Oct. 4, 1949. A. H. FEIBEL 2,483,894

LIFTING DEVICE

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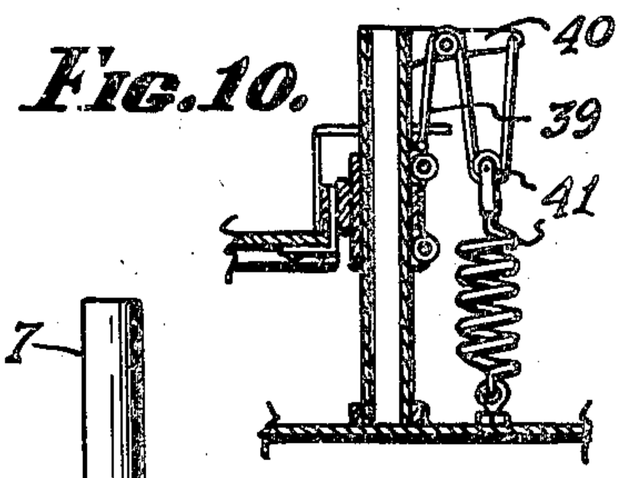

FIG. 10.

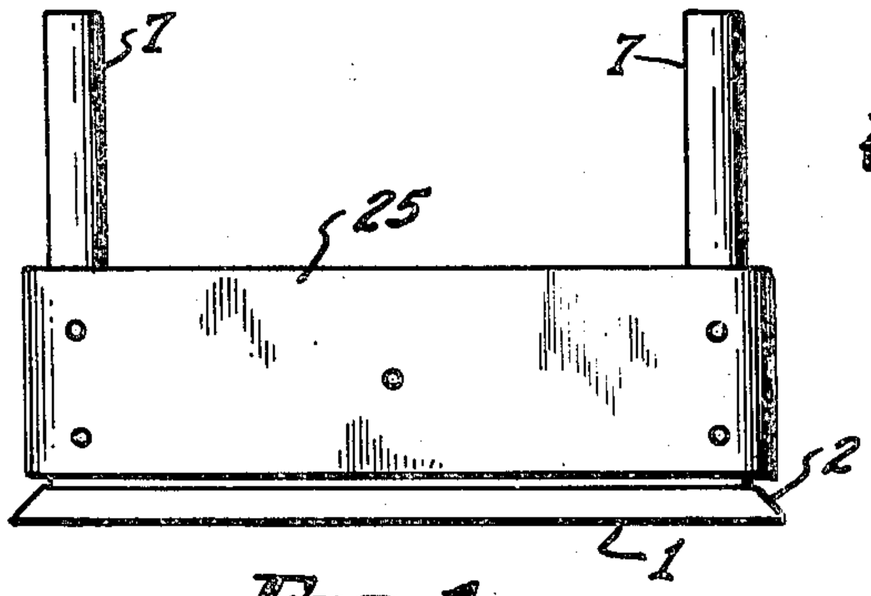

FIG. 1.

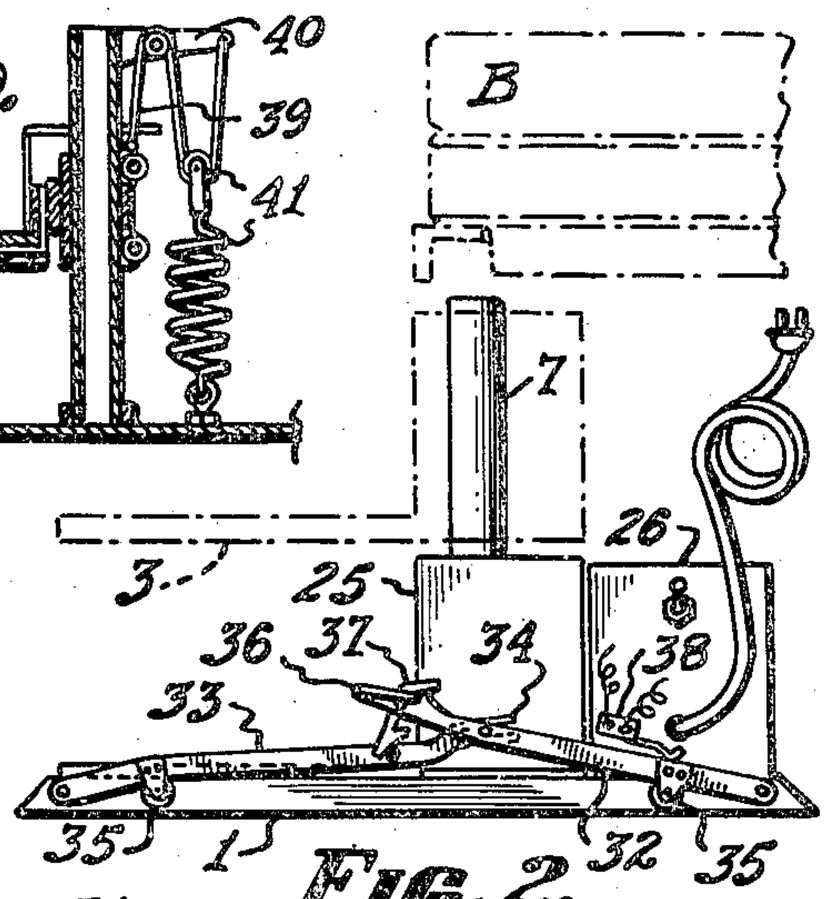

FIG. 2.

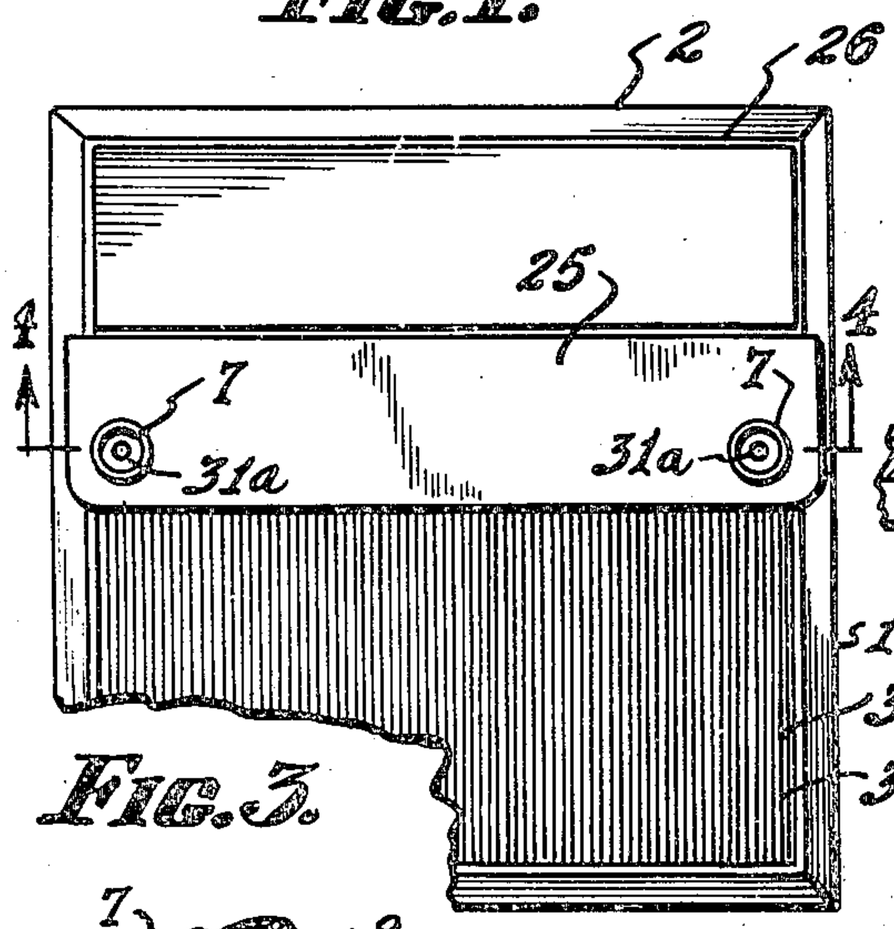

FIG. 3.

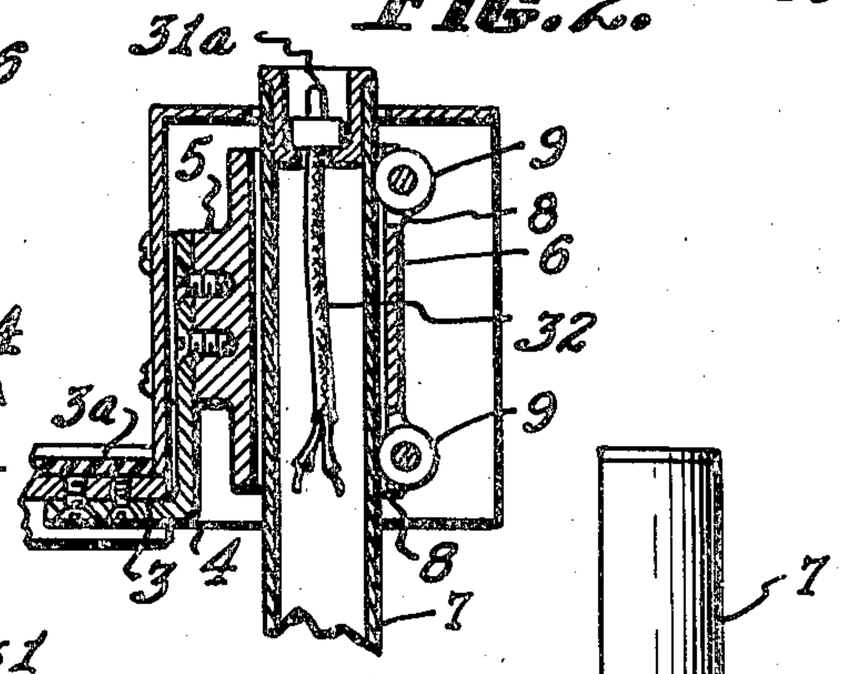

FIG. 5.

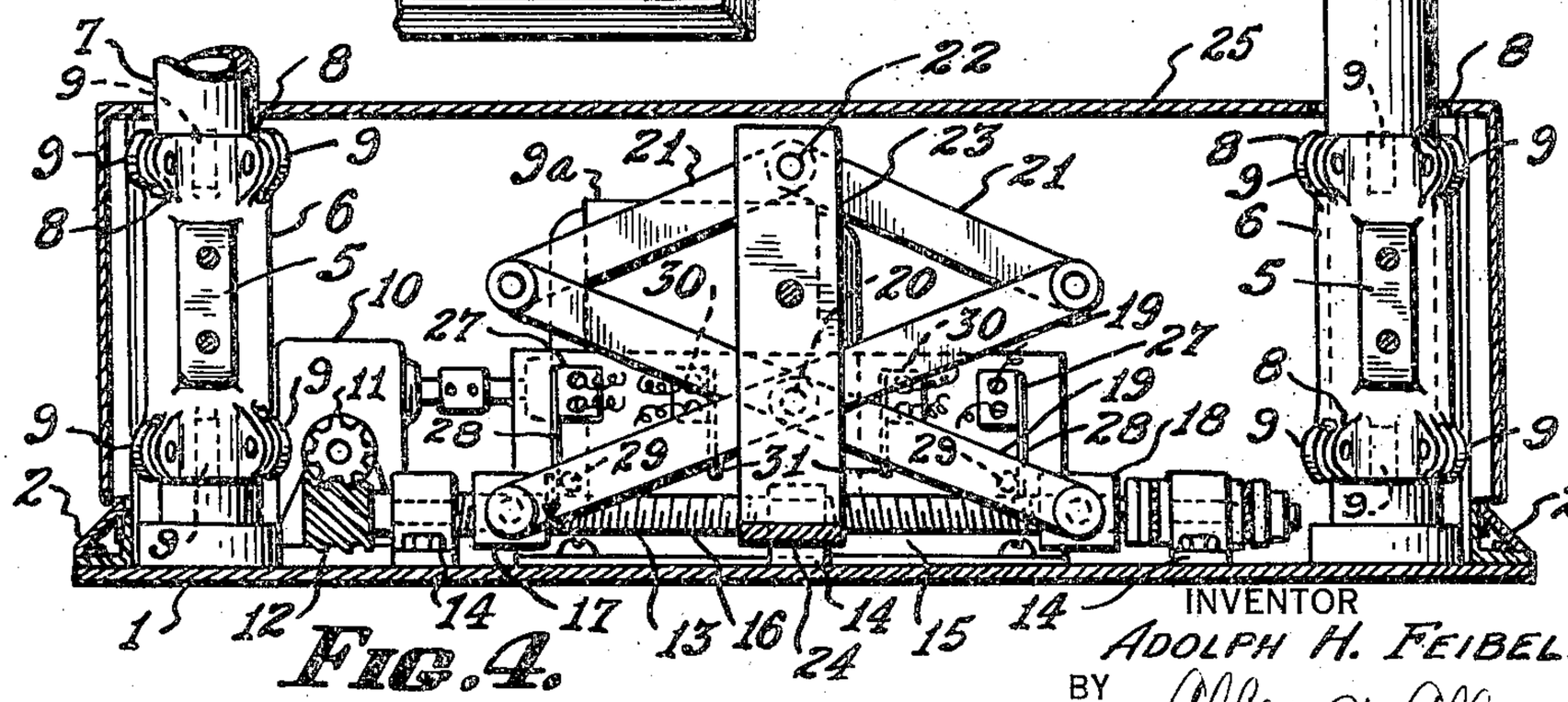

FIG. 4.

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LIFTING DEVICE

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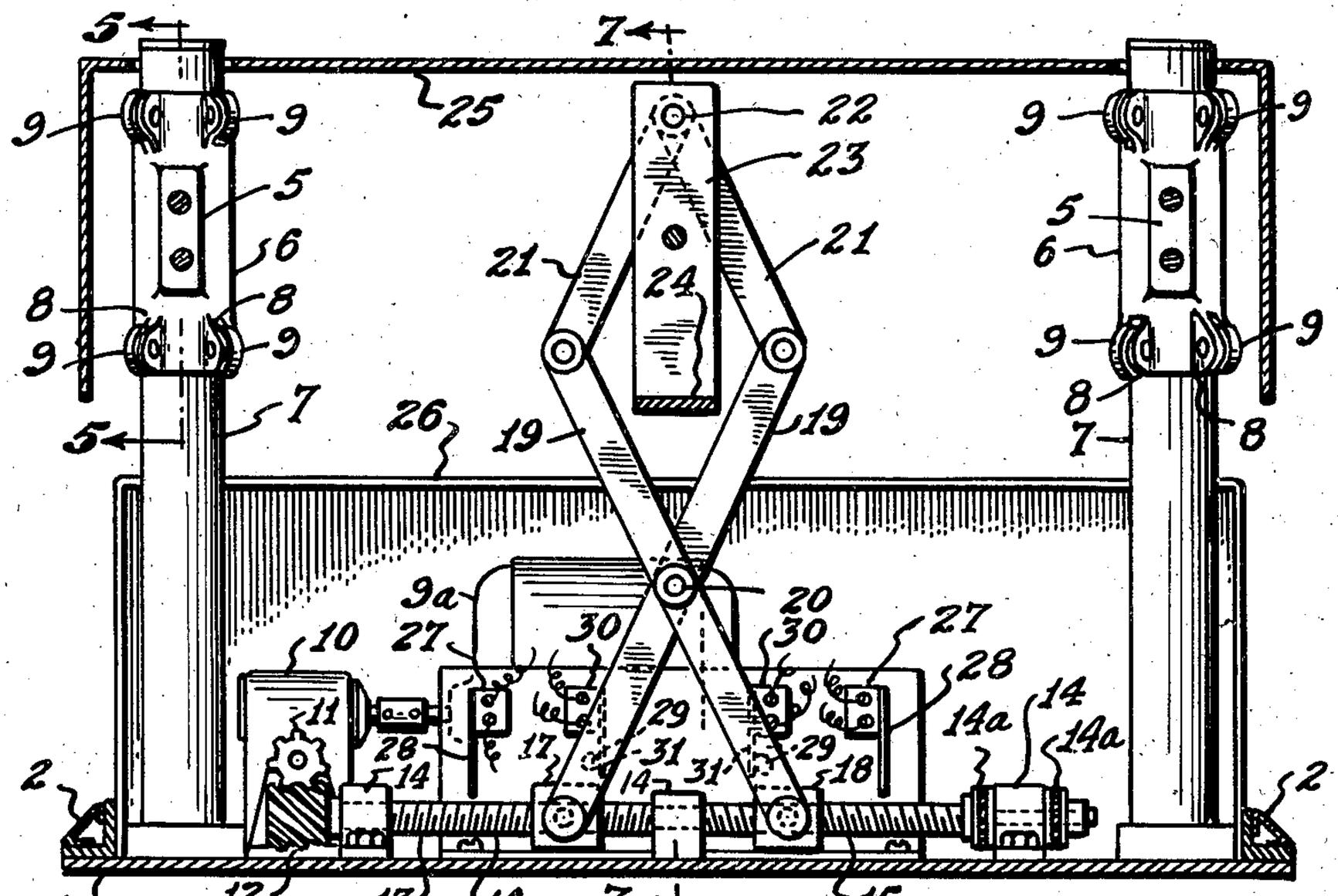

FIG. 6.

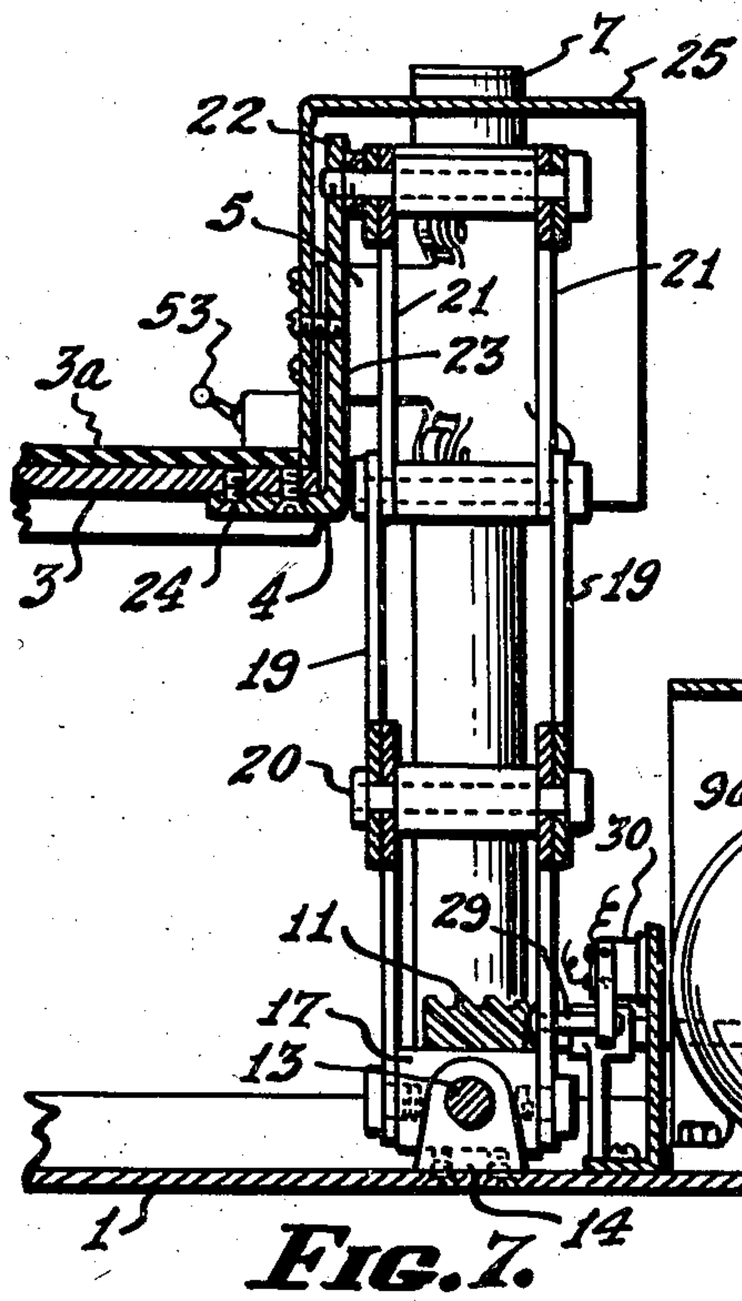

FIG. 7.

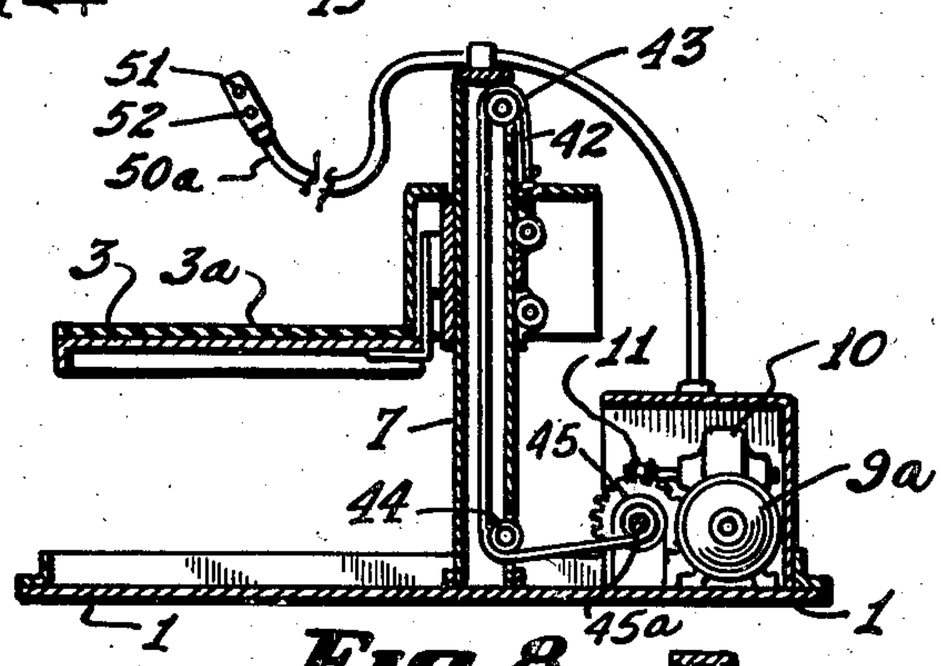

FIG. 8.

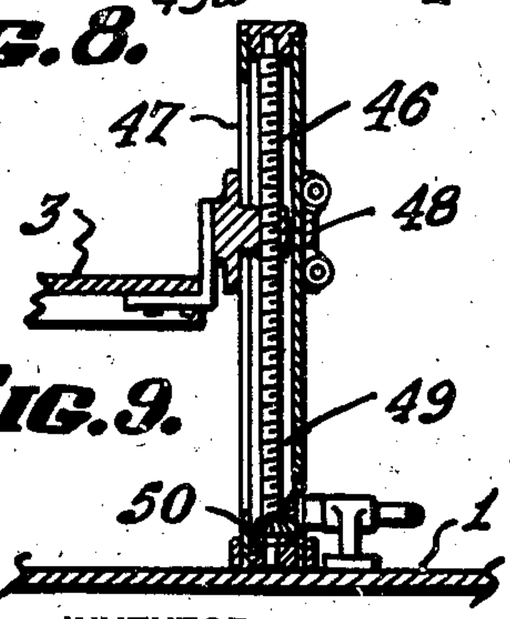

FIG. 9.

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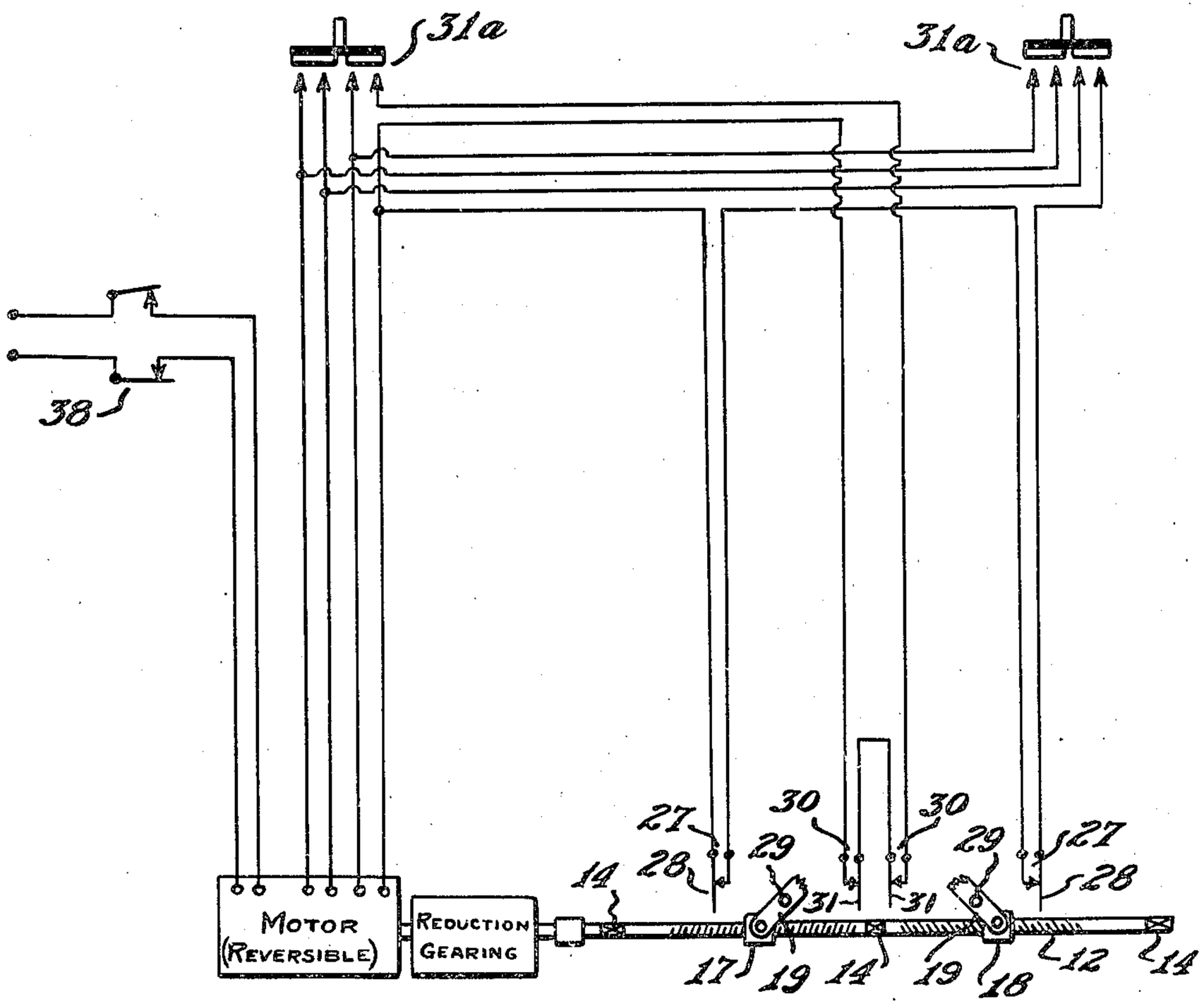

FIG. 11.

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Patented Oct. 4, 1949 2,483,894

UNITED STATES PATENT OFFICE

2,483,894

LIFTING DEVICE

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Application June 29, 1946, Serial No. 680,418

18 Claims. (Cl. 187—9)

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My invention relates to lifting devices for a purpose not hitherto applied in the lifting device art so far as I am advised and in the structure and arrangement of parts directed to making provision for this new zone of utility.

There are many cases where persons in hospitals and at home are neither completely bed ridden nor fully ambulatory, and require to be lifted in order to get them in and out of bed, or to be lifted in order to place them on and remove them from a treatment table. Indeed, with many patients classed as ambulatory, it is not possible for them to get into or out of bed by themselves. Thus old people, convalescent patients, and many wounded veterans are constantly presented with the painful and laborious task of getting up on their bed or out of it, or up on a treatment table and getting down therefrom, because from a seated position on the bed or platform their feet will not reach the floor. It is the object of my invention to provide a device which will alleviate to a considerable extent this difficulty.

One of my objectives is to provide a device which presents a power operated lifting platform under control of the operator, which may be the patient himself, which in its lower position is practically at floor level, and in its upper position will be high enough for a standing patient to sit down on his bed. Another objective is to provide a device which so far as driving and supporting elements are concerned can be so placed as not to take up space around the bed, thus interfering with the movements of the nurse or visitors or the patient. Another objective is to surround the operation of the device with safeguards against chance of defective operation such as would let the patient down on the floor with a bump, or jerk the patient while elevating him. Another objective is to provide for safety switches controlled by the position of the lifting element or its operating structure which will prevent the electrical driving mechanism from continuing to operate after the lifting platform has reached the limits of its movement. As an ancillary object I provide for means whereby the device can be lifted from the floor by means of rollers thus permitting it to be moved from place to place. One reason for such a provision is so that the device may be moved from room to room in a hospital or from bed to bed, as the case may be. In this connection when the rolling support is in position to elevate the device from the floor it is my object to cut off the power supply lines to the driving motor of the device, thus

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preventing an operation under circumstances when the device may roll out from under a patient attempting to use it when it is not firmly grounded.

Within the above objectives it is apparent that there are many mechanical devices which could be employed and in the specification to follow and in the drawings I have merely shown a principal example with a few alternatives in order that the operation of the invention may be understood and in the claims that follow I will state the inventive combinations involved in the structure as illustrated by the exemplary embodiments.

In the drawings Fig. 1 is a front elevation of the device.

Fig. 2 is a side elevation thereof.

Figure 3 is a plan view of the device.

Figure 4 is a section on the line 4—4 of Figure 3 on a larger scale with mechanism covers removed.

Figure 5 is a detail of the top of one of the supporting columns showing the platform mounting and one of the sliding shoes holding the platform, the plane of this section being taken along the line 5—5 of Figure 6.

Figure 6 is a section like Figure 4 but showing the platform raised.

Figure 7 is a section on the line 7—7 of Figure 6.

Figure 8 is a detail section showing another mode of operating the platform in which it moves down by gravity as controlled by the motor drive.

Figure 9 is a like detail showing a screw type operating device for moving the platform.

Figure 10 illustrates a spring counterbalance which it may be desirable to employ as an added safety feature.

Figure 11 is an exemplary diagram showing suitable electric control mechanism.

The device as shown has a base 1 which normally rests flush on the floor. It will be desirable to enclose this base in some way to form a chamber into which the lifting platform moves in its lower position. Preferably the platform will fit snugly within the enclosure in order to minimize catching the garments between the base and the platform as the latter reaches its lower position. To this end as an example, pieces of angle iron faced with a cover, to form a triangular box type molding 2 will be welded to the margins of the base. The lifting platform is a plate 3 which as noted fits down into the recess so formed in the base. It extends for about half (in the preferred form) of the area

of the base, and is secured to angle plates **4**, **4**, which in turn are bolted to the pads **5**, **5** on the shoes **6**, **6**, this arrangement as noted being near the two rear corners of the platform. Firmly secured at the two sides of the base are columns **7**, **7** on which the shoes slide. The shoes are tubular and in the preferred form have a series of pairs of ears **8**, three in number, at the top and bottom of the tubular portion, between which ears are mounted rollers **9** which ride against the columns. This or some other antifriction device will probably be required to insure smooth motion of the shoes along the columns for persons of different weight.

Mounted at the portion of the base back of the columns is the driving motor **9***a*, with gear reduction box **10**, driving a worm gear **11** which meshes with a worm gear **12** on the end of the shaft **13** which latter shaft is mounted in suitable bearings **14** at several points and extends traversely across the base between the columns the bearing **14***a* being arranged to take thrust in both directions. This shaft is formed with right and left threads **15** and **16** on which are nuts **17** and **18**. Pivoted to the nuts are the pairs of arms **19** which are pivoted together at **20** and are pivotally connected at their ends to pairs of arms **21** which are pivoted at **22** to a plate **23**.

The plate **23** (Fig. 7) depends from the position of the pivotal connection at **22**, and at its lower end has a projection **24** which extends under the platform and is bolted thereto. The result of this structure is a lazy tongs device which as shown in Figure 4 and 6 will serve to elevate the platform or lower it depending upon the direction in which the motor is driven, a reversible motor being the desired arrangement.

A cover **25** having holes in it to permit it to be slipped down over the two columns is mounted in place by screws setting into the angle plates that secure the ends of the platform to the sliding shoes and the plate **23**. This cover moves up and down with the platform. Another cover **26** is mounted over the motor and secured to the base or simply permitted to rest upon it, as desired.

In order to secure against the device coming to a stopping point when the toggle arms are fully extended or fully retracted, I prefer to supply limit switches which break the circuit to the operating motor. I have indicated one form of structure which will serve this purpose in which there are two switches to be operated when the device is clear down, and two to be operated when the device is clear up.

Thus there are switches **27**, **27**, which have operating arms **28** which lie in the path of pins **29** projecting rearwardly from the rearward set of arms **19** so that when the arms are swung down the switches will be opened. There is another pair of switches **30**, **30** having arms **31** which are contacted by the said pins when the arms **19** are fully extended. Beside assuring that the motor will not burn out, these switches will also prevent starting the up operation by mistake when the platform is up and vice versa.

There are a number of points at which the forward and reverse main switches for motor current may be mounted. One mounting is to arrange the switches in cups at the top of the two columns (which will preferably be in the form of tubes through which the wiring may extend.) Thus I have illustrated in Figure 5 one of the switches at **31***a*, with the conductors **32** extending down through the tubular column.

These switches are of the spring biased type which will open up unless manually held closed by means of the buttons.

In order to equip the base with rollers, I may employ a toggle construction of two levers **32** and **33** at each side of the device pivoted to each other by means of a fork as at **34**, and each lever pivoted on its ends to the angles which form a rim around the base. Each lever carries a supporting roller **35**. One of the arms of each pair has a treadle **36**, and a latch **37** which will catch over a pin on the other arm of the pair. By this construction the operator may press down on the treadle at each side and throw down the forked pivot center thus elevating the base on the rollers, a position which is held by means of the latch at each side.

In order to prevent an operation of the device without raising the roller device I may place a cut off switch **38** in a position to be closed by contact with the lever **32** at one side of the structure. This switch is biased to open position and will cut off current from the motor when the roller device is moved into position of giving a rolling support to the base.

Referring to Figure 2 as it will be noted the operating devices of the mechanism now described including the two columns may be located in a position beneath the edge of a bed indicated at B. The only thing that projects is the portion of the base which encloses the lifting platform. Thus the device is out of the way except for the parts which are directly employed in lifting or lowering the patient. The leverage effect of the weight of the person being lifted acts as a fulcrum on the forward edge of the base, so that even if the patient should rest his entire weight on the outer edge of the lifting platform there would be no danger of tipping the base. As shown the platform **3** may be equipped with a rubber mat **3***a*.

If desired to counterbalance the load on the platform it will be possible to secure cables **39** to the shoes at each side of the platform, and run these cables over brackets **40** secured to the top of each column (Fig. 10) and then down to springs **41** secured to the base. The cables then run over a roller secured to the spring and back to a point of attachment at the outer end of the bracket in each case.

As noted alternative structures for lifting the platform are numerous. In Figure 8 is shown a structure in which the shoes have cables **42** connected to them which pass over pulleys **43** in the top column walls, thence down through the columns around another pulley **44** in the lower wall and thence around a winding drum **45**. This winding drum (there would be one at each side of the platform) is mounted on a cross shaft **45***a* mounted and driven as in the instance of the right and left threaded shaft **13** already described.

Then again the two columns may be provided with threaded shafts **46** extending vertically through them and carried in bearings at their ends. The columns would be slotted as indicated at **47** (Fig. 9) and the shoes would include nut portions **48** mounted over the threaded shafts. The drive from the motor would then be by counter shafting from the motor to a pair of bevelled gears **49** introduced into the columns and meshing with bevelled gears **50** secured fixedly to the lower ends of the threaded shafts.

If desired the operation of the device may be controlled from an extension cord **50***a* which at the end carries a pair of switches operated by the buttons **51**, **52**, for up and down motion of the

device (Fig. 8). With such an extension cord the patient can readily operate the device bringing it himself to a position which will best assist him in standing erectly on the platform as he swings himself from the bed; or the movement of the platform may be controlled, as illustrated in Figure 7, by means of push buttons or other suitable switches mounted on the platform itself. As here shown the push button switch **53** is positioned to be operated by a light pressure of the patient's foot.

I claim:

1. A lifting device for the purpose described comprising a base, surrounding a desired space and arranged to rest on the floor, a lifting platform located within the confines of said space, vertical supports for the platform located on said base at the rear edge of said platform, said platform having means to move along said supports, a cover element fitted down over said vertical supports and secured to the platform for up and down movement with said platform, a power means for said platform located beyond said rear edge of the platform, and operating means for the platform arranged to engage with the same in the zone of the rear edge of the platform, said means being driven by the power means.

2. The combination of claim 1 in which the base is formed with a recess close to the floor into which the platform fits when in its lower position.

3. The combination of claim 1 in which the base is in the form of a flat-plate resting on the floor, said plate having an upwardly projecting rim forming a recess into which the platform fits when in its lower position.

4. The combination of claim 1 in which the supports are in the form of columns, and the means on the platform to move thereon consists of shoes slidable on the column and having anti-friction engagement therewith.

5. The combination of claim 1 in which the operating means comprises a motor and a lazy tongs said platform having means as its rear edge for securing same to the free end of the lazy tongs.

6. The combination of claim 1 in which the operating means comprises a plurality of vertically held screw shafts, and nuts for the shafts on which nuts the platform is supported as a cantilever.

7. A lifting device for the purpose described comprising a base, a lifting platform, and power means located on the base for elevating and lowering the platform with respect to the base, said base having columns thereon on which the platform moves, a cover member secured to said platform and extending outwardly therefrom, said cover member having apertures therein to permit it to be slipped down over said columns, the parts so arranged that the platform will take a position close to the floor and be raised to a position from which a patient may move without raising himself onto a bed or table.

8. The combination of claim 7 in which a roller support for the base is provided; said support being movable to position of removal of the same from engagement with the floor, and means whereby upon moving the support to position of engaging the floor the operation of the power means is inhibited.

9. The combination of claim 7 in which the power means includes a reversible electric motor, and switches for operating the motor in either direction are secured to the device, and switches for disenabling the switches first mentioned are provided and means operative upon the platform reaching the limit of its movement in each direction for actuating said disenabling switches.

10. The combination of claim 1 in which the power means includes a reversible electric motor, and switches for operating the motor in either direction are secured to the device, and switches for disenabling the switches first mentioned are provided and means operative upon the platform reaching the limit of its movement in each direction for actuating said disenabling switches.

11. A lifting device for the purpose described having a base resting flat on the floor, a reversible motor and elevating device located at one end of the base, a platform secured as a cantilever to said device, and extending therefrom to within the limits of the base area, the elevating device comprising lazy tongs secured to the platform, a cover member shielding said elevating device and secured to the platform for up and down movement with said platform, switches for the motor for energizing in each direction, and disenabling switches for the switches first mentioned, said switches having arms engaged by the lazy tongs when in position of extension and retraction, said disenabling switches thereby enforcing a stoppage of the elevating device at each end of its motion, and requiring the operation of the switch for the opposite movement of the motor in order to energize the motor.

12. The combination of claim 7 together with means moving with the platform for limiting the operation of the power means to movements within the range of said positions noted.

13. The combination of claim 11 in which the switches for the motor are spring biased to open circuit position.

14. The combination of claim 7 in which the power means is an electric motor, and which includes means moving with the platform for limiting the operation of the motor during movements within the range of the positions noted, including switches for energizing the motor which are spring biased to open circuit position.

15. A lifting device for the purpose described comprising a base to rest upon the floor, a lifting platform located to lie wholly above said base, vertical supports for the platform located on said base at the rear edge of said platform, means to guide the platform along said supports, an elevating device comprising lazy tongs secured to said platform, power means including a reversible electric motor, a cover member fitted down over said vertical supports and secured to said platform for up and down movement with said platform, switches for operating the motor in either direction, said switches arranged in cups at the top of said vertical supports, in combination with a roller support for said device, said support being movable to position of removal of the same from engagement with the floor, and means whereby upon moving the roller support to position of engaging the floor the operation of the power means is inhibited.

16. A lifting device for the purpose described comprising a base to rest upon a floor, vertical columns mounted on said base in spaced relation intermediate its ends, a lifting platform locatable in its lowest position within the confines of said base and substantially at floor level and extending forwardly of said columns, carriages on said columns connected to said platform so as to mount it for sliding movement, said carriages extending above the level of said platform, a first housing to the rear of said platform and movable therewith, said housing surrounding said

carriages and being perforated to permit said columns to extend upwardly through it, a second housing behind said columns and mounted to said base, a mechanical lifting device engaging said platform and base and located beneath said first housing, and a prime mover for said lifting device located beneath said second housing.

17. The combination of claim 16 in which control means for operating the prime mover is secured to the device in a position easily accessible to the user while standing on the platform.

18. The combination of claim 16 in which the prime mover includes a reversible electric motor, and switch means mounted in the tops of said vertical columns whereby the motor may be controlled by the user while on the platform without having to stoop or otherwise change his position.

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