F. S. ROOT.

INVALID LIFTING DEVICE.

APPLICATION FILED APR. 13, 1912.

1,106,847. Patented Aug. 11, 1914.

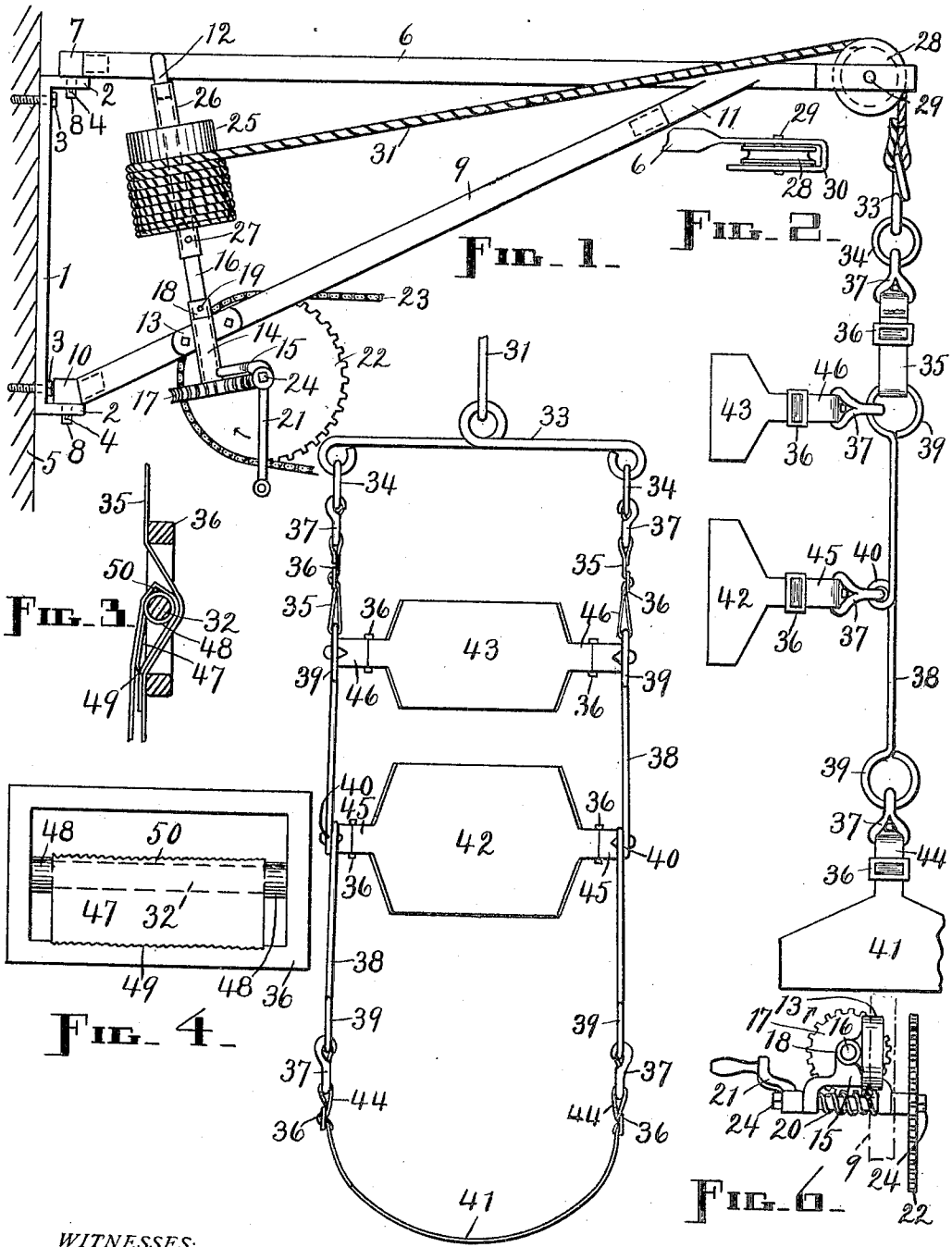


FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

FIG. 6.

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INVALID-LIFTING DEVICE.

1,106,847. Specification of Letters Patent. Patented Aug. 11, 1914.

Application filed April 13, 1912. Serial No. 690,470.

To all whom it may concern:

Be it known that I, FRANCIS S. ROOT, a citizen of the United States of America, residing at Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements in Invalid-Lifting Devices, of which the following is a specification.

My invention relates to improvements in devices designed for moving or handling cripples, invalids, and helpless and afflicted persons generally, and consists of certain peculiar hoisting and lowering means including a sling for the patient, together with such special auxiliary and subsidiary parts and members as may be needed to render the device practicable to its fullest extent, all as hereinafter set forth.

The object of my invention is to provide a safe, simple, easily manipulated, and comparatively inexpensive invalid lifter, which is convenient in use and operation both for the patient and nurse or attendant. With this device a sick or crippled person can be raised comfortably and without difficulty from a bed into a sitting position and while in such position removed from the bed and placed on a chair or another bed, for example, and can with equal facility be returned to the first-mentioned bed and to reclining position. This and other objects and advantages which will appear in the course of the following description I attain and secure by the means illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a lifting device in which is embodied a practical form of my invention; Fig. 2, a top plan of the forward terminal portion of the crane arm; Fig. 3, an enlarged detail in section of one of the new strap fasteners, illustrating its application to a strap; Fig. 4, a side elevation of the fastener alone; Fig. 5, a front elevation of the sling, and Fig. 6, a detail in plan of the intermeshing members and their support.

Similar figures refer to similar parts throughout the several views.

Two essential features or elements are necessary in an invalid lifter, one of which is a simple and convenient appliance for direct application to the patient, that herein shown and described forming the subject of a divisional application, and the other is a no less simple and convenient appliance for lifting the patient, through the medium of the first-mentioned appliance, swinging, and lowering said patient, through the same medium. Elements of such a character I have provided in the present device. I am aware that there are other devices designed for handling the sick and crippled, but know of none which embodies in so simple and practical a manner the necessary features as mine or which is made up of similar parts and combinations of parts.

Passing now to the consideration of the device in detail, I will first describe the lifting and swinging appliance or crane. This comprises a bracket 1 which has forwardly projecting arms 2—2 at the top and bottom, and is secured by means of bolts or screws 3—3 to a suitable support 5, as the wall of a room; a horizontal arm 6 preferably made of tubing and having at its rear end a fixed head 7 to rest on the upper bracket arm 2, said head being provided with a depending pin 8 which passes down through an opening made in said arm 2 to receive it; and a strut or brace 9 also preferably made of tubing and provided like said arm 6 with a fixed head 10 to rest on the lower bracket arm 2, said last-mentioned head being provided with a depending pin 8 for engagement with said lower bracket arm in the same way that said first-mentioned pin engages said upper bracket arm, and said brace having its front end in engagement with a Y-branch 11 on the underside of said arm 6 a short distance back of the front end of the same. Two cotter-pins 4 are inserted in the pins 8 below the bracket arms 2 to hold said pins 8 and the arm 6 and brace 9 in place. The crane members 6 and 9 are free to swing relative to the bracket 1. The outer terminal of the brace 9 may or may not be permanently or fixedly secured to the Y-branch 11. A depending lug or post 12 is rigidly attached to the arm 6 on one side and a short distance from the head 7, and a plate 13 is rigidly attached to the corresponding side of the brace 9 a little in advance of the position of said post. The plate 13 has a sleeve 14 attached thereto, which sleeve carries at the base a bracket 15. The bracket 15 extends forwardly from the sleeve 14. A shaft 16 is journaled in the sleeve 14. Said shaft has a gear 17 rigidly mounted thereon below the sleeve 14, and it is prevented from slipping out of said sleeve by means of a collar 18 pinned at 19 to the shaft above

the sleeve. A worm 20 is journaled in the bracket 15 to mesh with the gear 17. Both ends of the worm shaft preferably extend beyond the ends of the bracket 15, which constitute the bearings for said shaft, so as to receive interchangeably a crank 21 wherewith and whereby the worm can be operated from either side of the crane, it only being necessary to change the position or location of said crank. The crank 21 is for the use of the attendant, but provision may be made so that the patient can operate the winding mechanism. To this end a sprocket-wheel 22 may be mounted on either end of the worm shaft, and a sprocket-chain 23 furnished which extends from said sprocket-wheel to the patient. The worm shaft terminals which receive the crank 21 and the sprocket-wheel 22 are angular in cross-section. Such terminals appear at 24—24. A winding drum 25 is provided which has a sleeve 26 that protrudes from said drum at both ends and is mounted on the post 12 and the shaft 16, being pinned to the latter at 27. The pin 27 prevents the sleeve 26 from slipping down on the shaft 16 and at the same time locks said sleeve to said shaft. This construction greatly facilitates the act of assembling the parts besides being very strong and durable yet simple. No brake, stop or locking means for the drum 25 is ever required with the aforesaid worm and gear, since there is sufficient frictional resistance inherent in these members themselves to counteract or support any load that may be placed on the drum or that said drum may be required to carry. A pulley 28 is mounted on a spindle 29 which is journaled at the front end of the arm 6, the latter being flattened and bent to form a part 30 for the reception of said pulley. A chain or rope 31 has one end attached to the drum 25, and extends forward from said drum, upon which such rope is adapted to be wound, to the pulley 28, and over and downward from the latter to have a sling attached thereto.

Taking up next the sling referred to above, it will be observed that said sling consists of a rigid cross-bar 33, a pair of rings 34, a pair of straps 35, a plurality of strap fasteners or buckles 36 and snap-hooks 37, a pair of side rods or connectors 38, each having an eye 39 at either end and an intermediate eye 40, a seat 41, a back support 42 and a head support 43. The cross-bar 33 is attached at the center to the free end of the rope 31, and has the straps 35 suspended from its ends, that is, from the ends of said cross-bar, by means of the rings 34 and a pair of snap-hooks 37. The connectors 38 hang by their upper eyes 39 from the straps 35. The seat 41 is provided with end straps 44—44 which are connected with the lower eyes 39 by means of two of the snap-hooks 37, and the back support 42 is provided with end straps 45—45 which are connected with the eyes 40 by means of two more of said snap-hooks. The head support 43 has end straps 46—46, similar to the straps 44 and 45, which are connected with the upper eyes 39 by means of the fourth pair of snap-hooks 37. A buckle 36 is furnished each of the above-mentioned straps so that it can be adjusted to increase or decrease the length of the same.

In an apparatus like this sling a wide range of adjustment for the straps is needed, such adjustment sometimes amounting, however, to a mere fraction of an inch, for which reason ordinary tongue-provided buckles are not suitable, because every point of adjustment for them or for the straps must depend upon a hole in the latter; besides the wide range of adjustment required for the straps, the fastening means therefor must be so strong and positive that there is no possible danger of accident to the patient by the giving way of the straps, and ordinary sliding buckles, even when equipped with teeth, are not sufficiently dependable on account of their liability to slip under great strain. It was necessary, therefore, for me to produce an entirely new type of fastener or buckle, and this I have done in the buckle 36 with which the straps can be adjusted to any extent, whether great or small, and after such adjustment can be held with absolute security. This buckle, of which eight are used in the present embodiment of my invention, is described below.

The buckle 36 preferably consists of a substantially rectangular frame having a central cross-bar 32 and provided with a double serrated clasp 47. The clasp 47 has end hubs 48—48 that fit the cross-bar 32 and pivotally support said clasp on said cross-bar, and said clasp is of such dimensions that it is capable of bridging the space between the cross-bar and one of the sides of the buckle-frame which is parallel with such bar. The longitudinal edge of the clasp 47 that is adapted to be brought into engagement with or operative relation to the aforesaid frame side is serrated, as represented at 49, and the opposite longitudinal edge which extends into the space between the cross-bar 32 and the other frame side is also serrated, as represented at 50.

The buckle is applied or attached to a strap and the adjustment and securing of the parts are effected in the following manner: One end of the strap is first passed through the buckle frame in such a way as to locate portions of the strap behind the longitudinal sides of such frame and another portion of such strap in front of the cross bar 32, and then said strap is looped and the aforesaid end carried up behind the

clasp 47, over said cross-bar, and down between the teeth 49 and the adjacent side of the frame, the buckle being properly adjusted on the strap in the first instance, and the strap end being drawn into the aforesaid loop to the required extent in the second instance. The first reach of the strap is interposed between the buckle frame and that part of the strap that is engaged directly by the teeth 49. It is now plainly to be seen that a pull on the looped part of the strap, secured as just explained, meets with the resistance offered by the fixed end of said strap and with the resistance offered by the clasp teeth 49 and 50. The latter resistance is very powerful because the pull on the loop forces the teeth 49 harder against the inner end portion of the strap and crowds the latter with more force into frictional engagement with the first reach of the strap, and at the same time the strap is drawn tightly into contact with the teeth 50 and by reason of such contact acts on the clasp to urge said teeth 49 still deeper into the strap, the total result being that the inner end of the strap is prevented from freeing itself from the teeth 49 and this portion of the strap is prevented from drawing out of engaging relation with said teeth 50, so that a double hold on the strap is provided and maintained. The construction of this buckle is such that either set of teeth alone would hold the strap, hence the two sets afford a double measure of security. To unfasten the strap, simply loosen the looped portion and that part of the strap which is within the grasp of the buckle, disengaging such portion from the teeth 50 and swinging the clasp 47 rearwardly so as to disengage the teeth 49 from the strap. The strap can now be readjusted, after which it is secured as before. From the foregoing description of the buckle it will be understood how the several parts of the sling are adjusted and fastened by the buckles shown in connection therewith. The connectors 38 or equivalent members should be and are introduced into the construction of the sling, because they lend themselves so readily to the movements that are required of the seat 41 and the supports 42 and 43, and afford the necessary rigidity at the sides. The snap-hooks 37, although of usual and well-known construction, are very convenient for my purpose, since they can be so easily and quickly attached to and detached from the rings 34 and the eyes 39 and 40. Owing to the presence of the snap-hooks on both sides of the sling any one of the supporting members can be disconnected and again connected on either side of said sling or at either end of the member without difficulty.

After properly adjusting the straps 35, 44, 45 and 46 by means of the buckles 36, and securing said straps by the same means, the device is usually operated in the following manner, assuming that a patient is reclining at full length on a bed situated within range of said device. The crank 21 is rotated in the direction to pay out the rope 31 and let down the sling as far as is necessary. Then the snap-hooks 37 are detached from the eyes 39 and 40 on one side, the supporting members 41, 42 and 43 are passed under corresponding portions of the patient's body, the crane being swung on its pivots 8 into position to enable this to be done, provided said crane is not already in such position, and said snap-hooks are fastened to said rings again. Next the crank is rotated in the direction to wind the rope 31 on the drum 25, as indicated by the arrows in Figs. 1 and 6, and so elevate the sling and raise the patient into a sitting position. In thus elevating the sling, the rings 34, straps 35 and connecting snap-hooks 37 first draw up the supports 43 and 42, through the medium of the connectors 38 and intervening parts, and so elevate the head and shoulders or upper part of the body before raising the other portions of the patient's body. The body of the patient above the hips is now upright, as are the connectors also, and the further elevation of the sling seats said patient fairly therein, the support 41 bearing most of the weight, and raises the patient clear of the bed. The crank 21 may be now released, if desired, since the worm and gear will hold the drum and prevent the rope from unwinding under the weight of the patient suspended therefrom. With the patient thus suspended the crane is swung in either direction, and the sling partially rotated, with the hanging part of the rope as a supporting axis, if necessary, to locate the patient in the proper position relative to a chair or other piece of furniture, or it might be a carriage. Nothing further remains to be done except to rotate the crank in the reverse direction and so lower the patient into or onto the chair or other supporting medium, and to remove the sling. The patient is returned to the bed in practically the same way as he was removed therefrom, but during this operation the sequential movements of the body are reversed, that is to say, the descending sling allows the lower part of the body to rest on the bed first, then the back and head. The sequential operations or actions of the body-supporting members of the sling are rendered possible by the presence of the rings 34 and more especially of the connector eyes 39 and 40, the snap-hooks 37 slipping freely in such rings and eyes and having a range of movement therein that is ample for the purpose. The cross-bar 33 serves as the spreader of the sling, as well as the supporting member thereof, and is rotatable with the part of the rope 31 that hangs below the pulley 28, as previously observed.

The supporting members 41, 42 and 43 with their straps are preferably made of canvas or webbing. Ordinarily the sprocket-wheel 22 with its chain will be omitted, but, if the patient is able to help himself to the requisite extent, said wheel and chain may be applied, and the apparatus operated by the patient through the direct medium of the chain, in the same way as it is operated by the attendant through the direct medium of the crank.

It is clearly apparent that, in addition to the other advantages that this device possesses, is the facility with which the parts of said device can be assembled and placed in position ready for operation.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, in an invalid-lifting device, of a supporting bracket, an arm pivotally connected with said bracket and provided at its outer terminal with a pulley, a brace rigidly attached to said arm and also pivotally connected with said bracket, bearing members carried by said arm and brace, an approximately upright shaft and drum supported by said bearing members, said shaft and drum being rotatably connected, rotatable means for said shaft, and a flexible member, for a sling passing from said drum over said pulley.

2. The combination, in an invalid-lifting device, of a supporting bracket, an arm pivotally connected with said bracket and provided with a downwardly projecting member and with a pulley, a brace rigidly attached to said arm and also pivotally connected with said bracket, an approximately upright sleeve provided with a bracket, said sleeve being rigidly attached to said brace, an approximately upright shaft supported in said sleeve and carrying a gear, a driving member for said gear, said driving member being journaled in said bracket, means to rotate said driving member, a drum supported by said projecting member and shaft and coupled to the latter, and a flexible member, for a sling passing over said pulley and having one end attached to said drum.

3. The combination, in an invalid-lifting device, of a supporting bracket having arms, a tubular arm and rigidly-attached tubular brace both provided with heads pivotally connected with said bracket arms, said tubular arm having a flattened and bent part at its outer terminal and also having a downwardly projecting member, a pulley mounted in the space thus provided, an approximately upright sleeve provided with a bracket, said sleeve being rigidly attached to said brace, an approximately upright shaft supported in said sleeve and carrying a gear, a driving member for said gear, said driving member being journaled in said bracket, means to rotate said driving member, a drum supported by said projecting member and shaft and coupled to the latter, and a flexible member, for a sling passing over said pulley and fastened to said drum.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."