

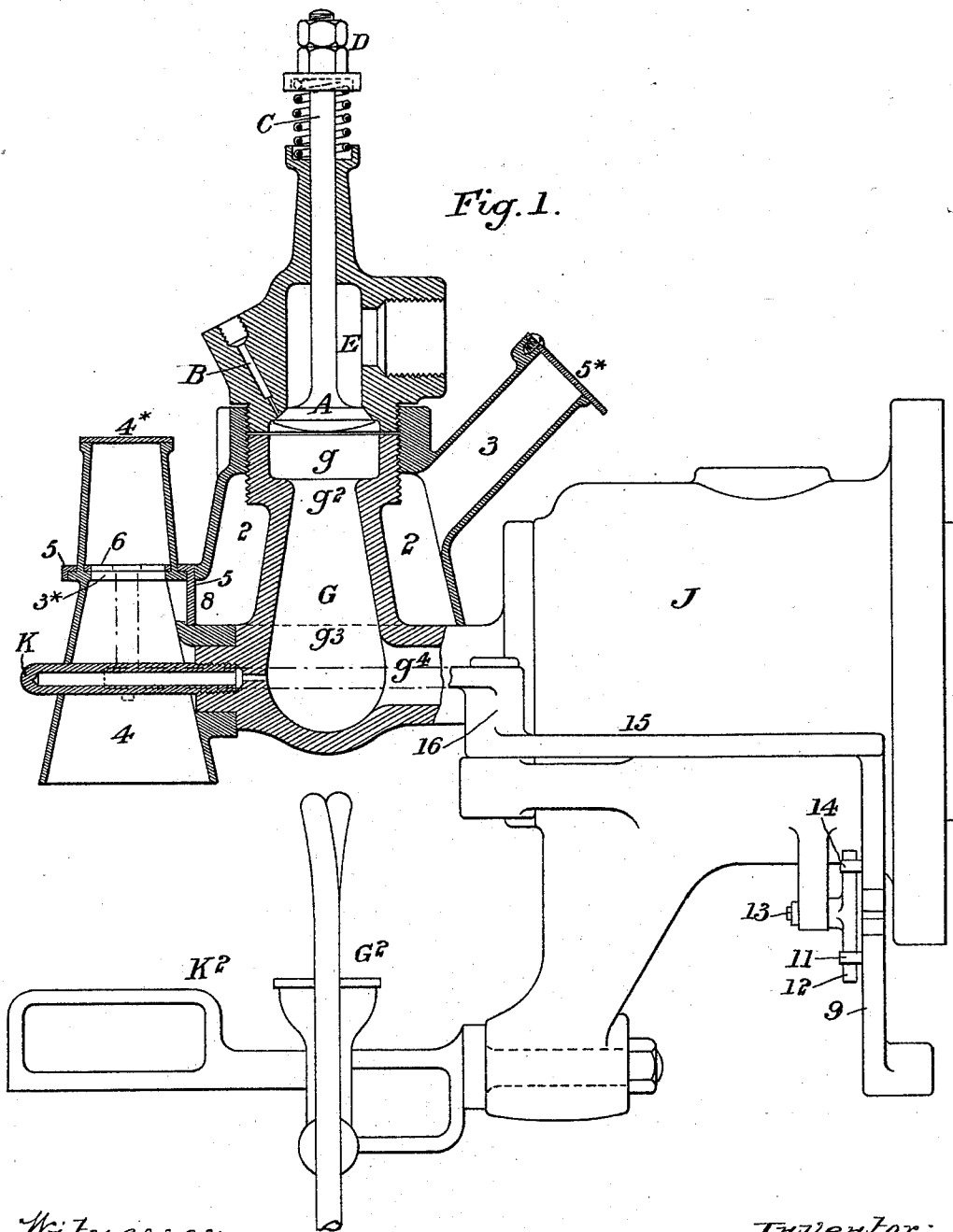
(No Model.)

3 Sheets—Sheet 1.

C. W. PINKNEY.
INTERNAL COMBUSTION ENGINE.

No. 571,239.

Patented Nov. 10, 1896.



Witnesses:-
Geo Lewis
W. R. Edelen.

Inventor:
Chas. William Pickney
by Solomon Adams
his attorney

(No Model.)

3 Sheets—Sheet 2.

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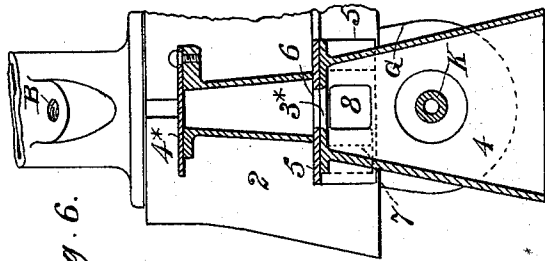


Fig. 6.

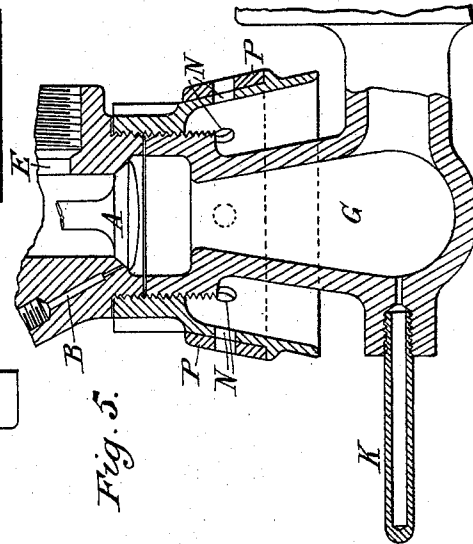


Fig. 5.

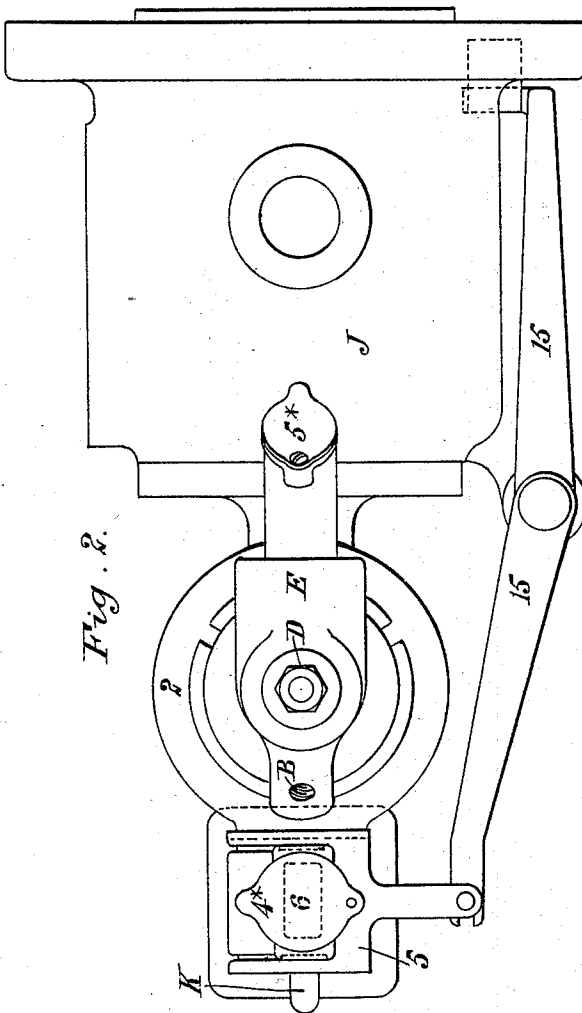


Fig. 2.

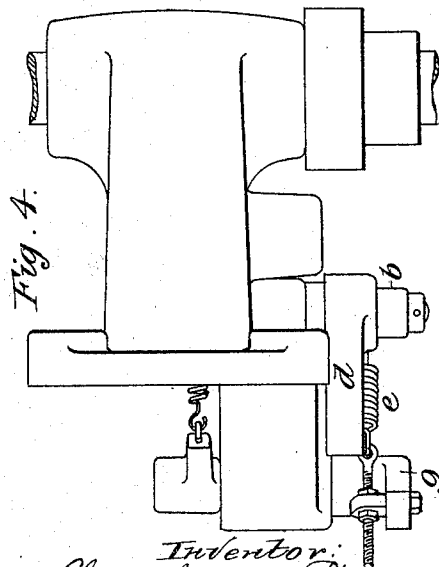


Fig. 4.

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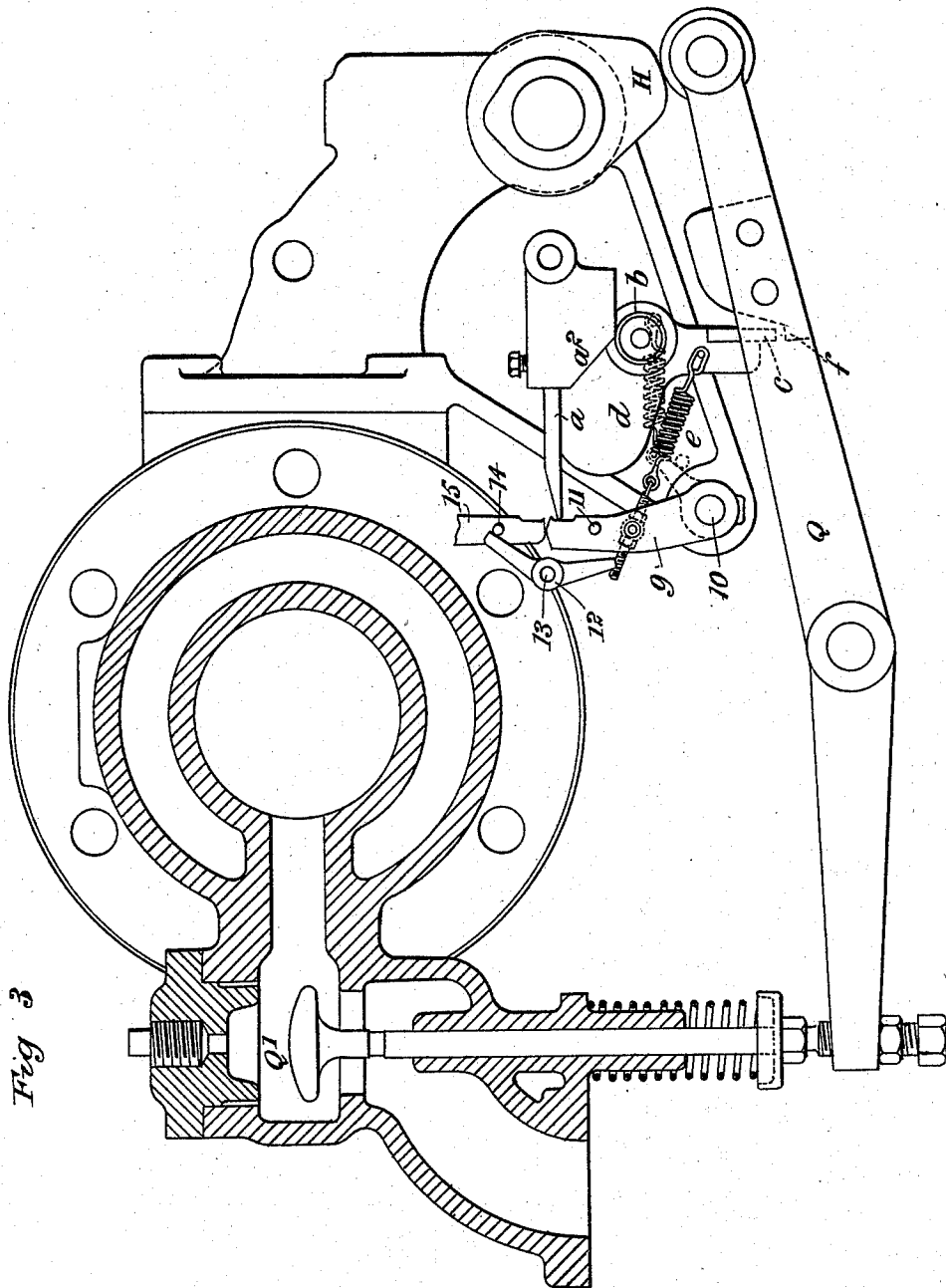
(No Model.)

3 Sheets—Sheet 3.

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INTERNAL COMBUSTION ENGINE.

No. 571,239.

Patented Nov. 10, 1896.



Witnesses:—
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W. R. Edelen.

Inventor:—
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UNITED STATES PATENT OFFICE.

CHARLES WILLIAM PINKNEY, OF SMETHWICK, ENGLAND, ASSIGNOR TO
TANGYES, LIMITED, OF BIRMINGHAM, ENGLAND.

INTERNAL-COMBUSTION ENGINE.

SPECIFICATION forming part of Letters Patent No. 571,239, dated November 10, 1896.

Application filed February 24, 1896. Serial No. 580,454. (No model.) Patented in England November 27, 1893, No. 22,753.

To all whom it may concern:

Be it known that I, CHARLES WILLIAM PINKNEY, engineer, a subject of the Queen of Great Britain and Ireland, residing at 1 Raglan Road, Smethwick, in the county of Stafford, England, have invented certain Improvements in Internal-Combustion Engines, (for which I have obtained a patent in Great Britain, No. 22,753, dated November 27, 1893,) of which the following is a specification.

The object of my invention is principally to simplify and improve the construction and operation of internal-combustion engines, such as are operated by the combustion of petroleum or other hydrocarbon (which I will refer to as "oil") with air, and this I effect by arrangements by which the heat resulting from the combustion of the successive charges is employed to sufficiently heat a vaporizer or vaporizers to assist in the complete vaporization of the oil taken in with the air for each charge and by which the complete mixing of the components of the charge is effected before it enters the working cylinder, and, further, by which premature ignition is prevented and the objection due to deposit of carbonaceous matter in the vaporizer is overcome.

My invention also relates to means whereby steady and efficient governing is effected in internal-combustion engines generally.

My invention in the main is more especially intended for use in what are known as "two-to-one" cycle-engines.

I will describe my invention with reference to the accompanying drawings, of which—

Figure 1 represents, partly in elevation and partly in longitudinal section, one end of an internal-combustion engine constructed according to my invention. Fig. 2 is a plan corresponding to Fig. 1. Fig. 3 is a transverse section through the combustion-chamber and showing in elevation the governor mechanism. Fig. 4 is a plan of the governor mechanism, and Fig. 5 is a sectional detail showing a modified arrangement for regulating the escape of hot air from beneath the hood of the vaporizer. Fig. 6 is a section showing the slide for opening and closing the passage for the heat of the lamp to the hood around the vaporizer.

The valve A, which controls the inlet of the charge, has a broad seat which enables it

to not only control the air-inlet passage E, but also to cover and uncover the opening B, (or openings,) through which oil is admitted, thereby rendering unnecessary the usual oil-supply valve. The valve A may be held to its seat normally by a spring C, adjustable by lock-nuts D. The air and oil are admitted by the said valve A into the vaporizer G, which opens into the combustion-chamber J, which in turn opens into the working cylinder. (Not shown.)

The vaporizer G is preferably made wider next the inlet-valve, as at g , it then being contracted, as at g^2 , and afterward widening again, as at g^3 , and then opening into a contracted passage g^4 , by which communication with the combustion-chamber J is established, as this insures a thorough mixing of the components of the charge. The said passage g^4 is made of such a length as to allow the part g^3 of the vaporizer G, with which it communicates, to be at such a distance from the combustion-chamber as to guard against premature ignition of the charge by heat derived from the said combustion-chamber.

At the side of the vaporizer G, preferably that side which is farthest from the combustion-chamber J, I secure an ignition-tube K, opening into the said vaporizer G. The vaporizer G is heated in the first instance by a lamp G^2 , which can, after the engine is at work, be moved to underneath the ignition-tube K upon the bracket K^2 .

In starting the engine the fly-wheel is moved around so that the vacuum which tends to form in the working cylinder as the piston thereof moves outward causes the inlet-valve A to open, so that air and oil are drawn in and get thoroughly mixed, the oil getting partially vaporized while passing through the hot vaporizer G and thence into the combustion-chamber and cylinder. At the end of the charging-stroke the inlet-valve A closes, and during the return stroke of the piston in the working cylinder the charge of mixed air and partially-vaporized oil is compressed, part of the charge being forced back into the vaporizer G and ignition-tube K, the heat of the vaporizer G, assisted by the heat due to compression, thoroughly vaporizing the oil, and the charge becomes explosive and the portion which enters the ignition-tube is ignited and causes the charge to ignite and drive the

piston forward in the working cylinder. At about the end of the forward stroke the exhaust-valve Q', Fig. 3, opens and remains open during the return stroke, and so on during work.

I have found that deposit of carbonaceous matter in the vaporizer is due to the low temperature of the incoming air and oil, and to overcome this I provide means whereby the part at or near to which the air and oil are admitted is heated to a degree to prevent such deposit. This can be effected by surrounding the part of the vaporizer next or near to the inlet with a hood or surrounding sleeve 2, so that when the engine is at work the heat from the vaporizer G enters between this hood or sleeve 2 and the said part of the vaporizer. There may be holes N in the said hood or sleeve 2, which can be opened and closed by the ring-valve P, as shown clearly in Fig. 5, to control the passage of the heated air and so enable the temperature at this part to be regulated. This opening and closing can be effected by hand or, if desired, by a connection from the governor. The heat of the lamp G², which is heating the ignition-tube, may be conducted under this hood, and the passages by which it is so conducted may be arranged to be opened and closed by gear operated by the governor, so that the heat is only conducted from the said lamp when the engine has exceeded normal speed, and consequently when no explosions are occurring. A convenient arrangement for this purpose is as follows:

The hood 2 around the vaporizer G may be provided with a chimney 3, and over the lamp may be a tube or chimney 4 with an opening 3* for allowing the heated products from the lamp to pass into the outer air, and another opening 8, by which the said products can pass between the hood 2 and vaporizer G. The openings 3* and 8 are opened and closed by a cover or valve or covers or valves, with passages therein so arranged that when the one opening is closed the other is open. The said cover or valve or covers or valves can be operated by hand, but preferably is or are operated by the governor in such a way that when the engine is working at normal speed the opening 3*, by which the heated products from the lamp pass directly to the outer air, is open, while the opening 8, leading to the space between the hood and the vaporizer, is closed. When the engine exceeds the normal speed, the said cover or valve is operated so as to close the opening by which the heated products pass directly to the open air, and the other opening 8 is uncovered so that the heated products pass into the space between the hood and the vaporizer. When the governor is of the kind hereinafter mentioned, the operation of the said covers or valves may be effected through a two-armed lever, one arm being acted upon by the ordinary lever actuated by the pecker of the governor when the engine is working at normal speed, so as to

move the cover or valve into the position first above named, if it be not already in that position, the other arm of the said lever being acted upon (to reverse the position of the cover or valve) by a lever which the pecker only operates when the said pecker is thrown clear of the ordinary lever on the engine exceeding normal speed. This arrangement is illustrated in Figs. 1, 2, and 3.

The openings 3* and 8 are covered and uncovered by the valve or slide 5, sliding in guides and provided with openings at 6 and 7, so relatively arranged that when one covers the one opening, 3* or 8, the other uncovers the other opening, 8 or 3*. When the engine is working at normal speed, the pecker of the governor coming into contact with the lever 9, turning on a fixed pin 10, the stud 11 will push the lower arm of the two-armed lever 12 (centered on the pin 13) into the position shown in Fig. 3, and the upper end of the said lever 12 will act on the projection 14 on the lever 15 (centered at 16) and move it into such a position that the slide 5 will be moved by the forked end of the lever so as to cover the opening 8 and uncover the opening 3* and allow the heat from the lamp to pass out by the opening 3*.

Directly the engine increases in speed beyond the normal the governor-pecker will jump over the top of the lever 9 and strike the lower end of the lever 15, which will then cause the slide 5 to move far enough to close the opening 3* and open the passage through the opening 8, so that the heat from the lamp rising in the chimney 4 will pass by the opening 8 into the hood 2 and through the chimney 3, and so keep the inlet end of the vaporizer hot while the engine is running beyond its normal speed. Directly the speed of engine falls to normal the pecker of the governor will strike the lever 9 and move the double-end lever 12, and this will act on the projection 14, lever 15, and slide 5, so as to open the passage 3* and close the passage 8. 4* and 5* are covers which can be used if the passages through the chimney 4 and through the hood 2 and chimney 3 are to be controlled by hand. They will be removed or left open when the slide 5, operated by the governor, is employed.

In large engines I prefer to use more than one vaporizer for convenience in starting, but it will only be necessary to heat one of them with a lamp (that one being furnished with the ignition-tube) for starting purposes, after which the heat generated during work will be sufficient to put the other vaporizer or vaporizers into operation and keep them heated, as is the case when using but one vaporizer.

The water-space surrounding the combustion-chamber I prefer to be in direct communication with the water-space surrounding the working cylinder.

The governing I prefer to effect by means of an incline governor, such as is described in the specification of Letters Patent No. 504,613,

granted to me September 5, 1893, so arranged, however, as to allow the exhaust-valve to be operated when the engine is working normally and to cause it to be spragged open when normal speed is exceeded.

I employ the usual lever 9 of the incline governor, which lever is acted upon by the pecker *a*, having an inclined surface *a*², coming against a projection or roller *b*, so that when the normal working of the engine is exceeded the incline surface *a*² comes in contact with the projection or roller and the pecker is thrown and passes clear of the lever 9 without operating it. With this lever is combined a stop, which is brought clear of the exhaust-valve lever when the governor-lever is operated by the pecker when the engine is working at normal speed or less; but when this speed is exceeded the said stop is not removed, and so prevents the exhaust-valve lever returning and the exhaust-valve *Q* closing until the engine resumes its normal speed. This can be effected by a tumbler *d*, centered in proximity to the governor-lever 9, and having a stop *c* at one end and a counterweight at the other end. This tumbler is connected (preferably by a spring connection, as shown at *e*) to the governor-lever 9 in such a way that when the said lever 9 is moved by the pecker *a* in the ordinary working of the engine the tumbler *d* is also moved to cause its stop *c* to allow of the return of the exhaust-valve lever *Q*; but when the engine exceeds its normal speed and the pecker *a* does not operate the governor-lever 9 the stop *c* is in such a position that it obstructs the return of the exhaust-valve lever *Q* by coming against the catch *f*, and so sprags the exhaust-valve *Q* open, and then the exhaust-gases flow in and out of the cylinder and the air and oil inlet valve *A* does not open. In this way the vaporizer's heat is retained. When the engine returns to its normal speed and the pecker *a* operates the governor-lever 9, this causes the aforesaid stop *c* to be removed from the path of the catch *f*, to allow the exhaust-valve lever *Q* to move and the exhaust-valve *Q* to close when it is not operated upon by the cam *H*, which opens it. Although I have shown this spragging arrangement as applied to an incline governor, it is not limited to such governors, as it can be employed with other governors, the stop *c* being brought into and out of the path of the catch *f* by the action of the governor after the manner hereinbefore described.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a petroleum-engine the combination with the vaporizer, of a heat-retaining hood surrounding the same at the inlet portion thereof to retain heated air to prevent the deposit of carbonaceous matter in the vaporizer, a lamp or heater, a tube or chimney over the same having passages therefrom one

for discharging the gases from the lamp into the atmosphere and another leading to the hood for supplying heat thereto, and a valve for alternately closing one passage and opening the other, substantially as described.

2. In a petroleum-engine the combination with the vaporizer, of a heat-retaining hood surrounding the same at the inlet portion thereof, to retain heated air to prevent the deposit of carbonaceous matter in the vaporizer, a lamp or heater, a tube or chimney over the same having passages one for discharging the gases from the lamp into the atmosphere and another leading to the hood for supplying heat thereto, a valve for opening the passage to the atmosphere and closing that to the hood during the normal working of the engine, and means for automatically operating said valve to close the passage to the atmosphere and open that to the hood when the normal speed of the engine is exceeded and no explosions take place, substantially as described.

3. In a petroleum-engine, the combination with the actuating-lever of the inlet-valve mechanism, of a pecker adapted to operate said lever during the normal running of the engine, but to be lifted out of the path of said lever when excessive speed is attained, a suitably-actuated lever for opening the exhaust-valve of the engine at proper intervals, a stop in the path of said lever, connections between the stop and the actuating-lever of the inlet-valve whereby movement of the latter during the normal running of the engine withdraws the stop from the path of the lever of the exhaust-valve, allowing the same to close, but remains in the path of said lever and holds the exhaust-valve open during the running of the engine at abnormal speed, substantially as described.

4. In a petroleum-engine, the combination with the vaporizer, of a heat-retaining hood surrounding the same at the inlet portion thereof to retain heated air, a lamp or heater, a tube or chimney over the same having passages therefrom, one for discharging the gases from the lamp into the atmosphere and another leading to the hood for supplying heat thereto, a valve for opening the passage to the atmosphere and closing that to the hood during the normal running of the engine, an actuating-lever for said valve arranged in proximity to the pecker of the inlet-valve-operating mechanism, whereby when excessive speed is attained the pecker engages and operates the lever to automatically close the passage from the lamp to the atmosphere and open that from the lamp to the hood, substantially as described.

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

CHARLES WILLIAM PINKNEY.

Witnesses:

FREDERICK JOHN EDWARDS,
JOHN HERBERT CHANDLER.