

No. 617,934.

Patented Jan. 17, 1899.

W. B. MASON.
PUMPING APPARATUS.

(Application filed Feb. 21, 1898.)

3 Sheets—Sheet 1.

(No Model.)

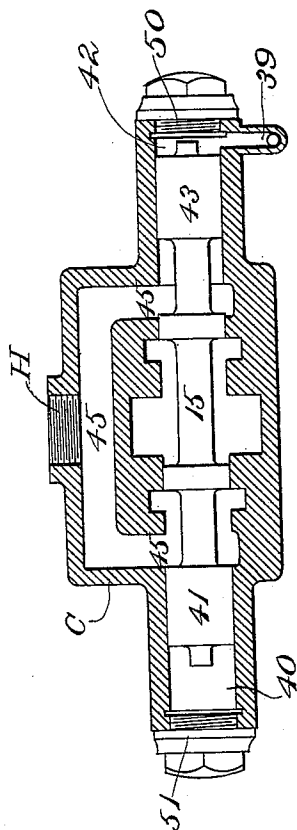


Fig. 2.

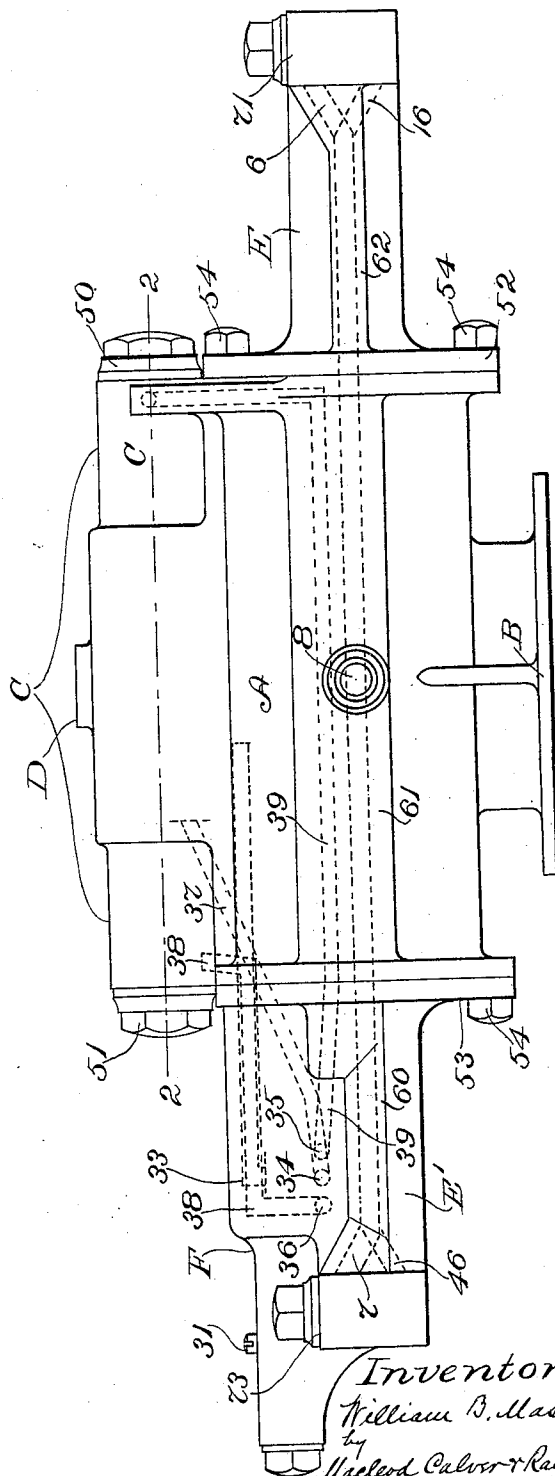


Fig. 1.

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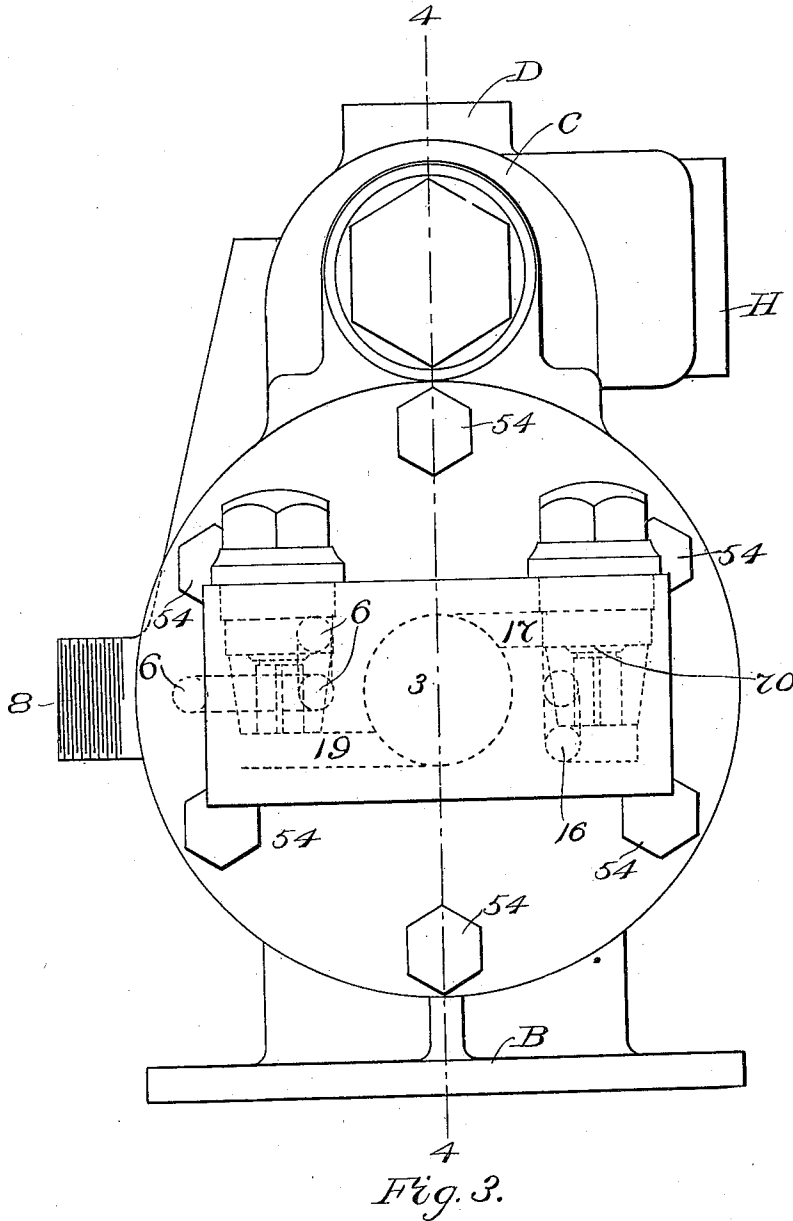
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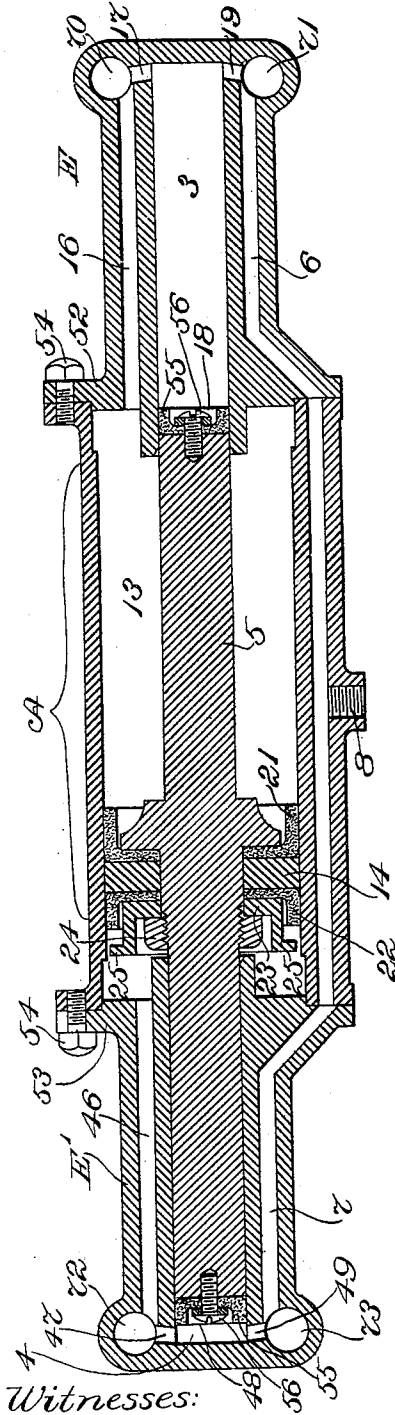
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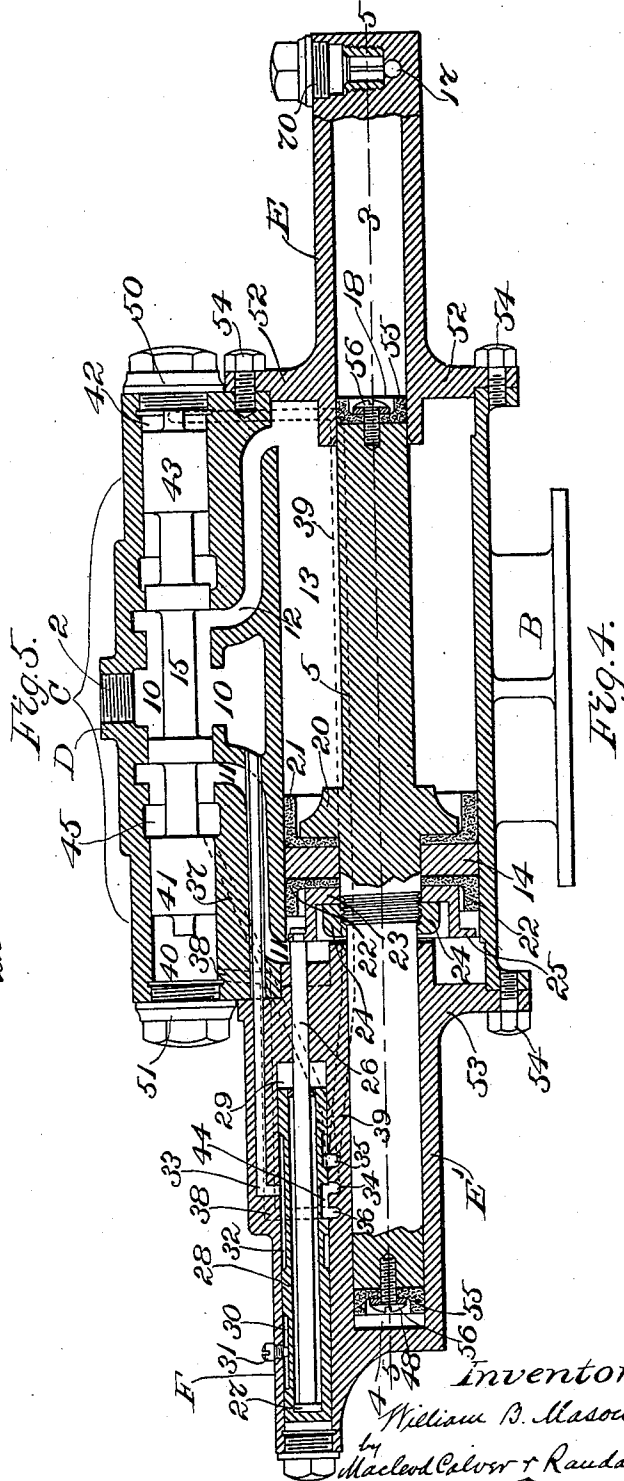
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UNITED STATES PATENT OFFICE.

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PUMPING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 617,934, dated January 17, 1899.

Application filed February 21, 1898. Serial No. 671,009. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM B. MASON, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Pumping Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention has for its object to provide an improved apparatus by the employment of which water under pressure may be used to charge a tank under a higher pressure, a portion of the water which at the lower pressure furnishes the power being supplied to the tank under the higher pressure.

It sometimes become desirable to charge a tank with water under a relatively high pressure. This may be effected by means of a pump of any well-known construction; but in many instances steam or other motive power to run the pump is not easily obtained or is expensive. In most instances water such as is piped into the buildings of a town or city is obtainable, and this water is under pressure, and if it can be used furnishes, usually, the most economical and convenient means of charging the tank. By means of my apparatus I am enabled to use water in a pipe under relatively low pressure and to obtain therefrom power to pump a portion of the same water which furnishes the power into a tank or other receptacle against a relatively high pressure.

In the following description and accompanying drawings I have fully set forth my invention, and in the claims at the close of this specification I have pointed out and clearly defined the novel features thereof.

In said drawings, Figure 1 is a side elevation of an apparatus embodying my invention. Fig. 2 is a horizontal section on line 2 2 of Fig. 1. Fig. 3 is an end elevation, enlarged, some of the interior parts being indicated in dotted lines. Fig. 4 is a vertical section on line 4 4 of Fig. 3. Fig. 5 is a horizontal section on line 5 5 of Fig. 4, the inlet and outlet ports of the supplementary cylinders being shown for greater clearness in full lines at the ends of said cylinders where they should properly be shown in dotted lines.

In the drawings the shell or case of the apparatus is shown as made in three parts, each of which is preferably of cast metal.

A is the central portion, which is provided underneath with a base-plate B, upon which the apparatus is designed to rest. On the top or upper portion of the part A is formed an auxiliary shell or case C, within which is located an exhaust-chamber, a pressure-chamber, and a double-acting valve, which controls the inflow of water to the main cylinder.

D is a boss on top of the part C, through which the water-inlet 2 (see Fig. 4) is formed. At each end of the central part A are cases or shells E E'. The shells E E' contain cylinders or chambers 3 and 4, respectively, into which alternately the opposite ends of the double-acting plunger 5 move to force the water contained in said cylinders into the outlet-passages 6 and 7 (see Fig. 5) leading from said chambers 3 and 4, respectively.

F is an auxiliary case or cylinder on top of the case E' and preferably formed integral therewith. The cylinder F contains an auxiliary valve, hereinafter described. The outlet with which the passages 6 and 7 communicate is shown at 8, Figs. 1 and 5. The outlet for the exhaust-water is shown at H, Fig. 2.

The water from the supply-pipe, which is under relatively low pressure, enters through the inlet 2 into the valve-chamber 10. Leading from said chamber are two ports 11 and 12, which communicate with the interior of the main cylinder 13, one of said ports entering said cylinder at one end thereof on one side of the piston 14 and the other of said ports entering said cylinder 13 at the opposite end thereof and at the opposite side of the piston 14. The said ports 11 and 12 are opened and closed alternately to the water in the chamber 10 by means of the double-acting valve 15. In Fig. 4 the port 12 is shown as in communication with the said chamber 10, while the port 11 is cut off therefrom. The water in the chamber 10 may pass in the position in which the valve is shown in said Fig. 4 through the said port 12 and into the main cylinder 13. In said cylinder 13 the pressure of the water is exerted upon the piston 14 and causes the said piston and the plunger 5 to

move toward the left in Fig. 4. In said figure the said piston is shown as at the end of a stroke to the left. The water in the cylinder 13 at the right of piston 14 not only exerts a pressure on the piston within the said cylinder, but it flows through the port 16 (see Fig. 5) and through the short port 17 into the cylinder 3. In flowing into the cylinder 3 the water passes through a check-valve 70 of common construction, which allows it to pass into the said cylinder 3, but prevents it from passing back through the said inlet passages or ports. By this arrangement the pressure of the live water is also exerted on the end 18 of the plunger 5, and the plunger is consequently moved by a pressure exerted over an area equal to the entire cross-sectional area of the piston and plunger.

When the parts are in the position shown in Figs. 4 and 5, the small or supplementary cylinder 3 at the right-hand end of the apparatus is filled with water, which cannot flow back through the port by which it entered and which at the return stroke of the plunger 5 is forced out of the cylinder 3 through the short port 19 and thence through the port 6 to the outlet 8. In flowing through the said ports 19 and 6 it passes through a check-valve 71 of common construction, which permits it to flow toward the outlet, but prevents it from flowing in the opposite direction. The plunger 5 is provided with an annular projection or collar 20, which is preferably integral with said plunger, and between which and the annular piston 14 is placed a suitable packing of leather or similar material. The packing employed in the apparatus shown is a cup-shaped packing of leather, (designated at 21.) A similar packing 22 is placed on the other side of the annular head 14, and an annular cup-shaped ring of metal 23 is then slid on the plunger and placed next the packing 22, and the whole is secured in place by means of a nut 24, which is screwed on a threaded and slightly-enlarged portion of the plunger 5, as shown. The cup-shaped ring 23 has an outwardly-projecting flange, (shown at 25.) At one point on this flange is secured a valve-actuating rod 26, (see Fig. 4,) which reciprocates with the piston 14. The opposite end of the said valve-rod 26 is provided with a cap 27, which plays in a cylindrical chamber in the auxiliary valve 28. The valve 28 is preferably cylindrical and moves in a cylindrical chamber 29 in the shell or case F. As above stated, the valve-rod 26 moves with the piston 14 in the main cylinder 13; but the valve 28, which is operated by said rod 26, has a relatively small movement which is imparted to it by said rod at the end of each stroke or lengthwise movement of the latter. In the position in which the parts are shown, Fig. 4, the cap 27 on the said rod 26 has been moved into contact with the left-hand end of the valve 28 and has moved the said valve 28 toward the left. When the rod 26 moves toward the right at the next stroke

of the plunger 5, the cap 27 will be brought into contact with the right-hand end of the valve 28 and will at the end of the stroke of the said plunger move the said valve 28 a short distance toward the right. The object of the auxiliary valve 28 is to reverse the valve 15 positively and certainly at the proper times—that is, at the end of the full stroke of the plunger 5—and the lost motion in the valve-rod 26 permits the said valve 28 to remain stationary during the greater part of the movement of the plunger 5 and to be moved at the proper time at the end of the stroke of the plunger 5 to reverse the valve 15 and cause a movement of the plunger 5 in the opposite direction. The auxiliary valve 28 is grooved lengthwise at 30, and a screw-stud 31, which is set in the valve-casing F, projects into said slot 30 and prevents the valve 28 from rocking or rotating, while at the same time permitting it to be moved lengthwise. An annular chamber 32 is formed on the valve 28, which is connected by means of a port 33 with the lower part of the chamber 10, so that live water may pass from said chamber through the port 33 into the annular chamber 32. Underneath the valve 28 are three openings or ports 34, 35, and 36. The opening 34 leads into the exhaust-port 37. (Indicated in dotted lines in said Fig. 4.) The opening 36 leads into the port 38, which connects with the left-hand cylinder 40, in which the piston-head 41 at the left-hand end of the valve 15 works. The opening 35 connects with the port 39, which leads to the cylinder 42, in which the piston 43 at the opposite end of the valve 15 works. In Fig. 4 the plunger 5 has completed its stroke toward the left in said figure, and the valve-actuating rod 26 has moved the valve 28 so as to open the port 39 to the inflow of live water from the annular chamber 32 and to permit the exhaust from the cylinder 40 to pass through the port 38 through the connecting groove or recess 44 in the valve 28, and thence out by the exhaust-port 37 into the exhaust-chamber 45. The pressure in the cylinder 40 being removed from the piston 41 and the live water being admitted to the cylinder 42 to act upon the piston 43, the valve 15 will now be moved toward the left, closing the port 12 to the live water in the chamber 10 and opening it to the exhaust-chamber 45 and opening the port 11 to the live water in the chamber 10 and closing it to the exhaust-chamber 45. The live water will then pass through the port 11 into the cylinder 13 and will exert a pressure on the left side, Fig. 4, of the piston 14, and will also pass through the port 46 and the short port 47 into the cylinder 4 and will exert a pressure on the head 48 at the left-hand end of the plunger 5. This will force the plunger 5 toward the right, exhausting the water from the right-hand end of the cylinder 13 and forcing the water in the cylinder 3 through the outlet passages or ports 19 and 6. The ports 46 and 47 are provided with a check-valve 72

to admit the live water into the cylinder 4 and to prevent it from flowing through said ports in the reverse direction in the same manner as are the ports 16 and 17, which admit the live water into the cylinder 3 at the opposite end of the machine. In like manner the outlet-ports 49 and 7 from the cylinder 4, through which the water is pumped or forced when the plunger 5 moves back again toward the left in said figures, are provided with a one-way valve 73 to prevent the flow of water in the opposite direction in the same manner as are the outlet-ports 19 and 6 at the opposite end of the machine. The ends of the cylinders 42 and 40 of the valve 15 are closed by means of screw-bolts 50 and 51, which are screwed into or otherwise suitably secured to the casing C, and form the ends of the said cylinders 42 and 40. The shells or cases E and E' are flanged, as shown at 52 and 53, respectively, and are secured to corresponding flanges on the central case or shell A by means of screw-bolts 54 or other suitable fastening means.

The ends of the plunger 5, which work within the cylinders 3 and 4, are suitably packed. A cup-shaped leather packing 55 is employed in the apparatus, as illustrated in the drawings, and is held in place by a screw 56 in the well-known manner.

The inlet-ports 16 and 46 and the outlet-ports 6 and 7 in the shells E E', respectively, as also the inlet-ports in the shell A, are formed, preferably, in longitudinal ribs or projections on said shells. These ribs on the outlet side of the machine are shown at 60, 61, and 62, Fig. 1.

In the foregoing description I have referred to the use of my apparatus in connection with a tank or reservoir containing water under pressure; but I do not desire to limit myself to the employment of my apparatus in this connection, as it may be put to a very large variety of uses in which it is necessary to employ a pump.

What I claim is—

1. An apparatus comprising the main cylinder and the two supplementary cylinders at opposite ends thereof, the main and supplementary pistons all moving in unison, ports providing for the admission of live fluid into the main cylinder and its outflow as waste, valve mechanism controlling the movement of the fluid through such ports, ports leading a part of the live fluid to the respective supplementary cylinders, and valves for such ports, whereby such live fluid in one supplementary cylinder acts against the corresponding supplementary piston to assist in the expulsion of the fluid from the other supplementary cylinder by the other supplementary

piston, outlet-ports for the said supplementary cylinders, and valves therefor, substantially as described.

2. An apparatus comprising the main cylinder and the two supplementary cylinders at opposite ends thereof, the main and supplementary pistons all moving in unison, ports providing for the admission of live fluid into the main cylinder and its outflow as waste, valve mechanism controlling the movement of the fluid through such ports, ports establishing direct connection between the main cylinder and the respective supplementary cylinders, and valves for such ports, whereby the live fluid entering the main cylinder may pass thence to the supplementary cylinders and act in each of the latter against the corresponding supplementary piston to assist in the expulsion of the fluid from the other supplementary cylinder by the other supplementary piston, outlet-ports for the said supplementary cylinders, and valves therefor, substantially as described.

3. The herein-described apparatus comprising the main cylinder and the two supplementary cylinders at opposite ends thereof, the double-acting plunger having its ends working in the said supplementary cylinders and provided with the piston working in the said main cylinder, the ports providing for the admission of live fluid into the main cylinder and its outflow as waste, the valve 15 controlling such ports, the valve-cylinders at opposite ends of the said valve, ports communicating with the said valve-cylinders, the auxiliary valve 28 controlling the said ports and having the chamber within the same, the valve-actuating rod 26 reciprocating in unison with the said piston, extending within the said chamber, and imparting movement to the said auxiliary valve at the ends of the strokes of the piston, the ports establishing direct connection between the main cylinder and the respective supplementary cylinders, the check-valves in said ports, whereby the live fluid entering the main cylinder may pass thence to the supplementary cylinders and act in each of the latter against the corresponding end of the double-acting plunger 5, to assist in the expulsion of the fluid from the other supplementary cylinder by the other end of said double-acting plunger, outlet-ports for the said supplementary cylinders, and valves therefor, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM B. MASON.

Witnesses:

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