

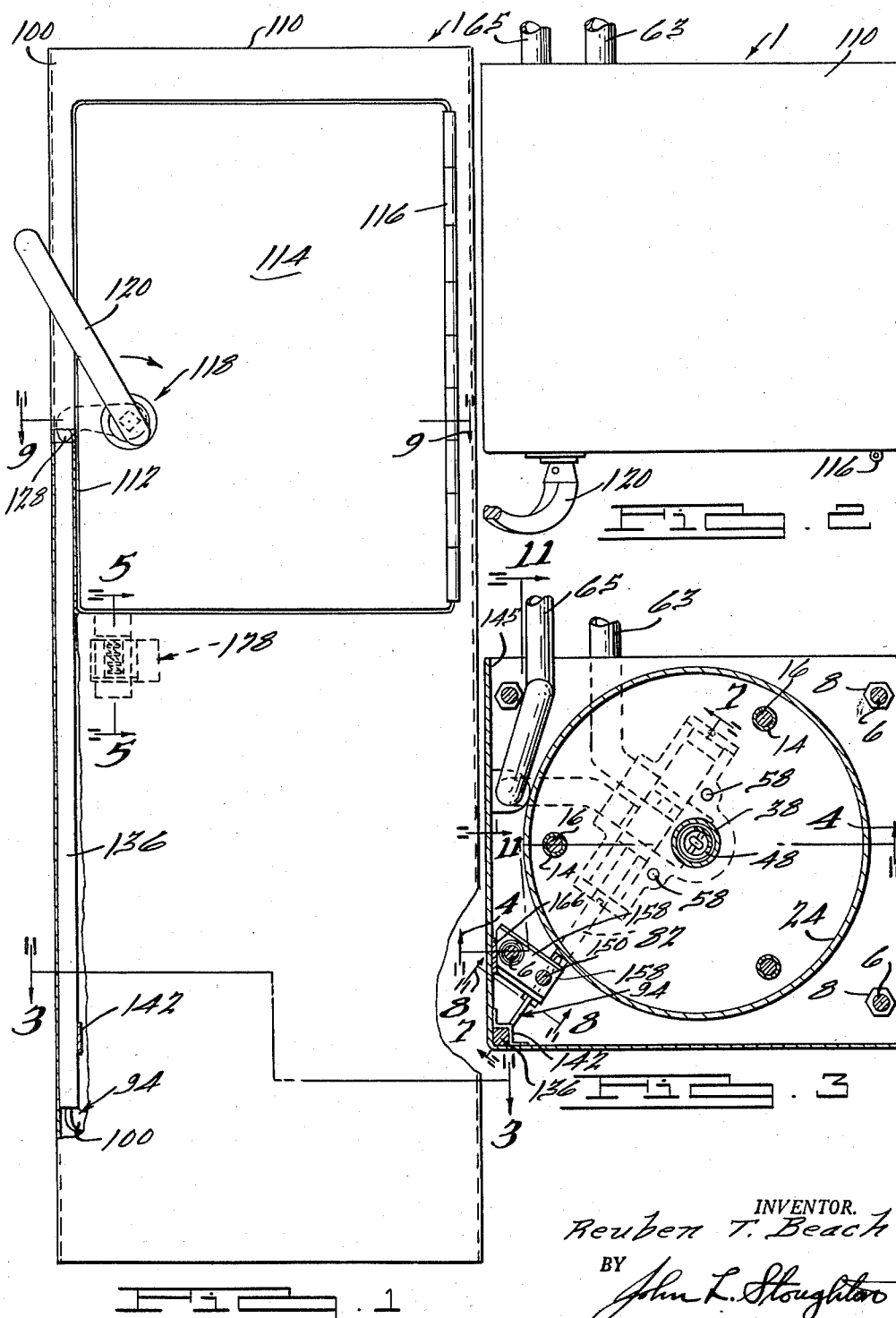
Dec. 15, 1959

R. T. BEACH
CAN CRUSHING DEVICE

2,916,985

Filed Jan. 23, 1956

4 Sheets-Sheet 1



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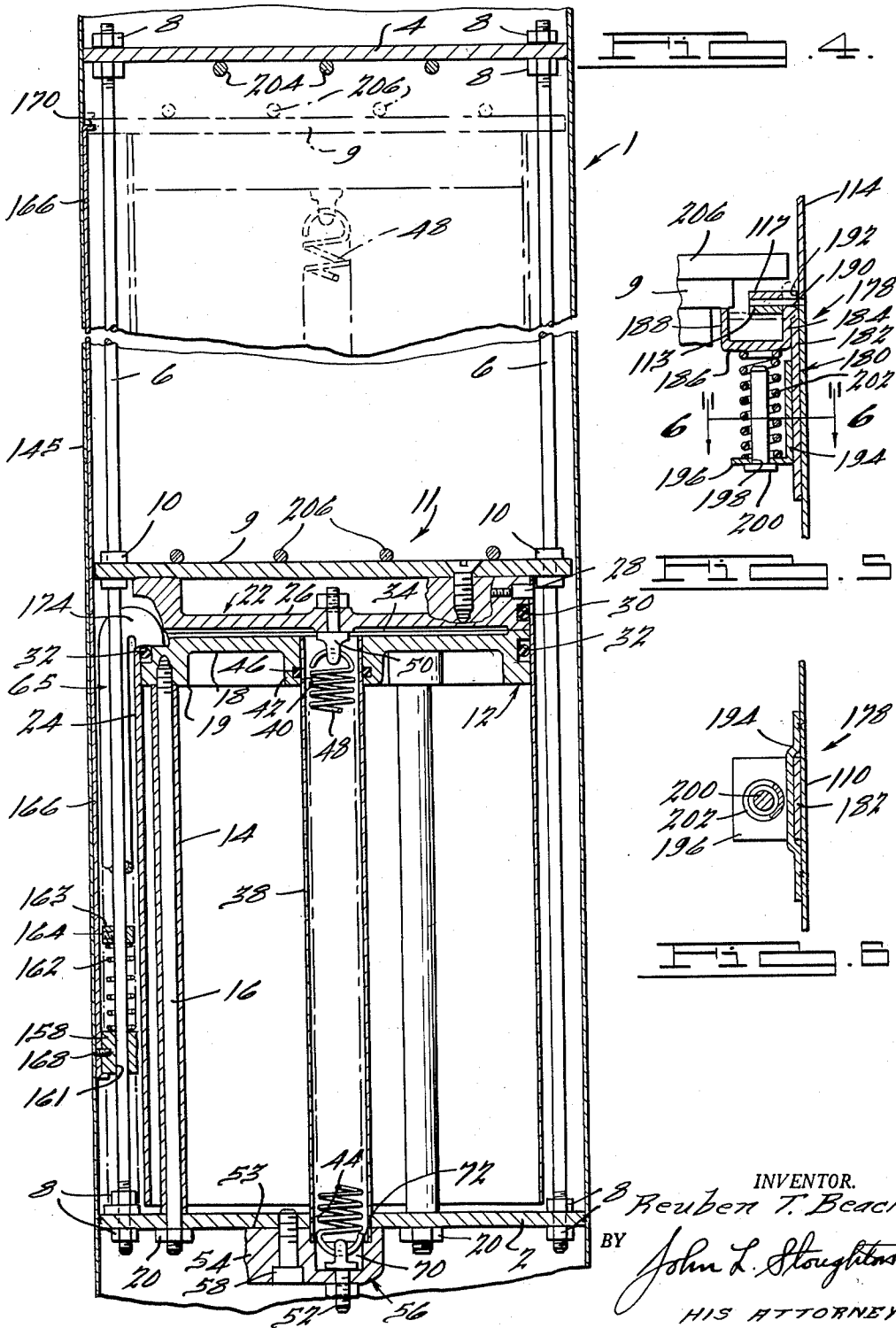
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4 Sheets-Sheet 2



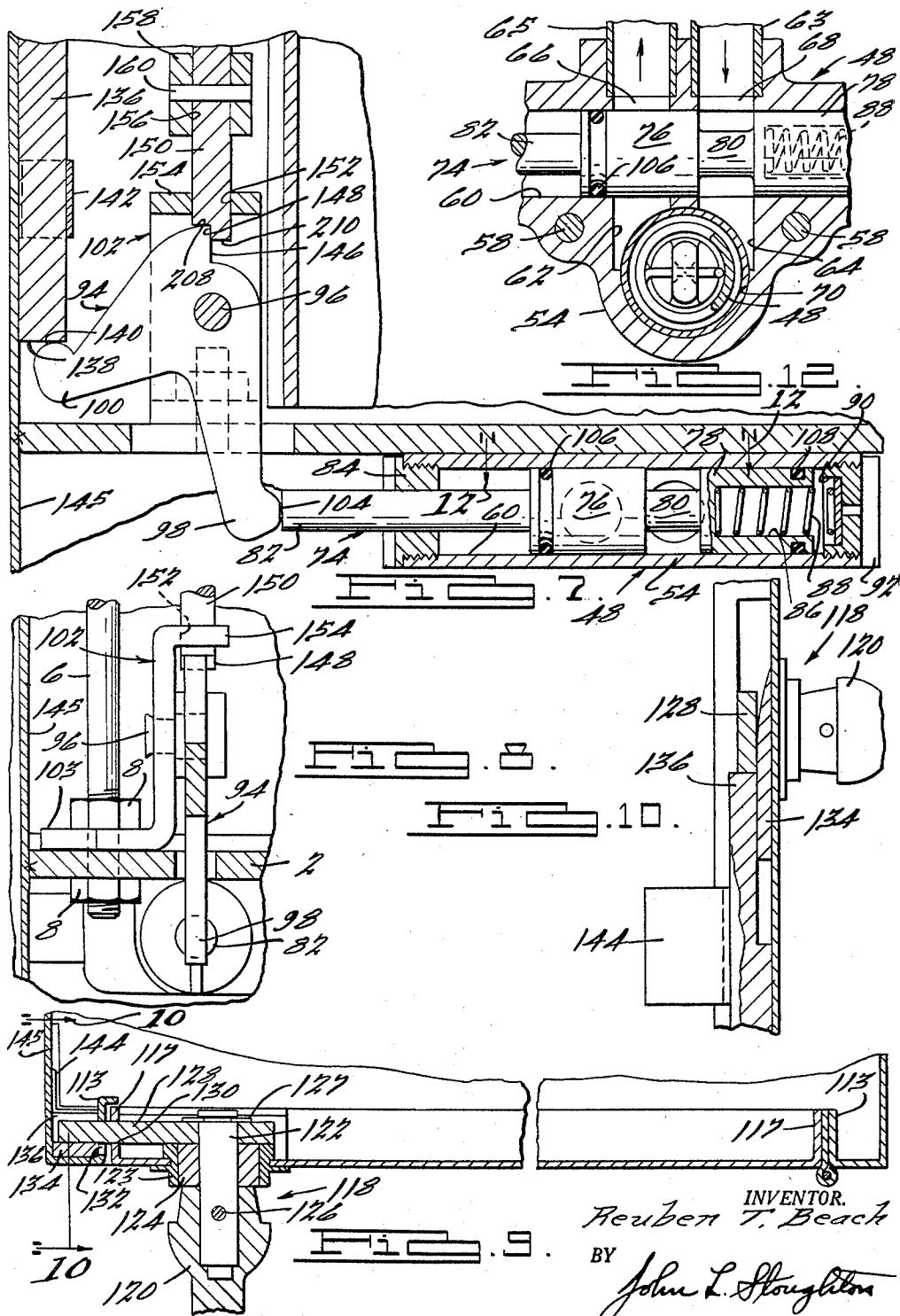
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4 Sheets-Sheet 4

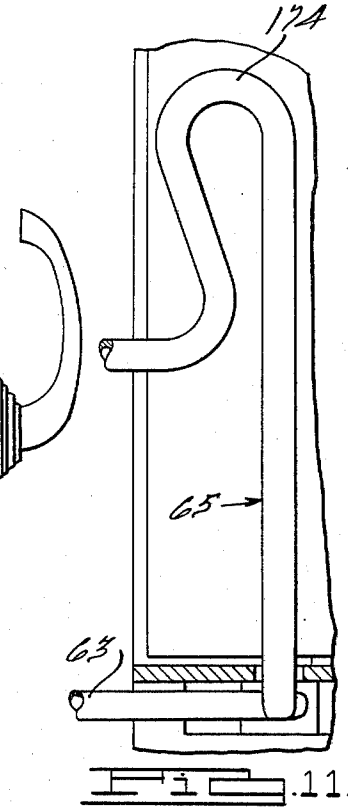
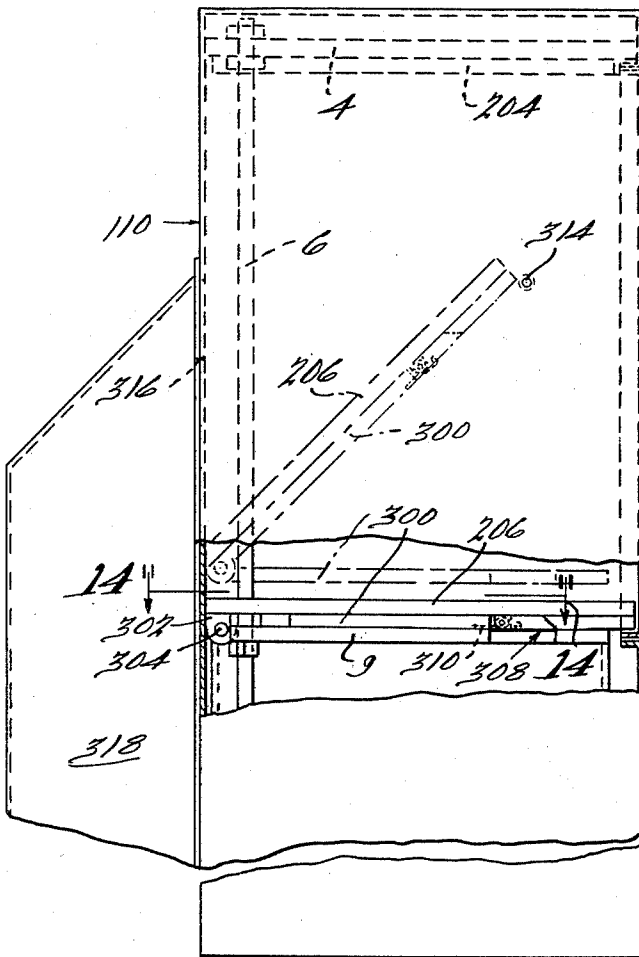
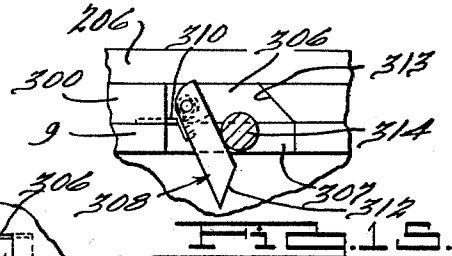
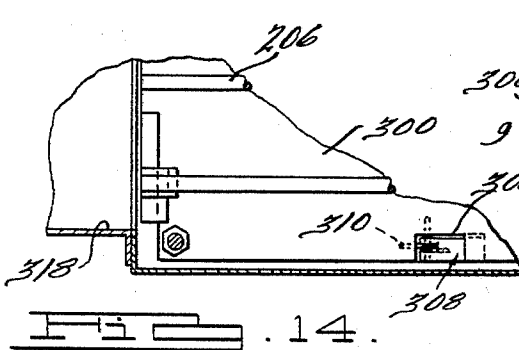


FIG. 13.



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2,916,985

CAN CRUSHING DEVICE

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Application January 23, 1956, Serial No. 560,705

4 Claims. (Cl. 100—53)

This invention relates to an improved can crushing device which is adapted to crush or compress, after they have been emptied, metal cans of the type in which food, oil, etc., are sold.

The problem of disposing of used cans in either rural or urban areas, in private homes or commercial establishments is a pressing one which becomes more and more acute. If the empty cans are crushed, the space which they then occupy is a small fraction of the original space and more used cans may be placed in the trash containers, thereby effecting economies in their disposal. A useful can crusher, however, must be inexpensive so that users of canned goods such as homes or commercial establishments such as a filling station, can afford to purchase the same. It is desirable, therefore, to utilize a construction which uses a source of power which is readily available to the potential users. Furthermore, power must be of a type in which only a simple and inexpensive mechanism is necessary to apply the power for can crushing purposes. Electric power is, in most instances, readily available but this power requires the use of motors which are relatively expensive. Water under moderate pressure is in most instances available, and hydraulic mechanisms are relatively inexpensive. Such a mechanism must, however, require only the usual water pressure found in domestic supplies. In places which are connected to a public supply, the pressure is normally maintained between 30 and 40 pounds per square inch while the pressure in places which pump their own usually is normally maintained between 20 and 40 pounds per square inch.

A relatively inexpensive form of hydraulic motor would be a ram or piston and cylinder type. If such a motor were of large enough area, any desired crushing pressure could be obtained at the usual domestic water pressures. However, for space and economic reasons, the crushing apparatus should not greatly exceed the diameter of the largest can which is to be crushed. This is normally not over 7 or 7½ inches in diameter. Also the crusher should be operable at the lowest expected pressure and, preferably, at a pressure below the minimum of 20 pounds to insure positive actuation of the crusher at all times and places.

A prime object of this invention is to provide a simple inexpensive fluid operated can crushing apparatus operable at low fluid pressure.

Another object is to provide such an apparatus which may be powered from the usual domestic water supply.

A further object is to provide such an apparatus which is automatic in operation.

A still further object is to provide such an apparatus which is safe to use around children.

Other objects will be apparent from the specification, the appended claims, and the drawings, in which drawings:

Fig. 1 is a front elevation view of a can crusher embodying the invention with certain of the parts cut away to disclose details of the automatic control feature;

Fig. 2 is a top plan view of the crusher shown in Fig. 1;

Fig. 3 is a sectional view taken substantially along the line 3—3 of Fig. 1 looking in the direction of the arrows;

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Fig. 4 is a sectional view taken substantially along the line 4—4 of Fig. 3 looking in the direction of the arrows;

Fig. 5 is a partial sectional view of the safety door lock and taken substantially along the line 5—5 of Fig. 1 looking in the direction of the arrows;

Fig. 6 is a partial sectional view showing another portion of the door lock and taken substantially along the line 6—6 of Fig. 5 looking in the direction of the arrows;

Fig. 7 is a partial sectional view of the valving mechanism and the control therefor taken substantially along the line 7—7 of Fig. 3 looking in the direction of the arrows;

Fig. 8 is a partial sectional view of the valving mechanism and control therefor taken substantially along the line 8—8 of Fig. 3 looking in the direction of the arrows;

Fig. 9 is a partial sectional view taken substantially along the line 9—9 of Fig. 1 showing the way in which the door lock actuates the automatic control for the valving mechanism;

Fig. 10 is a partial view taken substantially along the line 10—10 of Fig. 9 looking in the direction of the arrows;

Fig. 11 is a partial view showing the water trap taken substantially along the line 11—11 of Fig. 3 looking in the direction of the arrows;

Fig. 12 is partial view showing the valving mechanism taken substantially along the line 12—12 of Fig. 7 looking in the direction of the arrows;

Fig. 13 is a side elevational view with parts broken away showing a modified form of the invention;

Fig. 14 is a partial view taken substantially along the line 14—14 of Fig. 13; and,

Fig. 15 is a detail of the spring latch used in the modified form of the invention.

Referring to the drawings by characters of reference, the can crusher 1 comprises a frame-like supporting member having a lower rectangular plate member 2 and an upper rectangular plate member 4. A plurality of tie rods 6 extend longitudinally of the can crusher and secured, by means of the nuts 8, the end members 2 and 4 in fixed spaced relation. A third rectangular plate member 9 is provided with bearing sleeves or bushings 10 slidable along the rods 6. The member 9 is movable towards and away from the upper plate member 4 by means of the piston and cylinder assembly generally designated 11.

The assembly 11 comprises a fixed piston 12 secured to the lower plate 2 by the sleeves 14 and rods 16. For this purpose, the piston head 18 of the piston 12 is provided with a plurality of downwardly extending bosses 19 which are provided with downwardly opening screw threaded apertures which receive the upper threaded ends of the rods 16. The sleeves 14 are concentrically positioned about the respective rods 16 intermediate the head 18 and the plate 2 and serve to prevent the piston 12 from movement toward the plate member 2. The lower end portions of the rods 16 extend through apertures in the plate 2 and nuts 20 are screw threaded to the outwardly extending ends of the rods 16 to complete the securement.

The movable cylinder assembly 22 of the assembly 11 comprises a cylindrical sleeve 24 which is closed at its upper end portion by a circular end wall 26 and which extends therefrom toward the lower supporting plate 2 in telescopic relation to the piston head 18. The end wall 26 may be secured to the sleeve 24 as by the studs 28 and the joint therebetween may be made fluid tight by a suitable seal as, for example, the O ring 30.

A second O ring 32 is provided within a peripheral recess in the piston head 18 and acts to prevent leakage

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flow of fluid between the fixed piston 18 and sleeve 24 while permitting relative movement therebetween. The adjacent surfaces of the piston head 18 and cylinder wall 26 are recessed to form a chamber 34. As will be explained below, this chamber 34 is always maintained filled with water and provides smoother operation.

Fluid is transmitted to and from the chamber 34 through a central tube 38 which has its upper end portion extending through a central aperture 40 of a downwardly extending boss 42 of the head 18 and has its lower end extending through a central aperture 44 in the lower end plate 2. Fluid leakage between the tube 38 and the boss 42 is prevented by means of an O ring 46. A return spring 48 extends centrally of the tube 38 and has its upper end suitably secured to the cylinder wall 26 as by an eye 50 carried by the wall 26. The lower end of the spring 48 is similarly secured by an eye 52 secured to the valve body 54 of a fluid control valve 56. The valve 56 is secured to the lower surface of the lower plate 2 in overlying relation to the aperture 44 by the studs 58. A cylindrical chamber 60 extends longitudinally and completely through the body 54 parallel with said lower plate 2. A second and third chamber 62 and 64 extend through the body 54 transversely to and through the chamber 60. One end of each of the chambers or passageways 62 and 64 opens outwardly through the valve body 54 for connection with supply and drain conduits 63 and 65 respectively. Their intersections with the chamber 60 form outlet and inlet ports 66 and 68 respectively. The inner ends of the passageways 62 and 64 open into an upwardly extending passageway 70 which is aligned with the aperture 44 in the lower plate member 2. The upper outwardly opening end portion of passageway 70 is counterbored and receives the lower end portion of the tube 38 which seats against a shoulder 72 formed at the lower end of the counterbore. The tube 38 may be suitably secured in fluid tight relation within the counterbore as by soldering or brazing. The chambers 60, 62, 64, and 70 may be made as by drilling.

Longitudinally slidable within the cylindrical chamber 60 is a port controlling or valving member 74. The member 74 has a pair of large diameter cylindrical portions 76 and 78 which have a piston-like fit within the chamber 60 to open and close the ports 66 and 64 or vice versa. The portions 76 and 78 are joined by a reduced diameter neck portion 80 to permit fluid flow through the one of the passageways which is not blocked by the larger diameter portions 76 or 78. The member 74 is also provided with an operating stem 82 which preferably is of reduced diameter relative to the portions 76 and 78, and which extends outwardly of the body 54 through an annular plug member 84 screwthreaded into one open end of the chamber 60. The portion 78 has a central aperture or recess 86 opening outwardly through its end wall opposite to the neck portion 80 and houses one end portion of a spring 88 which seats against the inner end of the aperture 86. The other end of the spring 88 extends beyond the portion 78 and into a suitable recess 90 of a cap member 92 which is screwthreaded into the end portion of the cylindrical chamber 60 opposite to that which receives the member 84.

The spring 88 urges the valve member 74 toward the left so that the valving member portion 78 will normally close the inlet port 68 to block fluid flow through the passageway or chamber 64 while the portion 76 will be moved out of blocking position relative to the outlet port 66. The valving member 74 may be moved into the right hand position (as shown in Fig. 7) against the force of the spring 88 by means of a bell crank lever 94 which is fulcrumed on a pin 96 and has a pair of arms 98 and 100. The pin 96 is carried by an S shaped bracket 102 which has one end portion 103 apertured to receive one of the rods 6 and is clamped to the upper surface of the lower end plate member 2 by the rod nuts 8. The arm 98 of the lever 94 is provided with a rod engaging

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surface 104 which, when the lever 94 is rotated counterclockwise, engages the end surface of the stem 82 and moves the valving member 74 to the position shown in Fig. 7 in which position the portion 76 blocks outlet port 66 and portion 78 opens the inlet port 68. Fluid flow along the walls of chamber 60 past the portions 76 and 78 is prevented by the O rings 106 and 108.

The structure so far described is completely encased in a sheet metal housing 110. Access to the space between the relatively movable members 4 and 9 for the purpose of inserting or removing cans, is had by means of an opening 112. The inner marginal edges of the opening 112 are formed by bending marginal edge portions of the housing 110 to provide interned flanges 113. The opening 112 is closable by means of a door hinged along one edge portion 116 and which is also provided with inwardly extending flanges 117 formed by bending marginal edge portions. The door 114 is opened and closed by a suitable locking mechanism 118 having an easily graspable handle 120.

The handle 120 is carried by a square stub shaft 122 suitably carried by a bearing member 124 journaled in a sleeve 123 secured to the door 114. The handle 120 is joined to the shaft 122 by a pin 126 and a C-washer 127 holds a bolt 128 to the inner end portion of shaft 122. When the handle 120 is rotated counterclockwise to the position shown in Fig. 1 (the door 114 being nearly closed), the bolt 128 moves through an aperture 130 in the flange 117 and an aperture 132 in the flange 113 and cams downwardly along the cam member 134, thereby moving the door 114 to fully closed position. The outer end of the bolt 128, as it is being moved counterclockwise into locked position, engages the upper end of a vertically extending square shaft 136 and moves this shaft downwardly causing its lower end portion 138 to rotate the bell crank lever 94 counterclockwise forcing the valve mechanism into the position shown in Fig. 7. With the inlet port 68 open, fluid under pressure flows into the upwardly opening chamber 70 and through the central tube 38 into the chamber 34 to force the movable cylinder member 22 upwardly.

The lower end portion of the shaft 136 is guided for reciprocal movement, in the corner of the housing 110, by means of a bracket 142 (Figs. 3 and 7) which is suitably secured to the housing as by welding. The upper end portion of the square shaft 136 is guided within the U-shaped opening between the sheet metal housing 110 and the flange 113. An L-shaped bracket 144 is welded to the side wall 145 of the housing 110 as shown in Fig. 9, to hold the upper end of the square shaft 136 in the U-shaped opening.

The bell crank lever 94 is provided with a shoulder 146 which, when the lever 94 is in its counterclockwise position, is engaged by a shoulder 148 of a vertically movable locking member or pin 150 which is normally urged, by means to be described below, downwardly into locking position to lock the bell crank lever 94 in its counterclockwise position holding the valving member 74 in its fluid admitting position. The pin 150 extends upwardly from its shoulder 148 through an aperture 152 in the upper horizontal end portion 154 of the bracket 102 and into an aperture 156 of a connecting member 153 (Figs. 3 and 7). A dowel 160 may be used to secure the pin 150 to the member 153. The member 158 is provided with a second aperture 161 through which one of the tie rods 6 extends, whereby the member 158 and pin 150 are guided for vertical movement but held against rotation. A spring 162 surrounds the tie rod 6 and has its lower end seating against the top surface of the connecting member 158. A collar 163, carried by one of the tie rods 6 and held in fixed position thereby by a set screw 164, positions the upper end of the spring 162 so that the spring acts to urge the member 153 and pin 150 downwardly.

A strap member 166 lies along the inner face of the

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side wall 145 of the housing 110 and has its lower end portion secured to the connecting member 158 as by a screw 168. The upper end portion of the strap member is provided with an inturned flange 170 which is engageable by the member 9 as it reaches the upper limit of its upward movement as shown by its dot-dash lines in Fig. 4. When the flange 170 is engaged by the member 9, the strap member 166, connecting member 158 and pin 150, are all moved upwardly whereby the shoulder 148 on the lower end of the pin 150 moves upwardly beyond the shoulder 146 permitting the bell crank lever 94 to rotate clockwise and the valving member 74 to move to the left (Fig. 7) under the force exerted by the spring 88. Movement of the valve member 74 to the left is limited by engagement of the cylindrical portion 76 with the plug 84. In this position of the valving member 74, the portion 78 closes the inlet passageway 68 and the portion 76 opens the outlet passageway 66, permitting fluid from the chamber 34 to discharge through the tube 38, chamber 70, and the outlet passageway 66 into the outlet tube 65. The plate 9, together with the movable cylinder, then moves downwardly by the force exerted by the spring 48 and gravity.

The outlet tube 65 extends upwardly at the rear of the can crusher and then is rebent downwardly at 174 to form a strap-like portion shown in Fig. 11. The top of the rebent portion 174 of the outlet conduit 65 extends slightly above the bottom of the chamber 34 and prevents all of the water or other liquid within the chamber 34 from draining.

In order to prevent the door 114 from being opened during a can crushing operation, when the movable cylinder moves upwardly, the door is provided with an automatic door lock generally designated 178. The bolt portion 180 of the door lock is formed from a single piece of sheet metal and has an upwardly extending portion 182, the upper end of which is rebent upon itself as at 184 and then is bent to extend inwardly into the cabinet as at 186 and then upwardly at 188, forming a U-shaped channel piece. The portion 188 is engageable by the lower side of the plate member 9 when the cylinder member 22 is in its lowermost position, as shown in Fig. 4. The rebent portion 184 is aligned with an aperture 190 in the flange 113 and a corresponding aperture 192 in the door flange 117.

The bolt 180 is held in sliding relation to the casing 110 by means of an offset strap member 194, which has an outwardly extending lower flange 196 apertured as at 198 to receive a spring supporting pin 200. A spring 202 surrounds the spring supporting rod 200 with its lower end portion resting upon the flange 196 and its upper end portion engaging the inwardly extending portion 186 of the bolt 180 and urges the bolt 180 upwardly. When the cylinder moves upwardly, the plate member 9 moves upwardly and permits the bolt 180 to be moved upwardly by the spring 202 so that the rebent portion 184 moves through the aperture 192 of the door flange 117 to lock the door closed.

The adjacent surfaces of the plate members 4 and 9 are provided with rod-like members 204 and 206 respectively, which are preferably of the same diameter and which extend from the front edge to the back edge of the plate members 4 and 9 and are staggered crosswise so that the rods 204 and 206 are offset one from the other. The rods 204 and 206 are important adjuncts to this can crushing mechanism in that the provision of one or more of these rods 204 or 206 act to markedly decrease the pressure required in the chamber 34 to crush the can which is placed between the members 4 and 9. These members 204 and 206 reduce the pressure required to crush the cans by upwards of 50%, thereby reducing the necessary diameter of the piston and cylinder assembly 11.

In order to operate the can crusher, the operator grasps the door handle 120 and rotates it in a clockwise direc-

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tion to rotate the bolt 128 out of its camming position back of the camming member 134 and out of the aperture 132 in flange 113 and pulls the door 114 open. The can to be crushed is placed endwise between the plate members 4 and 9. The door is then substantially closed and the handle 120 rotated in the counterclockwise direction into the position shown in Fig. 1 in which position the bolt 128 first cams about the camming member 134 to tightly close the door 114, and then engages the upper end of the square rod 136 and moves it downwardly. As the rod 136 is moved downwardly, its lower end portion 138 engages the camming surface 140 of the bell crank member 94 and rotates it counterclockwise causing its other arm 98 to move the valving member 74 into the position shown in Fig. 7. This opens the inlet passageway 68 for fluid flow from the inlet conduit 63 through the passageway 64 and 70 up through the tube 38 into the chamber 34, causing the movable cylinder assembly 22 and attached plate member 9 to move upwardly toward the plate member 4, crushing the can between the relatively moving members 4 and 9. The rod members 204 and 206 help to initially break down the can and reduce the force necessary to cause crushing.

When the movable cylinder assembly 22 starts its upward movement, the plate member 9 moves away from the bolt 180 permitting the spring 202 to move the rebent portion 184 of the bolt 180 upwardly into the aperture 192 of the door flange 117 to securely lock the door 114.

As the plate member 9 approaches its upward position, it engages the under surface of the inturned lip 170 of the member 166 and moves this member upwardly against the force of the spring 162. This moves the member 158 and the stub shaft 150 carried thereby upwardly, disengaging the shoulders 148 and 146. The spring 88 of the valve then moves the valving mechanism 74 to its leftward position. This movement also rotates the bell crank 94 to move the square rod 136 upwardly. Upward movement of rod 136 rotates the bolt 128 in a clockwise direction causing the handle to move into a straight up and down position, which indicates the crushing operation is completed. The movement of the bell crank 94 also brings the upper cam surface 208 thereof to a position in which it underlies the end surface 210 of the sub-shaft 150. When the valving member 74 is in its left hand position, it closes the inlet passageway 68 to terminate further flow of fluid to the chamber 34 and opens the outlet passageway 66, whereby water flows from the pressure chamber 34 downwardly through the tube 38, and through the discharge tube 65 past the trap-like rebent portion 174 thereof to a suitable drain.

Initial downward movement of the movable cylinder assembly 22 causes the plate member 9 to move away from the inturned portion 170 of the member 166. The member 166 does not move downwardly because the surface 208 of the bell crank member 94 now underlies the end surface 210 of the sub-shaft 150. The movable cylinder assembly 22 continues to move downwardly by the spring 48 within the tube 38. When the movable cylinder assembly 22 returns to its position as shown in Fig. 4, the member 9 will have engaged and moved the upturned portion 188 of the bolt 180 downwardly into its unlocked position with the rebent portion 184 out of the aperture 192.

The modification shown in Figs. 13, 14 and 15 is in most respects like the preferred form except that in the modified form a platform 300 is hinged to the plate member 9 by means of a downturned flange 302 and a hinge pin 304. The platform 300 and plate member 9 are provided with apertures 306 and 307. The aperture 306 is normally closed by a latch 308, which is urged by a spring 310 in a counterclockwise direction to close the aperture 306. The free end of the latch 308 is tapered as at 312, and the end wall 313 of the aperture 306 is likewise tapered to provide a stop means for limiting counterclockwise movement of the latch 308 under the

force of spring 310 to a position in which the bottom edge of the latch 308 is flush with the bottom of the platform 300.

A pin 314 is carried by the sheet metal housing 110 and lies in the path of movement of the aperture 306 in the platform 300 and aperture 307 in member 9; as the plate member 9 and platform 300 are moved upwardly past the pin 314, the latch swings clockwise to permit the pin 314 to move through the apertures 306 and 307. After the platform 300 and plate member 9 move beyond the pin 314, the spring 310 rotates the latch 308 to close the aperture 306. When the cylinder member 22 completes its upward stroke and then moves downwardly, the pin passes through the aperture 307 but engages the under surface of the latch 308. This causes the platform 300 to rotate counterclockwise and slide along the upper surface of the pin 314 into the dot-dash position shown in Fig. 13. Sometime during the time the platform 300 is rotated, the crushed can will slide outwardly and downwardly through an opening 316 in the housing 110 into a chute 318 which leads to a suitable receptacle for the crushed cans. Further downward movement of the platform 300 will cause it to slide beyond the pin 314 and fall back into its normal position against the plate member 9.

What is claimed and is desired to be secured by United States Letters Patent is as follows:

1. A can crushing apparatus comprising, a pair of relatively movable members, defining a space therebetween, which is adapted to receive a can to be crushed, a housing member surrounding said relatively movable members and cooperable therewith to enclose said space, said housing member having an aperture therethrough to permit cans to be placed within and removed from said space, a door for said aperture hingedly secured to said housing member, a latch for holding said door closed and including a bolt, a control device for controlling the relative movement of said members and operable in a first position to cause said relatively movable members to move toward each other and in a second position to cause said relatively movable members to move away from each other, an elongated member having first portion located in the path of movement of said bolt and engaged thereby upon movement of said bolt to latched position to move said elongated member from a first to a second position, a bell-crank lever having a first arm engageable by said elongated member and movable thereby from a first position to a second position upon movement of said elongated member to its said second position, said lever having a second arm engageable with said control device for actuating said device to its said first position when said lever is moved to its said second position, means maintaining said control device in its said first position, and means for releasing said maintaining means and returning said lever and said elongated member to their respective said first positions and said control device to its said second position.

2. A can crushing apparatus comprising, a pair of relatively movable members, defining a space therebetween, which is adapted to receive a can to be crushed, a housing member surrounding said relatively movable members and cooperable therewith to enclose said space, said housing member having an aperture therethrough to permit cans to be placed within and removed from said space, a door for said aperture hingedly secured to said housing member, a latch carried by and for holding said door closed and including a rotatable bolt, a control device for controlling the relative movement of said members and operable in a first position to cause said relatively movable members to move toward each other and in a second position to cause said relatively movable members to move away from each other, an elongated member having a first portion located in the path of movement of said bolt and engaged thereby upon rotation of said bolt to latched position to move said

elongated member from a first to a second position, a bell-crank lever having a first arm engageable by said elongated member and movable thereby from a first position to a second position upon movement of said elongated member to its said second position, said lever having a second arm engageable with said control device for actuating said device to its said first position when said lever is moved to its said second position, means maintaining said control device in its said first position, and means for releasing said maintaining means and returning said lever and said elongated member to their respective said first positions and said control device to its said second position, said last named means also acting to rotate said bolt to a position to permit opening of said door.

3. A can crushing apparatus comprising a pair of relatively movable members, defining a space therebetween, which is adapted to receive a can to be crushed, a housing member surrounding said relatively movable members and cooperable therewith to enclose said space, said housing member having an aperture therethrough to permit cans to be placed within and removed from said space, a door for said aperture hingedly secured to said housing member, a latch carried by and for holding said door closed and including a rotatable bolt, a control device for controlling the relative movement of said members and operable in a first position to cause said relatively movable members to move toward each other, an elongated member having a first portion located in the path of movement of said bolt and engaged thereby upon rotation of said bolt to latched position to move said elongated member from a first to a second position, a bell-crank lever having a first arm engageable by said elongated member and movable thereby from a first position to a second position upon movement of said elongated member to its said second position, said lever having a second arm engageable with said control device for actuating said device to its said first position when said lever is moved to its said second position, an elongated apparatus having a first portion lying in the path of movement of one of said relatively movable members, said lever having a shoulder, said apparatus having a second portion engageable with said shoulder upon movement of said lever to its said second position for holding said lever in its said second position, force exerting means holding said shoulder in engagement with said second portion of said apparatus, said one of said relatively movable members being operable to move said apparatus to move its said second portion out of engagement with said shoulder whereby said force exerting means is rendered effective to return said lever and said elongated member to their respective said first positions.

4. The combination of claim 3 in which there is provided a second latching mechanism actuated as a consequence of the movement of said relatively movable members toward each other to latch said door closed irrespective of said first named latch.

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