

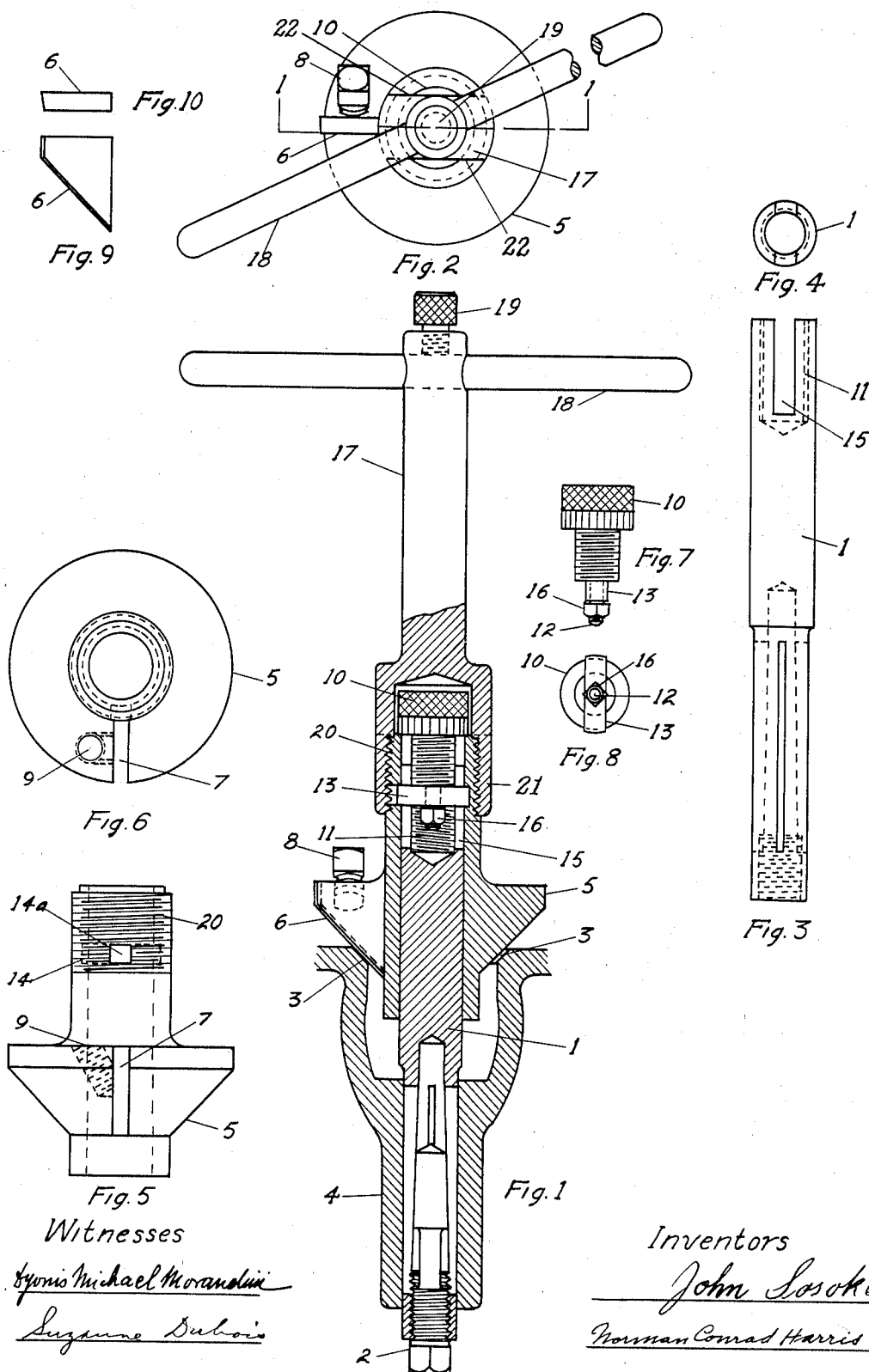
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SEAT FACER

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UNITED STATES PATENT OFFICE

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SEAT FACER

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3 Claims. (Cl. 90—125)

Our invention relates to valve seat facing and refacing tools in which a guided shaft carries rotatable cutting tools so that the depths of cut are micrometrically adjustable according to need and desire during the operation of the tool, and the refacing of the seat is assured along a circular conical surface having vertical cone axis coincident with the fixed axis of the tool shaft.

The object of our improvement is to provide for a strictly circular cone surface of the seat after the operation of the tool and also to provide a strictly circular cylindrical surface adjacent to, and limiting the extent of, the conical seat surface.

A further object of our invention is to permit micrometric adjustments of the cutting depths and to provide for successive desired parallel shifting of the plane of cutting.

A still further object is to make the cutting tools removable for the purpose of resharpener.

It is well known that hand operated reamers, facers and refacers previous to this invention did not secure an absolutely and strictly defined position of the cutting tool, although an approximately fixed position of the tool has been attained by various previous devices. Neither was such a micrometric adjustment of the cutting surface provided for which would readily and without disassembly change the adjustment for desired cutting depths. The present inventors do not know of any hand operated device of this kind which provided for the removal of the cutting tool for the purpose of sharpening. The lack of these features of previous hand operated devices rendered them impractical and did not permit them to cut and polish surfaces of the desired shape accurately. Particularly, surfaces intended to have circular straight cone shape, that is cone surfaces supposed to have circular cross sections when cut by planes perpendicular to their conic axis, obtained slightly or considerably elliptical perpendicular cross sections or cross sections of other non-circular shape after the operation of such tools, as the result of their lack of the aforementioned features.

Our invention eliminates all these disadvantages and furnishes a mechanical device which is practical, inexpensive in comparison with previous devices and which furnishes a hand operated tool equal in accomplishment to expansive and elaborate machine tools.

Our invention is explained in the following description and the accompanying drawing in which Fig. 1 shows a longitudinal cross section of the device, the cross section being made along

the cutting plane indicated as I—I of Fig. 2. Fig. 2 is a top plan of the device. Fig. 3 is an elevation of that part of the device which provides for the fixing of the device in position and for its guiding. Fig. 4 is a plan of Fig. 3. Fig. 5 shows the adjustable tool holder in elevation. Fig. 6 is a plan of Fig. 5. Fig. 7 is the elevation of the adjusting screw and the adjusting bar assembled. Fig. 8 is a bottom plan of Fig. 7. Fig. 9 is an elevation of the cutting tool. Fig. 10 is a plan of Fig. 9.

Referring to the accompanying drawing, the construction and operation of our device may be exemplified in the following which, however, does not set any limitation to other constructions and uses of our invention.

In Fig. 1 the device is inserted into the valve stem guide 4 of the valve seat to be faced or refaced. 1 is an expansion pilot which fits into 4 to which it is immovably fixed, after insertion, by means of screw 2. Expansion pilot 1 should be fixed to valve stem guide 4 in such a relative position that tool holder 5 is in close proximity, by means of cutting tool 6, to valve seat 3. Cutting tool 6 is set in groove 7, Fig. 5, of holder 5 by means of set screw 8 operating in threaded hole 9.

The upper end of pilot 1 has an axial threaded opening for the reception of adjustable, knurled headed micrometric screw 10, the female threads of this opening are shown as 11 in Figs. 1 and 3. The threaded opening of pilot 1 has a longitudinal cross slot 15, so that the wall of the threaded opening is entirely removed at two diametrically opposite places. The lower end of screw 10 has a reduced cylindrical portion 12 upon which is loosely fastened crossbar 13 of rectangular cross section, which has a central cylindrical opening for the reception of the reduced cylindrical portion 12 of screw 10. Portion 12 is threaded and receives nut 16 which prevents crossbar 13 from sliding off the reduced portion of 10, but does not tighten the crossbar immovably on screw 10.

The protruding ends of crossbar 13 slide, upon the hand adjustment of the knurled headed screw 10, axially in slot 15 through which they penetrate so as to fit slideably into an internal annular groove 14 of tool holder 5. The function of crossbar 13 is to adjust tool holder 5 axially on pilot 1, by the adjustment of micrometric screw 10. All these parts are preferably made to fit together with a high degree of precision but still free on each other without undue friction. Slot 15 prevents the rotation of the crossbar 13 when

screw 10 is being adjusted, whereas the annular groove arrangement permits the free rotation of tool holder 5 upon the ends of crossbar 13 and around the pilot assembly when handle stem 17 is turned. The entire procedure is more fully described below. Opening 14a serves for the insertion of crossbar 13 at the time of assembling but has no further function in the operation of the tool.

Tool holder 5 is conical and has a cylindrical central bore whereby it turns around pilot 1. 5 carries cutting tool 6. Any desired number of tools may be used, one only being shown in the drawing. The cutting tool is adjustably fixed in the radial groove 7 of tool holder 5 by adjusting screw 8 in threaded hole 9. This arrangement permits the easy removal of the cutting tools for the purpose of sharpening or exchange.

In the use of the device the valve is removed from the valve casing in which the seat is to be faced and pilot 1 is inserted and fixed in valve stem guide 4. Then the knurled head of screw 10 will be adjusted so that cutting tool 6 will slightly penetrate into the surface of valve seat 3. Now tool holder 5 will be turned around a few times by handle stem 17, as described below, in order to face the valve seat.

Handle stem 17 is a cylindrical rod which has an axial cylindrical opening within its lower end 21 of enlarged circular cross section. This opening is partly threaded for the reception of the upper cylindrical part of tool holder 5 which is screwed into handle stem 17 by means of threads 20. The opening of stem end 21 is large enough to accommodate also the knurled head of screw 10 without interfering with it.

Hollowed end 21 has two parallel and longitudinally milled plane cuts 22 upon that part of it which accommodates the knurled head of screw 10. These cuts 22 permit the exposure of this knurled head and render it accessible for adjustments, as shown in Fig. 2.

Handle stem 17 has a circular cross hole through its upper end through which handle 18 penetrates and is held by screw 19.

In the cutting operation the assembly of pilot 1, micrometric screw 10 and crossbar 13 is stationary, and the assembly of tool holder 5 and handle stem 17 turns on the pilot. After a few rotations the adjusting screw 10 will be reset in order to move tool holder 5 and tool 6 parallel to themselves into a new lower cutting position and a few more turns of stem 17, holder 5 and tool 6 will be made by hand. The alternate adjusting of screw 10 and the rotation of handle 18 will continue until a desired smoothness of valve seat surface 3 is obtained. After this the facer will be removed and the operation is finished.

Pilot 1 is exchangeable so as to fit stem guides of various diameter.

It is evident that the usefulness of our device is not limited to the operation described hereinbefore. Various other exhibits of the device are possible without deviating from the principles upon which our invention operates. For example, the hand rotation of handle stem 17 may be substituted by a mechanical or electrical rotation. Also the micrometric feeding of the tool 6 may be made automatic by substituting a self-feeding device for hand screw 10. This substitution may be attained by a ratchet arrangement or by other convenient means.

Also cutting tools and tool holders of various shapes to meet special requirements may replace those described in the example. For instance,

for reaming the cylindrical surface adjacent to the valve seat, tools lying along circular cylindrical directrices with their cutting edges and inserted in a tool holder adapted to this particular requirement may be used. The usage of a plurality of cutting tools does not constitute any new improvement upon our device; we have provision for this possibility since a plurality of cutting tools may find place, according to special needs, upon the surface of the tool holder.

The securing of the cutting tools also may be arranged differently from the set screw device 8 depicted in the accompanying drawing. For example, side screws instead of top screws may be used; or a tapered ring fit may be provided for.

The insertion and the fixing of the facer immovably in the valve seat stem guide also may be arranged differently. Instead of the longitudinal slots of 1 and the conical screw 2, that is instead of an expansion pilot, we may use a solid pilot which is fit to the valve stem guide by its upper conical portion only, while a conical nut screwing into the lower portion of the solid pilot is seated against the lower part of the valve stem guide, thereby providing an immovable fit for the pilot and nut combination, in the valve stem guide.

The handle 18 may be replaced by a socket on the top of handle stem 17, into which socket a speed wrench or a mechanism of similar device, for instance a breast drill, will be inserted.

Such changes, however, as described here will not alter our objectives and the principal methods and mechanisms by means of which our objectives are attained.

We claim:

1. In combination: an axle adapted to be fixed immovably by means of a tight fit in cylindrical openings at one end and having threads and axial slots at the other end, a solid of rotation coaxially aligned with and adapted to rotate around said axle and having an internal annular groove adjacent to said axle, a micrometric screw cooperating with the threads of and being coaxial with said axle and adapted to vary the combined axial length of said axle and said screw, said screw also having an unthreaded and reduced cylindrical portion, a cross bar secured to said screw against independent axial displacements but fitting around said reduced cylindrical portion of said screw so as to be free from the rotations of said screw, said cross bar being adapted to slide axially within said axial slots of said axle and fitting loosely into the annular groove of said solid of rotation, thereby axially supporting said solid without preventing it in its independent rotational motion, and means of rotation to turn said solid around said axle and said screw.

2. A tool of the class described comprising: a cylindrical expansion pilot adapted to be fixed immovably by a tight fit to the valve stem guide of a valve and having at its upper end a threaded axial opening for the reception of a screw and having two diametrically cut axial slots through its wall for the reception of a cross bar in the said pilot, a micrometric feed screw engaging within the threaded axial opening of said pilot and having an unthreaded reduced cylindrical portion, a cross bar having a bore fitted on said reduced cylindrical portion of said screw and means to hold said cross bar rotatably thereon, said cross bar extending through and beyond said axial slots and being slidably adjustable therein by means of said screw, a cutting head in the form of a circular sleeve rotatable around said pilot

and having an annular groove receiving the ends of said cross bar, said cutting head being adjustable thereby lengthwise with said pilot, a cutting tool adjustably and removably carried by said cutting head and adapted to penetrate into the surface of a valve seat by the adjustment of said screw and means to rotate said cutting head.

3. A valve seat facing tool comprising a pilot adapted to be fixed immovably by a tight fit in a valve stem guide, a cutting head rotatable around and coaxial with said pilot and having an internal annular groove adjacent to said pilot, a diametrical cross bar slidable in said annular groove,

there being a longitudinal slot in said pilot through which said cross bar extends and may slide longitudinally to said pilot and a threaded axial hole through said pilot intersecting said slot and a micrometric screw therein having a portion adapted to fit rotatably in a hole in said cross bar, a cutting tool on said cutting head adapted to face a valve seat when turned around said pilot and to penetrate said valve seat upon adjustment of said micrometric screw and means to turn said cutting head.

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15	90
20	95
25	100
30	105
35	110
40	115
45	120
50	125
55	130
60	135
65	140
70	145
75	150