

Feb. 17, 1953

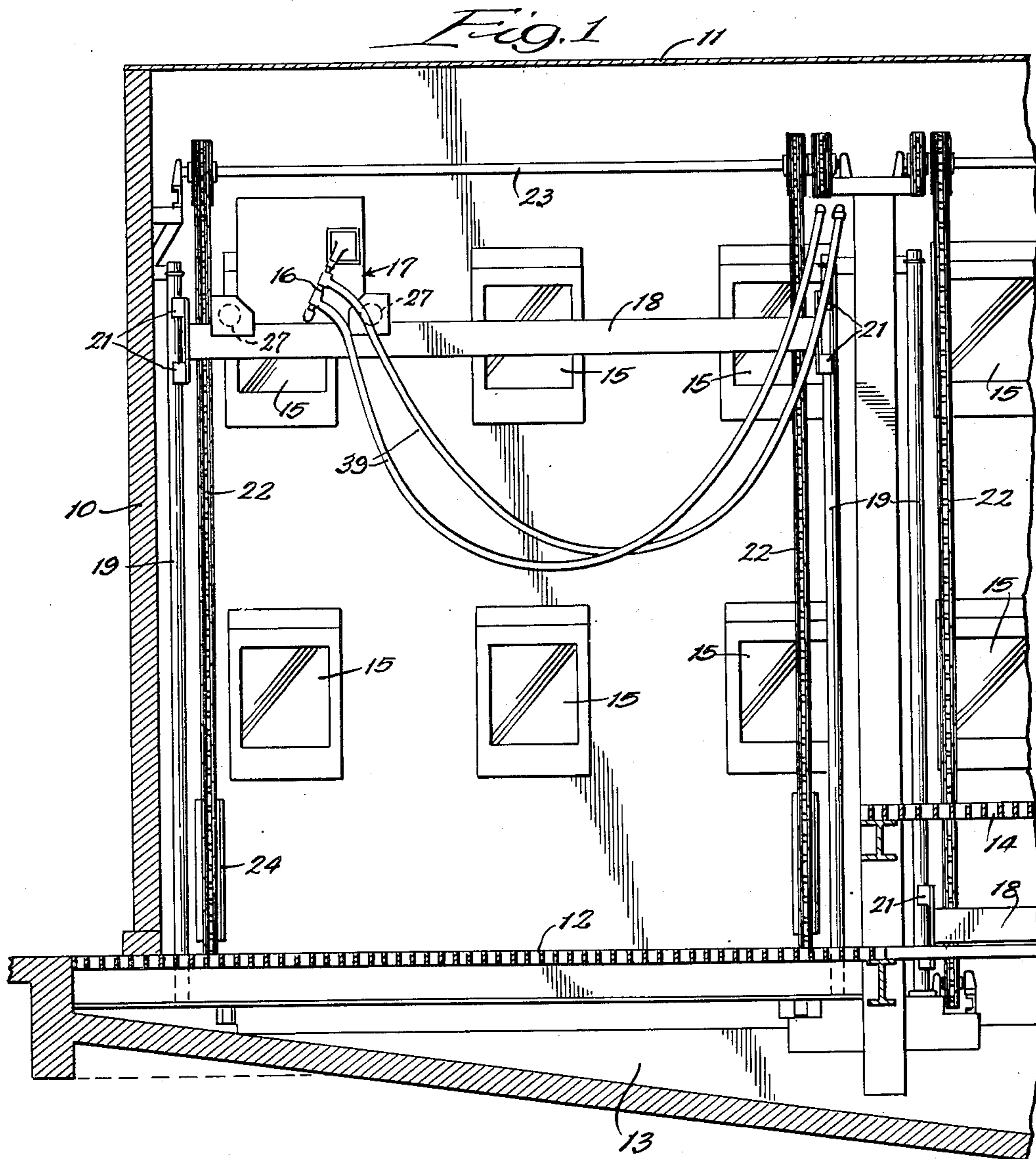
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2,628,455

CLEANING APPARATUS FOR CASTINGS AND THE LIKE

Filed June 8, 1949

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

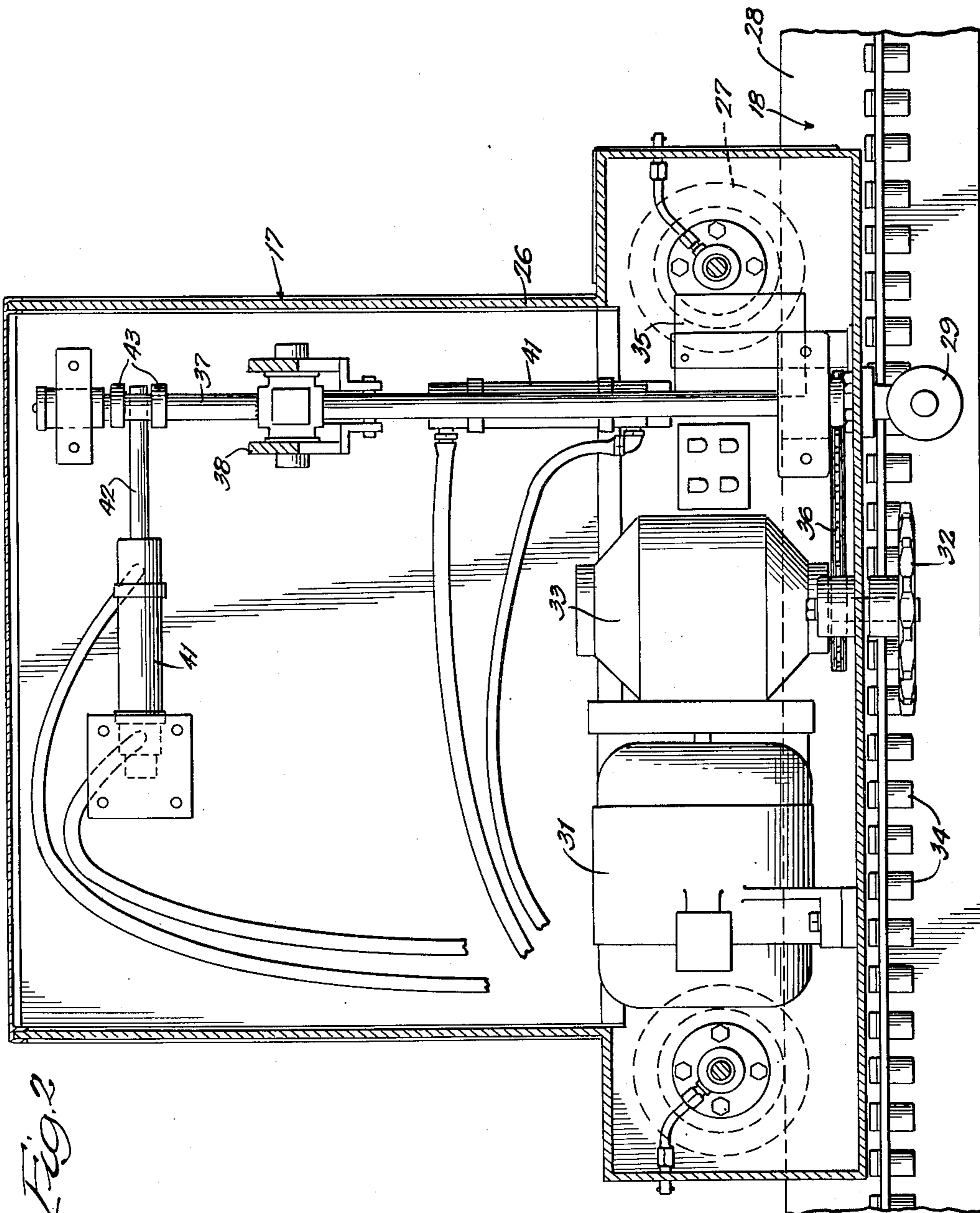


Fig. 2

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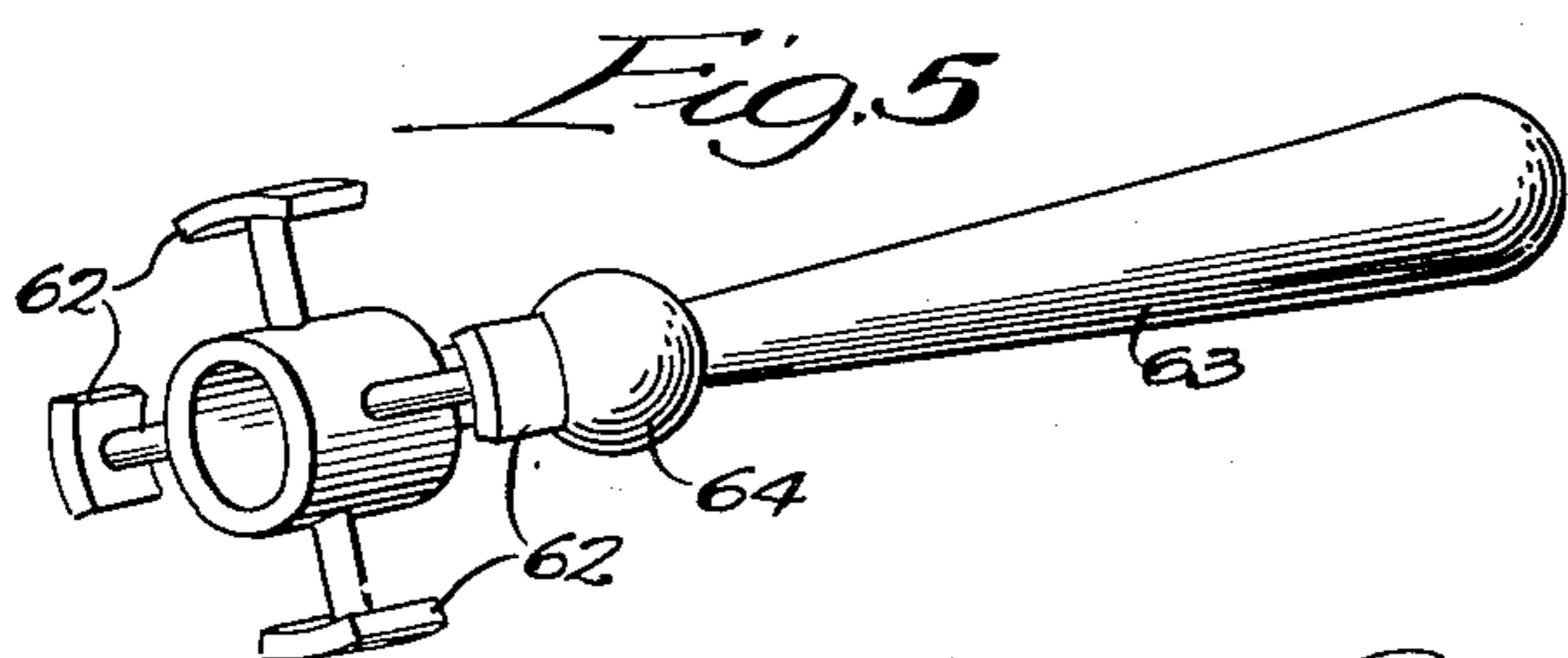
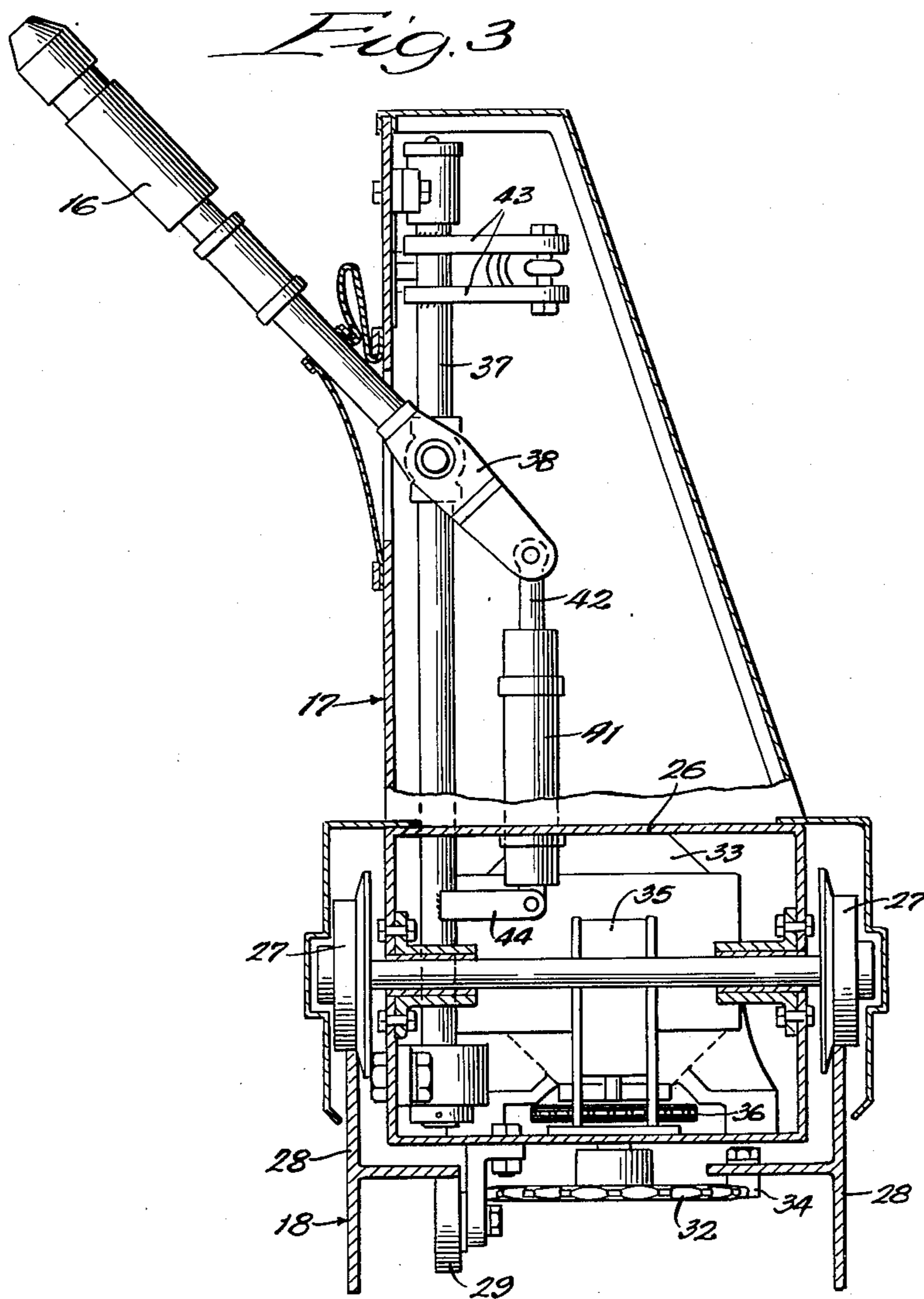
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CLEANING APPARATUS FOR CASTINGS AND THE LIKE

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4 Sheets-Sheet 3



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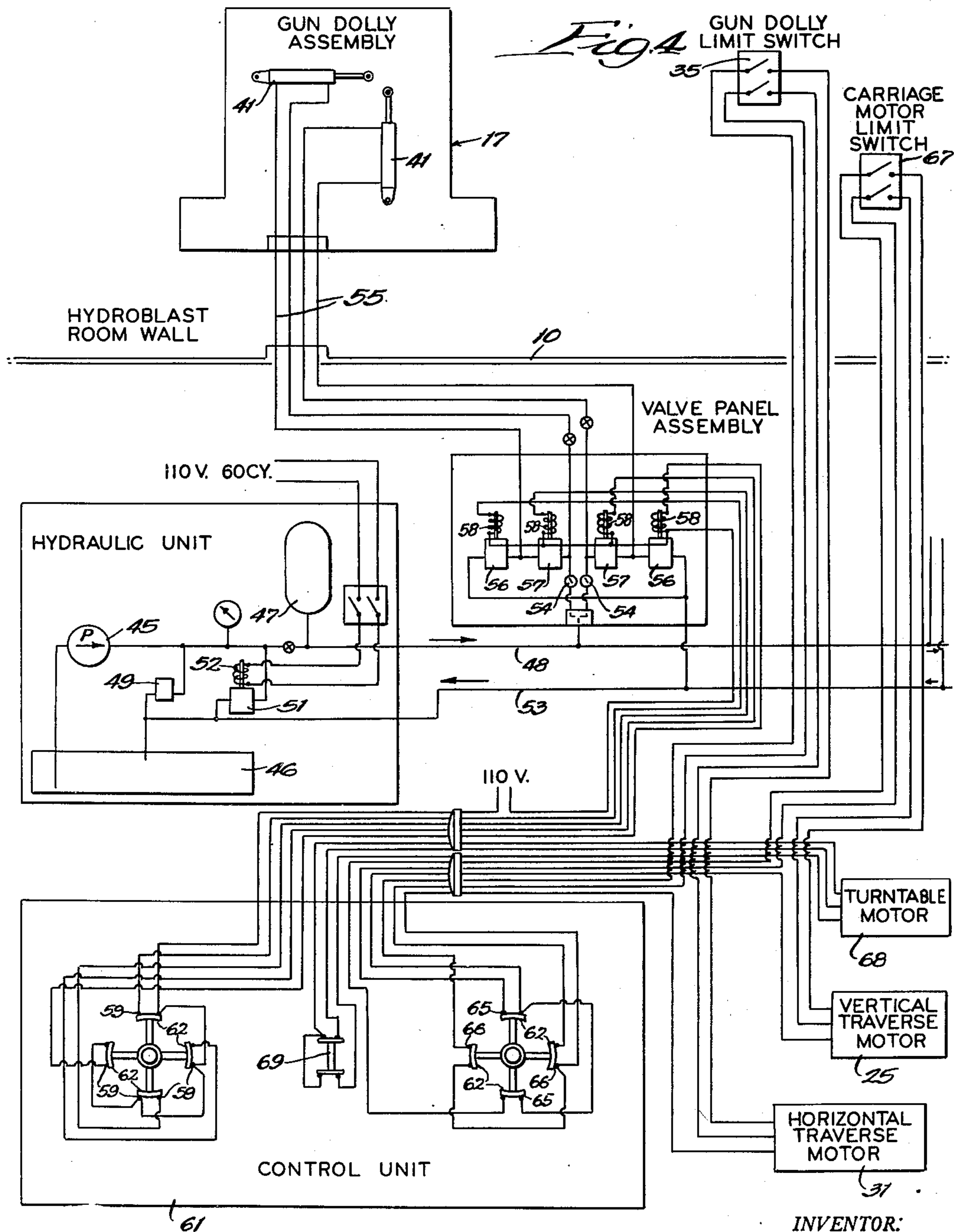
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CLEANING APPARATUS FOR CASTINGS AND THE LIKE

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4 Sheets-Sheet 4



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## UNITED STATES PATENT OFFICE

2,628,455

CLEANING APPARATUS FOR CASTINGS  
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8 Claims. (Cl. 51—8)

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This invention relates to cleaning apparatus for castings and the like and more particularly to apparatus for removing cores, scale and other foreign material from castings and similar articles by means of a jet of water in which abrasive material may be carried.

The cleaning of castings by water jets with or without the addition of abrasive particles has been practiced for some time. For relatively small jets it has been the usual practice for the operator to hold the nozzle or gun in his hands so that extreme flexibility is obtained in directing the jet against the article from any desired position and at any desired angle. However, for high volume jets the reaction on the nozzle is too great to permit manual handling, and it becomes necessary to mount the nozzle on a support.

For mounted guns or nozzles it has been the practice to support the castings or like articles to be cleaned on turntables or other movable supports so that different portions thereof may be presented to the jet. It has also been proposed to mount the gun or nozzle for angular adjustment so that the jet can be directed against the castings at different angles. Even with this construction, however, sufficient flexibility is not provided to permit adequate cleaning of all types of articles.

It is accordingly one of the objects of the present invention to provide a cleaning apparatus in which the jet can be directed against the articles from any desired horizontal and vertical position relative to the articles and at any desired angle. In the preferred construction the gun or nozzle mounting is capable of bodily adjustment both vertically and horizontally, and the gun is universally adjustable on its mounting.

Another object is to provide cleaning apparatus in which both the position and the angle of the gun can be controlled from a remote point such as a point outside of the cleaning room in which the gun is mounted. According to one feature of the invention, the control is electrical, and the control unit is connected to the operating mechanism through flexible leads so that the mechanism can be controlled from any desired remote position.

Still another object is to provide cleaning apparatus in which the gun is mounted on a carriage which is horizontally movable on an elongated horizontal beam and the beam is mounted for vertical movement. In the preferred construction the carriage carries its own drive means so that it can move along the beam as desired.

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Still another object is to provide cleaning apparatus in which the angle of the gun is adjusted by fluid motors controlled through electrically operated valves from a remote point.

The above and other objects and advantages of the invention will be more readily apparent when read in connection with the accompanying drawings, in which—

Figure 1 is a partial sectional view through a cleaning room equipped with cleaning apparatus embodying the invention;

Figure 2 is a vertical section through the gun carriage;

Figure 3 is a section transverse to Figure 2 through the gun carriage;

Figure 4 is a diagram of the control circuits; and

Figure 5 is a perspective view of the switch control handle.

The invention may be applied to any desired cleaning room shown as having vertical side walls 10, a roof 11, and a floor 12 formed by a grating to permit flow of water and abrasive particles therethrough. A sump 13 is provided below the grating 12 to collect the water, sand and the like for reuse or for other disposal, as desired. Castings or other articles to be cleaned may be supported above the floor on a rotatable grating 14 and which is preferably rotatable so that the casting can be turned for cleaning all sides thereof. The construction of the turntable forms no part of the present invention, and it is, therefore, not described in detail. One of the side walls of the room is formed with a plurality of glazed openings 15 through which an operator outside the room may observe the cleaning operation in the room.

The castings or other articles are adapted to be cleaned by a high velocity jet of water projected by a gun or nozzle 16 carried on a carriage 17 which is mounted for travel along a horizontal beam 18. The beam is supported for vertical movement on vertical guides or tracks shown as round posts 19 mounted at spaced points adjacent one wall of the room. The ends of the beam 18 are formed with guide brackets 21 slidably engaging the tracks 19. To move the beam vertically, a pair of chains 22 are provided running over sprockets on a shaft 23 near the top of the room. The chains 22 are connected to the ends of the beam 18 and to counterweights 24. The shaft 23 is driven by a motor shown at 25 in Figure 4 which may be mounted either inside or outside of the room, as desired. As shown in Figure 1, the mechanism as described may be

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duplicated any desired number of times in the same room to provide any desired number of guns in the room.

As best seen in Figures 2 and 3, the carriage 17 comprises a supporting frame or housing 26 providing an enclosure for portions of the operating mechanism. The frame carries four wheels 27 by means of which it is mounted for rolling movement on the beam 18 which, as best seen in Figure 3, is formed by a pair of T beams 28 spaced apart with their webs extending toward each other. As shown, the rollers 27 rest on the flanges of the beams 28, and to hold the carriage against accidental movement a roller 29 may engage the lower surface of one of the flanges.

To move the carriage along the beam, an electric motor 31 is carried by the carriage and drives a sprocket 32 through a gear reducer 33. The sprocket meshes with a series of pins 34 carried by the web of one of the beams 28 so that as the sprocket turns the carriage will positively be moved along the beams. Movement of the carriage to its extreme positions in either direction is limited by a limit switch 35 connected to the motor 31 and driven from the gear reducer 33 through a chain 36. It will be understood that as the carriage approaches the limit of its travel in either direction the limit switch will interrupt the motor circuit and prevent further travel in such direction.

In order to mount the gun 16 on the carriage 17 having universal movement a shaft 37 is journaled in the carriage for rotation about a vertical axis. A yoke 38 spans the shaft 37 and is pivoted thereto on a horizontal axis, and the gun 16 is connected to the yoke to be swung thereby. By turning the shaft 37, the angle of the gun in a horizontal plane may be adjusted while the swinging of the yoke 38 will adjust the gun in a vertical plane so that by a combination of the two movements complete universal adjustment of the gun is possible. The gun may be supplied with water under pressure and with a mixture of water and abrasive if desired through hoses 39, as shown in Figure 1, which are flexible so that the gun may be supplied and may operate in any position.

To adjust the angular position of the gun, fluid motors are employed, each of which includes a cylinder 41 in which a piston is slidable and which has a piston rod 42 projecting from one end thereof. The motor for horizontal adjustment is secured in the frame 26 and has its piston rod pivotally connected to a double arm 43 rigidly secured to the shaft 37. Thus by swinging the arm 43 the shaft 37 will be turned. The motor for vertical adjustment is fastened to a bracket 44 rigidly carried by the shaft 37 and has its piston rod pivoted to the end of the yoke 38, as best seen in Figure 3. Thus by operation of this motor the vertical angle of the gun will be controlled. It will be noted that with motors as shown a differential action is obtained due to the difference in area at opposite ends of the piston produced by displacement of the piston rod so that each piston has a small end from which the piston rod extends and a large end. The purpose of this construction will be more apparent hereinafter.

Figure 4 illustrates diagrammatically the control system for the several motors required to produce the desired movements. As shown, the fluid motors 41 may be supplied with operating fluid from a pump 45 receiving liquid from a sump 46 and discharging it through an accumulator 47 into a high pressure supply line 48. A bypass valve 49 may be provided to limit the pres-

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sure, and a controllable bypass valve 51 operated by a solenoid 52 may be provided to cut off the pressure when desired. Return of exhaust liquid to the sump is through a return line 53 and the supply and return lines 48 and 53 may supply any desired number of gun units.

The small ends of the cylinders 41 are connected, as shown, to the supply line 48 through check valves 54 so that the small ends of the cylinders are subjected at all times to full pump pressure. The large ends of the cylinders 41 are connected respectively through lines 55 to the midpoint between control valves 56 and 57. The valves 56 are connected to the return line 53, as shown, while the valves 57 are connected to the pressure supply lines for the different fluid motors. When either of the valves 57 is opened full pump pressure will be admitted to both ends of its corresponding motor and due to the differential piston area the piston rod of that motor will be moved out of its cylinder. On the other hand, when either of the valves 56 is opened the large end of its corresponding motor will be connected to the sump, and the piston rod will be moved into the cylinder. When both valves are closed, the large ends of the cylinders will be closed, and the pistons cannot move in either direction.

The valves 56 and 57 are controlled by individual solenoids 58 which are connected respectively to switch terminals 59 in a control box 61. The switch terminals are normally open and are adapted to be closed by contacts 62 to complete circuits selectively to the solenoids 58 to open the desired one of the valves. The switch contacts 62 are carried by an operating handle 63 as best seen in Figure 5 which projects from the control box and which is mounted therein on a universal joint connection including a ball 64 on the control handle slidably received in a socket, not shown, in the control box. The switches and handle are so arranged that movement of the handle in any given direction will cause movement of the gun in the same direction. For example, if the handle is moved down, it will close the contacts 59 at the top, as seen in Figure 4, to open the valve 56 for the vertical motor 41. This will cause the piston rod 42 to move down thereby depressing the back end of the bracket 38 and raising the front end of the gun to correspond generally to the angle of the handle. It will be noted that movement of the handle to a diagonal position may close two of the switches to cause simultaneous operation of the two motors 41 thereby to move the gun diagonally. In this way by simple movements of a single control handle movements of the gun can be accurately controlled.

The motors 25 and 31 for controlling vertical movement of the beam 18 and horizontal movement of the carriage on the beam may be controlled through a similar switch mechanism including the vertically spaced contacts 65 to control the motor 25 and the horizontally spaced contacts 66 to control the motor 31. The contacts 65 and 66 may be closed by cooperating contacts 62 carried by a control handle identical with that shown in Figure 5 and described above. It will be noted that the motor 31 is connected in the circuit through the limit switch 35 and a similar limit switch 67 may be provided for the motor 25 to limit vertical travel of the beam 18 in either direction.

When it is desired to raise the gun bodily, the handle for controlling the motors 25 and 31 may be raised to close the lower switch contacts 65.

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These will energize the motor 25 in a direction to raise the beam 18. Similarly, if it is desired to shift the gun and carriage to the left, the handle may be moved to the left to close the contacts 66 at the right, as seen in Figure 4. This will operate the motor 31 in a direction to move the carriage to the left on the beam. In this way the two motors may be controlled either separately or simultaneously to shift the carriage and the gun bodily to any desired position within the cleaning room. It will be noted that the gun can travel the full length of the beam 18 and can move from a position adjacent to the floor 12 of the room to an upper position close to the ceiling of the room. This adjustment together with the angular adjustment of the gun provided by the motors 41 gives complete flexibility of control so that the jet can be directed against the casting or other object from any desired position and at any desired angle to effect a complete cleaning operation.

The control unit may also control operation of the turntable on which the casting is mounted. For this purpose a reversible motor 68 is provided to drive the turntable and a reversing switch 69 is mounted in the control box to control the motor 68. In this way the turntable can be turned in either direction, as desired.

In the construction as best indicated by the diagram of Figure 4, the only parts which need to be inside the cleaning room are the carriage with its directly associated parts and the limit switches. The remainder of the mechanism may all be mounted outside of the cleaning room and the connections from the control box to the several motors and valves may be through flexible cables. In this way the operator can control all parts of the mechanism from any convenient position outside of the control room. Thus the operator can station himself adjacent any one of the several windows 15 from which the article to be cleaned is most clearly visible and can exercise complete control from such position.

While one embodiment of the invention has been shown and described in detail herein, it will be understood that this is illustrative only and is not to be taken as a definition of the scope of the invention, reference being had for this purpose to the appended claims.

What is claimed is:

1. Cleaning apparatus for castings and the like comprising a supporting structure including spaced vertical track members, a horizontal beam mounted on the track members for vertical movement thereon, means including a reversible electric motor to move the beam vertically, a carriage mounted on the beam for horizontal movement thereon, means including a reversible electric motor to move the carriage on the beam, a nozzle on the carriage, pairs of control switches for controlling the motors respectively, and a single operating handle engageable with the control switches and movable in different planes to control the respective pairs of switches.

2. Cleaning apparatus for castings and the like comprising a supporting structure including spaced vertical track members, a horizontal beam mounted on the track members for vertical movement thereon, means including a reversible electric motor to move the beam vertically, a carriage mounted on the beam for horizontal movement thereon, means including a reversible electric motor to move the carriage on the beam, a nozzle on the carriage, pairs of control switches for controlling the motors respectively, and a single

operating handle engageable with the control switches and movable in different planes to control the respective pairs of switches, means mounting the nozzle for universal angular adjustment, motors on the carriage connected to the nozzle to move it in different planes, control devices for the last named motors respectively, and a single operating handle movable in different planes to operate the respective control devices.

3. Cleaning apparatus for castings and the like comprising a supporting structure including spaced vertical track members, a horizontal beam mounted on the track members for vertical movement thereon, means including a reversible electric motor to move the beam vertically, a carriage mounted on the beam for horizontal movement thereon, means including a reversible electric motor to move the carriage on the beam, a nozzle on the carriage, pairs of control switches for controlling the motors respectively, a single operating handle engageable with the control switches and movable in different planes to control the respective pairs of switches, means mounting the nozzle for universal angular adjustment, motors on the carriage connected to the nozzle to move it in different planes, control devices for the last named motors respectively, a single operating handle movable in different planes to operate the respective control devices, a single control box in which the control switches and control devices are mounted, and flexible connections from the control box to the motors.

4. Cleaning apparatus for castings and the like comprising a supporting structure including spaced vertical track members, a horizontal beam mounted on the track members for vertical movement thereon, means including a reversible electric motor to move the beam vertically, a carriage mounted on the beam for horizontal movement thereon, means including a reversible electric motor to move the carriage on the beam, a nozzle on the carriage, pairs of control switches for controlling the motors respectively, a single operating handle engageable with the control switches and movable in different planes to control the respective pairs of switches, means mounting the nozzle for universal angular adjustment, fluid motors on the carriage connected to the nozzle to move it in different planes, flexible connections to supply operating fluid to the fluid motors, and control means to control the supply of operating fluid.

5. Cleaning apparatus for castings and the like comprising a supporting structure including spaced vertical track members, a horizontal beam mounted on the track members for vertical movement thereon, means including a reversible electric motor to move the beam vertically, a carriage mounted on the beam for horizontal movement thereon, means including a reversible electric motor to move the carriage on the beam, a nozzle on the carriage, pairs of control switches for controlling the motors respectively, a single operating handle engageable with the control switches and movable in different planes to control the respective pairs of switches, means mounting the nozzle for universal angular adjustment, fluid motors on the carriage connected to the nozzle to move it in different planes, flexible connections to supply operating fluid to the fluid motors, electrically controlled valves to control the supply of operating fluid to the fluid motors, and switches operable from a remote point to control the valves.

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6. Cleaning apparatus for castings and the like comprising a supporting structure including spaced vertical track members, a horizontal beam mounted on the track members for vertical movement thereon, means including a reversible electric motor to move the beam vertically, a carriage mounted on the beam for horizontal movement thereon, means including a reversible electric motor to move the carriage on the beam, a nozzle on the carriage, pairs of control switches for controlling the motors respectively, a single operating handle engageable with the control switches and movable in different planes to control the respective pairs of switches, means mounting the nozzle for universal angular adjustment, fluid motors on the carriage connected to the nozzle to move it in different planes, flexible connections to supply operating fluid to the fluid motors, electrically controlled valves to control the supply of operating fluid to the fluid motors, switches operable from a remote point to control the valves, a single control box in which all of said switches are mounted, and flexible connections from the control box to the valves and electric motors.

7. Cleaning apparatus for casting and the like comprising a room adapted to receive castings to be cleaned, spaced vertical track members in the room, a horizontal beam mounted on the track members for vertical movement thereon, a carriage mounted on the beam for horizontal movement thereon, a nozzle on the carriage, means including motors for moving the beam vertically and moving the carriage on the beam, means mounting the nozzle on the carriage for

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universal angular adjustment, motors connected to the nozzle to move it, and control means for all of the motors operable from a single point outside of the room.

8. Cleaning apparatus for castings and the like comprising a room adapted to receive castings to be cleaned and having a vertical wall formed with glazed openings therein, spaced vertical track members in the room, a horizontal beam mounted on the track members for vertical movement thereon, a carriage mounted on the beam for horizontal movement thereon, a nozzle, means mounting the nozzle on the carriage for universal angular adjustment, power means for moving the beam vertically on the track members, power means for moving the carriage on the beam, power means for angularly adjusting the nozzle on the carriage, and control means for the power means operable from outside of the room.

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