Feb. 27, 1945. C. D. HATHCOCK 2,370,310

ELEVATOR

Filed June 28, 1944 4 Sheets-Sheet 1

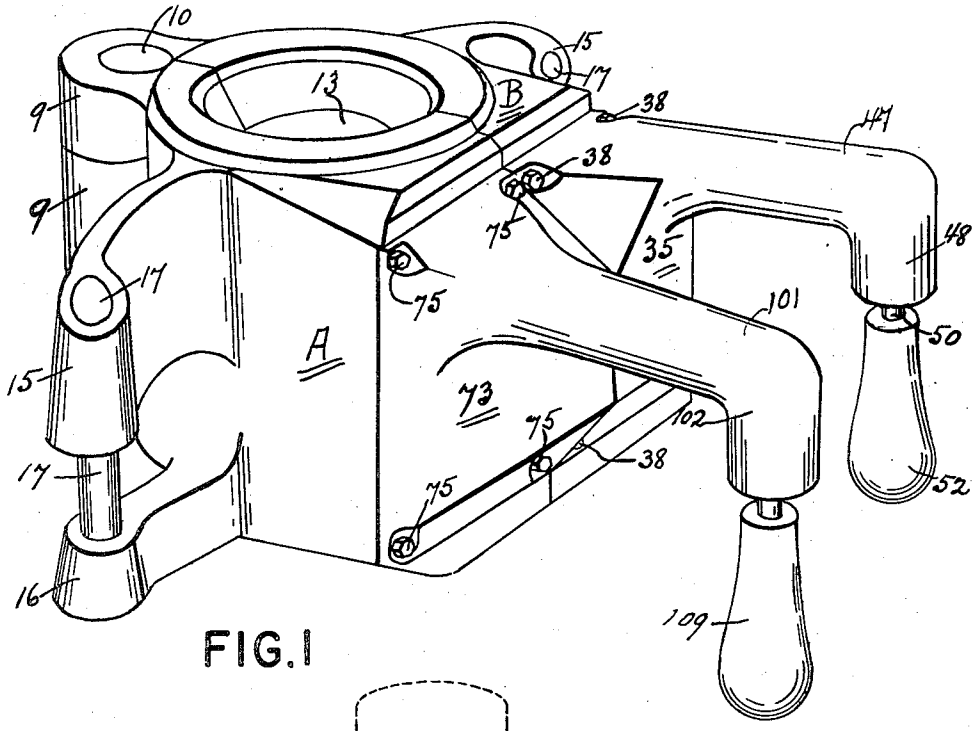


FIG. 1

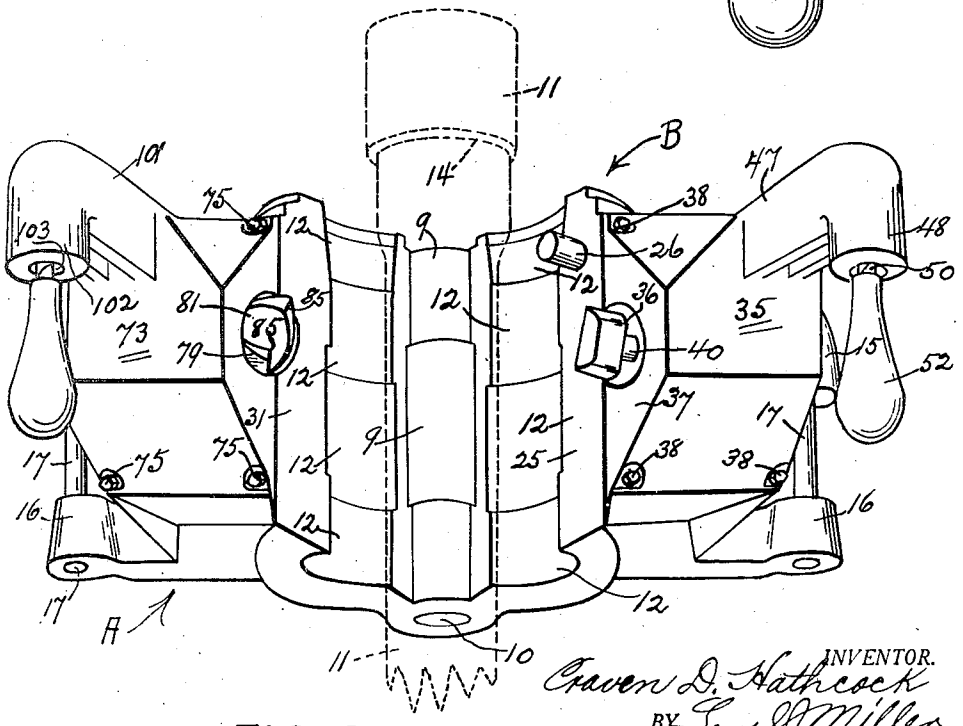


FIG. 2

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ELEVATOR

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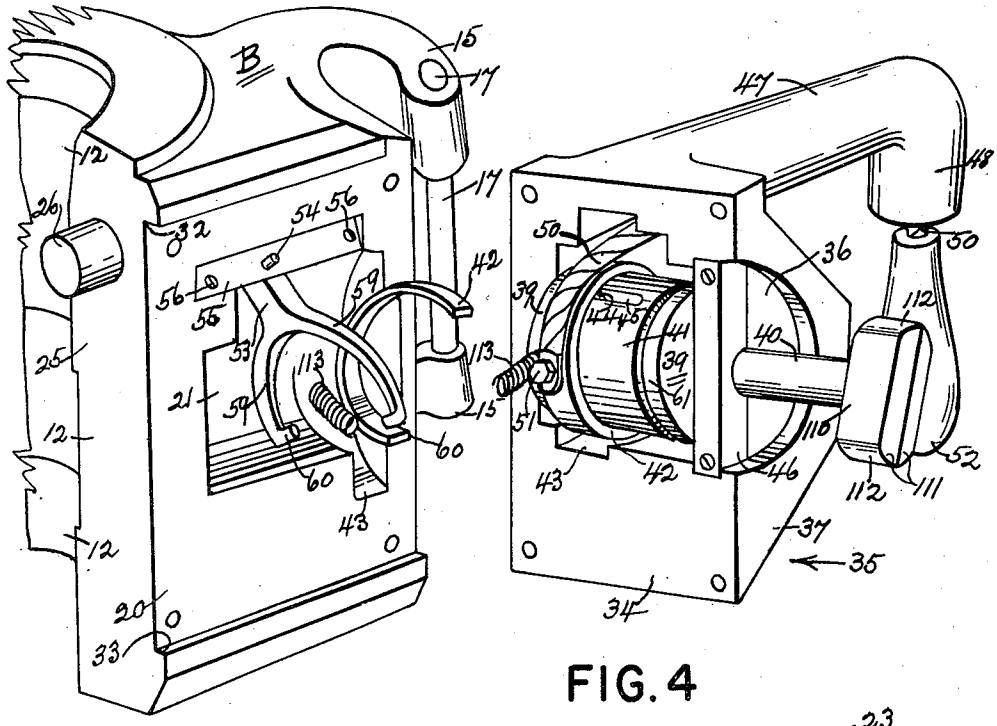


FIG. 4

FIG. 3

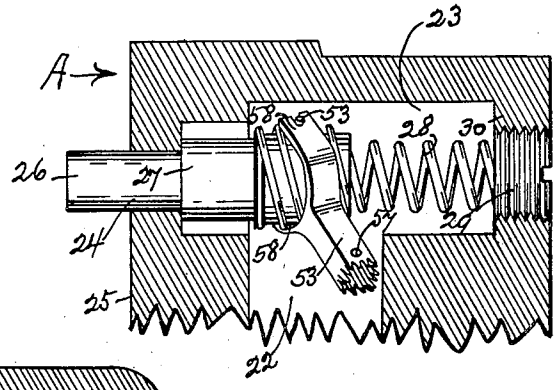


FIG. 6

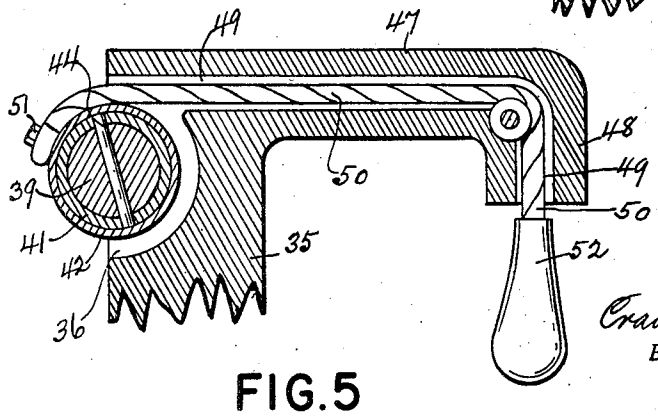


FIG. 5

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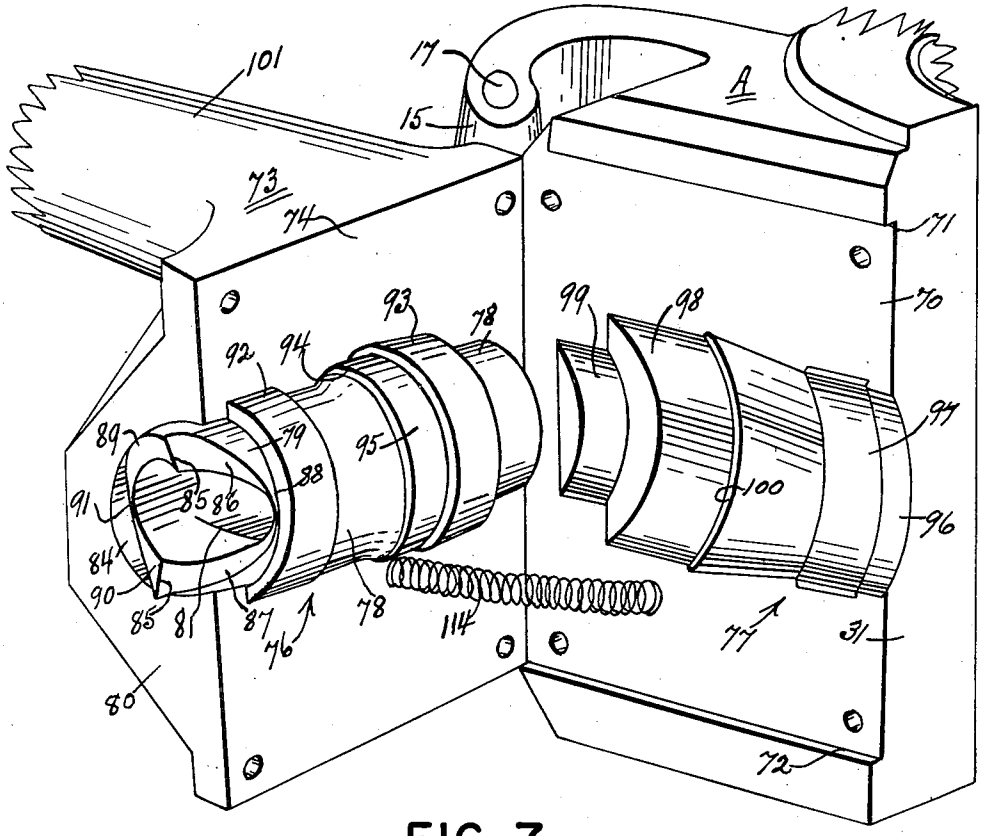


FIG. 7

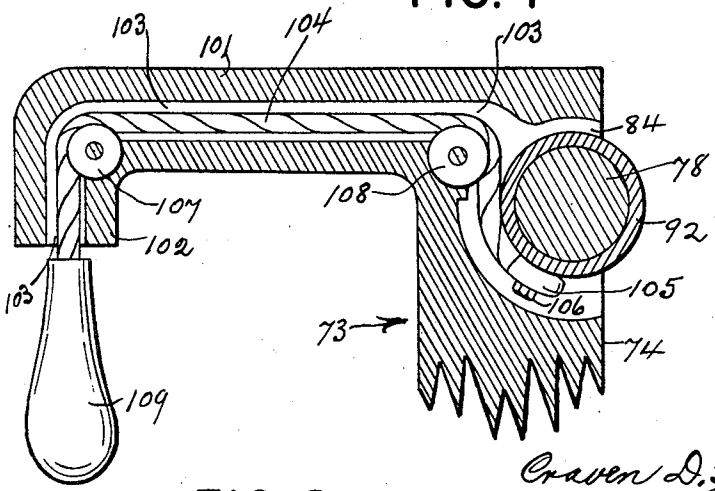


FIG. 8

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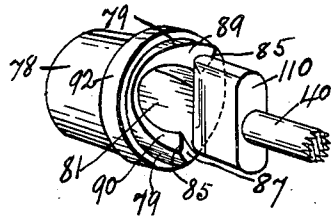


FIG. 9

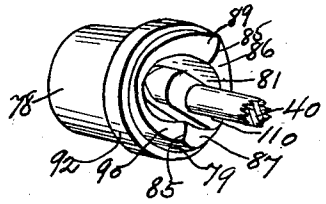


FIG. 10

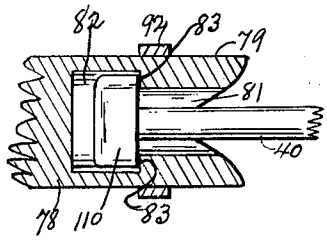


FIG. 11

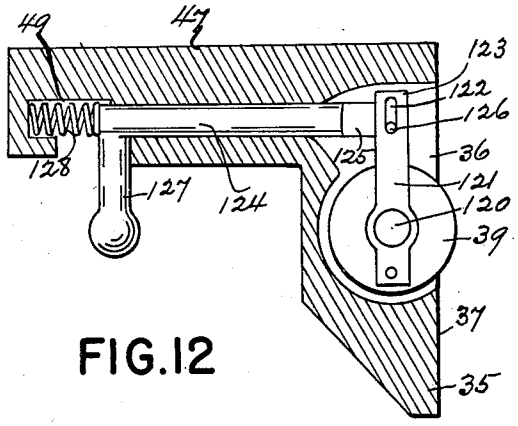


FIG. 12

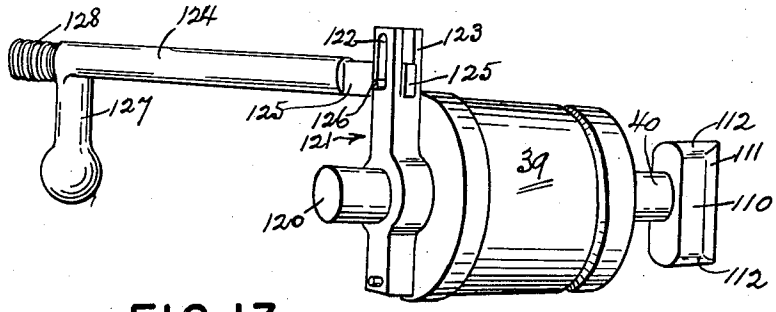


FIG. 13

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UNITED STATES PATENT OFFICE

2,370,310

ELEVATOR

Craven D. Hathcock, Oklahoma City, Okla.

Application June 28, 1944, Serial No. 542,507

16 Claims. (Cl. 294—90)

My invention relates to elevators for handling pipe, particularly drill pipe, in a well derrick.

The present invention pertains to elevators for lowering and raising pipe into and out of wells, more particularly oil wells, and relates more specifically to elevators of the jaw-type, wherein two arcuate body halves or members are hinged together at the rear, so that their forward edges may be swung together to surround or envelope a pipe beneath a shoulder thereon.

The prime object of the present invention is to provide, in a jaw-type elevator, a horizontally moving latch or lock for the forward edges of the body halves.

A further object is to provide, in such an elevator, a latch or locking mechanism which is sufficiently strong to withstand the prying effect normally exerted when a string of "external upset" or tapered pipe is being supported thereon.

A still further object is to provide, in an elevator of the type described, a locking mechanism which will be instantaneous and automatic in operation.

Another object is to provide, in an elevator of this type, a locking mechanism which may be manually released instantaneously.

Another object is to provide a lock releasing means, which cannot be inadvertently fouled and released by contact with derrick members, cables, or other elements usually present in an oil well derrick.

Still another object of the present invention is to supply an elevator of the class described, which is so designed that it may be made for either a left or right handed operation, or both.

Yet another object is to provide a locking mechanism which will not become opened through jarring or through vibration of the body halves.

Other objects will be apparent from the following description when taken in connection and in conjunction with the accompanying four-sheet drawings, wherein:

Figure 1 is a perspective view of the elevator closed, and looking slightly downwardly thereon from a point in front and slightly to the left hand thereof;

Figure 2 is a perspective view of the elevator open, and looking slightly upwardly from a point directly in front of the same;

Figure 3 is a fragmentary perspective view of the front portion of the right hand body half, the front plate having been removed to disclose a portion of the latch operating mechanism;

Figure 4 is a perspective view of the front plate which has been removed and turned back from the body half of Figure 3, the plate being shown as containing a portion of the latch operatively mounted therein;

Figure 5 is a fragmentary vertical sectional view through the upper portion of Figure 4, and disclosing further the latch operating mechanism;

Figure 6 is a fragmentary vertical sectional view through the upper portion of Figure 3, and disclosing a further portion of the latch operating mechanism;

Figure 7 is a fragmentary perspective view of the front portion of the left hand body half, the front plate having been removed and swung back to disclose the left hand portion of the latch mechanism;

Figure 8 is a fragmentary vertical sectional view through the front plate of Figure 7, and disclosing a portion of the latch operating mechanism;

Figure 9 is a fragmentary perspective view detailing the relative positions of female and male latch members as they are on the verge of becoming inter-engaged;

Figure 10 is a similar view showing the engagement partially completed;

Figure 11 is a fragmentary vertical sectional view through the female latch member or socket, and showing the male latch member engaged therein;

Figure 12 is a vertical sectional view taken upon the plane of Figure 8, but disclosing a slightly different embodiment of latch operating mechanism; and,

Figure 13 is a perspective view of a similar embodiment of latch operating mechanisms applied to the right hand elevator body half.

Like characters of reference designate like parts in all the figures wherein they occur.

In the drawings:

The reference character A indicates the left hand body half or member, looking from the front of the elevator, and B indicates the right hand half.

The rear portions of the two body halves A and B are provided with interengaging hinge loops 9 which are vertically bored alignedly to receive a hinge pin 10 whereby the front edges of the two halves may be swung apart to permit entry therebetween of a vertically disposed pipe 11 (Fig. 2). Interiorly, the body halves are each provided with a vertically extending semi-circular groove 12 which grooves combine, when the body halves are closed together, to form a central bore 13 adapt-

ed to closely envelope the pipe section 11 beneath an enlargement 14 carried thereby.

The body halves A and B are each provided with laterally projecting bail arms 15 and 16 which are vertically spaced from each other to receive therebetween a usual elevator bail, not shown, for operatively supporting the elevator in a well derrick in a usual manner. Removable pins 17 are provided to span the space between the arms 15 and 16 so as to retain the bails in place.

The mechanism thus far described, the parts of which have been indicated by the reference numerals 9 to 17 inclusive, is not new nor is it individual to this particular invention alone, since a similar structure is found in most well pipe elevators of the "jaw type."

The invention per se resides in the means for latching the forward edges of the two body halves together, and in the mechanism for locking and unlocking the latching means. This structure will be next described.

The front edge or face 20 of the body half B is provided with a cavity 21, the majority of which is open to the face 20, but which has an upwardly extending portion 22 communicating at its upper end with a horizontally extending portion 23. The cavity portion 23, at its left hand end has a lateral bored portion 24 which extends through the left hand face 25 of the body half B (Fig. 6). Reciprocably mounted in the bored portion 24 is a plunger 26 having, within the cavity portion 23, an enlargement or head 27. A compression spring 28 engages the head 27 and extends beyond the head toward the right hand end of the cavity portion 23. A threaded plug or adjustment screw 29 is provided in a suitable perforation in the cavity wall 30 which lies at the right hand end of the cavity portion 23, and the screw 29 bears against the spring 28. The spring 28 urges the plunger 26 toward the left hand end of its throw, or into a position in which the plunger projects beyond the face 25 and toward the body half A. It is apparent that when the two body halves A and B are swung together upon the hinge pin 10, the leftwardly projecting portion of the plunger 26 will contact the right hand face 31 of the body half A, and the plunger will be moved toward the right hand against the action of the spring 28. The office of the plunger will be more fully described hereinbelow.

The front face 20 of the body half B is adapted by horizontal shoulders 32 and 33 to receive a flat face 34 of a latch housing 35 (Fig. 4). The housing 35 has a cavity 36 which is open at the face 34 and which is also open at the edge 37 of the housing. The edge 37 forms a continuation of the edge 25 of the body half B, when the housing is mounted between the shoulders 32 and 33 thereof. The cavity 36 of the latch housing 35 registers with and forms a continuation of the cavity 21 in the body half B when the housing 35 is mounted upon the body B in the position shown in Figs. 1 and 2. Suds 38 act to hold the housing 35 in place upon the body half B.

As best illustrated in Figs. 4 and 5, the cavity 36 in the housing 35 contains a substantially cylindrical latch body 39 which is solid (Fig. 5), and which has at one end a horizontally projecting rod portion 40. The latch body 39 is mounted within a tubular sleeve 41 and within which it may reciprocate longitudinally. The sleeve 41 is in turn carried within a split ring 42 adapted to rotate within an annular groove 43 formed partially in the latch housing 35 and partially in the body half B. The latch body 39 has a pin 44 which extends through two oppositely positioned longitudinally extending slots in the sleeve 41. One of the slots is shown in Fig. 4 and is indicated by the reference numeral 45. It may therefore be seen that the latch body 39 may move longitudinally with relation to the sleeve 41, due to the slot 45, but the pin 44 will force the body to rotate with the sleeve if the sleeve is rotated. A vertical bar 46 is disposed in the cavity 36 and journals the rod 40 for rotation and reciprocation.

The latch housing 35 has an integral forwardly projecting handle 47 having a down-turned free end portion 48. The handle 47 and portion 48 are provided with a continuous longitudinal through bore 49. An actuating cable 50, or other suitable element, extends through the bore 49 and its inner end is anchored by a stud 51 to the exterior surface of the split ring 42. The stud 51 also extends through the ring 42 and into the sleeve 41 so that the ring and sleeve must rotate in unison. A hand hold knob 52 is provided on the outer end of the cable 50 whereby the cable may be longitudinally pulled manually by an operator. A longitudinal pull upon the knob 52 will obviously cause a partial rotation of the ring 42, sleeve 41, latch body 39 and rod 40. The office of such rotative movement will be more fully described hereinbelow.

As explained hereinabove, the latch body 39, and consequently the rod 40, are permitted both rotative and longitudinal movement within the cavities 21 and 36 when the latch housing 35 is in place upon the body half B.

Longitudinal movement of the latch body 39 and rod 40 toward the body half A is accomplished through the hereinabove described movement of the plunger 26 toward the right hand through contact with the face 31 of the body half A as the body halves are closed together. This is brought about by the structure next described hereinbelow.

The head 27 of the plunger 26 is equipped with two oppositely disposed outwardly projecting pins or trunnions, one of which is indicated in Fig. 6 by the reference numeral 53. A yoke 54 is pivotally mounted to the body half B by a pivot pin 54 carried by a removable plate 55 mounted by studs 56 to span the upper portion 22 of the cavity 21 (Fig. 3). A perforation 57 in the yoke receives the pivot pin 54 for this purpose. One end portion of the yoke 53 extends into the cavity 23, and this end is bifurcated to form two legs or tines 58 having notches in their ends to engage the two trunnions 53 on the head 27 of the plunger 26 (Fig. 6). The opposite end portion of the yoke 53 extends into the cavity 21, and is also bifurcated to form two arcuate legs or tines 59. The tines 59 have end portions 60 bent toward each other, and these end portions 60 straddle the latch body 39 and engage with a superficial groove 61 surrounding the same. It may readily be seen that when the plunger 26 is urged toward the right hand against the action of the spring 28, the tines 59 will, due to the pivot pin 54, be urged toward the left hand. Such movement of the tines 59 will cause the latch body 39 and rod 40 to also move toward the left hand, or in other words, toward the body half A. The object of such longitudinal movement of the latch body 39 and rod 40 will be more fully described hereinbelow.

Referring now more particularly to Figs. 7 and 8 of the drawings, the portion of the latch and latch operating mechanism which is housed in the body half A will next be described.

The body half A has a flat front face 70 corresponding in position to the front face 20 of the body half B. This face 70 has horizontal top and bottom shoulders 71 and 72 between which is mounted a latch housing 73 having a flat face 74 adapted to lie against the face 70 when the housing 72 is in assembled position. Studs 75 (Fig. 1) act to hold the latch housing in position upon the body half A in an obvious manner. In Fig. 7 the latch housing 73 is shown as having been swung outwardly from its normal position upon the body half A.

The flat face 70 of the body half A and the flat face 74 of the latch housing 73 are each provided with one-half of a machined cavity for rotatably journalling the female portion 76 of the body latching mechanism. In Fig. 7 of the female latch portion or member 76 is shown as being operatively nested in the cavity portion 84 formed in the housing 73, and consequently that portion of the cavity is practically all hidden by the latch member 76. However, the hidden portion 84 of the cavity is identical with the portion carried by the flat face 70 of the body half A. This latter cavity portion is indicated as a whole by the reference numeral 77, and will be more fully described hereinbelow.

The female latch member 76 is composed substantially of an elongated element 78 having an end portion 79 extending to or slightly beyond the right hand edge 80 of the housing 73. The end portion 79 has a longitudinal substantially oval bore 81 which communicates with an enlarged socket or cavity 82, the wall of which is circular. An abrupt annular shoulder 83 is provided around the inner end of the bore 81 at its junction with the socket 82 (Fig. 11).

The right hand end portion 79 of the latch element 78 terminates in two transverse points or knife-edges 85 which are oppositely disposed radially from each other. Arcuate flat surfaces 86 and 87 extend longitudinally away from one side of the points 85, and converge as shown at 88. Similarly, arcuate surfaces 89 and 90 extend longitudinally away from the other sides of the points 85, and converge as shown at 91.

The latch element 78 is journalled for rotation in spaced sleeve-type bearings 92 and 93, and an annular shoulder 94 acts to prevent longitudinal displacement of the element 78. Adjacent the shoulder 94, the element 78 is provided with a smooth annular surface 95.

As best illustrated in Fig. 7, the cavity 77 in the flat face 70 of the body half A an arcuate portion 96 for journalling the end portion 79 of the element 78, has a similar portion 97 for nesting the bearing 92, has a portion 98 for nesting the bearing 93, and has a portion 99 for journalling the left hand end of the element 78. The cavity is also formed with an annular shoulder 100 for bearing against the shoulder 94 of the element 78 to prevent its longitudinal movement.

As illustrated in Figs. 1, 2, 7 and 8, the latch housing 73 has a forwardly projecting rigid handle 101 similar in exterior form to handle 47 on the latch housing 35. The handle 101 has a downwardly turned free end portion 102, and a bore 103 extends longitudinally within the handle to communicate at its inner end with the cavity 84 in the latch body.

As a means for manually rotating the female latch element 78 within the cavities 77 and 84, a cable 104 is provided in the bore 103. The inner end of the cable 104 is attached by an eye 105 and stud 106 to the surface 95 of the latch element 78. The cable 104 extends over sheaves 107 and 108 within the bore 103 to facilitate its longitudinal movement by manually pulling upon a knob 109 at the outer end of the cable. A downward pull upon said knob will partially rotate the latch element 78 in an obvious manner.

In Figs. 4, 9, 10 and 11, the rod 40 is shown as having a substantially rectangular enlargement or head 110 upon its free end. The head 110 has an outer bevelled side 111 and arcuate ends 112, and is of a dimension to pass through the oval bore 81 of the female latch element 78 if the head is properly rotated to coincide with the bore as the two body halves A and B are swung together. A retrieving spring 113 is attached at one end of the stud 51 (Fig. 4), and its other end (Fig. 3) is attached in any suitable manner to the wall of the cavity 21. This spring 113 acts to normally hold the latch body 39 in a position at which the sides and ends of the head 110 do not coincide with the sides and ends of the oval bore 81 in the female latch element 78. In a similar manner, the latch element 78 has a retrieving spring 114 which normally holds it in a radial position in which its sides and ends do not coincide with the sides and ends of the head 110.

When the two body halves A and B are swung together from the position shown in Fig. 2, the bevelled side 111 of the head 110 contacts the arcuate surfaces 87 and 89 or the arcuate surfaces 86 and 90, as the case may be, and these arcuate surfaces cause the head 110, rod 40 and latch element 39 to rotate so that the head will coincide with the oval bore 81 of the female latch element 78 and will enter the bore 81 and pass beyond the shoulder 83 (Fig. 11) into the chamber 82. The spring 113 will then return the head 110 to its original axial position at which time the head will then be positively engaged with the shoulder 83. The body halves A and B will therefore be positively latched together. It is possible and probable that during the engaging movement of the head 110 and shoulder 83, the female latch element 78 will partially rotate against the retrieving action of the spring 113, and if such movement occurs, the element 78 will return to its original axial position as soon as the head 110 passes the shoulder 83. The relative rotation of the head 110 and female latch element 78 by the arcuate surfaces 89 and 87 is illustrated in Figs. 9 and 10.

In order to release the head 110 from its latching engagement with the shoulder 83, outward longitudinal movement of either the cable 50 or the cable 104 will rotate either the head 110 or latch element 78 to cause the head 110 and oval bore 81 to again coincide so that the body halves may be swung apart.

It will, of course, be understood that when the two body halves are swung together, the plunger 26 and yoke 53 will cause the rod 40 and head 110 to move longitudinally into the oval bore 81 of the female latch element 78. It is obvious that if the rod 40 were to be elongated to sufficiently project beyond the edge 37 of the latch housing 35, it would enter the bore 81 to a point beyond the shoulder 83 without the presence of the plunger 26 and yoke 53. In such a structure, however, the head 110 might interfere with the free entry and removal of the pipe 11 with relation to the elevator bore 13.

It is also thought to be obvious that the latching mechanism would function suitably if one of the latch elements, either 39 or 78 were to be held against rotation. In such a structure only one

of the cables and actuating knobs would be necessary, but the device could not be operated with both the right and the left hand of the operator.

It is thought the operation of the device will be apparent from the above description without further elucidation.

In Figs. 12 and 13 is shown a slightly different mechanical arrangement for manually rotating the latch element 39, rod 40 and head 110.

In this embodiment, the inner end of the latch body 39 is provided with an integral axial stem 120 to which is keyed or pinned a transverse arm 121 having an elongated through slot 122 in its projecting bifurcated end portion 123. A pull rod 124 extends through the longitudinal bore 49 in the handle 47 and has its flattened end 125 interposed between the legs of said bifurcated end portion 123. A transverse pin 126 passes through the slot 122 and flattened end portion 125 of the pull rod to engage the rod 124 and the arm 121. The outer end of the pull rod 124 is provided with a perpendicular handle 127 by which the rod may be moved manually in an outward direction with relation to the handle 47. A spring 128 acts to return the pull rod 124 to the inner end of its throw.

Obviously a similar actuating mechanism could well be used to manually rotate the female latch element 78 in lieu of the cable 104 and knob 109 if desired.

It is thought that the mechanism described hereinabove will accomplish all of the objects and purposes set forth.

I claim:

1. In a well pipe elevator, the combination with two arcuate hinged together body halves adapted to be swung together to surround a pipe, of a latching mechanism for holding the two body halves in closed relation, including: a tubular female latch element rotatably carried by one body half at the free end thereof; a neck at one end of said element having a substantially oval bore with an open end presented toward the free end of the other body half; an enlarged socket within the latch element at the inner end of said oval bore; an annular shoulder surrounding the inner end of said bore; a male latch element carried by the other body half and having a head shaped to enter the bore of said neck when the two latch elements are in proper relative radial positions; and means for automatically rotating a latch element to engage the head on the shoulder after said head has entered said socket.

2. In a well pipe elevator, the combination with two arcuate hinged together body halves adapted to be swung together to surround a pipe, of a latching mechanism for holding the two body halves in closed relation, including: a tubular female latch element carried by one body half at the free end thereof; a neck at one end of said element having a substantially oval bore with an open end presented toward the free end of the other body half; an enlarged socket within the latch element at the inner end of said oval bore; an annular shoulder surrounding the inner end of said bore; a male latch element rotatably carried by the other body half and having a head shaped to enter the bore of said neck when the two latch elements are in proper relative radial positions; and means for automatically rotating a latch element to engage the head on the shoulder after said head has entered said socket.

3. In a well pipe elevator, the combination with two arcuate hinged together body halves adapted to be swung together to surround a pipe, of a latching mechanism for holding the two body halves in closed relation, including: a tubular female latch element rotatably carried by one body half at the free end thereof; a neck at one end of said element having a substantially oval bore with an open end presented toward the free end of the other body half; an enlarged socket within the latch element at the inner end of said oval bore; an annular shoulder surrounding the inner end of said bore; a male latch element rotatably carried by the other body half and having a head shaped to enter the bore of said neck when the two latch elements are in proper relative radial positions; and means for automatically rotating a latch element to engage the head on the shoulder after said head has entered said socket.

4. Organization as described in claim 1, and means for manually partially rotating the rotatable latch element to a radial position in which the head may be withdrawn from said socket through the bore of said neck.

5. Organization as described in claim 2, and means for manually partially rotating the rotatable latch element to a radial position in which the head may be withdrawn from said socket through the bore of said neck.

6. Organization as described in claim 3, and means for manually partially rotating one of said latch elements to a radial position in which the head may be withdrawn from said socket through the bore of said neck.

7. Organization as described in claim 3, and means for manually partially rotating both of said latch elements to radial positions in which the head may be withdrawn from said socket through the bore of said neck.

8. Organization as described in claim 1, and means for automatically partially rotating the rotatable latch element, to a radial position in which the head will automatically enter the bore of said neck, when the free ends of the two body halves are swung together.

9. Organization as described in claim 2, and means for automatically partially rotating the rotatable latch element, to a radial position in which the head will automatically enter the bore of said neck, when the free ends of the two body halves are swung together.

10. Organization as described in claim 3, and means for automatically partially rotating at least one of said latch elements to a radial position in which the head will automatically enter the bore of said neck, when the free end of the two body halves are swung together.

11. Organization as described in claim 1, and means for automatically moving one of the latch elements longitudinally in its supporting body half, toward the other latch element, when the free ends of the two body halves are swung together.

12. Organization as described in claim 2, and means for automatically moving one of the latch elements longitudinally in its supporting body half, toward the other latch element, when the free ends of the two body halves are swung together.

13. Organization as described in claim 3, and means for automatically moving one of the latch elements longitudinally in its supporting body half, toward the other latch element, when the free ends of the two body halves are swung together.

14. Organization as described in claim 1, and: means for automatically partially rotating the rotatable latch element to a radial position in

which the head will automatically enter the bore of said neck, when the free ends of the two body halves are swung together; and means for automatically moving one of said latch elements longitudinally in its supporting body half toward the other latch element when the free ends of the two body halves are swung together.

15. Organization as described in claim 2, and: means for automatically partially rotating the rotatable latch element to a radial position in which the head will automatically enter the bore of said neck, when the free ends of the two body halves are swung together; and means for automatically moving one of said latch elements longitudinally in its supporting body half, toward the other latch element, when the free ends of the two body halves are swung together.

16. Organization as described in claim 3, and: means for automatically partially rotating the rotatable latch element to a radial position in which the head will automatically enter the bore of said neck, when the free ends of the two body halves are swung together; and means for automatically moving one of said latch elements longitudinally in its supporting body half toward the other latch element when the free ends of the two body halves are swung together.

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