March 14, 1961 E. V. SELLARS ET AL 2,974,809

FLOOR CRANES

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Fig. 1

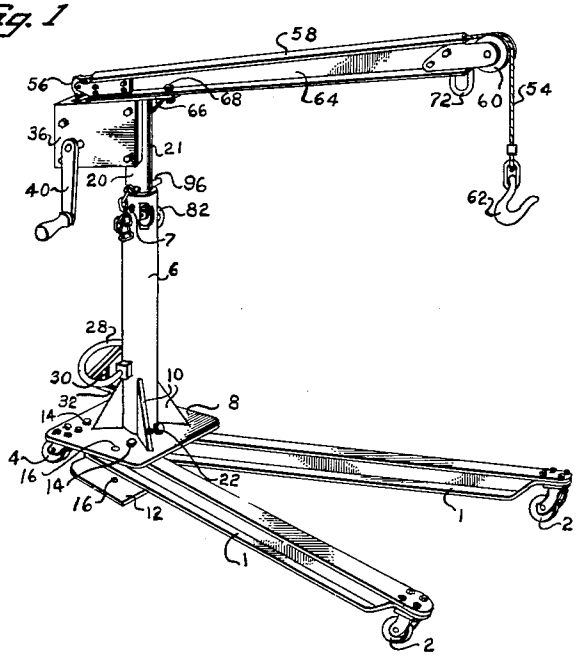
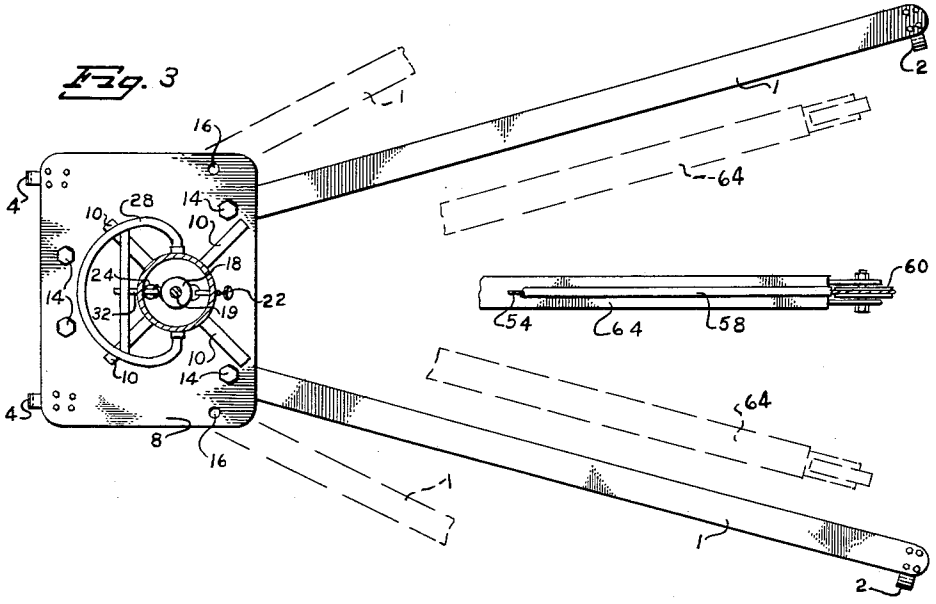


Fig. 3



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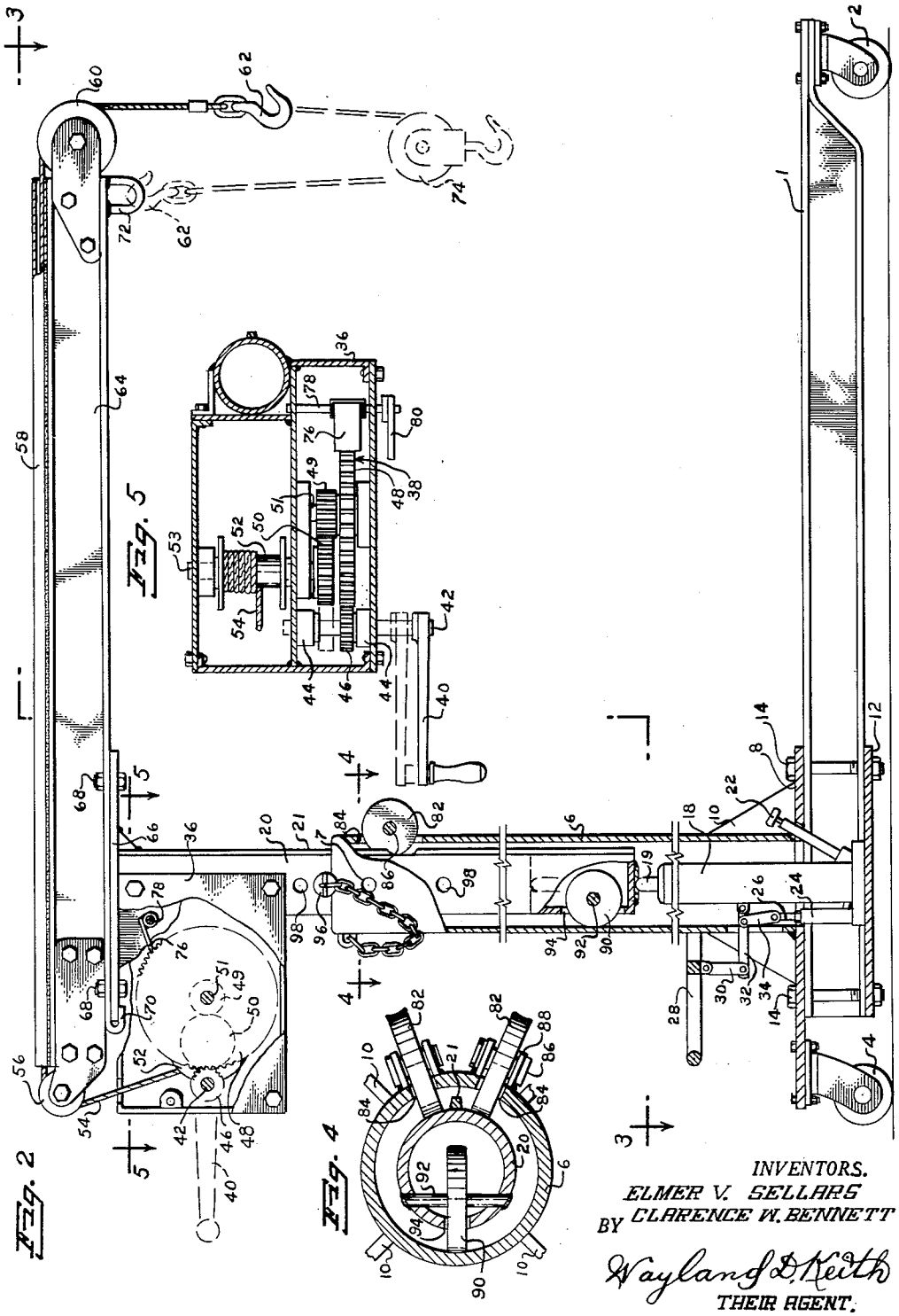


Fig. 2

Fig. 4

Fig. 5

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FLOOR CRANES

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1 Claim. (Cl. 212—34)

This invention relates to improvements in floor cranes, and more particularly to floor cranes for use in shops, such as automobile repair shops, machinery maintenance shops, and the like, where it is desirable to have a versatile crane which will readily lift several hundred pounds, and which is of such construction as to be readily mobile, to enable it to be moved from place to place for performing lifting operations.

Various cranes have been proposed heretofore, but these for the most part, were of such size and construction as did not readily lend to the use thereof by a single workman.

The present device is of a character which will enable a single workman to remove an engine or the like from the chassis of an automobile, without the aid of a helper, which device may be built small in size, yet have the structure thereof of sufficient strength as to readily enable the lifting of the heaviest types of automotive and truck engines from the frames on which they are mounted, without the necessity of using auxiliary power boosters.

An object of this invention is to provide a floor crane which is stable, for lifting loads within the capacity thereof, and the boom of which may be moved from side to side, with the entire crane assembly being movable forward or backward to accommodate the removal or replacement of motors or the like from close or confined places.

Another object of this invention is to provide a floor crane which may be readily dismantled and packed into a small carton for shipping or storage, and which may be readily assembled at the place of use.

Still a further object of this invention is to provide, in a floor crane, the combination of a winch and a hydraulic lifting mechanism, which components may be used independently of each other, or together to accomplish a desired lifting action.

A yet further object of the invention is to provide a floor crane, the boom of which may be locked in position at selected points within the length of movement of the upright slidable member.

Still a further object object of the invention is to provide a floor crane which is simple in construction, easy to operate, sturdy in construction, powerful in lifting capacity, and which may be used with a minimum of instructions.

With these objects in mind and others which will become manifest as the description proceeds, reference is to be had to the accompanying drawings, in which like reference characters designate like parts in the several views thereof, in which:

Fig. 1 is a perspective view of the floor crane, taken from a side and the top, and showing the hook-line in position for raising an object;

Fig. 2 is a side elevational view of the floor crane with parts broken away and shown in section to show the details of construction, an alternate arrangement thereof being shown in dashed outline;

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2, looking in the direction indicated by the arrows, and showing portions of the device in dashed outline to indicate alternate positions of the various parts;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2, looking in the direction indicated by the arrows; and

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 2, looking in the direction indicated by the arrows, and showing the crank member in dashed outline as shifted longitudinally into an alternate position to obtain a different gear ratio.

With more detailed reference to the drawing, the numeral 1 designates a pair of beams which diverge to form a base, under which base casters 2 and 4 are mounted for pivotal movement about a vertical axis and for turning movement about the horizontal axis, to enable the device to be rolled over a floor or the like. It is preferable to have four casters secured beneath the base in order to give greater stability to the crane.

An upright tubular standard 6 is welded to a plate 8 at the lower end thereof, which plate 8 rests on the top of beams 1, which beams may be I-beams or the like. Ribs or gusset plates 10 are secured to the plate 8 and to the upright standard 6, as by welding, to securely brace the upright standard 6. A plate 12 is positioned beneath the beams 1 and bolts 14 pass through holes 16 formed in the respective plates 8 and 12 and through holes which are formed in the beams 1, so as to secure the plates in binding relation to the beams 1.

A jack 18, preferably of the hydraulic type, seats on the plate 12 and extends upward within upright tubular standard 6, which jack 18 has a ram 19 therein in abutting relation with the lower end of an upright, slidable member 20, which member 20 is telescoped within the tubular, upright standard 6. The jack 18 has the ram 19 thereof in axial alignment with the upright, slidable member 20, which ram is rounded to fit in complementary relation with the end of the slidable member 20, which will enable pivotal movement of the upright slidable member with respect to the ram, and also to enable the member 20 to be lifted vertically.

The jack 18, as shown in Fig. 2, is of the conventional hydraulic type, and has a self contained reservoir and a hydraulic cylinder therein. A valve 22 is interposed between the jack 18 and the reservoir, to enable the bypassing of hydraulic fluid from the cylinder of the jack back to the reservoir, when it is desired to lower the jack. An actuating pump cylinder 24, having a plunger 26 therein, is operated by a lever 28, which lever is connected through a linkage 30, to the jack lever 32, which jack lever has a further linkage 34 pivotally connected to the upper end of the plunger 26 thereof. By having the lever 28 pivotally mounted, in this manner, it is possible for a workman to use either the hoist or the hydraulic jack individually, or they may be used at the same time, as the hoist may be operated by hand, and the lever 28 may be operated by foot power.

The upright slidable member 20 has a housing 36 mounted thereon, which houses a gearing unit designated generally at 38. The gearing unit 38 is operated by a crank 40, and is of a type which may be shifted to give a double reduction or a single reduction, depending upon the load being lifted by the longitudinal movement of the shaft 42. The crank 40 is secured to shaft 42 and is slidable longitudinally in bearings 44, which bearings 44 also journal the shaft 42 for rotation about the axis thereof. A gear 46 is fixedly secured to shaft 42 and may be moved from the position as shown in full outline in Fig. 5 to that shown in dashed outline in the same fig-

ure, by movement of the crank shaft longitudinally from the position shown in full lines to that shown in dashed lines, in Fig. 5. By moving the gear 46 from out of engagement with gear 48 and into engagement with gear 50, the gear ratio of winch drum 52 is changed to give a different pull on cable 54.

The cable 54 extends outward through housing 36, and over sheave 56, through guide conduit 58 and over sheave 60, and which cable preferably has a hook 62 on the end thereof. The guide conduit is mounted on top of beam 64, which beam 64 is mounted at the top of upwardly slidable member 20, to give positive guiding action to the cable. The beam 64 is preferably bolted to the plate 66 by means of bolts 68, which beam 64 forms an outwardly extending boom and has a re-entrant hook 70 on the lower web thereof to engage an edge of plate 66, so as to relieve some of the tension load from bolts 68. The beam 64 has an eye 72 secured to the lower side thereof, near the outer end, so the hook 62 may engage the eye to enable the use of a block 74, when it is desired to double the power of the winch 52.

A pawl 76 is mounted on and fixed to a shaft 78 so that the pawl will disengage the gear teeth of the gear 48, when the crank is rotated in a direction to lift the load. However, when the gear tends to rotate in the opposite direction, the pawl 76 will engage the teeth of the gear 48 to hold the load at the desired position. The shaft 78 is rotatably mounted in housing 36 and extends to the exterior thereof and has an operating handle 80 thereon, exterior of the housing 36, for lifting the end of the pawl 76 out of engagement with the teeth of the gear 48, when it is desired to release the pawl. When the operating handle 80 is positioned as shown in Figs. 2 and 5, the pawl 76 will engage the teeth of the gear 48, but, upon raising the handle 80, the pawl 76 will disengage the teeth to enable the gear 46 to be rotated in the opposite direction. The pawl holding arrangement is effective for holding the load when the gear 46 is in either position, and which will enable shifting the gear 46 without any strain being exerted thereon while it is being shifted.

The gear 48 and the gear 49 are preferably made integral and are rotatably mounted on shaft 51, so upon turning of gear 48, the gear 49 will be turned, which gear 49 is in mesh with gear 50, which gear 50 is secured to the shaft 53 on which shaft the winch drum 52 is also fixedly secured. In this manner, the desired gear ratio between crank 40 and winch drum 52 may be obtained. It is preferable that the housing 36 also enclose winch 52, except for an opening at the top thereof through which cable 54 passes.

The upright slidable member 20 is preferably tubular in construction and has a central rib 21 secured to the forward side thereof in alignment with the axis. A pair of rollers 82 are spaced apart and mounted exterior of upright standard 6 near the top thereof, which rollers extend through slotted openings 84 and are in bearing engagement with the upright slidable member 20 on each side of the rib 21, a spaced distance circumferentially therefrom, so as to enable limited rotary movement of upright slidable mamber 20, so as to enable the swinging of beam 64 from side to side, as indicated in Fig. 3, yet the beam 64 will be maintained within the confines of the angular divergence of base beam members 1. In this manner the load is retained against tipping sidewise, due to unstable equilibrium. The rollers 82 are mounted on shafts 86, which pass through outstanding lugs 88 on each side of the respective slotted openings 84.

A roller 90 is mounted on a shaft 92, at the lower end of upright slidable member 20, which upright slidable member 20 has a slotted opening 34 in the lower end thereof on the side opposite the rib 21. Upon placing a load on hook 62, the downward movement of beam 64, at the outer end, will cause binding engagement thereof with rollers 82 and will cause roller 90 to move into engagement with the inner diameter of upright standard 6, which will enable the upright movement of the slidable member 20 with the comparatively great load thereon, without material friction between the movable elements. The faces of rollers 82 and 90 are contoured to complementally engage the respective tubular members so as to enable the beam 64 to be swung from side to side as indicated in Fig. 3. The upright standard 6 has a transverse hole 7 formed therethrough. A pin 96, of a length greater than the outside diameter of upright standard 6, is provided, which may be passed through hole 7 and through one of the holes 98, to lock the beam 64 in a fixed relation against turning with respect to upright standard 6. However, by putting the pin 96 through one of the holes 98 above the top of upright standard 6, as indicated in Fig. 1, the pin will relieve the weight from jack 18 and yet enable the beam to be swung from side to side within the limits of the arcuate movement of the rib 21 engaging one of the inner adjacent faces of rollers 82.

Operation

When it is desired to use the floor crane for lifting a motor from the frame of a vehicle, the base beams 1 are moved below the object to be lifted, so that the desired center of pull will be below hook 62 or the hook of block 74, whereupon, the hook 62 or the hook of block 74, whereupon, the hook 62 or the hook of block 74 is secured to the object to be lifted, such as an engine. If the beam 64, which forms the boom, is too low or too high, it may be adjusted by means of the hydraulic jack 18. This is accomplished by manipulation of valve 22, and if it is to be raised, the valve 22 is closed and the lever 28 is operated to pump hydraulic fluid from the reservoir of jack 18 into the cylinder thereof, so as to move plunger 19 upward. When the plunger 19 has reached the desired height, a pin 96 may be positioned through holes 7 and 98, to lock the upright standard 6, however, if the pin 96 is placed through a hole 98 above upright standard 6, the upright slidable member 20 is free to move within an arc defined by the inner faces of rollers 82 abutting with the adjacent side of rib 21 which is secured longitudinally along the front face of upright slidable member 20.

When it is desired to move the floor crane into narrow places, the beams 1 are moved together, as shown in full outline in Fig. 3, and bolts 14 are passed therethrough and through plates 8 and 12, which secure the beams in fixed relation thereto. However, if obstructions so dictate, it may be necessary to move the beams outward at the outer ends thereof, as shown in dashed outline in Fig. 3, and bolts 14 may be passed through the outermost holes 16, so as to hold the beams 1 in fixed relation with respect to plate 8, with the beams 1 pivoting on the rearmost of the bolts 14, as will best be seen in Figs. 2 and 3.

The degree of movement of the beam 64 is less than the angular divergence of the base beams 1, so as to prevent instability of the device. With the hook 62 or the block 74 anchored to the object to be lifted, the crank may be moved longitudinally so that gear 46 will either engage gear 48 or gear 50, depending on the weight of the load to be lifted. Then, upon turning the crank 40, to move the gear 46 in a clockwise direction, gears 48 and 50 will turn in a counter-clockwise direction, with the pawl 76 ratcheting with each tooth of gear 48 until the object is lifted to the desired height. The gear 50 is secured to the shaft 53, as is the winch drum 52, which drum will wind the cable 54 thereonto and, upon releasing the crank 40 to stop the turning movement of the gears, the pawl 76 will hold the load at any desired height. If the gear 46 is first engaged with gear 50, and the load is too heavy to be lifted thereby, the turning action may be stopped at any height and the shaft 42 and crank 40 moved longitudinally outward until the gear

46 is in mesh with gear 48, whereupon, the crank will turn gears 46, 48, 49 and 50 to rotate drum 52, thereby giving much greater pull on cable 54. Then, upon connecting hook 62 to eye 72 the pull may be substantially doubled, less the loss of power caused by friction. The pawl 76 is mounted on and secured to shaft 78, which shaft extends outward through case or housing 36, has a handle 80 secured thereto to enable the pawl 76 to be remotely operated to enable the ready lowering of the load. The housing 36, which encloses gears 38, 46, 49 and 50, is preferably sufficiently tight to hold a lubricant.

The jack is so constructed that it may be readily disassembled and the various parts laid side by side, to occupy the minimum space for shipment or for storage. The beam 64 is bolted to plate 66 by bolts 68, and the plate 8 is welded to the lower end of upright standard 6, so also is the plate 66 welded to the upper end of upright slidable member 20. With bolts 14 and 68 removed, the beams 1 may be laid in side-by-side relation to occupy the minimum space, as the plate 8 may be lifted upward from the beams 1 and jack 18, so as to present an open space for insertion and removal of the jack 18. Pins are provided in the various linkages 30 and 34 to enable the ready assembly and disassembly of the various parts.

The outer ends of beams 1 have the webs thereof cut away and the flanges thereof secured together so as to enable the beams 1 to be used at a lower center of gravity, when the casters 2 are attached theerto. Likewise, the casters 4 are attached beneath plate 8, so as to enable the beams 1 to occupy a lower center of gravity, as will best be seen in Fig. 2.

Even with the gearing shifted into the most powerful lifting arrangement, and with the cable 54 arranged with the block 74 therein, it is sometimes necessary to use additional power. This can be done by using the hydraulic jack 18 to move the upright slidable member 20 upward, which will increase the lifting power in accordance with the size of the jack used below the upright slidable member 20.

While the device has been shown and described in some detail in one embodiment thereof, it is to be understood that changes may be made in the minor details of construction, and adaptations made to different uses without departing from the spirit of the invention or the scope of the appended claim.

Having thus clearly shown and described the invention, what is claimed as new and desired to be secured by Letters Patent is:

A floor crane comprising a pair of horizontally disposed, outwardly extending base members, an upright cylindrical, tubular standard secured to said base members, an upright, cylindrical, slidable member telescoped in said upright, cylindrical, tubular standard and adapted to be coaxial therewith and selectively movable longitudinally with respect thereto and selectively rotatable with respect to said upright, cylindrical, tubular standard, an outstanding beam mounted on and secured to said upright, cylindrical, slidable member and extending laterally outward therefrom and lying in a vertical plane passing between said base members, a hoist drum mounted on said slidable member near the upper end thereof, a sheave member mounted on each end of said beam, a cable passing outward from said hoist drum and over said sheaves on said beam, said cable having an end thereof extending downward from one of said sheaves on said beam for recveiving a load, said upright, cylindrical, slidable member having a longitudinal, radial rib on the face thereof immediately below said outstanding beam, which rib is secured to said upright, cylindrical, slidable member within said upright, cylindrical, tubular standard, said upright tubular standard having a pair of rollers mounted thereon near the top thereof, one of said rollers of said pair of rollers being one each side of said rib and being in rolling engagement with said upright, cylindrical, slidable member on each side of said rib to limit the arcuate travel of said outstanding beam between vertical planes of said pair of beams forming said base, and a further roller secured to said upright, cylindrical, slidable member on the opposite side thereof from said rib to be in rolling contact with the inner face of said upright, tubular standard.

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