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W. WEIR.

STEAM DRIVEN AIR PUMP.

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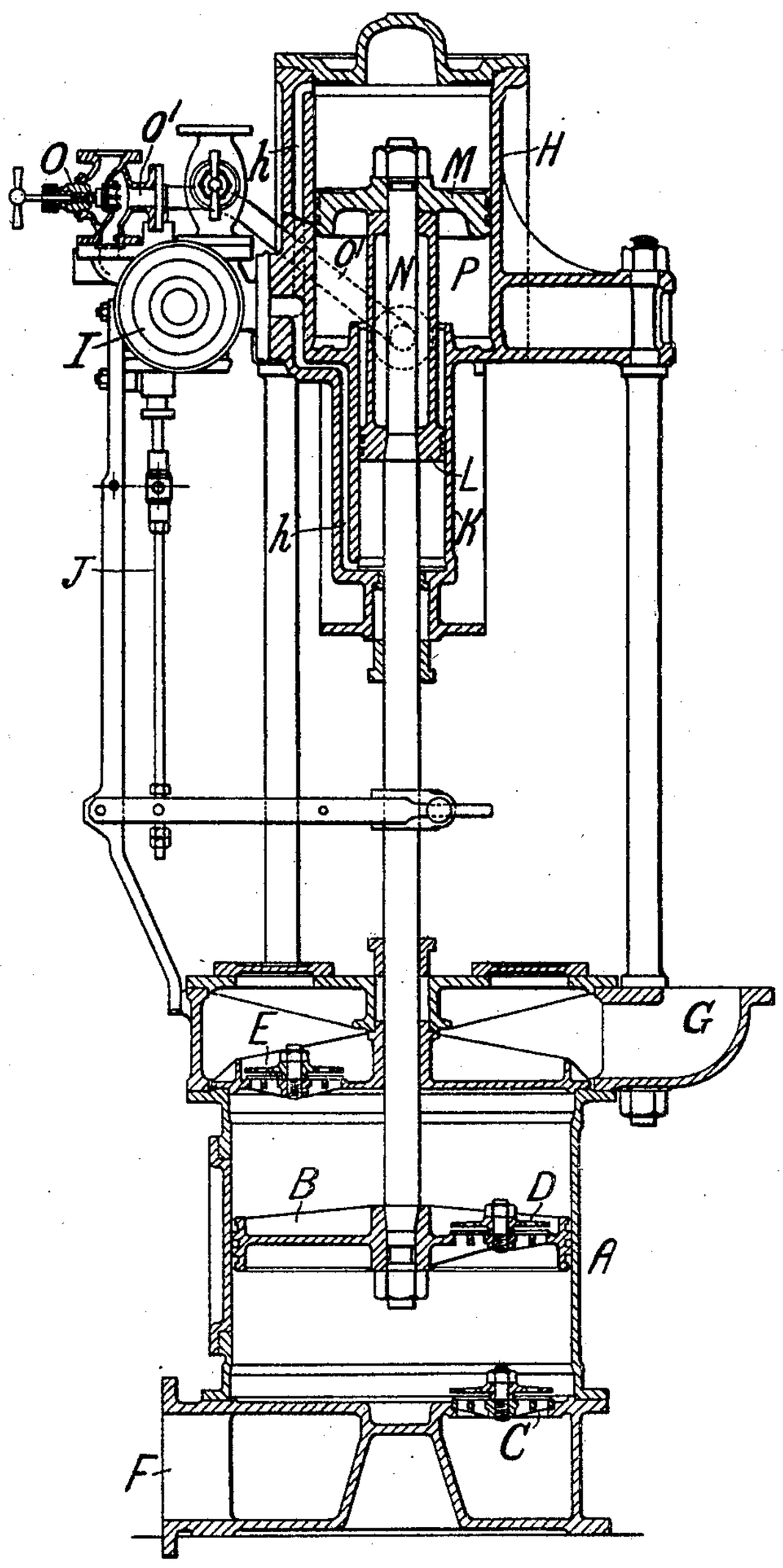

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UNITED STATES PATENT OFFICE

WILLIAM WEIR, OF CATHCART, SCOTLAND.

STEAM-DRIVEN AIR-PUMP.

No. 799,507. Specification of Letters Patent. Patented Sept. 12, 1905.

Application filed April 18, 1905. Serial No. 256,299.

To all whom it may concern:

Be it known that I, WILLIAM WEIR, a subject of the King of the United Kingdom of Great Britain and Ireland, residing at Cathcart, county of Renfrew, Scotland, have invented certain new and useful Improvements in Steam-Driven Air-Pumps, of which the following is a specification.

This invention has for its object by a novel construction and combination of parts to improve the working of vertical air-pumps of the single-acting type when these are driven independently and directly by the piston-rods of steam-cylinders, and particularly to overcome the defects in working of this type of pump due to the unequal and unbalanced loads on the air-pump piston on its upward and downward strokes. It is well known that the load on the air-pump piston is practically confined to the upward stroke of the pump, and this causes the working of the pump when driven by double-acting steam-cylinders to be unequal and unsatisfactory.

This invention is applicable to single vertical direct-acting air-pumps driven by steam-cylinders fitted with any type of actuating steam-valve.

The invention is illustrated in the accompanying drawing, which shows a sectional elevation of a single direct-acting air-pump fitted with my improvements.

The air-pump end A is of the usual single-acting type fitted with bucket B and foot-valves C, bucket-valves D, and head-valves E, also the usual suction branch F at the bottom and delivery branch G. The main steam-cylinder H is fitted with any well-known type of steam actuating-valve I, having suitable auxiliary valve-driving gear J. In open communication with the main cylinder H is arranged an auxiliary cylinder K, having a piston L, connected to the main piston M by the piston-rod N. The inlet stop-valve O is arranged with a branch pipe O′, leading to the space P between the two pistons L and M, so that the under side of the piston M and the top side of the piston L are always subject to the steam-pressure being used for driving the pump. The top side of the piston M and under side of the piston L are connected by the usual steam and exhaust ports *h* with the main-valve chest I.

It is well known that the load on the air-pump piston B is variable on the upward and downward stroke and is greatest on the upward or discharge stroke. This causes the working of the pump to be irregular when driven by double-acting steam-cylinders. With this improved cylinder arrangement on the upward or discharge stroke of the pump the steam slide-valve I gives steam to the under side of the piston L, while the same steam-pressure is admitted by the pipe O′ to the space P, and in this way the full area of the main piston M is available for actuating the pump. On the downward stroke the steam slide-valve admits steam to the upper side of the piston M and the pipe O′ also admits the same pressure to the space P. There is therefore only the steam-pressure on an area equal to that of the piston L available for actuating the pump, and the relative areas of M and L are arranged so that the available pressure on the downward stroke is only sufficient to drive the pump at the desired speed.

Although the drawing shows the special steam-cylinder arrangement applied to an ordinary single-acting air-pump having foot, bucket, and head valves, it will be understood that my improvement is also applicable to air-pumps of the suction valveless type.

It will be seen that for the purpose of securing greater compactness two or more rods connecting the piston and pump-bucket may be fitted, carried outside the auxiliary cylinder, the piston of which is connected to that of the main cylinder by a rod in the usual way.

Having now described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a single-acting pump driven from direct-acting steam-cylinders, the combination with a main steam-cylinder and its piston, of an auxiliary steam-cylinder the chamber of which has open communication at one end with the chamber of said main cylinder, an auxiliary piston working in said auxiliary cylinder and separated from said main piston, and means for admitting steam to the space between said pistons at the same pressure as that employed to operate said pistons to actuate the pump.

2. In a single-acting pump driven from direct-acting steam-cylinders, the combination with a main steam-cylinder and its piston, of an auxiliary steam-cylinder the chamber of which has open communication at one end with the chamber of said main cylinder, an auxiliary piston working in said auxiliary cylinder and separated from said main piston, means for admitting steam to the space between said pistons at the same pressure as that

employed to operate said pistons to actuate the pump, and a single piston-rod by which both of said pistons are carried.

3. In a single-acting pump driven from direct-acting steam-cylinders, the combination with a main and an auxiliary cylinder, the latter opening at one end into the former, of separated main and auxiliary pistons, means for admitting steam to the space between said pistons at the same pressure as that employed to operate said pistons to actuate the pump, and a single piston-rod by which both of said pistons are carried.

4. In a single-acting pump driven by a direct-acting steam-engine, the combination with main and auxiliary steam-cylinders, of separated main and auxiliary pistons working therein, said auxiliary cylinder being in open communication with the chamber of said main cylinder on the side of said auxiliary piston nearest said main piston, and means for admitting steam to the space between said pistons at the same steam-pressure as that employed to operate said pistons to actuate the pump.

5. In a single-acting pump driven by a direct-acting steam-engine, the combination with main and auxiliary steam-cylinders, of separated main and auxiliary pistons working therein, said auxiliary cylinder being in open communication with the chamber of said main cylinder on the side of said auxiliary piston nearest said main piston, means for admitting steam to the space between said pistons at the same steam-pressure as that employed to operate said pistons to actuate the pump, and a single piston-rod on which both of said pistons are mounted one above the other.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM WEIR.

Witnesses:
WALLACE FAIRWEATHER,
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