C. W. BALDWIN.

Hydraulic Elevator.

No. 201,980. Patented April 2, 1878.

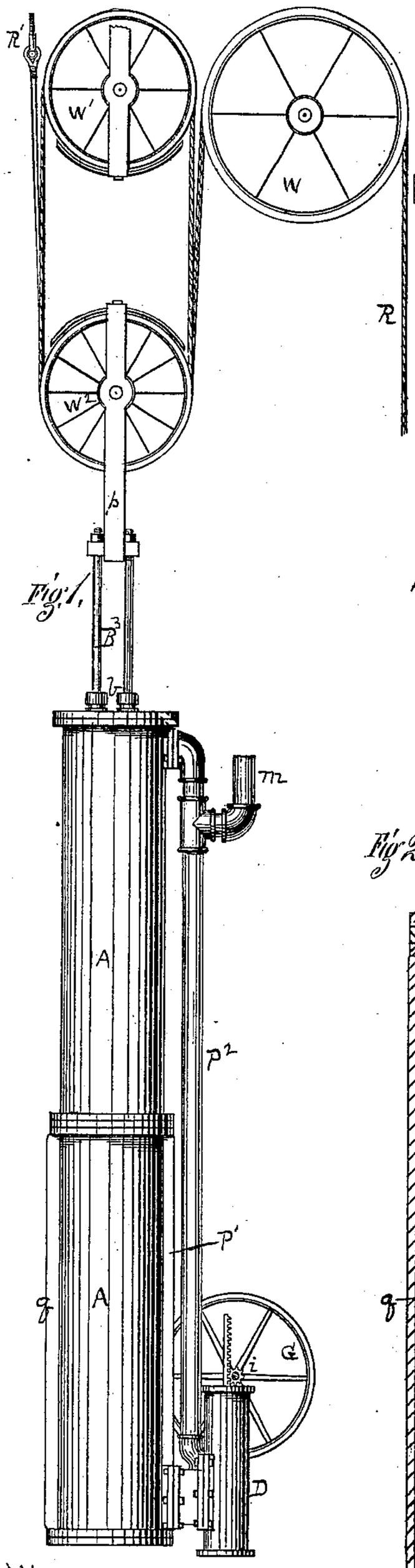

Fig. 1.

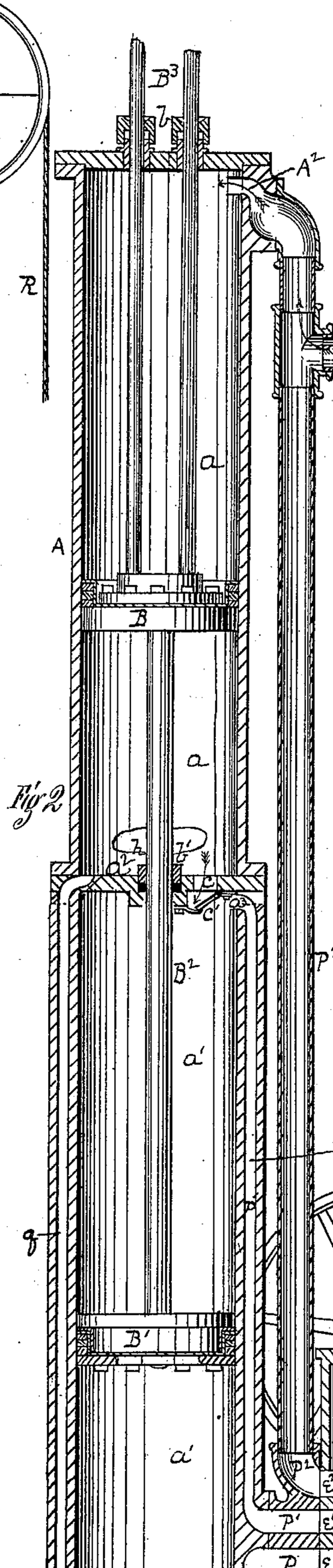

Fig. 2.

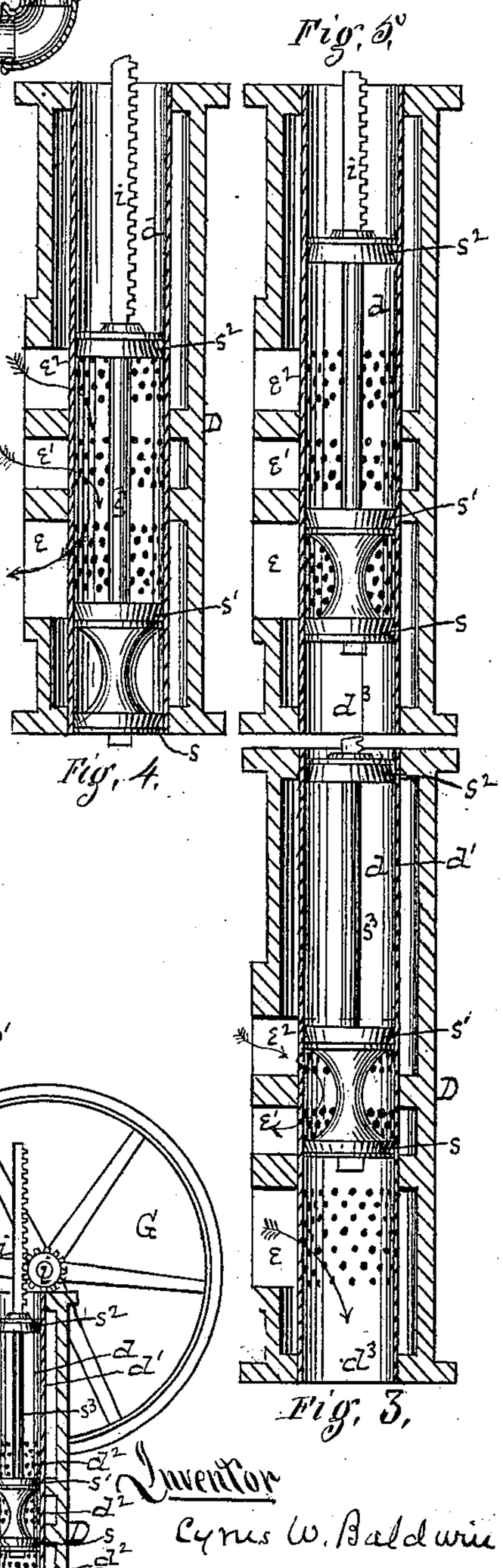

Fig. 4.

Fig. 3.

Witnesses

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IMPROVEMENT IN HYDRAULIC ELEVATORS.

Specification forming part of Letters Patent No. **201,980,** dated April 2, 1878; application filed February 8, 1878.

To all whom it may concern:

Be it known that I, CYRUS W. BALDWIN, of Brooklyn, county of Kings, State of New York, have invented or discovered a new and useful Improvement in Hydraulic Elevators; and I do hereby declare the following to be a full, clear, concise, and exact description thereof, reference being had to the accompanying drawing, making a part of this specification, in which, like letters indicating like parts—

Figure 1 is an outline elevation of so much of the apparatus as is requisite in order to illustrate my improvement. Fig. 2 is a sectional elevation, to an enlarged scale, of the cylinder, piston-valves, and connections of Fig. 1; and Figs. 3, 4, and 5 are sectional views, to a somewhat larger scale, of the valve devices of Fig. 2, showing the different positions of the valves as adjusted for different purposes.

This improvement relates to that class of hydraulic elevators in which the ram, piston, or plunger is operated by variations of fluid-pressure on one or both sides of the piston or head, and more specifically to the construction of a double piston, in connection with other operative devices, whereby a double lifting-power is secured without increase of fluid-pressure, or of the diameter of the cylinder.

A portion of the lifting-rope is represented at R. This rope passes over the pulley or wheel W, in the usual way, and thence any desired number of times around the fixed and movable sheaves or pulleys W^1 W^2, (of which more or less may be used, as desired,) and its end is made secure at R′. The movable pulleys W^2 are connected by a stirrup, *p*, with the double piston-stem B^3, which latter, passing through stuffing-boxes *b* into the cylinder A, is connected at its opposite end with the double piston B B^1. The cylinder A is made in two parts, or is divided into two compartments or chambers, *a* a^1, by means of a transverse diaphragm, a^2, at or about midway between its two ends. The piston-heads B B^1 play one in each chamber. Both are attached to the same intermediate stem B^2, so as to receive the same motions. The stem B^2 plays through a stuffing-box, *b′*, and in the diaphragm I make a port, *c*, opened and closed by any suitable form of valve, *c′*. Supply and discharge ports A^1 A^2 are made at or near the ends of the cylinder A.

The valve-case D has a valve-chamber, *d*, preferably of cylindrical form, and, by preference, lined with lining d^1, and in such lining I make perforations d^2, covering the ports *e* e^1 e^2. The port *e* has a pipe communication, P, with the cylinder-port A^1. The port e^1, by a pipe or passage, P^r, communicates with a cylinder-port, a^3, at or near the upper end of the chamber a^1, and the port e^2 is connected, by a pipe, P^2, with the cylinder-port A^2.

In the valve-chamber D, I arrange a series of disk-shaped valves, *s* s^1 s^2, on a common stem, s^3. These valves are provided with suitable packing, preferably cup-leather packing, and the stems project outside of the valve-case, so that the valves can be shifted by rack and pinion *i*, or in other suitable way. Water under pressure is admitted at *m* from any suitable head or source of supply.

The valves in valve-case D receive their motion, through rack and pinion *i*, from an operating-wheel, G, or other equivalent device capable of being moved so as properly to shift the valves by the use of an operating-cord in the car, or other known means adapted to the like end. A hand-hole, *h*, covered by a cap, is provided in the side of the cylinder A near the diaphragm a^2, for convenience in packing the stem B^2 and the piston-head B.

The lower open end of the valve-chamber constitutes a waste-port, as at d^3. The apparatus has also an open water passage or communication, *q*, from the chamber *a*, near the diaphragm a^2, to the chamber a^1, below or outside of the utmost point of motion of the piston-head B^1.

When the operator in the car desires to raise the car while empty or with only a light load, he works his operating-cord so as to bring the valves to the position shown in Fig. 2.

Both chambers *a* a^1 are presumed to be full of water under pressure, as also the communicating pipes. Full water-pressure will then be effective on the upper side of the piston-head B, and water below the piston-head B^1 will flow out freely at d^3. The valve s^1 prevents the supply from escaping at the waste-port. Water from below the piston-head B

will open valve c' and flow through the port c, so as to fill the space vacated by the piston B^1 as it moves downward, the latter acting, perhaps, somewhat as a pump-piston to draw the water through. The residue, if any, of water under B will pass through q to the waste-port.

To work the apparatus with maximum effect in raising heavy loads, the wheel G is turned so as to shift the valves to the position shown in Fig. 3. In this adjustment the ports e^1 and e^2 are brought into communication, and water in the pipe P^2 (which is continuously under pressure) is free to pass from port e^2, through between the valves s and s^1, through port e^1, and into pipe P^1, and by port a^3 into the upper end of the lower cylinder or chamber, and above the piston-head B^1. Water-pressure will then act effectively on top of the piston-head B, as before; also, the water-pressure, entering at a^3, as just explained, will close the valve c', and act with its full force on the upper side of the piston-head B^1, the water below B escaping by q and d^3, as before, and water below B^1 escaping at d^3, in both cases without resistance. I thus get the effective force of the water-pressure on two cylinders instead of one, thus practically doubling the power of the apparatus.

To lower the car, the valves are shifted to the position in Fig. 4. In this adjustment both valves s s^1 are below the escape-port, so that the waste is entirely cut off; also, both ports e^1 and e^2 are brought into communication with the port e. The car, then being sufficiently heavy, or being counterweighted, comes down by its own gravity. Water above the two piston-heads flows by ports e^2 e^1 into the chamber a^1 below the lower piston B^1, and a portion of it passes up q into the space below the upper piston B. By raising the valves a little the port e can be partially closed, and the circulation of water from above to below the pistons can thereby be so choked as to prevent a too rapid descent of the car, should such danger occur. To stop the car at any time it is only necessary to bring the valves to the position shown in Fig. 5. The waste or discharge is closed by the valve s, and the circulation from above the pistons to below them is prevented by the valve s^1.

In all the adjustments described the valves are balanced as regards water-pressure; but if such balancing is not desired the valve s^2 may be omitted, the end of the valve-chamber being closed by a cap made with a stuffing-box for the valve-stem to play through.

As regards the passage P^1 and its port e^1, and the manner of opening and closing the latter, I do not limit myself to the form of construction shown; but in so far as the same is an element in the present improvement, I include herein any suitable water-conduit, communicating at one end with the water under pressure, and at the other end with the chamber a^1 above the piston B^1, and provided with any suitable form or construction of valve or cock, operated in any desired way, for opening and closing such conduit; nor, by speaking of the upper and lower sides of the piston-heads, do I intend to confine myself to a vertically-arranged apparatus, since the cylinder may be arranged horizontally, if so preferred. The terms "upper" and "lower," "above" and "below," are used relatively.

It will also be observed that the chambers a a^1 are, in effect, two cylinders fixed in position in the same axial line; and, if so preferred, they may be made separately, and so arranged relatively to each other. The stem B^2, made a little longer, will then extend through a stuffing-box in each contiguous cylinder-head, and a suitable water-conduit, with any proper form of valve, will take the place of the diaphragm-port c, so as to perform the same function. In such case the passage q may have the same lower terminus as described, or a separate valve may be added for closing it at the proper time.

I might also use the same device and arrangement in general if both cylinders were open at one end and the water applied to only one side of the piston, so that by forcing it up or down the necessary power might be communicated to the car; but I prefer to use water on both sides of the piston, so as to utilize the full pressure at the point of discharge, and to have the water to act as a brake in the descent of the car by passing it through a confined space to the bottom of the piston.

Nor do I limit myself in either form of the invention to the use of pistons of the same diameters, since they may be varied in this respect at pleasure, or according as it may be desired that the additional piston should do more or less than double the work of the first one; also, by a duplication of the proper pipes and ports, the skilled mechanic can adapt the apparatus described to three or more like cylinders and pistons, and such feature is hereby included within the present invention.

I claim herein as my invention—

1. In a hydraulic elevator, the combination of two or more cylinders arranged in line, a corresponding number of piston-heads (one in each cylinder) on a common stem, a valve-governed conduit connecting the adjacent ends of the two cylinders, a water-supply port and a water-discharge port to each cylinder, and a valve in one of such water-supply ports, substantially as and for the purposes set forth.

2. In a double-cylinder and double-piston hydraulic elevator, a valve-governed water-passage connecting the adjacent ends of the two cylinders, and a valve-governed water-supply to such other cylinder, combined substantially as described, with reference to the automatic opening and closing of the valve between the cylinders, accordingly as the water-supply valve may be closed or opened.

3. In a double-cylinder and double-piston hydraulic elevator, in which one piston is continuously subject to water-pressure, the combination of a pipe or conduit, P^2, for transmitting such pressure, a valve-governed conduit

from or connected with the same source of pressure leading to the same side of the other piston, and a valve device for bringing the discharge-ports of both cylinders into communication with the pressure pipe or conduit, substantially as set forth.

4. In a hydraulic elevator, the combination of two or more cylinders arranged in line, a corresponding number of piston-heads (one in each cylinder) on a common stem, an arrangement of water-supply ports for applying water-pressure simultaneously to and exhausting it from the same side of the piston-heads, such ports being opened and closed for supply and escape by successive movements of a series of valves on a single stem, substantially as set forth.

5. In combination with two cylinders and two pistons (one in each cylinder) on a common stem, a valve-governed circulation-pipe, P^1, arranged in one adjustment of the valves to connect the main water-supply with one end of its cylinder, and in another adjustment to bring the opposite ends of its cylinder into communication, substantially as set forth.

6. The pipes P^1 P^2, leading from the upper ends of the water-chambers a a^1 through a common valve-case, in combination with pipes or passages P and q, which lead to the opposite ends of the same cylinders, substantially as set forth.

In testimony whereof I have hereunto set my hand.

CYRUS W. BALDWIN.

Witnesses:
WM. BRO. SMITH,
HARRY C. BEACH.