HOW TO TEST A LATHE.

To test if the cone spindle is parallel with the ways or shears, bore a long hole in a piece of cast iron, using a stout tool holder, and a short stiff tool, taking a fine cut with a tool having its cutting edge slightly rounded, with a feed of 16 to an inch, at a speed of 25 ft. per minute. Let the tool feed through the hole and back again, so that it may be definitely known that the tool does not spring away from the work. Then, without moving the tool from the cut, wind the tool to the entrance of the hole, and let it stand there while the lathe runs forty or fifty revolutions. Traverse the tool to the other end of the hole, and let it stand while the lathe runs again. Then stop the lathe and traverse the tool (without taking it from the cut) along the hole, and if it marks a line stronger at one end of the hole than at the other, the tool has sprung and another fine cut must be taken as before, but if not and the whole is parallel, the spindle is true.

To avoid the wear of the tool it must be made as hard as possible. If the cut was started at the front and the hole bored is smallest at the back, another cut should be taken, commencing at the back and feeding toward the front. If the hole is still smallest at the back, the lathe cone spindle is not parallel with the ways.

To determine whether the cross slide is at a right angle with the ways or shears, take a fine cut over a radial face, such, for example, as the largest face plate, and test the finished plate with a straight edge. If the face plate runs true and shows true with a straight edge, so that it is unnecessary to take a cut over it, grind a piece of steel a little rounding on its end, and fasten it in the tool post or clamp, with the rounded end next to the face plate. Let the rounded end be about ¼ inch away from the face plate, and then put the feed motion into gear, and, with the steel near the periphery of the face plate, let the carriage feed up until the rounded steel end will just grip a piece of thin paper against the face plate tight enough to cause a slight strain in pulling the paper out, then wind the tool in toward the lathe centre and try the friction of the paper there ; if equal, the cross slide is true.

In taking a cut down a radial face, to test the truth of the cross slide of the rest, the cut should be started from the periphery, for the following reasons : It is obvious that to some degree (however slight it may, under careful manipulation, be) the tool will become dulled as the cut proceeds. Now with an equal depth of cut, and under equal conditions, there is more strain and wear upon the tool edge when cutting the larger than when cutting the smaller diameter.

To test the workmanship of the back head or tailstock, place the forefinger on the spindle close to the hub whence it emerges, and observe how much the hand wheel can be moved without moving the spindle ; this will show how much, if any, lost motion there is between the screw and the nut in the spindle. Next wind the back spindle as far as it will go, take hold of the dead center and pull it back and forth, when an imperfect fit between the spindle and the hole in which it slides will be shown by the lateral motion of the dead center. Wind the dead center in again, and tighten and loosen the spindle clamp, and see if doing so moves the spindle in the socket. Wind the dead center out again and slide the tailstock up the lathe bed until the dead center nearly touches the live one, and after bolting the tailstock to the lathe bed, bring the center points close together and see if they coincide. If the tailstock sets over for turning tapers, the setting screws may be operated to adjust the centers.

To examine the slide rest, move the screw handles back and forth to find how much they may be moved without giving motion to the slides ; this will determine the amount of lost motion between the collars of the screws and between the screws themselves and the nuts in which they operate. To try the fit of the movable slides in the stationary sliding ways or Vs, remove the screws and move the slide so that only about one-half inch is in contact with the Vs, then move the slide back and forth laterally to see if there is any play. Move the slide to the other end of the Vs, and make a similar test, adjusting the slide to take up any play at either end. Then clean the bearing surfaces and move the slide back and forth on the Vs, and the marks will show the fit, while the power required to move the slide will show the parellelism of the Vs.

If the lathe carriage has a rack feed, operate it slowly by hand, to ascertain if it can be fed slowly and regularly by hand, which is of great importance. Then put the automatic feed in gear, and operate the feed gear back and forth, to determine how much it can be moved without moving the slide rest. To test the fit of the feed screw to the feed nut, put the latter in gear and operate the rack motion back and forth. It has been assumed in this method of testing that means of adjustment are provided whereby any play in the cone spindle bearings may be taken up.

HOW TO USE A FILE.

By Joshua Rose, M.E.

The excellence of a piece of work operated upon by a file is only limited by the skilfulness of the operator, because a file can be made of any required form and size, and the quantity of metal it will cut away and the location of the same may be varied at will ; hence it is evident that it is possible to perform with the file every cutting operation assignable to steel tools.

The legitimate use of the file may be classed under four headings :—1. The removal of surplus metal. 2. To correct errors in the truth of work that has been operated upon by such machine tools as the planer and shaper. 3. The production of small intricate or irregular forms. 4. To fit work together more accurately than can be done by the use of other tools. With reference to the first, the domain of the file has of late years been greatly circumscribed by the introduction of special machines which will finish small work sufficiently accurate to render subsequent filing unnecessary. As a correcting process, however, filing still maintains a pre-eminent position from the fact that no other tool can be so delicately or minutely applied, and it is found that work produced by special or other machine tools, though sufficiently true for ordinary purposes, yet require correction in all cases where the utmost attainable exactitude and smoothness are required. One of the main reasons for this is to be found in the fact that work to be operated upon in special machines requires to be held or clamped firmly, and as a result is almost inevitably sprung. Another reason is that in filing, the work, unclamped and therefore unsprung, may be tried to its place or to gauge, &c., and any detectable error remedied. On large work this is especially the case, and for this reason the file is almost the only finishing tool. In the production of small intricate, or irregular forms, the file is either used to originate a cutter or tool to be used in a machine tool, or if but few of the pieces are required, it is applied direct to get out the work, machine tools being employed to rough the work out somewhat near to the required shape.

It is always desirable that the surface to be filed should lie horizontally level, and for ordinary work the face to be filed should be about the same height as the operator's elbow. If the work is large and requires a long reach, it is better to be lower, while if it is very small, so that but little pressure is required upon the file, it may be placed higher, so as to render less stooping necessary, and the eye may be able to add its scrutiny to the sense of feeling of the hand, upon which principally successful practice depends. When the work is level with the elbow, the first joint of the arm is in a line with the force required to push the file, which places less strain upon the arm. This is of great consequence in filing chipped surfaces or removing a quantity of metal.

The teeth of a file are unequal in height, and as the file warps in hardening, it is evident that, even supposing the operator to move the file in a straight line, the surface filed would not be straight ; hence files to be used upon flat surfaces should be thickest in the middle, and thinner at each end of their lengths. This gives to the surface of the teeth tops a curve or sweep in the length of the file, so that if it should warp slightly in the hardening process, the effect is to merely lessen the sweep on one side and increase it on the other. This is of but little consequence, because by altering the height of the respective ends of the file to the work, any part of the file may be brought into contact with the work, and its action located to any required part of the work. If the file is moved in a straight line it will file flat so long as the surface is curved ; but if the file is hollow in its length, it cannot under any circumstances file a flat surface, and one of the greatest objections to recut files is that the original curve is not maintained. The most expert mechanic, however, cannot move a file in a straight line, and the curve of the file is usually about sufficient to compensate for the variation of the stroke from a horizontal plane. The level of the teeth across the file may either be flat or slightly rounding, but in no case should it be hollow, for in that case the two file edges would cut two grooves.

For convex surfaces a flat file is usually employed, but for concave surfaces the file must be given a convexity greater than the concavity of the work, so that any desired part of the file may be brought into contact with the work, nothwithstanding a slight irregularity in the curve of the file. A round file should always be a trifle smaller in diameter than the hole it is to be used upon, and before inserting it in the hole the eye should be cast along the length of the file while the latter is revolved slowly in the fingers. By this means we may select the curve in the length of the file, and bring it to bear upon the work so as to avoid filing the edges away.

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