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CYLINDER HEAD AND LINER HOISTS

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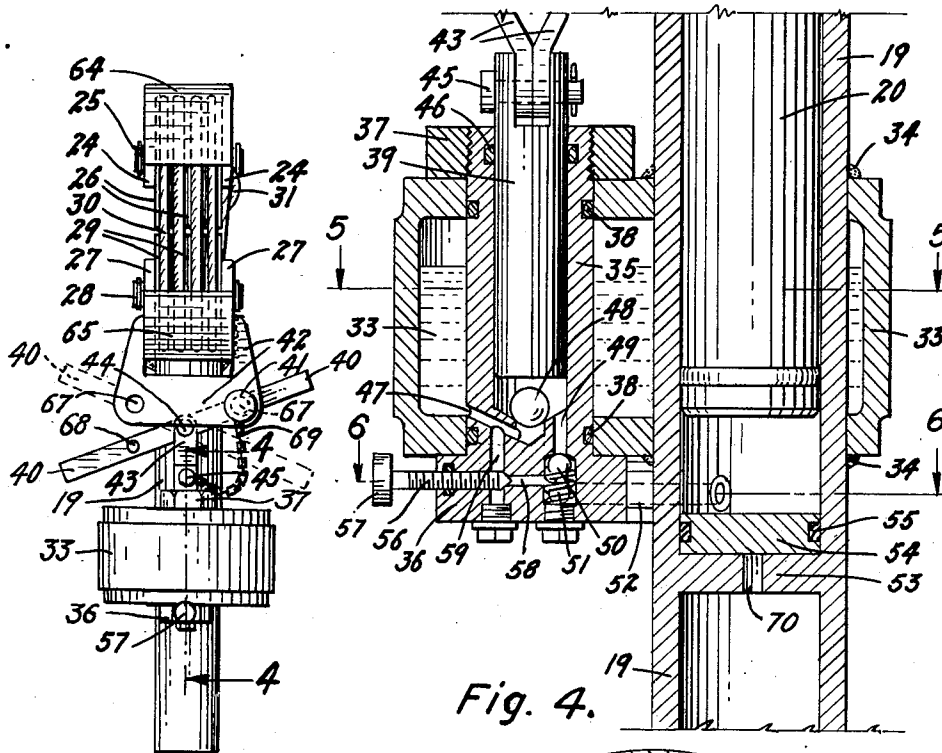


Fig. 3.

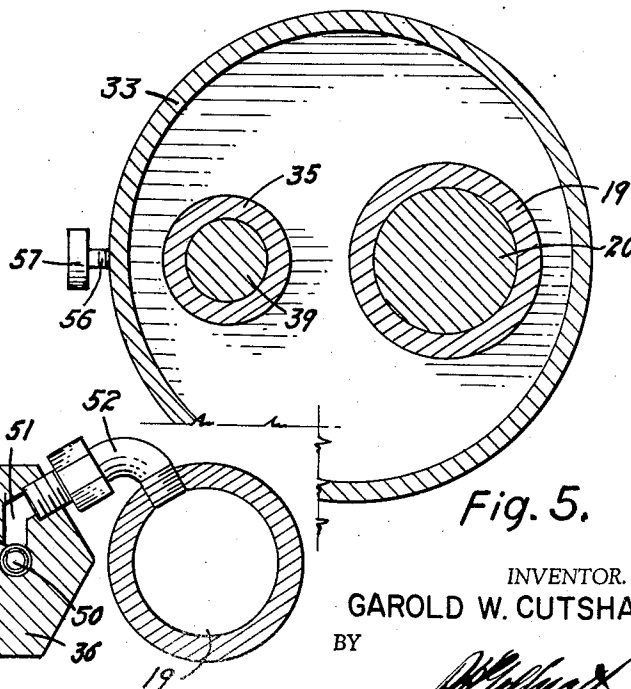


Fig. 5.

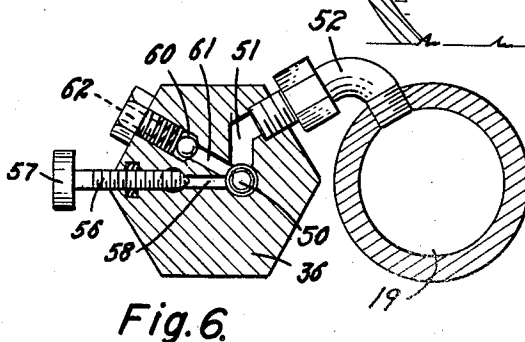


Fig. 6.

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CYLINDER HEAD AND LINER HOISTS

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1 Claim. (Cl. 212—34)

This invention relates to a hoist of a type more particularly intended for pulling or lifting cylinder heads and cylinder liners from locomotive diesel engines. In the usual railway diesel locomotive, there is so little head room over the engines and beneath the roof that it is exceedingly difficult to lift the cylinder heads from the engine block and to pull and replace the cylinder liners for renewal and repairs.

The principal object of this invention is to provide a simple and convenient hoist which can be efficiently used in the limited space allotted in a diesel locomotive to pull, lift, lower and replace the engine cylinder heads and cylinder liners; which can be quickly and easily mounted on the diesel engine block for secure and safe support and which will be hydraulically operated to produce a relatively high lift from a minimum movement of a hydraulic mechanism.

Another object is to provide a hoist of this character in which the elements of the hydraulic mechanism will also serve as supporting elements for the hoist and in which all cable reels, ratchets, gears, cranks, etc. will be eliminated, and to so construct the hoist that it may be rotated with a minimum of effort about a vertical axis from a position over a cylinder to a position over the aisle alongside of the engine.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is had to the accompanying drawing which forms a part thereof. Like numerals refer to like parts in all views of the drawing and throughout the description.

In the drawing:

Fig. 1 is a side view of the improved cylinder hoist as it would appear when in place upon a conventional locomotive type diesel engine;

Fig. 2 is a plan view of a mounting bracket employed for supporting the improved hoist upon the engine;

Fig. 3 is a rear view of the hoist;

Fig. 4 is an enlarged fragmentary, vertical section taken on the line 4—4, Fig. 3;

Fig. 5 is a horizontal section looking downwardly on the line 5—5, Fig. 4; and

Fig. 6 is a similar horizontal section looking downwardly on the line 6—6, Fig. 4.

In Fig. 1, a portion of the top of a V-type diesel engine cylinder block is indicated at 10 with the usual head guide crab studs at 11. In the usual engine there is a pair of the crab studs 11 positioned at each side of each engine cylinder bore. Portions of a conventional engine valve case are shown in cross section at 12, from which the conventional deck cover has been removed to expose the heads of the cylinders therein. The improved hoist is designed to be mounted upon the top of the engine cylinder block at 10 at the side of a cylinder bore and is

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maintained in place thereon by means of the crab studs 11.

The mounting is accomplished by means of a mounting bracket 13, as shown in detail in Fig. 2. The mounting bracket 13 is provided with a lower hole 14, adapted to be passed over the lowermost stud of a pair of the studs 11, and with a similar upper hole 15 adapted to be passed over the uppermost stud of the pair. Spacer washers 66 are welded about the holes 14 and 15 below the bracket 13 and the upper hole 15 is provided with an upwardly-projecting guide sleeve 16. The guide sleeve 16 is formed on or affixed to the mounting bracket 13 to guide the latter freely on and off the studs 11 without cramping. The lower extremity of the bracket preferably, but not necessarily, extends in a horizontal plane when the bracket is inclined on the normal incline ($22\frac{1}{2}^\circ$) of the top of the cylinder block of a typical V-type diesel locomotive engine. A pivot stud 17 is mounted or formed on the horizontal lower extremity. As illustrated, the stud is positioned in a notch in the extremity and is welded to the latter as indicated at 18. The improved hoist is designed to be rotatably mounted upon the pivot stud 17.

The hoist consists of a tubular hydraulic cylinder 19 which also forms the mast of the hoist. A hydraulically actuated plunger 20 is slidably mounted in the hydraulic cylinder 19 and projects upwardly from the top of the latter. The plunger 20 is formed from relatively heavy, solid shafting ($1\frac{1}{2}$ " dia.) and is bent in an inverted L-shape to provide a substantially horizontal hoist boom portion 21 at the upper extremity of the plunger.

The forward extremity of the hoist boom portion 21 is bifurcated and a cable pulley, which will be herein designated as the boom pulley 22, is mounted in the bifurcation upon a suitable axle pin 23. An upper, pulley-supporting plate 24 is welded to each side of the upper extremity of the plunger 20 and the rear extremity of the boom portion 21. The upper plates 24 extend rearwardly in parallel, spaced-apart relation to support a second axle pin 25 upon which a plurality of independent grooved cable pulleys, which will be herein designated as the upper multiplying pulleys 26, are journaled.

A lower pulley-supporting plate 27 is welded to each side of the upper extremity of the hydraulic cylinder 19. The lower plates 27 extend rearwardly in parallel, spaced-apart relation to support a third axle pin 28 upon which a similar plurality of grooved, lower cable pulleys, which will be herein designated as the lower multiplying pulleys 29, are journaled. As illustrated, there are four cable pulleys on each of the axle pins 25 and 28. The number of pulleys could be varied depending upon the particular hoist ratio desired. For the intended purposes of the hoist, four pulleys on each of the axle pins 25 and 28 have been found to be most satisfactory.

A hoisting cable 30 is secured at its rear extremity to one of the upper plates 24, as indicated at 31, and is then trained around the two sets of multiplying pulleys 26 and 29, thence forwardly from the last upper multiplying pulley 26 and over the boom pulley 22 so as to depend from the latter. The depending forward extremity of the hoisting cable is provided with a suitable hook 32 to which the load to be lifted may be attached. The hook 32 is preferably formed from a bent length of pipe in which the cable is securely brazed.

It can be seen from the above, that if the plunger 20 be forced upwardly from the hydraulic cylinder 19 a distance of 1" the hook 32 will be moved upwardly a distance of 9" due to the 8 to 1 ratio of the multiplying pulleys 26 and 29 and to the 1" rise of the boom por-

tion 21. Therefore, an exceedingly high or long lifting and lowering action can be attained with very little increase in height of the hoist assembly. This feature is a great advantage when working in the limited head room provided over the engines in a diesel locomotive.

The upward movement of the plunger 20 is accomplished by means of a hand-operated hydraulic pump mounted upon and supported by the hydraulic cylinder 19. The pump is mounted in a circular reservoir 33, preferably formed from a short length of steel tubing with circular top and bottom plates welded thereto. The hydraulic cylinder 19 passes through the reservoir adjacent one side thereof as shown in Figs. 4 and 5. The cylinder 19 is welded or otherwise permanently attached to the reservoir 33, as indicated at 34, to provide a fluid-tight joint therebetween.

A vertical pump cylinder 35 extends upwardly through the other end of the reservoir 33. The pump cylinder is provided with a preferably hexagonal cylinder head 36 which can be held by a wrench and drawn tightly against the bottom of the reservoir 33 by means of a clamp nut 37 which is threaded upon the upper extremity of the pump cylinder so as to engage the top of the reservoir 33. The pump cylinder is sealed to the reservoir by means of suitable packing or sealing rings 38.

A cylindrical pump piston 39 is positioned in the pump cylinder and extends upwardly therefrom. The piston 39 is sealed in the cylinder 35 by means of a suitable O-ring 46. The pump piston is arranged to be vertically reciprocated from a pump handle 40, pivotally mounted between two spaced-apart, parallel, U-shaped, bracket plates 42 which are welded to and extend below the lower supporting plates 27. The bracket plates are provided with pivot pin holes 67 at each side of the axis of the pump piston so that the handle 40 can be pivoted at either side upon a withdrawable handle pin 41 inserted through the pin holes 67 at that side. A pair of connecting links 43 extends from a pivot pin 44, extending through the pump handle 40, into a slot in the top of the piston 39 where they are secured by means of a wrist pin 45. It can be seen that manual vertical reciprocation of the handle 40 will reciprocate the pump piston 39 in the pump cylinder 35.

Each upward stroke of the piston 39 will cause hydraulic fluid to be drawn from the reservoir 33 through an intake port 47, past a check valve ball 48 and into the pump cylinder 35. Each downward stroke of the piston 39 will force the fluid through a discharge port 49, past a spring-loaded check valve 50, into a pressure passage 51, and thence through a coupling fitting 52 into the hydraulic cylinder 19 below the plunger 20. The cylinder 19 is provided with a bottom disc 53 welded or formed therein below the fitting 52 and above the lower extremity of the cylinder. Leakage past the bottom 53 is prevented by means of a circular plug 54 provided with a suitable sealing ring 55.

It can be readily seen from the above that vertical reciprocation of the pump handle 40 will cause the plunger 20 to gradually rise in the cylinder 19 to decrease the suspended length of the cable 30.

The fluid can be released from the hydraulic cylinder to allow the plunger to descend by unscrewing a threaded needle valve 56 provided with a suitable finger grip head 57. Opening of the valve 56 opens a relief passage 58 and allows fluid to flow from the pressure passage 51 to a return passage 59 which communicates with the discharge port 49 and the reservoir 33 so as to allow the plunger 20 and the hook 32 to gradually descend. A spring-loaded, ball, safety valve 60 controls a safety passage 61 communicating with the pressure passage 51 to allow fluid to escape from the latter through a safety port 62 should the pressure in the hydraulic cylinder exceed the predetermined maximum for which the valve 60 is set.

It is believed that the manner of using the improved

hoist will be apparent from the above description. Briefly, let us assume it is desired to pull the lining from one of the engine cylinder bores for repairs. The mounting bracket is fitted over the pair of crab studs 11 at the side of the cylinder. The open lower extremity of the hydraulic cylinder is then fitted over the pivot stud 17 to support the hoist in a rotatable vertical position adjacent the cylinder. The hook 32 is attached to the cylinder head. The pump handle is then reciprocated to cause the cable to lift the cylinder head from the cylinder and the boom portion 21 is then rotated to swing the cylinder head to a position over the aisle alongside of the engine. The needle valve 56 is then opened to release the hydraulic pressure in the hydraulic cylinder to allow the cylinder head to gradually descend to the floor. The above procedure is then repeated with the cylinder liner to withdraw the latter and place it upon the floor. The replacement of the cylinder head and liner is simply a reversal of the above procedure.

The lower and upper multiplying pulleys are provided with lower and upper arcuate cable guards 63 and 64, respectively, and the boom pulley 22 is provided with a similar cable guard 65 which acts to retain the cable 30 in place upon the respective pulleys.

It is desired to call attention to the mounting of the pump handle 40. The handle 40 is made relatively short for convenience in handling in restricted places. When in use a piece of pipe is slipped over the handle to provide leverage. It is necessary that the handle be interchangeable from right to left hand so that a lever pipe placed thereon will project outwardly over the aisle alongside of the engine regardless of whether the boom portion is positioned over a cylinder at the left of the mounting bracket 13 or over a cylinder at the right of the mounting bracket. The handle is provided with two pin receiving openings 68 and the changeover is easily accomplished by withdrawing the pin 41 from the openings 67 and 68 at one extremity of the bracket plates 42 and replacing the pin 41 in the openings 67 and 68 at the other extremity of the bracket plates, as indicated in broken line in Fig. 3. The pin 41 is preferably provided with an attachment chain 69 to prevent accidental dropping of the pin.

The guide sleeve 16 covers most of the threaded portion of the crab stud 11 upon which it is positioned so that if desired, the conventional crab stud nut can be threaded against the sleeve 16 (as shown in broken line in Fig. 1) with very few turns to quickly lock the mounting bracket in place if desired.

The attachment of the extremity of the cable 30 at 31 can be accomplished in any desired manner. As illustrated, it is attached by means of a wedge key in a wedge socket similar to the attachment used on quick detachable cable hooks.

There are many conventional hooks, clamps, and fittings for attaching the hook 32 to the cylinder head and cylinder liner any of which may be used with this invention.

A drain opening 70 is drilled in the bottom disc to discharge any leakage past the plug 54. This opening also serves to allow a rod to be inserted upwardly for forcing the plug 54 from the cylinder for repair and replacement.

While a specific form of the improvement has been described and illustrated herein, it is to be understood that the same may be varied within the scope of the appended claim without departing from the spirit of the invention.

Having thus described the invention, what is claimed and desired secured by Letters Patent is:

A hoist for pulling and lifting the heads and liners from the cylinders of an internal combustion engine block comprising: a hydraulic cylinder; means for supporting said cylinder in a substantially vertical position on said engine block; a plunger positioned in said cylinder and projecting above the top of the latter; a boom portion

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mounted on and projecting forwardly from the top of said plunger; a boom pulley carried by said boom portion; an upper multiplying pulley supported from said plunger; a lower multiplying pulley supported from said hydraulic cylinder; a flexible element secured at its rear extremity and extending about said lower and upper multiplying pulleys thence over said boom pulley with its forward extremity depending from the latter; and means for forcing hydraulic fluid under pressure into said hydraulic cylinder to urge said plunger upwardly so as to separate said multiplying pulleys to elevate the forward extremity of said cable, said means for supporting said cylinder in a substantially vertical position on said engine block comprising a mounting bracket including a lower hole and an upper hole, a spacer washer welded to the under side of said plate about each of said holes, and an upwardly projecting guide sleeve mounted about said upper hole, said holes being adapted to engage over the

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spaced crab studs of an engine cylinder bore, the lower portion of said plate being inclined at an obtuse angle upwardly, said lower portion normally extending in a horizontal plane when said crab studs are seated in said holes, and a pivot stud pivotally mounting said hydraulic cylinder.

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