

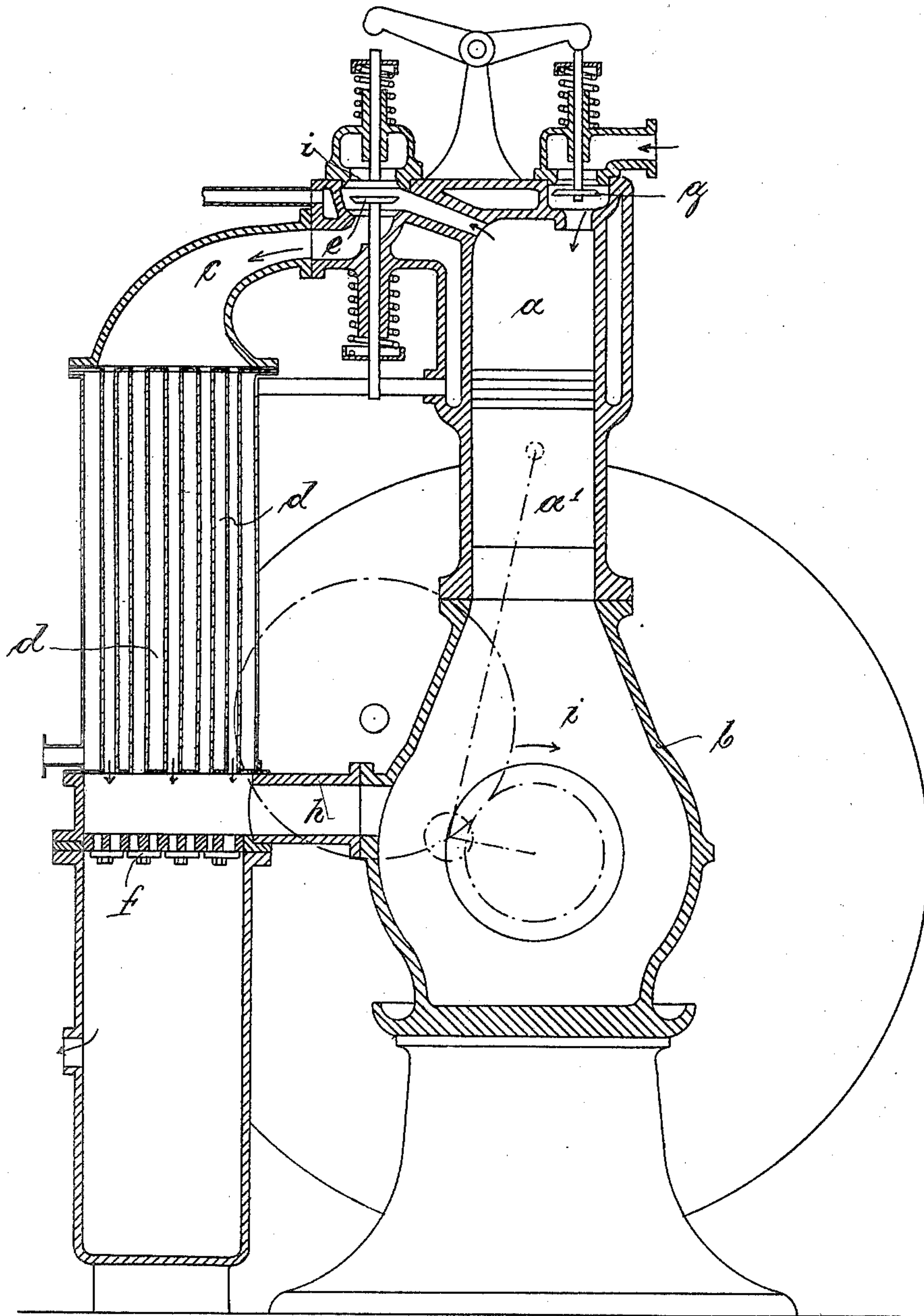
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Patented Feb. 12, 1901.

W. MAYBACH.
EXPLOSION AND COMBUSTION MOTOR.

(Application filed July 23, 1900.)

(No Model.)



Witnesses:
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UNITED STATES PATENT OFFICE.

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EXPLOSION AND COMBUSTION MOTOR.

SPECIFICATION forming part of Letters Patent No. 668,111, dated February 12, 1901.

Application filed July 23, 1900. Serial No. 24,594. (No model.)

To all whom it may concern:

Be it known that I, WILHELM MAYBACH, manager, a subject of the King of Würtemberg, and a resident of Cannstadt, in the Kingdom of Würtemberg, in the German Empire, have invented certain new and useful Improvements in Explosion and Combustion Motors, of which the following is an exact specification.

10 My invention relates to certain improvements in explosive engines or motors; and one object thereof is to provide a device for completely removing the products of combustion from the cylinder of such an engine or
15 motor after a working stroke has been made.

A further object is the provision of means for creating a vacuum in the cylinder of the engine, which, in addition to assisting in the removal of the last remnants of the products
20 of combustion from the cylinder, shall reduce the back pressure on the piston during its working stroke.

These objects I attain by means of the construction hereinafter set forth with reference
25 to the accompanying drawing, in which the view represents a vertical section of an explosive motor or engine, showing my invention applied thereto.

Referring to the drawing, the letter *a* indicates the cylinder of an explosive-motor, which cylinder is suitably supported on and connected to a crank-case C, in which cylinder operates in the usual manner a piston *a'*, having suitable connections (shown diagram-
35 matically) with a crank. A passage *c* connects one end of the cylinder—in this case the upper end—with a condenser *d*, which in the present case is of the surface-condensing type, although it will be obvious that any
40 desirable type of condenser may be employed.

A disk valve *e* is seated in the passage *c*, as shown, and this valve is so constructed and connected with the valve-gear as to be operated periodically through the medium of one
45 of the ordinary forms of the said valve-gear as employed in engines of this kind.

An air-admission valve *g* is so located as to provide for the admission of air to the cylinder at the time and for the purpose here-
50 inafter stated, and a valve *i* is provided for the admission of the explosive charge, these

valves being operated at suitable times by any of the common forms of valve-gear, for the purpose hereinafter stated.

One end of the condenser, in the case shown 55 the end farthest from the passage *c*, is connected by a passage *h* to the inclosed crank-case C, the latter being in free communication with one end of the cylinder *a*. It will thus be seen that the condenser is in com- 60 munication with the cylinder on opposite sides of the piston, one such communication being controlled by a valve, such as the valve *e*.

Suitable relief-valves *f* are provided in the 65 passage *h*, by means of which valves any excess of pressure in the condenser over that of the atmosphere may be automatically relieved.

The valve *g* is so arranged and timed in its 70 operation with respect to the movements of the piston and the other operating parts of the engine that it will open to admit air to the cylinder during the expelling stroke of the piston, as well as the other stroke, so that 75 as the piston expels the bulk of the gaseous products of combustion from the cylinder the air drawn in through the air-admission valve acts to force the last remnants of the said gaseous products out of the cylinder and 80 into the condenser.

In operation, when the piston has begun its return or discharge or expelling stroke, after having been driven forward by an explosion of the gaseous mixture, the valve *e* 85 is opened and the products of combustion flow through the passage *c* to the condenser *d*, where they are partially condensed, such condensation of the gases creating a vacuum or partial vacuum, which assists in drawing 90 said gases from the cylinder, and any over-pressure which may exist at the beginning of the expelling stroke of the piston is readily relieved by the opening of the relief-valves *f*. The valve *g* is also open during this 95 stroke of the piston, and as there is a vacuum in the cylinder *a*, as above indicated, air is readily drawn in through the air-admission port controlled by the valve *g*, and as the expelling stroke of the piston nears its comple- 100 tion this inflow of air expels the last remnants of the products of combustion, the air

acting to force said last remnants out of the cylinder into the condenser, and the valve *e* is closed before the piston begins its second forward stroke. Air and the charge of oil or gas composing the explosive mixture are drawn in through the valve *i* on this stroke of the piston, and on the second return stroke said mixture of air and gas or oil is compressed in a manner common to motors of the type shown. The charge is exploded by any suitable means, and as the piston is driven forward the vacuum existing in the condenser, and hence in the passage *h* and inclosed crank-case *C*, increases the efficiency of operation very materially.

It will be understood that while this invention is shown as applied to an explosive-motor of the four-cycle type it is not restricted to engines of this type, as it will give equally good results if applied to engines operating on other cycles.

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

1. In an explosive-engine, the combination with a cylinder provided with suitable ports, a piston operating therein, a condenser and passages connecting the same with the cyl-

inder on opposite sides of the piston, one of said pistons being controlled by a valve, of an air-inlet valve for admitting air to said cylinder, said air-inlet valve being so arranged and timed in operation as to admit air into the cylinder during the expelling stroke of the piston, and thereby force the last remnants of the products of combustion from the cylinder, and means for operating said valves, substantially as described.

2. In an explosive-engine the combination with a cylinder, a piston operating therein, and a condenser in communication with the cylinder on opposite sides of the piston, of means for admitting air to the cylinder during the expelling stroke of the piston so timed in operation as to cause the air to force the last remnants of the products of combustion from the cylinder at the end of the expelling stroke, and means for admitting explosive mixture to the cylinder for exploding the same, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

WILHELM MAYBACH.

Witnesses:

HERMANN WAGNER,
WM. HAHN.