No. 865,548. PATENTED SEPT. 10, 1907.

G. H. WARD.

APPARATUS FOR BORING CYLINDERS.

APPLICATION FILED OCT. 3, 1905.

2 SHEETS—SHEET 1.

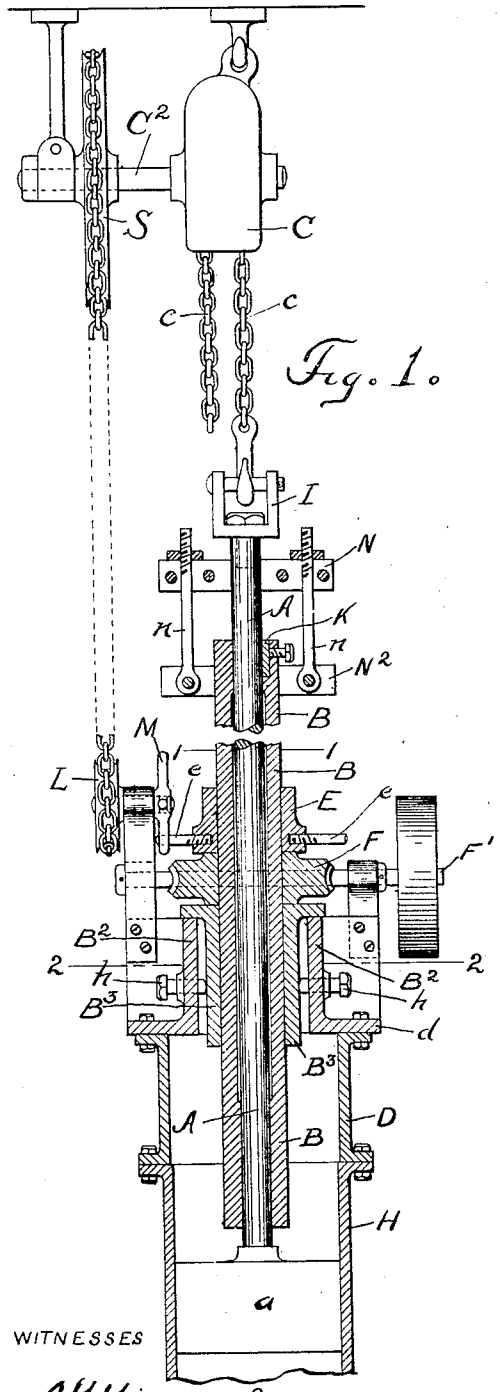
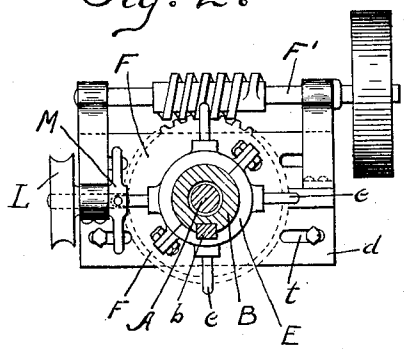


Fig. 1.

Fig. 2.



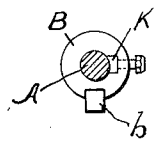


Fig. 3.

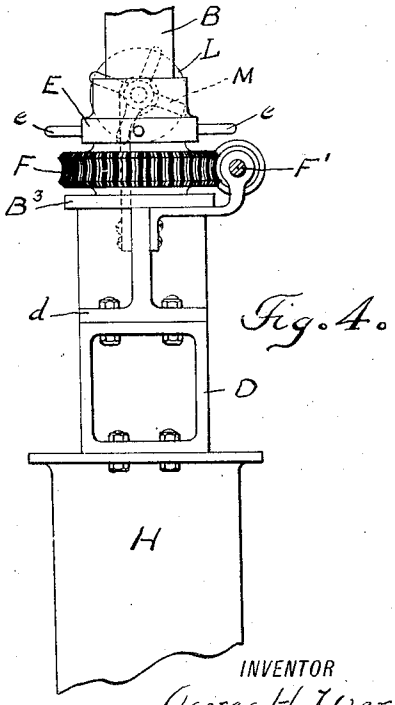


Fig. 4.

WITNESSES

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2 SHEETS—SHEET 2.

Fig. 5.

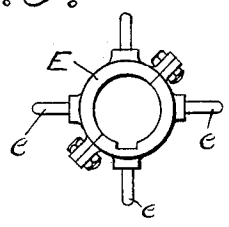
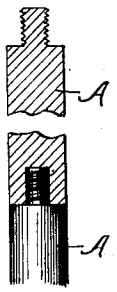


Fig. 6.



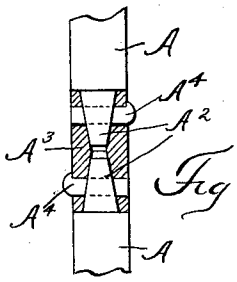


Fig. 7.

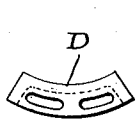


Fig. 8.

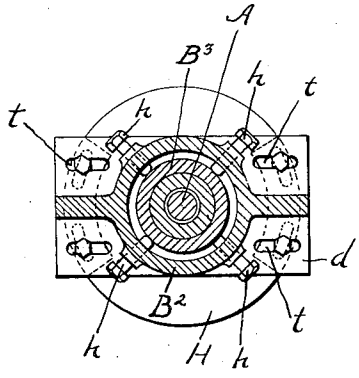


Fig. 9.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR BORING CYLINDERS.

No. 865,548. Specification of Letters Patent. Patented Sept. 10, 1907.

Application filed October 3, 1905. Serial No. 281,117.

To all whom it may concern:

Be it known that I, GEORGE H. WARD, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, (with post-office address 78 Delavan street,) have invented certain new and useful Improvements in Apparatus for Boring Cylinders, of which the following is a specification.

My invention relates to apparatus for boring cylinders, and one of the special objects of the invention is to provide means whereby a cylinder may be re-bored when worn, without removing it from the place in which it is installed.

My invention is especially useful in re-boring the cylinders of hydraulic elevators and generally speaking may be said to consist in the novel manner of utilizing a hoisting tackle or block and fall as a part of the feed mechanism by which the boring tool is advanced as the cut progresses.

The invention consists further in the special combinations of apparatus or devices comprising, among other things, a tool rod carrier through which a tool rod may be slipped centrally, a drive wheel having a splined connection with said carrier for rotating the same while it advances, a swivel suspension of the tool rod from the block and fall or hoisting tackle to permit rotation of the rod when clamped to the tool rod carrier, and suitable means connected with the tool rod or tool rod carrier for imparting rotation to the hoisting shaft of the tackle to permit the feed of the tool rod and tool rod carrier under the action of gravity.

The invention consists also of a suitable framework adapted to be erected on the cylinder and adapted to carry an axially fed rotatable tool rod carrier together with the driving mechanism therefor, a hoisting tackle from which the tool rod connected with said carrier is suspended by a swivel connection and drive and feed mechanism mounted on the framework for rotating the tool rod carrier and for imparting through suitable devices such as a chain connection, a feed movement to the hoisting shaft of the tackle.

My invention consists further in the special details of construction and combinations of parts hereinafter more particularly described and then specified in the claims.

In the accompanying drawings, Figure 1 is a general vertical central section of an apparatus constructed in accordance with my invention and applied to a cylinder to be bored parts being shown in elevation. Fig. 2 is a cross section of Fig. 1 on the line 1, 1. Fig. 3 is an end view of the hollow tool rod carrier looking from the top. Fig. 4 is an edge view of a part of the apparatus. Fig. 5 is a plan of the device which rotates with the tool rod carrier and operates upon a star feed wheel for the purpose of actuating the mechanism of the hoisting tackle to lower the tool rod as the cut progresses. Figs. 6 and 7 illustrate forms of couplings that may be used to couple the sections of the tool rod. Fig. 8 is a plan of one of the parallels. Fig. 9 is a section on the line of 2, 2, of Fig. 1.

H indicates the cylinder to be bored, which cylinder in the present instance is supposed to be in vertical position and to be the cylinder of a hydraulic elevator. Temporarily bolted to the flange of said cylinder is a suitable framework which supports the various operating parts for rotating the tool rod and feeding the same as will be presently described. Said framework consists conveniently of the two risers or parallel uprights D bolted to the flange of the cylinder and provided at their top with means for attachment of a cross head *d* having elongated bolt holes *t* to accommodate the same to cylinders of different diameters.

A is the tool rod proper, which is operated in sections added from time to time as the cut progresses and carrying at its lower end or on its lower section, a cutter head *a* of any desired kind. The sections of tool rod A may be joined by couplings of any desired character such for instance as indicated in Figs. 6 and 7. Fig. 6 shows a form of screw coupling, which may be used for coupling the sections of rod. In Fig. 7 are shown sections of rod with tapered projections A^2 on the axial line of the rod, which projections enter the ends of a transversely perforated coupling sleeve A^3 adapted to receive keys A^4 which pass through transverse perforations in the projections A^2. These are merely typical of any desired form of coupling for joining the sections of rod end to end.

The upper end of the upper section of rod A is supported by a hoisting tackle C of any desired form or construction adapted to hold its load at any point at which the power ceases to be applied so as not to allow the load to come down "on the run". The suspension or support of the rod A is by a swivel shackle of any desired character indicated at I, said shackle being connected with the load chain *c* of the hoisting tackle. The swivel attachment of the rod A to the shackle permits the rod to turn freely when operated for the purpose of turning the cutter head and cutter in engagement with the work.

Supported within the hollow upright B^2 rising from the cross head *d* is a suitable guide B^3 for the tool rod carrier B, which latter is adapted to turn and rise and fall in said guide B^3. Said tool rod carrier B has a central bore as indicated through which the tool rod may be moved axially when a new section of tool rod is to be added. Let into the tool rod carrier is a proper compression key K by which the tool rod may be clamped to the carrier so as to partake of the rotating and axial movement of said carrier.

Upon the carrier B is a spline *b* which works in a slot in the hub of a suitable drive wheel, the purpose of which is to establish a spline connection between

the carrier and the drive wheel, whereby said carrier may be rotated, but be at the same time, free to move axially for the purpose of feeding the tool rod and tool as the cut progresses.

The drive wheel with which such spline connection is effected is indicated at F. Said wheel is mounted to turn in a horizontal plane on some portion of the framework, suitable bearings being provided for it, preferably, on the top of the guide B^3. Wheel F may be driven by a screw on the drive shaft F′, said screw being geared up to the wheel by a worm on the edge of the wheel. Shaft F′ may be rotated by electric motor or other temporarily installed power, belted to a pulley on the shaft F′. Said shaft turns in suitable bearings carried by brackets bolted to ribs carried by the cross head or other portion of the framework. Any other connection may be used in place of the spline connection of the drive wheel and tool rod carrier for the purpose of rotating the rod and permitting the feed movement of the same axially.

On tool rod carrier B is a sleeve E which may be supported loosely on the top of the wheel F, but which has suitable spline connection with the carrier B similar to that of the drive wheel F. The carrier B, by rotation, rotates the collar or sleeve E and the latter is provided with any number of fingers for engaging the arms of the star feed wheel M which is attached to a shaft supported in brackets on the rib carrying shaft F′. The shaft of the star feed wheel carries a chain or other suitable wheel L and through this wheel and chain passing over the chain sheave S carried by the hoisting shaft C^2 of the hoisting tackle, said hoisting shaft may be rotated to give slack to the chain *c* and permit the tool rod and attached tool carrier B to descend under gravity and feed the cutter to the work as the cut progresses. The extension C^2 of the hoisting shaft is supported by a hanger connected to any suitable rigging while the tackle block is provided with the usual hook for attachment or support to any suitable rigging by which the shaft C^2 may be hung in proper alinement with the apparatus below. The sleeve E is bisected as shown to permit it to be readily removed from position, and replaceable sleeves may be provided which may have a different number of arms *e* to vary the rate of feed. The guide B^3 may be adjusted by suitable screws *h* to bring the tool rod carrier and tool rod central over the bore of the cylinder H.

In practice for vertical boring, tool rod carrier B may be a rod say 8 feet in length. The weight of the tool rod and tool rod carrier is taken by the hoisting tackle and the feed governed by the slack in the load chain through rotation of the star feed wheel M and intermediate parts between the same and chain *c*, such rotation being brought about through rotation of sleeve E which rotates with the tool rod carrier B sliding axially through said sleeve. A suitable safety clamp N may be attached to the upper end of the carrier B to prevent any possibility of the same sliding down through the cross head and to limit the downward movement thereof.

In operation, tool rod carrier may be fed down to its full length as determined by the stop N, when the weight thereof may be taken by an independently placed block and fall and the compression clamp K then released. The tool rod carrier B may be then "fleeted" to its full height or to any intermediate point and an additional length of sectional tool rod A inserted. After this has been done, the compression clamp K is again set to connect tool rod carrier B rigidly to the tool rod and the tool rod carrier released from its supporting block and fall and the operation then resumed, the feed then taking place through the weight of the rod and rod carrier as released by the hoisting tackle and feed mechanism. If desired, the feed may be assisted by placing suitable additional weights on either the carrier B or the tool rod. As a means additional to the compression key K for insuring a rigid connection of the tool rod and carrier and preventing the one from slipping on the other, I may use a supplemental clamp N^2 clamped directly on the tool rod and the rods *n* connecting the same with the clamp N in the tool rod carrier.

What I claim as my invention is:

1. In an apparatus for boring cylinders, the combination of a tool rod, a hoisting tackle with which the rod is connected by a swivel, a rotary hoisting shaft for the tackle, a centrally bored and rotatable tool rod carrier with which the rod has a spline connection and means connected with the tool rod carrier for rotating the hoisting shaft of the tackle.

2. In an apparatus for boring cylinders, the combination of a centrally bored tool rod carrier, means for clamping a tool rod therein, a drive wheel having a splined connection with the carrier for rotating the same while permitting its advance, a hoisting tackle of the character described having a rotary hoisting shaft, a swivel suspension for the rod and feed mechanism for rotating the hoisting shaft of the tackle in a direction to permit the load to come down, thus advancing the tool rod.

3. In an apparatus for boring cylinders, a supporting framework comprising risers adapted to be secured to the end of the cylinder and a cross-head mounted on the risers and extending across the space between the same, a tool rod carrier, a central guide on said cross-head adapted to permit the carrier to rise and fall and to turn with the tool working centrally in the space between the risers and in line with the axis of the cylinder, means for clamping the tool rod in said carrier, combined with a horizontal drive wheel having a bearing on said cross-head and having its axis in line with the axis of the cylinder, and a spline connection between the same and the tool rod carrier to permit axial movement of the carrier through the wheel and at the same time compel rotation of the carrier.

4. In an apparatus for boring cylinders, the combination of a centrally bored tool rod carrier, a supporting chain and chain wheel, feed mechanism for rotating said wheel, a collar having spline connection with the carrier and provided with projecting arms or fingers, and a star feed wheel connected to the feed mechanism and operated by said arms.

5. In an apparatus for boring cylinders, the combination of a framework adapted to be mounted on the end of the cylinder, an axially fed rotatable tool rod carrier and drive mechanism therefor mounted on said framework, a tool rod adapted to slide through the carrier, means for clamping the same to the carrier, a block and fall having a rotary hoisting shaft, a swivel suspension by which the rod is connected with the block and fall, a star feed wheel, means connected therewith for rotating the shaft of the block and fall, and operating fingers rotated by the tool rod.

6. In an apparatus for boring cylinders, the combination of a framework adapted to be applied to the end of the cylinder, a hoisting tackle and having a hoisting shaft, a tool rod suspended by a swivel connection from the load chain of said tackle, mechanism mounted on the framework for rotating said tool rod, a star feed wheel mounted on said framework, means rotating with the tool rod for operating the

star feed wheel and a chain sheave attached to the hoisting shaft of the hoisting tackle and connected with the shaft of the star feed wheel, as and for the purpose described.

7. In an apparatus for boring cylinders, the combination of a framework provided with a guide and adapted to be applied to the end of the cylinder with the guide in line with the bore thereof, a tool rod carrier guided in said frame and having a spline connection with a drive wheel mounted on the frame, a hoisting tackle having a hoisting shaft, a tool rod having a swivel support from the load chain of said tackle, means for clamping the tool rod carrier to the tool rod, a star feed wheel, means for rotating the same and connections from said star feed wheel to the hoisting shaft of a hoisting tackle.

8. In an apparatus for boring cylinders, the combination of a tool rod supported from a hoisting tackle having a hoisting shaft, a framework adapted to rest on a cylinder to be bored, drive mechanism for the tool rod mounted on said frame, a sheave on the hoisting shaft of the hoisting tackle and mechanism supported by the frame for communicating the motion of rotation of the tool rod to said hoisting shaft to rotate said shaft and permit said tool rod and attached parts to descend and feed the cutter to the work.

Signed at New York in the county of New York and State of New York this 2d day of October A. D. 1905.

GEORGE H. WARD.

Witnesses:
C. F. TISCHNER, Jr.,
LILLIAN BLOND.