No. 878,933. PATENTED FEB. 11, 1908.

F. W. BRADY.

FUEL FEEDING MECHANISM FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED APR. 14, 1906.

4 SHEETS—SHEET 1.

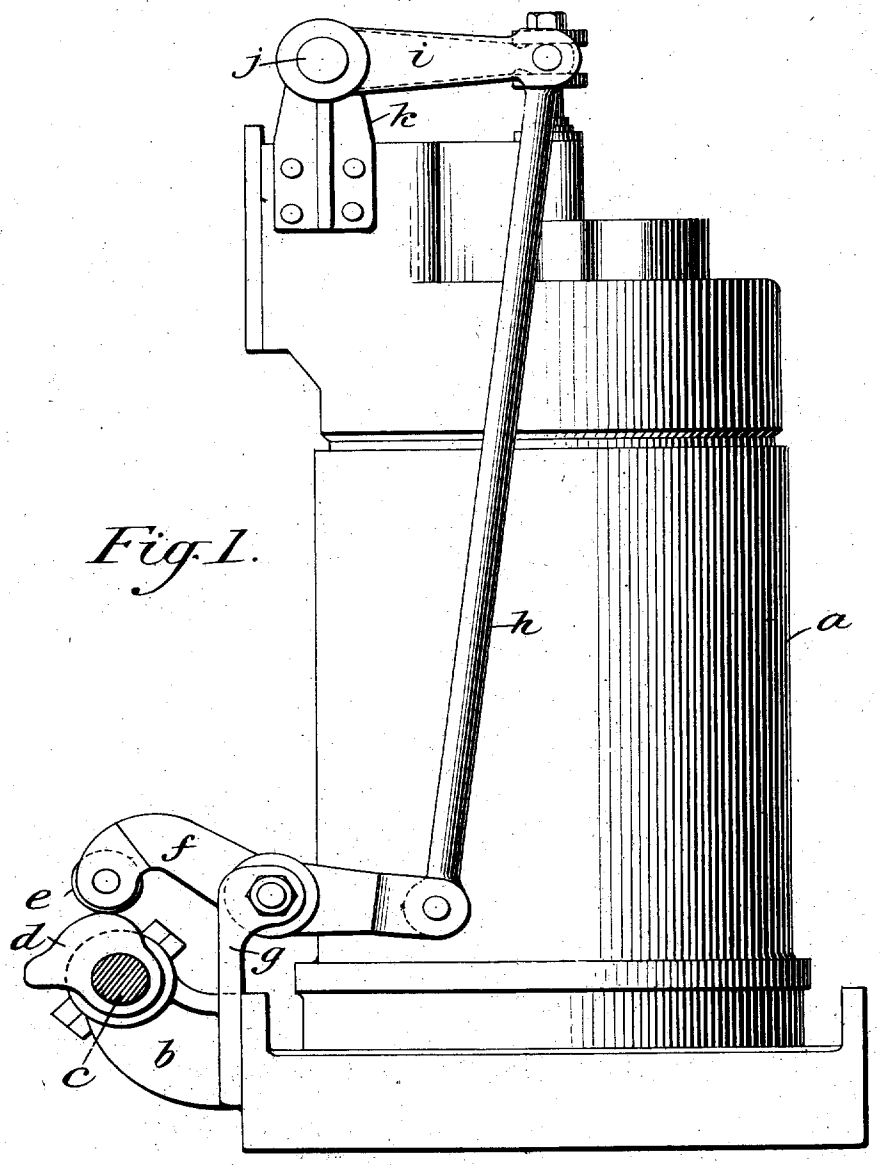


Fig. 1.

Witnesses:
D. W. Edelin.
R. C. Coast

Inventor:
Francis W. Brady,
by Munn & Goldsborough
Attys.

No. 878,933. PATENTED FEB. 11, 1908.

F. W. BRADY.

FUEL FEEDING MECHANISM FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED APR. 14, 1906.

4 SHEETS—SHEET 2.

Fig. 2.

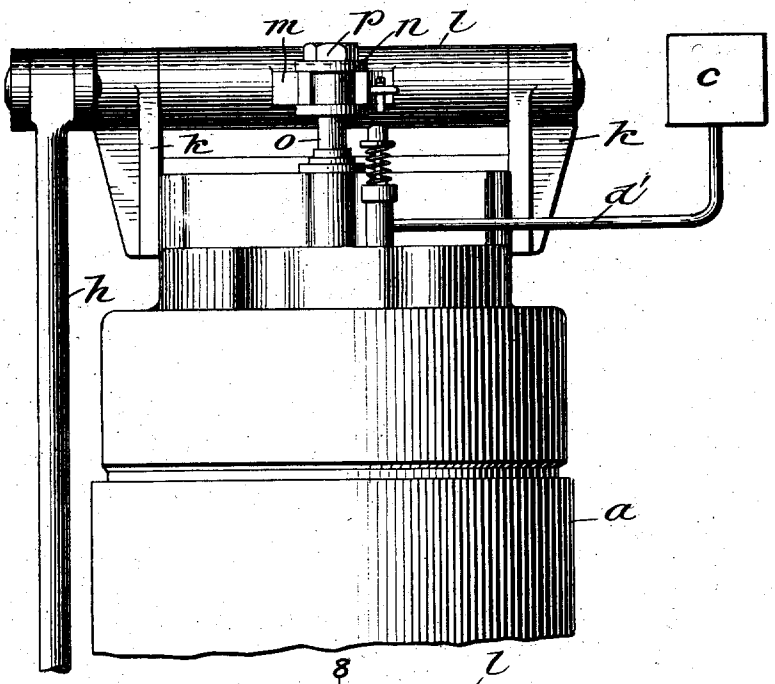
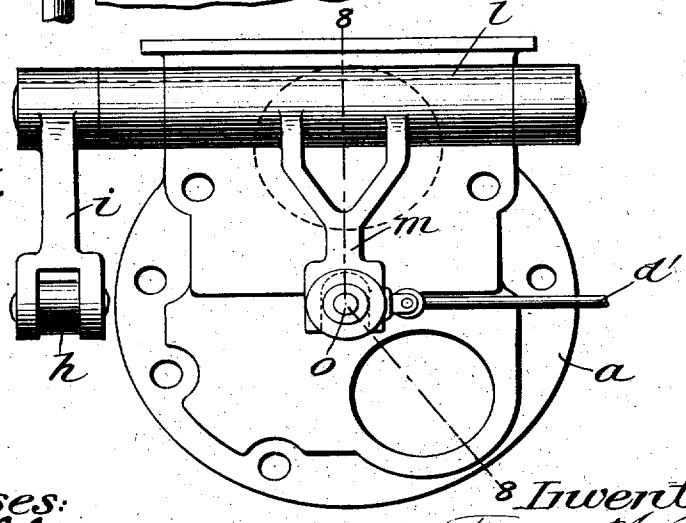


Fig. 3.



Witnesses:
D. W. Edelin.
R. Croft

Inventor:
Francis W. Brady.
by Pennie & Goldsborough
Attys.

No. 878,933. PATENTED FEB. 11, 1908.

F. W. BRADY.

FUEL FEEDING MECHANISM FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED APR. 14, 1906.

4 SHEETS—SHEET 3.

Fig. 4.

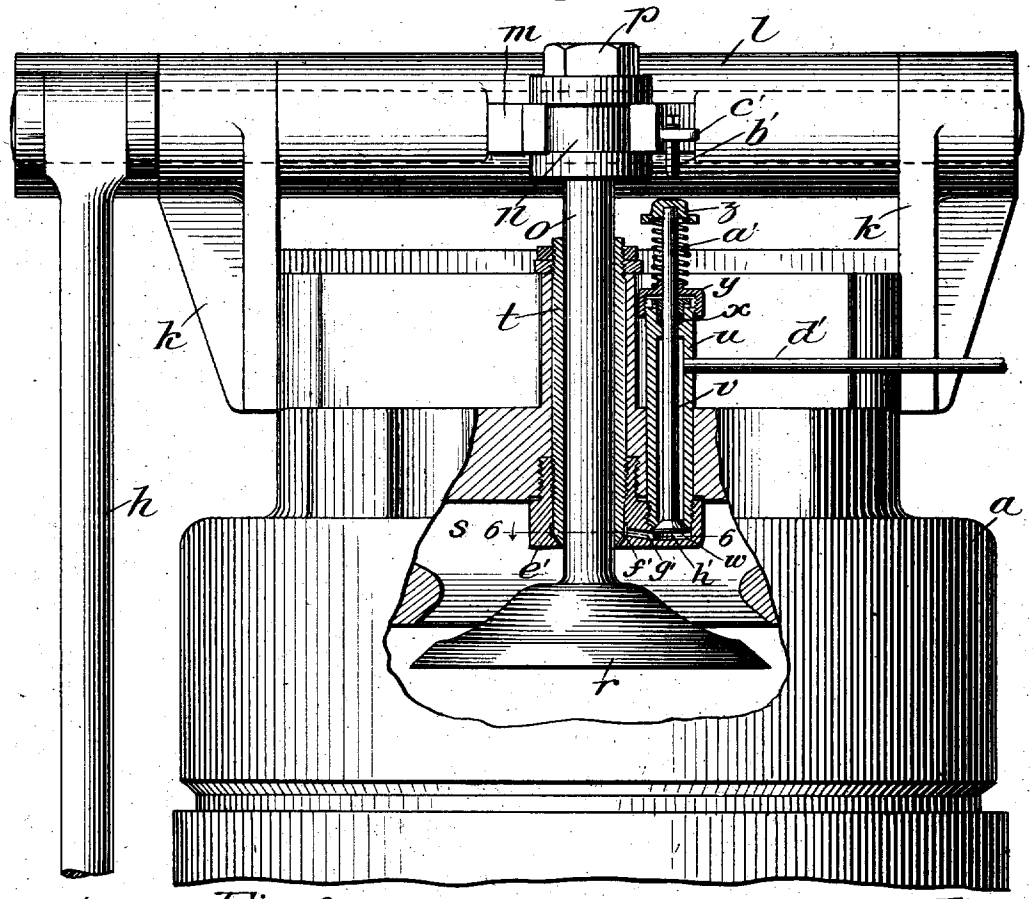


Fig. 6.

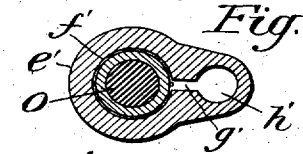


Fig. 5.

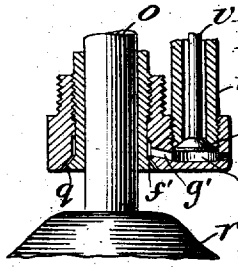
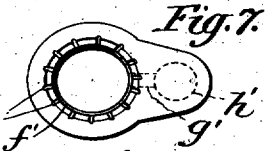


Fig. 7.



Witnesses:
D. W. Edelin.
R. C. Court

Inventor:
Francis W. Brady.
by Pennie & Goldsborough.
Attys.

No. 878,933. PATENTED FEB. 11, 1908.

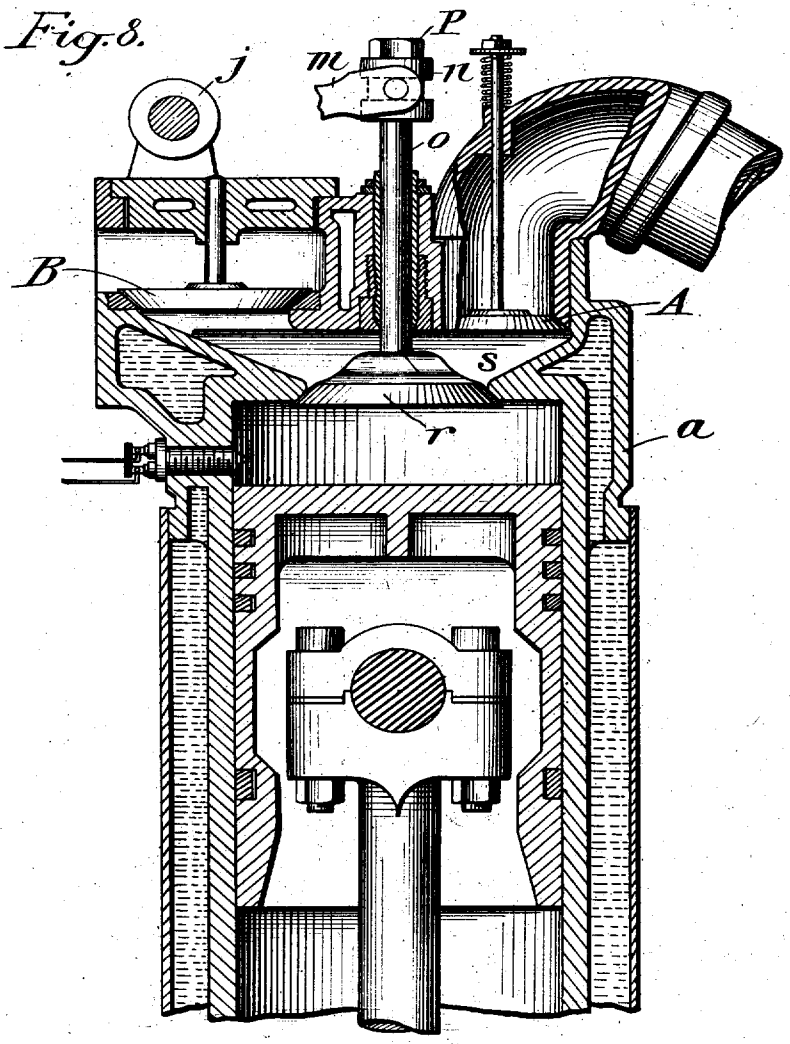
F. W. BRADY.

FUEL FEEDING MECHANISM FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED APR. 14, 1906.

4 SHEETS—SHEET 4.

Fig. 8.



WITNESSES:

R. Hart.

M. E. Brawner.

INVENTOR:

Francis W. Brady.

BY

Pennie & Goldsborough.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

FRANCIS W. BRADY, OF ENGLEWOOD, NEW JERSEY.

FUEL-FEEDING MECHANISM FOR INTERNAL-COMBUSTION ENGINES.

No. 878,933. Specification of Letters Patent. Patented Feb. 11, 1908.

Application filed April 14, 1906. Serial No. 311,765.

To all whom it may concern:

Be it known that I, FRANCIS W. BRADY, a citizen of the United States, residing at Englewood, county of Bergen, State of New Jersey, have invented certain new and useful Improvements in Fuel-Feeding Mechanism for Internal-Combustion Engines; 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 improvements in fuel feeding mechanism for internal combustion engines, and has for its object to provide mechanism whereby a hydrocarbon oil is fed to a vaporizer periodically in predetermined quantity, and whereby the fuel feed is abruptly begun and ended at the proper times, and after-drip is prevented.

My improvements are particularly applicable to, and are herein described in connection with, an internal combustion engine in which the oil is periodically fed to a vaporizer in the path of the air entering the combustion chamber, and in which the period of oil feed continues during part only of the suction stroke. The utility is not, however limited to such engines.

Referring to the drawings, Figure 1 is a side elevation of the engine cylinder, showing the mechanism for actuating the rock shaft, which operates the fuel feed and valve mechanism; Fig. 2 is a front elevation of the same, with parts broken away; and Fig. 3 is a top plan view. In each of these figures the inlet and outlet valve mechanisms have been omitted for clearness of illustration. Fig. 4 is a front elevation, partly in section on an enlarged scale; Fig. 5 is a detail view of a modification; Fig. 6 is a cross section of the line 6—6 of Fig. 4, Fig. 7 is a bottom plan view of Fig. 5 with the valve removed, and Fig. 8 is a central section of the engine through the line 8—8 of Fig. 3 and showing the inlet and exhaust valve mechanisms.

The same reference numerals are applied to like parts throughout.

The cylindrical casing *a* containing the combustion chamber may be of any desirable form, and should be provided with an appropriate water jacket. The base of the cylinder carries a bracket *b*, in which is journaled a cam shaft *c*, which may be driven from the crank shaft of the engine, (not shown). This cam shaft carries a cam *d*, which engages with a roller *e*, on the end of an arm *f*, pivoted in a bracket *g*, which is also attached to the base of the cylinder. At the other end of the arm *f*, is pivoted a connecting rod *h*, which is pivoted at its upper end to a horizontally extending arm *i*, rigidly fastened to a rock shaft *j*, journaled in brackets *k*, bolted to the casing *a*. This rock shaft carries a sleeve *l*, carrying a forked arm *m*. This sleeve *l* and arm *m* are rigidly secured to the rock shaft and move therewith. The fork of the outer end of the arm *m* embraces a flanged collar *n* which is placed on the reduced upper end of the valve stem *o* and clamped in place by a nut *p*. The stem *o* passes through the head of the cylinder and carries at its lower end a bell-shaped valve *r*, adapted to be seated by an upward movement of the rock shaft on an appropriate seat between the combustion chamber of the engine and the valve chamber *s* in the head of the cylinder.

Surrounding the valve stem *o* is a tubular casing *t*, screw-threaded at both ends and fitting snugly within a cylindrical opening in the cylinder head. This casing *t* forms a bearing surface for the stem *o*, and is secured in position by the nuts screwed on to its upper screw-threaded end, as shown in Fig. 4. In proximity to the valve stem *o* a tubular casing *u* is mounted in a second cylindrical opening in the cylinder head. At the upper end of this casing is a contracted opening, through which the rod *v* passes, and by which it is supported out of contact with the sides of the tubular casing *u*, so that an oil chamber is formed between the interior surface of the casing *u* and the rod *v*. This rod *v* carries at its lower end a conoidal enlargement *w*, which forms at once a valve for controlling the oil flow and the piston of a pump for positively feeding the oil, as will be hereinafter explained. Surrounding the rod *v* at its upper end is a stuffing box *x* of suitable construction, and screwed to the top of the casing *u* is the cap *y*, having a central projection surrounding the rod *v*, and to the top of the rod *v* is screwed the cap *z* having a central recess. A compression spring *a'* is mounted between the caps *y* and *z*, the lower end of the spring surrounding the projection of the cap *y* and the upper end fitting in the cap *z*.

A screw-threaded pin *b'* is supported in a lug *c'* on the arm *m* immediately above the center of the cap *z*. An oil supply pipe *d'* is

tapped into the side of the cylindrical casing *u* and communicates with the oil chamber therein. The cylindrical opening in the head of the cylinder, in which the casing *t* is fitted, has an enlarged internally screw-threaded portion at its lower end, into which a casing *e'* is adapted to be screwed. This casing fits into a recessed portion in the lower face of the cylinder head, and surrounds the lower end of the casing *t*. Screw threads on the interior surface of the casing *e'* engage with screw threads on the exterior surface of the casing *t*. This casing *e'* has a contracted opening surrounding the stem *o* and has a beveled face against which the beveled end of the casing *t* fits. Cut in the face of these beveled surfaces are a series of grooves *q* forming flat oil ducts (see Fig. 6). These two beveled surfaces form a cone feed for the liquid fuel. Immediately above this cone feed and surrounding the casing *t* is an annular distributing recess *f'* into which opens a laterally and downwardly extending passage *g'* which communicates with a cylindrical chamber *h'* immediately beneath the head *w* on the rod *v*. Above this chamber *h'* is a screw-threaded cylindrical opening, into which the lower screw-threaded end of the casing *u* fits.

The operation of this device is as follows: The cam *d* is driven from the crank shaft of the engine by a reducing gearing of such character that the cam rotates once for every two revolutions of the crank shaft. In the position shown in Fig. 1, the cam has raised the outer end of the arm *f* and thereby rotated the rock shaft *j* and depressed the arm *m* to open the valve *r*. At this position the engine is in about the middle of its exhaust stroke and the products of combustion are being forced past the valve *r* and out through an exhaust port B in the chamber *s* by the in-stroke of the piston. During this in-stroke and the following out-stroke, the cam continues to hold the valve *r* open. The suction caused by the out-stroke of the piston closes the exhaust port B and opens an air-inlet port A in the chamber *s*, drawing air into this chamber and across the face of the valve *r*. During the continuation of this out-stroke, the sharp projection on the cam *d* comes under the roller on the end of the arm *f* and rocks the shaft *j* and the arm *m* so far that the pin *b'* comes into contact with the cap *z* and presses down the rod *v*, feeding the oil to the face of the valve *r* in the manner hereinafter described. This valve *r* is heated by the heat of the combustion chamber and forms an efficient vaporizer for the fuel which is carried into the combustion chamber mixed with the air, which continues to sweep across the valve *r*. At approximately the end of the out-stroke of the piston the sharp projection on the cam *d* rides from under the roller *e* on the end of the arm *f*, allowing the arm to move downward and rock the shaft *j* and the arm *m* to close the valve *r*. By this same movement the pin *b'* is lifted from the head *z* of the rod *v* and the spring *a'* returns the rod to the position shown in Fig. 4. The construction is such that the oil feed is stopped before the valve *r* is closed, whereby the air continues to sweep across the valve *r* after the oil feed has stopped, thereby completely clearing the chamber *s* and the face of the valve *r* of fuel. During the next in-stroke of the piston, the gases are compressed in the cylinder and ignited in any appropriate manner, and the next out-stroke is the explosion stroke, during which the valve *r* remains closed. At the beginning of the next in-stroke of the piston, the valve *r* is opened by the cam *d*, as shown in Fig. 1, thus completing the cycle of operations.

The operation of the oil feed is as follows:— So long as the pin *b'* is out of contact with the cap *z* the spring *a* holds the head *w* on the rod *v* against its seat on the casing *u*, thus retaining the oil in the chamber within this casing. The chamber *h'* and the downwardly inclined oil duct *g'* form a trap in which, during the operation of the engine and when the oil valve is closed, a small quantity of oil collects from each preceding stroke and is retained in close proximity to the distributing recess, so that when the rod *v* is pressed down by the pin *b'* it instantly forces the oil in the chamber *h'* and duct *g'* through the grooves *q* onto the valve *r* in flat jets, and as long as the rod *v* is held down the oil continues to be forced in jets by the pressure on the oil supply due to the elevation of the fuel tank C onto the valve *r*. When the pin *b'* is lifted from the cap *z*, the head *w* is returned to its seat and the oil collects again in the duct *g'* and the chamber *h'* owing to the downward inclination of that duct. The upward movement of the head *w*, which fits snugly the chamber *h'*, causes a slight back draft through the duct *g'* and the oil passages leading therefrom to the valve *r*, and, consequently, the flow of oil is abruptly and certainly stopped and dripping is prevented. This is a valuable feature in any oil feed, particularly so in the above described cycle of operations.

The passages from the cylindrical recess *f'* to the valve stem may be made by grooves in either the beveled surface of the casing *t* or of the casing *e'* or both.

It is obvious that the time during which the rod *v* is depressed may be varied by screwing in and out the screw-threaded pin *b'*.

In Figs. 5 and 7, I have shown a modification in the construction of the feed cone which consists in changing the direction of the oil passages from the annular distributing recess *f'* to the valve *r*. In this modification the bevels on the casing *e'* and the lower end of the casing *t* are directed outwardly

instead of inwardly. By this construction, the oil is not fed against the stem *o* but it is fed away from the stem and projected directly onto the valve *r*.

The nature of my improvements will be understood from this description of the form in which I prefer to embody them, though it is obvious that the improvements may be embodied in other forms without departing from the spirit of my invention.

What I claim is:

1. In an internal combustion engine, a valve provided with a vaporizing surface across which the air entering the combustion chamber passes, a stem for said valve, a series of ducts arranged about said stem in the form of a cone, a distributing recess communicating with said ducts, and means for feeding a liquid fuel to said distributing recess under pressure and thence through the ducts onto the vaporizing surface.

2. In an internal combustion engine, a valve provided with a vaporizing surface across which the air entering the combustion chamber passes, a stem for said valve, a series of ducts arranged about said stem in the form of a cone, a distributing recess communicating with said ducts, a means for feeding liquid fuel to said distributing recess under pressure, and thence through the ducts onto the valve surface, and means for creating a back-draft through said ducts after the fuel feed.

3. In an internal combustion engine, a combustion chamber, a valve across which the air entering the combustion chamber passes, a stem on said valve, oil ducts spaced about and directed downwardly toward said stem, and means for feeding oil under pressure through the ducts against said stem, and thence onto the valve surface at intervals.

4. In an internal combustion engine, a combustion chamber, a valve across which the air entering the combustion chamber passes, a stem on said valve, oil ducts spaced about and directed downwardly toward said stem and means for feeding oil under pressure through the ducts against said stem, and thence onto the valve surface at intervals, and means for creating a back-draft through said ducts after the oil feed.

5. In an internal combustion engine, a combustion chamber, an air inlet valve communicating with the combustion chamber and provided with a vaporizing surface, means for feeding a liquid fuel directly onto the vaporizing surface of said valve during part only of the suction stroke, and means for creating a back draft through said port after the fuel feed.

6. In a vaporizer for internal combustion engines, an oil inlet port, an oil pump having an eduction port, an oil duct connecting the eduction port with the oil inlet port of the vaporizer, and means for creating suction through the eduction port of the pump and said duct at intervals.

7. In a vaporizer for internal combustion engines, an oil inlet port, a chamber, oil inlet and outlet ports in said chamber, a duct connecting the oil outlet port of said chamber with the inlet port of the vaporizer, an oil supply connected to the inlet port of said chamber, and a piston in said chamber adapted to open communication between the oil inlet and outlet ports in one position and to close such communication in another position, whereby one movement of the piston stops the feed of oil to the vaporizer and withdraws the oil from proximity to the oil inlet port of the vaporizer into the piston chamber, and another movement of the piston forces the oil in said chamber into the vaporizer and opens communication between the vaporizer and oil supply.

8. In an internal combustion engine a combustion chamber, an air inlet valve for said chamber, an oil duct through which oil may be fed onto the surface of the valve, an oil chamber communicating with said duct, a piston in said chamber, means for opening the air inlet valve to admit air to the combustion chamber across the surface of the valve, means for subsequently moving the piston in the oil chamber in one direction to inject oil onto the surface of the air valve, means for subsequently moving the piston in the opposite direction to create a back-draft through the oil duct, and means for subsequently closing the air valve.

9. In an internal combustion engine, a combustion chamber, an air inlet valve for said chamber, an oil duct through which oil may be fed onto the surface of the valve, an oil chamber communicating with said duct, a piston in said chamber, an oil supply port in said chamber, means for opening the air inlet valve to admit air to the combustion chamber across the surface of the valve, means for subsequently moving the piston in the oil chamber in one direction to force the oil in said chamber onto the surface of the valve and establish communication between the oil supply and the said oil duct, means for subsequently moving the piston in the opposite direction to close communication between the oil supply and said duct, and to create a back-draft through said duct, and means for subsequently closing the air valve.

10. An internal combustion engine having a combustion chamber, an air valve, a stem on said valve, a rocker engaging said stem, a duct through which oil may be fed onto the surface of the valve, a chamber communicating with the duct, a piston in said chamber, an oil supply port in the chamber adapted to be closed by the piston, means for actuating the rocker to open the air valve, and a stop carried by the rocker and adapted to engage with the piston in the oil chamber after the

air valve is open to force the oil in said chamber into the oil duct and open communication between the oil duct and the oil supply.

11. An internal combustion engine having a combustion chamber, an air valve, a stem on said valve, a sleeve surrounding said stem, a casing surrounding said sleeve, oil ports about said stem between the sleeve and casing, an annular distribution chamber above said ports between the sleeve and casing, an oil chamber in said casing, an oil duct connecting said distribution and oil chambers, a plunger in the oil chamber, an annular chamber surrounding said plunger and opening into the oil chamber, a head on said plunger adapted to close the end of the annular chamber when the plunger is withdrawn, means for supplying oil to said annular chamber, and means for opening the air valve of the combustion chamber and for actuating the plunger in one direction to force the oil in the oil chamber through the oil port onto the air valve and open communication between said ports and the oil supply, and in the other direction to shut off the oil supply and create a back-draft through said ports.

12. An internal combustion engine having a combustion chamber, an air valve, a stem on said valve, a rocker engaging said stem, and means for feeding oil to the surface of said valve, said means comprising an oil chamber, an oil passage leading from the oil chamber to the valve, a plunger in said chamber, an outlet port in said chamber communicating with the said oil passage, an oil inlet port in said oil chamber, a head on the plunger adapted to close the oil inlet port when the plunger is withdrawn, a spring for withdrawing said plunger, and an adjustable stop on the rocker adapted to move the plunger against the action of the spring.

13. In an internal combustion engine, a valve provided with a vaporizing surface, a stem for said valve, juxtaposed conical surfaces surrounding said stem, fuel ducts between said surfaces, a distributing recess communicating with said ducts and means for feeding liquid fuel to said distributing recess under pressure and thence through the ducts onto the vaporizing surface.

14. In an internal combustion engine, a combustion chamber, a valve across which the air entering said chamber passes, a stem on said valve ports about said stem, a distribution chamber surrounding said stem and communicating with said ports, an oil duct leading into the distribution chamber, a valve controlling the flow of oil through said duct, means for opening the first mentioned valve, and means for opening the oil valve while the first mentioned valve is open.

15. In a vaporizer for internal combustion engines, an oil inlet port, a chamber, oil inlet and outlet ports in said chamber, a duct connecting the oil outlet port of said chamber with the inlet port of the vaporizer, an oil supply connected to the inlet port of said chamber, and means in said chamber for opening and closing communication between the inlet and outlet ports to control the oil feed.

16. In an internal combustion engine, a valve, a stem on the valve, a sleeve surrounding the stem and having a beveled surface at its end, a casing surrounding the sleeve and having a beveled surface adapted to contact with the beveled surface on the sleeve, oil ducts about the stem between the beveled surfaces, and means for feeding oil to said ducts.

17. In an internal combustion engine, a valve provided with a vaporizing surface across which the air entering the combustion chamber passes, a stem for said valve a series of ducts arranged about said stem, a distributing recess communicating with said ducts, an oil duct leading into said recess and downwardly inclined away therefrom, a chamber in which the duct terminates, the chamber and duct together forming a reservoir, and a plunger operating in said chamber, whereby the oil collects in said reservoir in close proximity to the distributing recess and upon the movement of the plunger is quickly forced onto the vaporizing surface.

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

FRANCIS W. BRADY.

Witnesses:
BURGESS A. CRUDEY,
WILLIAM H. DAVIS.

Certificate of Correction in Letters Patent No. 878,933

It is hereby certified that in Letters Patent No. 878,933, granted February 11, 1908, upon the application of Francis W. Brady, of Engelwood, New Jersey, for an improvement in "Fuel-Feeding Mechanism for Internal Combustion Engines," an error appears in the printed specification requiring correction, as follows: Page 3, line 63, the word "an" should be stricken out and the words *a single* inserted instead; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 17th day of March, A. D., 1908.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.

air valve is open to force the oil in said chamber into the oil duct and open communication between the oil duct and the oil supply.

11. An internal combustion engine having a combustion chamber, an air valve, a stem on said valve, a sleeve surrounding said stem, a casing surrounding said sleeve, oil ports about said stem between the sleeve and casing, an annular distribution chamber above said ports between the sleeve and casing, an oil chamber in said casing, an oil duct connecting said distribution and oil chambers, a plunger in the oil chamber, an annular chamber surrounding said plunger and opening into the oil chamber, a head on said plunger adapted to close the end of the annular chamber when the plunger is withdrawn, means for supplying oil to said annular chamber, and means for opening the air valve of the combustion chamber and for actuating the plunger in one direction to force the oil in the oil chamber through the oil port onto the air valve and open communication between said ports and the oil supply, and in the other direction to shut off the oil supply and create a back-draft through said ports.

12. An internal combustion engine having a combustion chamber, an air valve, a stem on said valve, a rocker engaging said stem, and means for feeding oil to the surface of said valve, said means comprising an oil chamber, an oil passage leading from the oil chamber to the valve, a plunger in said chamber, an outlet port in said chamber communicating with the said oil passage, an oil inlet port in said oil chamber, a head on the plunger adapted to close the oil inlet port when the plunger is withdrawn, a spring for withdrawing said plunger, and an adjustable stop on the rocker adapted to move the plunger against the action of the spring.

13. In an internal combustion engine, a valve provided with a vaporizing surface, a stem for said valve, juxtaposed conical surfaces surrounding said stem, fuel ducts between said surfaces, a distributing recess communicating with said ducts and means for feeding liquid fuel to said distributing recess under pressure and thence through the ducts onto the vaporizing surface.

14. In an internal combustion engine, a combustion chamber, a valve across which the air entering said chamber passes, a stem on said valve ports about said stem, a distribution chamber surrounding said stem and communicating with said ports, an oil duct leading into the distribution chamber, a valve controlling the flow of oil through said duct, means for opening the first mentioned valve, and means for opening the oil valve while the first mentioned valve is open.

15. In a vaporizer for internal combustion engines, an oil inlet port, a chamber, oil inlet and outlet ports in said chamber, a duct connecting the oil outlet port of said chamber with the inlet port of the vaporizer, an oil supply connected to the inlet port of said chamber, and means in said chamber for opening and closing communication between the inlet and outlet ports to control the oil feed.

16. In an internal combustion engine, a valve, a stem on the valve, a sleeve surrounding the stem and having a beveled surface at its end, a casing surrounding the sleeve and having a beveled surface adapted to contact with the beveled surface on the sleeve, oil ducts about the stem between the beveled surfaces, and means for feeding oil to said ducts.

17. In an internal combustion engine, a valve provided with a vaporizing surface across which the air entering the combustion chamber passes, a stem for said valve a series of ducts arranged about said stem, a distributing recess communicating with said ducts, an oil duct leading into said recess and downwardly inclined away therefrom, a chamber in which the duct terminates, the chamber and duct together forming a reservoir, and a plunger operating in said chamber, whereby the oil collects in said reservoir in close proximity to the distributing recess and upon the movement of the plunger is quickly forced onto the vaporizing surface.

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

FRANCIS W. BRADY.

Witnesses:
BURGESS A. CRUDEY,
WILLIAM H. DAVIS.

Certificate of Correction in Letters Patent No. 878,933

It is hereby certified that in Letters Patent No. 878,933, granted February 11, 1908, upon the application of Francis W. Brady, of Engelwood, New Jersey, for an improvement in "Fuel-Feeding Mechanism for Internal Combustion Engines," an error appears in the printed specification requiring correction, as follows: Page 3, line 63, the word "an" should be stricken out and the words *a single* inserted instead; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 17th day of March, A. D., 1908.

[SEAL.]

C. C. BILLINGS,
Acting Commissioner of Patents.

Correction in Letters Patent No. 878,933

It is hereby certified that in Letters Patent No. 878,933, granted February 11, 1908, upon the application of Francis W. Brady, of Engelwood, New Jersey, for an improvement in "Fuel-Feeding Mechanism for Internal Combustion Engines," an error appears in the printed specification requiring correction, as follows: Page 3, line 63, the word "an" should be stricken out and the words *a single* inserted instead; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 17th day of March, A. D., 1908.

[SEAL.]

C. C. BILLINGS,

Acting Commissioner of Patents.