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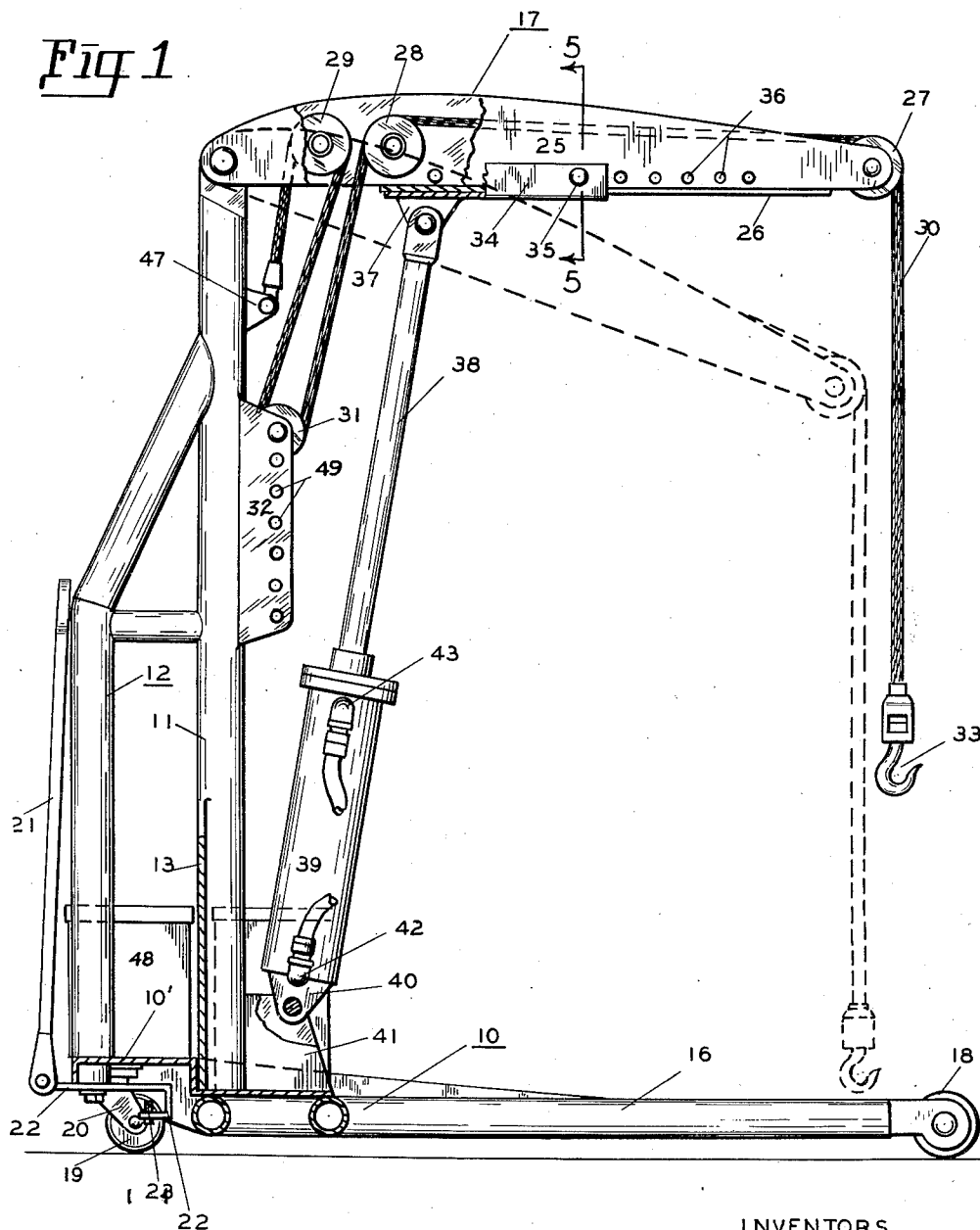
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HYDRAULIC FLOOR CRANE

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2 Sheets-Sheet 1

Fig 1



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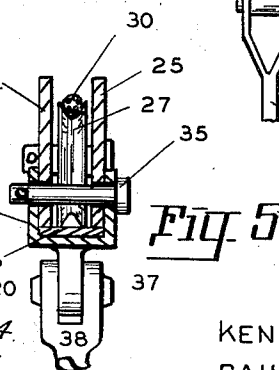
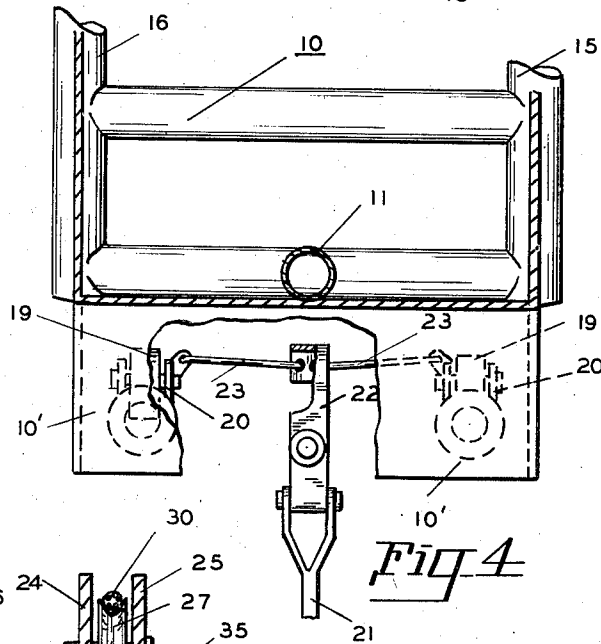
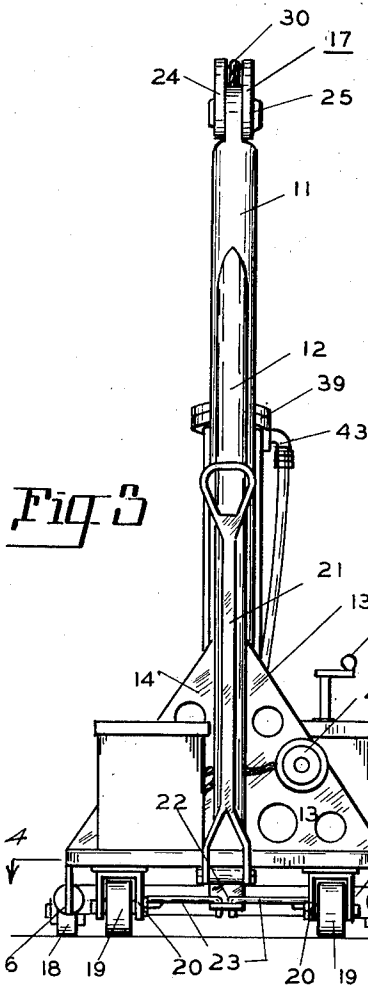
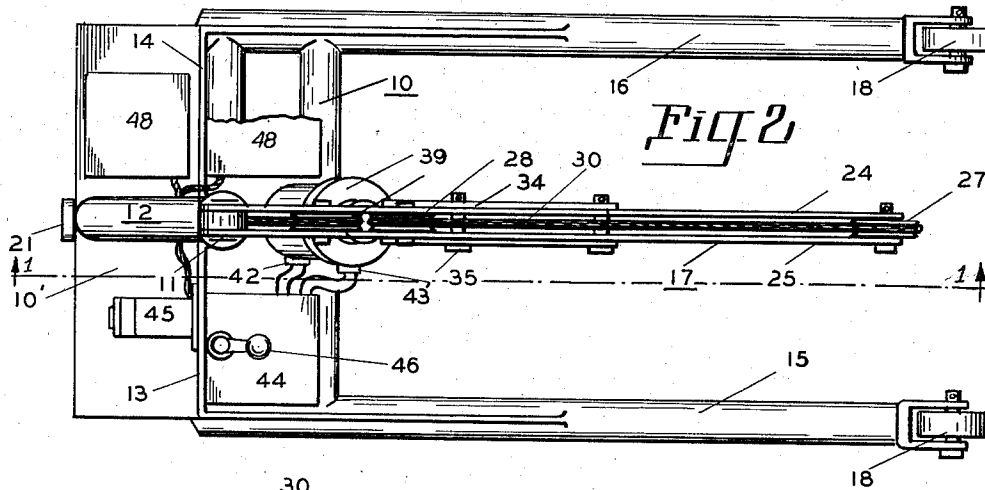
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HYDRAULIC FLOOR CRANE

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5 Claims. (Cl. 212-8)

This invention relates in general to hoisting mechanism and cranes, and particularly to cranes mounted on movable bases suitable for general use in garages, machine shops, etc. More specifically, this invention relates to hydraulically operated hoists and cranes of the cantilever type.

An object of this invention is to provide an improved portable crane which will be simple in construction and capable of quick and easy operation.

Another object of this invention is to provide a cantilever-type floor crane in which the length of the hoist cable can be readily adjusted without the employment of the usual windlass or rotatable drum.

A further object of this invention is to provide a hydraulic crane in which a cantilever arm and hoist cable are so combined that the lifting movement of the arm will simultaneously produce a shortening of the distance between the free end of the hoist cable and the movable end of the arm, and vice versa, thereby reducing the amount of movement actually required of the lever arm itself.

These objects or other advantages we obtain by constructing our improved hydraulic floor crane in the manner hereinafter briefly described in reference to the accompanying drawings.

In the drawings:

Fig. 1 is a sectional side elevation of the crane taken on the line 1-1 of Fig. 2, with a portion of the cantilever arm broken away the broken lines indicating the cantilever arm and hoist cable moved to a different desired position for lifting a particular load;

Fig. 2 is a top plan view of the crane;

Fig. 3 is an end elevation as viewed from the left in Fig. 2;

Fig. 4 is a fragmentary section on the line 4-4 of Fig. 3 with a portion of the base broken away to show the steering connection associated with the tongue; and

Fig. 5 is a vertical transverse section through the cantilever arm taken on the line 5-5 of Fig. 1.

The crane includes a suitable base, indicated in general by the reference character 10, on which is rigidly mounted the standard or pedestal 11. The pedestal 11 is further braced to the base by an upright member 12, to which it is attached by suitable welded connections. The bottom of the upright member 12 is welded to the extension 10' of the base. A pair of triangular plates 13 and 14, welded to the base 10 and to the pedestal 11 also act as bracing members for the pedestal.

The base 10 includes a pair of identical hori-

zontal extensions 15 and 16 at each side, which preferably extend for a distance from the base of the pedestal 11 equal at least to the length of the cantilever arm 17 so as to provide adequate stability for the crane under all load-lifting conditions. A wheel 18 is rotatably mounted in the outer end of each of the base extensions 15 and 16.

A second pair of wheels 19 are mounted in forked supports 20 which in turn are respectively attached, by suitable pivotal mountings, below the base extension 10'. This second pair of castor-like wheels 19 facilitate the steering of the crane as it is pulled or pushed from place to place on the floor. A handle or tongue 21 for the crane is hinged to a pivoted bracket 22 which bracket is pivoted beneath the base extension 10' for movement in a horizontal plane, and the inner end of the bracket 22 is connected by links 23 to the pivotal forked supports 20 of the castor-like wheels 12. This convenient steering means enables the crane to be turned in a small space on the floor.

The cantilever arm, indicated in general by the reference character 17, has its secured end pivotally connected to the top of the pedestal 11 as shown. The cantilever arm is preferably composed of two parallel identical spaced side plates 24 and 25 which are secured in parallel relationship by a bottom connecting plate 26 (Figs. 1 and 5) to which they are securely welded. At the outer end of the compound cantilever arm 17 a pulley or sheave 27 is rotatably mounted on a stub shaft extending between and through the side plates 24 and 25. Two similar pulleys 28 and 29 are mounted in the arm 17 near the inner or attached end in the relative positions shown in Fig. 1.

A fourth pulley 31 is mounted between a pair of parallel vertical bracket plates 32 secured to the pedestal 11. One purpose of these four pulleys, as apparent from Fig. 1, is to act as guiding and supporting means for the hoist cable 30. The inner end of the hoist cable 30 is secured in any suitable manner to the pedestal 11 as indicated at 47 in Fig. 1. The outer and free end of the hoist cable 30 carries the customary swivel hook 33 or similar convenient means for attachment to the load to be lifted.

A U-shaped plate 34 (Figs. 1 and 5), extending around the underside of the cantilever arm 17, is secured in position on the arm by a pair or more of pins 35 which extend through the sides of the U-shaped plate 34 and through suitable holes 36 provided in the side plates of the cantilever arm 17. The bottom of the U-shaped plate

34 carries an integral bracket 37 to which the end of a hydraulic piston rod 38 is pivotally connected.

A hydraulic cylinder 39, secured by means of a pivotal base mounting 40 to a bracket 41, which bracket in turn is welded to the base 10 and to the bottom of the pedestal 11, contains the usual hydraulic piston (not shown) which is attached to the lower end of the piston rod 38. The hydraulic cylinder 39 is provided with the usual ports 42 and 43 at the bottom and at the top of the cylinder respectively, and a suitable flexible tubing connects these ports to a hydraulic pump 44 which is operated by a small electric motor 45 (see Figs. 2 and 3). Operation of the pump 44 and motor 45 is governed by manual control lever 46. The pump includes valve controls and hydraulic fluid reservoir like the various types of hydraulic pumps used in hydraulic hoists, etc. Movement of the control lever 46 to the extreme position in one direction causes hydraulic fluid to be delivered to the cylinder 39 through port 42 below the cylinder piston forcing the piston upwardly; while movement of the control lever to the reverse position will permit reverse movement of the hydraulic fluid through port 42 and thus permit the hydraulic piston to be moved downwardly by the weight of the arm 17. Electric energy for operating the motor 45 is furnished from storage batteries 48.

It will be observed from Fig. 1 that movement of the cantilever arm 17 up or down will not only move the free end of the hoist cable 30 and the hook 33 simultaneously up or down; but, due to the fact that the position of pulley 31 remains fixed during such up or down movement of the arm 17, the hook 33 will actually move up or down more rapidly than the end of the cantilever arm 17. In other words, when the cantilever arm 17 is swung downwardly from the horizontal full line position shown in Fig. 1 to the dotted line position, the distance between the hook 33 and the pulley 27 will not remain the same, but will actually be increased. Similarly, if the lever arm 17 were swung upwardly, the distance between the pulley 27 and the hook 33, or end of the hoist cable, would be reduced. Thus as previously stated, the hook 33 will be raised more rapidly than the end of the arm 17 when the arm is raised, and will be lowered more rapidly than the end of the arm when the arm is lowered. The result of this gain in speed of movement of the end of the hoist cable is to reduce the amount or period of operation required for the hydraulic pump.

Although we have shown and described the hydraulic pump in our crane as electrically driven, a hand pump can also be used very satisfactorily with our device, dispensing with the necessity for any electric motor and batteries. Hydraulic hand pumps, for example, are commonly used with hydraulic jacks and their operation is very simple and easy. The fact that the period of operation of the pump is reduced in our crane is of particular importance when a hand hydraulic pump is employed.

As a further means of minimizing the actual amount of pump operation required, we provide a simple expedient for adjusting the free end length of the hoist cable 30 extending below the end of the cantilever arm. This is accomplished by adjusting the position of the pulley 31 in the pair of vertical supporting plates 32. These plates 32 are formed with respective pairs of registering holes 49 so that the pin on which the pulley 31 is

rotatably mounted may be placed through any pair of holes according to the length of hoist cable which is desired to extend below the actual end of the cantilever arm. Thus, it is evident from Fig. 1 that moving the pin for the pulley 31 to a lower pair of holes will shorten the downwardly extending free end of the hoist cable 30. An advantage of this adjustment can be seen if it will be assumed that the crane is to be used for lifting and moving a series of heavy objects which are supported in such position that the tops extend above the full line position of the hook 33, as shown in Fig. 1. The adjusting of the position of the pulley 31 to a lower pair of holes in the plates 32 will raise the hook 33 so that the crane will be in position to carry out the lifting and moving of these objects without any excessive raising of the cantilever arm.

The U-shaped plate 34 carrying the bracket 37 to which the hydraulic piston rod 38 is connected, is shown in Fig. 1 as adjustably mounted on the cantilever arm 17; thus, by adjusting the position of the U-shaped plate 34, the piston rod connecting bracket 37 can be moved further out on the cantilever arm 17. The result of such change of relative location of the bracket 37 will be readily understood. Thus, when the bracket 37 is positioned further out on the arm 17, less up and down movement of the arm 17 will be produced by a given amount of movement of the piston rod 38 than when the bracket 37 is in the position shown in Fig. 1, but the leverage will, of course, be greater when the bracket is moved further out. Under special conditions, when a controlled very slight lifting of the load is desired, it might be more desirable to have the bracket 37 placed in such adjusted position further out on the cantilever arm. For ordinary purposes, however, the bracket position illustrated in Fig. 1 is the most practical. Furthermore, if desired, this adjustable feature can be omitted, and for ordinary use the bracket 37 can be welded solidly to the cantilever arm 17 and the adjustable U-shaped bracket 34 entirely dispensed with.

Various other modifications and changes in the details of construction of the separate members of our floor crane might be made without departing from the scope of our invention. It is not our intention to restrict our crane to the exact form or construction of the individual members previously described or to limit our invention otherwise than as set forth in the claims.

We claim.

1. In a hydraulic crane of the character described, a base, a pedestal mounted on said base, a cantilever arm hinged to the top of said pedestal for up and down movement in a vertical plane, a hydraulic cylinder and piston, means for pivotally supporting said cylinder near the bottom of said pedestal, a piston rod extending upwardly from said cylinder, the upper end of said piston rod pivotally connected to said cantilever arm, a pulley mounted in the outer end of said arm, a pair of pulleys supported on said arm between the inner hinged end of said arm and the pivotal connection of said piston rod with said arm, a fourth pulley mounted on said pedestal, a hoist cable, means for attaching the inner end of said cable in fixed position on the crane, said cable extending from said attached end over the nearest pulley on said cantilever arm, around said fourth pulley and thence over the remaining two pulleys on said cantilever arm, the free end of said cable extending downwardly from the pulley on the outer end of said arm and terminating in a load

engaging element, means, including a hydraulic pump, for actuating said hydraulic piston and rod, and a manual control for said piston actuating means, whereby said load engaging element will be caused to move up or down with, but more rapidly than, the end of said cantilever arm when said arm is moved by said piston rod.

2. In a hydraulic crane of the character described, a base, a pedestal mounted on said base, a cantilever arm hinged to the top of said pedestal for up and down movement in a vertical plane, a hydraulic cylinder and piston, means for pivotally supporting said cylinder near the bottom of said pedestal, a piston rod extending upwardly from said cylinder, a bracket adjustably mounted on the underside of said cantilever arm, the upper end of said piston rod pivotally connected to said bracket, a pulley mounted in the outer end of said arm, a pair of pulleys supported on said arm between the inner hinged end of said arm and said bracket, a fourth pulley adjustably mounted on said pedestal, a hoist cable, means for securing the inner end of said cable in a fixed position on the crane, said cable extending from said secured end over the nearest pulley on said cantilever arm, around said adjustably mounted fourth pulley and thence over the remaining two pulleys on said cantilever arm, the free end of said cable extending downwardly from the pulley on the outer end of said arm and terminating in a load engaging element, means, including a hydraulic pump, for actuating said hydraulic piston and rod, and a manual control for said piston actuating means, whereby said load engaging element will be caused to move up or down with, but more rapidly than, the end of said cantilever arm when said arm is moved by said piston rod, and whereby the length of said free end of said cable can be changed by adjusting the position of said adjustable fourth pulley.

3. A hydraulic floor crane including a base, wheels supporting said base, a pedestal mounted on said base, a cantilever arm hinged to the top of said pedestal for up and down movement in a vertical plane, a hydraulic cylinder and piston, means for supporting said cylinder on said base, a piston rod extending upwardly from said cylinder, the upper end of said piston rod pivotally connected to said cantilever arm, a pulley mounted in the outer end of said arm, a pair of pulleys supported on said arm between the inner hinged end of said arm and the pivotal connection of said piston rod with said arm, a fourth pulley mounted on said pedestal, a hoist cable, means for attaching the inner end of said cable in fixed position on the crane, said cable extend-

ing from said attached end over the nearest pulley on said cantilever arm, around said fourth pulley and thence over the remaining two pulleys on said cantilever arm, the free end of said cable extending downwardly from the pulley on the outer end of said arm, a load-engaging element on the free end of said cable, means, including a hydraulic pump, for actuating said hydraulic piston and rod, and a manual control for said piston actuating means, whereby said load engaging element will be caused to move up or down with, but more rapidly than, the end of said cantilever arm when said arm is moved by said piston rod.

4. A hydraulic floor crane of the character described comprising a base, wheels supporting said base, a pedestal mounted on said base, a cantilever arm hinged to the top of said pedestal for up and down movement in a vertical plane, a hydraulic cylinder and piston, means for pivotally supporting said cylinder on said base, a piston rod extending upwardly from said cylinder, the upper end of said piston rod pivotally connected to said cantilever arm, a pulley mounted in the outer end of said arm, a pair of pulleys supported on said arm between the inner hinged end of said arm and the pivotal connection of said piston rod with said arm, a fourth pulley adjustably mounted on said pedestal, a hoist cable, means for securing the inner end of said cable to said pedestal, said cable extending from said secured end over the nearest pulley on said cantilever arm, around said adjustably mounted fourth pulley and thence over the remaining two pulleys on said cantilever arm, the free end of said cable extending downwardly from the pulley on the outer end of said arm, a load-engaging element on the free end of said cable, means, including a hydraulic pump, for actuating said hydraulic piston and rod, an electric motor for operating said pump, and a manual control for said piston actuating means, whereby said load engaging element will be caused to move up or down with, but more rapidly than, the end of said cantilever arm when said arm is moved by said piston rod, and whereby the length of said free end of said cable can be changed by adjusting the position of said adjustable fourth pulley.

5. The combination set forth in claim 4 with said base, including a pair of parallel horizontal extensions, extending to a distance from the base of said pedestal equal at least to the length of said cantilever arm.

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