This invention relates to a chain hoist of the general character illustrated in Patent No. 1,973,844 dated September 18, 1934, and is a continuation in part of the copending applications, Serial No. 736,280 filed July 21, 1934, now Patent No. 1,999,036, dated April 23, 1935, allowed October 11, 1934, and Serial No. 755,259 filed November 30, 1934, the latter including a governor construction also included in this invention, said applications and patent illustrating in detail the interior operative mechanism of a hoist embodying the present invention.

The aforesaid disclosures are illustrated as applied to a chain and hand wheel operable shaft device. The length of the endless chain associated with the hand wheel is limited; hence when the hoist of the aforesaid previous disclosures is utilized, it is limited to about twenty feet or thereabouts of lift and even then an excessive length of hand wheel chain is required.

The present invention relates to a device that does not include this practical disadvantage.

The present invention relates to an attachment which if desired, may be applied to the last filed copending disclosure.

The present invention has for its chief object to provide a hoist of the general character indicated with a power shaft operating structure that is not subject to the aforesaid limitation and which can be readily and interchangeably associated with the device last mentioned.

The chief feature of the invention consists in changing the hand wheel drive from a chain to a lever arm type of operation.

Other objects and features will be set forth more fully hereinafter.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

In the drawings, Fig. 1 is a front elevation of a lever operable chain hoist embodying the invention.

Fig. 2 is an elevational view taken at right angles to Fig. 1 and parts being broken away to show other parts in detail.

Fig. 3 is a top plan view of the power applying portion of the invention.

Fig. 4 is a side elevation view of the governor construction associated with the power shaft.

Fig. 5 is a view similar to Fig. 1 and of a modified form of the invention, wherein plural applications. The lever is utilized, one lever means being illustrated near the idler or normal position and the other lever means approaching the end of its power applying position.

Fig. 6 is a view similar to Fig. 2 and of the modified form of the invention shown in Fig. 5.

Fig. 7 is a view similar to Fig. 3 and of a form of the invention shown in Figs. 5 and 6.

In the drawings 10 indicates a hoist housing and 11 a cover forming a portion of the completed housing. Swivelly mounted thereto is a sustaining hook 12. Extending from the housing is a length 13 of a sprocket chain to the lower end of which may be secured to the load to be elevated in any suitable manner. The portions 14 and 15 constitute the surplus chain and in reality successive continuations of the chain 13, portion 15 being suitably anchored to the hoist housing substantially as disclosed in application Serial No. 15,755,259, previously referred to or as illustrated in the patent before mentioned.

It is to be understood, having reference to the patent, that the chain 13 is associated with a sprocket gear carried by a shaft which also carries a rotating gear. This gear meshes with a pinion which, as illustrated in the patent and in both copending applications, is slidable mounted relative to the main power shaft 16, the pinion being normally constrained into meshing engagement by the spring 17.

Enclosed within the housing is a brake structure which is operatively associated with the power shaft. The respective control mechanism and the various forms of this brake mechanism and selective control, is not only set forth in the before mentioned patent but is also illustrated and described in the two copending applications. Suffice to say that the control rod 9 to which may be attached a suitable length of control cable or cord 18 is adapted to control the interior mechanism not shown. Power for rotating the sprocket engaging chain 13 is derived, as stated, from shaft 16 and when the shaft is reversely rotated, either through the load lowering by gravity or otherwise, the rate of lowering of the load is determined by the control imposed through rod 9.

Also as illustrated and described in the last filed of the copending applications, in order that the device may be foolproof to prevent an excessive rate of lowering or upon brake failure, a governor is provided. The governor is inoperative in the elevating operation and only becomes operative for restricting the rate of movement of shaft rotation in the reverse direction or load lowering and when the rate is excessive.

Herein such governor mechanism is illustrated clearly in Figs. 2 and 3. The cover portion 11 of the housing includes an annular portion 8 having an interior cylindrical surface 19 consti-
tutting a drum. Mounted on the shaft 16 and keyed thereto is a hand wheel 20 which has a chain engageable perimeter 21. However, in the present form of the invention, the endless chain is not required or utilized for the reason previously set forth, to wit, too much chain.

The hand wheel 20 pivotally supports at 22 a pair of levers 23, each terminating in a weighted portion 24. The levers are diametrically positioned.

In other words, they are positioned in balanced relation. The operating end of each governor lever is connected as at 26 to one end of a shoe 27, the other end of each shoe being fixedly secured to the wheel as at 27. The shoe may be provided with friction lining 28. Associated with each governor lever is a loading spring 29 and an adjusting arm 30 terminating in a lockable shaft 31 which adjusts the force of the spring 29 for loading the centrifugal governor.

Upon reverse rotation of shaft 16, if the centrifugal force exerted by said rotation exceeds the force imposed by springs 29, the governor levers will be actuated to force the shoe friction lining 28 into engagement with the drum surface 10 for controlling the speed in the load lowering movement of the shaft 10.

In the constructions exemplified by the patent before mentioned and the two copending applications, the ratio between the slideable pinion and the gear rigid with the chain engaging the sprocket is approximately three to one. With the present invention, this gear ratio may be one and a half to one. In other words, the gear is reduced in size and the pinion is increased in size.

Pivoted support upon the shaft 16 is retained thereon by washer 32 and cotter pin 33, or, the like, is a lever arm 34 which has an extension 35 to which is secured one end of a coil spring 36, the other end being anchored as at 37 in an extension 38 rigid with or integral with the cover. This projecting portion 38 is so positioned it will be apparent that the wheel 29 can still be used for endless chain rotation, as illustrated and described in the before mentioned patent. The arm 34 terminates adjacent the end 35 in a spring guard or cam formation 39. This is to prevent interference with the spring. An adjustable connection, as indicated at 40 for the spring 36, may be provided.

The arm 34, due to the influence of spring 36, is normally constrained into its tilted counterclockwise position and a portion 41 connected thereto by the portion 42 is adapted to engage, in the extreme counterclockwise tilted position, a stop 43 rigid with the cover as at 44. It will also be apparent that this stop 43 is so arranged it would not interfere with endless chain operation of the wheel. The portions 34, 42 and 41 constitute a U-shaped member as well as a lever arm and which straddles in radial relation the periphery of the hand wheel 20, but the portion 42 is radially spaced a considerable distance therefrom.

A substantially L-shaped member having a relatively wide base portion 45 is pivotally supported at 46 between the sides of the U-shaped member and the surface 47 of the member 45 rides on the two spaced peripheral portions 48 of the hand wheel. The end 49 of the member 45 is suitably relieved for the necessary operation.

In a well 50 formed in the member 45 is seated one end of the spring 51, the other end being seated in a well 52 formed in the portion 42 of the lever arm. This spring normally constrains the L-shaped member into a position for tilting counterclockwise said member on the member 46. The limitation of said tilting movement is determined by the adjusting bolt 53 threaded and mounted in a portion 52 and the adjustment of this stop 53 is maintained by the nut 54.

The other arm of the L-shaped member is indicated by the numeral 55 and the same includes a plurality of holes 56 therein, which are in any desired spaced relation. Portion 55 may be of any desired length.

The portion 57 telescopically receives the free end of the arm 56. Portion 57 is aperture as at 58 and axially slidable in the aperture is a plunger 59 which terminates in an exposed knob 60 and is finger engageable portion 55. This plunger is carried by a flat spring 61 secured at 62 to the member 57. Whenever the length of the lever arm is desired to be changed, the knob 60 is engaged and the plunger 59 is retracted until it clears or is freed from one of the holes 56. Telescopically associated portions 55 and 51 are longitudinally adjusted until the desired hole 56 registers with the hole 55. Thereupon the knob 60 is released and the plunger 59 seats in the selected registering hole 56 so that the arm 55 and member 57 constitute a rigid arrangement. The end of the member 57 terminates in a suitable socket or anchorage for a power cable 62.

This cable 62 may be of any suitable length.

Putting down on cable 62 tilts the members 57, 55 and 45 relative to the lever arm 34 until the surface 43 engages the hand wheel surfaces 48 and continuing pulling locks all of the aforesaid to the hand wheel and then the hand wheel rotates the desired amount corresponding to the angular throw of the operating lever construction. Upon release of the cable 62, the spring 36 returns the entire lever structure until the arm 41 engages the stop 43. This reverse movement of the lever is permitted by reason of the tilting relationship between lever arm 34 and the extension 45, 55 and 51, the latter being, as stated, a flexible relative to the former. Another pulling down on cable 62 will again cause further rotation of the hand wheel.

It is by reason of the fact that only approximate 90° of arcuate movement is possible for the lever construction that the pinion enclosed within the housing may be increased and the gear and pinion ratio changed to one and one half, so that the quarter turn movement of the lever secures substantially the same degree of rotation of the sprocket engaging the chain 15 as a complete revolution of the hand wheel would obtain if the previous viously mentioned one to three and a half gear ratio were embodied in the host.

It will be apparent that if the loads are excessive, it is highly desirable to increase the applied force for rotating the hand wheel and this is done by lengthening the lever arm, if and when necessary, since the force applied is proportionate to the customary pulling wheel chain guard and less, and applying the lever construction, herein disclosed, thereto.

As set forth hereinbefore, the stop 43 and the anchorage 35 may be formed integral with the cover and in nowise interfere with normal endless
chain operation so that a hoist of the character shown herein is not only capable of operation as a lever actuated hoist but is also capable of operation as an endless chain operable hoist by the addition only of the endless chain and the removal of the lever construction.

When the hoist embodying the invention is to be mounted at the extreme height, with reference to the load and its supporting surface, this lever arm type of construction is the most practical form of the power application for the structures exemplified by the prior patent and the several copending applications.

In Figs. 5 to 7, inclusive, is illustrated a modified form of the invention. Herein numerals similar to those hereofore utilized in Figs. 1 to 4 but of the one hundred series designate similar or like parts with the addition of subscripts a and b whenever parts are duplicated.

In this form of the invention each lever means is independently operable relative to the other. Thus, both may be simultaneously operated, although each usually is operated in succession. The purpose of such alternate oppressive operation is to provide for faster elevation of the load. The operator alternately pulls down on cable or cord 152a and/or 152b, and releasing the same when the pivotal movement is completed and then engaging the other cable or cord and repeating this operation until the load has elevated to the desired height. As shown in Fig. 5, there may be a slight overpull of the pulling movement.

In this form of the invention, shaft 116 is elongated. Only one governor structure is utilized.

In this form of the invention, the member 145 is elongated so as to be stop for either or both lever mechanisms. Also similar to stop 76 the stop 170 secured to the hoist as at 171 is elongated so as to be operatively associated with the lever to limit the power applying travel.

In Figs. 5 to 7, inclusive, a slightly modified form of lever mechanism is illustrated. In this form, instead of the pull-down cable anchored member telescopically receiving the tiltable wheel peripherally engaging member, the reverse thereof is illustrated.

Since a rather detailed description has been given relative to the form of the invention shown in Figs. 1 to 4, are herein designated by the subscripts "a" and "b", as well as by the increase of 100 in reference numbers.

In this form of the invention as distinguished from the form shown in Figs. 1 to 4, the lever mechanisms are positioned between the two wheels 120a and 120b and thus are protected, as it were, by the wheels 123. By reason of such positioning, the stop portion 141a is positioned similarly to the stop portion 41, while the stop portion 141b is oppositely directed. In this form of the invention, the spring anchorages 136 is elongated so as to provide a support for both spring 136a and 136b.

Each wheel and lever means operates in substantially the same manner as that set forth for the purpose of the wheel and lever means illustrated in Figs. 1 to 3, inclusive.

While the invention has been described in great detail in the foregoing specification, the same is intended to be illustrative and not restrictive in character and the various modifications suggested and/or described and/or illustrated herein, as well as others which will readily suggest themselves to persons skilled in this art, are all considered within the broad scope of this invention, reference being had to the appended claims. Also, the disclosure in the prior patent, before mentioned, and the copending applications so far as they relate to the detailed mechanism enclosed within the housing, are expressly made a part of this application.

The invention claimed is:

1. In a chain hoist including a housing arrangement, a load chain depending therefrom, chain moving means within the housing including a power shaft having an exposed end, and a control mechanism within the housing including a control member projecting therefrom, of a governor structure operatively interposed between the shaft and housing, a power wheel on the shaft, and lever means operatively associated with the wheel for manually rotating said wheel in a load elevating direction.

2. A device as defined by claim 1, characterized by the lever means including a lever arm pivoted on the shaft axis and normally constrained toward reverse rotation, stop means operatively associated with the arm and housing determining the constrained position of the arm, and a tiltable driving shoe operatively interposed between the lever arm and the wheel for rotating the wheel when the lever arm is actuated against its constraint and automatically releasable when the lever arm is operable by its constraining force.

3. A device as defined by claim 1, characterized by the lever means including a lever arm pivoted on the shaft axis and normally constrained toward reverse rotation, stop means operatively associated with the arm and housing determining the constrained position of the arm, and a tiltable driving shoe operatively interposed between the lever arm and the wheel for rotating the wheel when the lever arm is actuated against its constraint and automatically releasable when the lever arm is operable by its constraining force, said constraining force including a spring anchored at one end to the lever arm and at its opposite end to the housing.

4. A device as defined by claim 1, characterized by the lever means including a lever arm pivoted on the shaft axis and normally constrained toward reverse rotation, stop means operatively associated with the arm and housing determining the constrained position of the arm, and a tiltable driving shoe operatively interposed between the lever arm and the wheel for rotating the wheel when the lever arm is actuated against its constraint and automatically releasable when the lever arm is operable by its constraining force, said constraining force including a spring anchored at one end to the lever arm and at its opposite end to the housing, one of the spring anchorages being of adjustable character.

5. A device as defined by claim 1, characterized by the lever means including a lever arm pivoted on the shaft axis and normally constrained toward reverse rotation, stop means operatively associated with the arm and housing determining the constrained position of the arm, and a tiltable driving shoe operatively interposed between the lever arm and the wheel for rotating the wheel...
the wheel when the lever arm is actuated against its constraint and automatically releasable when the lever arm is operable by its constraining force, said lever arm including an extension, and a spring anchored at one end to the arm extension and at its opposite end to the housing for imposing the constraining force.

6. A device as defined by claim 1, characterized by the lever means including a lever arm pivoted on the shaft axis and normally constrained toward reverse rotation, stop means operatively associated with the arm and housing determining the constrained position of the arm, and a tiltable driving shoe operatively interposed between the lever arm and the wheel for rotating the wheel when the lever arm is actuated against its constraint and automatically releasable when the lever arm is operable by its constraining force, said lever arm including an extension, and a spring anchored at one end to the arm extension and at its opposite end to the housing for imposing the constraining force, said arm having a plurality of spring anchorages for selective anchorage of said spring.

7. A device as defined by claim 1, characterized by the lever means including a lever arm pivoted on the shaft axis and normally constrained toward reverse rotation, stop means operatively associated with the arm and housing determining the constrained position of the arm, and a tiltable driving shoe operatively interposed between the lever arm and the wheel for rotating the wheel when the lever arm is actuated against its constraint and automatically releasable when the lever arm is operable by its constraining force, said lever arm being of extensible character.

8. In a hoist having a rotatable power member and a housing, the combination of a wheel rigid with the member, a lever arm pivotally supported coaxial with the wheel axis and constrained toward one position, a wheel engaging shoe pivotally supported by said arm and normally constrained toward non-engagement, and an extension upon said shoe constituting an operative extension of said arm for initially tilting the shoe into wheel gripping engagement and then operative to rotate the arm and the wheel.

9. A device as defined by claim 8, characterized by the addition of an elongated member, said member and shoe extension having a cooperative connection therebetween for adjustable lever arm purposes.

10. A device as defined by claim 8, characterized by the addition of a second wheel also rigid with the member, a second lever arm, a second shoe, and a second shoe extension similarly mounted, constrained and operable, the lever arms operating in opposition to the respective constraining forces the opposition operations occurring successively if desired.

11. A device as defined by claim 1, characterized by the addition of a second power wheel rigid with the shaft, and a second lever means similarly associated therewith, both lever means being operable successively if desired for the purpose set forth.

12. A device as defined by claim 1, characterized by the lever means including a lever arm pivoted on the shaft axis and normally constrained toward reverse rotation, stop means operatively associated with the arm and housing determining the constrained position of the arm, and a tiltable driving shoe operatively interposed between the lever arm and the wheel for rotating the wheel when the lever arm is actuated against its constraint and automatically releasable when the lever arm is operable by its constraining force, and further characterized by the addition of a second power wheel rigid with the shaft, a second lever arm similarly constrained and mounted, and a second driving shoe similarly mounted on the second lever arm and cooperating with the second wheel, said lever arms and shoes being successively operable if desired for the purpose set forth.

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