Aug. 22, 1933. F. W. SEELERT 1,923,847

VALVE SEAT CUTTING DEVICE

Filed May 31, 1930

Fig. 1

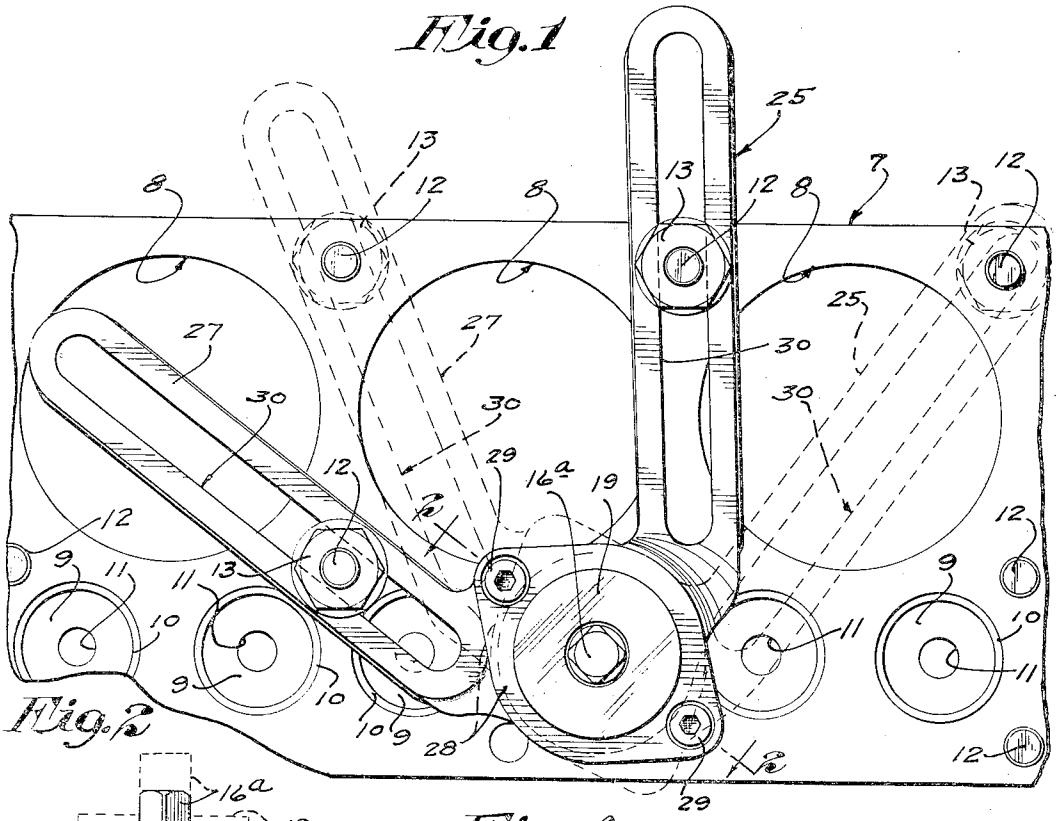


Fig. 2

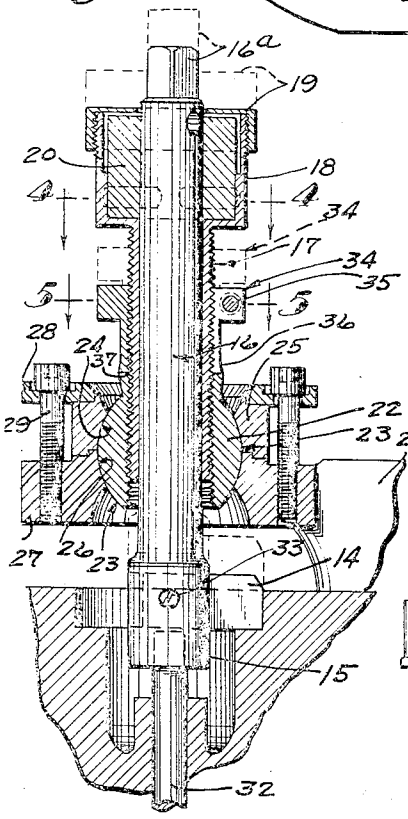


Fig. 4

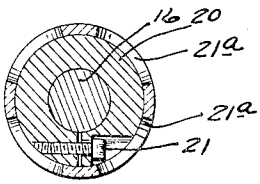


Fig. 5

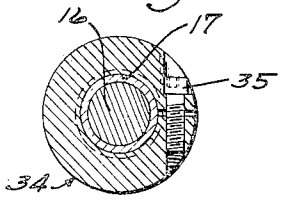


Fig. 3

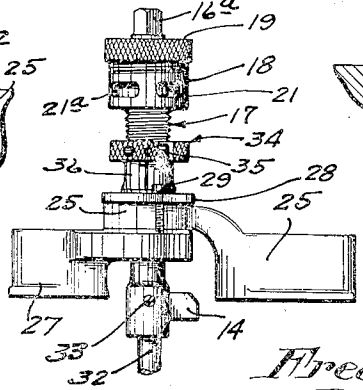
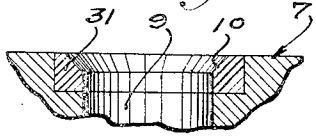


Fig. 6



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VALVE SEAT CUTTING DEVICE

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2 Claims. (Cl. 90—12.5)

My present invention relates to a novel and extremely accurate valve seat cutting device and has for its main object the provision of such a device in which the cutting element may be accurately positioned before the cutting operation is commenced and maintained in that preset position during the entire cutting operation.

Generally stated, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawing, which illustrates the invention, like characters indicate like parts throughout the several views.

Referring to the drawing:

Fig. 1 is a plan view of the device showing the same in operative position on a motor block, which block is indicated only diagrammatically and some parts thereof being broken away;

Fig. 2 is a view in axial section taken on the line 2—2 of Fig. 1 and showing the same in operative position on the motor block, some parts being broken away;

Fig. 3 is a view of the device in side elevation on a reduced scale;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a view taken on the line 5—5 of Fig. 2; and

Fig. 6 is a fragmentary view of the motor block corresponding to the portion thereof shown in Fig. 2 but illustrating an annular ring set in the valve seat portion of the block, which portion is shown as cut out in Fig. 2 and said ring having a valve seat formed therein.

The motor block is indicated as an entirety by the numeral 7, the cylinders by the numerals 8, the valve opening by the numeral 9, valve seats by the numeral 10, and the valve stem guides by the numeral 11. The engine block is here illustrated with the cylinder head removed and the cylinder head bolts, which are indicated by the numeral 12, project considerably above the surface of the cylinder block proper and the cylinder head bolt nuts, which are illustrated as only being applied to those cylinder head bolts, which are in use, are indicated by the numeral 13.

My valve seat cutting device includes a cutting element or tool 14 removably and adjustably carried by a chuck-like cutter head 15 that is formed on the lower end portion of a cutter spindle or arbor 16. This arbor 16 is rotatively mounted in a combined arbor supporting bearing and feed screw 17, which combined arbor supporting bearing and feed screw is in the form of an externally threaded sleeve formed at its upper end portion with an enlarged cup-like head 18 that is normally closed at its upper portion by means of a cap 19 that is removably secured thereon by means of screw-threads or the like. The upper end portion of the arbor 16 is made angular at 16*a* for application of a suitable tool such as a wrench or the like, not shown, for turning the arbor and the cutting tool to form a cutting operation.

Detachably mounted on the upper end portion of the arbor, below the angular portion 16*a*, and detachably secured thereto by frictional engagement and contained within the cup-like upper end portion of the arbor supporting bearing 17, is a stop collar 20. The stop collar 20 is in the form of a split annular ring that is detachably and adjustably secured on the arbor by frictional clamping action produced by means of a clamping screw 21. This stop collar 20 is rotatable within the cup-like portion 18 and by engagement thereof with the bottom of said cup-like portion 18 and the top of the cap 19, said arbor is adjustably held against axial movements through the supporting bearing 17 but is free for rotation therein.

The combined arbor supporting bearing and feed-screw 17 is mounted in and has screw-threaded engagement with a ball-like member 22, the sides of which are approximately semi-spherical and which member 22 forms the universally movable member of a ball and socket joint 23. The ball and socket joint 23 comprises the ball-like member 22, an upper half socket 24 formed on the inner approximately annular end of a mounting arm 25 and a lower half socket 26 formed on the inner approximately annular end of a mounting arm 27. These half sockets 24 and 26 are normally held in loose frictional engagement and are adapted to be clamped tightly against the semi-spherical surfaces of the ball-like member by means of a retaining and clamping device comprising a collar 28 and clamping screws 29. The collar 28 surrounds the ball and socket connection and is seated on the upper annular portion of the mounting arm 25 and the screws 29 have screw-threaded engagement with the arm 27 but are entirely free from the arm 25. It should now be apparent that when the screws 29 are loose, the ball-like member 22. combined bearing and feed screw 17 and arbor 16 will be free for universal movements in respect to the arms 25 and 27 and said arms will be free for pivotal movements in respect to each other. When the

screws 29 are tightened; however, the half sockets 24 and 26 will be tightly clamped against the semi-spherical surfaces of the ball-like member 22 and thereby lock the bearing supporting sleeve 17 against universal rocking movements in respect to the arms and said arms against pivotal movement in respect to each other. The arms 25 and 27, which are quite heavy and very rigid, have flat bottom surfaces that are in the same horizontal plane and which are adapted to be seated on the smooth flat top of the engine cylinder head and said arms are provided with longitudinal slots 30 that are adapted to receive cylinder head bolts 12.

The particular cutting element 14, here illustrated, is meant for the purpose of cutting away the portion of the cylinder blocks surrounding the valve opening 9 and in which portion the valve seat 10 is all formed substantially as illustrated in Fig. 2. When this cutting operation is complete an annular ring 31 is pressed into the cut-out portion and then a new valve seat 10 is formed in said ring 31. This operation is, however, common practice in the automobile trade and when the operation is accurately done, highly satisfactory results are obtained. In order to obtain a high degree of accuracy, however, it is first essential to accurately position the cutting element before the cutting operation is commenced and to positively hold the same positioned during the cutting operation.

Cooperating with the chuck-like cutter head 15 of the arbor 16 and depending axially therefrom is a pilot stem 32, which stem 32 is adapted to be inserted into and closely engage the sides of the valve guide that cooperates with the particular valve seat to be operated on to co-axially align the arbor 16 with the valve guide and thereby properly position the cutting element 14 at right angles to the valve guide. It is, of course, understood that a valve seat should always be in perfect axial alignment with its cooperating valve guide and it is, therefore, essential in performing a cutting operation, as here illustrated, to have the cut perfectly round and centered in respect to said valve guide.

The cutting element 14 is adjustably and removably secured in the chuck-like cutter head 15 by means of a set-screw or the like 33 and said cutter 14 will be set before the cutting operation is commenced to make a cut of the desired diameter.

Attention is now called to the fact that the arbor 16, which is held against axial movements in respect to the combined feed-screw and supporting bearing 17 is movable axially through the ball-like member 22 with said combined bearing sleeve and feed-screw by screwing said sleeve upward or downward in respect to said ball. By this means the cutting element 14 may be set at a desired elevation and progressively moved downward during the cutting operation to increase the depth of the cut.

Operation

To set the device for a cutting operation the clamping screws 29 are loosened sufficiently to release clamping action of the half sockets on the ball-like member 22 and permit free universal movements of the bearing sleeve 17 in the arbor 16 and free pivotal movements of the arms 25 and 27 in respect thereto and in respect to each other. The arbor is now raised upward by screwing the combined bearing sleeve and feed-screw upward to such an extent that the bottom of the cutter 14 will be above the bottom of the arms 25 and 27. With this accomplished the pilot stem 32 may be inserted into the valve guide 11 of a particular valve seat to be operated on and the arms 25 and 27 seated against the engine block with the slots 30 in each thereof slipped over a conveniently located cylinder head bolt 12. The pilot stem 32, which should be of proper size to snugly fit the guide 11, will very accurately position the arbor 16 in co-axial alignment with the guide 11 and also position the cutter at right angles thereto. With the arbor 6 properly aligned the cylinder head bolt nuts 13 may be applied to the bolts 12 and drawn down tightly against the tops of the arms 25 and 27 and the clamping screws 29 are then tightened to cause the half sockets 24 and 26 to tightly engage the ball-like member 22.

It will now be apparent that the arbor 16 will be positively held against wabbling movements in the pre-aligned position during the complete cutting operation even though quite great side thrust be exerted thereon caused by turning pressure applied to the upper end portion of the arbor 16. The cutting element 14 should now be moved downward by manipulation of the combined bearing and feed screw 17 so that the bottom thereof engages the top of the blocks, as shown by dotted lines in Fig. 2.

By reference to Figs. 2 and 5, it will be seen that the feed screw 17 is provided with an adjustable cut depth determining and limiting stop collar 34, which collar is split and provided with a clamping screw 35. This collar 34 has screw-threaded engagement with the feed screw 17 and has a depending skirt-like portion 36, the bottom of which is adapted to engage the annular stop projection 37 formed on the upper portion of the ball-like member 22. With the cutting element 14 adjusted to engage the top of the block, as shown by dotted lines in Fig. 2 prior to the commencing of the cutting operation, the depth of the cut to be made is determined and the cut depth and determining and limiting stop collar 34 is set so that the bottom of its skirt-like portion 36 is spaced from the top of the annular stop projection of the ball-like member 22 a distance equal to that of the depth of the cut desired.

With the stop collar 34 positioned, as described, the clamping screw 35 is tightened so as to prevent accidental movement of said stop collar on the feed screw 17. The actual cutting operation is performed by rotating the cutting tool 14 by application of a suitable tool to the angular part 16*a* of the arbor 16 and progressively feeding the cutting tool downward by manipulation of the combined feed-screw and supporting bearing 17.

This progressive downward movement will, of course, be continued until the skirt portion 36 of the cut depth determining and limiting stop collar 34 comes into engagement with the stop shoulder 37 on the ball-like member 22, at which time the cut will be of the predetermined depth and the operation complete.

It is obvious that the cylinder head bolts in various engines are located at much different positions relative to the valves and also that even in the same engine the cylinder head bolts will be located in different relation to the various valves thereof, and it is, therefore, highly important that the mounting arms 25 and 27 are movable pivotally in respect to one

another and that they be provided with slots or the like so that they may be brought into co-operation with bolts lying at various distances from the valve.

By reference to Fig. 1, it will be noted that in the event that the particular cylinder head bolts 12, illustrated as being used to clamp the arms 25 and 27 against the top of the cylinder block were absent, the arms might be swung into the position, shown in dotted lines, to cooperate with other cylinder head bolts 12. It will appear from the above that this device will be universally applicable to substantially all engines.

It is also important to note that the mounting arms 25 and 27 are always at considerable angle to one another and therefore very rigidly brace the supporting bearing sleeve.

What I claim is:

1. The combination with a tool for operating on valve seats comprising a cutting element, an arbor for said element, and a pilot stem adapted to be inserted into and closely engage a valve guide that cooperates with the particular valve seat to be operated on and to cooperate with said arbor to co-axially align the arbor with the valve guide, of an arbor supporting bearing in which said arbor is rotatably mounted, a pair of mounting arms for said supporting bearing, a ball and socket connection between said arms and said arbor supporting bearing comprising substantially semi-spherical surfaces carried by said arbor supporting bearing, a lower half socket formed on one of said arms, and an upper half socket formed on the other of said arms, said arbor supporting bearing normally being free for universal movements in respect to both said arms, and said arms being free for pivotal movements in respect to one another and said arbor supporting bearing, clamping means for positively locking said semi-spherical surfaces against movement in respect to said arms, and said arms against movement in respect to each other and means for feeding the arbor through its supporting bearing including external screw feed threads on the supporting bearing.

2. The combination with a tool for operating on valve seats comprising a cutting element, an arbor for said element, a pilot adapted to co-operate with the arbor and the valve stem guide of a particular valve seat to be operated on to co-axially align the arbor with the valve stem guide, of a combined arbor supporting bearing and feed-screw in the form of an externally screw-threaded sleeve in which the arbor is rotatably mounted, means for holding said arbor against axial movements in said combined supporting bearing and feed-screw, mounting arms for said combined supporting bearing and feed-screw, a ball and socket connection between said arms and said combined supporting bearing and feed-screw comprising a substantially spherical member carried by and having screw-threaded engagement with the combined supporting bearing and feed-screw, a lower half socket formed on one of said arms and an upper half socket formed on the other of said arms, said combined arbor supporting bearing and feed-screw being normally free for universal movements in respect to said arms, said arms being free for pivotal movements in respect to each other, and means for positively locking said semi-spherical surfaces against movements in respect to said arms, and said arms against movement in respect to each other.

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