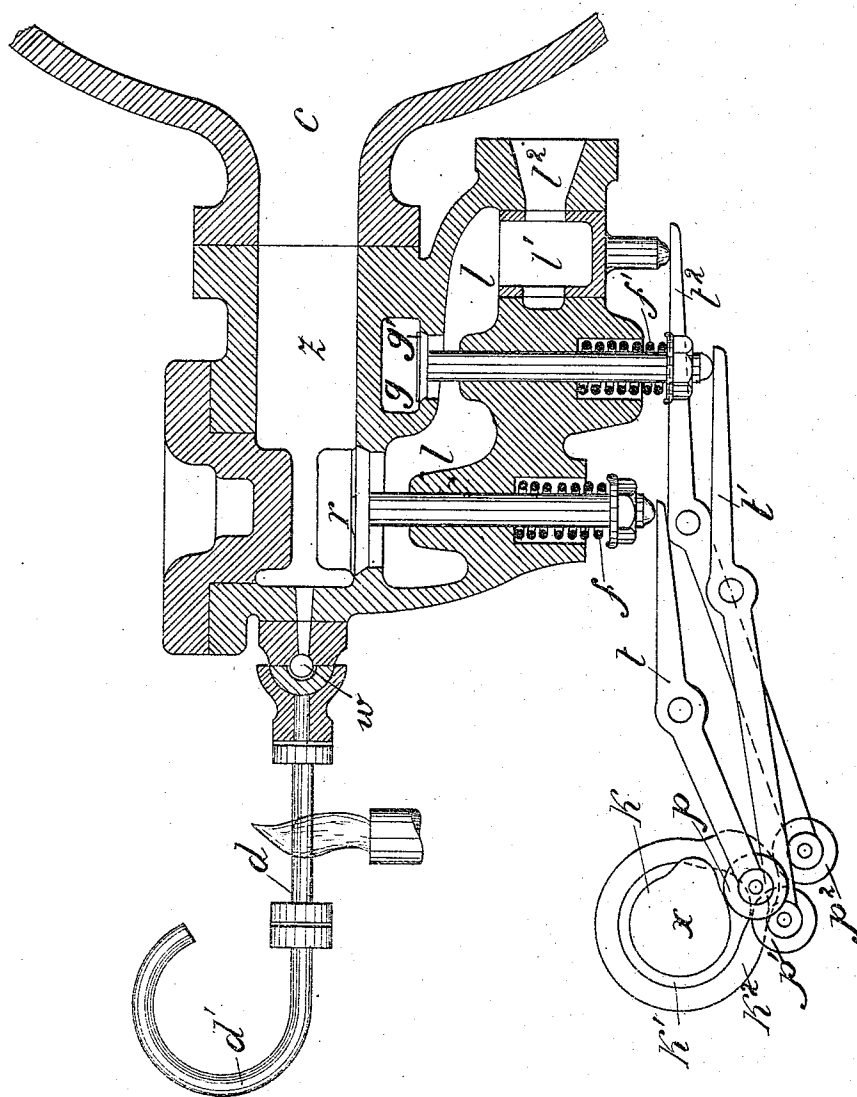


(No Model.)

B. STEIN.
GAS AND PETROLEUM MOTOR.

No. 478,651.

Patented July 12, 1892.



Witnesses:
R. J. Janssen
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UNITED STATES PATENT OFFICE.

BERNHARD STEIN, OF BERLIN, GERMANY, ASSIGNOR TO THE BERLINER MASCHINENBAU ACTIEN-GESELLSCHAFT, VORMALS L. SCHWARTZ-KOPFF, OF SAME PLACE.

GAS AND PETROLEUM MOTOR.

SPECIFICATION forming part of Letters Patent No. 478,651, dated July 12, 1892.

Application filed December 24, 1890. Serial No. 375,760. (No model.) Patented in England November 25, 1890, No. 19,171.

To all whom it may concern:

Be it known that I, BERNHARD STEIN, a subject of the Emperor of Austria, and a resident of Berlin, in the Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Gas and Petroleum Motors, (for which I have obtained a patent in England, No. 19,171, dated November 25, 1890,) of which the following is a full, clear, and exact specification.

My invention relates to gas-motors in which the explosive mixture is introduced into the explosion-cylinder in two charges having a different proportion of gas—that is to say, gas-motors in which the first charge of the combustible mixture contains a greater proportion of air than the second charge, which only contains as much air as is necessary for the complete combustion of the gas; and my invention consists in a valve arrangement by means of which such alterations of the proportions of gas and air may be caused in a very effective and reliable way.

In order to make my invention more clear, I refer to the accompanying drawing, in which the figure is a sectional elevation of the valve arrangement.

In carrying my invention into effect I provide a chamber or sleeve *z* between the explosion-cylinder *c* and ignition-tube *d*, the latter being heated red-hot by means of an auxiliary flame in the usual manner and separated from sleeve *z* by a valve *w*, which at the end of compression is opened by any suitable means in order to allow a certain quantity of the strong mixture to enter tube *d* for being exploded therein and to explode or ignite thereby the contents of the cylinder, too. The end *d'* of tube *d* is curved, as shown, or it may form a bulb. At the rear of said sleeve *z* there is arranged a valve *r*, which, after being opened by lever *t* and cam-disk *k* on shaft *x*, serves for establishing a or interrupting the communication of sleeve *z* with the open air. Such communication is afforded by channel *l*, into which leads another channel *g*, serving for conveying gas to the motor. Channel *g* may be opened or closed by a valve *g'*, actuated by a lever *t'*

and by a cam-disk *k'* in like manner as lever *t*. The channel *l* is provided at its rear end with a valve *l'*, which is actuated by a third lever *t''* and by a cam-disk *k''* in exactly the same way as the levers *t* and *t'*. This valve *l'* is adapted to lessen or to enlarge the communication established between air-channel *l* and the outer air by the branch channel *l'*. Rolls *p*, *p'*, and *p''* are attached to the ends of the levers *t*, *t'*, *t''* for lessening friction. Spiral springs *f* and *f'* are constantly tending to close the valves *r* and *g'*.

The mechanism operates as follows: Both the valves *r* and *g'* are opened by the levers *t* and *t'* at the beginning of the suction period and a mixture of air and gas is drawn into the cylinder. The proportion of gas contained in the mixture depends, as a matter of course, on the greater or smaller opening of valve *g'*. Shortly before the suction period is closed the valve *l'* is lifted, so as to diminish the quantity of air entering channel *l* by branch channel *l'*, and the mixture now entering the cylinder is of stronger condition, owing to the greater proportion of gas. Instead of lifting valve *l'* it may also be lowered, this having the same effect, as described. The said strong mixture forms the proper explosive gas, which now fills the rear part of the cylinder as well as the sleeve *z*. Now when the valve *w* is opened by any suitable means a part of the strong mixture enters the ignition-tube *d* and the contents of the cylinder are exploded in known manner. That part of the combustion-gases which remains in tube *d* is at the entrance of the mixture pressed into the tube or bulb *d'*, thus insuring quick and reliable ignition of the strong mixture contained in tube *d*.

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

The combination of sleeve *z*, inserted between cylinder *c* and ignition-tube *d*, and valve *r*, closing or establishing communication between sleeve *z* and air-channel *l*, with valve *g'*, closing or establishing communication between gas-channel *g* and air-channel *l*, and with valve *l'*, lessening or enlarging commu-

5 nication between air-channel l and the open
air, and operating means constructed, as de-
scribed, so that said valves r and g' are opened
at the beginning of the suction period and
passage of valve l is reduced at or near the
close of that period, for the purpose as de-
scribed.

In testimony whereof I have signed this
specification in the presence of two subscrib-
ing witnesses.

BERNHARD STEIN.

Witnesses:

ADOLF SCHEIBEL,
ROBERT SEMLER.