This invention relates to pumping mechanism and particularly to pumping mechanism operated by compressed air.

The general object of the invention is to provide a pumping mechanism which does not involve the use of pistons, packing or the ordinary pump valves, and which may be used for pumping water containing sand, gravel or sediment which would be likely to cut out piston cups and packing glands.

Another object is to provide a portable pump capable of being operated by compressed air and particularly capable of being operated by the usual portable motor-driven air compressors used for rock drills, tampers and other air operated tools used in road building or like work.

A further object is to provide a water receiver into which water is drawn by an injector operated by compressed air and provide means, when the water receiving tank is full, to automatically cause the compressed air to be directed into the tank itself and force the water out therefrom.

My invention is illustrated in the accompanying drawing wherein:

Fig. 1 is a side elevation of my improved pumping mechanism, the tank and the valve casing being broken away.

Fig. 2 is a sectional on the line 2—2 of Fig. 1.

Referring to the drawing, 15 designates a water receiving tank of any desired capacity. This tank is connected at its bottom to an elbow 11 which in turn is connected to the inlet and outlet valve casings 12 and 13. Within each of these valve casings there is disposed a check valve 14 shown in dotted lines in Fig. 1. From the valve casings 12 and 13 extend the nipples 15 which are formed and constructed so that they may be readily engaged with hose pipes or other lines wherein water may pass into the valve casing 12 and out of the valve casing 13.

Connected to the upper end of the tank 10 is an injector casing 16 having therein the injector nozzle 17. The injector casing is connected by a pipe 18 to a source of compressed air, this pipe having therein a shut-off valve, the casing of which is designated 19. The opposite end of the injector casing 16 is connected by a pipe 20 to a valve casing 21 having therein the upwardly extending seat 22, this seat being open on its bottom. Extending downward from the pipe section 21 is a casing 23 and bolted to this casing is a cylindrical piston casing 24. Disposed within the casing 23 is a vertically movable cut-off valve 25 having a stem 26 which extends downward into the casing 24 and is provided with a piston 27. A spring 28 urges this piston downward. The lower end of the casing 24 is connected to an air chamber 29 in turn connected by a pipe 30 to the air inlet pipe 18. The chamber 29 is provided with a cut-off valve 31 which, when raised, cuts off the supply of air from the pipe 30 to the chamber 29. An exhaust port 32 is provided below the inlet of the pipe 30.

Mounted upon the wall of the tank 10 is a housing 33, as shown in Fig. 3, and extending through the wall of the housing is a pintle or trunnion 34 carrying an arm 35 which has a pin and slot connection with the cut-off valve 31, the slot in the cut-off valve being designated 36. Disposed within the housing 33 and mounted upon the pintle or trunnion 34 is an arm 37 which extends into the tank 10 and carries at its end the float or ball 38. Of course, the pintle or trunnion 34 extends through a packing gland 39 so as to prevent the escape of air.

The cut-off valve, as will be seen from Fig. 1, is formed with a port 40 which, when the cut-off valve is fully lowered is in coincidence with the relief or exhaust port 32 and when the valve 31 is lifted to a predetermined height by the float 38, this port 40 will coincide with the port 41 into which the pipe 39 opens.

The operation of this mechanism is as follows:

Assuming that the tank 10 is empty, then compressed air is forced through the pipe 18 and through the nozzle 17 and out through the pipe 20 and the valve casing or chamber 21, the valve 25 at this time being lowered. The injector action of the air passing through the nozzle 17 will cause air to be drawn upward from the upper end of the tank and carried outward through the pipe 20 and valve casing 21 and discharged. The partial vacuum thus created will act to draw water into the tank through the elbow 11 and the valve casing 12, the valve 14 lifting to permit this inlet of water. When the water has risen within the tank to a predetermined height, the ball float 38, which has risen with the water, will cause the arm 35 to shift the valve 31 from the position shown in Fig. 1 to a position where pipe 30 will be communally connected with the lower end of the piston casing 24. Compressed air, therefore, will be directed into the valve chamber 29 and against the underface of the piston 27 urging the piston upward against the action of the spring 28 and closing the cut-off valve 25 against the seat 22, thus preventing the further flow of air through the pipe 20. Inasmuch as the air is prevented from flowing through the pipe 20, it will now pass downward into the upper
portion of the tank 10 and act to force the water out of the tank. This will close the check valve 14 in the casing 12 and open the check valve in the casing 13, permitting water to be forced out from the tank and out through the outlet pipe. When the float has fallen to the position shown in Fig. 1, it will pull the valve 31 downward so as to bring the port 40 into coincidence with the relief port 42 and cut off the passage of air through the pipe 30. This will relieve pressure beneath the piston 27 and the valve 25 will be opened and the compressed air will again pass out through the pipe 20, drawing in a fresh charge of water into the tank 10.

It will be seen that a pump of this character is extremely simple, that it may be readily operated by any ordinary air compressor such as commonly used by road working gangs or builders, and that the pump is particularly adapted for pumping water in which sand, gravel or silt is carried in suspension as there are no valves which the sand or silt would be likely to cut out or wear nor any reciprocating parts which would be likely to be scored by sand or gravel and no valve seats to be worn away. The pumping mechanism may be made, of course, of any desired size for any conditions of work, and it may be made very portable so that it may be carried around from one job to another. It is particularly designed to take the place of the ordinary hand pump used for pumping water out of ditches, holes or depressions in the ground and does away with the necessity of detailing a workman for the purpose of operating the pump, and eliminates the necessity of using a motor operated pump provided with pistons, valves and other parts liable to be worn away by the sand or gravel in the water.

While I have illustrated a particular embodiment of my invention, I do not wish to be limited thereto as obviously many changes might be made therein without departing from the spirit of the invention as defined in the appended claims.

What is claimed is:

1. A pumping mechanism of the character described, including a liquid containing tank, an inlet pipe and an outlet pipe connected to the lower portion of the tank, check valves in said pipes, a compressed air pipe line communicably connected to the upper end of the tank and adapted to be connected at one end to a source of compressed air, an injector nozzle disposed within said pipe line immediately above the connection to the tank, a valve seat formed in the discharge end of the air pipe, a casing extending downward from the valve seat, a cut-off gate valve disposed within said casing and adapted when raised to engage said seat, a piston carried by the cut-off valve, a spring urging the cut-off valve to an open position, an air chamber communicating with the piston casing and having an air inlet port and a relief port, a pipe connecting the air inlet port to the compressed air pipe behind the injector nozzle, a vertically movable valve extending into said air chamber and having a port adapted when raised to connect the air inlet pipe with the interior of the chamber and when lowered to connect the interior of the chamber with the relief port, said valve having a slotted shank, a float disposed within the tank and having an arm pivoted at one end, the pivot of said arm carrying a second arm having a pin connection to the slot in the valve shank.

2. A pumping mechanism of the character described, including a liquid containing tank, an inlet pipe and an outlet pipe connected to the lower portion of the tank, check valves opening in one direction in said pipes, a compressed air pipe line extending in a straight line above the top of the tank and connected through the top of the tank to the interior thereof, said pipe line having an injector nozzle disposed immediately above the opening into the tank, a valve seat formed in the outlet end of the pipe line and extending entirely thereacross, a cut-off valve disposed at right angles to the compressed air pipe line and movable from a position on said seat and entirely across the compressed air pipe line to a position entirely withdrawn from the pipe line, said cut-off valve having a port, a valve seat formed in the outlet end of the pipe line and extending entirely thereacross, a cut-off valve disposed at right angles to the compressed air pipe line and movable from a position on said seat and entirely across the compressed air pipe line to a position entirely withdrawn from the pipe line, said cut-off valve having a piston, a valve seat formed in the outlet end of the pipe line and extending entirely thereacross, a cut-off valve disposed at right angles to the compressed air pipe line and movable from a position on said seat and entirely across the compressed air pipe line to a position entirely withdrawn from the pipe line, said cut-off valve having a piston, a cylinder within which the piston is disposed, a valve chamber in communication with the cylinder below the piston, the valve having a port communicatively connecting the air chamber and having a vent port, a float movable vertically in the tank, a valve operating across said ports, means operatively connecting the float to said valve to cause the closing of the compressed air port and the opening of the vent port when the float is fully lowered and the closing of the vent port and the opening of the compressed air port when the float has risen a predetermined amount, and means urging the valve to an open position.

RAYMOND W. BRYANT.