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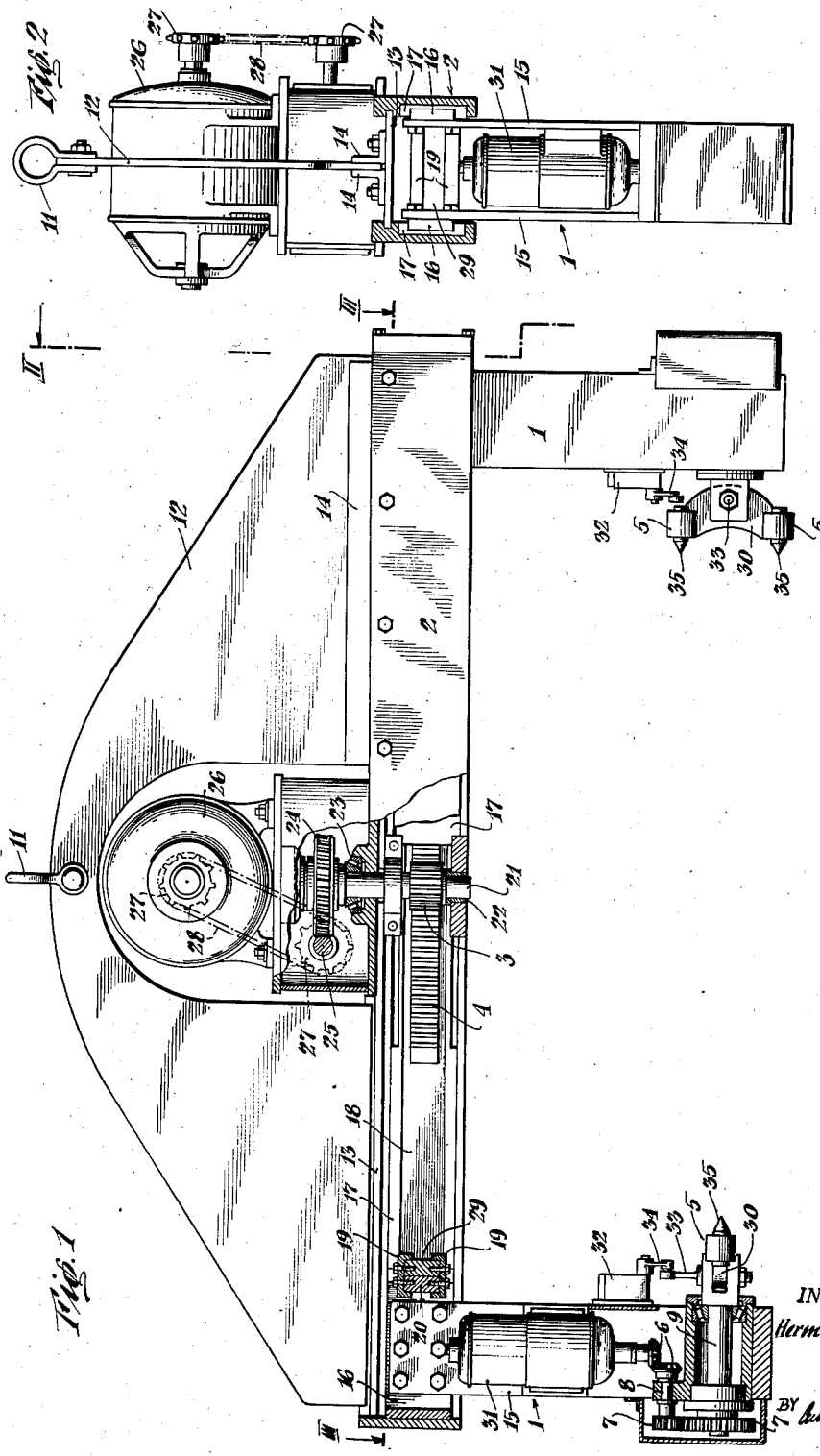
H. H. COLSON

2,390,293

WORK HANDLING UNIT

Filed Dec. 19, 1942

2 Sheets-Sheet 1



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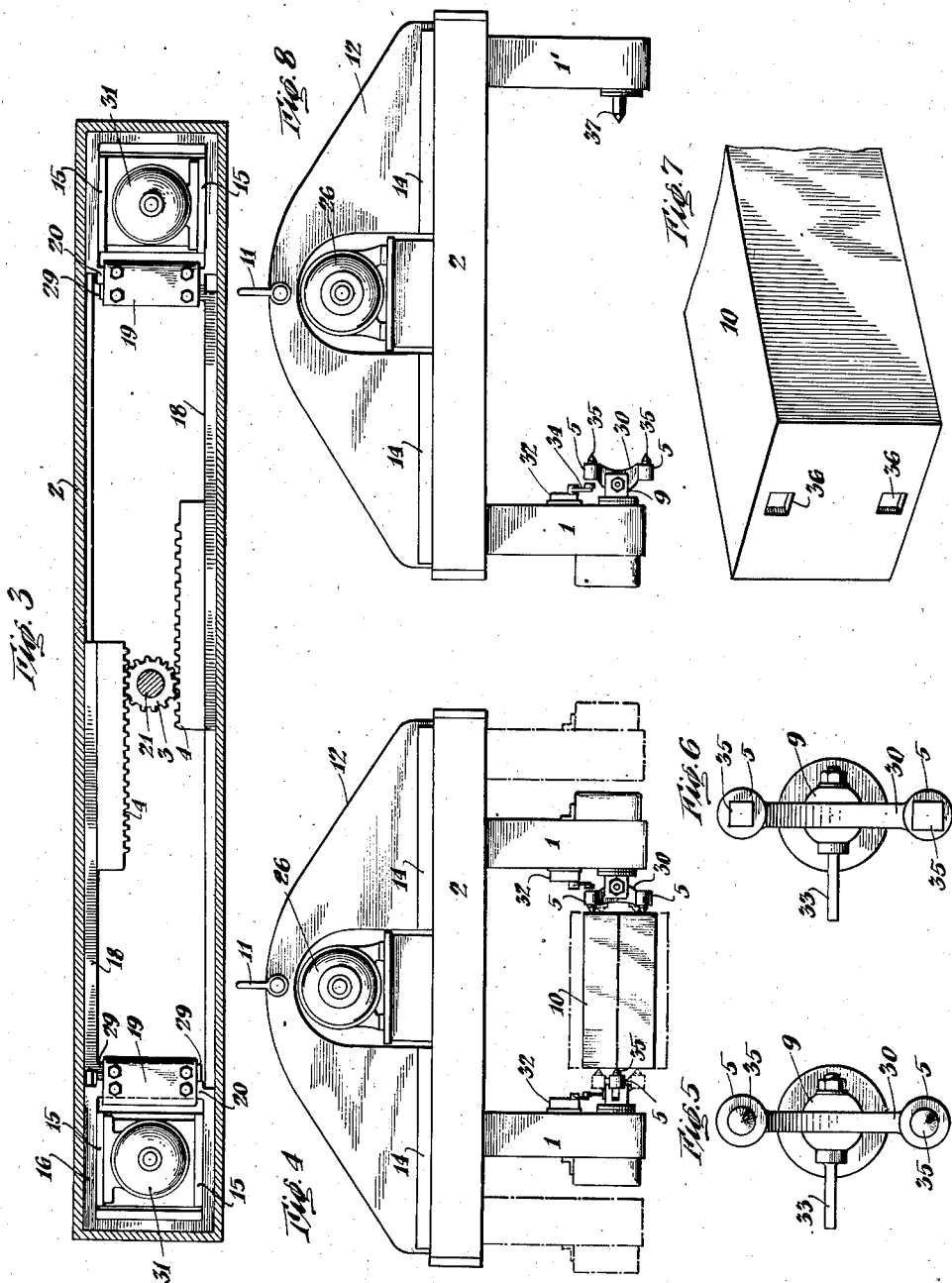
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2 Sheets-Sheet 2



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WORK HANDLING UNIT

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6 Claims. (Cl. 294—86)

This invention relates to work handling units particularly adapted to the lifting and manipulating of heavy bulky objects such as large metal ingots or bar and other similar work. It is difficult for the operator to lift and manipulate such objects when, for instance, they are processed on a machine such as an ingot scalper. The primary object of this invention is to provide a unit by which such objects may be lifted and then positively rotated through, if desired, a predetermined arc. Another object of the invention is the provision of a grab or tong-like unit with work engaging members so mounted on the jaw or tong arms thereof as permit rotation of the work held by said members. Additional objects of the invention will be referred to, or will be apparent, from the following description of a preferred embodiment of the invention and from the accompanying drawings in which:

Fig. 1 is a side elevation view of the preferred unit with parts cut away to reveal certain features thereof.

Fig. 2 is an end elevation of said unit, the view shown being as indicated by line II—II of Fig. 1.

Fig. 3 is of a section taken along line III—III of the unit shown in Fig. 1.

Fig. 4 is a side elevation of said unit with its parts in work engaging position.

Fig. 5 is a front elevation of the work engaging element shown in Figs. 1 to 4, inclusive.

Fig. 6 is a front elevation of a modified work engaging element.

Fig. 7 illustrates a work piece prepared for engagement by the element shown in Fig. 6.

Fig. 8 is a side elevation of a unit embodying the invention in a somewhat modified form.

As shown in the drawings, in which like numerals designate like parts, the unit broadly comprises, in combination, jaw members, or tong arms, 1 mounted on frame 2 for movement lengthwise thereof, means such as pinion 3 and racks 4, for effecting such movement, work engaging means such as part 30 and studs 5 rotatably mounted on the said jaw members and means such as the motor driven assembly of gears 6 and 7 and shafts 8 and 9 for positively rotating the work engaging means to cause rotation of the work piece 10 held therebetween.

When, as in the embodiment of the invention here shown, the unit is adapted to be moved to the place of operation, and there suspended, by a travelling hoist or crane, the entire unit is supported by the hoist hook 11 attached to suspension plate 12 which is attached to the frame-held support plate 13 by members such as angles

14. If, however, the unit is to be used only at one place, it may be equally well supported from the floor, in which case elements such as hook 11 and plate 13 may be eliminated.

The unit includes mechanism for effecting two essential movements of certain of its parts. The first movement, in sequence, is the closing and opening of jaw members 1 to engage and disengage the work. Such a movement is indicated by Fig. 4 by the full line and dotted line positions of the jaw members. The second movement is the rotation of the work engaging means, carried on the jaw members, to rotate the work piece held therebetween.

It is not necessary that both of the tong arms or jaw members 1 be movable, and one of them may be stationary, but in the preferred device shown both are mounted for movement lengthwise of the frame 2, thus maintaining the balance of the unit around the suspension point 11. Each jaw member or arm consists of an assembly mounted on the stiff legs 15 which are attached to and carried on blocks 16. These blocks are mounted for movement in slide supports 17 recessed into the side members of the frame, and the blocks are held in position therein by cross members 20. The slide supports 17 extend lengthwise of the frame and also support the movement of the rack arms 18 upon each of which is mounted, for engagement with the pinion 3, the racks 4. Each rack arm, at its end adjacent the arm 1, is provided with an angled portion 29 which is attached, as shown generally at 19, to cross member 20. Thus each arm 1 forms with a rack arm 18 a unit movable in the frame 2 under force exerted through the pinion 3 on the attached rack 4. Pinion 3 is fixed on shaft 21 which is suitably mounted for rotation in the upper and lower frame members as by bearings 22, 23. Worm gear 24 is likewise fixed on shaft 21 and rotation of the shaft in either direction is achieved by the rotation of the gear 24 by the worm gear 25, which latter is driven by the reversible motor 26 through sprockets 27 and chain 28. It is thus apparent that the rotation of pinion 3 will, through the racks 4, simultaneously move rack arms 18 in opposite directions, thus effecting simultaneous movement of the jaw members 1 toward or away from each other, lengthwise of the frame, to close upon or open away from the work. The dimensioning of this tong-like assembly, particularly as to length of frame and depth of tong or jaw arm, will determine the ultimate size of

the work which may thus be handled within the movement of the jaw members.

In the preferred device, as shown in Figs. 1 to 4, inclusive, the assembly carried by the jaw member 1 is the same for each member and, therefore, a description of one is a description of the other. Mounted on each such jaw member is the work engaging means which, as shown, consists of studs 5 carried by a stud arm 30 mounted in the split end of shaft 9, which shaft is mounted for rotation on cross plates carried by the stiff legs 15 which compose each arm. A motor device 31 is likewise mounted on the arm and is adapted to drive shaft 9 through bevel gears 6, shaft 8 and spur gears 7. In order to control rotation of shaft 9 and stud arm 30 through a predetermined arc, limit switch 32 is connected in the circuit of motor 31 and is actuated by arm 33 fixed to the split end of shaft 9 in such a position as adapts it to contact switch arm 34 at a given point in the rotation of shaft 9. As best seen in Fig. 4, each stud arm 30 bears two studs 5. The opposite stud arms, as shown, are so mounted as to be at 90 degrees to each other, thus providing a distributed support for the work held between them. The work contacting extremities 35 of studs 5 may take various shapes, such as points (Fig. 5) or squares (Fig. 6) in which latter case, of course, it will be necessary to provide the work piece with suitably shaped recesses to receive the same, such as the recesses 36 in the work piece shown at Fig. 7. Where the material of which the work is composed permits, I prefer to use pointed studs, such as those shown at Fig. 5, and to provide as a driving means for the movement of the arms 1 a stall type motor, thus allowing the pointed ends of the studs 5 to be driven into the work piece as the arms 1 close thereon until the motor stalls, thus to hold the stud ends in the work by the pressure applied by the stalled motor until the motor is reversed and the arms 1 moved apart to release the work piece. Where this is not feasible, other types of stud ends may be used or the work piece may be recessed to admit the pointed ends of the studs illustrated in Fig. 5. It is not necessary that the rotatable work engaging means carried by the jaw members be in any of the forms shown so long as such means are adapted to positively contact and hold the work piece during the lifting and manipulation thereof.

From the above description the operation of the preferred device embodying the invention will be readily understood. The unit is brought to and positioned at the work piece by means of a travelling hoist. The operator then starts the motor 26 which, acting through the rack and pinion device above described, moves the jaw arms 1 to the position shown in full line in Fig. 4, to firmly grasp the work piece 10 between the rotatable work engaging means carried on each of the jaw arms. The unit, thus engaging the work piece, is now lifted by the hoist to permit the work piece to be rotated. The motors 31, which are connected for simultaneous control and starting, are now started, thus rotating, through the gears 6 and 7 and the shaft 8, the shafts 9 and stud arms 30 mounted thereon and, consequently, the work piece 10 carried by the studs. After rotation of the work piece has proceeded through the desired arc and to, for instance, the dotted line position shown in Fig. 4, the motors 31 are stopped as the arms 33 attached in the desired position on the shafts 9 trip the arms 34 of the limit switches 32. The unit is then lowered to bring the work piece to rest on the desired support and the motor 26

is reversed to open the jaw arms 1 and to thus release the work piece.

It will be apparent that a device embodying the principles of this invention may take many forms. A modified form is that shown in Fig. 8. In this form only jaw arm 1 is provided with rotatable work engaging means (such as that shown in Fig. 1) while jaw arm 1' is provided with the single fixed stud 37, which is centered with respect to the axis of rotation of the shaft bearing the stud arm 30 on arm 1. When the work piece is contacted, stud 37 merely holds one end of the work piece at the center of rotation and provides a pivot upon which the work piece is rotated by rotation of the stud arm 30 mounted on jaw arm 1. Other modifications will suggest themselves to those skilled in the art, and the embodiments here shown and described are but examples of the manner in which the invention may be practiced within the scope of the appended claims.

I claim:

1. In a work handling and manipulating unit, the combination of a frame, jaw members movably positioned in said frame for movement lengthwise thereof, work engaging means carried on said jaw members and rotatably mounted thereon, means for positively moving said jaw members toward and away from each other to engage and disengage the work, means for rotating said work engaging means, and means for terminating said rotation at predetermined points.

2. In a work handling and manipulating unit, the combination of a frame, jaw members movably positioned on said frame for simultaneous movement toward and away from each other lengthwise of said frame, work engaging means rotatably mounted on said jaws to contact work lying therebetween, means for effecting said simultaneous movement of said jaws, driving means to rotate said work engaging means and limiting means connected with said driving means to halt said rotation at a predetermined point.

3. In a work handling and manipulating unit, in combination, a frame, jaw members comprising stiff legs depending from said frame and mounted for translation on said frame toward and away from each other, work engaging means rotatably mounted on said legs, driving means to positively rotate said work engaging means through a predetermined arc, said work engaging means comprising radially disposed studs adapted to drivingly engage the adjacent surface of said work, and means adapted to positively translate said legs on said frame and to exert constant pressure thereon after the work is engaged by said studs.

4. In a work handling and manipulating unit, in combination, a frame, jaw members comprising a pair of stiff legs depending from said frame, one of said legs being mounted for translation on said frame toward and away from the other, work engaging means rotatably mounted on said legs, driving means to positively rotate said work engaging means through a predetermined arc, said work engaging means carried by at least one jaw comprising radially disposed studs for drivingly engaging the adjacent surface of said work and means adapted to effect said translation to close the jaw upon the work and to constantly press the work engaging means against said work.

5. In a work handling and manipulating unit, in combination, a frame, jaw members comprising stiff legs depending from said frame and mounted

for translation on said frame toward and away from each other, each of said legs having rotatably mounted thereon work engaging means, driving means for positively rotating one of said work engaging means through a predetermined arc, and means adapted to translate said legs until said work is contacted by the work engaging means and to thereafter exert constant pressure toward said work to hold the work engaging means in contact therewith.

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6. In a work handling and manipulating unit the combination of a frame, jaw members slidably mounted on said frame for movement lengthwise thereof, work engaging members mounted on at least one of said jaw members for driving engagement with the end of said work and means adapted for closing said jaw upon said work to clamp the work and to apply constant pressure thereto.

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