F. HOFFMAN.

LINER PULLER.

APPLICATION FILED APR. 8, 1919.

1,385,452. Patented July 26, 1921.

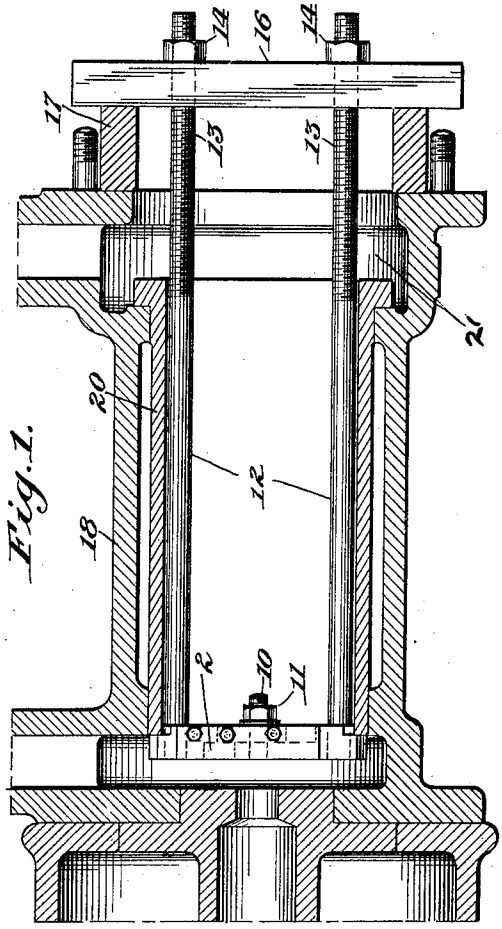


Fig. 1.

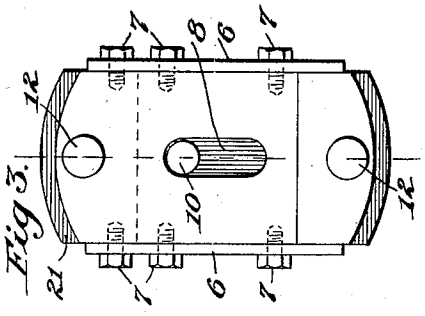


Fig. 3.

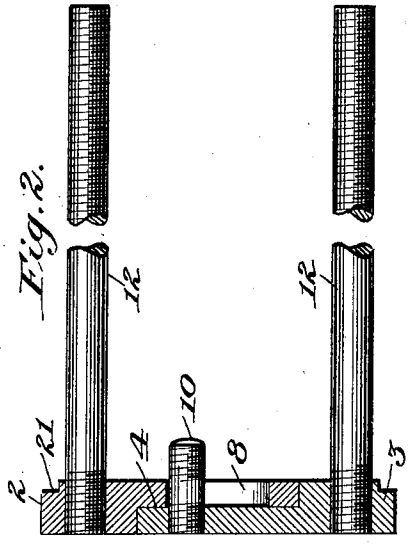


Fig. 2.

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UNITED STATES PATENT OFFICE.

FELIX HOFFMAN, OF NEWPORT NEWS, VIRGINIA.

LINER-PULLER.

1,385,452. Specification of Letters Patent. Patented July 26, 1921.

Application filed April 8, 1919. Serial No. 288,489.

To all whom it may concern:

Be it known that I, FELIX HOFFMAN, a citizen of the United States, residing at Newport News, in the county of Warwick and State of Virginia, have invented a certain new and useful Improvement in Liner-Pullers, of which the following is a full, clear, and exact description.

This invention relates to improved devices for pulling out the liner of engine cylinders or pump cylinders, and is particularly useful for extracting liners of cylinders for internal combustion engines, although the device is not limited to this use. The cylinders of internal combustion engines, and other engines and pumps, are sometimes provided with detachable liners which, when worn or injured, may be removed and replaced with new liners. Great difficulty has been experienced in extracting these liners, and efforts have been made to construct tools which may be inserted in the cylinder, and by some device caused to engage the end of the liner, so that power may be applied to the tool and the liner thereby pulled out of the cylinder. These devices have in all instances known to me been unsatisfactory, either because of the inability to properly position the tool back of the end of the liner in such manner as to reliably engage therewith, or by reason of the fact that the tool was incapable of being applied to the liners of cylinders of varying diameters. Another disadvantage which has been found to follow from the use of devices of this character heretofore employed, is their inability to be inserted through the top of the cylinder, hence requiring for their operation a cylinder which is provided with a hole in the bottom thereof.

The above and other disadvantages and defects in devices for pulling liners from cylinders as heretofore employed are overcome by my invention, which contemplates the employment of an adjustable liner puller, which is so constructed as to be insertible into the cylinder from the top or open end, and is provided with pulling members which are relatively movable in a radial direction, and are adapted to engage with the ends of liners for cylinders of different diameters. The pulling members are provided with tension devices, such as bolts, which are arranged in such manner as to be located at or near the inner surfaces of the liner at diametrically opposite points, and when strain is applied to these members the liner is extracted by the application of force at two spaced points, remote from the center of the cylinder. This provides for applying the pulling force at the most effective points, and prevents any liability of collapsing the pulling members.

In the drawings, which illustrate a preferred embodiment of the invention,

Figure 1 shows an engine cylinder and its liner in longitudinal section, with the pulling device shown in elevation and in position to remove the liner;

Fig. 2 is an enlarged view, partly sectional, of certain parts of the puller, and

Fig. 3 is a plan view of the device, with certain parts removed.

The engine cylinder 18 is provided with a detachable liner 20 which may have the usual flange to fit against a wall of the combustion chamber or other cylinder enlargement 21. The pulling device comprises two members 2, 3, which are recessed and overlapped at their central portion to provide the sliding joint 4. The member 2 is herein shown as provided with a slot 8, and a bolt 10 is fastened to the member 3, and projects upwardly through the slot, a nut 11 being threaded to the bolt and serving to clamp the two members together in different positions of adjustments which are made to agree with the differences in size of cylinder liners. One of the members, as 3, has secured to its opposite sides by bolts, to which are applied nuts 7, guiding strips 6, said strips embracing the edges of the member 2, and serving as guiding means to maintain the two members in parallelism with each other.

Tension bolts 12, 12, are threaded or otherwise rigidly secured to the outer edge portions of the members 2, 3, which latter are provided with rabbeted arcuate portions 21 at their ends adapted to conform to the curvature of a cylinder liner, and to receive the end thereof when the device is inserted in liner-pulling position within the cylinder, as shown in Fig. 1. The bolts 12 extend outwardly beyond the end of the cylinder and are provided with threads 13. A bar 16 is provided with two spaced holes through which extend the threaded ends 13 of the bolt 12, and suitable supporting blocks 17 rest upon the end of the cylinder and serve as abutments to receive the thrust of the

bar 16 when tension is applied to the rods 13 through the instrumentality of the nuts 14.

In the use of the device, the nut 11 is loosened sufficiently to permit the two members 2, 3, to be collapsed or shortened, as shown in Fig. 2, whereby the distance between the extreme outer ends of the members is less than that of the diameter of the liner 20 to be extracted. The members 2, 3, are then inserted through the open end of the cylinder and the liner 20 a distance sufficient to carry said members into the chamber beyond the end of the liner. The spacer block 17 and bar 16 having been placed in their appropriate positions, as shown in Fig. 1 of the drawings, the nuts 14 are applied to the threaded ends of the rod 12 and are rotated until said rods are tensioned sufficiently to apply pressure through the members 2, 3, to the liner 20 and pull the latter from the cylinder.

It will be noticed that the two tension bolts 12 which are attached to the pulling member will always be positioned closely adjacent to the inner surface of the liner, as contradistinguished from locating these bolts at the center of the device, and as a result thereof the pull will be applied so close to the liner as to avoid the danger of collapsing, or bending the pulling members when the latter are subjected to the maximum strain necessary to remove the liner. Another advantage following from the use of this device is that by reason of the fact that its members are adjustable and may be inserted in the open end of the cylinder, it is possible to operate said members in a very short space between the lower end of the liner and the bottom of the cylinder which is not true of devices of this character heretofore employed.

Having thus described my invention what I claim as new and desire to secure by Letters Patent of the United States is:—

1. A liner puller comprising an adjustable device consisting of two members for engaging the end of a liner, and means comprising two members each of which engages one of the first named members for applying a pulling strain to said members first named for extracting the liner.

2. A device of the character described, comprising members slidable transversely upon each other adapted for insertion through the open end of a cylinder and constructed to engage the end of a liner, and means for applying a pulling strain thereto to remove a liner from its cylinder.

3. A liner puller having in combination two members which are slidable radially and constructed to engage the end of a liner, means for holding said members in different positions of adjustment, and tension means connected at one end to said members for causing said members to extract a liner.

4. A liner puller having, in combination, two members slidable radially with reference to a liner, and constructed to engage the inner end of said liner, spaced tension rods connected to said members and extending through the open end of the cylinders, and means for applying power to said rods to extract a liner.

5. A liner puller having, in combination, two members recessed at their central portion, and arranged to overlap and slide upon each other, a clamp for holding said members in adjusted position, tension rods located near the outer extremities of said members and arranged to extend through the open end of a cylinder, and means for exerting tension upon said rods.

6. A liner extractor comprising slidable members 2, 3, having the slot and bolt connection 8, 10, and the clamping nut 11, the tension rods 12, 12, located near the outer ends of said members, and means for applying tension to said rods.

In testimony whereof I have hereunto set my hand.

FELIX HOFFMAN.

Witnesses:
S. L. Wood,
E. F. Heard.