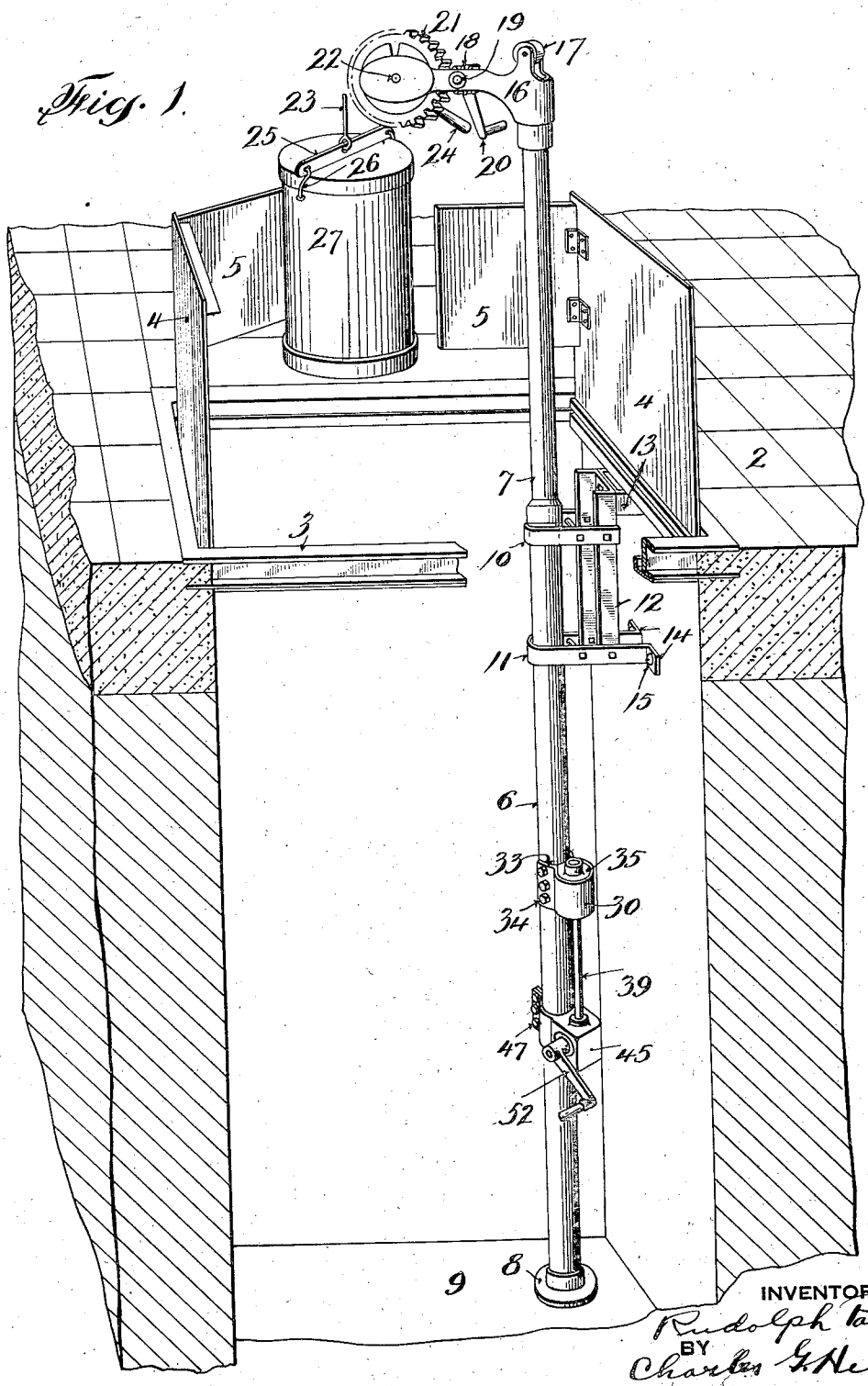
Oct. 22, 1935. R. PAYSON 2,018,568

HOIST

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Fig. 1.



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Fig. 2.

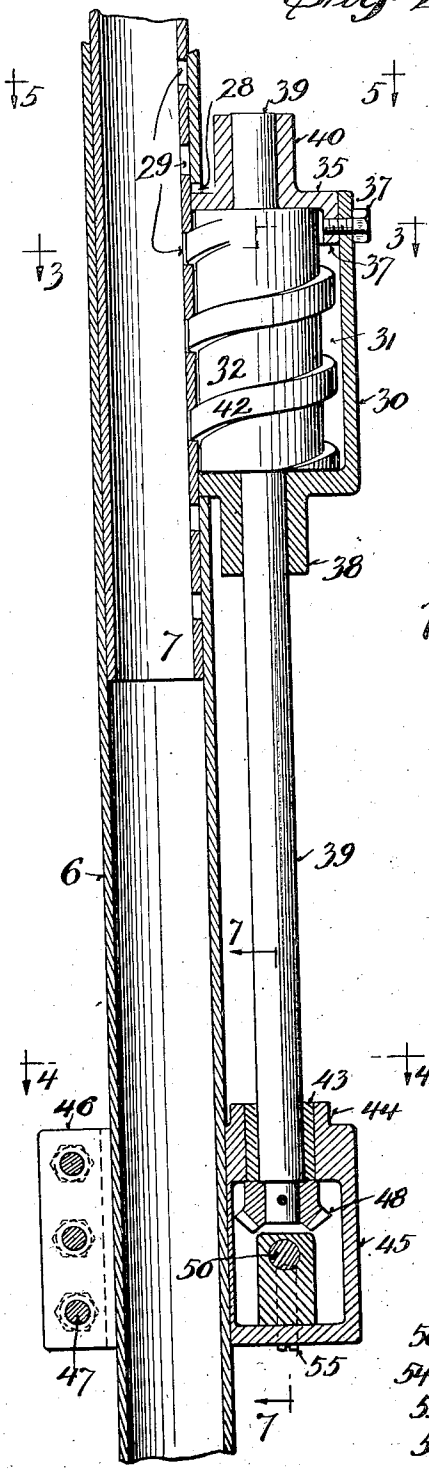


Fig. 6.

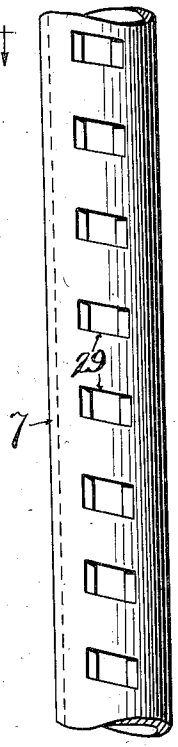


Fig. 3.

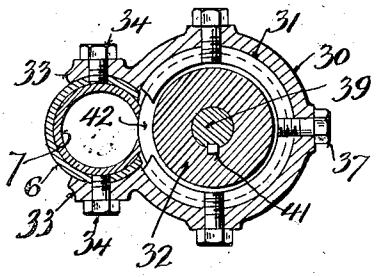


Fig. 4.

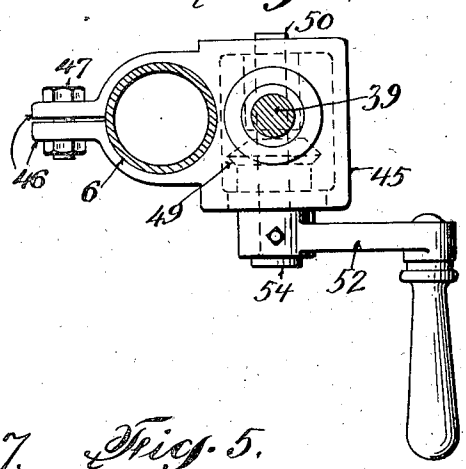


Fig. 7.

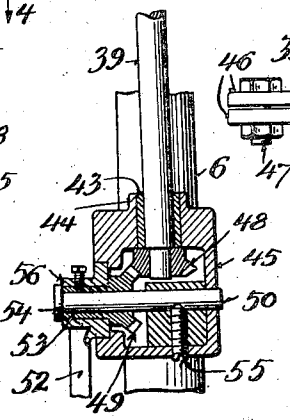
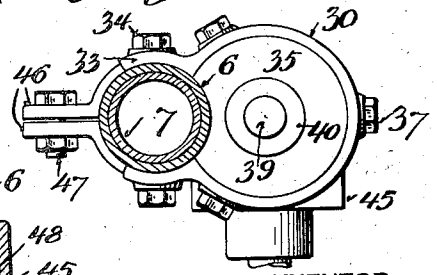


Fig. 5.



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UNITED STATES PATENT OFFICE

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HOIST

Rudolph Payson, Flushing, N. Y.

Application July 31, 1931, Serial No. 554,228

3 Claims. (Cl. 189—14)

My invention relates to hoists and while it is not limited to a specific use, I have shown the same embodied in the form of an ash hoist for lifting ash cans, garbage cans and other objects out of, and lowering them into the cellar of a building. Where it is necessary to lift large quantities of ashes from the cellar of a building onto the sidewalk or some structure adjacent the level of the sidewalk it is common practice to provide a hoist which may be lowered or retracted below the level of the doors adjacent the plane of the walk when the same is not in use, to permit the doors to be closed; and usually such hoists are made extensible so that the upper part of the hoist may be projected through the doorway to a point sufficiently high to permit cans and other objects to be raised, so that the bottom of the objects will be brought to the level or above the level of the walk. Sometimes the winch is operated by manual power at the top of the hoist, whereas in other cases a motor located at the lower portion or at the front of the hoist serves to operate the winch. As far as my present invention is concerned, it may be embodied in a hoist regardless of whether the winch is operated manually or by means of a motor and whether mounted at the rear or the front of the hoist.

One object of my invention is to provide a very simple but reliable device for raising and lowering the upper section of the standard or mast for the purpose of elevating the crank arm into position to permit the hoist to be used in the manner described, or to be retracted below the doors or into the pit and below the sidewalk level.

Another object is to provide safe means for raising and lowering the standard or mast. This includes a worm and worm gear for raising and lowering the standard or support. Heretofore, the raising and lowering device has included a pawl and ratchet device for holding the support or mast in raised position, which pawl had to be released from the ratchet when the support was to be lowered. There was always the danger of the support or mast falling too rapidly if the pawl was released at a time when the lowering device was not under the control of the operator. In the present case I employ a worm and worm gear, which permits the support or mast to be raised and lowered, but which will prevent the support from causing backward movement of the raising device. With this arrangement it is unnecessary to use a pawl and ratchet as the raising and lowering device cannot be operated reversely by the weight of the support or mast, and the latter is therefore locked in position against downward movement except under the control of the raising and lowering device.

Another object of my invention is to provide a very simple form of supporting device or mast for the hoist, consisting of a tubular member adapted to slide and telescope within another tubular member. The outer tubular member is provided with an opening through which the worm of the raising and lowering device may extend into engagement with the inner tubular member. The inner tubular member is preferably provided with slots or cuts whereby this member itself constitutes the gear member of the worm and gear drive.

Another object of the invention is to provide an improved bracket support for the upper end of the stationary member of the vertical support or mast which is of simple but strong construction and which will securely retain the vertical support in position.

Other features of my invention will be set forth in the following detailed description.

In the drawings forming part of this application,

Figure 1 is a view showing the ash pit of a building structure broken away and with my improved hoist shown in perspective and in position for raising and lowering objects,

Figure 2 is a vertical, sectional view of the apparatus for raising and lowering the movable section of the support or mast,

Figure 3 is a cross sectional view taken on the line 3—3 of Figure 2,

Figure 4 is a cross sectional view taken on the line 4—4 of Figure 2,

Figure 5 is a sectional view taken on the line 5—5 of Figure 2,

Figure 6 is a face view of a portion of the inner member of the mast or vertical support, and

Fig. 7 is a fragmentary sectional view taken on the line 7—7 of Fig. 2.

In the drawings I have shown in Figure 1 an ordinary pit 1, such as is formed below the surface of the sidewalk 2 adjacent a building, whereby ashes from the basement or other substructure of the building may be raised for the purpose of bringing the ashes to the level of the sidewalk. It will be understood that the present hoist is adapted for use wherever a hoist is employed to raise or lower materials and wherein the mast or support is adapted to be raised and lowered.

The upper end of the pit is shown as enclosed by a rectangular steel frame 3 to which the trap doors 4 are hinged, so that the doors may be swung open or to the vertical position shown in

Figure 1, or they may be folded down to close the top of the pit when the device is not in use.

Very often additional doors 5 are pivoted to the vertical swinging doors 4 in order to provide protection for one side of the pit opening, and these doors are adapted to swing freely in one direction to permit ash cans and other articles to be moved from the pit onto the sidewalk or other structure 2, but they protect persons from accidentally stepping into the pit when the hoist apparatus is in active position. These several devices are all commonly used in the art and form no part of my present invention.

The vertical support or mast forming part of the present invention is composed of an outer tubular member 6 which may have any cross sectional shape, but which I have shown as circular in cross section; and of an inner tubular member 7 telescoping and sliding vertically within the outer member, and this inner member may be of any cross sectional shape although I have shown it as circular and of such proportions as to slide freely and vertically within the outer tubular member 6 and guided by the latter and supported from it in a manner hereinafter described. The outer tubular member 6 of the mast or support is shown with its lower end stationarily held in a collar 8 attached to the member 9 at the bottom of the pit and forming means for rigidly holding the lower end of the mast or support. The upper end of the mast member 6 terminates at some point below the level of the sidewalk 2, preferably below the level of the swinging doors 4 when they are in their closed position. The upper end of the outer member of the mast is surrounded by U shaped straps 10, 11 one of which is shown adjacent the upper end of the mast member and the other disposed below the same but parallel with the upper one, and one of these straps is connected with the side wall of the pit and back by a piece of channel iron 12 which is disposed in a vertical position and is connected with a bracket on the framework at the upper end of the ash pit, as shown at 13.

Preferably, the lower strap 11 is extended beyond the channel member 12 and the two ends of the strap are turned at right angles, as shown at 14 and these ends are secured against one of the vertical walls of the ash pit by screws or bolts 15. It will be apparent that the straps 10, 11 being spaced vertically apart and engaging around the outer member of the mast securely hold the latter in place and the channel member 12 unites the straps with each other and with the supporting structure, so that a very substantial and rigid means is thus provided for the upper end of the stationary portion of the mast.

The inner tubular member 7 of the mast, as stated above, is adapted to slide vertically within the stationary member 6 in order to be raised above the pit, and to be lowered into it. On the upper end of this telescoping member I have shown a head or bracket 16 having an idler roller 17 adapted to engage the folding doors 4 for the purpose of lifting or opening them when the mast is raised, and permitting the doors to move downwardly into closed position when the mast is lowered.

I have shown a simple hand operated winch of well known construction for raising and lowering articles into or out of the pit, but as stated above, any type of winch may be used as far as the present invention is concerned. In the drawings I have shown a pinion 18 mounted on the stud 19 which is adapted to be revolved by the hand crank 20. This pinion meshes with and drives the larger gear 21 which is mounted on the stud 22 on the forked end of the bracket 16 and on the same stud there is a drum on which a cable 23 is wound and unwound when the crank 20 is operated.

Usually there is a pawl and ratchet device adapted to be released and to be thrown into operation by the arm 24 for the purpose of controlling the operation of the drum and to prevent retrograde movement of the winch while the object is being attached or removed. In Figure 1 I have shown a bar 25 attached to the free end of the cable 23 and this is supplied with hooks 26 or other means for engaging a receptacle such as an ash can 27.

The outer tubular member or stationary portion of the mast is provided with an aperture 28 through which the worm may operate upon the inner or movable member of the mast. The inner tubular member 7 of the mast is provided with a number of apertures 29 angularly disposed or having a certain pitch inclination as shown in Figure 6, the pitch corresponding with the pitch of the worm. These slots may be milled at equal distances apart and parallel with each other in a vertical line along the tubular member 7 so that the tubular member itself becomes a worm gear and it may be directly driven by the thread of the worm as will be hereinafter described. The several slots 29 will extend from about the lower end of the telescoping member of the mast upwardly along this member and for a distance corresponding approximately with the distance the inner member of the mast is to move vertically between the retracted and extended positions.

There is a shell or housing 30 having a substantially cylindrical chamber 31 therein, in which the worm member 32 is housed. This housing has extensions 33 extending partly around the stationary member 6 of the mast at opposite sides and these extensions are bolted to the member 6 by means of the bolts 34 so that the housing is fixed to the member 6 at such position as to permit the worm to operate in a manner hereinafter described.

The lower end of the worm may rest and revolve on the bottom surface of the interior of the housing 30. The top of the housing is closed by means of a detachable head 35 having a flange 36 fitting within the upper end of the housing and secured therein by the bolts 37. The lower end of the housing is provided with a hub or boss 38 forming a bearing for the vertically disposed shaft 39; and the removable head is provided with a similar boss 40 forming a bearing for the shaft above the worm. The worm 32 surround the shaft and is keyed thereto by means of the key 41 so that the worm revolves with the shaft. The thread 42 on this worm projects through the opening 28 of the stationary member of the mast and projects into one or more of the inclined slots 29 of the inner member of the mast in order to mesh with the latter.

The shaft 39 extends vertically or parallel with the mast and its lower end projects through a bearing member 43 mounted on the hub 44 on the top of a housing 45. This housing has portions 46 surrounding the stationary member 6 of the mast and which are adapted to be clamped to the mast by means of the bolts 47.

The mitre gear 49 arranged in the housing 45 meshes with and drives the mitre gear 48. The gear 49 is mounted to revolve on the shaft 50

which has one end journaled in a wall of the housing 45. The mitre gear 49 has a hub 53 which revolves on the shaft 50, the hub having its bearing in one wall of the housing 45.

The shaft 50 has a head 54 to hold the hub 53 and the mitre gear in position and the shaft 50 is held in position by a set screw 55 which permits the shaft 50 to be adjusted to maintain the gear 49 in mesh with the gear 48. The crank 52 has a hub 56 having a polygonal aperture to fit onto the polygonal exterior of the hub 53 so that the crank, the hub 53, and the mitre 49 revolve together around the shaft 50. The exterior of the hub 56 is adapted to have a bearing on the housing.

By arranging the crank arm 52 below and spaced from the worm and worm gear, the crank may be placed in the most advantageous position for operation by a person of average height, and the worm gear and worm may be disposed at a higher level, so that they may raise and lower the upper mast section the required distance without having the movable section pass below the bottom of the pit; i. e., the bottom wall 9.

Operation

Assuming that the mast is in its lowest position, that is, the movable section 7 is lowered, so that the top of the mast and the winch are below the folded position of the doors 4, and assuming that the device is to be used for raising ash cans or other objects into or out of the pit, the following operations will be performed:

The operator will revolve the crank 52 to operate the gear 49 which will act on the mitre gear 48 to cause the worm shaft 39 to revolve. The worm 32 will revolve with the shaft 39 and its thread 42 engaging continuously in the several slots 29 of the inner member 7 of the mast will, as the worm revolves, cause the inner member 7 to move upwardly. The speed at which the inner mast member moves upwardly will depend upon the speed at which the crank is operated and upon the pitch of the worm. The crank 52 will be operated until the inner member of the mast rises to about the position shown in Figure 1, and when it is at the desired height the operator will simply cease to operate the crank 52. The hoist is then in condition to be used for raising and lowering objects. The operator, standing on the sidewalk level, may operate the hand winch for the purpose of raising ash cans or other articles from the bottom of the pit to the level of the sidewalk or, reversely, lowering objects from the level of the walk to the bottom of the pit. The winch will be disposed sufficiently above the plane of the walk to allow the bottom of the articles to be raised to this plane, as shown in Figure 1. If the winch is electrically operated, the operator will proceed the same as with any ordinary electrically operated winch.

It will be apparent that when the mast is in the projected position, as shown in Figure 1, the movable section of the mast cannot move downwardly, even though it is supporting a heavy load, because the worm gear cannot act reversely on the worm and cause the revolution of the latter, if the thread of the worm is not very steep in pitch, because of the irreversibility of the gear and worm.

It is, therefore, not necessary for the operator to lock the mast in any position as the worm and gear automatically perform this function in any position of the movable member of the mast. There is no possibility of the mast collapsing while the device is in use, by the accidental displacement of a pawl or from any other cause. The movable section of the mast is always locked in its various positions against gravitational action on the movable member of the mast, by the worm and worm gear. In the construction shown and described, the inner member of the mast constitutes the worm gear.

When the various raising or lowering operations have been completed the hoisting device may be lowered into the pit by operating the hand crank 52 in the reverse direction to that in which it was operated for the elevation of the mast. This will revolve the worm in the opposite direction to that first described, and the thread of the worm will act on the member 7 to gradually lower the same into the stationary member until the upper end of the movable section of the mast, together with the winch, have been lowered below the plane of the sidewalk so that the hoist is fully retracted within the pit, permitting the doors 4 to close the top of the pit, leaving the sidewalk unobstructed. If at any time during the raising or lowering operation the operator should let go of the crank 52 the parts will all remain in the position they occupy at that time because gravity will not cause the movable parts to come down against the locking action of the worm and worm gear. The thread of the worm projects into the slots 29 of the member 7 and prevents the mast section from revolving, so that no other means is necessary to prevent the section 7 from revolving.

It will be apparent from the above description that I have provided a very simple and efficient device for raising and lowering the movable member of the mast, which device is self-locking against accidental or retrograde movement of the mast section under the action of gravity. This prevents the mast from falling accidentally thereby avoiding injury to the operator as well as to the hoist itself.

Having described my invention, what I claim is:

1. A hoist including a mast consisting of a tubular lower section having an aperture, a tubular upper section telescoping in said lower section, said upper section having inclined slots cut therein to form a worm gear in said section, an upwardly extending shaft and means at its lower portion for revolving it, a worm on the upper portion of said shaft extending through said aperture and meshing with the worm gear formed in said upper mast section to cause the raising and lowering of said upper section, and means for supporting said worm on said lower mast section to relieve said shaft from carrying the load of said upper mast section.

2. A hoist including a mast consisting of a tubular lower section having an aperture, a tubular upper section telescoping in said lower section, said upper section having inclined slots cut therein to form a worm gear in said upper section, an upwardly extending shaft and means at its lower portion for revolving it, a worm on the upper portion of said shaft, extending through said aperture and meshing with said worm gear of the upper mast section, a housing for said worm in which said worm is journaled, said housing being secured to said lower mast section and supporting said worm, whereby said shaft is relieved of the load of said upper mast section.

3. A hoist including a mast consisting of a tubular lower section, a tubular upper section telescoping in said lower section, said upper section having a worm gear formed therein, an upwardly extending shaft adjacent said mast, gears adjacent the lower end of the shaft, a housing for said gears,

mounted on the lower mast section, and means outside said housing for operating the shaft through said latter gears, a housing for the upper end of said shaft, mounted and supported on the lower mast section, a worm on the upper portion of said shaft, acting on said worm gear to raise and lower the upper mast section, said worm being disposed in and supported by said housing whereby the shaft is relieved of the support of the upper mast section.

RUDOLPH PAYSON.