Jan. 27, 1953 G. EPPINK 2,626,683

MATERIAL ELEVATOR ATTACHMENT FOR LADDERS

Filed July 10, 1950 2 SHEETS—SHEET 1

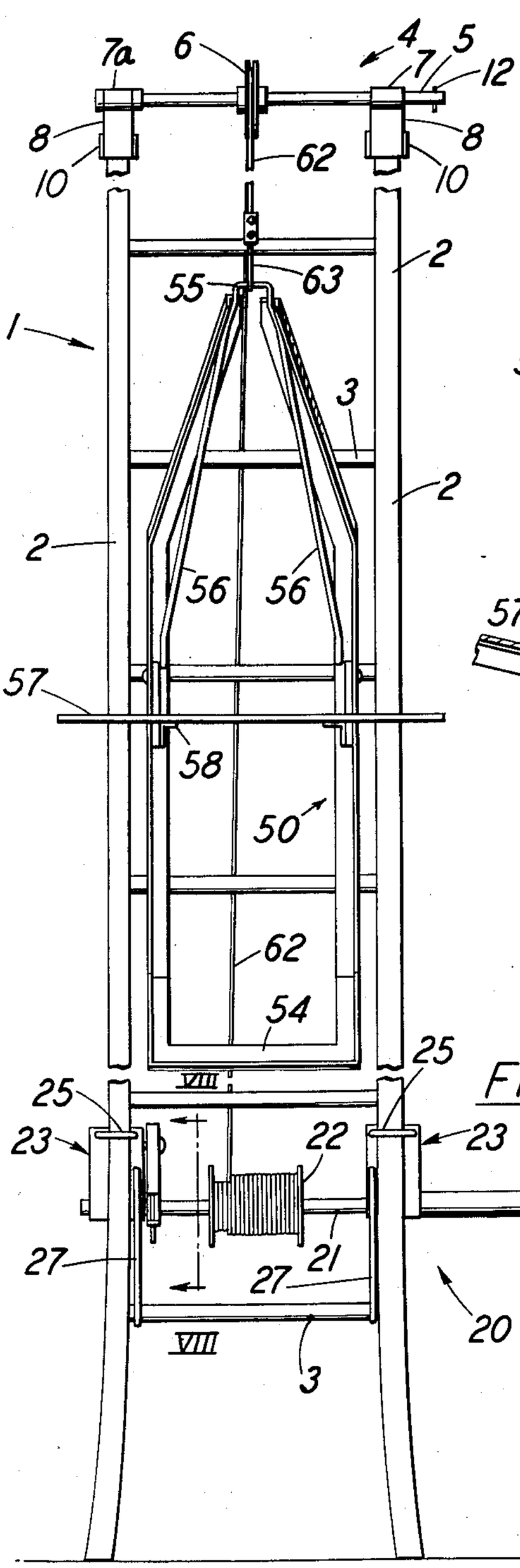

Fig. 1.

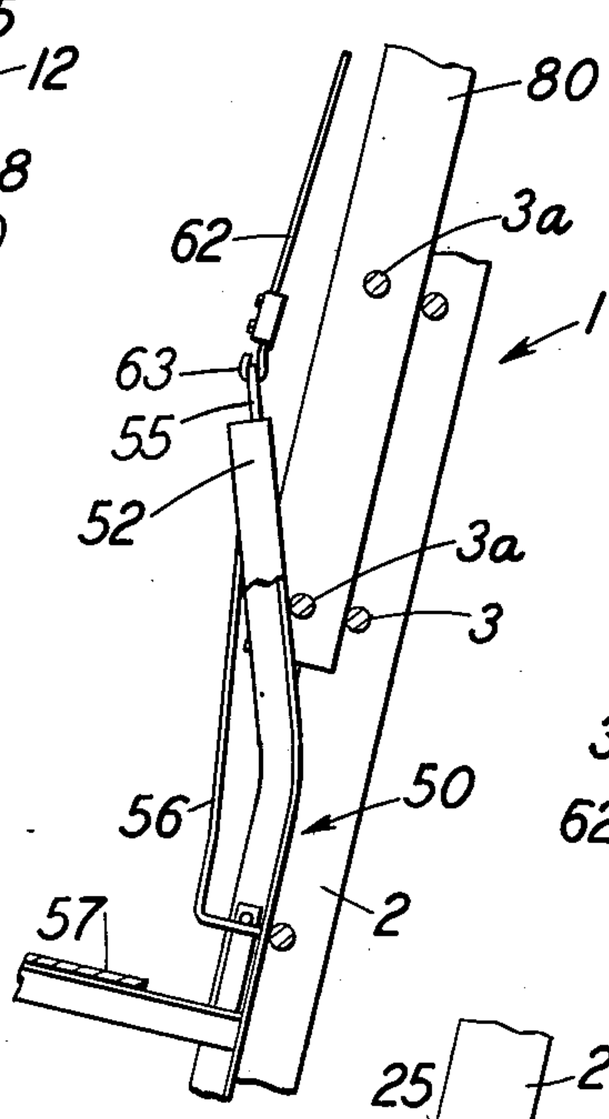

Fig. 10.

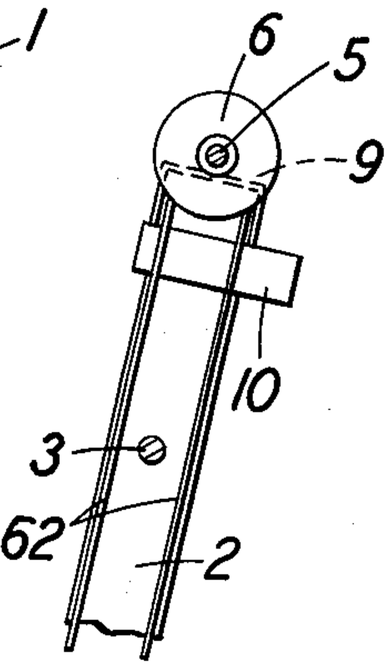

Fig. 5.

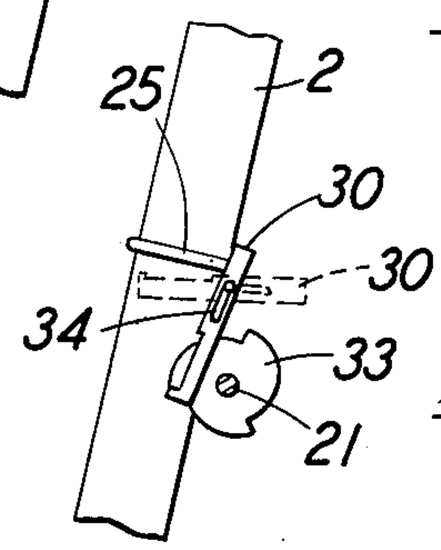

Fig. 8.

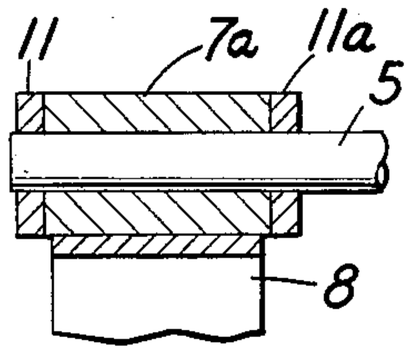

Fig. 9.

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MATERIAL ELEVATOR ATTACHMENT FOR LADDERS

Filed July 10, 1950 2 SHEETS—SHEET 2

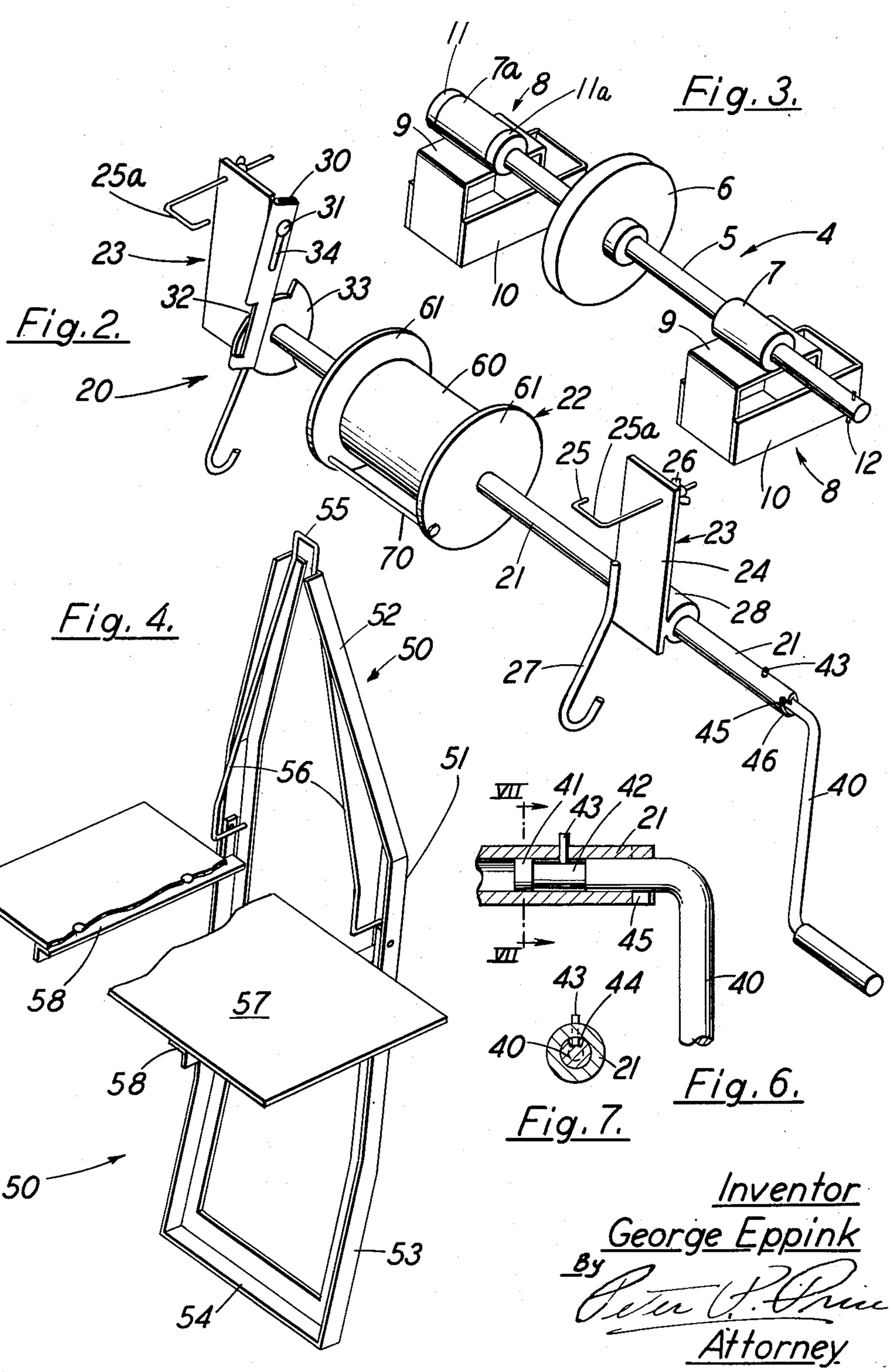

Fig. 6.

Fig. 7.

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2,626,683

MATERIAL ELEVATOR ATTACHMENT FOR LADDERS

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7 Claims. (Cl. 187—10)

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My invention relates to materials elevator and particularly to a detachable elevator unit designed to be mounted upon a standard ladder of the type conveniently used by carpenters and masons in construction work.

A number of materials elevator attachments for ladders have been developed, which prior developments have employed several different principles of construction. Each of these prior developments has, however, proved to be unsatisfactory in service because of either their complexity, their lack of ease in operation, their limitation to single length ladders, or their lack of adaptability to use under varying conditions.

In order to be practical any materials elevator arrangement to be used with a ladder must be both simple and economical to build. At the same time the equipment must be adaptable to use with any of the many types, sizes and shapes of ladders commonly in use. This adaptability must include its capacity for use with sectional ladders. It must be adapted to mounting on each of these various types of ladders without in any way weakening the ladder or requiring permanent attachment to the ladder whereby the weight of the equipment must necessarily be raised with the latter when the ladder is put into place. This last factor is particularly important where the equipment is to be used by a single operator. Even where two men are involved in the operation of erecting the ladder, it is both undesirable and unsafe to require the raising of a ladder having a quantity of heavy equipment anchored to the ladder, particularly at its upper end. It is also desirable to make the elevator equipment removable in order to facilitate transportation of the ladder. The operation of mounting and dismounting the equipment should be simple and capable of rapid execution.

Many of the existing materials elevator attachments for a ladder mount the materials holding slide or cradle on the rails of the ladder. This seriously restricts the equipment because of the number of different ladder widths in common use. Further, some types of ladders are designed with rails of constant spacing but others have rails which converge as they extend up the ladder.

It is, therefore, a primary object of my invention to provide a materials elevator designed to be detachably mounted upon and used with any ladder irrespective of its size, construction or number of sections.

It is a further object of my invention to provide a materials elevator for a ladder which is simple in construction and is readily attachable or removable from the ladder and does not utilize any permanent attachments to the ladder.

It is an additional object of my invention to provide a materials elevator for a ladder so designed that the materials placed upon the elevator are readily accessible at any place on the ladder.

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A further additional object of my invention is to provide a materials elevator for a ladder which is both safe in operation and sufficiently strong to handle any load which the ladder will support without requiring the operator to exert more than a reasonable amount of effort.

These and other objects and purposes of my invention will be immediately seen by those acquainted with the design and construction of builders' equipment and hardware upon reading the following specification and the accompanying drawings.

In the drawings:

Figure 1 is a front, elevation view of a ladder equipped with my improved materials elevator.

Figure 2 is an oblique view of the winch assembly for my improved materials elevator.

Figure 3 is an oblique view of the pulley assembly for my improved materials elevator.

Figure 4 is a fragmentary, oblique view of the carriage for my improved materials elevator.

Figure 5 is an enlarged, fragmentary, side elevation view of the upper end of a ladder equipped with my materials elevator.

Figure 6 is an enlarged, fragmentary, partially sectional view of the handle mounting for the winch of my improved materials elevator.

Figure 7 is a sectional view taken along the plane VII—VII of Figure 6.

Figure 8 is a sectional view of the ratchet mechanism for the winch of my improved materials elevator taken along the plane VIII—VIII of Figure 1.

Figure 9 is an enlarged, fragmentary, sectional view of the mounting for one end of the pulley assembly of my improved materials elevator.

Figure 10 is a fragmentary, sectional, elevation view of the carriage which is used with a multisectional ladder.

In executing the objects and purposes of my invention I have provided a winch assembly detachably mountable to the lower end of a conventional ladder and a pulley assembly detachably mountable to the upper end of a conventional ladder. A carriage is provided to slidably ride upon the ladder rungs between the ladder rails, the movement of which carriage is controlled by a cable running over the pulley assembly and anchored to the winch. The carriage is provided with a platform designed to stand out from the carriage in a substantially horizontal position when the ladder is inclined against the side of a building. The upper and lower ends of the carriage are bent outwardly from the ladder to prevent interference between the ladder and the carriage ends as the carriage moves up and down the ladder.

In the following description the terms "upwardly" and "downwardly" are freely used and are to be taken as meaning "upwardly" in the direction shown in Figure 1 or as a ladder is normally used and "downwardly" away therefrom. The terms "inwardly" and "outwardly" are also

freely used and are to be taken as meaning "inwardly" toward the wall or surface against which the ladder is resting, i. e., toward the right as the ladder appears in Figure 5, and "outwardly" away therefrom.

Referring specifically to the drawings, the numeral 1 indicates a ladder having a pair of spaced, side rails 2 held together by a plurality of substantially equally spaced ladder rungs 3. The rungs 3 and rails 2 are each of conventional design and may be round, rectangular or square, depending upon the construction of the ladder. The lower end of the rails 2 are shown as diverging slightly outwardly from the center of the ladder. This construction is illustrative only and is not to be considered a limitation since ladders having any type of footing or lower end may be used.

At the upper end of the ladder 1 there is placed a pulley assembly 4 which includes a shaft 5 and a pulley element 6. Preferably, the pulley element 6 is rotatably mounted on the shaft 5 but the pulley element 6 may be rigidly mounted to the shaft 5 and the shaft 5 permitted to rotate with the pulley element 6. The shaft 5 is, on each side of the pulley element 6, mounted by means of bearings 7 and 7*a*. The bearings 7 and 7*a* are each attached to one of a pair of cap elements 8. The cup-shaped cap elements 8 consist of a U-shaped strap 9 (Figs. 3 and 5) joined at their free ends by means of a U-shaped arm 10. The U-shaped arm 10 extends perpendicularly to the strap 9 and extends out from the strap a substantial distance on one side. The purpose of this construction will appear more fully hereinafter. The size of the strap 9 is such that the space enclosed between the sides of the strap 9 and the sides of the arm 10 will slidably receive the upper end of the rails 2. Although, as between various makes of ladders, the size of the rails 2 will vary somewhat, this variation is not so great that the caps 8 may not be made of sufficient size to assure seating over the largest of these rails and yet be capable of securely supporting the pulley assembly 4 on ladders having rails of somewhat different dimensions.

The shaft 5 is mounted to the bearing 7*a* in such a manner that the shaft 5 may not move axially in relation to this bearing. To this end, a pair of rings 11 and 11*a* (Fig. 9) are mounted on the shaft 5, one at each end of the bearing 7*a*, thus preventing the shaft from moving axially of the bearing 7*a*. The shaft 5 is free to slide axially in relation to the bearing 7. This permits the spacing between the caps 8 to be varied to accommodate ladders of differing widths, yet the spacing of the pulley element 6 from the left hand rail 2 (as appearing in Fig. 1) will remain constant. A pin 12 is mounted in the end of the shaft 5 adjacent the bearing 7 to prevent this bearing from sliding off the end of the shaft 5 while the pulley assembly is being transported.

In place of the use of the bearings 7 and 7*a*, the bearing 7*a* may be dispensed with and the end of the shaft 5 rigidly welded or bolted to the cap 8. The rings 11 and and 11*a* can then be eliminated since the shaft and cap are permanently locked together. When this construction is used, the pulley element 6 must be rotatably mounted on the shaft 5. The bearing 7 remains unchanged since it must still be adjustable axially along the shaft.

The winch assembly 20 includes a shaft 21 on which is mounted a drum 22 (Figs. 1 and 2). The shaft 21 is mounted to the ladder 1 by means of a pair of support assemblies 23, each detachably

mountable upon one of the rails 2. The support assemblies 23 each include a plate 24. Each plate 24 has, at one of its upper corners, a J-shaped clasp 25. The clasp 25 is threaded at one end for engaging a wing nut 26 whereby it may be drawn toward the plate 24 to securely clasp the rail 2 between the arm 25*a* of the clasp 25 and the plate 24. At the corner of the plate, diagonally spaced from the clasp 25, a depending hook 27 is rigidly mounted to each of the plates as by welding. The hook 27 is shaped substantially similar to that of a question mark and is designed to hook under and about one of the rungs 3. When the winch assembly 20 is in operation, the loading of the winch urges the winch assembly upwardly, which movement is resisted by the positive engagement between the hook 27 and the rung 3.

Each of the plates 24 is equipped with a bearing 28 for rotatably supporting the shaft 21. The shaft 21 is held against axial movement, relative to the bearing 28 on the plate 24 on the left hand side (as appearing in Fig. 1), by the use of rings similar in construction and purpose to the rings 11 and 11*a* on the shaft 5. A pawl 30 consisting of a U-shaped member is pivotally and slidably mounted on one of the plates 24 by means of a stud 31. The pawl 30, adjacent one end, is equipped with a cut-out 32 for engaging the notches of the ratchet 33 mounted on the shaft 21. The pawl 30 is pivotally hung adjacent its upper end whereby it moves into engagement with the ratchet wheel 33 by gravity. The slot 34 permits the pawl 30 to be moved upwardly and then tipped backwardly away from the ratchet wheel 33. When the pawl is moved rearwardly on the stud 31, its center of balance changes and by gravity it is urged to disengage the ratchet 33.

The shaft 21 is of tubular cross section and at one end is equipped with a handle 40 designed to slide into the end of the shaft 21 (Figs. 2, 6 and 7). The end of the handle 40 received into the shaft 21 is equipped with a ring 41 and an annular channel 42 adjacent the ring 41. A slot 44 (Fig. 7) in the ring 41 permits the ring to pass the peg 43 mounted on and projecting into the shaft 21. The peg 43, once past the ring 41, seats within the annular channel 42. The handle 40 is equipped with a stud 45 for engaging the convolute slots 46 in the end of the shaft 21. Thus, the handle is first inserted in the end of the shaft 21 with the slot 44 in the ring 41 aligned with the peg 43. The ring 41 is pushed beyond the peg 43 and then the handle is turned slightly to prevent its being withdrawn until the slot 44 and the peg 43 are again aligned. The motion of the handle is, in one direction, transmitted to the shaft 21 by means of the engagement of the peg 45 with one of the slots 46.

The carriage 50 consists of a frame 51 having a central body portion, an upper portion 52 and a lower portion 53. The lower portion 53 is braced by the cross member 54. Both the upper portion 52 and the lower portion 53 of the frame are, in the same direction, inclined away from the main body portion of the frame. This inclination causes both the upper and the lower ends of the frame 51 to stand outwardly from the rungs 3 when the carriage 50 is seated on these rungs. The upper portion 52 of the carriage converges in a direction away from the main body portion and, at its upper end, is provided with a loop 55. A pair of guide rods 56 are mounted to the frame adjacent the loop 55. These guide rods extend downwardly and attach to the upper end of the main body portion of the

carriage. In a downward direction the guide rods **56** diverge and stand outwardly from the frame **51**. The guide rods **56** serve to space the materials on the platform **57** outwardly from the ladder rails **2**. This is particularly important when my elevator is being used with a sectional ladder (Fig. 10). Adjacent the lower ends of the guide rods **56**, a materials holding member of platform **57** is hingedly mounted to the frame **51** by means of the brackets **58**. The inward ends of the brackets **58** are L-shaped whereby the platform **57** may be pivoted upwardly to seat against the guide rods **56**. The platform will be so spaced outwardly from the frame **51** that the guide rods **56** will not interfere with this pivotal movement of the platform. The platform **57** is held perpendicular to the frame **51** by the abutment of the ends of the brackets **58** with the frame **51**.

The platform **57** may be replaced with a box or basket. Sides may be added to the platform to make it suitable for use with bulk materials such as mortar or cement.

The drum **22** consists of a central cylinder **60** having at each end a terminal disk **61**. A cable **62** is mounted to the drum in any conventional manner, as by a bolt or engagement in a slot in the cylinder **60**, and passes from the drum **22** up the ladder **1** and over the pulley element **6** and on the front or upper side of the ladder is provided with a hook **63**. The hook **63** engages the loop **55** at the upper end of the carriage **50**. The cable **62** may be of any suitable material such as wire or fiber rope and is designed to be wound around the drum **22** between the terminal disks **61**.

The various parts of my pulley assembly, winch assembly and carriage assembly may be fabricated from any suitable material. The choice of materials will depend upon the factors of cost, weight and suitability.

Operation

For purposes of transportation my materials elevator may be divided into four separate units consisting of the pulley assembly **4**, the winch assembly **20**, the carriage assembly **50** and handle **40**. Each of these separate units may be carried separately, materially facilitating movement of the elevator. When the materials elevator is being transported, the cable **62** is entirely wound onto the drum **22** and the rod **70** is installed. The rod **70** merely projects through one of the disks **61** and threadedly engages a suitable opening in the other of the disks **61**. With the rod **70** in place, the cable cannot become unwound from the drum **22**.

The winch assembly **20** is then pulled upwardly until the hooks **27** firmly engage the rung **3** and the wing nuts **26** tightened to pull the clasps securely against the rails **2**. The pulley assembly **4** is mounted to the ladder merely by seating the caps **8** over the upper ends of the ladder rails **2**. The rod **70** is removed from the drum **22** and the cable **62** unwound and passed up on the under or inward side of the ladder and over the pulley **6** and then down the front or outward side of the ladder. By means of the hook **63** the end of the cable is engaged to the carriage assembly **50**. When the ladder is positioned against the side of a building or the edge of a roof, the arms **10** space the top of the ladder outwardly from the wall or the roof edge (Fig. 5) sufficiently to insure an operating clearance for the pulley **6**. When the ladder is resting against a roof or building with the top of the ladder projecting upwardly above this point of support, the cable **62** will not touch the building. The pulley element **6** has a groove of sufficient depth that the cable will travel within the outline of the ladder rails **2** (Fig. 5). In this position the arms **10** are unnecessary because the pulley is so placed that additional clearance for it is unnecessary.

The handle **40** is next installed by inserting the end of the handle into the end of the shaft **21** with the slot **44** aligned with the peg **43**. The handle is then turned to engage the stud **45** with the slot **46**.

The materials to be raised or lowered are placed on the platform **57**. My invention is suitable for use with any type of material, examples of which are bricks, containers of mortar, shingles, eaves troughing or rolls of roofing paper. By means of the crank **40** the drum **22** is rotated to wind up the cable **62**, causing the carriage assembly **50** to slide up the ladder. As the carriage assembly **50** slides up the ladder, the outward curvature of the upper portion **52** of the carriage frame permits the carriage to bridge the gap between the rungs without the carriage becoming snagged against one of the rungs. This outwardly inclination of the ends of the carriage frame permits the carriage to slide up and over the rungs **3***a* of a second section **80** of ladder (Fig. 10) without the carriage becoming snagged on the rungs **3***a* of the overlapping upper section **80**. Downward sliding of the carriage is prevented by the pawl **30** and ratchet **33**. When the carriage assembly **50** has reached the desired elevation it will be retained there by the pawl and ratchet. When the materials have been unloaded from the platform **57**, the pawl **30** is pivoted upwardly and backwardly on the stud **31** whereby it will cease to engage the ratchet wheel **33**. Using the handle **40** as a brake the cable may be permitted to unwind under the urging of the carriage assembly **50**, thus lowering the carriage assembly ready for another load. The outward inclination of the lower portion **53** of the carriage frame **51** prevents the lower end of the carriage from becoming snagged on the rungs **3** as the carriage descends. It also prevents snagging of the carriage as it bridges the joggle where the upper and lower sections of the ladder come together. When the elevator is to be used for lowering materials as well as raising them, any conventional means may be added to the winch assembly to check the descent of the carriage should the operator lose control of the handle **40**.

The winch assembly **20** is preferably mounted on the ladder **1** at a convenient height for manipulation of the handle **40** by the operator. Since each of the various assemblies constituting my materials elevator is quickly and easily mountable and demountable from the ladder, it is not essential that these assemblies be attached to the ladder prior to erection of the ladder. The operator places the pulley assembly on the ladder after the ladder is erected by pushing on the wall, separating the top of the ladder from the wall sufficiently to permit the pulley assembly **4** to be seated over the upper end of the rails.

Since the carriage assembly **50** rides upon the rungs **3** rather than the rails **2** and is constructed narrowly enough to seat between the rails of the upper section of a conventional extension type ladder, this carriage may be conveniently used with ladders of various widths because the width of the ladder has no bearing upon the operation of this carriage. The carriage assembly **50** is

made of sufficient length that it rides upon at least two and preferably more of the ladder rungs whereby the weight of the material being carried by the carriage is carried upon two or more of these rungs. By merely sliding the carriage assembly **50** upon the rungs rather than mounting it on the rails by means of wheels, as conventionally employed, the construction of the carriage is greatly simplified, and thus its cost and weight are both materially reduced. The carriage rides on the upper or outer side of the ladder. This arrangement positions the materials conveniently for loading and unloading at both the top and the bottom of the ladder. Where the carriage is mounted on the underside of the ladder, the materials cannot be conveniently unloaded, particularly where the ladder is positioned against the edge of a roof necessitating the unloading of the materials around the edge of the ladder and then up over the edge of the roof. The use of the pivotal mounting for the platform **57** permits the platform to be folded flat against the guide rods **56** when the platform is either not in use or being transported. Thus, it provides a more compact unit for transportation.

By making the mounting means for the pulley assembly **4** and for the winch assembly **20** each fixedly spaced from the pulley **6** and the drum **22**, respectively, on the same end, the pulley **6** and the drum **22** are always aligned longitudinally of the ladder **1** irrespective of the width of the ladder. Thus, the cable **62** will always be aligned for proper travel over the pulley **6** without the necessity of lengthy adjustments by the operator.

I have described both the structure and operation of one preferred embodiment of my improved materials elevator. Numerous modifications of my elevator may be made without departing from the principles of my invention. Each of these modifications are to be considered as included in the hereinafter appended claims unless these claims by their language expressly provide otherwise.

I claim:

1. In a materials elevator attachable to a ladder having an upper end and a lower end and a pair of spaced rails, a plurality of rungs mounted to and extending between said rails, the combination comprising: a winch; means for detachably mounting said winch to said ladder adjacent the lower end of said ladder; a pulley assembly; means for detachably mounting said pulley assembly to the rails of said ladder at the upper end of said ladder; a carriage slidably seated on said rungs between said rails; a flexible member attached to the upper end of said carriage and to said winch and seated over said pulley assembly whereby rotation of said winch in one direction will cause said flexible member to move said carriage up said ladder and rotation in the opposite direction will move said carriage down said ladder.

2. In a materials elevator as described in claim 1 wherein said pulley assembly includes a shaft and a pulley element mounted thereon and said means for detachably mounting said pulley assembly to the rails of said ladder includes a pair of cap members each defining an internal chamber for receiving the upper end of one of said rails.

3. In a materials elevator as described in claim 1 wherein said pulley assembly includes a shaft and a pulley element rotatably mounted thereon

and said means for detachably mounting said pulley assembly to the rails of said ladder includes a pair of cap members each defining an internal chamber for receiving the upper end of one of said rails; a spacer arm on each of said caps; each of said spacer arms projecting from said caps on the under side of said ladder.

4. In a materials elevator as set forth in claim 1 wherein said carriage includes a frame and a materials holding member projecting from said frame; each of the ends of said frame projecting away from said ladder.

5. In a materials elevator as set forth in claim 1 wherein said carriage includes a frame; a materials holding member hingedly mounted to said frame for pivotal movement from a position parallel to said frame to a position substantially horizontal when said ladder is inclined at an angle of substantially 60 degrees to a horizontal plane.

6. In a materials elevator as described in claim 1 wherein said pulley assembly includes a shaft and a pulley element rotatably mounted thereon and said means for detachably mounting said pulley assembly to the rails of said ladder includes a pair of cap members each defining an internal chamber for receiving the upper end of one of said rails; one of said cap members affixed to said shaft against movement axially of said shaft; the other of said cap members mounted on said shaft for sliding movement axially of said shaft.

7. In a materials elevator attachable to a ladder having an upper end and a lower end and a pair of spaced rails, a plurality of rungs mounted to and extending between said rails, the combination comprising: a winch including a drum; a pair of bracket elements for detachably mounting said winch to said ladder adjacent the lower end of said ladder, one of said bracket elements fixedly spaced from said drum, the other of said bracket elements variably spaceable from said drum; a pulley assembly, including a shaft and a pulley element mounted thereon; a pair of cap members mounted on said shaft, each of said cap members defining an internal chamber for receiving the upper end of one of said rails; one of said cap members fixedly spaced from said pulley element, the other of said cap members variably spaced from said pulley element; said pulley element and said drum aligned longitudinally of said ladder; a carriage slidably seated on said rungs between said rails; a flexible member attached to the upper end of said carriage and to said winch and seated over said pulley assembly whereby rotation of said winch in one direction will cause said flexible member to move said carriage up said ladder and rotation in the opposite direction will permit said carriage to move down said ladder.

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