Oct. 14, 1930. F. A. BEATTY 1,778,621

MATERIAL HANDLING APPARATUS

Filed April 29, 1929 3 Sheets-Sheet 1

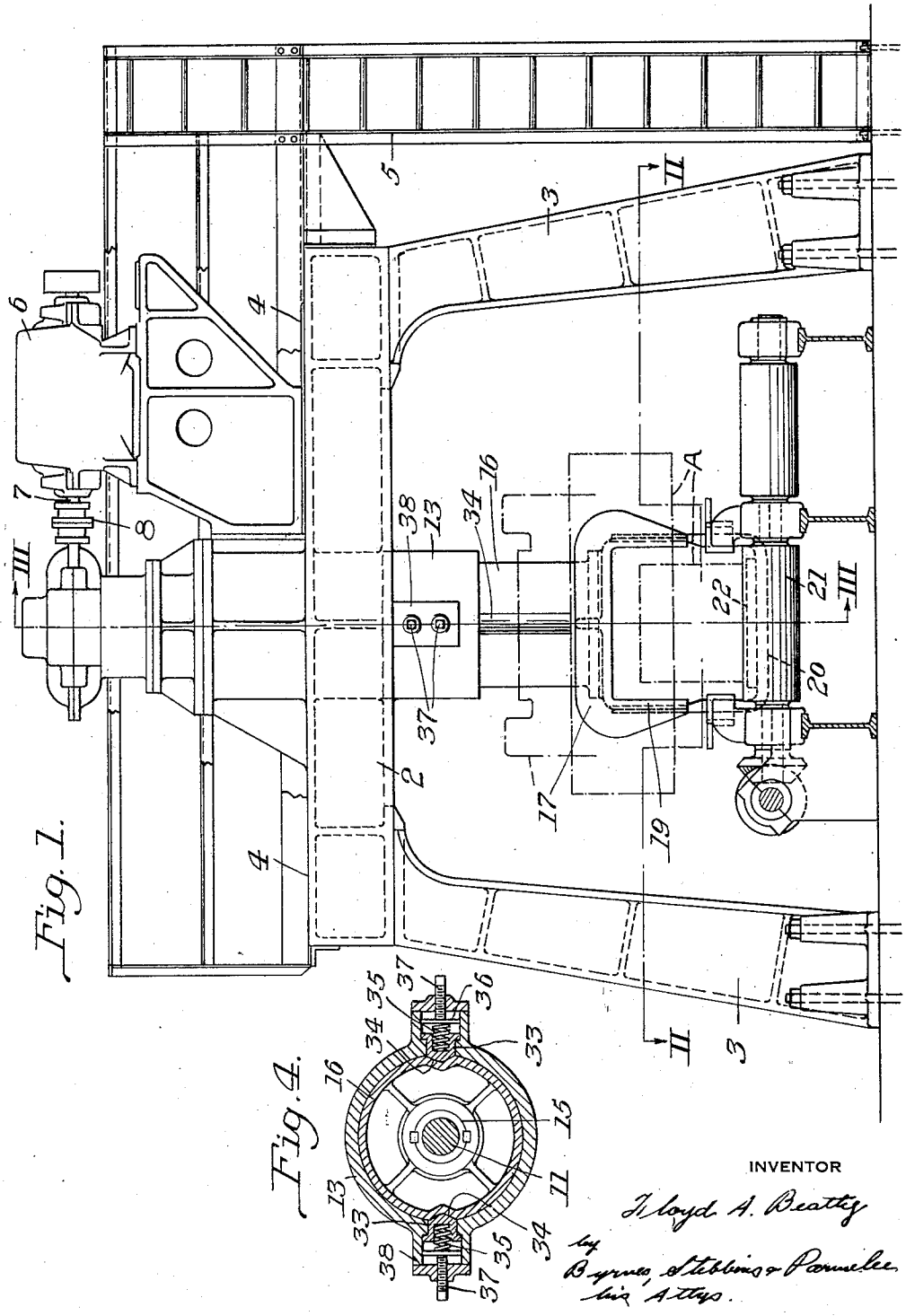


Fig. 1.

Fig. 4.

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MATERIAL HANDLING APPARATUS

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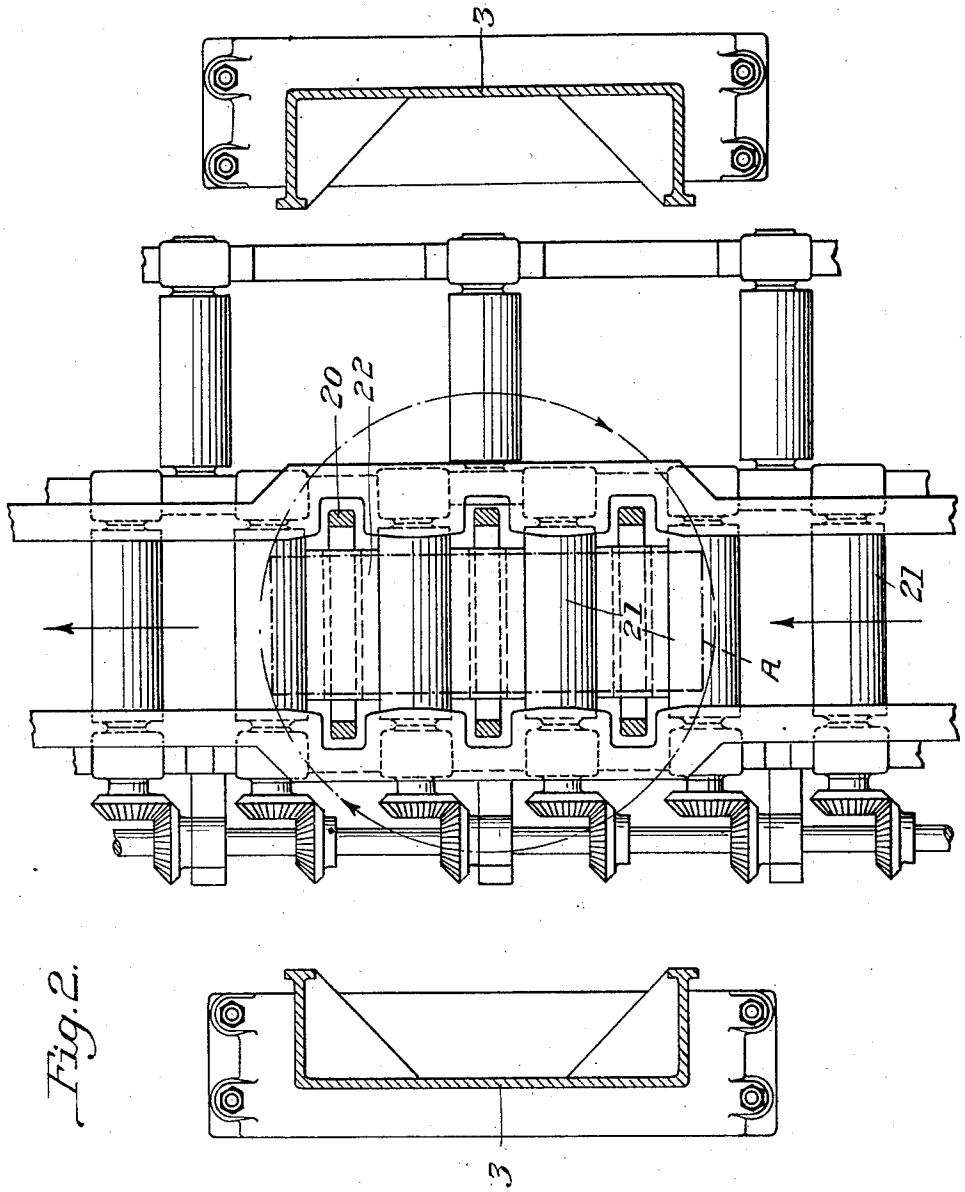


Fig. 2.

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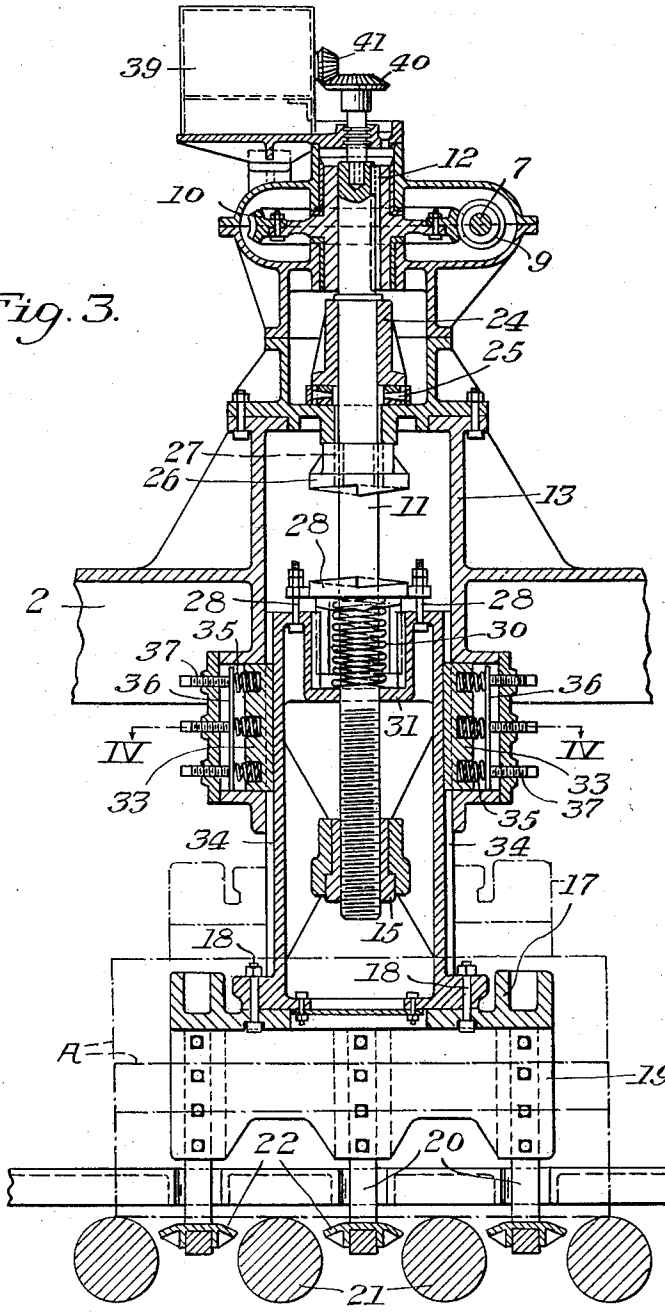
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MATERIAL HANDLING APPARATUS

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Fig. 3.



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UNITED STATES PATENT OFFICE

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MATERIAL-HANDLING APPARATUS

Application filed April 29, 1929. Serial No. 359,005.

My invention relates generally to material handling apparatus, and more particularly to such apparatus especially adapted for handling heavy sections such as ingots, billets, blooms and the like.

In rolling mill operation it is sometimes desirable to pick up such a section, rotate it through an angle, and then again place it on its support. In conveying ingots from the soaking pit to the rolling mills it is often desired to pick up the ingot from the roll table, rotate it through an angle of 180°, and thereafter replace the ingot on the table. This end for end rotation of the ingot enables the operator to introduce the desired end of the ingot into the rolling mills. The apparatus hereinafter more fully described is particularly adapted for carrying out such an operation.

In the accompanying drawings which illustrate the present preferred embodiment of my invention,

Figure 1 is an elevation of the apparatus,

Figure 2 is a section on the line II—II of Figure 1,

Figure 3 is a vertical section on the line III—III of Figure 1, and

Figure 4 is a horizontal section on the line IV—IV of Figure 3 showing the means for guiding the support substantially in one plane during a portion of the lifting operation.

Referring to the drawings, the apparatus comprises a frame indicated generally by the numeral 2. The frame is supported by channel shaped legs 3. Walks 4 are provided on the frame, and a ladder 5 is arranged as indicated in Figure 1 for the convenience of the operator.

The frame supports a motor 6, the drive shaft 7 of which is connected by means of a flexible coupling 8 to a worm 9. The worm operates a worm wheel 10 secured to a screw 11 by means of a key 12. The screw extends downwardly in a substantially vertical direction within a cylindrical portion 13 of the frame. At its lower end the screw 11 is threaded into a nut 15. The nut is carried by the upper cylindrical portion 16 of an ingot support 17. The ingot support is secured to the upper cylindrical portion 16 by bolts 18. The lower end of the ingot support is formed as a cradle 19 having arms 20 secured thereto. The arms are of general U shape, and have their bases extending across and below the tops of rollers 21 of the roll table on which the ingot is carried. The arms 20 are provided with liners 22 on which the ingot is supported. These liners can be easily replaced after having been burned by contact with the hot ingot. The ingot A is indicated by chain lines in the drawings.

The screw is supported on the frame 2 by a thrust bearing 24 having tapered rollers 25. An upper clutch jaw 26 is secured to the screw by a key 27. The upper end of the cylindrical support 16 carries a lower clutch jaw 28 connected thereto by bolts 29. A spring 30 surrounds the screw 11 between the lower clutch jaw 28 and a portion 31 of the cylinder 16. The screw 11 extends through the lower clutch jaw 28, but is not secured thereto. Rotation of the screw 11 in one direction through the worm wheel 10 and worm 9 raises the cylinder 16 within the cylindrical casing 13 of the frame. Rotation of the screw in the opposite direction lowers the cylinder 16. Rotation of the screw likewise raises or lowers the cradle 19 and the ingot supported thereon.

In order to prevent rotation of the cylinder 16 as the screw 11 is rotated, centering keys 33 are provided. The keys cooperate with recesses 34 provided opposite each other in the outer faces of the walls of the cylinder 16. The keys are normally pressed into the grooves by means of springs 35 having their opposite ends abutting against the keys and a plate 36. The position of the plate may be adjusted by screws 37 to vary the compression of the springs. The springs, plate, and screws are arranged within a casing 38.

The ingot A is carried by the rollers 21 to the lower chain line position indicated in Figures 1 and 3. The motor 6 is then started, rotating the screw 11 through the worm 9 and worm wheel 10. The upper clutch jaw 27 is likewise rotated, but the lower clutch jaw 28 remains stationary. The cylinder 16 is raised carrying with it the cradle 19 and the ingot A supported thereby. During upward movement of the cylinder 16, the cylinder is raised

substantially in one plane since the keys 33 cooperating with the recesses 34 prevent rotation. For a certain portion of its movement the cylinder 16 slides within the cylindrical portion 13 of the frame without rotating. When the cylinder 16 has been raised to a point where the lower and upper clutch jaws come together, rotation of the cylinder 16 occurs. This is accomplished by the action of the clutch jaws overcoming the action of the keys 33 tending to prevent rotation of the cylinder. In Figure 1 the ingot and cradle are indicated by the upper chain lines after the ingot has been raised from the rollers 21 and rotated through an angle of 90°. The rotation of the ingot ordinarily is continued through 180° to reverse the position of the ends of the ingot. The motor is then reversed, thereby reversing the direction of rotation of screw 11, and releasing the clutch jaws 27 and 28. Continued rotation of the screw replaces the ingot on the roll table.

As indicated in the drawings a control mechanism 39 is provided in order to automatically reverse the direction of the motor, thereby lowering the ingot onto its support after the ingot has been turned through the required angle. The control mechanism is not shown in detail as any usual or desired form may be employed. It is preferred, however, to actuate the control mechanism in accordance with the rotation of the screw 11. This is accomplished in the preferred embodiment by providing a bevel gear 40 secured to the top end of the screw 11 and which rotates a bevel gear 41 controlling the operation of the control mechanism 39. With this arrangement the reversing of the motor at the desired instant is controlled by the rotation of the screw 11.

My invention provides an ingot handling device which automatically picks up an ingot from a roll table until the ingot clears the guide rails of the table, then rotates it through a predetermined angle, and again lowers it onto the roll table.

I have illustrated and described the present preferred embodiment of my invention. It is to be understood, however, that the invention may be otherwise embodied within the scope of the following claims.

I claim:

1. Material handling apparatus comprising a support for an article, said support having a nut fastened thereto, a screw threaded in said nut, means for rotating said screw to raise or lower the support, means for preventing the support from rotating during a part of its upward movement, and means actuated by the further upward movement of the support for overcoming said second mentioned means to cause the support to rotate.

2. Material handling apparatus comprising a support for an article, said support carrying a nut, a screw threaded in said nut, means for rotating said screw to raise or lower the support, spring-pressed means for preventing the support from rotating during a part of its movement, and clutch means fastened to said screw for overcoming said spring-pressed means when the support is moved to a predetermined position to cause the support to rotate.

3. Material handling apparatus comprising a support for an article, said support having a substantially cylindrical portion carrying a nut, a screw threaded in said nut, means for rotating said screw to raise or lower the support, means for preventing the support from rotating during a part of its movement, a clutch jaw secured to said screw, and a second clutch jaw secured to said support, the clutch jaws being so arranged that when brought together they cause rotation of the support.

4. Material handling apparatus comprising a frame, an article support having a substantially cylindrical portion carrying a nut, said portion being slidable in a corresponding part of the frame, means for preventing the support from rotating during a part of its movement, said means and said cylindrical portion having projection and recess engagement, a screw threaded in said nut, means for rotating said screw to raise or lower the support, and means for overcoming said first mentioned means to cause the support to rotate.

5. Material handling apparatus comprising a frame, an article support having a substantially cylindrical portion carrying a nut, said portion being slidable in a corresponding part of the frame, means for preventing the support from rotating during a part of its movement, said means and said cylindrical portion having projection and recess engagement, a screw threaded in said nut, means for rotating said screw to raise or lower the support, and clutch means for overcoming said first mentioned means to cause the support to rotate.

6. Material handling apparatus comprising a frame, an article support having a substantially cylindrical portion carrying a nut, said portion being slidable in a corresponding part of the frame, means for preventing the support from rotating during a part of its movement, said means and said cylindrical portion having projection and recess engagement, a screw threaded in said nut, means for rotating said screw to raise or lower the support, a clutch jaw secured to said screw, and a second clutch jaw secured to said support, the clutch jaws being so arranged that when brought together they cause rotation of the support.

7. Material handling apparatus comprising a frame, an article support having a cradle at its lower end and a substantially cylindrical upper portion, said upper portion

being slidable in a corresponding part of the frame and having a substantially vertical groove in one of its walls, a spring pressed centering key carried by the frame and cooperating with said groove to prevent the support from rotating during a part of its movement, a nut carried by said cylindrical upper portion, a screw supported by the frame and threaded in said nut, means for rotating the screw to raise or lower the support, a clutch jaw secured to said screw, and a second clutch jaw secured to said cylindrical upper portion, the clutch jaws being so arranged that when brought together they cause rotation of the support.

8. Material handling apparatus including an article support, a nut carried thereby, a screw threaded in said nut, means for rotating said screw to raise or lower the support, spring-pressed means for preventing the support from rotating during a portion of its movement, clutch means fastened to said screw for overcoming said second mentioned means to cause rotation of said support at a predetermined portion of its movement, and means actuated by the movement of said screw for controlling said first mentioned means.

9. Material handling apparatus comprising a support for an article, said support carrying a nut, a screw threaded in said nut, means for rotating said screw to raise or lower the support, means for preventing the support from rotating during a part of its movement, a clutch jaw secured to said screw and a second clutch jaw secured to said support, the clutch jaws being so arranged that when brought together they cause rotation of the support.

10. Material handling apparatus comprising a frame, an article support having a portion to which a nut is fastened, said portion being slidable in a corresponding part of the frame, means for preventing the support from rotating during a part of its movement, said means and said portion having projection and recess engagement, a screw threaded in said nut, means for rotating said screw to raise or lower the support, and means for overcoming said first-mentioned means to cause the support to rotate.

In testimony whereof I have hereunto set my hand.

FLOYD A. BEATTY.