March 14, 1944. H. COHEN 2,344,390

RAISING AND LOWERING MECHANISM

Filed Jan. 6, 1943 2 Sheets-Sheet 1

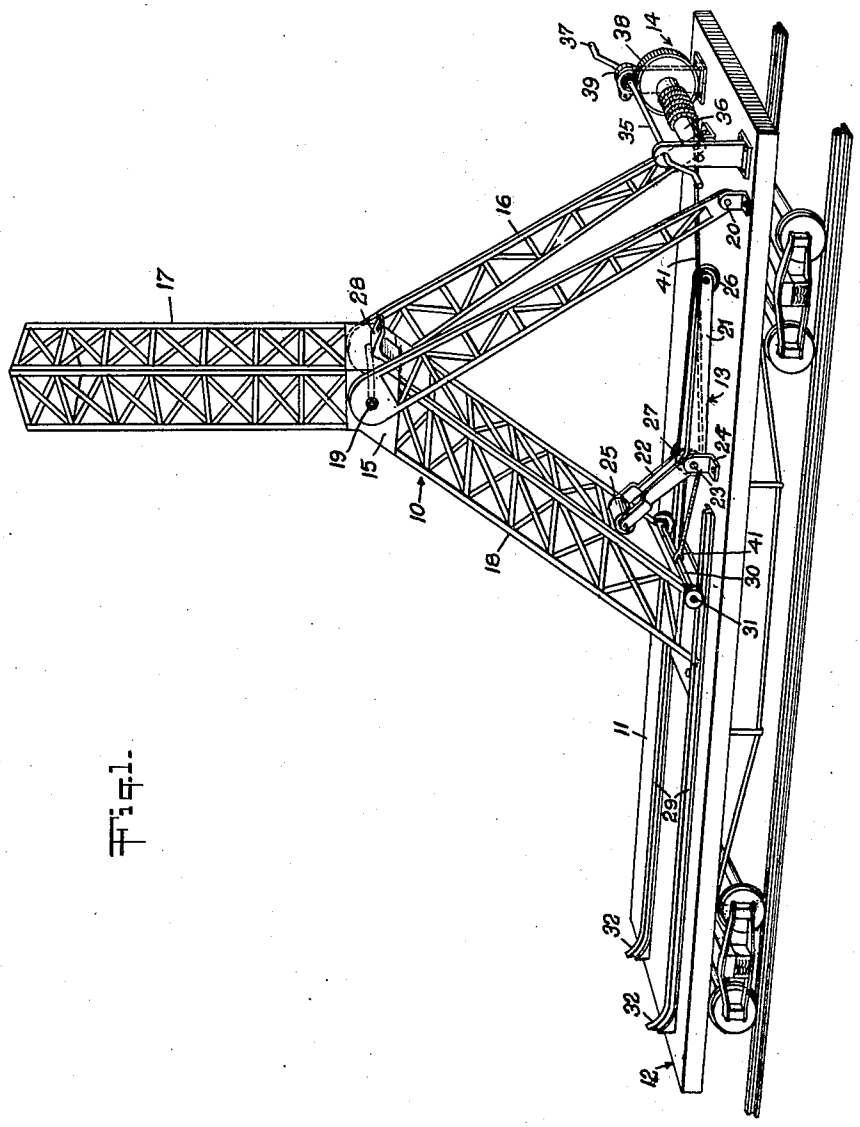


Fig. 1.

WITNESSES

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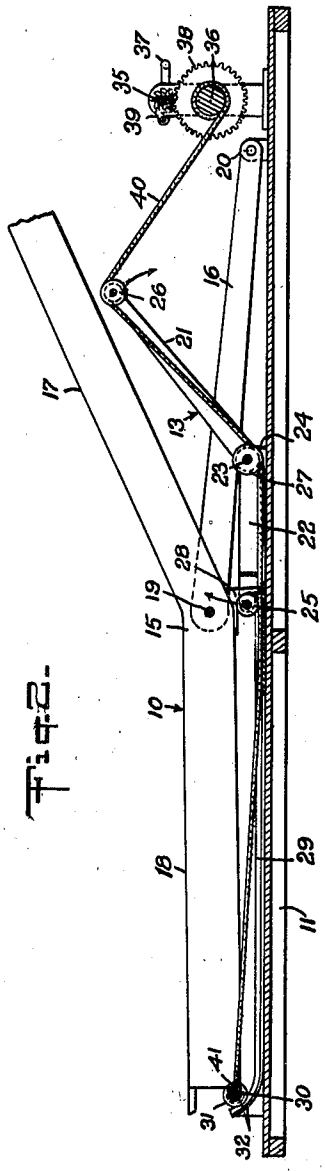


Fig. 2.

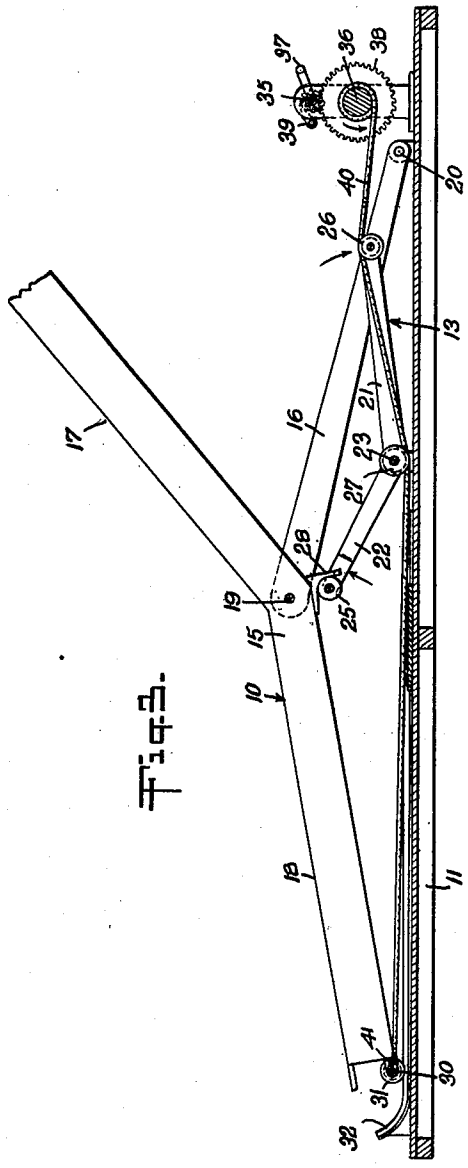


Fig. 3.

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Patented Mar. 14, 1944 2,344,390

UNITED STATES PATENT OFFICE

2,344,390

RAISING AND LOWERING MECHANISM

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Application January 6, 1943, Serial No. 471,405

8 Claims. (Cl. 189—15)

This invention relates to a mechanism for causing the movement of a structure between predetermined limits, that is to say, to raise and lower the structure, or to move it from one position into another and vice versa.

The invention contemplates the movement of a movable structure which is initially moved or boosted out of a dead center position and then fully or completely moved into the other position, together with suitable means for the application of power to cause the initial movement augmented by the action of gravity, and also to completely move the structure to the desired position.

The principal object of the invention is the provision of a mechanism of the indicated character which facilitates the movement of a structure from one position into another and minimizes the force required for causing such movement, which may be characterized as an opening and closing movement, a raising and lowering movement, or any other movement in which a structure in one position is moved into another position and vice versa, and in cases where the structure is in the form of mast, ladder, stairs, grille, chute, fixture, base member, door, window, cover, panel and others.

With the foregoing, other objects of the invention will appear from the following specification describing one embodiment thereof, the appended claims defining the scope of the invention, and the accompanying drawings illustrating the invention by way of example.

In the drawings—

Fig. 1 is a perspective view of a portable mast selected to illustrate the features of the invention;

Fig. 2 is a longitudinal section showing the mast in its fully lowered position;

Fig. 3 is a view similar to Fig. 2 showing the mast boosted or partly raised from its lowered position so that it may be completely moved into its raised position as shown in Fig. 1.

In the embodiment of the invention shown in the drawings, a structure 10 in the form of a mast is mounted for movement between predetermined limits from a lowered position to a raised position and vice versa on the deck or platform 11 of a wheeled truck or flat car 12. A booster 13 on the deck 11 is operable to boost or partly raise the mast 10 out of its lowered position so that it may be completely moved from the lowered position into a raised position. Suitable power means 14 serves for the application of force to operate the booster 13 and also to move the mast 10 into the raised or up position and said means 14 is operable to control the movement of the mast from the raised to the lowered or down position.

The mast 10 comprises a main section 15 and a leg section 16. The main section 15 consists of upper and lower portions 17 and 18, respectively, which are disposed at an obtuse angle with respect to each other. The leg section 16 has its upper end pivotally connected, as at 19, with the main section 15 intermediate the ends thereof or approximately at the juncture of the portions 17 and 18. The lower end of the leg section 16 is pivotally connected, as at 20, with the deck 11. In this manner the main section 15 is movably connected and subject to the angular movement of the leg section 16. The lower portion 18 of the main section 15 and the leg section 16 constitute supports for the upper portion 17 of the main section 15 when the mast is in the raised or up position as shown in Fig. 1. The sections 15 and 16 are so proportioned and connected that they move under the action of gravity out of their up relation to a down relation to thereby lower the mast to the down position.

The booster 13 for boosting or initiating the movement of the mast 10 out of its lowered position, in the present instance, consists of a rocker or bell-crank lever having arms 21 and 22, respectively, and a fulcrum or pivot 23. The pivot 23 is supported by suitable bearings 24 secured to the deck 11. The arm 21 carries a roll 25 at its free end, the arm 22 carries a sheave 26 at its free end, and a guide sheave 27 is loose on the pivot 23. An abutment 28 is secured to the main section 15 approximately at the juncture between the upper and lower portions 17 and 18 thereof. The booster or bell-crank lever 13 is operable to partly move the mast 10 out of its down position so that it may be completely moved out of the down position into the raised or up position. The roll 25 on the arm 22 is engaged by the abutment 28 and thus sets the booster 13 into its boosting position as the mast 10 moves into the lowered or down position.

In the movement of the mast 10, the lower end of the main section 15 rides on a track consisting of spaced parallel rails 29 secured to the top of the deck 11. The lower end of the main section 15 carries an axle 30 having wheels 31 on the opposite ends thereof which roll on the rails 29 respectively. Each of the rails 29 has a downwardly curved or inclined end portion 32. These portions 32 help to initiate boosting of the mast, although they are not absolutely necessary for

the effectual operation. By providing the end portions 32, the lower end of the main section will move downwardly under the action of gravity as the main section 15 moves laterally in the boosting operation.

When the mast 10 is in the lowered or down position, the sections 15 and 16 thereof bear such relationship that the lower portion 18 of the main section 15 is in dead center relation to the leg section 16, as shown in Fig. 2. In this relationship the booster 13 is set in its boosting or raising position with the roll 25 in engagement with the abutment 28 and the booster may be operated for the intended purpose.

The power means 14 serves for the application of force to operate the booster 13 and also to move the mast into the up or raised position, and such means 14 is operable to control the movement of the mast from the raised to the lowered position. In this movement of the mast the sections 15 and 16 thereof assume the down relationship under the action of gravity when the holding force which maintains the mast in the raised position is withdrawn. The power means 14 consists of a winch 35 having a drum 36 operated by means of cranks 37 geared to the drum by gearing 38. A suitable ratchet 39 is provided to check the rotation of the drum 36. A cable 40 has one end secured to the drum 36 and its other end is secured to the axle 30 as at 41. It will be obvious that by operating the cranks 37 the cable may be wound on the drum 36 or be permitted to unwind therefrom. The cable 40 passes over the sheave 26 on the arm 21 and under the sheave 27, as shown most clearly in Figs. 2 and 3. The winch 35 is arranged on the top of the deck 11, and it is to be understood that it may be arranged in any other desired position. It is also to be understood that any other suitable power device may be employed instead of the winch 35, such as an electric motor.

When the parts are in the relationship shown in Fig. 2 in which the mast is in the lowered position, the operation is as follows. The cranks 37 are operated to cause the rotation of the drum 36 counterclockwise. This causes the cable 40, in contact with the sheave 26, to bear down on the arm 21 of the booster 13 causing the arm 22 to move upwardly with the roll 25 in contact with the abutment 28. The cable 40 exerts a downward pressure to operate the booster 13 because the main section 15 cannot move laterally at the moment of the application of the downward pressure of the cable. After the lower portion 18 is out of the dead center relation with respect to the leg section 16, a pulling force is then exerted by the cable 40 on the axle 30 supplemented by the downward movement of the lower end of the section 15 under the action of gravity in which the wheels 31 ride down on the end portions 32. As the drum 36 continues to rotate the main section 15, guided along the rails 29 and also by the leg section 16, moves upwardly from the boosted position, as shown in Fig. 3, into the fully raised position, as shown in Fig. 1. The ratchet 39 is then brought into play to hold the drum 36 against rotation. As a consequence, the mast 10 will be maintained in the raised position in which the leg section 16 and the lower portion 18 of the main section 15 serve as supports for the upper portion 17 of the main section 15.

When it is desired to lower the mast 10 to the down position the ratchet 39 is released after which the cranks 37 are operated to permit the drum 36 to rotate slowly in a clockwise direction to pay out the cable 40, thereby enabling the sections 15 and 16 to move under the action of gravity until the sections 15 and 16 are at rest, thus bringing the mast to the lowered position.

In Figs. 2 and 3 the sections 15 and 16 of the structure 10 are conventionally illustrated as compared with the frame work shown in Fig. 1. The section 16 as shown in Fig. 1 consists of two parts in order to provide clearance for the cable 40. While the structure 10 in the present instance is shown in the form of a mast, it is to be understood that the structure 10 may be in the form of a ladder, stairs, grille, chute, fixture, base member, door, window, cover, panel and others, as hereinabove mentioned.

I claim:

1. The combination of a mast which may be moved to a raised position and a lowered position, and raising and lowering mechanism for the mast, said mast consisting of a main section and a leg section, said main section consisting of upper and lower angularly disposed portions respectively, said leg section having one end pivotally connected with said main section intermediate the ends thereof and the other end being pivotally connected with a fixed part, said lower portion of the main section and the leg section constituting supports for the upper portion of the main section when the mast is raised, said mechanism including a bell-crank lever operable to partly move the main section out of dead center relation with respect to the leg section when the mast is in the lowered position, so that it may be completely moved into the raised position, and means engageable with the lever and connected with the main section to operate the lever and also apply force to the main section to completely move the mast to its raised position.

2. The combination as set forth in claim 1, and a track on which the lower end of the lower portion of the main section of the mast rides in the raising and lowering operations.

3. The combination as set forth in claim 1, wherein said means consists of a cable, and a power device to operate the cable.

4. The combination with a structure connected for movement between one position and another, of a bell-crank lever operable to partly move the structure out of one position, and means to operate said lever, one end of said lever being engaged by said means and its other end engaging said structure, said means also being connected with said structure to complete the movement of the structure into the other position.

5. The combination with a movable structure consisting of a main section and a leg section, the leg section having one end pivotally connected with the main section intermediate its ends, and the other end being pivotally connected with a fixed part, of a bell-crank lever operable in conjunction with said main section to move it out of dead center with relation to the leg section so that the structure may be moved into a fully raised position, and a cable having one end connected with said main section and engaged with one end of said lever to operate the lever and then move the main section for the aforesaid purposes.

6. The combination with a structure mounted for movement on a swingable element between an up position and a down position, of a bell-crank lever, and a cable, said cable engaged with one end of said lever and the other end of said lever bearing on said structure in order to partly move

the structure out of one position when a pulling force is exerted on said cable, said cable also being connected with said structure to complete the movement of the structure into the other position subject to the continuance of said pulling force exerted on said cable.

7. The combination as set forth in claim 4, and an abutment on said structure which engages said other end of said lever during the return movement of the structure to reset the lever.

8. The combination as set forth in claim 4, and a horizontal track having an inclined portion, one end of said main section riding on said inclined portion so that said end of the main section may move initially downwardly and horizontally and then continue to ride along said track.

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