Feb. 14, 1939. R. PAYSON 2,147,313

TELESCOPIC HOISTING APPARATUS

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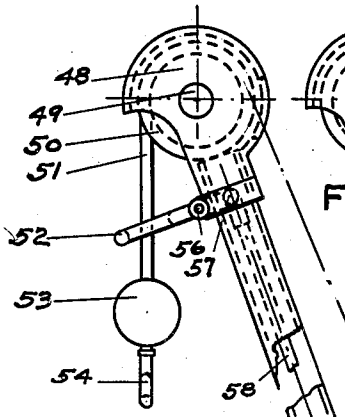


FIG. 1.

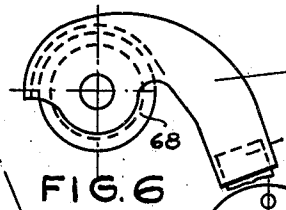


FIG. 6

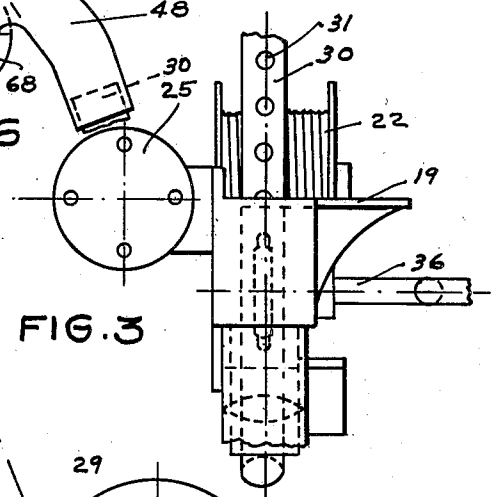


FIG. 3

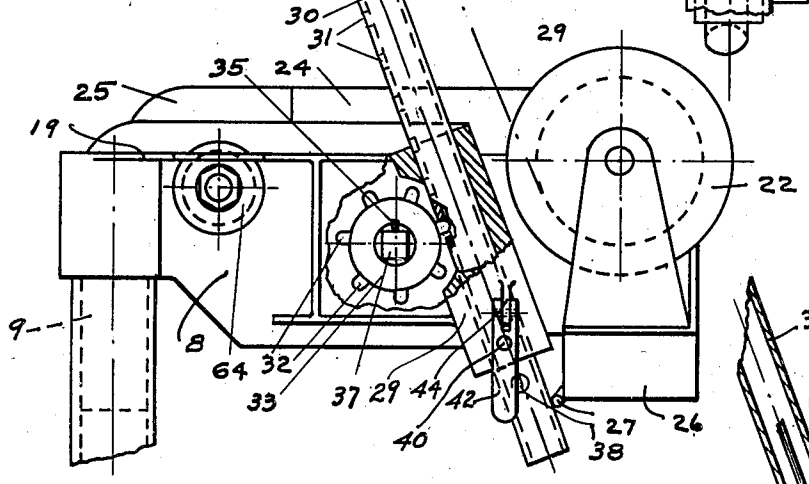
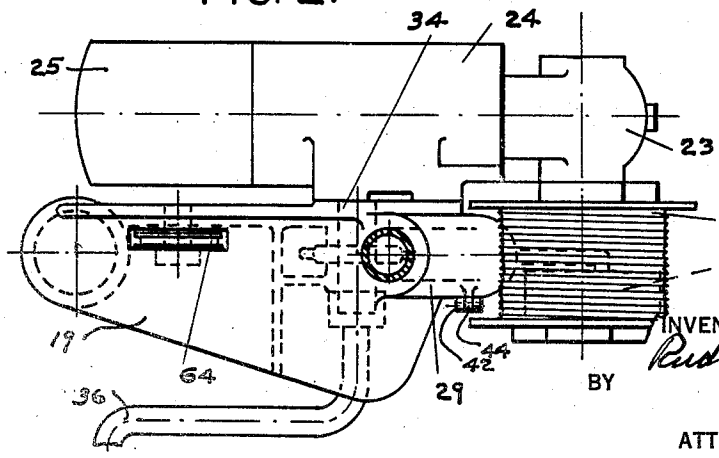


FIG. 2.



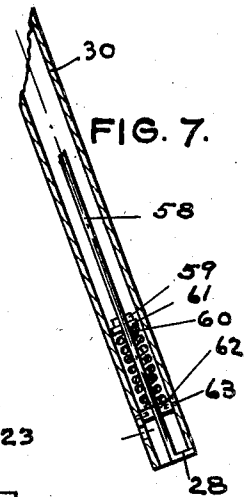


FIG. 7.

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FIG. 4.

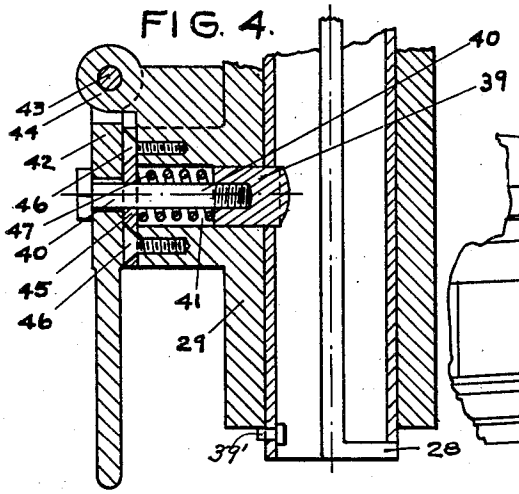


FIG. 5.

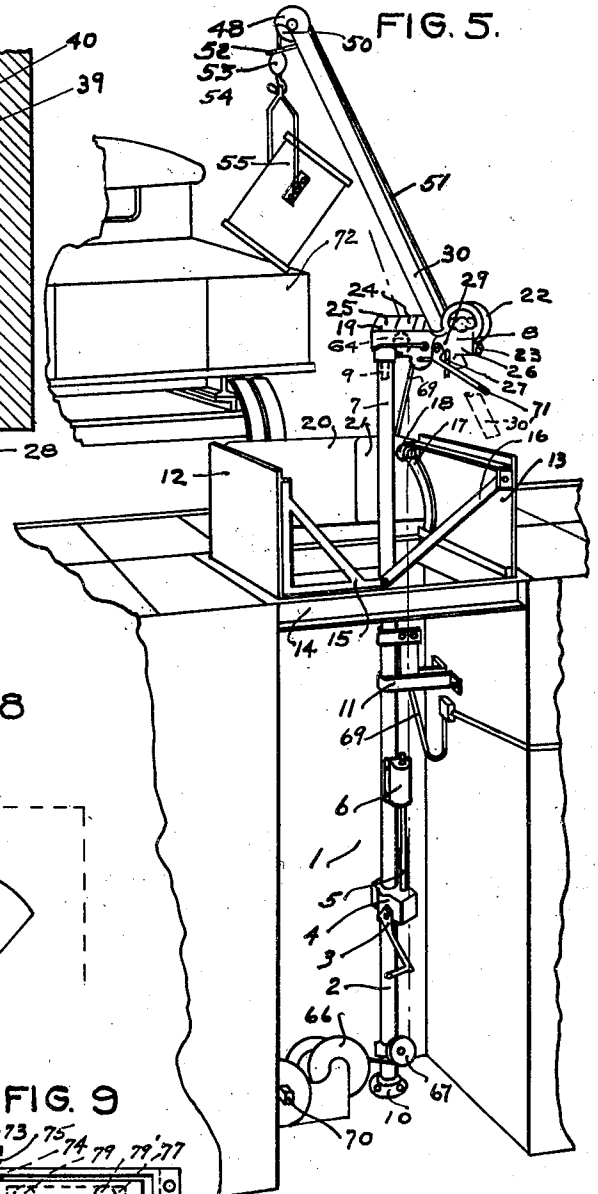


FIG. 8

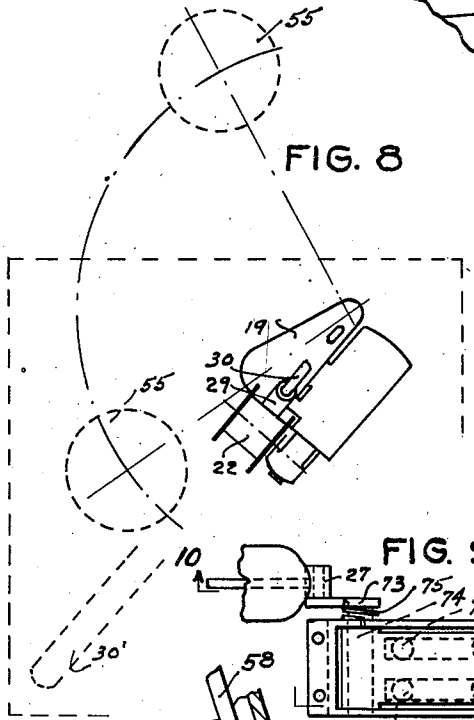
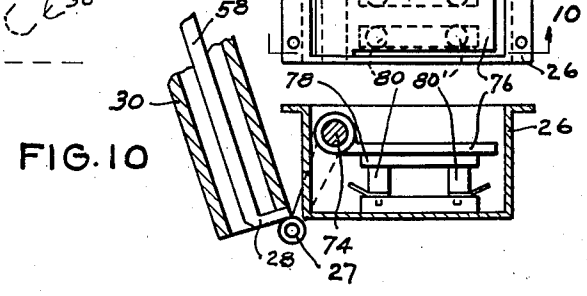


FIG. 9

FIG. 10



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FIG. 11

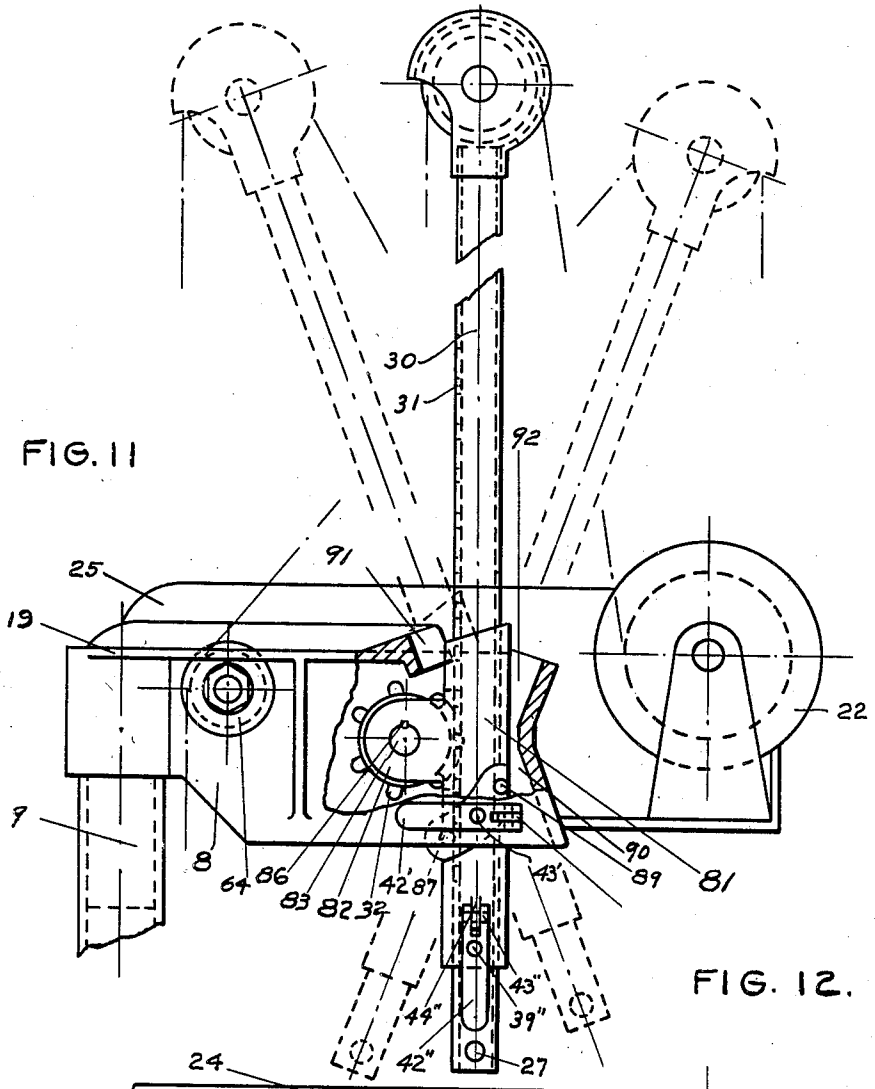
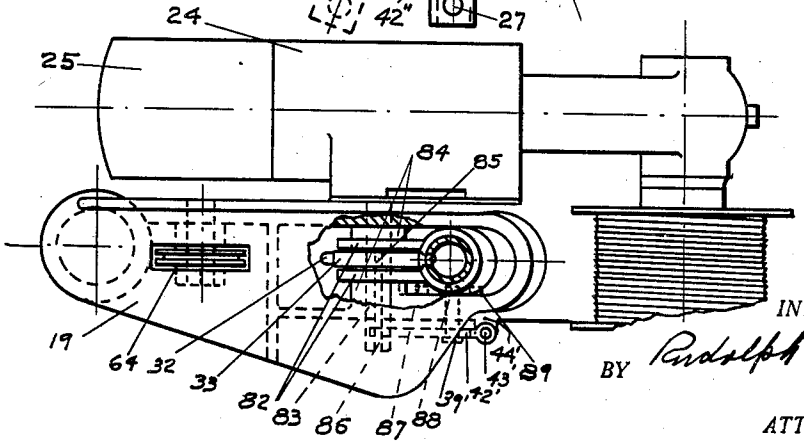


FIG. 12.



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Patented Feb. 14, 1939

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UNITED STATES PATENT OFFICE

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TELESCOPIC HOISTING APPARATUS

Rudolph Payson, Flushing, N. Y.

Application June 23, 1936, Serial No. 86,724

21 Claims. (Cl. 212—57)

This invention relates to cranes and particularly to cranes having telescopic masts adapted to retraction into a well at a curbside beneath a cover at street level.

An object of this invention is to provide a telescopic mast having a jib extension mechanically adjustable thereby obviating the usual manual support required for such jib adjustments.

Another object of this invention is to provide a positioning of a telescopic jib on a mast to give a maximum of space between the suspension rope and the mast for manipulation of the article being hoisted.

A further object of this invention is to provide a connection between a telescopic jib and a telescopic mast adapted to prevent interference of the jib in its retracted position with the mast.

Another object of the invention is to provide a lateral as well as vertical movement of the hoisting head in its telescopic movement.

Another object of the invention is to utilize the weight of the hoist operating mechanism as a counterweight to the object being hoisted.

The invention consists of a section of a telescopic mast carrying a cross member provided with a pinion and a guide bearing an elongated member angularly positioned therein and carrying a rack engaging the pinion such that when the pinion is rotated the elongated member moves in a plane including the first mentioned section of the telescopic mast and in a horizontal as well as a vertical direction. It is characteristic of the invention that a cantilever member supports a stubmast bearing a head sheave with an operative hoisting rope, the stubmast being angularly positioned and supported at its base by a connection adapted to progressively support the stubmast above its base portion while the base portion is progressively retracted below the cantilever member.

Also it is characteristic of the invention that the retracting movement may be reversed into an elevating movement in which case the progressive support of the stubmast from the retracted position to the elevated position terminates with the base of the stubmast being supported by the beforementioned connection.

Further it is characteristic of the invention that means operate to effect the traverse of the stubmast in its support to an oblique position relative to the cantilever member.

Referring to the drawings:

Fig. 1 shows a partial sectional side elevation of an embodiment of the invention.

Fig. 2 shows a plan view of the embodiment shown in Fig. 1.

Fig. 3 shows an end elevation of the embodiment shown in Figs. 1 and 2.

Fig. 4 shows a sectional view of the stubmast holding stop.

Fig. 5 shows a perspective view of the invention as applied to a telescopic mast and an associated electric power hoist detailed in Patents 2,006,476 and 2,018,568.

Fig. 6 shows a mast head supporting a head sheave in a position adapted to receive a hoisting rope from the foot of the telescopic mast.

Fig. 7 shows a sectional detail of the holding mechanism of the limit switch actuating assembly.

Fig. 8 shows the swing range of the stubmast acting as a boom in a hoisting operation.

Fig. 9 shows a plan view of the limit switch.

Fig. 10 shows a sectional view along line 10—10 of Fig. 9.

Fig. 11 shows a partial sectional view of elevation of a pivoted mounting of a stubmast.

Fig. 12 shows a partial sectional view in plan of the embodiment illustrated in Fig. 11.

It is characteristic of the invention that a stub mast in its elevated position as a mast also performs the function of a boom thereby giving support to a head sheave at a distance from the point of support of the stubmast.

Referring to the drawings and particularly to Fig. 5, in a well or pit 1 situated at a curbside adjacent a building, the lower stationary section 2 of a telescopic mast carries a crank 3 on a gear box 4 that through a shaft 5 and an associated worm in a box 6 on the mast drives a rack inside the mast on a movable section 7 of the mast. An opening in the mast section 2 behind the worm box 6 gives access to the rack on the movable mast section 7. Turning the crank 3 in one direction raises the movable mast section 7 and turning in the opposite direction lowers the section. The upper end of the movable mast section 7 carries a cantilever cross member 8 which has a depending pivot 9 which fits within the upper end of the hollow movable mast section 7 and accommodates rotation of the cross member 8 for various radial positioning of the mast as operating requirements later to be described may require. The telescopic mast rests on a foot 10 on the well floor and is supported laterally by a brace 11 to the well wall from the stationary section 2 of the mast.

When the upper section of the mast is fully telescoped downwardly, the cross member 8 is below the top of the well which is covered by a pair of horizontal doors 12 and 13 hinged at sidewalk level in a steel frame 14. One door 12 carries a bracket 15 depending downwardly to which a link 16 is connected from a pivot on the other door 13 so that the doors are raised together as pressure to raise them is applied to the door 13.

The door 13 carries a depending arm 17 and a roller 18 which rests upon the top of a shelf 19 on cantilever cross member 8 as the latter rises with the mast section 7 in consequence of the opera-

tion of the crank 3 in the suitable direction. The ends of the doors 12 and 13 adjacent the curb carry guard panels 20 and 21 which overlap sufficiently to safeguard the top of the well. The cross member 8 is raised to a height three or four feet above the street level and thus is made accessible from the street.

The cross member 8 is a housing for mechanism illustrated in detail in Figures 1 to 4 inclusive. It supports a winch 22 driven by a worm gear 23 operated by an electric motor 24 controlled by a magnetic brake 25 and a switch box 26 having a control 27 operated by a trip 28. The cross member 8 is moulded to form an angular guide 29 for a stub mast 30 resting in the plane of the guide and the telescopic mast axes. The stub mast has a rack on its side adjacent the telescopic mast made up of a series of holes 31 in alignment and accommodating pin teeth 32 on gear 33 mounted on a shaft 34 in bearings in the cross member 8. The shaft 34 with key 35 turns gear 33 when operated by a crank 36 on a square extension 37 of the shaft 34. The teeth 32 of the gear 33 operate the mast within the guide 29 in a direction determined by the direction of rotation of the gear. The teeth serve to prevent rotation of the stub mast in the guide as well as to give it lineal movement. When the stub mast 30 is fully extended in its upward travel, into a hole 38 in the stub mast fits a stop pin 39 on a bolt 40 through a hole 41 in the angular guide 29.

Referring to Fig. 4 the bolt 40 is shown loosely fitting in a handle 42 pivoted by pin 43 on an extension 44 of the angular guide 29. A plate 45 held by screws 46 to the guide 29 holds a compressed spring 47 in the hole 41 to push the stop pin 39 into working position. A pull on the handle 42 compresses the spring 47 further and retracts the pin 39 from engagement with the opening 38 of the stubmast 29 permitting the latter to be moved downwardly.

Referring to Fig. 5. The upper end of the stub mast 30 carries a hood 48 in which a pin 49 positions a grooved pulley 50 over which a rope 51 extends from the winch 22 through a limit switch ring 52 to a ball weight 53 and a hook 54 on which is suspended a container 55.

The limit switch ring 52 rests on a pivot 56 in a collar 57 and has an extension within the hollow stub mast 30 hinged to a rod 58 extending down the mast to the end thereof where it terminates in a hook 28 which is normally held within the stub mast 30 by a compressed spring 60 pressing upwardly against a collar 61 on the rod 58 held by a nut 59. The spring 60 also presses against a collar 62 around the rod 58 and held in the stubmast at its lower end by pins 63. See Figs. 1 and 7.

Referring to Fig. 5, it is particularly noted that an upper winch 22 and a lower winch 66 are provided. It is to be noted that these two winches do not function simultaneously. Either may be made operative individually. The operative combination illustrated in Figures 1, 2, and 3 is preferred. When the lower winch 66 is made operative, the special head sheave support illustrated in Fig. 6 is applied to the mast 30 to give the rope proper admittance to the head sheave 68 after the rope is guided from the lower winch 66 around bottom guide sheave 67 up over the sheave 64 and through the associated top opening in cross member 8.

Referring further to Fig. 5, an electric supply line 69 is directed to the floor winch 66 and there controlled by a switch 70 and to the upper winch 22 where it is controlled by a lever 71 and also by the limit switch ring 52 and the switch box 26.

Operation

In operation the crank 3 on the gear box 4 is operated to elevate the movable section 7 of the telescopic mast to bring the cantilever top member 8 in contact with the door opening roller 18 and extend the mast above the doors to the street operating level. The hand crank 36 is then operated to extend upwardly the stub mast 30 carrying the head sheave or pulley 50 with the rope 51 from winch 22 through the switch ring 52 to the ball 53 and hook 54. With the stub mast 30 extended upwardly to the limit the stop pin 39 is admitted to the cooperating opening 38 in the mast to hold the mast in a load carrying position. The winch 22 is then released allowing the weight 53 to unwind the rope from the winch and the hook 54 to sink to the bottom of the well where a container 55 is attached to the hook. The application of power to the winch then operates the winch to hoist the container 55 until the ball 53 contacts the limit ring 52 which cuts off the power and applies the magnetic brake 25 which holds the load. The operator then swings the cross member 8 and the stub mast until the container 55 is in a position to be dumped in a convenient truck 72 at the curb side as illustrated in Fig. 5. After dumping the container the operations are repeated. In closing the operations are reversed.

The cooperative functioning of the control 27 and trip 28 are set forth in detail in Figs. 9 and 10 where the trip 28 is shown in contact with the control roll 27. The control roll 27 is carried on a depending arm 73 on shaft 74 mounted in bearings in box 26. The spring 75 on shaft 74 by attachment to the box 26 and depending arm 73 is mounted to normally hold the roller 27 in pressure towards the stub mast 30 so that as the stub mast reaches its uppermost point the roller 27 is pressed slightly below the end of the mast and in contact with the trip 28. Mounted on the shaft 74 within the box 26 is an insulated lever arm 76 carrying two parallel conductors 77 and 78. Below each conductor is a pair of terminals 79—79' and 80—80'. The conductor 77 normally contacts terminals 79—79' and conductor 78 normally contacts terminals 80 and 80' when the roll 27 is in position below trip 28. The downward movement of the trip ring 52 actuates rod 58 and trip 28 on the end thereof causing the arm 73 to turn the shaft 74 and raise the conductors 77 and 78 from the respective terminals thereby doubly breaking the circuit. This double breaking of the circuit is an innovation particularly efficacious in its quick action and dependability.

In Fig. 8 the retracted position of the stubmast 30 is shown in dotted outline at 30'. The arc of swing by the stubmast is illustrated by the two positions of the can 55, and particularly the radius of rotation for such movement is to be noted as obtained by the angular positioning of the stubmast.

The several features outlined when cooperatively operated function in a manner new to the art and particularly efficacious in a hoisting apparatus functioning as a crane.

An embodiment of the invention illustrated in Figs. 11 and 12 utilizes a pivot guide 81 on member 8 to support the stub mast 30. The guide 81 is provided with a pair of ears 82 through which a shaft 83 passes to bearings 84 in the frame 8

so that the shaft acts as a pivot for the guide. A pinion 33 with teeth 32 rests on the shaft 83 between the ears 82 so that the teeth 32 mesh with the rack 31 in the stub mast 30 carried in the guide. A short key 85 in the shaft 83 causes the pinion 33 to rotate with the shaft 83. A second key 86 on the outer end of the shaft 83 engages a hand crank not shown to rotate the pinion. The guide 81 extends upwardly above and downwardly below the frame 8 thereby providing an extended bearing for the stubmast 30 which its carries. On an arc struck from the center of the pivot shaft 83 three openings 87, 88, 89 on the face of the guide 81 are positioned to successively receive a pin 39^1 in the frame 8. With pin 39^1 in engagement with the middle opening 88 the guide 81 and stubmast 30 are in an upright position. With the pin 43^1 in engagement with the left opening 87 the guide occupies a position in contact with the frame 8 in a lower bearing 90 and in an upper bearing 91. With the pin 43^1 in engagement with the upright opening 89 the guide occupies a position in contact with the frame 8 in an upper bearing 92. The extension of the guide 81 below the frame 8 carries a pin 39^{11} operated by a lever 42^{11} held by a pin 43^{11} on an extension 44^{11} from the guide 81. The pin 39^{11} cooperates with an opening 27 in the stubmast 30 to fix the mast position to the guide.

The pivoted guide 81 for stubmast 30 accommodates the angular positioning which permits the stubmast to function as a centilever and it accommodates the vertical extension and retraction that make a longer stubmast usable in the mechanism. Obviously the head sheave housing is to be chosen to accord with the rope operation employed. The extreme angular positions of the stubmast are shown in dotted outline, in Fig. 11. The one to the right shows a rope connection to the main mast and a floor positioned winch. The one to the left as well as the vertical one shows the rope connection to the winch 22 on the cross member 8.

In operation, starting with the stubmast in a retracted position, the guide is held in its upright position by engagement of the mid opening 88 with the pin 39^1. The pinion 33 is rotated with the teeth 32 operating in rack opening 31 in stubmast 30 to elevate the mast until the opening 27 in the base of the stubmast registers with the pin 39^{11} in the guide and engagement therebetween is effected. The engagement of pin 39^1 with opening 88 is then released and the stubmast is swung on its pivot shaft 83 to either right or left sufficiently to effect the contact of the guide 81 in its cooperating bearings 90 and 91 or 92 and with such positioning the pin 39^1 registers with one of the cooperating openings 87 or 89 and engages therewith.

For retraction the operations are reversed.

Obviously the stop arrangement 39^1—42^1—43^1—44^1 though not an absolute necessity is a great convenience. When this feature is omitted, the stubmast is manually supported from oscillation as the mast is elevated or retracted until finally positioned by the pivoting action.

The pivoted guide in effect resolves the oblique movement of the mast and the head sheave which it carries into its component horizontal and vertical parts whether the mast is inclined obliquely upwardly to the right or left.

The pivoted guide makes full retraction of a stubmast possible in a well that is of limited lateral dimensions when angularity of the mast would cause the contact with well walls.

The use of a curved stubmast is also contemplated and is intended to be a part of this invention when guided in the manner herein shown.

Other variations coming within the scope of the following claims are a part of the invention.

I claim:

1. In an ash hoist having a stubmast and a cantilever supporting member therefor, a connection between said members adapted to relative movement between said members comprising means to support the base of said stubmast in a constant angular position and therewith means to progressively support said stubmast above said base portion while retracting said base portion progressively below said cantilever member.

2. In an ash hoist having a stubmast and a cantilever supporting member therefor, a connection between said members adapted to relative movement between said members comprising means to support the said stubmast from the upper portion thereof in a retracted position below said cantilever member, and therewith means to progressively support said stubmast while retracing its travel from said retracted position until its base portion comes within the region of said support.

3. In an ash hoist having a stubmast and a cantilever member supporting said stubmast, a connection between said members comprising a gear mounted on said cantilever member, a rack mounted on said stubmast, and a guide holding said rack in engagement with said gear, said combination being adapted to the axial movement of said stubmast whereby the position of said stubmast is adjusted below said cantilever member.

4. In an ash hoist having a stubmast and a cantilever member supporting said stubmast, a connection between said members comprising a gear mounted on said cantilever member, a rack mounted on said stubmast, and a guide holding said rack in engagement with said gear, said combination being adapted to the axial movement of said stubmast whereby the position of said stubmast is adjusted from below said cantilever member.

5. In an ash hoist, the combination of a head sheave carrying a hoisting rope operatively connected to a winch, a mast supporting said head sheave, and a support for said mast adapted to move said mast longitudinally to a position obliquely upwardly whereby said head sheave is positioned for a hoisting operation, said support accommodating the longitudinal retreat of said mast into the well of an ash hoist and below said support.

6. In an ash hoist, the combination of a head sheave carrying a hoisting rope operatively connected to a winch, an inclined mast supporting said head sheave, and a support for said inclined mast adapted to move said mast lineally in its inclined position whereby said mast is given a telescopic movement, said support accommodating the longitudinal retreat of said mast into the well of an ash hoist and below said support.

7. In an ash hoist, the combination of a head sheave carrying a hoisting rope operatively connected to a winch, a mast supporting said head sheave, a support for said mast adapted to the rotation of said mast and sheave in a horizontal plane and adapted to the lineal movement of said mast and sheave to an oblique position from below said support, the oblique position of said mast determining the radius of horizontal rotation of said sheave.

8. In an ash hoist, the combination of a head sheave carrying a hoisting rope operatively connected to a winch, a mast supporting said sheave, a support for said mast accommodating rotation of said mast and sheave in a horizontal plane, and means to move said mast lineally to an oblique position thereby determining the radius of rotation of said mast and sheave, said support accommodating the longitudinal retreat of said mast into the well of an ash hoist and below said support.

9. In an ash hoist having a telescopic upright mast and an obliquely positioned stubmast on the top thereof adapted to swing around said upright mast, means to move said stubmast obliquely whereby said stubmast is enabled to telescope relative to said upright mast, said means accommodating the longitudinal retreat of said mast into the well of an ash hoist and below said means.

10. In an ash hoist the combination of a telescopic mast, a stubmast mounted on said telescopic mast, and means adapted to shift said stubmast obliquely relative to said telescopic mast, whereby said stubmast is positioned to act as a cantilever boom in a hoisting operation, said means accommodating the longitudinal retreat of said mast into the well of an ash hoist and below said means.

11. In combination with a telescopic mast mounted in a hoistway and rotatably supporting a cantilever cross member near the top thereof, a stubmast carrying a head sheave with a hoisting rope thereon operatively connected to a source of power, a mounting for said stubmast adapted to raise and lower obliquely said mast, relative to said member whereby said head sheave is positioned for hoisting vertically and swinging laterally material from said hoistway.

12. In combination with a telescopic mast mounted in a covered hoistway and rotatably supporting a cantilever cross member near the top thereof, a stubmast carrying a head sheave and a hoisting rope operatively connected to a power source, a mounting for said stubmast on said cantilever member adapted to shift said mast angularly over said cantilever member, and means to change the telescopic mast in height.

13. In telescopic ash hoist, the combination comprising a telescopic mast, lateral support for said mast, a cantilever cross member supported in a rotatable position at the upper end of said mast, a stubmast, slidably mounted on said cantilever member, a rack on said stubmast, and a pinion on said cantilever member in mesh with said rack whereby said stubmast is shifted in relation to said cantilever member into a position in accord with requirements of said hoist.

14. In a telescopic ash hoist, the combination comprising a telescopic mast, lateral support for said mast, a cantilever cross member supported in a rotatable position at the upper end of said mast, a stubmast carrying a head sheave and being slidably mounted in said cantilever member, a rack on said stubmast, and a pinion on said cantilever member in mesh with said rack whereby said head sheave is shifted into position to accord with operative requirements of said crane.

15. In a telescopic ash hoist, the combination comprising a telescopic mast, lateral support for said mast, a cantilever cross member supported in a rotatable position at the upper end of said mast, a stubmast carrying a head sheave and being slidably mounted in said cantilever member, a rack adapted to shift said mast into operative position above said cantilever member from a telescoped position below said member, and means to hold said stubmast in said operative position.

16. In an ash hoist having a radially movable stubmast rotatably supported on a collapsible mainmast, said radial movement being relative to said main mast at the lower end of said stubmast, means adapted to pivotally support said stubmast member for movement in a vertical plane with means to effect longitudinal movement and afford lateral support thereto.

17. Ash hoisting apparatus in a hoistway including a mast having a vertically movable section and a stubmast on said vertically movable section and a mounting between said members providing for longitudinal movement of said stubmast whereby the upper end of said mast is shifted obliquely relative to the said vertically movable section and along the direction of length of said stubmast in a positioning operation intermediate of a storage position below said mounting and a hoisting position thereby reducing or eliminating the hazards of swinging support for said stubmast usually incident to said positioning operation in said class of apparatus.

18. Ash hoisting apparatus in a hoistway including a mast having a vertically movable section and a stubmast on said movable section and a mounting between said members providing for sustaining the full weight of said stubmast as it is shifted between an oblique operating position and a submerged storage position relative to said hoistway while retaining the upper end of said stubmast within the oblique angle of said operating position.

19. Ash hoisting apparatus in a hoistway including a mast having a vertically movable section and a stubmast on said vertically movable section and a mounting between said members providing for longitudinal movement of said stubmast whereby the weight of said stubmast is continuously sustained by said vertically movable section during a positioning operation intermediate of a storage position in said hoistway and a hoisting position obliquely thereabove and adjacent thereto thereby eliminating the hazards of swinging support for said stubmast usually incident to said positioning operation in said class of apparatus.

20. In an ash hoist the combination comprising a telescopic main mast, a stubmast, a connecting member between said masts pivoted on said main mast and slidably connected to said stubmast and means to move said stubmast in said slidably connected member whereby said stubmast extends below said member and its pivot point on said mainmast.

21. In an ash hoist the combination comprising a telescopic main mast, a stubmast, between said masts a member pivoted on said main mast to swing in a horizontal plane and slidably connected to said stubmast to obliquely support said stubmast, and means to move said stubmast in said slidably connected member.

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