

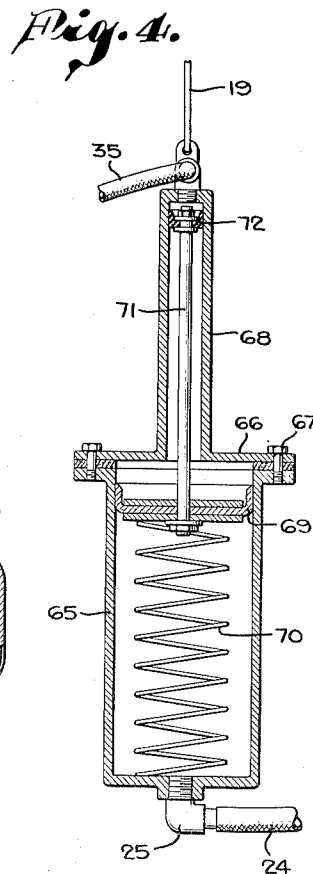
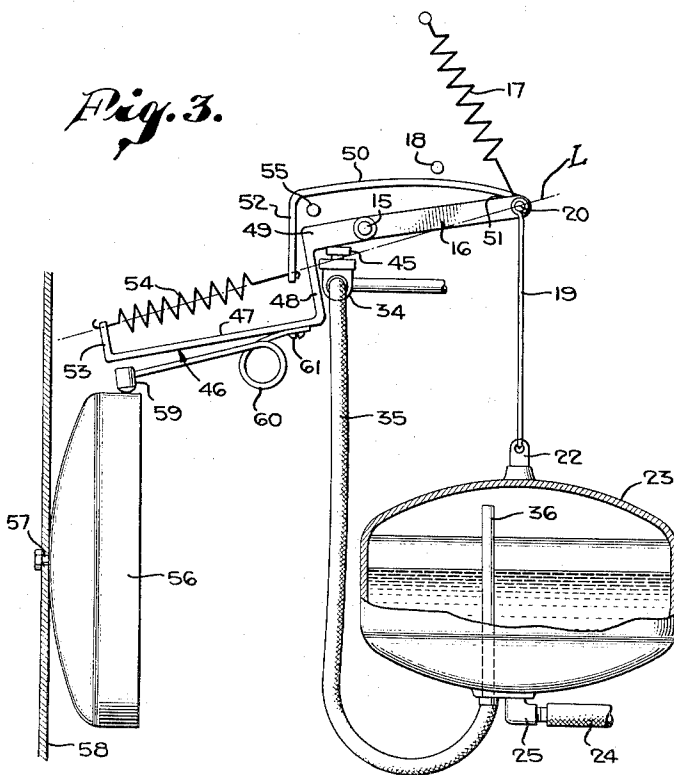
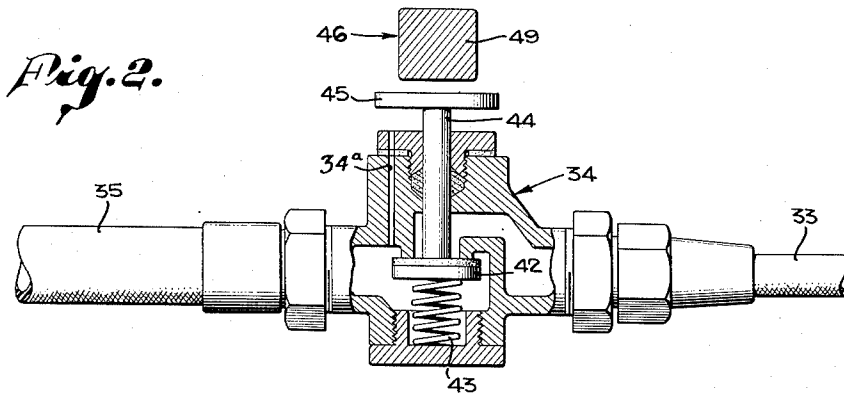
May 13, 1952

D. M. PAXTON
PRESSURE JET APPARATUS

2,596,593

Filed Dec. 8, 1947

2 SHEETS—SHEET 2



INVENTOR.
Dewey M. Paxton
BY
Samuel D. Jones
ATTORNEY

UNITED STATES PATENT OFFICE

2,596,593

PRESSURE JET APPARATUS

Dewey M. Paxton, Phoenix, Ariz., assignor to Industrial Research, Inc., a corporation of Arizona

Application December 8, 1947, Serial No. 790,249

5 Claims. (Cl. 103-243)

1

My invention relates to apparatus for producing jets of liquid of the same character and for the same purpose as the apparatus embodied in my pending application Serial Number 703,236, filed October 14, 1946.

It is a purpose of my present invention to both structurally and functionally simplify such apparatus without sacrifice of jet producing pressure and velocity, the structural simplification resulting in an apparatus of relatively low cost, and compact and light to enhance its portability.

It is also a purpose of my invention to provide a pressure jet apparatus which embodies a signal, preferably audible, which is operable automatically by and upon each actuation of the apparatus so that the operator may be apprised of and hence keep a record of the number of hydraulic jets produced by the apparatus for a given washing, flushing, or cleaning operation.

A further purpose of my invention is the provision of a liquid jet producing apparatus which may employ a single body of water repeatedly to produce successively jets of high pressure and velocity, thus conserving the water in localities where water is at a premium.

I will describe only two forms of liquid jet producing apparatus, each embodying my invention, and will then point out the novel features thereof in claims:

In the accompanying drawings:

Fig. 1 is a view showing schematically one form of pressure jet apparatus embodying my invention, with certain parts thereof in section.

Fig. 2 is an enlarged vertical sectional view taken on the line 2-2 of Fig. 1.

Fig. 3 is a view similar to Fig. 1 but showing the tank in lowered position as distinguished from the elevated position of Fig. 1, and with the valve and signal actuating mechanism in active position.

Fig. 4 is a view showing in vertical section and partly in elevation a modified form of apparatus embodying a pump which is to be substituted for the tank of the apparatus of Fig. 1.

Having specific reference to the form of my invention shown in Figs. 1 to 3, a stationary axle 15 is horizontally supported by any suitable means (not shown), and pivoted thereon at one end is an arm 16 urged by means of a spring 17 to an elevated position as defined by a stop pin 18. A rod 19 pivotally connected to the free end of the arm 16 as at 20, and likewise connected to an ear 22 fixed centrally to the top of a tank 23, suspends the latter from the arm for vertical movement therewith.

2

Water inlet and outlet means is connected to the bottom of the tank 23 through which water may be supplied to the tank, and such water discharged therefrom to a point for use. This water inlet and outlet means comprises a length of flexible hose 24 connected by an elbow 25 to the bottom of the tank 23. The other end of the hose is connected through an elbow 26 to the lower end of a pipe 27, the upper end of such pipe being connected by a cross union 28 to a water discharge pipe 29. A water supply conduit 30 is connected to the union 28 in axial alignment with a discharge pipe 29, and this conduit has therein a check valve 31 which operates to prevent water flow back to the source with which it is adapted to be connected. Ahead of this valve 31 there is interposed in the conduit a control valve 32 which is manually operable to cut off the water supply to the apparatus.

As in the apparatus embodied in my copending application hereinbefore referred to, water is adapted to be expelled intermittently from the tank 23 through the employment of compressed air, and for this purpose a compressed air supply line 33 is provided adapted for connection to an air motor (not shown). This line is connected to one side of a valve housing 34 with a flexible line portion 35 connected to the other side of the housing and extending to the bottom of the tank 23 where it is connected to an outlet stand pipe 36 that extends upwardly to a point above the normal water level in the tank. At the line portion 35 side the housing 34 is formed with a bleed port 34a the purpose of which will be described hereinafter.

The branch line 37 is connected to the main line 33 through a T union 38 and a valve 39, this branch line leading from the valve to the union 28 so that air under pressure can be supplied to the discharged pipe 29 when desired and as will be more fully described hereinafter. Connected to the other side of the union 38 is a pipe 40 leading to a pressure gauge 41 by which the pressure of air as supplied to the discharge pipe 29 through the branch line 37, may be determined.

The valve 39 is a conventional three way valve, and may be manually operated to connect the main line 33 to the branch line 37 or to discontinue the supply of air to the valve housing 34, and supply it directly to pipe 29.

As shown in Fig. 2 the valve housing 34 contains a valve 42 which is urged to closed position by a spring 43 and provided with a stem 44 having a head 45 exteriorly of the housing and

adapted to be engaged by an element to be later described for depressing the valve against the tension of the spring and thus opening the valve to permit air flow from the line 33 through the housing 34, line 35 and into the tank 23 through the pipe 36.

The elements 15, 16, 17, and 19, constitute parts of a mechanism for supporting the tank 23 for vertical movement to occupy the elevated position shown in Fig. 1 when the tank is empty of water, and to permit movement of the tank to the lowered position shown in Fig. 3 when the latter is supplied with a predetermined quantity of water, to open or close the valve 42 and to actuate a signal for audibly indicating that the tank 23 has been emptied of water.

This mechanism also includes an arm 46 having a horizontal portion 47 at the lower end of a vertical portion 48, and a second horizontal portion 49 which is pivotally mounted on the axle 15 and disposed directly above the head 45. An L-shaped flexible extension 50 of the arm 16 which is in the form of a spring wire, is fixed at one end to the free end of the arm as at 51. The vertical portion 52 of this extension is connected to a vertical portion 53 of the arm 46 by a coiled contractile spring 54. It is important to note that the upper end of the portion 53 is normally below the lower end of the portion 52, and that the latter is in the same horizontal plane as the axle 15. A stop pin 55 is positioned to engage the arm portion 49 and limit upward movement of the arm 46 under the action of the spring 54.

The audible signal hereinbefore referred to may comprise a bell 56 secured as at 57 to a vertical wall 58. This bell is adapted to be sounded by a tapper 59 on the free end of a spring arm 60 secured to the under side of the arm 46 as at 61.

In the operation of the apparatus to produce a pressure jet in the discharge pipe 29, the operator opens the control valve 32 allowing water to be supplied to the tank 23 through the pipes 27 and 24. Following this the valve 39 is adjusted to allow compressed air to flow through the line 33 to the valve housing 34. With the tank 33 in elevated position as shown in Fig. 1 and water flowing thereinto, as soon as the weight of the water overcomes the tension of the spring 17 the tank 23 will move downwardly to the position shown in Fig. 3, thereby swinging the arm 16 downwardly. As the arm moves downwardly the extension 50 is actuated to pull on the spring 54 and increase its tension, the extension flexing in so doing moves the vertical portion 52 downwardly. The instant the free end of the vertical portion 52 passes below the axle 15 as will be clear from the broken line in Fig. 3 which indicates the line of pull now exerted by the spring 54, the latter functions to snap the arm 46 to the lowered position shown in Fig. 3, wherein the horizontal portion 49 strikes the head 45 to open the valve 42 and close the bleed port 34a to prevent the escape of air. With the valve so opened compressed air from the line 33 now passes to the pipe 36 to rush into the tank 23 at a point above the water therein and thus expel the water through the hose 24, the pipe 27, and into the discharge pipe 29, the check valve 31 preventing the water from passing rearwardly to the source.

As soon as the tank 23 is sufficiently emptied so as to be raised by the spring 17, the coincidental elevation of the arm 16 elevates the extension 50 to remove the depressing action of the spring 54 on the arm 46 so that the latter is restored to its normal elevated position wherein

the portion 49 is moved out of engagement with the head 45 to allow the valve 42 to close under the action of the spring 43 and thereby prevent further flow of compressed air to the tank. The tank now being relieved of air pressure water will again flow from the pipe 30 through the pipe 27 and the hose 24 to refill the tank, thus initiating a second cycle of operation of the apparatus. From this mode of operation it will be clear that water will enter the tank 23 and be expelled therefrom in surges to be discharged from the pipe 29 in a continuous stream of fluctuating pressure and velocity and thereby effecting the high degree of cleaning action where the water as discharged is delivered to the cooling system of an internal combustion engine or to any other suitable use to which it may be put.

In order that the operator may have some audible indication as to the frequency and number of operations of the apparatus, the bell 56 has been provided. With each depression of the arm 46 the tapper 59 is caused to strike the bell thus indicating the beginning of a water surging operation. The tapper does not remain in contact with the bell following striking thereof by virtue of the spring 60, as will be understood.

If it is desired to discharge water from the pipe 29 of my apparatus in a continuous stream at a high constant pressure rather than in surges, the valve 39 is adjusted to discontinue air flow to the line 33 and cause it to flow through the line 37 where it combines with the water from the pipe 30 to increase the pressure and velocity of the water as discharged from the pipe 29.

Referring now to Fig. 4, I have here shown another form of apparatus which embodies all of the elements of the first apparatus with the exception of the tank 23 and the stand pipe 36. In place of the tank 23 I provide a water pump comprising a cylinder 65 to the lower end of which is connected the hose 24. The upper end of this cylinder is closed by a head 66 secured thereto by bolts 67, and the head is formed with a cylinder 68 of relatively small diameter as compared to that of the cylinder 65.

The air hose 35 is connected to the upper end of the cylinder 68 of an air pump so as to communicate therewith, and the two cylinders are suspended from the arm 16 by the rod 19 connected to the upper end of the cylinder 68. Within the cylinder 65 is a piston 69 urged upwardly therein by means of a spring 70, while a rod 71 is connected at its lower end to the piston 69, and at its upper end to a piston 72 which is movable in the cylinder 68.

The apparatus just described is designed more particularly for use where water is at a premium, for in this apparatus the same water can be used repeatedly to effect cleaning of the cooling system of an engine. Once the system is freed of accumulated matter, the water so used is drained from the cylinder 65, and filled with fresh water to flush out the system by opening the control valve 32.

In the operation of this form of my apparatus, the control valve 32 is opened to supply water to the bottom of the water pump cylinder 65, and the valve 39 adjusted to allow compressed air to flow to the valve housing 34. Once the cylinder 65 becomes filled with water, the control valve 32 is closed and the now filled cylinder descends to move the mechanism for the air valve 42 and the bell tapper 39, from the position of Fig. 1 to that of Fig. 2. In consequence, the bell 56 is sounded and the valve 42 opened to sup-

ply compressed air to the pump cylinder 68 whereupon the piston 72 is forced downwardly against the tension of the spring 70, to actuate the piston 69 and thus expel water from the cylinder 65 to be discharged finally from the pipe 29.

The cylinder 65 now being empty of water the two pumps rise under the lifting action of the spring 17 to allow the mechanism to return to its original position thus permitting the valve 42 to close, air in the cylinder 68 to bleed to atmosphere through the port 34a, and the pistons 69 and 72 to be moved by the spring 70 back to elevated position in their respective cylinders.

Under this upward movement of the piston 69, that water previously expelled is drawn back into the cylinder 65 for reexpulsion upon a second operation of the apparatus. In this manner the same water can be repeatedly employed and surged through the cooling system of an internal combustion engine as an example, until all foreign matter therein has been loosened. Once this is accomplished, the water so used is drained from the cylinder 65, and the cylinder refilled with fresh water by opening the control valve 32, to be used in flushing out the cooling system.

If the apparatus is below the cooling system being cleaned, the water expelled from the cylinder will flow back thereinto and elevate the piston 69. However, by adding the spring 70, the position of the apparatus with respect to the cooling system, may be disregarded, for the spring in expanding will rapidly elevate the piston to insure refilling of the cylinder with water and in a rapid manner.

Although I have herein shown and described only two forms of pressure jet apparatus each embodying my invention, it is to be understood that various changes and modifications may be made therein without departing from the spirit of my invention and the spirit and scope of the appended claims.

What I claim is:

1. A pressure jet apparatus, including: a pump having a cylinder and a spring-loaded piston therein; a hollow cylinder projecting from one end of the cylinder of the pump; a piston rod projecting from said pump piston into the hollow cylinder; a piston on the piston rod; water inlet and outlet means connected to the lower end of said pump; a compressed air line connected to the other end of said pump above the second-said piston; a normally closed valve in said line preventing air flow to said pump; and a spring-loaded mechanism supporting said pump for vertical movement and to snap the latter to an elevated position when empty of water, and permitting movement of said pump to a lowered position when containing a predetermined quantity of water, said mechanism so correlated to said valve as to open the latter when said pump is in lowered position to admit compressed air to said second said piston and move the first said piston thereof to expel water therefrom and thereby allow said mechanism to elevate said pump and close said valve.

2. A pressure jet apparatus, including: a water pump having a cylinder and a spring-loaded piston therein; a source of water supply for filling said pump; a valve for cutting off said cylinder from said source once the cylinder is filled; an air motor structurally associated with said piston and comprising a relatively small cylinder forming a coaxial continuation of the cylinder of the water pump and a piston working in said first cylinder and having its rod unitary with

the piston of the water pump; for actuating said water pump; a source of compressed air for operating said air motor; a normally closed valve controlling the supply of compressed air to said motor from said air source; and a mechanism operable by the water pump when filled to open said air valve thereby causing said air motor to actuate the water pump to expel water therefrom, and to allow closing of said air valve when said water pump is emptied, whereby said water pump will be actuated by said spring to draw water back thereinto to refill the same.

3. A pressure jet apparatus, including: a tank, water inlet and outlet means connected to said tank; a water supply conduit connected to said means; a supply line for compressed air communicating with the top portion of said tank; a normally closed valve in said line preventing air flow to said tank; and a mechanism for supporting said tank for vertical movement and capable of urging the empty tank to an elevated position and enabling said tank to move to a lowered position when containing a predetermined quantity of water, comprising a first arm; a second arm organized with said valve for opening the same; a common pivot for said arms from which they extend in opposite directions; a connection between said first arm and said tank suspending the latter from said arm; a spring connected to and positioned above said first arm for urging the arm and tank upwardly; an extension of said first arm projecting to the other side of said pivot from said arm; and a second spring so connected to said extension and said second arm that when said first arm is lowered by said tank to a position in which that end of said second spring which is connected to said extension is below said pivot the spring will depress said second arm and open said valve.

4. A pressure jet apparatus, including: a surge tank; water inlet and outlet means connected to the lower portion of said tank; a water supply conduit connected to said means; a supply line for compressed air communicating with the top portion of said tank; a normally closed valve in said line preventing air flow to said tank; and a spring-loaded mechanism supporting said tank for vertical movement and to urge said tank to an elevated position when empty of water, and permitting movement of said tank to a lowered position when containing a predetermined quantity of water as supplied thereto from said means, said mechanism so correlated to said valve as to open the latter under movement of said tank to lowered position thus allowing compressed air to be supplied to said tank for expelling water therefrom through said means, said mechanism comprising a first arm, a second arm for opening said valve, a common pivot for said arms from which they extend in opposite directions, a connection between said first arm and said tank suspending the latter from said arm, a spring connected to and positioned above said first arm for urging the arm and tank upwardly, an extension of said first arm projecting to the other side of said pivot from said arm, a second spring so connected to said extension and said second arm that when said first arm is lowered by said tank to a position in which that end of said second spring connected to said extension is below said pivot the spring will depress said second arm and open said valve.

5. A pressure jet apparatus, including: a surge cylinder; water inlet and outlet means connected to the lower end of said cylinder; a piston in

7

said cylinder; a spring for urging said piston upwardly within said cylinder; a piston rod projecting upwardly from said piston; a second cylinder surrounding the rod; a piston working in the second cylinder; a supply line for compressed air connected to the upper end of the second cylinder; a normally closed valve in said line preventing air flow to the second cylinder; and mechanism supporting the cylinders for vertical movement and to urge the latter to an elevated position when the first mentioned cylinder is empty of water, and permitting movement thereof to a lowered position when the first mentioned cylinder contains a predetermined quantity of water as supplied thereto from said means, said mechanism so correlated to said valve as to open the latter under movement of said cylinders to lowered position thus allowing compressed air to be supplied to the second cylinder for actuating the piston therein and through the rod thereof to operate the piston in the first mentioned

8

cylinder to expel water from the latter through said means.

DEWEY M. PAXTON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

10	Number	Name	Date
	318,202	Pedicord	May 19, 1885
	350,146	Metz	Oct. 5, 1886
	832,930	Strong	Oct. 9, 1906
	903,420	Themke et al.	Nov. 10, 1908
15	922,870	Esping	May 25, 1909
	1,186,485	McClelland	June 6, 1916
	1,528,541	Hampton	Mar. 3, 1925

FOREIGN PATENTS

20	Number	Country	Date
	586,761	France	Apr. 3, 1925