March 16, 1943. H. E. GRAU ET AL 2,313,743

PIPE TONG

Filed April 15, 1940 3 Sheets-Sheet 1

Fig. 2

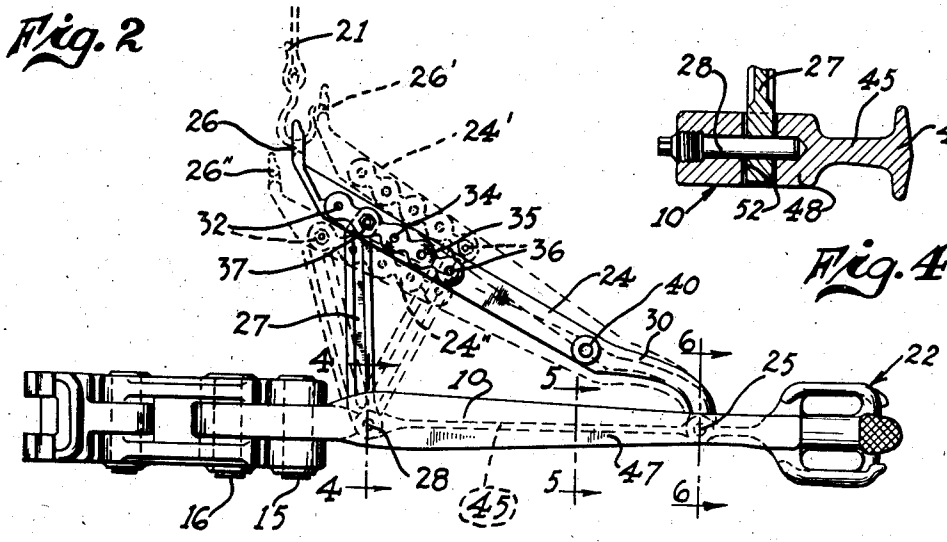


Fig. 4

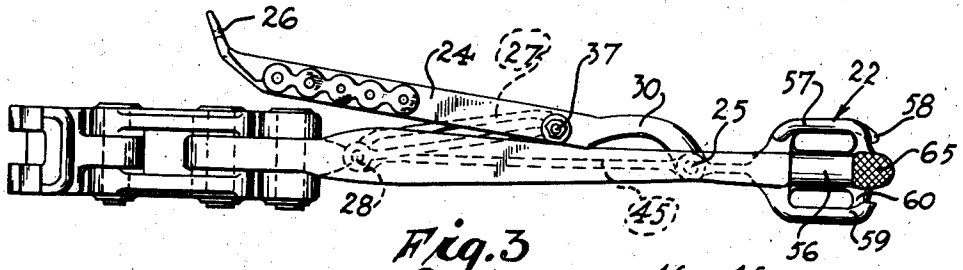


Fig. 3

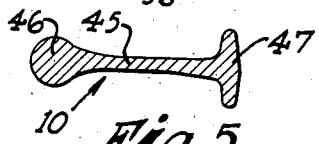


Fig. 5

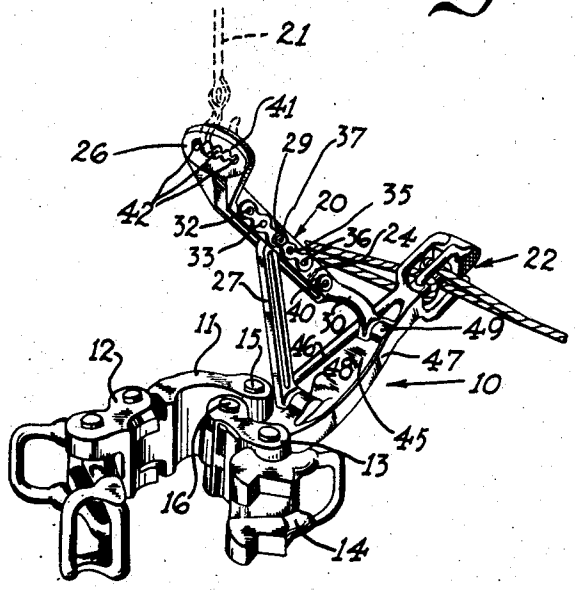


Fig. 1

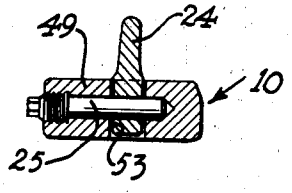


Fig. 6

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PIPE TONG

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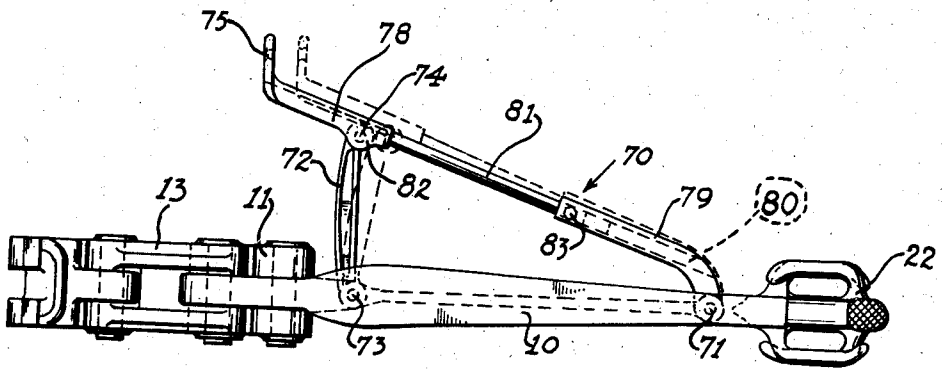


Fig. 7

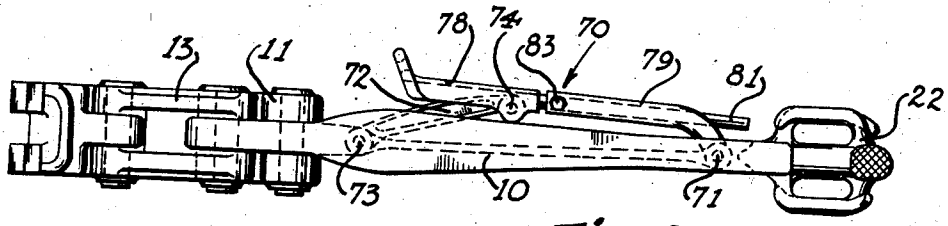


Fig. 8

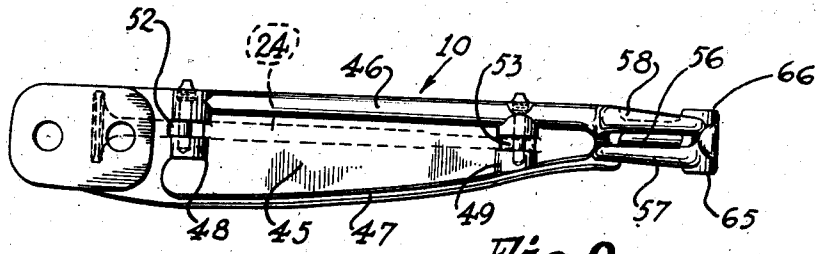


Fig. 9

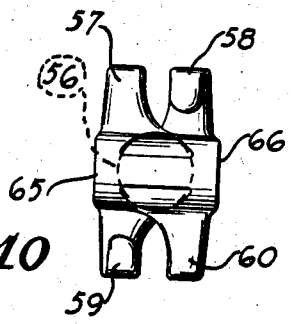


Fig. 10

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PIPE TONG

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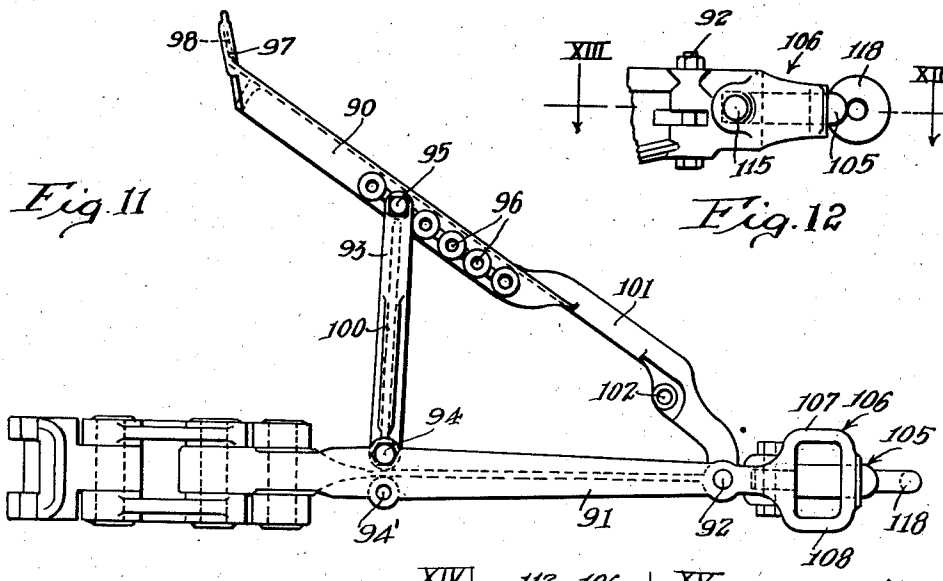


Fig. 11

Fig. 12

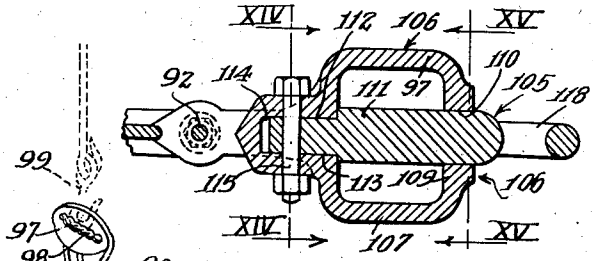


Fig. 13

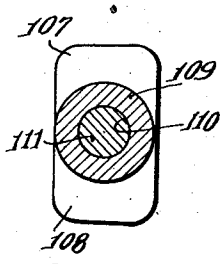


Fig. 15

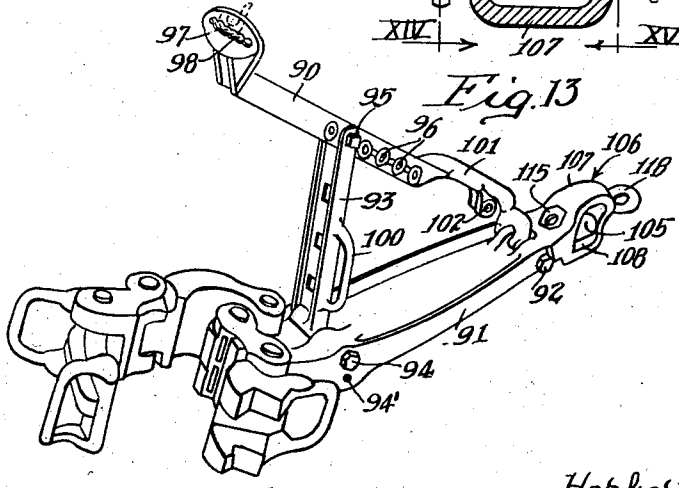


Fig. 16

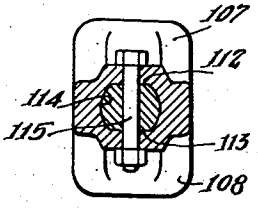


Fig. 14

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UNITED STATES PATENT OFFICE

2,313,743

PIPE TONG

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Application April 15, 1940, Serial No. 329,598

16 Claims. (Cl. 255—35)

This invention relates generally to pipe tongs and more particularly to a novel lever and an improved suspension for well pipe tongs.

This application is a continuation in part of our application Serial No. 272,360, filed May 8, 1939, on Pipe tongs.

Well pipe tongs for making up and breaking out joints in drill pipe and well casing are usually suspended in the derrick from a wire line, to provide ease of manipulation when in use, and to enable them to be swung out of the way of the derrick crew during other drilling operations. Because of the considerable weight of such tongs, it is necessary to provide proper balance by suspending them from a point directly above the center of gravity of the suspended mass. This is usually accomplished by providing a hanger connected to the tong lever and extending upwardly and forwardly to a point above the center of gravity of the tong, at which point the hanger is suspended from the wire line. Unfortunately, the center of gravity is not a fixed point but shifts both longitudinally and laterally of the tong when different sized jaws are substituted to accommodate different sizes of pipe. It is accordingly necessary to provide for both longitudinal and lateral adjustment of the suspension eye on the hanger if proper balance is to be obtained.

The tong hangers heretofore employed have been of two general types—either a completely rigid assembly or one including chains or other flexible members. The rigid assemblies have the advantage of definitely locating the suspension point with respect to the center of gravity of the tongs, but they are usually removed during transport and storage because of the excessive space occupied by the upwardly projecting arm. The other type of hanger including flexible linkage is equally unsuited to be used in handling the tongs when not suspended in the derrick, because of the lack of rigidity.

A principal object of this invention is to provide a tong hanger which is not only rigid but which may be collapsed or folded down onto the tongs to occupy a minimum of space, and locked in the collapsed position to permit handling of the tongs by the suspension eye on the hanger during transport.

A further object is to provide a rigid tong hanger which is easily adjustable to provide proper balance for a wide range of sizes of jaws.

A still further object is to provide a tong lever and hanger wherein the hanger is readily attached to either side of the lever to adapt the tongs to either right or left-hand operation.

A still further object is to provide a tong lever having a novel and improved arrangement for securing the tong line thereto.

Other objects and advantages will be apparent from the following description of a preferred embodiment and modifications thereof, reference being had to the accompanying drawings wherein:

Fig. 1 is a perspective view of a preferred embodiment of a tong embodying the novel hanger and lever;

Fig. 2 is a view in side elevation of the tong shown in Fig. 1;

Fig. 3 is a view similar to Fig. 2, showing the hanger in collapsed position;

Fig. 4 is transverse sectional view taken on line IV—IV of Fig. 2;

Fig. 5 is a transverse sectional view taken on line V—V of Fig. 2;

Fig. 6 is a transverse sectional view taken on line VI—VI of Fig. 2;

Fig. 7 is a view in side elevation of a tong embodying a slightly modified form of hanger;

Fig. 8 is a view similar to Fig. 7 showing the hanger in folded position;

Fig. 9 is a plan view of the tong lever;

Fig. 10 is an end elevation of the clevis on the outer end of the lever;

Fig. 11 is a view in side elevation of still another modification;

Fig. 12 is a top plan view of the outer extremity of the tong lever of Fig. 11;

Fig. 13 is a longitudinal section taken on line XIII—XIII of Fig. 12;

Figs. 14 and 15 are transverse sectional views taken on lines XIV—XIV and XV—XV, respectively, of Fig. 13; and

Fig. 16 is a perspective view of the tong and hanger of Fig. 11.

Referring to Figs. 1 to 5 of the drawings, the tong therein depicted comprises a lever or handle generally designated 10, on the inner end of which are pivotally mounted two opposed pairs of pipe-gripping jaws 11, 12, 13 and 14. The jaws 11 and 12 are pivotally connected to the lever at 15, and the jaws 13 and 14 are pivotally connected thereto at 16, as is customary in pipe tongs of this type. A hanger assembly generally designated 20, is detachably secured to the lever 10 and serves to suspend the tong from a wire line indicated in dotted lines at 21. A novel form of clevis 22 is formed on the outer end of the lever to enable a tong line to be quickly and easily applied to or removed from the lever.

The novel hanger assembly shown in Figs. 1 to 3 comprises an arm 24, pivotally connected at 25 to the lever 10 and adapted to be connected at 26 to the wire line 21, and a strut 27 having its lower end pivotally connected to the lever at 28 and having its upper end detachably connected at 29 to the arm 24 intermediate the ends of the latter. The arm 24 is channel-shaped in cross-section throughout the major portion of its length, the lower end thereof adjacent the pivot 25 being rounded as shown at 30 to provide a hand hold which may be grasped by the operator when manipulating the tongs.

As stated in the introductory remarks, the substitution of different sized jaws in the tong, to adapt it to handle different sizes of pipe, causes the center of gravity of the suspended mass to shift both longitudinally and laterally. Provision is made herein for shifting the suspension point 26 on the upper end of the hanger so that, irrespective of the size of jaws used, the suspension point may be located directly above the center of gravity, and the tong will be balanced and will assume a horizontal position when suspended from a single point. Longitudinal adjustment of the suspension point is effected in the embodiment of Figs. 1 to 3 by providing a longitudinal series of bolt holes 32, 33, 34, 35, 36 extending transversely through the side walls of the channel-shaped arm 24, the upper extremity of the strut 27 being adapted to be detachably secured to the arm 24 at any one of several points by means of a bolt 37 passing through one of the holes 32, 33, 34, 35 or 36 and a registering opening in the upper end of the strut. It will be observed from reference to Fig. 2 that as the strut 27 is moved to cause the bolt hole therein to register selectively with successive holes in the arm 24, the arm swings about its pivot 25 on the lever 10, assuming various angularly related positions as indicated at 24' and 24'', and disposing the suspension point 26 in different longitudinally spaced positions, as at 26' and 26''.

In the position of the arm indicated at 24' in Fig. 2, the strut 27 is connected to the arm by the bolt 37 passing through the bolt hole 36 most remote from the tong head, and the suspension point 26' is shifted as far to the right as is possible with the construction shown. When the strut is connected to the arm at the bolt hole 32 at the opposite end of the series, the arm assumes the position indicated in dotted lines at 24'' and the suspension point is moved to the extreme left position, indicated at 26''.

It will be understood that any desired range of longitudinal adjustment of the suspension point 26 may be provided by suitably varying the length of the strut 27 or the distance between the pivot points 25 and 28 on the lever, or by disposing the row of bolt holes in the arm in various angular relations to the longitudinal axis of the arm. It will also be understood that the series of bolt holes need not be disposed in a straight row, but may be formed on an arc.

The hanger assembly may be folded down into a compact, low-lying position on the lever, as shown in Fig. 3, to facilitate shipping and storage, and furthermore it may be locked in the folded position to permit handling of the tong by the hanger when the latter is in collapsed position. The advantages of this feature will be apparent to those familiar with well tongs.

To collapse the hanger from any of the operative positions shown in Fig. 2 to the folded position of Fig. 3, the bolt 37 is removed, and the strut 27 is swung clockwise about its pivot 28 into a nearly horizontal position above the lever 10. The arm 24 is then swung counterclockwise about its pivot 25. With the arm and strut in the positions shown in Fig. 3, the bolt hole in the free end of the strut registers with a special bolt hole 40 in the arm, adjacent the handle portion 30. By passing the bolt 37 through these registering openings the arm is locked in collapsed position, forming a rigid structure by which the tong may be handled.

Means are also provided for shifting the suspension point transversely of the tong to compensate for lateral shifting of the center of gravity when different sized jaws are substituted. This means comprises an upstanding, flat head 41 formed on the upper end of the arm 24, the head being elongated in a transverse direction and having a transverse row of eyes 42 in one of which the hook or clevis on the suspension cable is adapted to selectively engage.

An important feature of this invention resides in the construction of the tong lever, particularly insofar as it relates to the pivotal connection of the hanger arm and strut to the lever. As shown in Figs. 2, 3 and 9, the lever 10 comprises an elongated bar having a central web 45 reinforced along its edges by ribs 46 and 47. Thickened hub portions 48 and 49 are formed in the web adjacent opposite ends of the lever, and are bored transversely for the reception of the pivot pins 28 and 25 by which the strut 27 and the arm 24 are pivotally connected to the lever.

As clearly shown in Figs. 4, 6 and 9, the hub portions 48 and 49 have aligned slots 52 and 53 extending vertically therethrough to receive the pivot eyes on the lower ends of the strut 27 and arm 24, respectively. It will be noted in particular that the lever 10 is substantially symmetrical with respect to a horizontal plane extending through the web 45 and that the bores for the pivot pins 25 and 28 are disposed substantially in the central horizontal plane of the web 45 and hubs 48 and 49, whereby the strut and arm may be readily connected to either side of the lever.

We have also provided a novel and improved clevis on the outer end of the lever, which is designed to overcome the objections to those now in use. As shown in Figs. 2, 3, 9 and 10, the clevis comprises a central cylindrical hub portion 56, formed integral with the lever 10, an upper pair of retaining fingers 57 and 58, and a lower pair of similar but oppositely disposed fingers 59 and 60. Each finger projects outwardly from the lever at one end of the hub 56, extends longitudinally of the hub in spaced relation thereto, and has an inwardly inclined tip at its outer end terminating in spaced relation to the hub. It will be noted that the fingers of each pair are spaced from each other to provide a longitudinal channel therebetween, and that the fingers 57 and 60 are joined to the lever at the outer end of the hub 56 and project toward the tong head, whereas the fingers 58 and 59 are connected to the lever at the inner end of the hub and project away from the tong head. In this manner two labyrinthine channels are provided on opposite sides of the hub 56 whereby a permanent loop in the end of a tong line may be applied to the hub by suitable manipulation of the loop, but when once applied there is no danger of its becoming inadvertently detached, or of becoming fouled.

The large diameter of the hub portion 56 prevents excessive bending of the tong line at the end of the loop, and thus greatly prolongs the life of the line. The two pairs of oppositely extending fingers integral with the lever form a very simple and rugged lock having no separable parts to be manipulated, and yet the loop is as effectively restrained against accidental removal as though the clevis were entirely closed.

We prefer to provide a pair of anvil heads or striking surfaces 65 and 66 on opposite sides of the loop. As shown in Figs. 9 and 10, these heads project laterally beyond the retaining fingers so that in the event it becomes necessary or desirable to strike a blow on the end of the lever the fingers will be protected against injury. The striking surfaces may be knurled if desired.

In Figs. 7 and 8 there is shown a modified form of hanger embodying the features of rigidity in both operative and collapsed positions and of both lateral and longitudinal adjustment of the suspension point. As in the embodiment of Figs. 1 to 3, the hanger comprises generally a long arm 70 pivotally connected at 71 to the lever 10 at a point adjacent the outer end of the latter, and a relatively short strut 72 pivotally connected at 73 to the lever at a point adjacent the tong head, and connected to the arm 70 at a point 74 intermediate its ends. In this instance, however, longitudinal adjustment of the suspension eye 75 at the upper end of the arm 70 is effected by forming the arm as an extensible member comprising telescopic sections 78 and 79.

The arm section 79 constitutes the female member in the construction illustrated, and may be in the form of a hollow sleeve having a bore 80 extending axially through the straight portion thereof. The male section comprises a cylindrical portion 81 adapted to telescope within the bore of the female member, and an outer end portion, preferably channel-shaped in cross section, having aligned eyes at 82 for connection with the eye on the upper end of the strut 72. A retaining means in the form of a set screw 83 threaded into the sleeve 79 and engaging the rod 81 holds the telescopic sections in adjusted position.

The suspension eye 75 in this form of hanger may be adjusted to different longitudinally spaced positions simply by loosening the set screw 83 and varying the telescopic relation between the rod 81 and the sleeve 79, and thereafter tightening the set screw. Inasmuch as the strut 72 is connected to the tong lever at a point to the right of the center of gravity of the tong, the tong head tends to swing downwardly and thus tends to telescope the rod 81 into the sleeve 79. Consequently there is no danger of the telescopic sections becoming separated if the set screw should become loosened while the tong is suspended.

This form of hanger is also readily collapsed from the operative positions of Fig. 7 to the folded position of Fig. 8, by the simple expedient of loosening the set screw 83 and fully telescoping the sections 78 and 79. It will be observed that when in folded position the long arm 70 assumes an extremely low-lying position providing a compact arrangement for shipment and storage.

Referring now to the form of the invention shown in Figs. 11 to 16, the hanger illustrated therein is generally similar to that shown in Figs. 1 to 3. Thus, an upwardly and inwardly inclined main supporting arm 90 is pivotally connected to a tong lever 91 adjacent the outer end thereof, as by a pivot bolt 92, and is rigidly secured in any one of several angularly related positions with respect to the lever, by means of a strut 93. As in the embodiment shown in Figs. 1 to 3, the strut is pivotally connected at its lower end to the lever by a pivot bolt 94, and is adapted to be secured at its upper end to the arm 90 by a bolt 95, which is selectively engageable with any one of a plurality of bolt holes 96, to adjust the angular position of the arm 90 with respect to the lever and thereby adjust the suspension head 97, at the upper end of the arm, longitudinally with respect to the tong head and lever, and thereby compensate for longitudinal shifting of the center of gravity of the suspended mass resulting from the substitution of jaws of different sizes and weights. In this form of the invention the suspension head 97 also preferably is provided with a transverse row of eyes 98 adapted to be selectively engaged by a suspension hook 99 to balance the tong in a transverse direction.

It will be observed from a comparison of Fig. 16 with Fig. 1 that whereas in Fig. 1 the strut 27 is relatively narrow in transverse dimension and has its upper end inserted in the downwardly facing channel in the arm 20, in Fig. 16 the strut 93 is relatively wide in transverse dimension and its upper end straddles the U-shaped arm 90. It will also be observed that in lieu of a single point of pivotal connection between the lower end of the strut and the lever, as at 28 in Fig. 1, from which the strut may extend on either side of the lever, in Fig. 16 a second bolt hole 94' is formed in the lever below the central web thereof, for insertion of the pivot bolt 94 when the tong is inverted and the hanger is connected to the opposite side thereof.

In order to facilitate the manipulation of the tong while suspended in the derrick, a vertically extending handle 100 is formed integral with the strut 93 and projects laterally therefrom. It has been determined by actual practice that the provision of a handle at this point, in conjunction with the rounded hand-hold 101 provided on the inclined arm 90, enables the operator to grasp the tong and guide it onto or off the pipe with a minimum of effort.

This form of hanger may also be folded downwardly into a collapsed positon closely adjacent the upper surface of the lever and may be rigidly locked in this positon. To accomplish this, the bolt 95 connecting the upper end of the strut 93 to the arm 90 is removed, the strut is swung downwardly about the pivot 94 in a clockwise direction as viewed in Fig. 11, and the arm 90 is swung downwardly about the pivot 92 in a counterclockwise direction. When both members are in nearly horizontal position, the bolt holes in the upper end of the strut are aligned with a bolt hole 102 in the arm 90 adjacent the outer end thereof, and when the bolt 95 is inserted in these aligned holes the hanger assembly is rigidly locked in collapsed position.

It will be observed with reference to Figs. 12 to 15 that a slightly modified form of tong line clevis is provided on the outer end of the lever 91. In this instance a central pin member, generally designated 105, is detachably mounted in the end of the lever and extends centrally across a vertically extending eye 106 formed integral with the lever. As shown most clearly in Fig. 13, the eye 106 comprises an upper loop 107 and a lower loop 108, both merging into an outer end

wall 109. The latter is bored at 110 to snugly receive a cylindrical portion 111 of the pin member 105. The inner end of the pin member has flattened upper and lower faces 112 and 113 (Figs. 13 and 14) forming a noncircular portion fitting within a similarly shaped socket 114 in the end of lever 91, to prevent rotation of the pin member relative to the lever. A bolt 115 extends vertically through aligned bores in the lever and the pin member for detachably securing the latter in the lever.

To apply the looped end of a tong line to the pin member, the bolt 115 is removed and the pin withdrawn sufficiently to permit the loop in the line to be inserted in the eye in a vertical position. The pin is then inserted through the loop and returned to the assembled position shown in the drawings, and the bolt is replaced to secure the pin against withdrawal. The loop in the tong line is thus confined by the eye 106 against inadvertent removal from the pin, but may be quickly and easily removed when desired.

An auxiliary eye 118 is preferably formed integral with the outer end of the pin member 105, and serves as a convenient means for attaching a line for holding the tong swung back in a corner of the derrick when not in use.

While we have shown and described in detail a preferred embodiment of the invention and two modifications thereof, it will be understood that this is solely for illustrative purposes, and that various modifications may be made therein within the spirit of the invention and scope of the appended claims.

We claim:

1. In a pipe tong, a tong head, a handle projecting laterally therefrom, and a hanger assembly comprising rigid arms connected to said handle and to each other, one of said arms having means for attachment to suspension means, said arms being adjustable relative to said handle into a plurality of operative positions to vary the longitudinal position of said attaching means relative to the tong, said arms also being adjustable into a collapsed position in relatively low overlying relation to said handle, and means for rigidly locking said arms in any of said positions including said collapsed position.

2. In a pipe tong, a tong head, a handle projecting laterally therefrom, and a hanger assembly comprising rigid arms each pivotally connected at one end to said handle at points spaced longitudinally thereof, one of said arms having means for attachment to suspension means, means connecting said arms together adjacent their free ends, said arms being swingable about their pivotal connections with said handle into different operative positions to move said attachment means longitudinally of said handle, said arms also being adjustable into a collapsed position in relatively low overlying relation to said handle, and means for locking said arms in any of said positions including said collapsed position.

3. In a pipe tong, a tong head, a tong lever projecting laterally therefrom, and a hanger assembly comprising a first rigid arm connected at one end to said lever and having means adjacent its other end for attachment to suspension means, a second rigid arm having connection at one end with said lever and at its other end with said first arm, said last-named connection being adjustable to vary the position of said attachment means longitudinally of said lever, said arms being adjustable relative to said lever into a collapsed position closely adjacent the upper surface of said lever, and means for securing said arms in said collapsed position.

4. A pipe tong comprising a tong head, a lever extending laterally therefrom, and a hanger assembly comprising a first rigid arm pivotally connected at one end to said lever and having means adjacent its other end for attachment to suspension means, said arm having a substantially longitudinal series of connecting points intermediate its ends, a second rigid arm pivotally connected at one end to said lever and detachably connectible at its other end with said first arm selectively at any one of said series of connecting points to vary the position of said attachment means longitudinally of said lever, said arms being adjustable about their pivotal connections with said lever into collapsed position in close superposed relation to said lever, and said arms being connectible together at one of said series of connecting points to rigidly secure said arms in aforesaid collapsed position.

5. A pipe tong comprising a tong head, a lever extending outwardly therefrom, and a hanger assembly for suspending said tong from suspension means, said hanger assembly comprising a first rigid arm having one end thereof pivotally connected to said lever adjacent the end thereof remote from said tong head, said arm extending upwardly and inwardly to dispose its inner end substantially above the center of gravity of said tong, the inner end of said arm being provided with a transversely elongated head having a series of suspension eyes therein spaced apart transversely of the longitudinal axis of said lever and adapted to be selectively engaged by said suspension means, an intermediate portion of said arm being provided with a series of eyes spaced apart longitudinally of said lever, and a second substantially upright rigid arm pivotally connected at its lower end to said lever adjacent said tong head, the upper end of said second arm being adapted to be connected to said first arm at a selected one of said longitudinally spaced eyes.

6. A pipe tong comprising a tong head, a lever extending outwardly therefrom, and a hanger comprising a rigid arm pivotally connected at one end with said lever adjacent the outer end thereof, means for rigidly securing said arm in upwardly and inwardly inclined angular relation to said lever with its free end disposed directly above the center of gravity of said tong, said means rigidly securing said arm in any one of a plurality of angularly related positions relative to said lever, said arm being swingable about its pivotal connection with said lever into a collapsed position closely adjacent the upper surface of said lever, and means for securing said arm in said collapsed position.

7. A pipe tong as defined in claim 1, in which said handle includes means for detachably securing said hanger assembly selectively to either side thereof.

8. A pipe tong as defined in claim 1, in which said handle includes common means for detachably securing said hanger assembly selectively to either side thereof.

9. A pipe tong comprising a tong head, a lever extending laterally therefrom, and a hanger, said hanger comprising a first rigid arm having means at one end for attachment to a suspension cable and a pivot eye at its opposite end for pivotally connecting said arm to said lever for angular adiustment relative thereto about a transverse

axis, and a second rigid arm connected at one end to said first arm and having a pivot eye at its opposite end for pivotally connecting said second arm to said lever for angular adjustment relative thereto about a transverse axis spaced from said first-named axis, said lever having longitudinally spaced openings extending vertically therethrough into which the pivot eyes on said arms may be inserted from either side of said lever, and a pivot pin traversing each of said openings and engaging the respective pivot eyes on said arms, for connecting said hanger selectively to either side of said lever.

10. A tong lever comprising a relatively flat elongated arm having means at one end thereof for connection with a tong head and means at the other end for connection with a tong line, and common means for selectively connecting a suspension means to either side of said lever, said last-named means comprising longitudinally spaced transversely extending pivot hubs having their axes parallel to and substantially midway between the upper and lower surfaces of said lever, openings through the lever intersecting the axes of said hubs, and pivot pins in said hubs extending across said openings.

11. A tong lever comprising an elongated arm having means at one end for connecting a tong head thereto and means at its opposite end for detachably connecting a tong line thereto, said last-named means comprising a substantially cylindrical pin member extending longitudinally of said lever and adapted to be encircled by a loop in the end of a tong line, and guard means integral with said lever and extending along diametrically opposite sides of said pin member between the ends thereof for releasably confining said tong line loop on said pin member.

12. A tong lever as defined in claim 11, in which each of said guard means comprises a pair of fingers extending in opposite directions in spaced relation to each other and in spaced substantially parallel relation to said hub.

13. A tong lever as defined in claim 11, in which each guard means comprises a loop integral with said lever and having a bifurcation extending longitudinally thereof and laterally in opposite directions at opposite ends thereof, thereby defining a labyrinthine path for insertion of a tong line through said loop.

14. A tong lever comprising an elongated arm having means at one end for connecting a tong head thereto and means at its opposite end for detachably connecting a tong line thereto, said last-named means including an eye formed integral with said lever and comprising longitudinally extending portions disposed respectively above and below the central longitudinal plane of said lever and a substantially vertically extending portion integrally connecting the outer ends of said longitudinal portions, said vertical portion having a central opening therethrough and said lever having a socket in longitudinal alignment with said opening, a pin member insertible through said opening into a position wherein the inner end thereof is received in said socket and the outer portion thereof engages said opening and wherein the intermediate portion thereof extends across said eye, said intermediate portion being adapted to be encircled by a loop in the end of a tong line.

15. A tong lever comprising an elongated arm having means at one end thereof for connecting a tong head thereto and having means at the opposite end thereof for detachably connecting a plurality of lines thereto at spaced-apart points thereon, said last-named means comprising a substantially cylindrical pin member extending longitudinally of said lever and adapted to be encircled by a loop in the end of a tong line, guard means integral with said lever and extending along diametrically opposite sides of said pin member between the ends thereof for releasably confining said tong line loop on said pin member, and an auxiliary eye formed integral with the outer end of said pin member for detachably connecting a second line to said lever.

16. In a pipe tong, a tong head, a lever extending laterally therefrom, and a hanger comprising a rigid supporting arm and means connecting one end thereof to the lever, said arm including means adjacent its free end for connecting a suspension line thereto at any one of a plurality of points spaced apart transversely of the arm, said arm being adjustable relative to the lever to move said transversely spaced connecting points into different positions spaced apart longitudinally of the lever.

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