(No Model.)

H. DAVEY.

AIR COMPRESSOR.

No. 409,773. Patented Aug. 27, 1889.

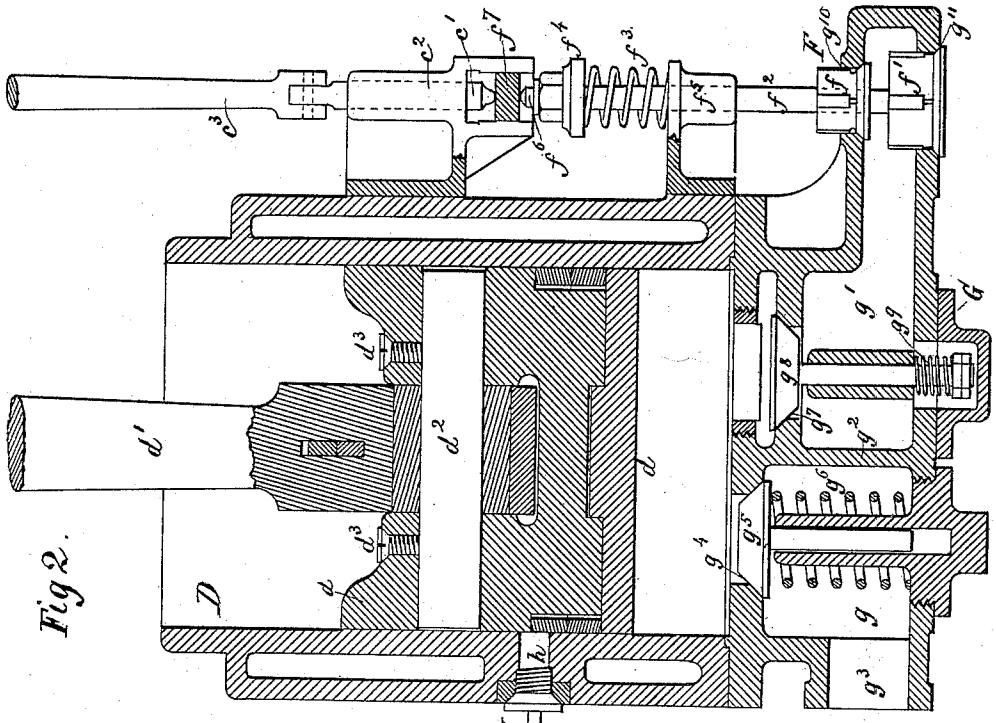


Fig 2.

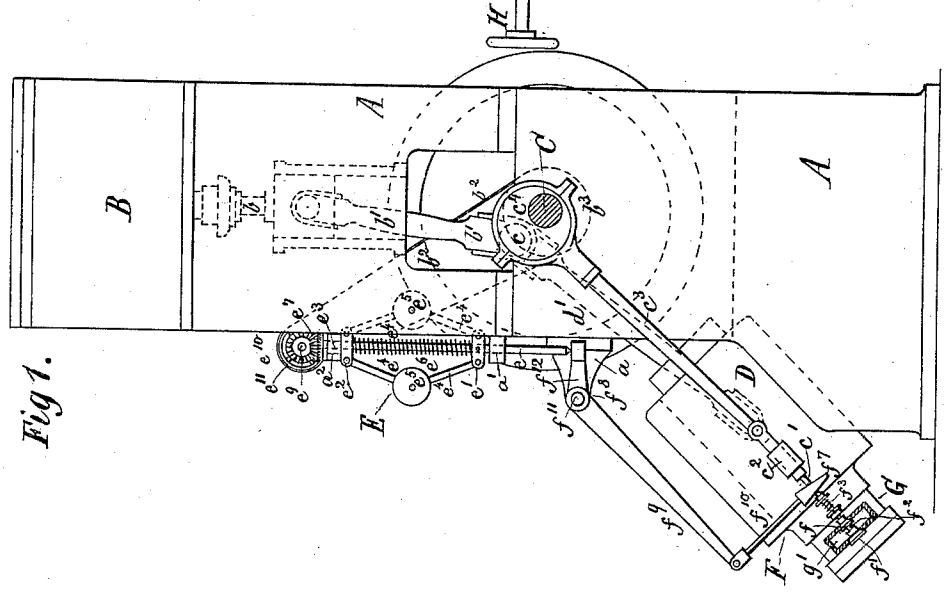


Fig 1.

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UNITED STATES PATENT OFFICE.

HENRY DAVEY, OF WESTMINSTER, COUNTY OF MIDDLESEX, ENGLAND.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 409,773, dated August 27, 1889.

Application filed October 2, 1888. Serial No. 286,950. (No model.) Patented in England July 29, 1887, No. 10,535, and in France April 28, 1888, No. 190,269.

To all whom it may concern:

Be it known that I, HENRY DAVEY, a subject of the Queen of Great Britain, residing at Westminster, London, in the county of Middlesex, England, have invented certain new and useful Improvements in Air-Compressors, (patented in England July 29, 1887, No. 10,535, and in France April 28, 1888, No. 190,269;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to air-compressors worked by steam-power; and it consists in certain novel constructions and combinations of parts, as will be hereinafter described, and pointed out in the claims, whereby the resistance of the compressed air in the compressor may be perfectly controlled and the engine kept at a uniform speed notwithstanding an increased pressure of air in the receiver takes place, and thus the quantity of compressed air delivered to the air-receiver is regulated in accordance with the increase and decrease of pressure in the air-receiver, this being accomplished by providing means adapted to be operated by hand or automatically, whereby the compression can be commenced at different points between the extremes of the piston-stroke.

In the accompanying drawings, Figure 1 is an elevation of my improved air-compressor driven by steam-power, the valve-seat of the automatic valve being shown in section. Fig. 2 is a longitudinal central section of the compressor-cylinder.

The letter A in the drawings represents a housing supporting a steam-cylinder B, main shaft C, compressor-cylinder D, governor E, and air-regulator F.

The steam-cylinder B is arranged at the top of the housing A, and its piston-rod b (shown by dotted lines) and connecting-rod b' operate a crank-pin c of the main crank-shaft C, arranged below the cylinder. The crank-pin c is by means of a connecting-rod d' connected with a piston d of the compressor-cylinder D. The cylinder D is arranged on an inclination at an angle of about forty-five degrees to the axis of the steam-cylinder B, by which arrangement the greatest leverage of the steam-engine is caused to overcome the greatest resistance of the compressor-piston. The connecting-rod d' is pivoted to a pin d^2, transversely arranged in the piston d, and prevented from turning by set-screws d^3. Connected with the bottom of the compressor-cylinder D is a valve-chamber G, subdivided into two sections $g\,g'$ by a partition-wall g^2.

Division g is provided with an opening g^3, communicating with a receiver, (not shown in the drawings,) a passage g^4, forming a valve-seat, and a valve g^5, with spring g^6. Division g' is provided with a passage g^7, forming a valve-seat, a suction-valve g^8, with closing-spring g^9, and check or regulating valves $f\,f'$, fitted to valve-seated passages or vents $g^{10}\,g^{11}$. The latter two valves are attached to a valve-rod f^2, and are held upon their seats by means of a spring f^3, bearing against a collar f^4 of the valve-rod f^2, and a guide-bracket f^5 of the same. Upon the end portion f^6 of the valve-rod f^2 a wedge f^7 reciprocates in accordance with the movements of an angular lever f^8, to the long arm f^9 of which it is connected by means of a pivoted rod f^{10}.

The fulcrum f^{11} of the lever f^8 is placed in a bracket a of the housing A, and from this fulcrum the short arm f^{12} of the lever f^8 extends horizontally to the spindle e of the governor E. The governor-spindle e is loosely fitted into two guide-brackets $a'\,a^2$, fastened to the housing A, and has two collars $e'\,e^2$, the lower collar e' being fastened to the spindle e, while the upper collar e^2 fits the same loosely; but it is vertically secured to its bracket a^2 by means of an ordinary journal e^3. The collars $e'\,e^2$ are connected by arms e^4 of two toggle-levers provided with weights e^5, and they are held apart by means of a spring e^6. A bevel-wheel e^7 is fastened to the collar e^2, and by an ordinary spline-and-groove connection revolves the spindle e and permits it to move vertically. A horizontal shaft e^9, suitably hung to the housing, is provided with a bevel-wheel e^{10}, which gears into wheel e^7, and with a pulley e^{11}, which is revolved by means of a belt b^2 and a pulley b^3 on the main shaft C.

When the engine revolves slowly, the spring e^6 depresses the lower collar e' and the spindle e, which depresses the short arm f^{12} of the lever f', and thus causes the large portion of the wedge f^7 to recede from the rod f^2, and vice versa. Above the wedge f^7, and in line with the valve-rod f^2, a reciprocating rod c' is held in a guide-bracket c^2, fastened to the compressor-cylinder D. This rod c' is pivoted to an eccentric-rod c^3, communicating the strokes of an eccentric c^4 on the main shaft to the rod c'. When the small portion of the wedge f^7 rests upon the valve-rod f^2, the rod c' comes in contact with the same at every stroke without moving the valve-rod; but when the large portion of the wedge f^7 is moved upon the valve-rod f^2 the rod c' with every downstroke pushes the said valve-rod down sufficiently to allow a full supply of air to enter the division g' of the valve-chamber and the compressor-cylinder while the piston d rises.

If the speed of the engine decreases owing to a rise of pressure and resistance in the air-reservoir, the governor E will move the wedge f^7 away from the rods c' and f^2, thus shortening the time during which the valves $f f'$ remain open and diminishing the quantity of air admitted into the compressor-cylinder, and lessening the labor of compressing the air for the engine, and enabling the engine to work at its normal speed. When on account of diminished pressure or resistance in the air-reservoir the steam-engine begins to run at a higher than a normal speed, the governor-spindle e will rise and cause the larger or thicker portion of the wedge to move between the valve-rod f^2 and reciprocating rod c', and thus permit the valves $f f'$ to remain open for a longer period and permit a greater quantity of air to be compressed and supplied to the air-reservoir.

I have shown in Fig. 2 a mode for effecting the regulation of pressure in the compressor-cylinder D by means of an escape-valve H, operated by hand. This valve is placed in the side of the compressor-cylinder about midway of the piston-stroke, and by opening it the air in the compressor-cylinder will escape until the descending piston d has passed and covered the passage h of the valve H, when compression begins with half the normal amount of air. Several valves H, arranged at different points of the piston-stroke, may be provided, so as to enable the operator to reduce the normal compression to any required degree. The valve H, or a series of these valves, may be employed as adjuncts to the automatic regulating mechanism, and in an emergency be brought into use conjointly with the automatic means herein described.

What I claim is—

1. In an air-compressor, in combination, a steam-cylinder B, an air-compressor D, provided with chambers g g' at one of its ends, reverse-acting spring-valves g^5 g^8, applied, respectively, in said chambers, an air-supply valve of valve-chamber g', a reciprocating valve-rod f^2, an automatic governor E, wedge f^7, interposed between rods f^2 and c^2, and connected to the governor by lever f^8, main shaft C, eccentric c^4 on said shaft, eccentric-rod c^3, and pulley b^3 of governor driving-belt, substantially as described.

2. In an air-compressor, in combination, wedge f^7, interposed between shafts f^2 and c^2, and connected to the governor by lever f^8, the sliding governor-spindle e in contact with and operating lever f^8, eccentric c^4 and its connecting-rod c^3, operating said shafts c^2 and f^2, and an air-supply valve, substantially as described.

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

HENRY DAVEY.

Witnesses:

ALEXR. R. C. RIDGWAY,

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