

Jan. 23, 1945.

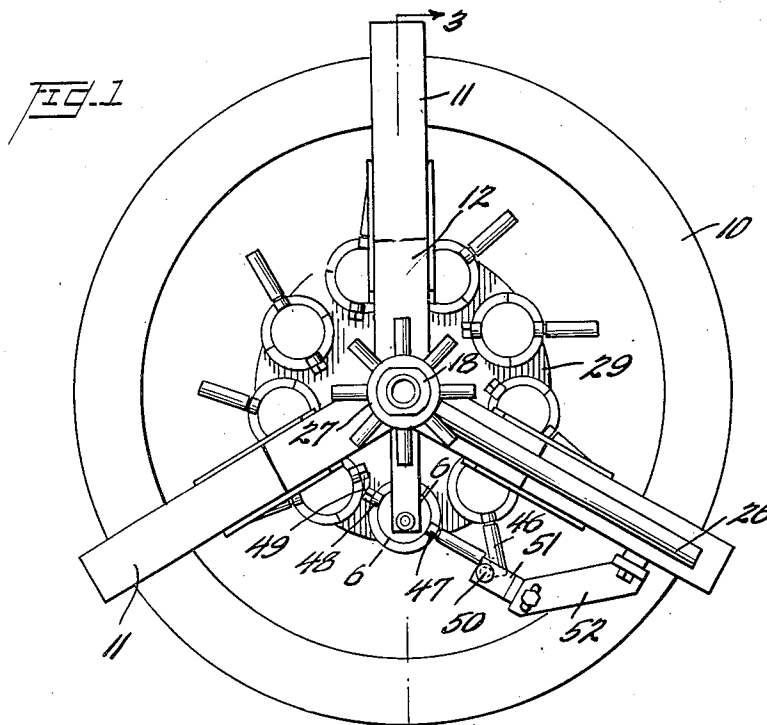
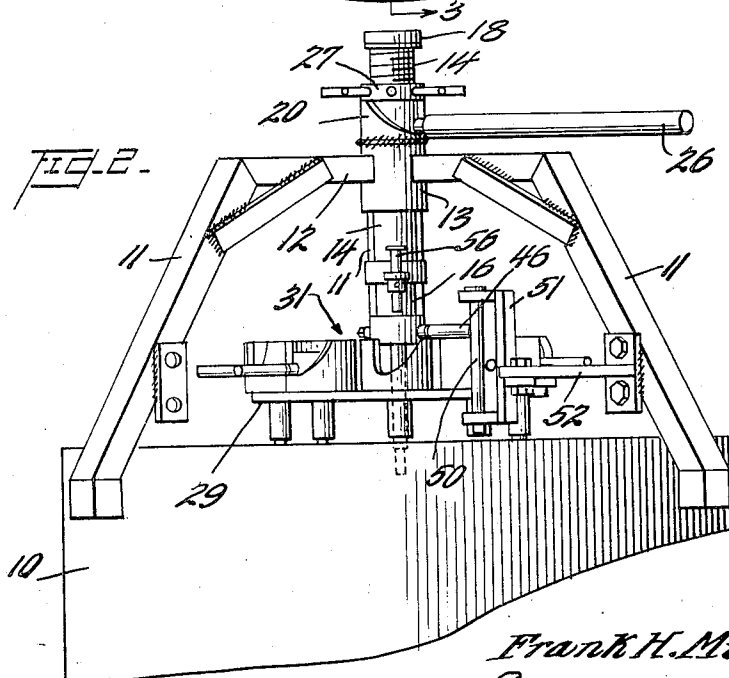
F. H. MUELLER

**2,367,732**

## IMMERSION APPARATUS

Filed Dec. 8, 1942

3 Sheets-Sheet 1



Juvencio

Frank H. Muetter  
334 Arthur Daley & Arthur  
Attorneys

Jan. 23, 1945.

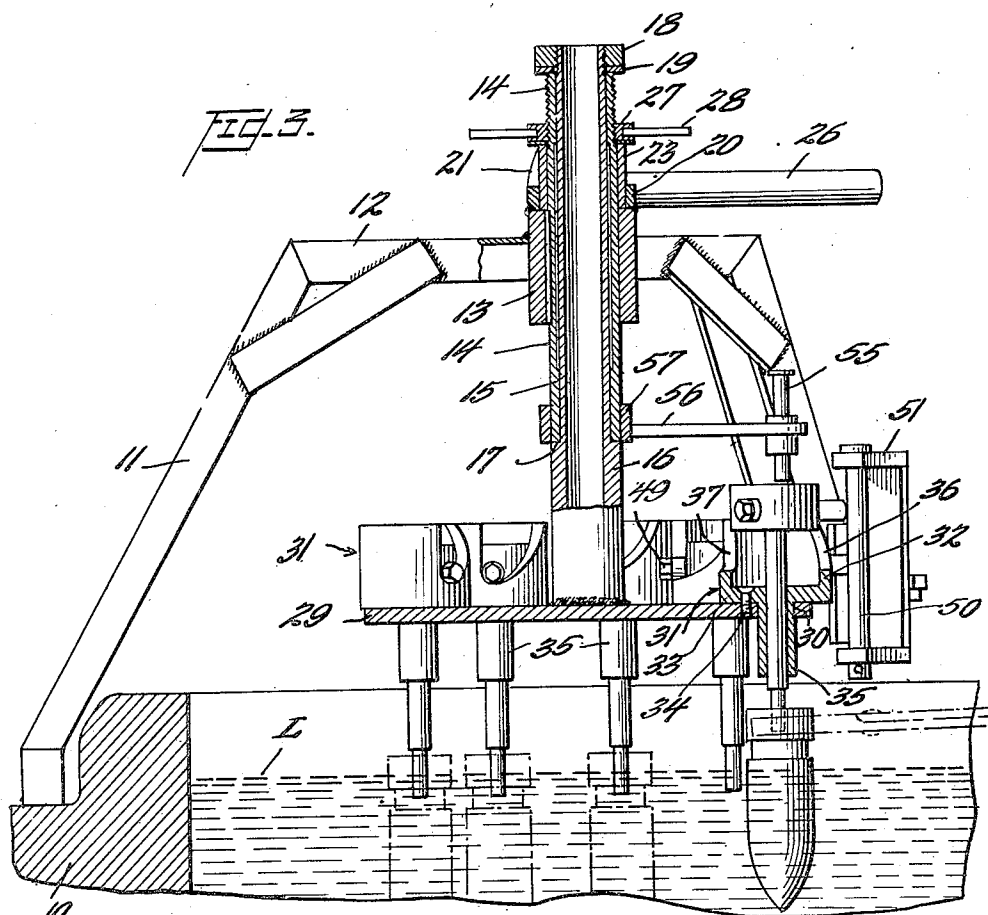
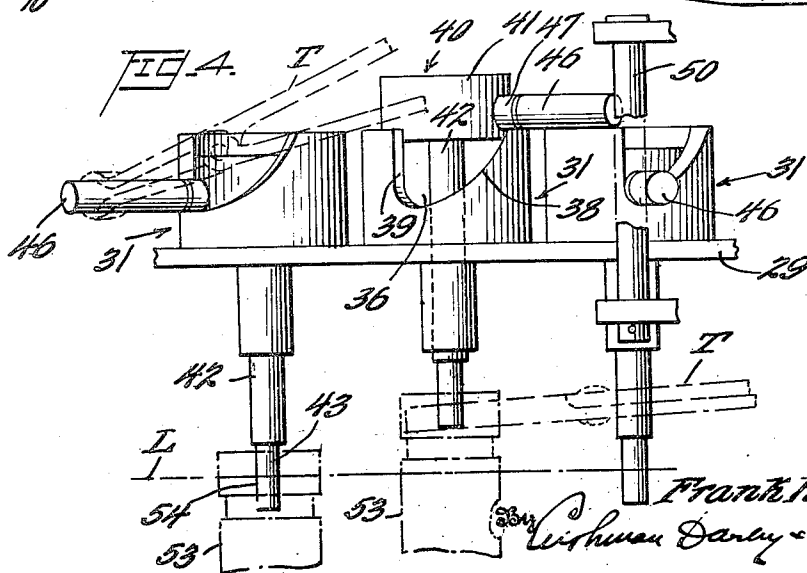
F. H. MUELLER

2,367,732

IMMERSION APPARATUS

Filed Dec. 8, 1942

3 Sheets-Sheet 2



Inventor

Frank H. Mueller,  
Cushman, Darby & Cushman  
Attorneys

Jan. 23, 1945.

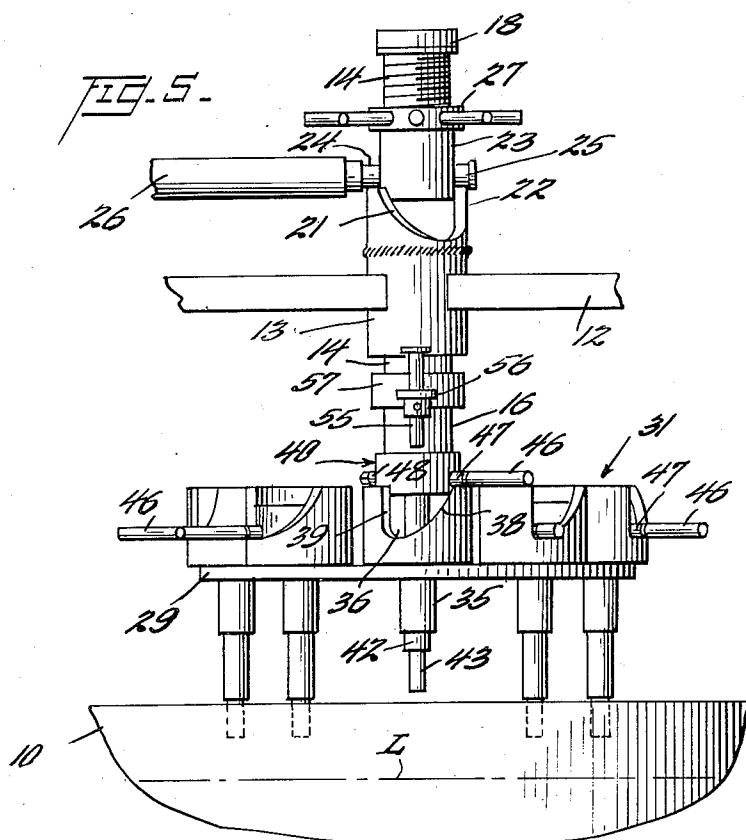
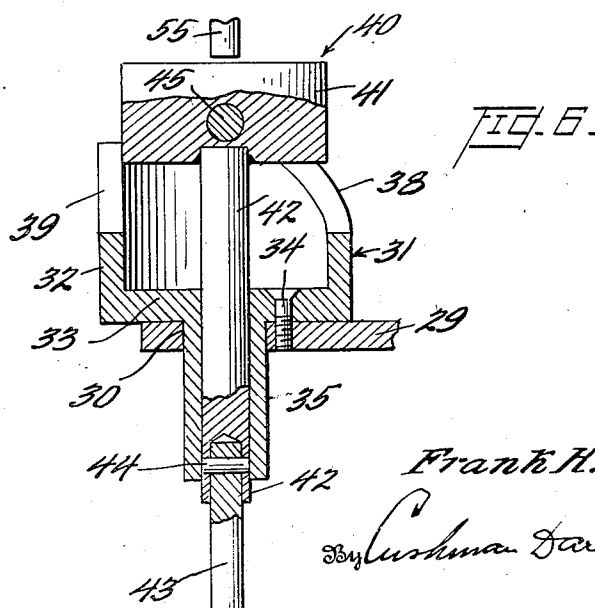
F. H. MUELLER

2,367,732

IMMERSION APPARATUS

Filed Dec. 8, 1942

3 Sheets-Sheet 3



Inventor

Frank H. Mueller

By *Cushman, Darby & Cushman*  
Attorneys

## UNITED STATES PATENT OFFICE

2,367,732

## IMMERSION APPARATUS

Frank H. Mueller, Decatur, Ill., assignor to Mueller Co., Decatur, Ill., a corporation of Illinois

Application December 8, 1942, Serial No. 468,279

14 Claims. (Cl. 214—17)

This invention relates to apparatus for the immersion of articles in a bath for conditioning or treatment thereby. While the invention is adapted for use in various situations, a prime example of its application is in association with a lead pot for the controlled immersion in the latter of objects such as projectiles or shot, which are to be heated in order to be hardened. A main object of the invention is to provide simple apparatus of the type mentioned with provisions facilitating loading and unloading, with controlled extent of immersion. A practical embodiment of the invention is shown by way of example in the accompanying drawings to which reference will now be made.

In the drawings:

Figure 1 is a plan view of the new apparatus in association with a lead pot.

Figure 2 is an elevation of the apparatus of Figure 1.

Figure 3 is a section substantially on line 3—3 of Figure 1.

Figure 4 is an enlarged elevation of parts appearing at right center, Figure 2.

Figure 5 is an elevation similar to that of Figure 2 with parts in a different relation, and

Figure 6 is a section substantially on line 6—6 of Figure 1.

Referring to the drawings, reference numeral 10 designates a lead pot of known design and per se forming no part of the present invention. Mounted on the top of the open pot or tank is a frame here shown as comprising three upwardly and inwardly extending members 11 to the top ends of which are secured horizontal inwardly extending members 12 which are in generally radial relation to a vertical sleeve 13 and have their inner ends secured to the latter for the support thereof.

Splined in member 13 is a sleeve 14 in which is rotatably received the reduced portion 15 of a shaft 16, the shaft 16 being held against axial displacement relative to sleeve 14 by a shoulder 17 at the lower end of the latter and by a nut 18 threaded on the upper end of the shaft and supported on the upper end of sleeve 14 through a washer 19.

A ring 20 is welded on top of sleeve 13 in concentrically spaced relation to sleeve 14, the ring being provided with diametrically opposite downwardly extending recesses each of which has an inclined or cam edge 21 and a vertical or abutment edge 22, these edges being in similar relation in the two recesses. A collar 23 disposed in the space between sleeve 14 and ring 20 is ro-

tatable relative to the two and is equipped with diametrically opposite rollers or followers 24 and 25 for cooperation with the recess edges 21 and 22. Also projecting radially from collar 23 is a handle 26 here shown as being coaxial with roller 24. The lower end of collar 23 normally rests on top of sleeve 13, as shown in Figure 3, with the rollers 24 and 25 at the bottom of the recesses. Sleeve 14 has a threaded upper portion with which is engaged a nut 27 resting on top of collar 23 for the support of sleeve 14 and therewith shaft 16. Nut 27 is provided with spokes 28 by means of which it may be rotated so as to vertically adjust the position of shaft 16. By pushing handle 26 in a clockwise direction, Figure 1, the rollers ride up the cam edge surfaces 21 onto horizontal lands at the top of the ring and in this manner shaft 16 can be quickly and easily lifted a substantial distance and retained in elevated position independently of the adjustment provided by the threaded supporting means. The two sets of cams and followers are provided for balance. A single set might be used.

Welded to the lower end of shaft 16 coaxially therewith is a circular plate or table 29 whose marginal portion is provided with a series of circular openings 30, Figures 3 and 6, whose centers are on a circle coaxial with the shaft. Guide members, generally designated by the reference numeral 31, include cup-like upper portions each comprising a cylindrical peripheral wall 32 and a bottom wall 33 resting on table 29 and secured thereto by screws as at 34. A coaxial tubular extension 35 projects downwardly from each bottom wall 33 through an opening 30. The peripheral wall 32 is provided with generally triangular diametrically opposed recesses 36 and 37 and each recess 36 has a cam edge 38 and a vertical or abutment edge 39. Each recess 37 has similar edges in the same relation.

Each guide member 31 has associated with it a work holder generally designated by the reference numeral 40. The work holder comprises a cylindrical head portion 41 vertically reciprocable and turnable in the cylindrical guide portion 32. Projecting coaxially downwardly from the head 41 is a cylindrical shank 42 guided for reciprocation and turning in the extension 35. The shank is provided at its lower end with an axial bore in which is received a coaxial pin 43 which is removably secured in place by a cross pin 44, Figure 6.

The head 41 is provided with a diametrical bore through which extends the reduced portion 45 of a handle 46, Strung on portion 45 adjacent the

head are rollers or followers 47 and 48, the assembly being maintained by a nut 49 threaded on the extremity of portion 45. The rollers are disposed for cooperation with the edges of recesses 36 and 37. Normally the rollers are at the bottom of the recesses as shown, for example, at the right of Figure 4, with the holder in lower limit position. It will be evident that by turning the holder in a counter-clockwise direction the rollers will climb the cam surfaces and will pass on to the horizontal lands at the upper ends thereof so as to elevate the holder and maintain it in elevated position, which position is occupied by the central holder, Figure 4. If the handle 46 is pushed so as to rotate the holder in a clockwise direction, the rollers will leave the lands and return along the cam surfaces to the lower limit position and if the pushing action is continued, the rollers, engaging the abutment surfaces as at 39, will impart a rotary movement to the table 29 in a clockwise direction.

It is here contemplated that the holders shall be automatically elevated upon rotary movement of the table and to this end I provide a vertical bar 50 whose ends are supported in end portions of a bracket 51 carried by an arm 52 which projects from one of the frame members 11. The bar 50 is in the path of travel of the outer end portions of handles 46 when they are in their lower limit position. As seen in Figures 1 and 4 a handle 46 so disposed is against the bar 50. As the table is now rotated in a clockwise direction, the handle will turn the holder in a counter-clockwise direction, sliding up the bar 50, so that the holder will be automatically moved to its upper limit position with the rollers resting on the lands at the upper ends of the cam surfaces. The handle now passes the bar.

The projectiles or shot 53, as herein contemplated, are provided at their base end with a coaxial socket or tracer hole 54 in which the pin 43 is receivable with a free fit, the pin being of such length that it abuts the bottom of the socket without contact of the projectile base with the shank 42 of the holder. The pins 43 are of special metal so as to withstand as far as possible the heat to which they are subjected. They may be replaced when necessary, but it is desired to protect the shank portions 42, as far as possible, in order that they may be more or less permanent.

In the operation of the apparatus a workman standing at the lower right, Figure 1, engages with his tongs T the butt end of a projectile, dips it head-down into the molten lead and then lifts it, or permits it to rise under the buoyant effect, to engage the pin 43 in the socket of the projectile as shown in the center portion of Figure 4. A vertically adjustable stop 55 carried by an arm 56 projecting radially from a ring 57 fixed to the bottom of the non-turning sleeve 14 overlies the head 41 of the holder 40 which is at the loading station and prevents accidental movement of the head upwardly out of the guide cylinder.

With his tongs the workman then engages the handle 46 of the thus loaded holder and pushes on the handle to lower the same and to bring the rollers into engagement with the abutment surfaces 39 so that continued pushing on the handle will rotate the table in a counter-clockwise direction an extent sufficient to elevate the succeeding holder. With the loaded holder in its lower limit position the shot will be submerged somewhat short of its upper end, as indicated at the left Figure 4, reference letter L designating the lead

level in the pot. The thus submerged shot has a considerable buoyant effect, but this, as here shown, is overcome by the weight of the head 41 of the holder so that the holder is yieldingly maintained in its lower position.

The holders are thus successively loaded and eventually a loaded holder will come around to the bar 50 and will be elevated as previously described, the shot following it upwardly due to its buoyancy in the lead bath. The workman engages the elevated shot with his tongs, pushes it downwardly to disengage it from the pin 43 and passes it out of the lead pot for the quenching operation. He then reloads the elevated holder, advances the table, and repeats the unloading and reloading operations.

By adjusting nut 27 it will be seen that the extent of immersion of the projectiles in the bath can be determined as desired. If for any purpose, for example for cleaning out the bath, it is desired to clear the top of the latter, the handle 26 is pushed to the position shown in Figure 5 so that the holders are all lifted clear.

It will thus be seen that the apparatus provides for uniform extent of immersion of the work and enables the work to be easily loaded and unloaded. Furthermore, the period of immersion is substantially uniform and will depend on the number of holders and the period required for loading and unloading. For the sake of uniformity in the final product, the period should be sufficient to enable the work to take the temperature of the bath. Obviously, intermittent motor driven means could be provided for stepping the table, but it has been found that the table drive is most conveniently and economically accomplished by the workman merely by a slight continuation of the pushing action by which he lowers the holders.

While I have described the invention in an at present preferred embodiment and in a certain use, it will be understood that I do not limit myself thereto, since such variations in the form and arrangement of parts and in manner of use are contemplated as are within the scope of the claims which follow.

I claim:

1. Immersion apparatus for association with an open tank, comprising a frame associable with the tank to extend thereabove, a work holder supported from said frame above the tank for vertical reciprocation between upper and lower limits and having a lower end engageable with the work, said holder and work being engageable by reason of the provision of a pin on the one and a socket on the other, means yieldingly retaining the holder in its lower position against the buoyancy of work engaged with the holder and immersed in liquid in said tank, and means operable to lift the holder to its upper position to facilitate removal of the work.

2. Immersion apparatus for association with an open tank, comprising a frame associable with the tank to extend thereabove, a work holder supported from said frame above the tank for vertical reciprocation between upper and lower limits and for turning about a vertical axis, means yieldingly retaining the holder in its lower position against the buoyancy of work engaged with the holder and immersed in liquid in said tank, and means operable to lift the holder to its upper position to facilitate removal of the work; said last-named means including an arcuate cam concentric with said holder, a follower on the holder which lifts the holder when the latter is

turned, and an arm projecting generally radially from said holder and engageable for turning the holder.

3. Immersion apparatus for association with an open tank, comprising a frame associable with the tank to extend thereabove, a work holder comprising a head portion, means supported from said frame above the tank for guiding said holder for turning on a vertical axis and for vertical reciprocation between upper and lower limits, a vertical pin in fixed connection with said head therebelow engageable in a socket in the work, the weight of said head portion being sufficient to retain the holder in its lower position against the buoyancy of work engaged with the holder and immersed in liquid in said tank, and means operable to lift the holder to its upper position to facilitate removal of the work.

4. Immersion apparatus for association with an open tank, comprising a frame associable with the tank to extend thereabove, an upwardly open cup-like member supported from said frame above the tank, said member having a peripheral wall having a downwardly extending recess with a cam edge terminating upwardly at a horizontal land and having a bottom wall provided with a central opening, a work holder including a head portion guided in said cup-like member for vertical reciprocation between upper and lower limits and for turning, said work holder also including a shank portion extending downwardly from the head portion through said bottom opening, means at the lower end of said shank portion for engaging the work, the weight of said head portion being sufficient to retain the holder in its lower position against the buoyancy of work engaged with the holder and immersed in liquid in said tank, a follower on said head portion disposed in said recess at the base of said cam edge when the holder is in its lower position, and means operable to turn said head whereby to cause said follower to travel upwardly on said cam edge and onto said land so as to lift the holder and maintain it in elevated position.

5. Immersion apparatus for association with an open tank, comprising a frame associable with the tank to extend thereabove, an upwardly open cup-like member supported from said frame above the tank, said member having a peripheral wall having a downwardly extending recess with a cam edge terminating upwardly at a horizontal land and having a bottom wall provided with a central opening, a work holder including a head portion guided in said cup-like member for vertical reciprocation between upper and lower limits and for turning, said work holder also including a shank portion extending downwardly from the head portion through said bottom opening, means at the lower end of said shank portion for engaging the work, the weight of said head portion being sufficient to retain the holder in its lower position against the buoyancy of work engaged with the holder and immersed in liquid in said tank, a follower on said head portion disposed in said recess at the base of said cam edge when the holder is in its lower position, and a handle projecting generally radially from said head manipulable to turn the head whereby to cause said follower to travel upwardly on said cam edge and onto said land so as to lift the holder and maintain it in elevated position.

6. Immersion apparatus for association with an open tank, comprising a frame associable with the tank to extend thereabove, a shaft supported by said frame for rotation on a vertical axis and

extending downwardly from the frame, a work holder supported above the tank by said shaft at the lower end of the latter eccentrically thereto for turning on a vertical axis and for vertical reciprocation between upper and lower limits, said holder having a lower end engageable with the work, means yieldingly retaining the holder in its lower limit position against the buoyancy of work engaged with the holder and immersed in liquid in said tank, an inclined arcuate cam carried by said shaft in concentric relation to said holder, a cam follower on said holder, an arm projecting generally radially from said holder and normally generally outwardly from the shaft axis when the holder is in its lower position, and a fixed abutment arranged to be struck by said arm upon rotation of said shaft whereby to swing said arm and turn said holder, the arrangement of said cam being such that upon said turning of said holder said follower will ride upwardly on the cam to lift the holder.

7. Immersion apparatus for association with an open tank, comprising a frame associable with the tank to extend thereabove, a shaft supported by said frame for rotation on a vertical axis and extending downwardly from the frame, a work holder supported above the tank by said shaft at the lower end of the latter eccentrically thereto for turning on a vertical axis and for vertical reciprocation between upper and lower limits, said holder having a lower end engageable with the work, means yieldingly retaining the holder in its lower limit position against the buoyancy of work engaged with the holder and immersed in liquid in said tank, an inclined arcuate cam carried by said shaft in concentric relation to said holder, a cam follower on said holder, an arm projecting generally radially from said holder and normally generally outwardly from the shaft axis when the holder is in its lower position, a fixed abutment arranged to be struck by said arm upon rotation of said shaft whereby to swing said arm and turn said holder, the arrangement of said cam being such that upon said turning of said holder said follower will ride upwardly on the cam to lift the holder, and a land at the upper end of the cam onto which the follower is moved just before said arm leaves said abutment whereby to retain the holder in upper position.

8. Immersion apparatus for association with an open tank, comprising a frame associable with the tank to extend thereabove, a shaft supported by said frame for rotation on a vertical axis and extending downwardly from the frame, a work holder supported above the tank by said shaft at the lower end of the latter eccentrically thereto for turning on a vertical axis and for vertical reciprocation between upper and lower limits, said holder having a lower end engageable with the work, means yieldingly retaining the holder in its lower limit position against the buoyancy of work engaged with the holder and immersed in liquid in said tank, an inclined arcuate cam carried by said shaft in concentric relation to said holder, a cam follower on said holder, an arm projecting generally radially from said holder and normally generally outwardly from the shaft axis when the holder is in its lower position, a fixed abutment arranged to be struck by said arm upon rotation of said shaft whereby to swing said arm and turn said holder, the arrangement of said cam being such that upon said turning of said holder said follower will ride upwardly on the cam to lift the

holder, and an abutment at the lower end of said cam engageable by said follower when said arm is manually returned, whereby continued pressure on said arm in the return direction will cause the holder and cam to revolve as a unit about the axis of said shaft.

9. Immersion apparatus for association with an open tank, comprising a frame associable with the tank to extend thereabove, a shaft supported by said frame for rotation on a vertical axis and extending downwardly from the frame, a work holder supported above the tank by said shaft at the lower end of the latter eccentrically thereto for turning on a vertical axis and for vertical reciprocation between upper and lower limits, said holder having a lower end engageable with the work, means yieldingly retaining the holder in its lower limit position against the buoyancy of work engaged with the holder and immersed in liquid in said tank, an inclined arcuate cam carried by said shaft in concentric relation to said holder, a cam follower on said holder, an arm projecting generally radially from said holder and normally generally outwardly from the shaft axis when the holder is in its lower position, a fixed abutment arranged to be struck by said arm upon rotation of said shaft whereby to swing said arm and turn said holder, the arrangement of said cam being such that upon said turning of said holder said follower will ride upwardly on the cam to lift the holder, a land at the upper end of the cam onto which the follower is moved just before said arm leaves said abutment whereby to retain the holder in upper position, and an abutment at the lower end of said cam engageable by said follower when said arm is manually returned, whereby continued pressure on said arm in the return di-

rection will cause the holder and cam to revolve as a unit about the axis of said shaft.

10. Immersion apparatus for association with an open tank, comprising a frame associable with the tank to extend thereabove, a shaft supported by said frame and extending vertically downwardly from the frame, a table carried by the lower end of the shaft above the level of liquid in the tank, a circular series of guide members carried by said table concentrically with the shaft axis, a work holder associated with each guide member and guided thereby for vertical reciprocation between upper and lower limits, each work holder having work-engaging means below said table, means for yieldingly retaining the holders in lower position against the buoyancy of work engaged therewith and immersed in liquid in said tank, and means operated as a result of rotation of said table for successively lifting the holders to upper position.

11. Apparatus according to claim 10 including means operable to lift the table.

12. Apparatus according to claim 10 including threaded means whereby said shaft is supported by the frame and whereby the shaft is vertically adjustable.

13. Apparatus according to claim 10 including cam and follower means operable to quickly displace said shaft vertically.

14. Apparatus according to claim 10 including threaded means whereby said shaft is supported by the frame and whereby the shaft is vertically adjustable, and including cam and follower means operable to quickly displace said shaft vertically independently of said threaded means.

FRANK H. MUELLER.