

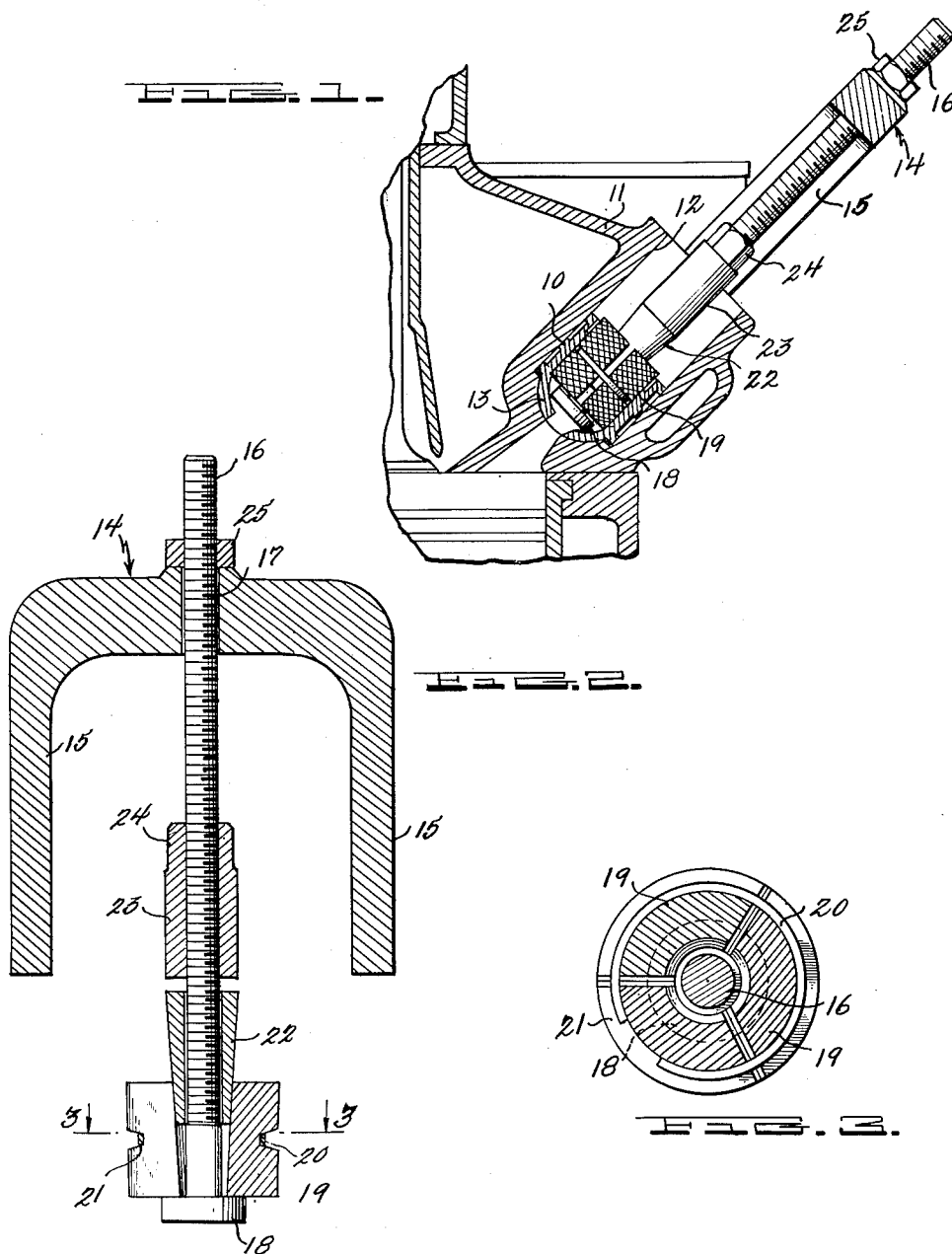
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PULLING TOOL

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PULLING TOOL

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1 Claim. (Cl. 29—265)

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This invention relates to a tool for pulling or extracting cylindrical elements and, among other objects, aims to provide a relatively simple and rugged puller of this type especially contrived to extract cup-shaped pre-combustion cylinders from the cylinder heads of diesel engines.

Another object of the invention is to provide a tool of the type set forth, having provision to be inserted through a bore into a shallow, cup-shaped cylinder and having a segmental expander adapted to be expanded into gripping engagement with the inner wall of the cylinder.

Still another object of the invention is to provide a puller of the type above described adapted to be operated by an end wrench, first, to effect gripping engagement with a cup element and, then, to extract the cup through the mouth of its bore.

Other objects of the invention will appear in the following specification, when considered in connection with the accompanying drawing, wherein:

Fig. 1 is a fragmentary sectional view, partly in elevation, showing the preferred form of the tool applied to a pre-combustion chamber in a diesel engine;

Fig. 2 is a vertical sectional view of the tool showing the expanding segments contracted for insertion in a cup element; and

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2.

In diesel engines employing pre-combustion chambers in the cylinder heads, much difficulty has been encountered in removing the chamber elements from their bores for cleaning or replacement after they have become clogged up with carbon or damaged, due to the high temperatures to which they are exposed. These chambers are in the form of cup-shaped cylinders closely fitted into the bottom of bores extending into the cylinder heads. They are clamped in place by bolted-on plugs having fuel conduits leading to the chambers. This invention provides a novel extracting tool for such chamber elements to facilitate repairs and replacements.

Referring to Fig. 1, the tool is shown as being applied to a pre-combustion chamber 10 mounted in the cylinder head 11 of a diesel engine. The chamber is cup-shaped and is seated in the bottom of a cylindrical bore 12. It has a rounded bottom portion 13 with an opening communicating with the engine cylinder.

Referring to Fig. 2, the tool is shown as having a yoke or inverted U-shaped support 14, with spaced legs 15 adapted to span the bore in the

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cylinder head 11 and rest on the head or blocks supported on the head. A threaded stem or screw 16 projects through and is slidably mounted in an opening 17 through the cross bar of the yoke and extends downwardly below the lower ends of the legs. The lower end of the stem is shown as having a disc-shaped head 18 and carries a segmental expander 19, herein shown as comprising three cylindrical segments with knurled or roughened outer surfaces. These segments are shown as having a tapered bore and are held assembled by means of a split spring ring 20 seated in an annular groove 21 extending around the segments substantially midway between their ends. The spring ring is adapted to hold the segments contracted to a diameter slightly less than the internal diameter of the cup-shaped cylinder 10, so that they can easily be inserted in the cup, and the thickness of the head 18 is such that it will extend into the rounded bottom of the cup below the lower end of the expander segments.

A conical expander sleeve 22 is slidably mounted on the stem 17 and coacts with the bore in the segmental expander 19 to expand the segments into gripping engagement with the interior surface of the cup-shaped cylinder 10. An elongated cylindrical nut 23 is threaded on the stem 17 above the conical sleeve and has a wrench receiving head 24 at its upper end, which is easily accessible to be engaged by an end wrench extending between the two legs 15 of the yoke. The diameter of the cylindrical lower end of the nut is slightly less than that of the upper end of the conical expander sleeve. The construction is such that, when the segmental expander is inserted in the pre-combustion chamber through the bore 12 of the cylinder head, the nut on the threaded sleeve 23 is accessible above the level of the mouth of the bore. The segmental expander elements are shown, in Fig. 2, as being contracted, with the conical sleeve 22 engaging the upper end portion of their tapered bore in the segmental expander. When the parts are in this position, the segmental expander is ready to be inserted in the cup-shaped chamber.

At the upper end of the screw or stem 16, above the cross bar of the yoke 14, there is shown an extracting nut 25, preferably of the same size as the hexagonal head portion 24 of the sleeve nut 23, so that an end wrench of the same size may be used to turn both the extracting nut and the sleeve nut. When the segmental expander elements are expanded in the cup-shaped chamber, as shown in Fig. 1, the nut 25 above the yoke is

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turned to pull up the stem or screw 16 and extract the chamber. When the chamber is removed, the segmental expander elements can be disengaged from it by tapping on the upper end portions of the segmental expander elements. It will be noted that the expander is of such length as to project slightly above the upper end of the chamber, as shown in Fig. 1. The lower head is seated in the rounded bottom of the cup and slightly spaced from the lower end of the expander to permit such disengagement. The extracted chamber is inspected for defects, such as warpage, due to heat, and all of the carbon is removed by sand blasting or scraping. Then, the chamber can be re-inserted and seated in the bottom of the bore 12.

From the foregoing description, it will be seen that the pulling tool is very simple in construction and effective in operation to remove cup-shaped and cylindrical elements from deep bores. However, it is to be understood that the tool is not limited to such use.

Obviously, the invention is not restricted to the particular embodiment thereof herein shown and described. Moreover, it is not indispensable that all of the features of the invention be used conjointly, since they may be employed advantageously in various combinations and sub-combinations.

What is claimed is:

A pulling tool for extracting cylindrical, cup-shaped pre-combustion chambers from their bores in diesel engines, comprising a U-shaped yoke member adapted to engage outside surface of the engine astride the bore and having an opening in its cross bar; a screw threaded stem slidably extending through said opening in the cross bar centrally between the legs of the yoke member and having a head with a flat upper surface on its lower end; an expander composed of a plurality of complementary cylindrical segments with roughened outer surfaces from top to bottom, each having a flat bottom wall adapted to rest on the upper surface of said head; said expander segments having a bore tapered at a small angle from top to bottom and diverging upwardly with its lower end smaller than said head; the assembled segments having an annular groove in their outer walls substantially midway between their ends and a spring member seated in the

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groove for holding the segments contracted about said stem; an elongated and tapered expander sleeve loosely and slidably mounted on the stem above said expander with its taper corresponding with the taper of said tapered bore and adapted to be forced downwardly to the bottom portion of the tapered bore to expand all of the segments radially and in parallelism with their roughened surfaces in gripping and binding engagement with the inner cylindrical surface of the pre-combustion chamber throughout its height; an elongated nut having a wrench-receiving head on its upper end screw threaded on the stem above the expander sleeve to exert expanding pressure thereon; the length of said nut being such that it is accessible above the upper end of the chamber bore in an engine for ready engagement by a wrench; and an extracting nut on the upper end portion of said stem coacting with the upper surface of the cross bar of the yoke, the size and shape of the head on the lower end of said stem being such that it can be seated within the bottom portion of the pre-combustion chamber when the contracted expander is seated in the cylindrical portion thereof, and said segments being slightly longer than the cylindrical portion of the chamber, so that their upper ends project thereabove to permit the expanded and wedged-in segments to be tapped on their upper ends after the expanding nut is backed off for removing the extracted chamber from the tool without damaging its upper end wall, whereby it can be cleaned and replaced.

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