July 28, 1931. H. C. MILLER ET AL 1,816,736

HYDRAULIC JACK

Filed May 18, 1928 2 Sheets-Sheet 1

FIG. 1.

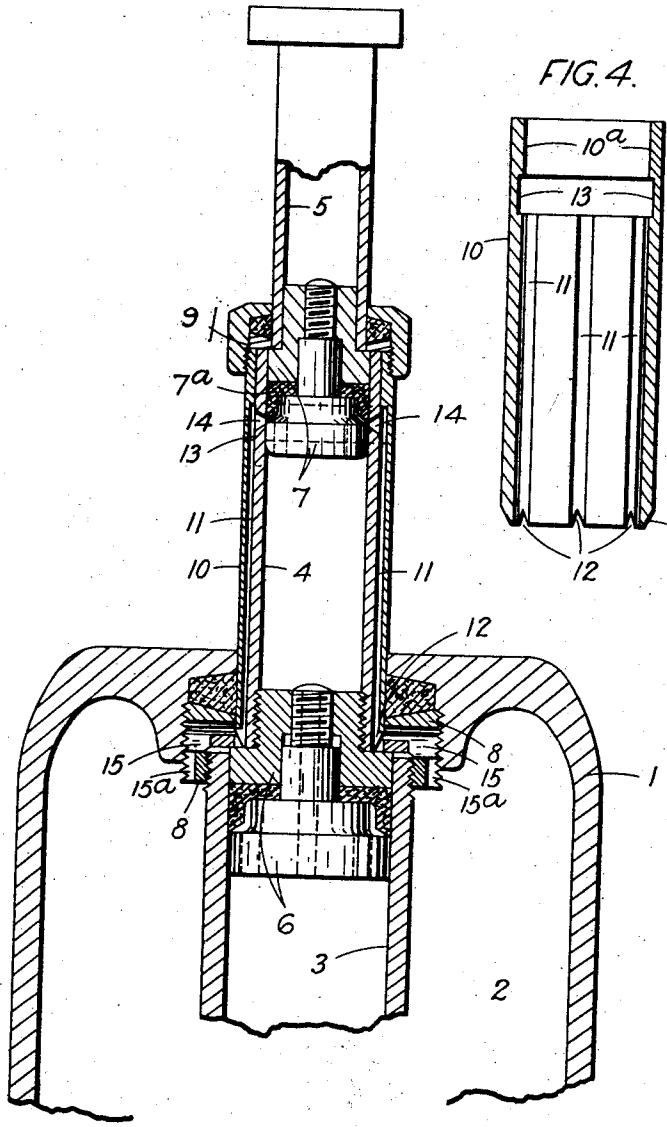
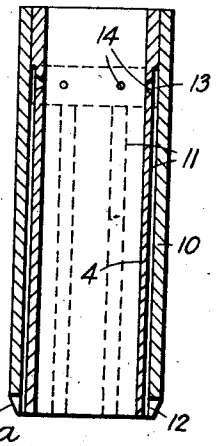


FIG. 4.

FIG. 5.



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FIG. 2.

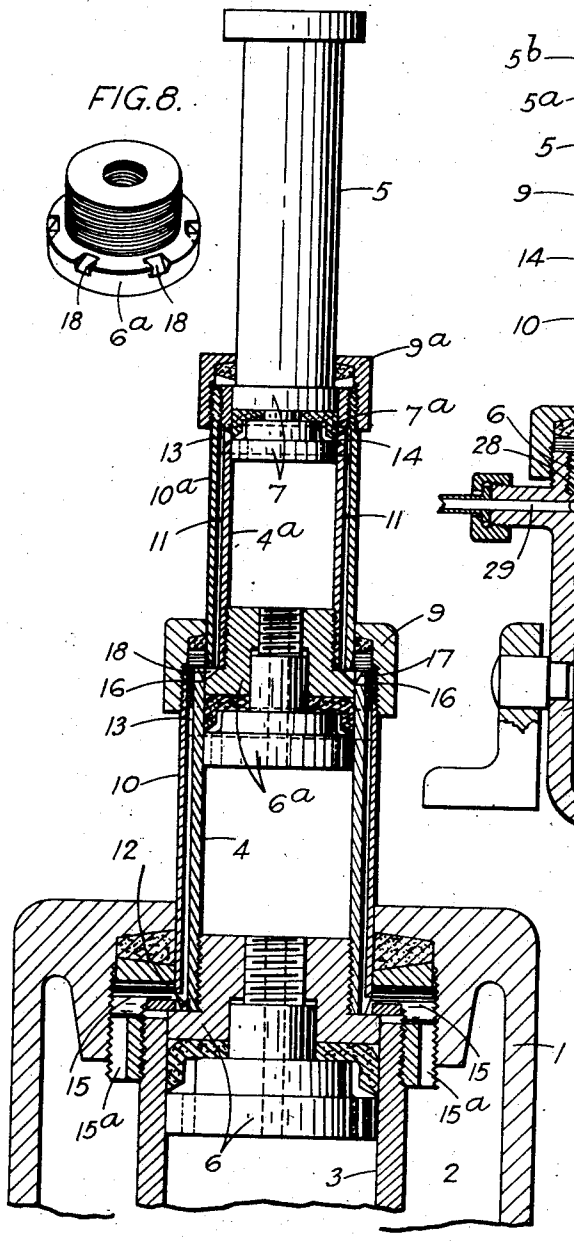


FIG. 8.

FIG. 3.

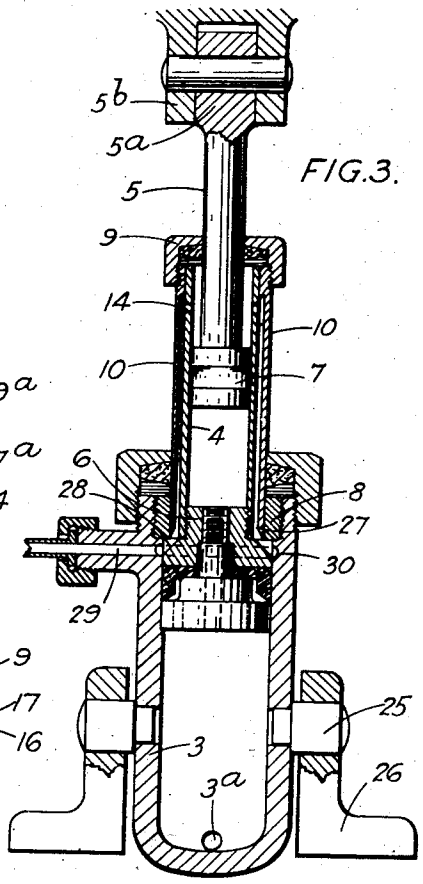


FIG. 6.

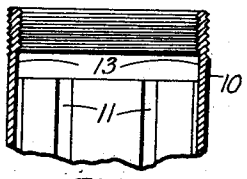
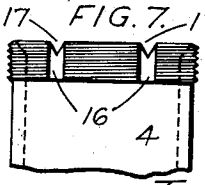


FIG. 7.



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UNITED STATES PATENT OFFICE

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HYDRAULIC JACK

Application filed May 18, 1928, Serial No. 278,826, and in Great Britain May 18, 1927.

This invention relates to hydraulic jacks and like lifting and tipping devices wherein the ram comprises two or more telescopic sections, and has for its object to improve the construction and arrangement of such rams so as to prevent damage thereto by continuous pumping when the ram is fully extended, and likewise to avoid leakage of the motive fluid at the ram joints.

According to this invention, in a hydraulic jack or like lifting or tipping device of the kind referred to, the telescopic tubular ram sections or lifts are provided with relief passages or ducts which are furnished with inlet and outlet apertures and arranged in the walls of the telescoping ram sections so that when the ram has reached the extremity of its lift the pressure chamber within the extended ram is connected through the relief passages or ducts to an outlet or overflow leading to the reservoir or sump of the jack or the like, and thus provide for the escape of excess of motive fluid from the pressure chamber when pumping is continued after the telescoping ram has reached the extremity of its lift.

The relief passages or ducts may be in the form of annular jackets or may consist of grooves or channels formed either internally or externally of the bottom and each of the intermediate tubular ram sections, and be enclosed by a liner or sleeve.

In one convenient construction the pressure relief passages or ducts are provided by fitting the bottom and each of the intermediate ram sections with an internally grooved or channelled sleeve, the lower end of which bears against the enlarged piston end of the ram section. Alternatively, the grooves or channels may be formed on the exterior of the ram section so as to be enclosed by the sleeve; or grooves or channels may be formed in the adjacent surfaces of the sleeve and the ram section enclosed therein.

When the grooves or channels are formed in the interior surface of an external sleeve, they conveniently terminate at their upper ends in an annular recess formed near the upper end of the sleeve, while their lower ends terminate in slots or openings formed in the bottom edge of the sleeve.

In the case of a two lift telescopic ram, the relief passages or ducts are formed in the bottom tubular section, while in the case of a ram having three or more lifts or sections, the relief passages or ducts are formed in the intermediate section or sections of the ram as well as the bottom section thereof; the relief passages in either case being connected to the interior of the ram by one or more perforations or vents formed in the upper end of the section immediately following the top or last ram lift or section. Thus, in the case of a two lift ram the perforations or vents are formed in the upper end of the wall of the bottom ram section, so that when the top ram section, which telescopes therein, is at the extremity of its lift the cup leather of such section just uncovers the perforations or vents and allows any excess of motive fluid to escape therethrough into the relief passages by which such fluid is returned to a reservoir or sump.

If desired a compression spring or resilient buffer may be arranged between the enlarged piston end of the top lift or section of the ram and the stop collar with which it co-operates, to retard the outward movement of such top lift or section towards the end of its stroke, so that continued pumping will move the top section against the resistance of the spring or buffer until the perforations or vents are uncovered by the cup leather on the piston end of such section, and thus enables the excess motive fluid to escape via the relief passages or ducts as above described.

The invention is illustrated by way of example in the accompanying drawings, wherein:—

Figure 1 is a vertical section illustrating one application of the invention to a hydraulic jack having a two lift telescopic ram.

Figure 2 is a similar view illustrating one application of the invention to a hydraulic jack having a three lift telescopic ram.

Figure 3 is a vertical section illustrating one application of the invention to a hydraulic vehicle tipping device having a two lift telescopic ram.

Figures 4, 5, 6, 7 and 8 illustrate details of construction presently referred to.

The jack illustrated at Figure 1 comprises a base 1 furnished as usual with a reservoir 2 for oil or other motive fluid, and a pressure cylinder 3 in which the telescopic ram works; a suitable force pump (not shown) being provided for forcing the oil or other motive fluid from the reservoir 2 into the pressure cylinder 3 in order to raise the ram in known manner.

The ram comprises a bottom tubular section 4 furnished with an enlarged perforated piston end 6 that works in the pressure cylinder 3, and a top section 5 provided with an enlarged piston end 7 that telescopes in the bottom section 4, into which latter the motive fluid is admitted through the perforated piston end 6, and when the ram is extended the piston ends 6 and 7 bear against the perforated stop collars and glands 8 and 9 secured as usual at the upper ends of the pressure cylinder 3 and the bottom tubular ram section 4 respectively.

As shown, the tubular ram section 4 is fitted with an external sleeve 10 that is screwed, brazed or otherwise secured thereto, with its lower edge seated upon the enlarged piston end 6, while its upper edge is flush with the upper edge of the ram section; the perforated gland and stop collar 9 being screwed or otherwise firmly secured to the upper end of such sleeve.

The relief passages or ducts for the circulation of excess motive fluid are provided by forming grooves or channels 11 in the inner surface of the sleeve 10, the lower ends of which grooves or channels terminate in slots or openings 12 formed in the bottom edge of the sleeve which is bevelled off externally as indicated at 12*a* in Figures 4 and 5, while their upper ends terminate in an annular recess 13 formed in the sleeve, as indicated at Figure 4 which is a sectional view of the sleeve.

The annular recess 13 of the sleeve registers with one or more perforations 14 through the wall of the tubular ram section 4, while the slots or openings 12 at the bottom of the sleeve register with perforations 15 formed in the stop collar 8 of the pressure cylinder 3, which perforations lead into the reservoir 2 via the slots 15*a* formed in the periphery of the stop collar 8.

The perforations 14 are arranged in the wall of the tubular ram section 4 so that the same are just uncovered by the cup leather 7*a* on the enlarged piston end 7 of the top ram section 5 when this section is at the extremity of its lift with its piston end 7 hard up against the stop collar 9 of the bottom ram section 4, so that if pumping of the motive fluid is continued the same escapes from the interior of the ram section 4 through the perforations 14 and is returned to the reservoir 2 via the relief passages or ducts 11.

The perforations 14 in the wall of the tubular ram section 4 are tapered outwardly as indicated, so as to prevent the same being choked by shredding of the cup leather or other foreign matter.

The jack illustrated at Figure 2 is similar to that described at Figure 1, except that the ram consists of three telescoping sections or lifts.

In this construction internally grooved sleeves 10 and 10*a* are fitted to the bottom ram section 4 and the intermediate ram section 4*a* respectively, while the vents or perforations 14 through which the grooved sleeves are connected to the interior of the telescoping ram are formed towards the upper end of the intermediate tubular ram section 4*a* instead of in the bottom ram section 4 as last described. Such vents or perforations 14 are just uncovered by the cup leather 7*a* on the piston end 7 of the top ram section when the latter is at the extremity of its lift and hard up against the stop collar 9*a* of the intermediate ram section 4*a*, the motive fluid passing into the latter through its enlarged perforated piston end 6*a* in known manner.

The grooves or channels in the sleeves 10*a* and 10 of the intermediate and bottom tubular ram sections are interconnected when the ram is fully extended by connecting grooves formed in the piston end of the intermediate ram section and the upper end of the bottom ram section.

As shown at Figures 2 and 7, the upper edge of the bottom ram section 4 is bevelled off internally as indicated at 16, while short grooves 17 are formed externally of the upper end, the top of such grooves terminating in slots 18 formed in the bevelled upper edge 16, while their lower ends communicate with the annular recess 13 in the sleeve 10.

The lower ends of the grooves or channels of the sleeve 10*a* of the intermediate ram section register with inclined slots 18 (see Figures 2 and 3) formed in the upper face of the enlarged piston end 6*a* of the intermediate ram section 4*a* and when the ram is fully extended the grooves in the sleeve 10*a* of the intermediate ram section communicates with the corresponding grooves in the sleeve 10 of the bottom ram section through the slots 18 and 17 and the external grooves 16 of the bottom ram section 4, so that excess of motive fluid escaping from the interior of the extended ram through the perforations or vents 14 can pass back via the grooves or channels to the reservoir or sump 2, as previously described.

Figure 3 illustrates one application of the invention to a hydraulic tipping device for

a vehicle or the like furnished with two telescoping ram sections or lifts.

As shown, such apparatus comprises a ram cylinder or pressure chamber 3 which is carried by trunnions 25 which journal in brackets 26 mounted upon the underframe of the vehicle (not shown).

The pressure chamber 3 is provided with an inlet 3*a* which is connected through a suitable force pump to an oil or water reservoir or the like, the upper end of the pressure chamber 3 being provided as usual with a perforated stop collar and gland 8 through which the bottom tubular section or lift 4 of the ram works, while the top section 5 of the ram works through a similar stop collar and gland 9 secured as usual to the bottom ram section, the head 5*a* of the top ram being pivotally connected to a lug 5*b* on the vehicle or other body to be lifted or tipped.

The bottom ram section 4 is fitted with an internally grooved external sleeve 10, and perforations or vents 14 are formed in the walls thereof so as to be just uncovered by the cup leather 7 of the top ram section when the latter is fully extended as previously described.

The bottom of the sleeve 10 is bevelled off internally as indicated at 27, so that the lower ends of the grooves or channels 11 in such sleeve are connected with radial slots 28 formed in the piston end 6 of the bottom ram section, which slots connect with an outlet 29 provided at the upper end of the ram cylinder or pressure chamber 3 through an annular groove 30 formed in the latter.

With this construction, as with those previously described, continued pumping of the motive fluid after the ram has reached the extremity of its lift, forces the motive fluid through the perforations or vents 14 into the relief passages or ducts formed by the grooved sleeve 10, and thence to the outlet 29 which may lead back to the reservoir or sump from which the motive fluid is pumped.

The relief passages or ducts may be formed in the tubular ram section or sections in any preferred manner. Thus, instead of forming the grooves or channels 11 and the annular recess 13 of the inner surface of the sleeve these may be formed in the exterior surface of the tubular ram section or sections, as indicated for example in the detail sectional view (Figure 5); such grooves or channels being covered by an external sleeve so that the slots or openings 14 in the bevelled lower edge thereof register with the external grooves or channels of the ram section.

We claim:—

1. A hydraulic jack having a ram that comprises a plurality of sections which telescope one into the other, wherein the bottom and each of the intermediate sections of the telescopic ram is fitted with an internally grooved sleeve to form passages externally of each of said ram sections, the passages of each section being provided at the ends with inlet and outlet apertures arranged so that when said telescopic ram sections are fully extended said passages continuously intercommunicate and terminate at one end in an overflow while the opposite end of said interconnecting passages are connected to the interior of the ram through perforations formed in the upper end of the ram section immediately following the top section, said perforations being uncovered by said top section when the latter is at the extremity of its lift, so that excess of motive fluid can escape from the interior of the extended ram to the overflow by way of said perforations and intercommunicating passages.

2. A hydraulic jack according to claim 1, comprising a telescopic ram of three or more telescoping sections, wherein the grooved sleeves of the intermediate section or sections communicate with grooves formed in the piston end of each of such sections, said grooved piston ends being connected to external grooves formed in the next succeeding ram section by openings in the upper end of such succeeding section.

In testimony whereof we affix our signatures.

H. C. MILLER.
MAY SUMNER,
Executrix of George Percy Sumner, deceased.