, and then the ordinary style of handle is preferable.

1 is a section of the knob, showing bush and washer. 2 is the view looking down on the top after the sides have been rasped and filed out, and 3 is the end view of the knob after this flattening of the sides.

In Fig. 6 (the fitting for the surfacing slide) the only difference is in the way the flange, A, is mounted, and in its size. The pulley and counter cannot now interfere with anything so long as they do not stand above the top of the upper slide-plate, and there is therefore a double advantage in making the counter as large in diameter as possible. In my own case the diameter of A on this slide is 5in., which brings the readings well up into the light, and, with a leading screw of ⅛in. pitch, gives each graduation for ·001 in a space of over $\frac{1}{16}$in. As the barrel for mounting A must now be of the construction shown in Fig. 6 (subject, of course, to the same consideration of a good fit at B), in order to lengthen the handle the set screws are put in on the other side of the flange, as at I; and the barrel having been turned with a small shoulder, as shown near the same letter, I, is threaded on the handle side, so that the larger flange, A, may be screwed on and pinned to the shoulder with a small screw, also shown at I. In this case, to lighten the flange, it is made as a wheel, instead of being solid, and the pin, D (Fig. 1), is screwed into one of the spokes. If the same distance from the centre be observed as in Fig. 1, the pulleys and handle-plates may all be exchangeable if need be. It is of course well to take all the distance that can be got between the end of the barrel abutting against the collar of the slide-rest screw at B and the set screws at I. The fixed index is mounted in the same way as in Fig. 1. The graduation on the edge of the flanges will, of course, depend on the pitch of the slide-rest screw. My own being ⅛in. pitch, 125 divisions give readings to one-thousandth part of an inch, which work admirably with vernier callipers. Say, for example, that it is required to turn a cylinder of ½in. diameter, or ·500. Having worked down very close with ordinary callipers, then gauge with the vernier. If the reading prove to be, say, ·525, there is ·024 to come off. On the parallel slide the adjustable index would be set on 24 divisions, but on the surfacing slide only 12, as the reduction of the work is, of course, double the direct motion of this slide. But in either case it is now only necessary to work on until the adjustable index coincides with the fixed index, and the exact gauge will have been secured by the one reading and adjustments without the trouble of recording any numbers. It is, of course, necessary to take care that there is no back-lash in the slides when the adjustable index is set, and to draw the tool so far clear that all back-lash may be taken out before the adjustable index can again coincide with the fixed pointer.

In conclusion, there may appear to be a great deal of work in these fittings, but I can only say that I do not think I ever made any addition to my lathe, which has paid so well in constant and general utility whenever the slide-rest is at work for any purpose whatever.

D. H. G.