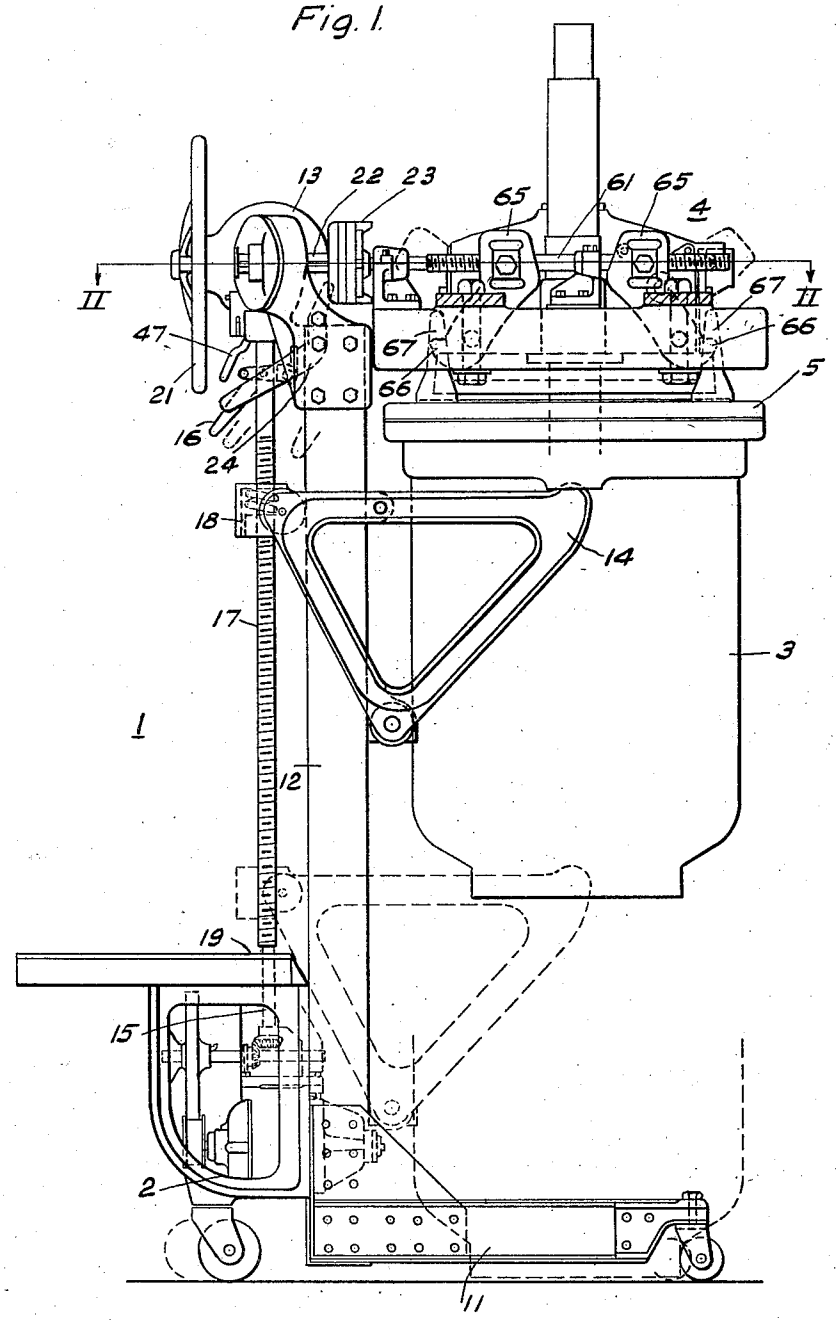
April 21, 1931. C. AALBORG 1,801,831

TANK LIFTER

Original Filed April 15, 1925 3 Sheets-Sheet 1

Fig. 1.



WITNESSES:
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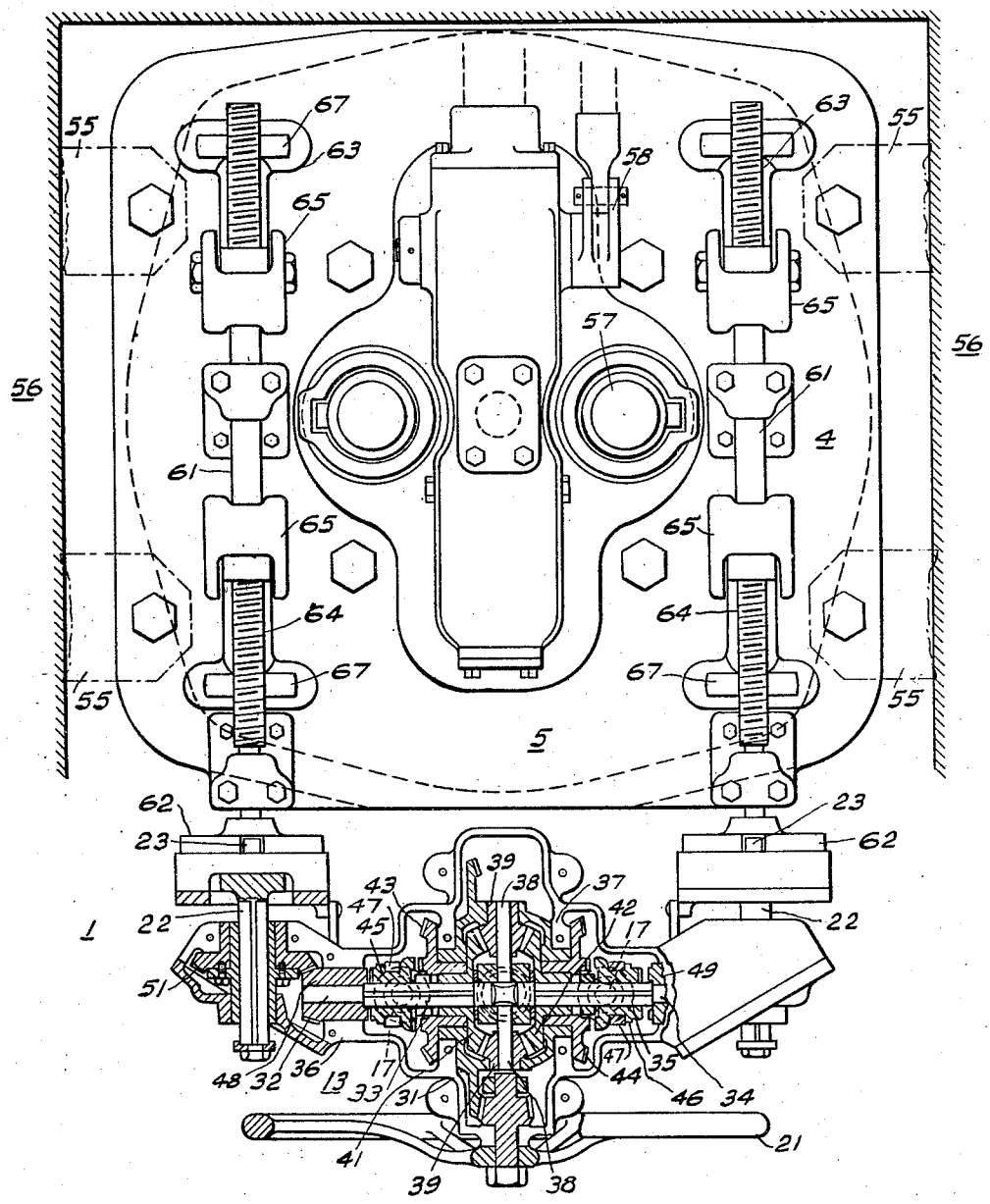
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TANK LIFTER

Original Filed April 15, 1925 3 Sheets-Sheet 2

Fig. 2.



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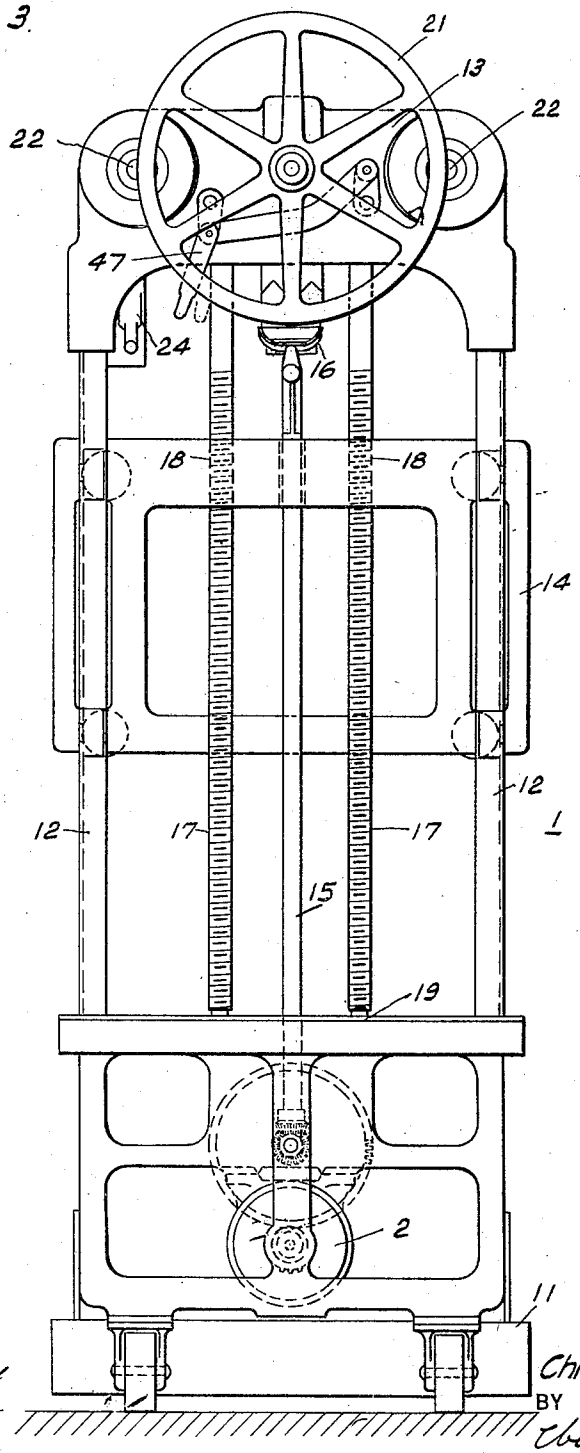
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TANK LIFTER

Original Filed April 15, 1925 3 Sheets-Sheet 3

Fig. 3.



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Patented Apr. 21, 1931

1,801,831

UNITED STATES PATENT OFFICE

CHRISTIAN AALBORG, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

TANK LIFTER

Original application filed April 15, 1925, Serial No. 23,400. Divided and this application filed March 2, 1926. Serial No. 91,776.

This application is a division of application Serial No. 23,400, filed Apr. 15, 1925.

My invention relates to power house equipment and particularly to tank lifters of the truck type.

One object of my invention is to provide a tank lifter that shall adjust or clamp a tank in position after it has reached its elevated position.

Another object of my invention is to provide a tank-lifting and adjusting device that shall have a source of power that may be selectively utilized for elevating a portion of a circuit breaker tank or the like and for adjusting or clamping the tank in elevated position.

It is a further object of my invention to provide an adjusting device for a plurality of groups of clamps such that the tension on all groups of clamps is equalized.

In power stations, it is customary practice to mount the cover members of oil circuit interrupters fixedly with respect to the walls and floors of the station. The cover members support the switch contact members, insulating bushings, operating mechanism and the like. The tank members of the circuit interrupters contain the insulating oil and are provided with clamping means for securing them to the cover members. Such clamping means are generally of a readily detachable character.

A tank-lifting device, that is generally of the truck type, is provided on each appropriate floor of the power house for raising and lowering the tanks when necessary. Heretofore, there has not been provided, so far as I am aware, a tank-lifting device that will also operate the adjusting or clamping means mounted on the cover members.

In the accompanying drawings,

Fig. 1 is an elevational view of a circuit interrupter and my improved tank-lifting and adjusting device in operative connection thereto.

Fig. 2 is a view, partially in plan and partially in section along the line II—II of Fig. 1, of the circuit interrupter and the tank-lifting and adjusting device, and

Fig. 3 is a rear end view of the device of Fig. 1.

My invention comprises, in general, a tank lifter 1 that is provided with a motor 2 for lifting a tank 3 of a circuit interrupter and for manipulating clamping devices 4 for drawing and securing the circuit interrupter tank 3 into engagement with the tank cover 5.

Referring particularly to Fig. 1, the tank lifter 1 comprises a base or platform 11, from which supporting and guiding members 12 extend upwardly for supporting a differential gear mechanism 13 and carriage 14. The motor 2 is mounted to the rear of the platform 11 and is connected to a main drive shaft 15 that extends upwardly parallel to the members 12 for engagement with the differential gearing 13. A manually operable clutch 16 is placed in the drive shaft 15 to insure that the attendant must always be present when the motor 2 is connected to the differential gearing 13.

A pair of threaded rods 17 extend downwardly from the gearing 13 and through openings 18 in the carriage 14 for moving the latter along the guide members 12. The lower end of the rods 17 bear against a platform 19, upon which the operator may stand when manipulating the tank lifter. A hand wheel 21 is also provided for manually actuating the differential gearing 13.

Referring particularly to Figs. 1 and 2, a pair of square shafts 22 extend forwardly from the differential gearing 13 and terminate in coupling members 23 for engagement with the clamping devices 4. A lever 24 is mounted on one of the guides 12 to permit the operator to move the coupling members 23 and the square shafts 22 into and out of engagement with the clamping devices 4.

Referring particularly to Fig. 2 the shaft 15 and the hand wheel 21 engage a ring gear 31 of the differential gearing 13. The shaft 15 engages the ring gear 31 by means of a gear connection below the plane of Fig. 2 and is indicated by dotted concentric circles. The ring gear 31 is adapted to freely rotate about a shaft 32 that is square for a portion of its length as at 33. The shaft 32 does not extend through the entire length of the differ-

ential gear 13 but is complemented, at the right of the center of the differential gear 13, by a shaft 34 having a square portion 35. Suitable bearing surfaces 36 and 37 are provided for supporting the shafts 32 and 33. Ring gear 31 turns within the bearing surfaces 36 and 37 and outside of the shafts 32 and 34.

The ring gear 31 supports a pair of stub shafts 38 that, in turn, carry pinions 39. The pinions 39 engage oppositely disposed gears 41 and 42 that fit upon the square portions 33 and 35 of the shafts 32 and 34, respectively. The shafts 32 and 34 are, accordingly, driven by the gears 41 and 42, respectively, but are capable of a differential action with respect to each other such that they deliver equal torques. Ring gears 43 and 44 are loosely mounted exteriorly of the hubs of the gears 41 and 42, respectively, whereby the hubs of the several gears are free to rotate relatively to each other, except for frictional engagement, which is negligible when considered in connection with the amount of torque to be delivered by the shafts 32 and 34. Ring gears 43 and 44 are adapted for engaging the screw threaded rods 17.

Driving clutches 45 and 46 are mounted for longitudinal movement on the square portions 33 and 35 of the shafts 32 and 34, respectively, and rotate therewith. Referring to Fig. 3, a hand lever system 47 is mounted exteriorly of the differential gearing 13 for sliding the driving clutches 45 and 46 inwardly and outwardly along the shafts 32 and 34, simultaneously. When the driving clutches 45 and 46 are moved inwardly, they engage the ring gears 43 and 44, respectively, and actuate the screw-threaded rods 17.

The outer ends of the shafts 32 and 34, respectively, are supported by, and rotate within, bevel gears 48 and 49, respectively, that, in turn, are connected to bevel gears 51 mounted on the squared shafts 22. When the driving clutches 45 and 46 are moved outwardly, by manipulation of the lever system 47, they disengage the ring gears 43 and 44, respectively, and engage the gears 48 and 49, respectively, thereby causing the square shafts 22 to rotate. If the coupling members 23 are in engagement with the clamping devices 4, the latter are manipulated in accordance with the direction of rotation of the shafts 22.

Referring particularly to Fig. 2, the covers 5 of the circuit interrupters are supported by braces 55 from the walls 56 of the power house. The covers 5 support the terminal bushings 57 and the operating connections 58 for the circuit interrupter. These latter features may be of any standard construction as they form no part of the present invention, except insofar as they are necessary to complete the several combinations described and claimed. The cover 5 also supports the clamping devices 4, each of which comprises a shaft 61 that terminates in a coupling 62 for cooperation with the couplings 23. The shafts 61 are oppositely threaded as at 63 and 64 for a distance from each end. The threaded portions 63 and 64 engage oppositely disposed clamps 65 whereby the clamps 65 are moved inwardly and outwardly along the shaft 61. Referring particularly to Fig. 1, the clamps 65 terminate in lugs 66 that engage and enter upwardly extending ears 67 carried by the circuit breaker tank 3.

In manipulating the tank lifter embodying my invention, assuming the tank to be removed from the circuit interrupter, the tank lifter 1 is moved into the position indicated by dotted lines below the cover member 5 and the motor 2 is started, or the hand wheel 21 turned. When the tank lifter 1 is driven by the motor 2, the operator grasps the handle of the clutch 16 and lifts it upwardly thereby causing the drive shaft 15 to turn the ring gear 31 and, through the intermediate gears, the shafts 32 and 34. The operator then manipulates the lever system 47 to cause the driving clutches 45 and 46 to engage the ring gears 43 and 44, whereby the screw threaded rods 17 will be actuated to raise the carriage 14 and tank 3 supported thereby.

When the tank 3 has been raised so that the ears 67 are in their proper position, the operator manipulates the hand lever 47 to cause the driving clutches 45 and 46 to engage the gears 48 and 49. At the same time the operator manipulates the handle 24 to cause the coupling members 23 to move outwardly and engage the coupling members 62. When such engagement is completed, motion is transmitted from the shafts 22 to the shafts 61 and the clamps 65 are drawn toward each other to cause the lugs 66 to seat in the ears 67. By reason of the differential action of the gearing 13, equal torque is always delivered to the screw threaded rods 17 or to the shafts 61 which prevents any shaft from being tensioned too tightly before its cooperating shaft is placed under the same condition of tension.

When the clamping devices 4 are secured, the clutch 16 is released and the differential gear 13 stops. The tank lifter 1 is then withdrawn automatically disengaging the couplings 23 and 62.

In the event that it is desired to lower the circuit interrupter tank 3, the foregoing cycle of operations is reversed.

It will thus be seen that I have provided a tank-lifting and adjusting device for circuit interrupters that both lowers and raises an element of the circuit interrupter and is capable of adjusting or clamping that element in place.

I do not wish to be restricted to the specific arrangement of parts herein set forth, as various modifications thereof may be effected without departing from the spirit and scope

of my invention. I desire, therefore, that only such limitations shall be imposed as are indicated in the appended claims.

I claim as my invention:

1. The combination with clamping means comprising a pair of threaded rods, of a source of power for operating the rods, a portable carriage for the source of power, and a coupling means on the carriage for connecting the source of power to the rods.

2. The combination with clamping means comprising a pair of threaded rods, of a source of power for operating the rods, a detachable coupling means for connecting the source of power to the rods, and means for differentially operating the rods.

3. The combination with clamping means for a tank member of a circuit interrupter comprising a pair of threaded rods, of a source of power for operating the rods, coupling means comprising differential gearing for connecting the source of power to the rods, and a portable frame supporting the coupling means and the source of power.

4. The combination with clamping means for uniting a tank member to a circuit interrupter comprising a pair of threaded rods, of a source of power for operating the rods, coupling means comprising differential gearing for connecting the source of power to the rods, means for gripping the ends of the rods and a portable carriage for moving the gripping means into engagement with the said threaded rods.

5. In a circuit interrupter, the combination with clamping means for a member actuated, a pair of threaded rods, of a source of power for operating the rods, coupling means comprising differential gearing for connecting the source of power to the rods, portable means for engaging the ends of the rods, and means for controlling the coupling means for connecting the engaging means to the source of power.

6. The combination with clamping means comprising a pair of threaded rods, of a source of power for operating the rods, coupling means comprising differential gearing for connecting the source of power to the rods, and means for controlling the operation of the coupling means comprising a longitudinally-adjustable shaft driven by the gearing.

7. The combination with clamping means comprising a pair of threaded rods, of a source of power for operating the rods, coupling means comprising a differential gearing for connecting the source of power to the rods, means for engaging the ends of the rods, and means for controlling the position of the engaging means comprising a shaft slidably connected to and driven by the gearing.

8. The combination with clamping means, of a pair of threaded rods to actuate the said means for engaging and supporting a member, a source of power for operating the rods, a portable structure supporting the source of power, and a coupling means associated with the source of power adapted to engage the rods through the movement of the said portable structure.

9. The combination with clamping means, of a pair of threaded rods for actuating the clamping means, a carriage supporting a source of power for operating the rods, coupling means mounted on the carriage adapted to be moved into engagement with the rods and means on the carriage connecting the source of power to the coupling means.

10. The combination in a portable power device, of a threaded shaft driven thereby, differential gearing operated by the threaded shaft, a lifting device, a threaded rod associated with the differential gearing operating the said lifting device, a clamping device, rotatable means for engaging and operating the said clamping device and means operable to selectively engage the rotatable means or the threaded rod with the said threaded shaft.

11. The combination with a source of power operating a shaft, of a differential driven thereby, a lifting device, a threaded rod for operating the lifting device, a clamping means for the member to be lifted, and means for connecting the shaft through the differential to the threaded rods or to the clamping means.

12. The combination with a portable lifting device, of a source of power mounted thereon, a carriage on the portable device for engaging an element, a pair of vertically operated rods for raising the carriage, a pair of horizontally operated rods adapted to clamp the element in raised position and a differential and transmission means operable to connect the source of power to either of the pairs of rods.

13. In a tank-lifting-and-adjusting device, a tank lifter, means for operating the lifter, a clamping means for the tank, means for operating the clamping means and a source of power engageable with either of the said means to operate the lifter or the clamping means.

14. In a tank-lifting-and-adjusting device, a portable lifter, a source of power associated therewith, clamping means for the tank, means on the lifter for engaging the clamping means and means for connecting the source of power to either the lifter or to the engaging means.

15. The combination with a support having an element movable into engagement therewith and a clamping means for said element, of a pair of threaded rods on the support for actuating the clamping means, portable means for engaging the threaded rods and a source of power on the portable means for actuating the rods.

16. The combination with a support having an element movable into engagement therewith and a clamping means for said element, of a pair of threaded rods on the support for actuating the clamping means, portable means for engaging the threaded rods a differential associated with the portable means and a source of power on the portable means actuating the differential.

17. In combination with a clamping means having an element adapted to be clamped thereby, of a threaded screw for actuating the clamping means, a portable power device movable into engagement with said element and with the said threaded screw and adapted to release and lower the element.

18. The combination with a clamping means having a support therefor and an element held in engagement with said support by said clamping means, of a threaded screw for actuating the clamping means, a portable power device movable into engagement with the element, a shaft on the power device, differential gearing operated by the shaft, and means operable to engage the gearing to raise the element and to operate the threaded screw to clamp the element in position.

19. The combination with a portable lifting device having a source of power mounted thereon, and a carriage on the portable device for engaging an element, of a pair of vertically operated threaded rods for raising and lowering the carriage, a pair of horizontally operated threaded rods, a clamping means for the element actuated thereby and a differential and transmission means for connecting the source of power to the vertically operated threaded rods and to the horizontally operated threaded rods.

In testimony whereof, I have hereunto subscribed my name this 20th day of February, 1926.

CHRISTIAN AALBORG.