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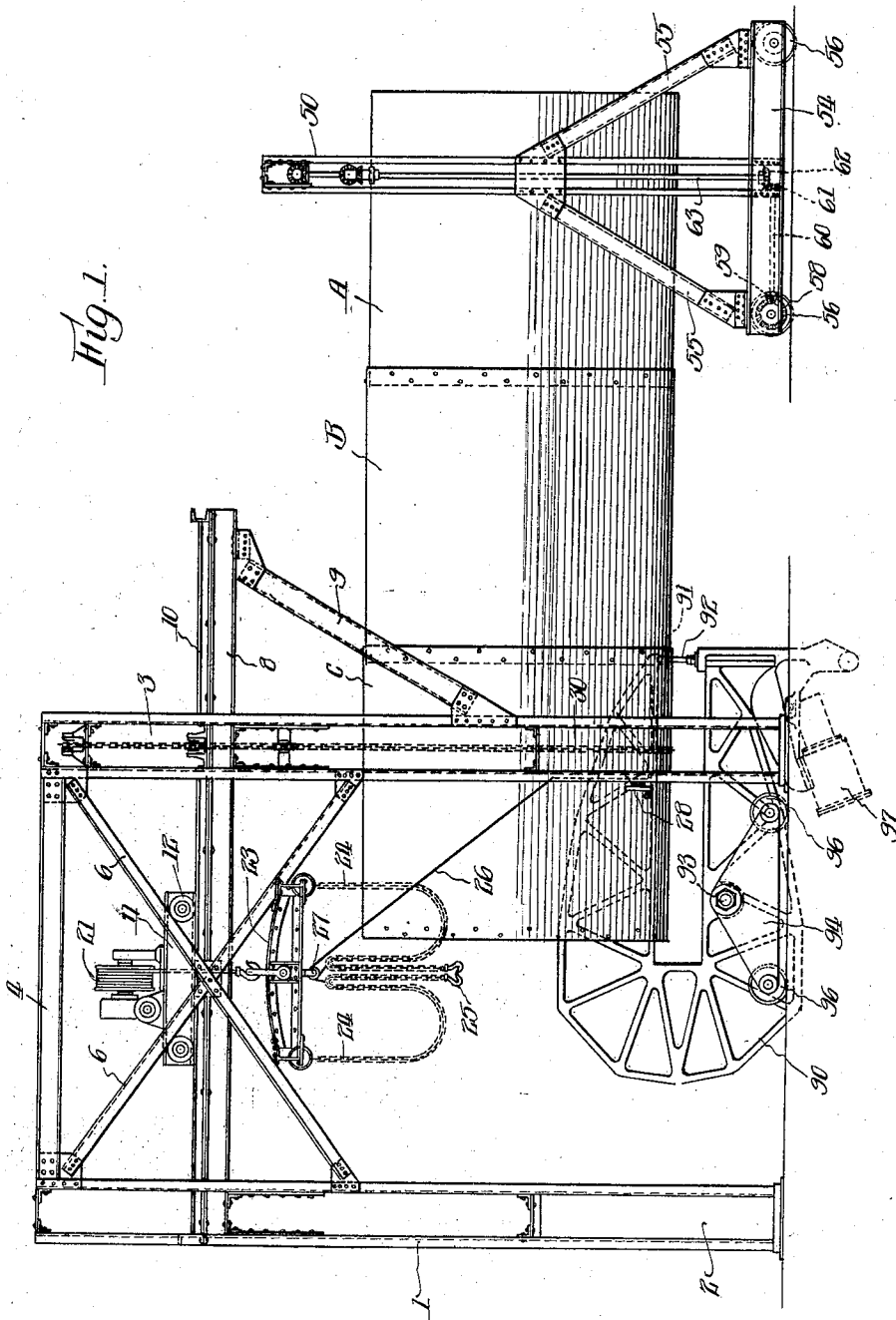
J. C. HANNA

1,876,290

WORK HANDLING DEVICE

Filed Dec. 24, 1928

3 Sheets-Sheet 1



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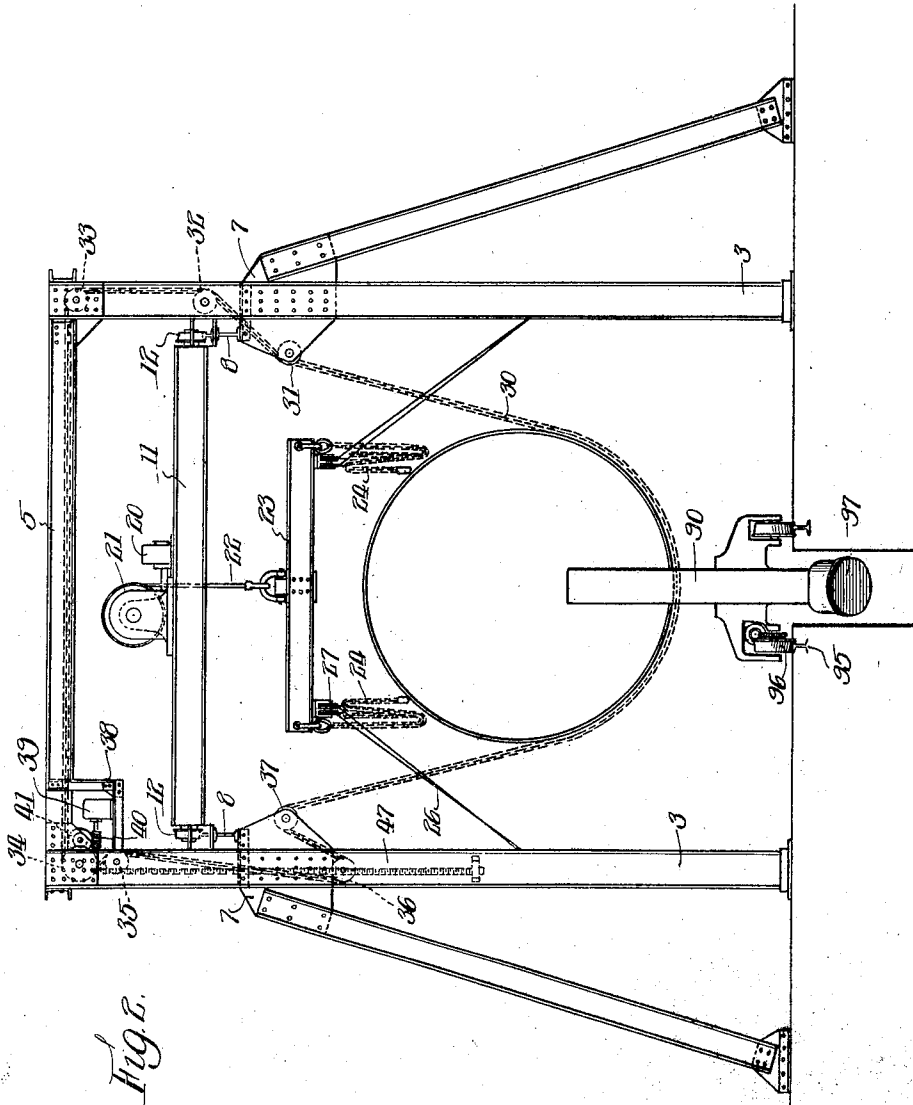
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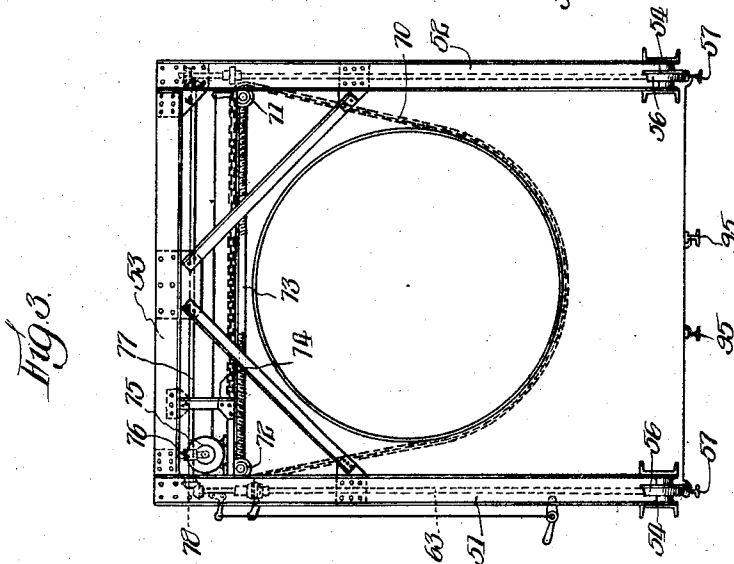
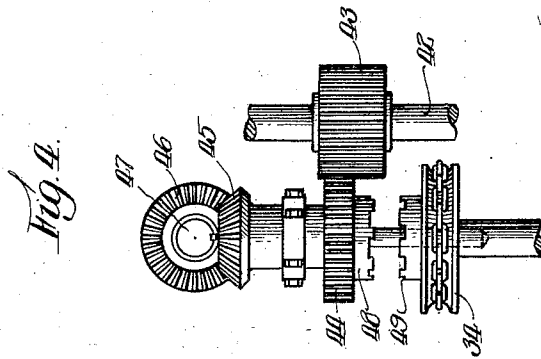
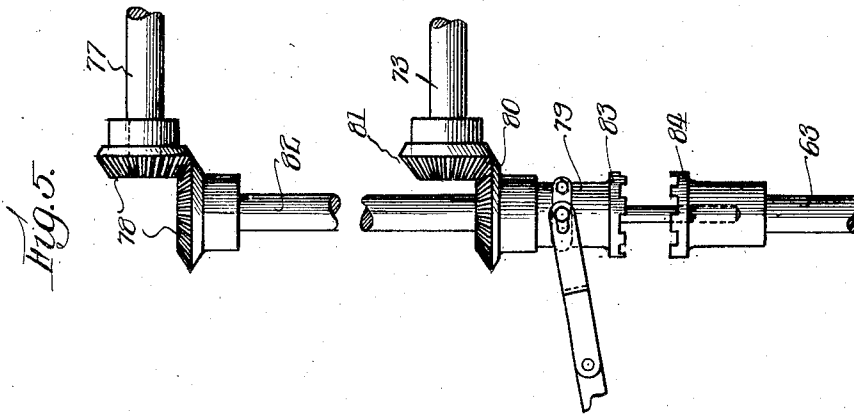
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WORK HANDLING DEVICE

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3 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

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## WORK HANDLING DEVICE

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This invention relates to apparatus for handling cylindrical work to be riveted. The purpose of this invention is to provide new and improved equipment for handling and riveting sectional tubular members formed of steel plate and riveting them together to form long cylinders of pipes of substantially large dimensions; thus there may be formed tubes used in ball or tube mills, sections of aqueduct pipe, pen stock pipe, etc.

Certain necessary steps involved in the fabrication of steel plate into the forms previously mentioned are as follows: The work must be brought into position and supported in such a manner that the girth seams may be easily brought into position relative to a riveting device. The step of riveting includes bringing one die into position to hold the manufactured head of the rivet while an opposed die crushes the opposite end of the rivet to form the other head. The work should be so supported that it may be rotated to bring the respective rivet holes in the girth seams into position to be riveted. Further the apparatus should be so arranged that additional sections to be joined may be easily and quickly brought into position and the completed work supported in such a manner that it can be easily removed for shipment. All of the above mentioned steps are efficiently carried out by my improved equipment.

It is further a specific object of this invention to support the work in position to be riveted by suspension means, as disclosed, comprising chains for suspending the work from upper frame sections in such a manner that the work may be easily manipulated and rotated.

Another object of my invention consists in the provision and arrangement of apparatus so that the following operations may be easily and quickly carried out:—raising a section of the work to be joined into position so that it may be temporarily joined by bolting to the completed work, then raising both the new section and the completed work and moving them longitudinally so as to bring the new section into position to be riveted after lowering in place.

Another and further object of my invention consists in efficient means for bringing a riveter supported on a carriage and tracks into position relative to the work.

Further and additional objects of this invention will be more clearly understood from the detail description.

In the drawings where one preferred form is shown—

Figure 1 is a side elevation of the complete apparatus showing the work supported and the riveter in position to rivet the girth seam.

Figure 2 is a vertical sectional elevation on line 2—2 of Figure 1, showing the forward suspension means.

Figure 3 is a vertical sectional elevation of line 3—3 of Figure 1, showing the rearward suspension means.

Figure 4 is a detail view showing the shiftable clutch for operating either the rotation means or raising means for the forward end of the work.

Figure 5 is a detail view of clutch means supported on the rearward movable frame adapted to cause the operation of the traversing means or the raising means.

The apparatus as shown in the drawings comprises generally a forward frame work which serves as a support for hoisting apparatus longitudinally movable and suspension means for the forward end of the work; a rearward movable gantry forming a support for the rearward suspension means, and a riveter supported on a carriage running on tracks beneath the forward frame.

The forward frame work will be first described having reference to Figures 1 and 2. The frame work denoted generally by 1 is made up from steel sections and comprising four corner posts 2—2, 3—3. Posts 2 and 3 are longitudinally spaced sufficient to allow the sections of work handled to be moved transversely between the posts and into place. The posts 2 and 3 are connected at their top ends by longitudinal horizontal members 4 and transverse horizontal members 5. The sides of the frame work are braced by cross beams 6 extending between posts 2 and 3. Near the tops of posts 2 and 3, brackets 7 are

riveted and form a support for I-beams 8 extending longitudinally of the frame work and to an overhanging end beyond post 3. The overhanging ends of the I-beams 8 are  
 5 braced by members 9 extending diagonally to the posts 3. The I-beams 8 serve as supports for tracks 10 which extend from the post 2 to the overhanging end of the beam 8. A carriage 11 running on wheels 12 travels on the  
 10 tracks 10. This carriage may be traversed in the usual manner by an independent motor (not shown). The carriage serves as a support for the hoisting apparatus comprising a motor 20 and a hoisting drum 21. A  
 15 hoisting cable 22 supports a bridge 23 to which is attached service slings comprising four chains 24 having hooks 25 at their ends. These chains may be passed around the section of work to be lifted and hooked together  
 20 in order to raise the section into place. To remove the chains out of the way when the riveting operation is taking place, strings 26 tied to the middle points of the chains and running around pulleys 27 on the bridge 23  
 25 may be drawn up by windlass 28. The forward suspension means consist of a flexible endless chain 30 running around the work and guided by pulleys or sheaves 31, 32, 33, 34, 35, 36, and 37. Pulley 34 is a drive pulley and  
 30 when rotated in either direction moves the endless chain 30 to rotate the work. Pulley 36 is vertically movable by rotation of screw shaft 47. The vertical movement of pulley 36 will serve to raise or lower the work, as the  
 35 case may be, by varying the loop of chain between guide pulleys 31 and 37. It will be noted that the supporting chain 30 extends completely around the hoisting apparatus as  
 40 guided by pulleys supported on the frame work, thus movement of the hoisting apparatus interferes in no way with the suspension means for the forward end of the work. Driving means are provided for either rotating  
 45 pulley 34 or moving pulley 36 in order to either rotate the work or raise or lower the work, and comprise a frame 38 supporting a reversible motor 39, shown in Figure 2. A worm screw 40 on the motor shaft rotates a  
 50 worm gear 41 which is secured to shaft 42 to which is secured a pinion 43 having a wide face. Details of the drive from pinion 43 to the screw shaft 47 or the pulley 34 are shown in Figure 4 in which a shiftable pinion 44 is  
 55 in mesh with the pinion gear 43 and is formed integrally with a beveled gear 45 shown in mesh with bevel gear 46 secured to the upper end of the screw shaft 47; thus rotation of the motor in either direction will serve to either  
 60 lower or raise the work by raising or lowering pulley 36, as the case may be. The pinion gear 44 is formed integrally with a clutch collar having clutch teeth 48 for engagement with a collar having clutch teeth 49. The  
 65 clutch element 49 is formed integral with

the drive pulley 34 so that longitudinal movement of pinion gear 44 by suitable shifting means will engage clutch elements 48—59 and move bevel gear 45 out of mesh with gear 46. Operation of the motor 39 will then cause  
 70 rotation of the work by movement of the endless chain 30 due to rotation of the drive pulley 34.

The rearward end of the work is supported by a rearward movable gantry 50, shown in  
 75 Figures 1 and 3. Movable gantry 50 comprises a vertical frame formed from posts 51—52 connected at their upper ends by transverse beam 53 and secured at their lower ends to horizontal longitudinal beams 54, which  
 80 are braced by beams 55. At the ends of the horizontal members 54, wheels 56 are secured to support the frame work for movement along the tracks 37. As shown in Figure 1, drive means for rotating the wheels and moving  
 85 the gantry on the tracks is provided and consists of gear 58 attached to one of wheels 56 on each side of the frame, meshing with bevel gear 59, secured to horizontal shaft 60 which is rotated by vertical shaft 63 through  
 90 meshing bevel gears 61—62. The rearward suspension means similar to the forward suspension means consists of an endless chain 70; in this case, guided by pulleys 71 and 72. Pulleys 71 and 72 are supported for movement  
 95 to and from each other due to rotation of a double screw shaft 73, thus rotation of the screw shaft 73 in one direction will bring pulleys 71 and 72 closer together thereby lowering the work and, rotation in the opposite  
 100 direction, will move the pulleys 71 and 72 farther apart thereby raising the work.

The means for moving the gantry on the tracks or raising or lowering the work consists of a reversible motor 75 supported on a  
 105 frame 74, the motor shaft causing rotation of a worm gear 76 secured to a transverse shaft 77. As shown in detail in Figure 5, the drive shaft 77 causes the rotation of vertical shaft 82 through bevel gears 78. A bevel gear 80 is secured to vertical shaft 82 to cause  
 110 rotation of horizontal double screw shaft 73 through bevel gear 81. Keyed to shaft 82 is a shiftable clutch having clutch teeth 83 for engagement with a companion clutch element 84 formed integral with vertical shaft 63. Thus, as shown, rotation of the drive shaft 77 will cause rotation of shaft 82 and rotation  
 115 of screw shaft 73 through bevel gears 80, 81 thus either raising or lowering the work, depending upon the direction of rotation of the motor. But movement of the shiftable clutch element 79 will engage clutch elements 83—84 and thus cause rotation of the vertical shaft 63, movement of the gantry along the  
 120 supporting tracks 54 simultaneously with the raising of the work. It will be apparent that the means shown for supporting the suspension chain 70 may well be used for support-  
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ing the forward suspension chain 30 and either form may be used as desired.

The riveter shown in Figure 1 supported for longitudinal movement beneath the forward frame consists of a U-shaped frame 90 and, when in position for riveting, its upper leg extends within the interior of the work and supports and holds an upper die 91 for forming the inner head of the rivet while the other lower leg of the riveter extends beneath the work and serves as a guide for a movable lower die 92 which moves upward to hold the manufactured head of the rivet. The U-shaped frame is supported by pivot 93 on a carriage 94 which is guided on tracks 95 by supporting wheels 96. A ram 97 is shown for operating the riveter. The frame of the riveter is so supported relative to its carriage 94 that the normal tendency of the weight of the riveter is to swing the U-shaped frame counterclockwise, as viewed in Figure 1, thus bringing the upper die 91 away from the work. Upon movement into position operation of the ram 91 causes the lower die 92 to move upward until it encounters the manufactured head of the rivet thus holding the rivet in position. Further upward movement of the lower die 92 would necessitate a raising of the work which does not occur owing to the weight of the work, instead there is a movement of the U-shaped frame relative to the lower die, thus a clockwise movement of the rivet frame is caused bringing the upper die 91 down upon the inside end of the rivet crushing it to form the inside head. Any usual means may be provided to move the riveter on its supporting tracks.

The use of the apparatus so far described is substantially as follows: Assuming that the sections A, B, C, as shown, have been riveted together, the rivet frame is moved forwardly and beyond the frame work on its supporting tracks. The movement of the rivet frame 90 from beneath the frame work 1 allows an additional section to be placed beneath the hoisting means. The hoisting bridge 23 is lowered and chains 24 passed around the section and connected by their hooks 25. Upon rotation of the hoisting motor 20, the section is raised until it is substantially adjacent the end of section C. The additional section may then be temporarily bolted to section C and then the hoisting means operated to raise the forward end of the work, while the rearward suspension means are operated to raise the rearward end of the work, thus the sections A, B, C together with the additional section are raised and the support of chain 30 is released. At the same time as the parts are raised they are traversed rearwardly by movement of the hoisting carriage 11 and the rearward movable gantry 50, until the additional sec-

tion is substantially over the position of section C, as shown in Figure 1, the lowering of the work will then support the additional section on the forward suspension means 30 and the hoisting chains 24 may be released, the hoisting carriage 11 moved out of the way and the chains 24 drawn up by strings 26. The work is now in position to be riveted and the rivet frame 90 is moved rearwardly by movement of carriage 94 and the operator may then insert the rivets in respective rivet holes and operate the riveter to form the rivet heads. The work may be rotated by the means described to bring the respective rivet holes and the girth seam into position. In use, the apparatus is so arranged that flat cars may be run beneath the work and the completed work lowered on the flat cars for shipment. It is apparent that improved work-handling devices have been described whereby the handling of the work is expedited and the operation of riveting facilitated.

I claim:

1. In apparatus for handling sectional cylindrical work adapted to be progressively riveted section by section, a fixed framework extending above and over the longitudinal path of movement of the work, horizontal trackways on said framework above said work, hoisting mechanism supported on said trackways for travel in a path above the work, and adapted to lift and longitudinally move the work, an endless sling having a loop for receiving and suspending the work and means on said framework for supporting said sling to extend around and above the path of travel of said hoisting mechanism.
2. In apparatus for handling sectional cylindrical work adapted to be progressively riveted section by section, a fixed framework extending above and over the longitudinal path of movement of the work, horizontal trackways on said framework above said work, hoisting mechanism supported on said trackways for travel in a path above the work, and adapted to lift and longitudinally move the work, an endless sling having a loop for receiving and suspending the work, means on said framework for supporting said sling to extend around and above the path of travel of said hoisting mechanism, and means for moving said sling to rotate the work.
3. In apparatus for handling sectional cylindrical work adapted to be progressively riveted section by section, a fixed framework extending above and over the longitudinal path of movement of the work, horizontal trackways on said framework above said work, hoisting mechanism supported on said trackways for travel in a path above the work, and adapted to lift the work by one end and longitudinally move the work, an endless sling having a loop for receiving and suspending one end of the work, means on said

framework for supporting said sling to extend around and above the path of travel of said hoisting mechanism, means for moving said sling to rotate the work, and a movable  
5 frame for supporting the other end of the work in cooperation with either said hoisting mechanism or said sling.

Signed at Chicago, Illinois, this 20th day of December, 1923.

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JOHN C. HANNA.

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