wherein were kept the cream of our models. The little boys dropped the items of stock which they had been clutching, and clustered eagerly around. I felt that the time had arrived for some defensive work. Gently levering Father's fingers from the catch of the door, I stood before the showcase.

"Not these, Sir, please," I said. "They are rather expensive and easily damaged." Father looked hurt.

"Come along boys," he called, giving me a dirty look—

"If the gentleman doesn't want us to see his toy trains we'll go along to Woolworth's—they've got just as good ones there."

I opened the shop door, and they left haughtily.

. . . . That night, I beat my wife.

A GAUGE O STEAM LOCO FOR BEGINNERS.

Part 12

By "1121"

Piston.

This of course, is another rather important bit, but there is nothing particularly difficult about it. It is only necessary to ensure that it is a good fit in the cylinder bore, and that the piston rod is fitted truly in the centre. For this reason, unless, again, you possess true-running collets, it should be turned and centred at one setting from 7/16 in. diameter rod and the finished article is shown in Fig. 59. As detailed in the "sequence of operations" diagrams in Fig 60. the end of the bar should be turned down to a little, say 1/64 in., over finished diameter, and the packing groove then put in with the parting-tool. The width and depth of groove shown make just about the right space to take a single wind of ordinary commercial graphited asbestos yarn, which is used to perfect the seal between piston and cylinder-bore, and provide a certain degree of continuous lubrication. The groove being put in before the piston is finally turned down to size, it is not a very serious matter if you accidentally knock the bar slightly out of true, as it will still clean up on the final operation. Furthermore, any burr produced will be projecting into the groove from either side, not outwards to the surface, and you need not risk marking the piston by trying to file it off.

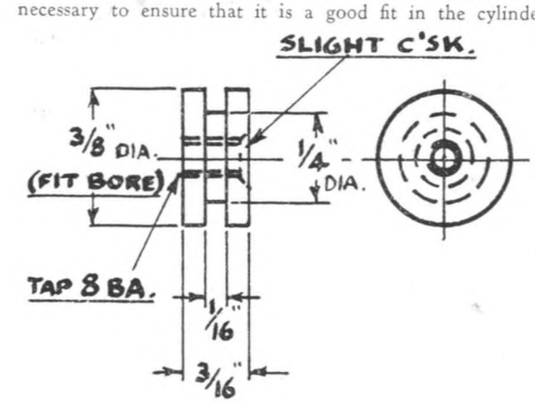

Fig. 59. The Piston.

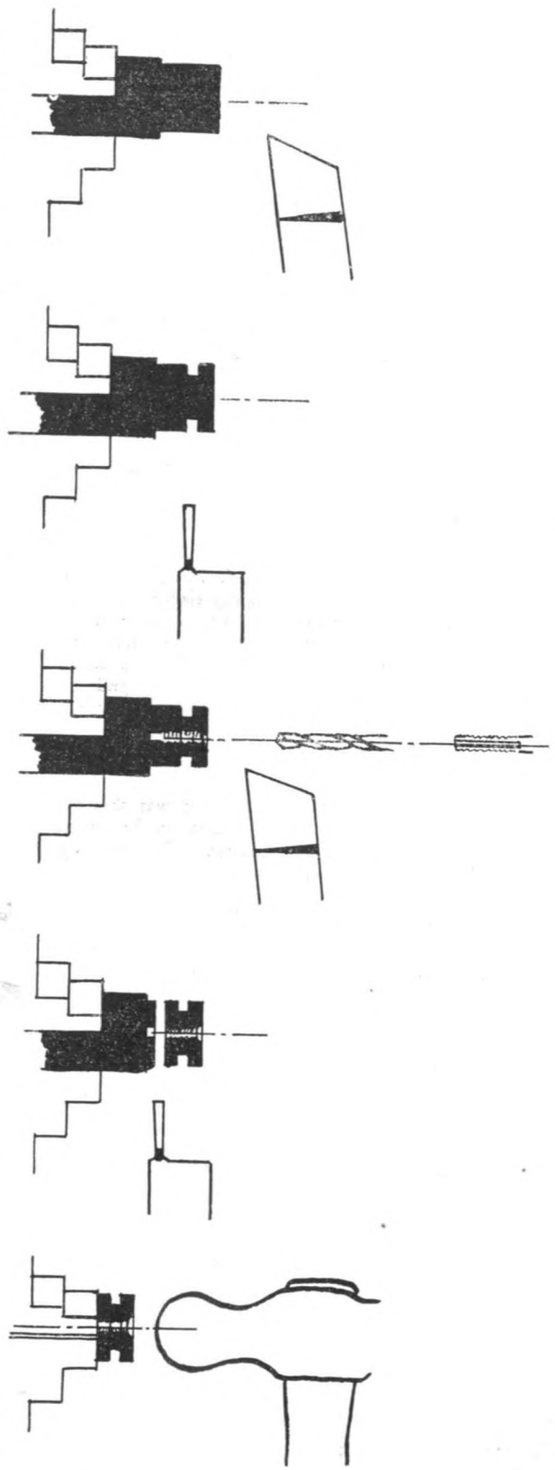

Fig. 60.

Sequence of operations for turning piston and fitting to rod. Top to bottom:

1. Face end, turn to 1/64 in. over finished diameter.

2. Form packing groove with parting tool.

3. Centre, drill No. 51, tap 8 B.A., countersink slightly.

4. Part off.

5. Screw on to rod, hold rod in 3 jaw chuck, with piston against jaws, lightly rivet over end of rod into countersink.

A word or two on the technique of turning a bar to an accurate fit without the aid of accurate measuring devices may not be out of place at this point. The cylinder-block is, of course, used as a gauge to check the diameter, and operations are commenced only on the extreme end of the bar, say for a length of 1/32 in. or so. If you then find you have turned it down a bit small, you haven't scrapped the whole job, and can start again using the undersize end diameter as a "witness" to produce a more correct size, afterwards facing off the unwanted end. The original "roughing-down" turning should be carried back to a sufficient length, and the packing groove put in sufficiently far back from the end, to allow for such an eventuality.

This short length of "pilot" should, ideally, be turned to be a very tight fit in the end of the cylinder bore—too tight to push right in by hand, but tight enough for the block to stick on the end. When you reach this stage you can go ahead and turn back the remainder of the piston, with the knowledge that if you don't *quite* get down to this "pilot" diameter you are still safe. With the point of your tool hovering over the "pilot" diameter you can now carefully increase the depth of the cut until the tool *just* touches, and then wind it along the bar at that setting.

Now, there is always a certain amount of "spring" in the best lathe, and in the tool-holder and tool, and in the bar projecting from the chuck, and this, as we have seen before, causes the tool to remove a little more metal if a second cut is taken even without increasing its depth. The point is—and this is the principle underlying this system of arriving at a required diameter—the deeper the previous cut has been the greater is this amount of "spring." We are putting a *very* light cut on our "pilot" diameter, and then taking this through a slightly larger diameter which we have left on the rest of the bar, and although cutting on the "pilot" is not likely to produce any "spring," when we get along to the "step" this larger diameter *will* do, and if, having taken this cut, we were to take another at the same tool setting we should find that our tool would cut no deeper on what was the "pilot" portion, but would start to do so as soon as it encountered the slightly larger diameter on the next bit, left by the "spring" of the tool on the previous cut. That is quite a lot of complicated wordage, and we think it is about time we introduced some sort of diagram to illustrate, step by step, what we have been endeavouring to describe up to this point (Fig. 61).

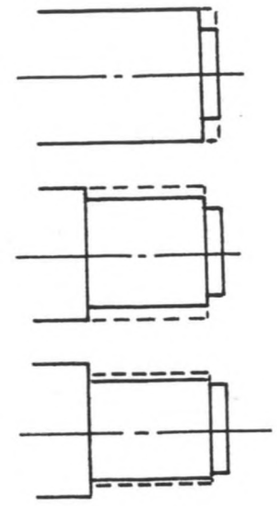

Fig. 61.

Sequence of operations when beginning to turn a rod to an accurate diameter. (Packing groove not shown). Top to bottom:

1. "Pilot" turned to be too tight for bore.

2. Remainder turned down almost to pilot diameter.

3. A cut over the remainder at pilot diameter leaves "step" due to spring. A further cut at the same setting removes this step.

Note Relative sizes have been much exaggerated for clarity—dotted lines show previous diameter turned in each case.

With our piston at this stage—we have just taken an infinitesimal cut over the "pilot," and know that the "spring" in the tool has left the remainder a little bit bigger—we should try on our cylinder-bore. It it slips nicely over the "pilot," we can run the tool along at the the same setting, and know that we are removing no more metal from the "pilot" but are reducing the remainder down (or nearly down, due to further "spring") to pilot size. If the bore will now go right on, we are O.K. If it still only goes over the "pilot," obviously the remainder is still a little bigger, and another cut at the same setting should eliminate this increase of diameter.

To go back to the beginning of our last paragraph, if our bore will *not* slip on the "pilot," then the whole thing is still too big, and a little more cut should be put on to reduce the diameter of the pilot *and* the remainder of the bar, with everything once more re-

produced—"spring," increased diameter behind the "pilot," and all. Then, once more, we try on our cylinder, and continue thus until we reach the desired stage of the bore going over the "pilot," but no further.

Now, if we overstep the mark when putting on our cut, we shall find that the cylinder slips over the "pilot" *too* easily, but due as we have been explaining, to "spring," it should still not go past the "step" behind the "pilot," unless we have been *very* heavy-handed with our cut, in which case, we must start again.

With our "pilot" now too small, and the rest of the job too big, it is easy to see that our required diameter lies somewhere between the two, and we can now commence operations on the *next* bit of diameter, producing *another* "pilot" behind the first to help us to get the rest of the job down to the size we want, and when we are finally there we can face off our all our "experimenting" from the end of the bar, and get it down to the correct 1/16 in. from the packing groove.

All this explanation is of a very old precision-turning dodge which is nothing like so complicated as it sounds and comes as second nature to an "expert" turner. We quite anticipate that we are now due for severe trouble from such folk for taking up so much space over it. It is done, however, and like some of the other similarly detailed "how-to-do-it" instructions we have been delivering in the course of this series, we hope it will last for all time and cover any future occasion when we merely write "turn the so-and-so to be a good fit in the so-and-so" —and let it go at that! One reader, we should mention, has been kind enough to write and say "Please do not curtail your detailed instructions by even one word. Most of us need and appreciate all the help we can get." *He's* happy anyway!

Now to get back to our piston. When we have got the diameter right, and the end faced off, it should be centred and drilled No. 51. The centering of course, is important, and we refer you to previous remarks (top of page 186 Oct. 1952) on the subject. Drill deep enough to ensure that you can tap a full thread deep enough to take in the whole 3/16 in. thickness of the piston. If you are using phosphor bronze, you will have to be careful with that tap, as you don't want to leave the end in there after all that turning work. We refer you back again to "Tapping without Tears" p. 175 Sept. 1952, and "Tapping in the Lathe," p.206, Nov. 1952. Put a *slight* countersink in the end of the hole, and part off the piston to finished thickness. Alternatively saw it off as square as you can, and screw it temporarily on to the piston rod with this side outwards, hold the rod in the 3-jaw chuck with the side of the piston flat against the fronts of the jaws, and *carefully* face the piston down to size.

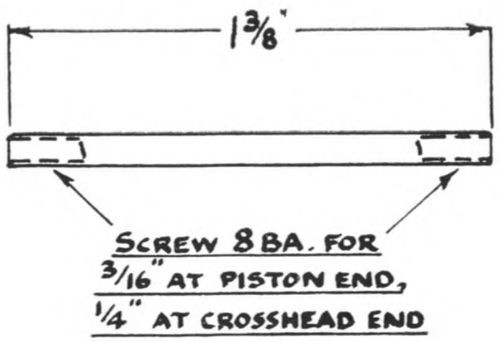

Fig. 62. The piston rod.

The piston rod, as shown in Fig.62, is a plain length of 3/32 in. stainless steel (rather hard to work—commercial grades vary a lot) or phosphor bronze rod, threaded 8 B.A. diameter each end. 3/32 in. in actual fact, is rather bigger than 8 B.A. diameter, but your die will screw it all right if it is opened up well for the first cut. Your tailstock or other die-holder should have three screws in it, and the centre one can be screwed into the "split" in the die, which will force it open.

Withdrawal of this screw and tightening of the other two closes the die up, so that within limits an adjustment of diameter of thread cut can be achieved. In this manner the thread should be cut successively smaller until the piston will just screw on tightly. Do the crosshead end of the rod the same, again using the piston as a gauge, but this time reducing the thread to a slightly easier fit for the crosshead.

Hold the piston rod tightly in a pair of pliers, with something soft wrapped round to avoid marking the rod, and screw the piston on tightly, countersink side outwards. The end of the rod should project through 1/32 in. or so—if it doesn't, remove the piston and give it a slight countersink on the rear side to let the thread enter a little further.

Hold the rod in the lathe with the piston firmly back against the chuck jaws, and very gently rivet over the end of the rod into the countersink. It doesn't want much—it is only to prevent the rod from coming unscrewed.. If the rivetted-over end still projects a little, face or file it flush at this stage.

To the Editor.

A Gauge OO Layout.

Dear Sir,

With reference to Mr. Stainsby's article in the July issue, I do hope he does not base his Watlington Branch line exactly as his photos. It will surely be stretching the imagination too much! These points for instance:—

1. After leaving Princes Risborough there are no signals, points being operated by ground frames.

2. No tunnels—there's only one overbridge.

3. A Mogul never! Only 0—6—0T, 57xx, 54xx etc., 0—4—2T and 2—4—0 Metro (now scrapped).

4. Single track—not double, and no long trains as I think that at the most only three corridor can be run round maybe only two.

Since the last war even excursions are worked by the only auto trailer, the excursions being joined at Princes Risborough. As an afterthought, even the trailer is not used as push-pull as most locos are not fitted.

I hope this does not sound too drastic, but I am quite willing to help in any way with information.

Yours faithfully,

L. Howse.

THE WESTBURY LINES OO GAUGE LAYOUT

Part 2. **By C. HUMPHREY LEACH.**

The space available as indicated by the plan, is very restricted. Sixteen feet by eleven feet plus a large bay is hardly my conception of a model railway space in 4 mm. scale. It is of course a space in which much pleasure can be known and hours of enjoyment can be spent. However, there were times when I wondered whether I had sufficient room or whether the scale was too big! I decided the scale was admirably right because I did not want to lose sight of my valve gears in motion, of drivers turning. I did not want to lose the flanges where they should not be removed and I required that every semblance of realism should be known from the operational point of view. It was necessary, therefore, to construct a through station and where the continuous run was required the station would have to be used each time round.

I was not prepared in any circumstances whatever, to restrict my station platforms beyond the absolute minimum of seven feet because that wasn't really suitable—I required platforms twelve feet long, and I was not prepared to wriggle my track around like tram lines.

Until such time as I can arrange my sixty foot room with a minimum width of twenty-five feet I shall enjoy the snaking effort of my trains and—go through the station every complete circuit. I have never regretted my firmness on this point and would only have 'climbed down' had I been going to operate small locomotives and wagons. Now I do not expect all modellers to stick rigidly to these ideals, but it must be appreciated my pleasure consists in operation of a realistic nature, not construction. And when you understand 60 ft. x 25 ft. is my ideal for OO gauge you will readily appreciate the theme is on 'running' and creating the impression of the real thing.

And what of O gauge then? In my opinion, so far as indoor operation is concerned, it is a gauge for the constructor, because the running effect is far away from realism. Gauge O is the kind of gauge which permits of detail for a photograph. The lines will not lend themselves to realism, neither in operation nor appearance, unless a vast area is available. So far as operation and running is concerned, together with

Off loop to engine shed. 0—4—0 shunter (colliery) bringing up empties.