Nov. 19, 1929. J. N. WARRINGTON 1,736,104

PILE EXTRACTOR AND THE LIKE

Filed July 18, 1927

Fig. 1.

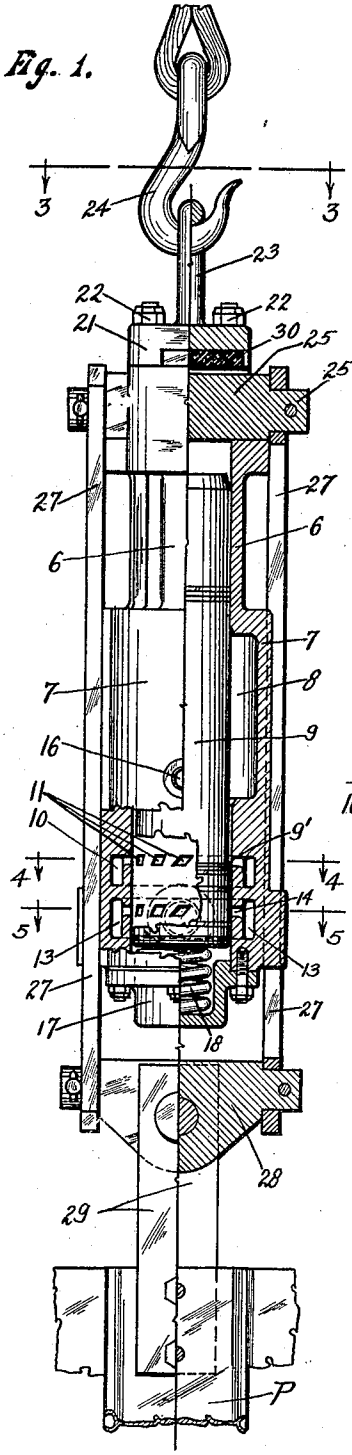


Fig. 2.

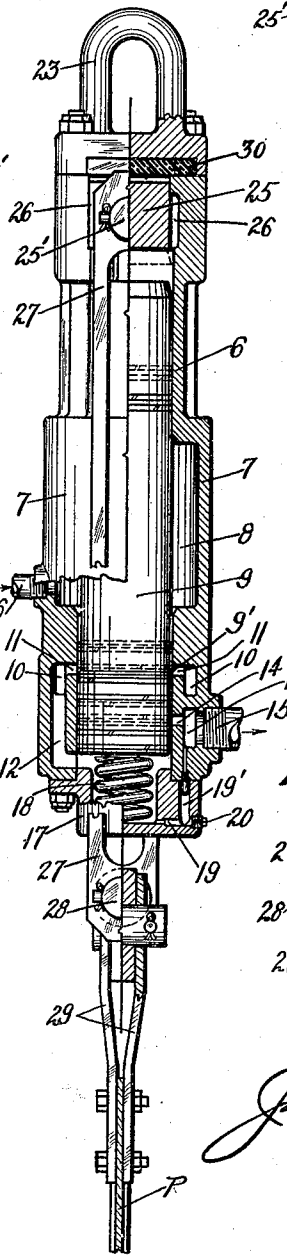


Fig. 3.

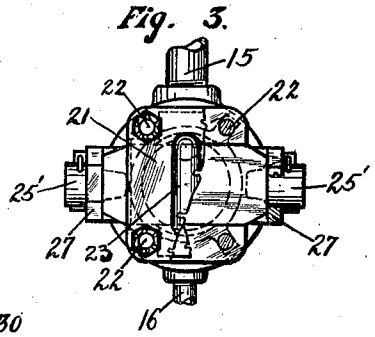


Fig. 4.

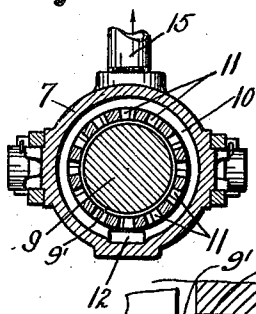


Fig. 4A.

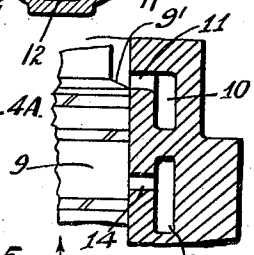
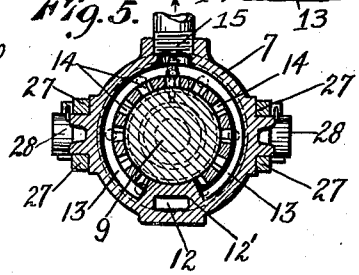


Fig. 5.



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BY

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Patented Nov. 19, 1929 1,736,104

UNITED STATES PATENT OFFICE

JAMES N. WARRINGTON, OF LOS ANGELES, CALIFORNIA

PILE EXTRACTOR AND THE LIKE

Application filed July 18, 1927. Serial No. 206,479.

My invention relates to a device adapted to be interposed in the line of pull for withdrawing pile and the like from the place in which they have been used and operated during the pull on said pile for the purpose of loosening said pile and facilitating the work of withdrawing it.

It is well known that sheet piling used for concrete forms frequently adheres to the concrete and is difficult to withdraw without injury to the pile or to the work, and it is the purpose of my invention to provide a simple, practical and economical device which can be attached as a link in the line of pull from the derrick to the pile and which can be set in operation during the pull to strike upward blows rapidly, thus loosening the pile and enabling the derrick to pull it out.

Another object of my invention is to provide a device of the character referred to in which there is a cylinder with a combination piston, ram and valve operating therein, the one element serving the triple purpose of ram, piston and valve, controlling the inlet and exhaust of steam or compressed air, with suitable co-operating mechanism to receive and apply the blows without injury to the device.

While I have shown my device as particularly adapted to pile extracting apparatus, I am aware that it has many other applications and uses and do not intend to limit it to the particular use and application shown on the accompanying drawings for purposes of description. In the drawings forming a part of these specifications,

Figure 1 is a side elevation of my invention, partly in longitudinal section;

Figure 2 is a similar view at right angles to the view of Fig. 1;

Figure 3 is a top plan view with parts broken away;

Figure 4 is a cross sectional view taken on line 4—4 of Fig. 1;

Figure 4ª is an enlarged detail view to show an annular shoulder on the piston; and

Figure 5 is a cross sectional view taken on line 5—5 of Fig. 1.

Referring now more in detail to the drawings, my invention embodies, as shown for illustrative purposes, a cylindrical body 6, having the enlarged portion 7, to provide an annular chamber 8, around the combination element 9, mounted therein and constituting a piston, a ram and a valve, all three being embodied in the one element 9, as more particularly referred to hereafter. The lower portion of said cylinder body has therein, preferably formed in the wall thereof, an annular passageway 10, with ports 11, opening therefrom into the central part of said cylinder, around the element 9, with a downward extension of said passageway, designated 12, and communicating with the lower end of the cylinder body, as will be clear from Fig. 2. There is also formed a second annular passageway 13, in the wall of said cylinder body, below the passageway 10, with the ports 14, leading therefrom to the inside of said cylinder body 7, as do the ports 11. Said annular passageway 13 is interrupted at one side, as seen in Fig. 5, with solid material forming the downward extension 12, from the annular passage 10, said solid material being designated 12′. Said passageway 13 constitutes an exhaust passage, with outlet connection at 15. An inlet connection 16 is provided in the side of said cylinder body, communicating with the annular chamber 8, around said movable element 9, as will be clear from Fig. 2.

An end block or cap 17 is provided for the lower end of said cylinder body, in which is a coiled spring 18, adapted to yieldingly receive said element 9, as indicated in Fig. 2. An outlet vent from said cap is designated 19, with a removable plug 20, said outlet vent being extended upwardly as at 19′, and communicating with the annular passage 13, and to the exhaust outlet at 15, Fig. 2.

The upper end of said cylinder body is provided with a cap block 21, secured in place with four bolts or screws, as 22, said cap block 21, being provided on top with an integral link or loop, 23, to receive a hook 24, from derrick or other power mechanism for applying pull to said hook and said link. The upper end of said cylinder body 6, below said cap block 21, is provided with a cross head or bar 25, through a suitable opening trans-

versely through said upper end, said opening being designated 26. The outer ends of said cross head or bar 25, are preferably round, as at 25′, upon which are two side bars 27, 27, extended down along opposite sides of said cylinder body, as clearly shown, and provided at their lower ends with a connecting cross head, 28, to which is attached a pull plate or member 29, which is adapted to be attached to pile, P, or other thing which is to be pulled from its place. In the top cap block 21, I have shown a cushioning member, 30, preferably of rubber, with slight clearance between said cushion and the cross bar 25, as shown.

The use and operation of my invention as here illustrated may be briefly described as follows:

Assuming that it is to be used for pulling pile, P and that a derrick is used to furnish the power, attached to the device by means of the hook 24, and that the device as here shown is interposed as a link in the line of pull between the derrick hook 24 and the pile P the pull strain is applied to the upper end of the cylinder through the link or loop 23, and to the cross head or bar 25, and thence through the side bars 27, 27, to the cross bar 28, at their lower ends, and thence through the member 29, to the pile P, to which said member 29 has been attached. If the pile is capable of being pulled with such pull as is applied through this connection, it is unnecessary to use the ram action of the element 9. If the pile sticks, however, and it is desirable to apply blows in the direction of the pull, steam or air under pressure is turned into said cylinder through the inlet at 16, and into the annuler chamber 8. It will be understood that any fluid under pressure can be used. The pressure thus created in said chamber 8, operates on the annular shoulder 9′, of said piston element 9, forcing said piston element down past the ports 11, whereupon said steam or other fluid enters said ports 11, and the annular passage 10, and down to the lower end of said piston element 9, through the passage extension 12, operating to force said piston element 9 upwardly as a ram, its upper end striking the cross bar 25. As soon as the element 9 moves upwardly sufficiently to uncover the ports 14, the steam or fluid below said element 9, is permitted to escape out through the exhaust 15, and said element 9 moves downwardly again as before, its weight and the action of the steam on the annular shoulder 9′, operating to accomplish this downward movement, until the inlet ports 11 are again opened. Thus the lower end of said element 9, operates as a valve over the ports 11 and 14, controlling the by-passes from the annular chamber 8, to the lower end of the cylinder, and from the lower end of the cylinder out through the exhaust 15. There will always be sufficient amount of the fluid in the lower end of said cylinder to act as a cushion for the piston or ram. This is due to the fact that the exhaust outlet ports are closed before said piston or ram reaches its lowermost movement. Should there be no cushioning fluid therein at any time, for any reason, the spring 18, takes the weight of said piston or ram, but normally said spring is not engaged by said ram on its downward movement. The action is to produce a series of intermittent upward strokes against the cross bar 25, during the application of the pull strain from the derrick. The force of these strokes is conveyed through the cross head 25, and the side bars 27, 27, to the pile P.

Thus I have provided a very simple and practical device of the character referred to in which there is no separate valve, for the element 9, operates as its own valve, and its movements control the inlet and exhaust of the operating fluid. It operates as a piston under the action of the operating fluid, and it also operates as a ram, producing intermittent, short strokes against the cross head 25, as heretofore described.

I do not limit the invention to the use illustrated, realizing that there are possibly many different uses to which the invention proper can be put, but it is my intention to cover such similar devices as may come within the scope of the hereto appended claims.

I claim:

1. In combination with a pull line, a cylinder, a combination piston, valve and ram operating as a single, detached element therein, means for admitting an operating fluid to said cylinder to automatically operate said element as a ram to intermittently strike blows in the direction of the pull on said line and means for alternately directing said operating fluid against a small area of said element to return the same for each power stroke.

2. In combination with a pull line, a cylinder adapted to be connected as a link in said pull line, said cylinder having inlet and exhaust openings, and a floating element in said cylinder, said floating element being adapted to operate as a valve, a piston and a ram, means for connecting a supply of fluid under pressure to said cylinder for operating said element as a ram to strike blows in one direction and means for alternately directing said operating fluid against a small area of said element to return the same for each power stroke.

3. A cylinder adapted to be connected at its opposite ends as a link in a pull line and having inlet and exhaust openings, with by-passes, means for connecting a supply of operating fluid to said cylinder, a detached element moving freely in said cylinder and adapted to function as a valve for controlling

said inlet and exhaust openings, as a piston operated by said fluid, and as a ram for striking blows in one direction automatically and means whereby said operating fluid returns said element after each power stroke with less force.

4. Means for pulling pile and the like including in combination a line attached to the pile, a cylinder forming a part of said line and through which pull is applied, said cylinder having inlet and exhaust openings and by-passes therefor, and a combination piston, valve and ram, as a single, integral, detached element moving freely in said cylinder and adapted to be operated intermittently to strike blows in one direction, the power stroke of said element being accomplished by said fluid pressure, and the action of said fluid pressure being controlled by the movement of said element and means whereby said operating fluid returns said element after each power stroke with less force.

5. In combination, a cylinder having inlet and exhaust openings, means for connecting an operating fluid to said inlet opening, a single unitary element floating in said cylinder and operable as a valve to control the inlet and exhaust, as a piston moved by said fluid, and as a ram for striking intermittent blows and means whereby said operating fluid returns said element after each power stroke with less force, substantially in the manner described.

6. In combination, a cylinder having an enlarged annular portion, a cylindrical element in said cylinder bridging at all times said enlarged annular portion, whereby an annular chamber is formed within said cylinder around said element, an annular shoulder on said element below said annular chamber, whereby pressure therein forces said element downwardly, by-pass means uncovered by the downward movement of said element, said by-pass leading to the lower end of said cylinder for moving said element upwardly, and means providing exhaust outlet to be uncovered by the upward movement of said element.

7. In combination, a cylinder, said cylinder having a cylindrical chamber therein with an enlarged portion intermediate its ends, a cylindrical element fitting said cylindrical chamber and bridging the enlarged portion, means for connecting a supply of operating fluid to the annular chamber around said element formed by said enlarged portion, said element having one end provided with an annular shoulder within said cylindrical chamber near one end of said annular chamber, whereby operating fluid in said annular chamber operates on said annular shoulder to move said element in one direction, a by-pass having one end connected with the end of said cylindrical chamber for admitting operating fluid thereto to move said element and having its other end in communication with said annular chamber and adapted to be controlled by a part of said element, and means providing an exhaust from the end of said cylindrical chamber, the opposite end of said element being adapted to intermittently strike blows as it is moved by said operating fluid, and means in said opposite end of said cylinder to receive said blows.

8. In combination, a cylinder having an enlarge portion intermediate its ends, a cylindrical element fitting therein and bridging said enlarged portion, whereby an annular chamber is formed around said element intermediate its ends, one end of said element being slightly larger and forming an annular shoulder in the cylinder near said annular chamber, means for connecting a supply of operating fluid to said annular chamber, said operating fluid operating on said annular shoulder to move said element in one direction, means forming a by-pass around the enlarged part of said element, one end of said by-pass being covered and uncovered by the movement of said element, and the other end of said by-pass communicating with the end of said cylinder and admitting operating fluid to the end of said cylinder to move said element in the opposite direction, the enlarged portion of said element alternately covering and uncovering said by-pass to admit operating fluid to the end of said cylinder, and means forming an exhaust outlet positioned to be alternately opened and closed by said element, whereby said operating fluid automatically and intermitently moves said element as a valve, a piston and a ram.

9. In a device of the character referred to, a cylinder having an enlarged portion intermediate its ends, a cylindrical element fitting said cylinder and bridging said enlarged portion, whereby to form an annular chamber around said element, the end of said element having an annular shoulder moving in said cylinder to be acted on by an operating fluid in said annular chamber, by-pass means from said annular chamber to the end of said cylinder, controlled by said element operating as a valve, whereby said operating fluid automatically operates said element as a ram, and means for connecting a supply of operating fluid to said cylinder.

10. In combination, a cylinder, a cylindrical element moving in said cylinder and being slightly shorter in length than the cylindrical chamber of said cylinder, said element having an annular shoulder at one end thereof, means forming a chamber in the side of said cylinder intermediate its ends and intermediate the ends of said element and communicating with the portion of said cylinder in which said annular shoulder on said element is, means for connecting an operating

fluid to said chamber in the side of said cylinder, to operate on said annular shoulder and move said element in one direction, and means forming a by-pass around said annular shoulder to the end of said cylinder to admit operating fluid for moving said element in the opposite direction, said by-pass being controlled by a part of said element operating as a valve, means forming an exhaust from said cylinder and adapted to be controlled by a part of said element operating as a valve, the opposite end of said element being adapted to operate as a ram when moved by said operating fluid in one direction, means connected with said cylinder to receive the direct blows of said element, and means whereby said operating fluid acts as a cushion for the rebound of said element.

11. In a device of the character referred to, in combination, a cylinder, a combination valve, piston and ram fitting therein and extending throughout the greater part of the length of the cylinder, whereby to have a short movement therein, said combination valve, piston and ram being a unitary element floating freely in said cylinder, means providing inlet and exhaust openings and by-passes for said cylinder, means for connecting a supply of operating fluid thereto, said unitary element having an annular shoulder thereon adapted to receive operating fluid for moving it in one direction, said element operating as a valve to control the admission of operating fluid to the end of said cylinder for moving said element in the opposite direction as a ram, and means whereby sufficient operating fluid is retained in the end of said cylinder to cushion the rebound movement of said element.

12. In a device of the character referred to, a cylinder, a combination valve, piston and ram movably mounted in said cylinder and extending throughout the greater part of the length of said cylinder whereby to have a short movement therein, said combination element having an annular shoulder positioned to be operated on by an operating fluid to move said element in one direction, means providing inlet and exhaust openings and by-passes, all controlled by said element operating as a valve, means for connecting an operating fluid thereto for automatically and intermittently operating said element as a ram, means whereby operating fluid is retained to cushion the rebound of said element in one end of said cylinder, and means for drainage of the end of said cylinder to remove condensation.

13. In combination, a body having a cylindrical chamber therein, means providing additional chamber space intermediate the ends of said cylindrical chamber, a cylindrical element fitting within said cylindrical chamber and extending throughout the greater portion of the length thereof, whereby to have a short movement therein, said element bridging said additional chamber space, said element having a shoulder portion adjacent said additional chamber space, whereby operating fluid therein operates to move said element in one direction, means for connecting a supply of operating fluid to said chamber space, by-pass means to the end of said cylinder for operating fluid to move said element in the opposite direction as a ram, said element operating as a valve to control the flow of said operating fluid, and means whereby sufficient operating fluid is retained in said cylinder end to cushion the rebound of said element, means at the opposite end of said cylinder body to receive the blows of said element operating as a ram, and exhaust means controlled by said element operating as a valve, substantially as described.

14. In combination, a body having a cylindrical chamber therein, means providing an enlarged portion of said cylindrical chamber, a cylindrical element therein extending throughout the greater part of the length of said cylindrical chamber and bridging said enlarged portion intermediate its ends, said element having a shoulder part adjacent said enlarged portion of said cylinder chamber, means for connecting an operating fluid to said device, said operating fluid operating on said shoulder to move said element in one direction, means forming by-pass to the end of said cylinder for operating fluid to move said element in the opposite direction as a ram, said element operating as a valve to control the flow of said operating fluid, means for retaining sufficient operating fluid in the end of said cylinder to cushion said element on the rebound movements thereof, means for exhaust from said cylinder controlled by said element operating as a valve, and means connecting the end of said cylinder by a by-pass with said exhaust for slow leakage therethrough, and means at the opposite end of said body for taking the blows of said element when operated as a ram.

15. In combination, a cylinder, a combination valve, piston and ram element fitting therein, means forming an enlargement of said cylinder chamber intermediate its ends and intermediate the ends of said element, means for connecting an operating fluid therewith, inlet and exhaust openings and by-passes all controlled by said element operating as a valve, means whereby said operating element automatically operates said element as a ram and piston and valve, cushioning means at the opposite ends of said cylinder body to receive the opposite ends of said element, and means whereby operating fluid operates as a cushioning means for the rebound of said element in said cylinder.

16. In combination with a pull line, a cylinder, means for connecting the upper end of said cylinder to said pull line, means connected

with the upper end of said cylinder and outside of said cylinder for connecting the upper end of said cylinder to a pile to be pulled, the lower end of said cylinder being suspended in said connecting means, a combination valve, piston and ram operating in said cylinder, means for connecting an operating fluid to said cylinder for operating said element as a ram, by-pass means controlled by said element operating as a valve to control the flow of said operating fluid, whereby said operating fluid automatically operates said element as a valve, a piston and a ram, means whereby said operating fluid in the end of said cylinder operates to cushion the rebound of said element, means for drainage of said cylinder of liquid therein, and cushioning means at the upper end of said cylinder body to cushion any blow transmitted to the direct connection to said cylinder, substantially as described.

17. In combination with a pull line, a cylinder body having its upper end connected in said pull line, a cross bar through the upper end of said cylinder body, connecting members from said cross bar at opposite sides of said cylinder and connected with a cross bar at their lower ends below the lower end of said cylinder, whereby pull on the upper end of said cylinder is transmitted through said connecting members to said lower cross bar, said cylinder having inlet and exhaust openings and by-pass means for operating fluid, a combination valve, piston and ram element operating in said cylinder and adapted to be automatically and intermittently operated as a ram to strike said upper cross bar, and means whereby sufficient operating fluid is retained in a lower end of said cylinder to cushion the rebound of said element, substantially as described.

Signed at Los Angeles, Los Angeles County, California, this 12th day of July, 1927.

JAMES N. WARRINGTON.