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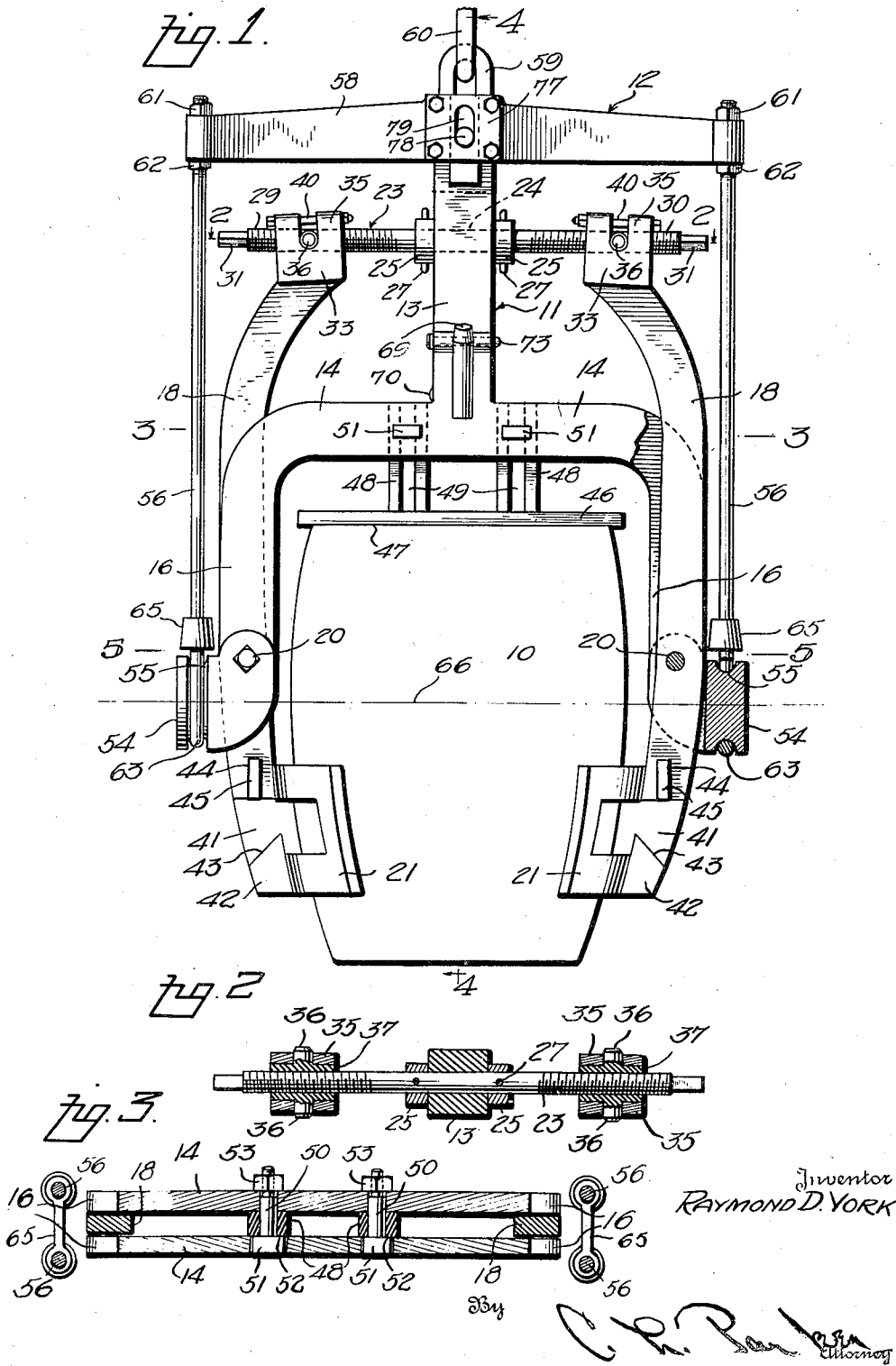
R. D. YORK

2,205,023

CRUCIBLE SUPPORT

Filed Dec. 16, 1938

2 Sheets-Sheet 1



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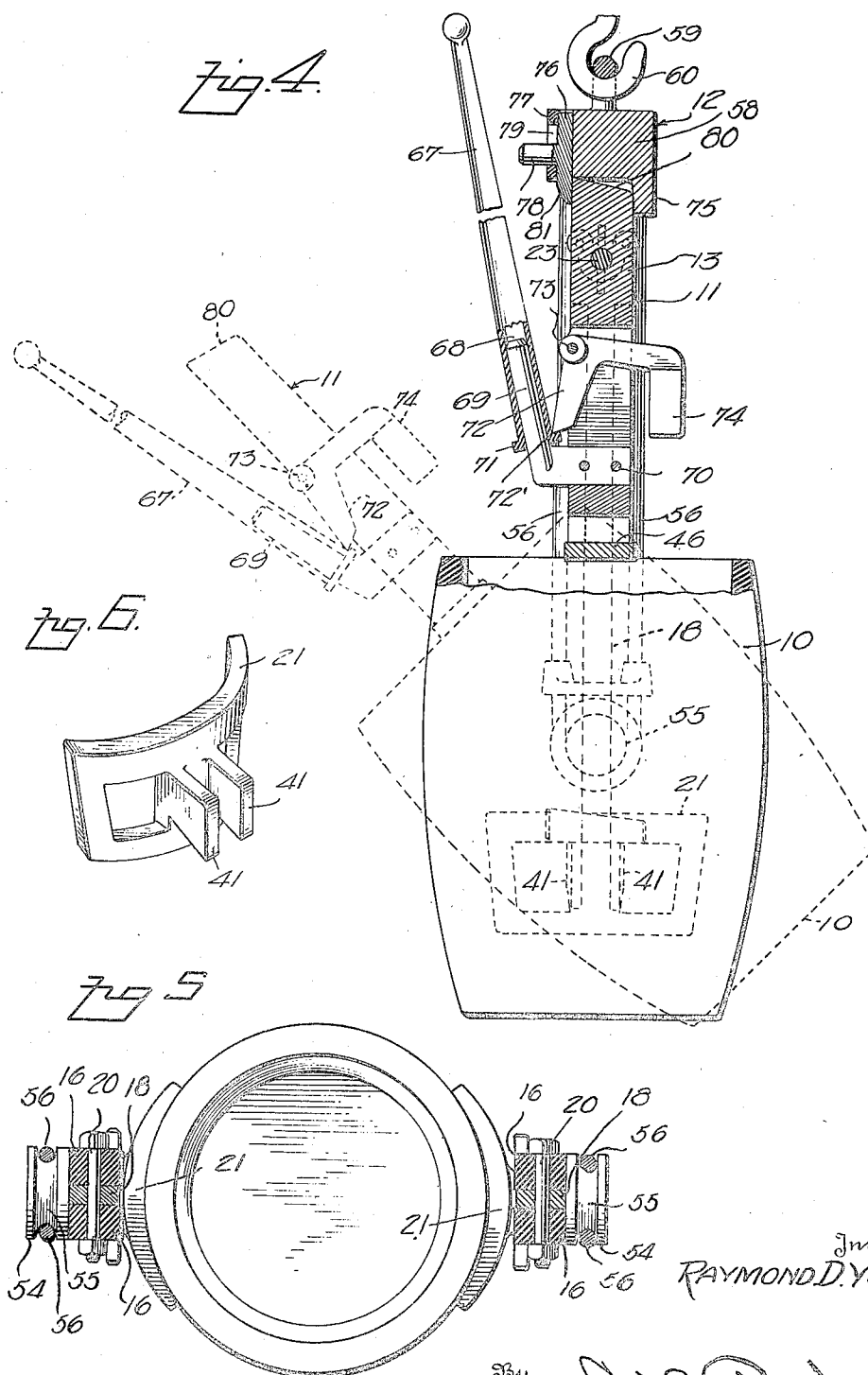
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CRUCIBLE SUPPORT

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12 Claims. (Cl. 22—82)

This invention relates to a crucible support and more particularly to a support which provides means for tilting the crucible after its engagement and removal from a furnace in order that molten metal may be poured therefrom.

The principal object of the invention is to provide a novel crucible support which will permit a tilting movement of the crucible after its engagement and removal from a furnace whereby molten metal may be poured therefrom without first releasing the crucible from its support.

A further object is to provide a supporting structure for a crucible supporting unit which will permit turning movement of the supporting unit and the crucible supported thereby relative to the supporting structure whereby molten metal may be poured from the crucible.

A further object is to provide a crucible supporting unit, rotatably mounted in a supporting structure, with locking mechanism for retaining the supporting unit and the crucible supported thereby in a normal vertical position relative to the supporting structure.

A further object is to provide such a crucible supporting unit with a member to which a novel lever may be applied for imparting a turning movement to the crucible supporting unit relative to the supporting structure.

A further object is to provide a crucible supporting unit having a member to which a lever may be applied for imparting a tilting movement to the crucible supporting unit relative to the supporting structure, and wherein a counter-weighted detent, pivotally mounted on the crucible supporting unit, engages the lever to effectively prevent disengagement thereof from the crucible supporting unit during tilting movement of the crucible supporting unit.

Other objects and advantages of the invention will become apparent during the course of the following description.

In the drawings I have shown one embodiment of the invention. In this showing:

Figure 1 is a front elevation of the mechanism showing a crucible supported thereby,

Figure 2 is a sectional view taken on line 2—2 of Figure 1,

Figure 3 is a sectional view taken on line 3—3 of Figure 1,

Figure 4 is a sectional view taken on line 4—4 of Figure 1, parts being shown in elevation and parts being broken away,

Figure 5 is a sectional view taken on line 5—5 of Figure 1, and

Figure 6 is a detail perspective view of one of the crucible-engaging jaw elements.

Referring to the drawings, the numeral 10 designates a crucible supported by an article supporting unit indicated as a whole by the numeral 11. This unit is rotatably carried by a supporting structure indicated as a whole by the numeral 12 for turning or tilting movement relative thereto in a manner to be described.

The supporting unit 11 comprises a vertical member 13 and oppositely projecting integral parallel horizontal members 14 rigidly formed on the lower end thereof. The ends of the horizontal members 14 are turned downwardly to provide depending pairs of spaced vertical members 16.

A pair of arms 18 are respectively pivoted to the pairs of vertical members 16 by bolts 20. Crucible gripping members 21 are carried by the lower ends of the arms 18 and are movable into or out of engagement with the crucible 10 upon pivotal movement of the arms 18 about the pivot bolts 20. The members 21 are detachably connected to the arms 18 in a manner to be described.

A shaft 23 is provided to effect pivotal movement of the arms 18 and a consequent movement of the crucible gripping members 21 into or out of engagement with the crucible 10. The vertical member 13 of the supporting unit 11 provides a journal 24 for the shaft 23. Endwise movement of the shaft 23 relative to the vertical member 13 is prevented by collars 25 which are secured to the shaft 23 by pins 27, the collars 25 abutting vertical faces of the member 13. The respective ends 29 and 30 of the shaft 23 are threaded in opposite directions to provide conventional right hand threads on the end 29 and left hand threads on the end 30. The shaft 23 is preferably squared at both ends as at 31 in order that a wrench may be used at either end of the shaft to rotate it.

Trunnion cradles 33 are provided on the respective upper ends of the arms 18. Each of the trunnion cradles 33 is provided with spaced pairs of vertical members 35 to receive trunnions 36. The trunnions are carried by sleeves 37 internally threaded for engagement with the threaded portions of the shaft 23. Bolts 40 extend through the members 35 transversely of the trunnions 36 to prevent disengagement thereof from the respective cradles 33 and 34.

By reason of the oppositely threaded ends 29 and 30 of the shaft 23 having engagement with the internally threaded sleeves 37, it will be ap-

parent that rotation of the shaft 23 will cause pivotal movement of the members 18 about the bolts 20 in a manner which will effect simultaneous movement of the crucible gripping members 21 into or out of engagement with the crucible 10.

The gripping members 21 are frictionally engageable with the sides of the crucible 10 and have their gripping surfaces shaped to conform to the shape of the crucible. Each of the gripping members 21 is removably secured to the lower ends of one pair of the members 18 in order that various sizes of the gripping members may be used according to the crucible to be supported thereby. Each of the gripping members 21 is provided with a pair of lugs 41 spaced from each other a distance approximately equal to the thickness of each of the members 18. Abutments 42 are formed on the lower ends of the members 18 and for the purpose of providing a key fit of the lugs 41 with the abutments 42, it will be noted that the contacting faces of these elements slope inwardly and upwardly as at 43 toward the article to be engaged. Openings 44 are formed in the members 18 to receive wedges 45 which are driven into engagement with the upper edges of the lugs 41 to securely hold the lower edges thereof in engagement with the abutments 42. The mechanism for detachably securing the gripping members to their supporting members is illustrated and described in my copending application Serial No. 232,005, filed September 27, 1938.

Means are preferably provided to properly position the members 21 with respect to the side of the crucible. To this end, an adjustable positioning plate 46 is provided which may be brought into contact with the top 47 of the crucible. Pairs of fingers 48 are formed on the plate 46 and are spaced to provide elongated slots 49. The fingers 48 are positioned and slidable between the members 14 in order that the plate 46 and the top of the crucible 47 will be properly positioned relative to the supporting unit 11 according to the size of the crucible to be supported. To secure the plate 46 to the arms 14, bolts 50 are provided which pass through the slots 49. The bolts 50 are provided with enlarged rectangular heads 51 which frictionally engage the fingers 48 as at 52. Openings are provided in one of the arms 14 corresponding to the shape of the heads 51 to prevent turning movement of the bolts 50 relative to the members 14. Nuts 53 are provided for the purpose of securely clamping the fingers 48 and plate 46 in any desired position according to the size of the crucible to be used. The mechanism for positioning the gripping members relative to the top 47 of the crucible 10 is described in my above mentioned copending application.

In order that the crucible 10 after its removal from a furnace may be tilted to pour molten metal therefrom, it is desirable to connect the supporting unit 11 for turning movement relative to the supporting structure 12. To this end, a trunnion 54 is preferably formed integral with each pair of vertical members 16. The trunnions 54 are provided with circumferential grooves 55 which provide circular trackways for the lower looped ends of substantially U-shaped members 56 connecting the crucible supporting unit 11 to the supporting structure 12 in a manner to be described.

The supporting structure 12 comprises a hori-

zontal member 58 provided with an eye 59 which may be connected to a hook 60 of any suitable lifting apparatus. The members 56 are formed from metal rods which are doubled back on themselves and are suspended from the horizontal member 58 by nuts 61. Lock nuts 62 are provided to prevent upward movement of the members 56 relative to the horizontal member 58. By doubling the rods 56 back on each other, the ends of each rod, which are connected to the horizontal member 58, are parallel to and spaced from each other and the mid-portions 63 are formed in the shape of a semi-circle for sliding engagement with the groove 55. Spacing members 65 are connected between the parallel portions of each of the members 56 immediately above the trunnions 54 to prevent any spreading motion of the parallel portions of the members 56 adjacent the trunnions 54 which would permit disengagement of the semi-circular portions of the members 56 from the circular grooves 55.

It will be seen that the above described arrangement provides a pivotal support in the nature of a trunnion for the crucible supporting unit 11. However, it is desirable that the crucible supporting unit 11 may be rotated relative to the supporting structure 12 with a minimum of effort and, accordingly, the horizontal axis 66 of the trunnions 54 about which the turning movement takes place is preferably located adjacent the center of gravity of the supporting unit 11 and the crucible 10 supported thereby. Moreover, it is desirable that the unit 11 and the crucible 10 normally occupy a vertical position relative to the supporting structure 12 and, accordingly, the horizontal axis 66 is preferably located slightly above the center of gravity of the unit 11 and the crucible 10 supported thereby.

A handle 67 is provided to enable an operator to tilt the crucible for the purpose of pouring molten metal therefrom. The handle 67 has a cylindrical opening 68 formed in one end thereof for engagement with a member 69 projecting from the vertical member 13 of the supporting unit 11. The member 69 is secured to the vertical member 13 by any suitable means such as the rivets 70.

A collar 71 is formed on the end of the handle 67 and is engageable with a detent 72 to prevent disengagement of the lever 67 from the member 69 during that time in which the crucible 10 is tilted to pour metal therefrom. The detent 72 is pivotally connected to the vertical member 13 by a pivot pin 73 and is provided with a counterweight 74 which will maintain the point 72' of the detent 72 in constant engagement with the handle 67. Any disengaging movement of the lever 67 from its support 69 will operate to jamb the collar 71 against the point 72' of the detent 72, and to remove the lever 67 it will first be necessary to raise the counterweight 74 and thereby allow the collar 71 to clear the point 72' on the detent 72. It will be apparent that this arrangement will securely prevent disengagement of the lever 67 from the member 69.

During the removal of the crucible 10 from a furnace, it is desirable to provide means for retaining the unit 11 in a substantially vertical position relative to the supporting structure 12. To this end, an abutment 75 is preferably formed integral with the horizontal member 58 for the purpose of preventing turning movement of the unit 11 to the right, as viewed in Figure 4, at all times. A gravity actuated pawl 76 is also con-

connected to the horizontal member 58 for normally preventing turning movement of the unit 11 in the opposite direction. The pawl 76 is mounted on the horizontal member 58 by a plate 77 which permits sliding movement of the pawl 76 relative to the horizontal member 58. A handle 78 is provided to enable an operator to raise the pawl 76 to permit turning movement of the unit 11 to the left, as viewed in Figure 4. The plate 77 is provided with a slot 79 through which the handle 78 protrudes whereby manual actuation of the pawl 76 will be permitted.

In order that the unit 11 may be returned to its normal vertical position and locked in such position without the necessity of actuating the pawl or latch 76, the upper surface 80 of the member 13 is inclined to provide a cam surface as shown in Figure 4. The bottom edge 81 of the pawl 76 has a similar inclination or is rounded to secure a camming action which will cause the pawl 76 to automatically ride up the surface 80 upon return of the unit 11 to its normal vertical position. It will be apparent that the latch 76 will drop to lock the unit 11 in its normal vertical position as soon as such position is reached.

The operation of the apparatus is as follows:

The plate 46 is adjusted in order that the gripping members 21 will be properly positioned relative to the sides of the crucible. When the parts of the apparatus are in normal position, the latch 76 will be operative to prevent turning movement of the crucible supporting unit 11 relative to the supporting structure 12.

The mechanism may be lowered by the hook 60 until the plate 46 contacts the upper edge 47 of the crucible 10. The mechanism will then be in a position for the gripping members 21 to properly engage the sides of the crucible 10. This is accomplished by applying a wrench to either end 31 of the shaft 23 and rotating this shaft to cause movement of the trunnions 36 away from each other. Such movement of the trunnions 36 will impart a similar movement to the cradles 33 on the respective upper ends of the pivotally mounted members 18 whereby the crucible gripping members 21 on the respective lower ends of the members 18 will be moved into engagement with the crucible 10. In such position the apparatus is operable to furnish a support by which the crucible can be transported.

When it is desired to tilt the crucible for the purpose of pouring molten metal therefrom, the operator will slip the open end 68 of the handle 67 downwardly over the projecting member 69 secured to the supporting unit 11. It will be apparent that prior to such application of the handle 67 to the member 69, the point 72' on the detent 72 will have been in engagement with the member 69. Upon downward movement of the handle 67 relative to the member 69, the collar 71 will contact the detent 72 and cam the same out of engagement with the member 69. As soon as the collar 71 passes the point 72' on the detent 72, the counterweight 74 will cause a pivotal movement of the detent 72 into engagement with the handle 67 at a point above the collar 71. In this position, it will be apparent that the detent 72 will be operable to prevent accidental disengagement of the lever 57 from the member 69.

Before a turning or tilting movement can be imparted to the crucible supporting unit 11 relative to the supporting structure 12, it will be necessary for the operator to raise the handle 78 and latch 76. After releasing the latch 76 from en-

gagement with the crucible supporting unit 11, the latter and the crucible supported thereby may be rotated to a position such as that shown in dotted lines in Figure 4 for the purpose of pouring molten metal.

Particular attention is invited to the latching of the handle 67 to the projection 69. I am aware that detachable handles have been used with prior constructions for tilting crucibles to pouring position, but such prior constructions have been found to be highly disadvantageous. When an operator grasps a crucible-tilting handle when the latter is in such a position as the solid line position shown in Figure 4, a downward pull on the handle tends more firmly to engage the handle with the projection 69 or corresponding element. When the pouring position is reached, however, it has been found that with prior constructions an operator sometimes will accidentally or carelessly exert a pull on the handle in the direction of the free end thereof. In prior constructions, therefore, handles have become disconnected from the crucible supporting means, thus permitting the crucible to suddenly swing back toward its normal or vertical position, resulting in the splashing of molten metal from the crucible and frequently resulting in injury to the operator.

It obviously is desirable that the operator exert a force at right angle to the handle 67 to tilt the crucible, and if this operation is carefully performed, there is no danger that the handle will become detached. Carelessness in handling an apparatus of this character is frequent, however, and in order to prevent injury to an operator or other nearby workman, the present construction provides means for positively preventing accidental detachment of the handle 67 from the projection 69. Regardless of any endwise pull on the handle 69, the engagement of the flange 71 with the detent 72 will positively prevent detachment of the handle, and accordingly the crucible cannot swing back to its normal position except under the control of the operator. Thus the apparatus provides means for preventing serious and painful injuries to operators.

After a pouring operation has been completed, the operator may reduce the pull on the handle 67 to permit the parts to swing back to their normal position. As such position is approached, the cam face 80 will engage and lift the latch 76, and when the vertical member 13 reaches its normal position, the latch 76 will drop to operative position and the entire crucible supporting unit 11 will be prevented from swinging. The handle may be readily detached, when desired, by manually lifting the counterweight 74 to move the detent 72 away from the flange 71, whereupon the handle may be moved endwise to disconnect it from the projection 69.

It will be apparent that the apparatus herein illustrated and described furnishes a convenient means for supporting a crucible. By having the crucible supporting mechanism rotatably mounted with respect to a supporting structure, a convenient means for pouring molten metal from the crucible is provided. In addition, the locking mechanism is effective to prevent any uncontrolled movement of the crucible supporting unit relative to the supporting structure.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size and ar-

rangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

I claim:

1. A device of the character described comprising a supporting structure, an article supporting unit connected to said structure for turning movement relative thereto, an operating lever, one end of said lever and a portion of said unit being constructed for interfitting engagement whereby said lever is operable for turning said unit with respect to said supporting structure, and means for preventing disengagement of said lever from said unit during turning movement of the latter.

2. A device of the character described comprising a supporting structure, an article supporting unit connected to said structure for turning movement relative thereto, an operating lever, one end of said lever and a portion of said unit being constructed for interfitting engagement whereby said lever is operable for turning said unit with respect to said supporting structure, and a detent carried by said unit and biased into engagement with said lever to prevent disengagement of the latter from said unit during turning movement thereof.

3. A device of the character described comprising a supporting structure, an article supporting unit connected to said structure for turning movement relative thereto, an operating lever, one end of said lever and a portion of said unit being constructed for interfitting engagement whereby said lever is operable for turning said unit with respect to said supporting structure, and means for preventing disengagement of said lever from said unit during turning movement of the latter, comprising an abutment formed on said lever and a detent pivotally connected to said unit and engageable with said abutment.

4. A device of the character described comprising a supporting structure, an article supporting unit connected to said structure for turning movement relative thereto, an operating lever, one end of said lever and a portion of said unit being constructed for interfitting engagement whereby said lever is operable for turning said unit with respect to said supporting structure, the end of said lever adjacent said unit having an annular shoulder thereon, and a detent pivoted to said unit and movable to an operative position with an end thereof engaging said shoulder to prevent disengagement of said lever from said unit, said detent having a weighted portion to bias it for movement to said operative position.

5. A device of the character described comprising a supporting structure, an article supporting unit connected to said structure for turning movement relative thereto, said unit being provided with a member projecting therefrom, a lever engageable with said projecting member whereby application of a manual force to said lever will effect relative turning movement of said article supporting unit, and means preventing disengagement of said lever from said projection during turning movement of said unit.

6. A device of the character described comprising a supporting structure, an article supporting unit connected to said structure for turning movement relative thereto, said unit being provided with a member projecting therefrom, a lever engageable with said projecting member whereby application of a manual force to said lever will effect relative turning movement of

said article supporting unit, and means preventing disengagement of said lever from said projection during turning movement of said unit, comprising an abutment formed on said lever and a detent engageable with said abutment on movement of said lever tending to disengage itself from said projection.

7. A device of the character described comprising a supporting structure, an article supporting unit connected to said structure for turning movement relative thereto, said unit being provided with a member projecting therefrom, a lever engageable with said projecting member whereby application of a manual force to said lever will effect relative turning movement of said article supporting unit, and means preventing disengagement of said lever from said projection during turning movement of said unit, comprising an abutment formed on said lever and a detent engageable with said abutment on movement of said lever tending to disengage itself from said projection, said detent being pivotally mounted on said article supporting unit and provided with a counterweight maintaining engagement thereof with said lever.

8. A device of the character described comprising a supporting unit and a supporting structure, said unit comprising a substantially inverted U-shaped frame, an arm pivoted to the lower end of each arm of said frame, means for effecting relative movement of the lower ends of said pivoted arms toward and away from each other, and an article engaging member carried by the lower end of each pivoted arm, said supporting structure comprising a pair of substantially U-shaped supporting elements, trunnions carried by the lower ends of the arms of said frame and rotatable in the looped lower ends of said supporting elements, said unit having an upwardly extending vertical member, a projection carried by and off-set laterally from said vertical member and inclined therefrom toward its upper end, and a handle having a socket recessed to receive said projection.

9. A device of the character described comprising a supporting unit and a supporting structure, means connecting said unit to said structure for swinging movement on a horizontal axis, said unit comprising a body portion and a pair of depending arms having cooperative article engaging jaws on their lower ends, means for effecting movement of said arms to move said jaws toward and away from each other, and an operating lever having one end thereof and a portion of the body portion of said unit interfitting whereby said lever is operable for swinging said unit on said axis.

10. A device of the character described comprising a supporting unit and a supporting structure, means connecting said unit to said structure for swinging movement on a horizontal axis, said unit comprising a body portion and a pair of depending arms having cooperative article engaging jaws on their lower ends, means for effecting movement of said arms to move said jaws toward and away from each other, an operating lever having one end thereof and a portion of the body portion of said unit interfitting whereby said lever is operable for swinging said unit on said axis, and means carried by the body portion of said unit and engageable with said lever to prevent disengagement of the latter from said unit during tilting movement thereof.

11. A device of the character described comprising a supporting unit and a supporting struc-

ture, means connecting said unit to said structure for swinging movement on a horizontal axis, said unit comprising a body portion and a pair of depending arms having cooperative article engaging jaws on their lower ends, means for effecting movement of said arms to move said jaws toward and away from each other, an operating lever having one end thereof and a portion of the body portion of said unit interfitting whereby said lever is operable for swinging said unit on said axis, and a pivoted detent carried by the body portion of said unit and having an end engageable with said lever to prevent disengagement thereof from said unit upon tilting movement of the latter.

12. A device of the character described comprising a supporting unit and a supporting structure, means connecting said unit to said struc-

ture for swinging movement on a horizontal axis, said unit comprising a body portion and a pair of depending arms having cooperative article engaging jaws on their lower ends, means for effecting movement of said arms to move said jaws toward and away from each other, an operating lever having one end thereof and a portion of the body portion of said unit interfitting whereby said lever is operable for swinging said unit on said axis, said lever being provided with a shoulder, and a detent pivoted to the body portion of said unit and movable to an operative position with one end in engagement with said lever to prevent disengagement thereof from said unit upon swinging movement of the latter, said detent being weighted to bias it for movement to said operative position.

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