R. A. HALL.

CAM SHAFT BUSHING INSERTER AND EXTRACTOR.

APPLICATION FILED JULY 13, 1920.

1,369,172. **Patented Feb. 22, 1921.**

FIG. 1.

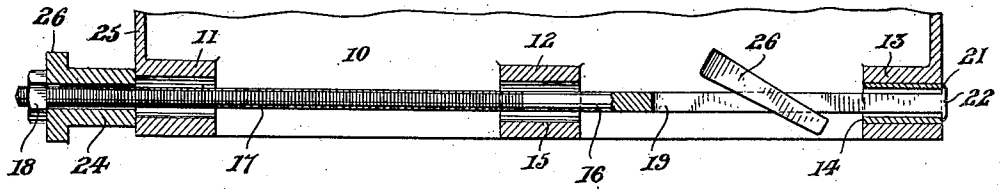


FIG. 2

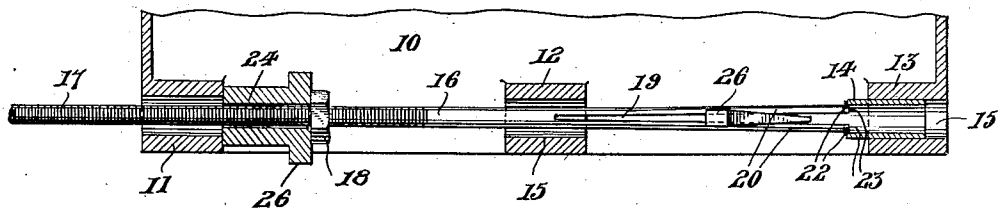


FIG. 3.

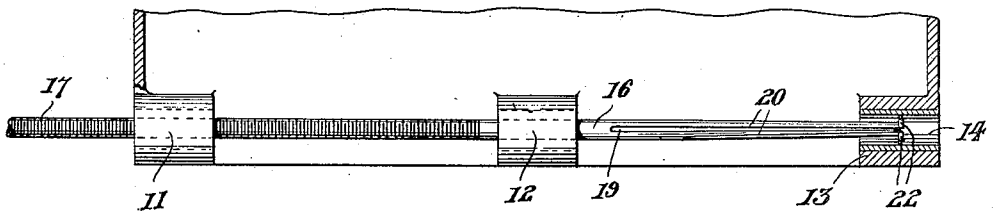


FIG. 4.

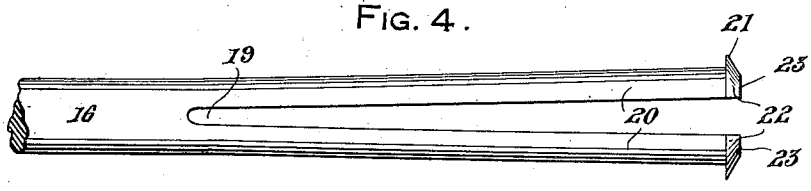


FIG. 5.

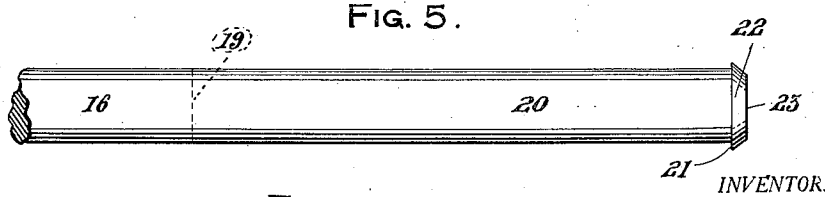
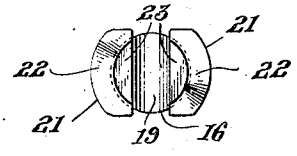


FIG. 6.



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CAM-SHAFT-BUSHING INSERTER AND EXTRACTOR.

1,369,172. Specification of Letters Patent. Patented Feb. 22, 1921.

Application filed July 13, 1920. Serial No. 395,983.

To all whom it may concern:

Be it known that I, ROY ALBERT HALL, a citizen of the United States of America, residing at Lancaster, in the county of Lancaster and State of Pennsylvania, have invented certain new and useful Improvements in Cam-Shaft-Bushing Inserters and Extractors, of which the following is a specification.

The primary object of the invention is the provision of a simple and inexpensive tool for easily and quickly inserting or removing a cam shaft bushing, such as the rear bushing for the cam shaft in a Ford motor which is extremely difficult of access and is positioned within the base or crank case of the motor.

A further object of the invention is the provision of a tool adapted for engaging any removable bushing which cannot be readily driven in or out by reason of its inaccessible position, the device being readily engaged with the bushing even when positioned where it is impossible to drive the bushing or engage the same by the hands of the operator.

A still further object of the invention is to provide a repair tool for manipulating bushings and the like and being capable of longitudinal movement in either direction, while rotary movement thereof is readily prevented.

With these general objects in view and others that will appear as the nature of the invention is better understood, the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawing and claimed.

In the drawing, wherein like reference characters indicate corresponding parts throughout the several views,

Figure 1 is a sectional view through the crank case of a motor illustrating the employment of my device during the extraction of the bushing from the rear bearing of a cam shaft,

Fig. 2 is a similar view showing the reverse operation of inserting the bushing for the rear bearing of the cam shaft,

Fig. 3 is a view partly in elevation and partly in section during the insertion of the tool through the rear bushing,

Fig. 4 is an enlarged elevational view of the bushing engaging end of the device,

Fig. 5 is an elevational view of an adjacent side thereof, and

Fig. 6 is an end elevation of the bushing engaging end of the tool.

Referring more in detail to the drawing, I have illustrated my bushing inserter and remover in connection with a portion 10 of the crank case of an explosive motor in which a plurality of bearings 11, 12 and 13 are provided in axial alinement with each other for journaling the cam shaft of the motor, it being understood that a bushing such as 14 is provided in the bore 15 of each journal with the shaft, not shown, mounted for turning in the said bushings. The rear bearing 13 is extremely difficult to reach in most motors even when the bottom plate of the base or the crank case is removed and my tool is especially serviceable in removing as well as inserting such a bushing as 14 from the rear bearing 13.

A rod 16 of lesser diameter than the bearing bore 15 has a threaded portion or shank 17 at one end thereof upon which a nut 18 is threaded while the opposite end of the shank is bifurcated or longitudinally slotted as at 19 forming bifurcations or arms 20, slightly resilient and normally positioned divergent.

A head upon the bifurcated end of the tool is in the form of a semi-circular flange 21 at the free end of each arm 20 having a beveled arcuate outer face 22 with a semi-circular flat end 23. When the bushings have been removed from the bearings 11 and 12, the shank 16 is longitudinally projected through said bearings and the head members 21 forced with their beveled faces 22 against the adjacent open end of the inner bushing 14, it being apparent that upon driving the arms 20 through the bushing 14, the arms 20 will be drawn toward each other. When the flanges 21 emerge from the opposite end of the bushing 14, the arms 20 spread apart by reason of their resiliency, engaging the bushing 14 rearwardly of the flanges 21 as illustrated in Fig. 1 of the drawing.

A guard 24 upon the shank 16 rests against the adjacent side 25 of the motor 10 while the nut 18 bearing upon the outer flanged end 26 of the guard 24 may be turned upon the screw threads 17 for forcing the shank 16 outwardly of the base 25 and extracting the bushing 14 from the bearing 13. The bushing 14 is readily re-

moved from the bearing 13 in this manner and any convenient expedient may be employed for preventing the shank 16 from turning if required, such as a wedge or stop bar 26 forced through the slot 19 and engaging the adjacent wall of the motor 10.

The introduction of the shank 16 through the bushing 14 is illustrated in Fig. 3 and the extracting operation in Fig. 1 of the drawing while Fig. 2 illustrates a manner in which the bushing 14 may be inserted into the rear bearing 13. The flanges 21 or head of the tool is engaged with the adjacent inner end of the bushing 14 and the stop bar 26 placed in the slot 19 to maintain the arms 20 substantially expanded to prevent the head from entering the bushing 14. The guard 24 is placed upon the threaded portion of the shank 17 inwardly of the bearing 11 with the nut 18 inwardly of the guard 24 and upon turning the nut 18 in the required direction, the shank 16 will be forced inwardly pushing the bushing 14 into the bore 15 of the inner bearing 13.

It will be apparent that the wedge or stop 26 may be employed only when required to prevent the shank 16 from revolving, whereby longitudinal movement of the tool in either direction is insured, although other rotation preventing means may be adopted such as the holding of the outer threaded end 17 of the shank against rotation in any convenient manner.

The complete operation of the invention will be fully understood from this detailed description thereof, and while the form of the invention herein set forth is believed preferable, it will be understood that changes may be made therein without departing from the spirit and scope of the invention as claimed.

What is claimed as new is:—

1. In combination, a bushing appliance comprising a shank bifurcated at one end forming resilient spaced arms and threaded at its opposite end, arcuate flanges at the free ends of the arms adapted for engaging the open end of a bushing during the introduction of the shank into the bushing and the passing of the flanged end therethrough, an adjustable retracting means upon the threaded end of the shank, and rotation preventing means adapted for wedging positioning between the arms whereby a bushing is locked upon the arms inwardly of the flanges thereof.

2. A bushing device comprising a shank having a bifurcated end with terminal arcuate flanges outwardly beveled to the semi-circular flat ends of the arms, a bearing guard adjustably mounted on the shank, an adjusting nut threaded upon the shank outwardly of the guard, and a locking wedge positioned between the arms when the device is in use adapted for preventing rotation of the shank during the longitudinal movement thereof.

3. A device for moving rear bushings of a cam shaft comprising an elongated shank having one end portion threaded and a longitudinal slot in the other end of the shank providing spaced resilient arms normally arranged divergent and terminating in semi-circular end faces, arcuate flanges at the free ends of the arms beveled toward said end faces, an adjusting nut upon the threaded portion of the shank, a bearing member upon the shank in contact with said nut during operation, and rotation preventing means for the shank wedged between said resilient arms whereby said flanges are permitted to operatively engage a bushing during the bushing inserting or extracting operation of the device.

In testimony whereof I affix my signature.

ROY ALBERT HALL.