N. M. LOWER.

OIL SEPARATOR FOR STEAM ENGINES.

APPLICATION FILED FEB. 19, 1914.

1,144,331.

Patented June 22, 1915.

5 SHEETS—SHEET 1.

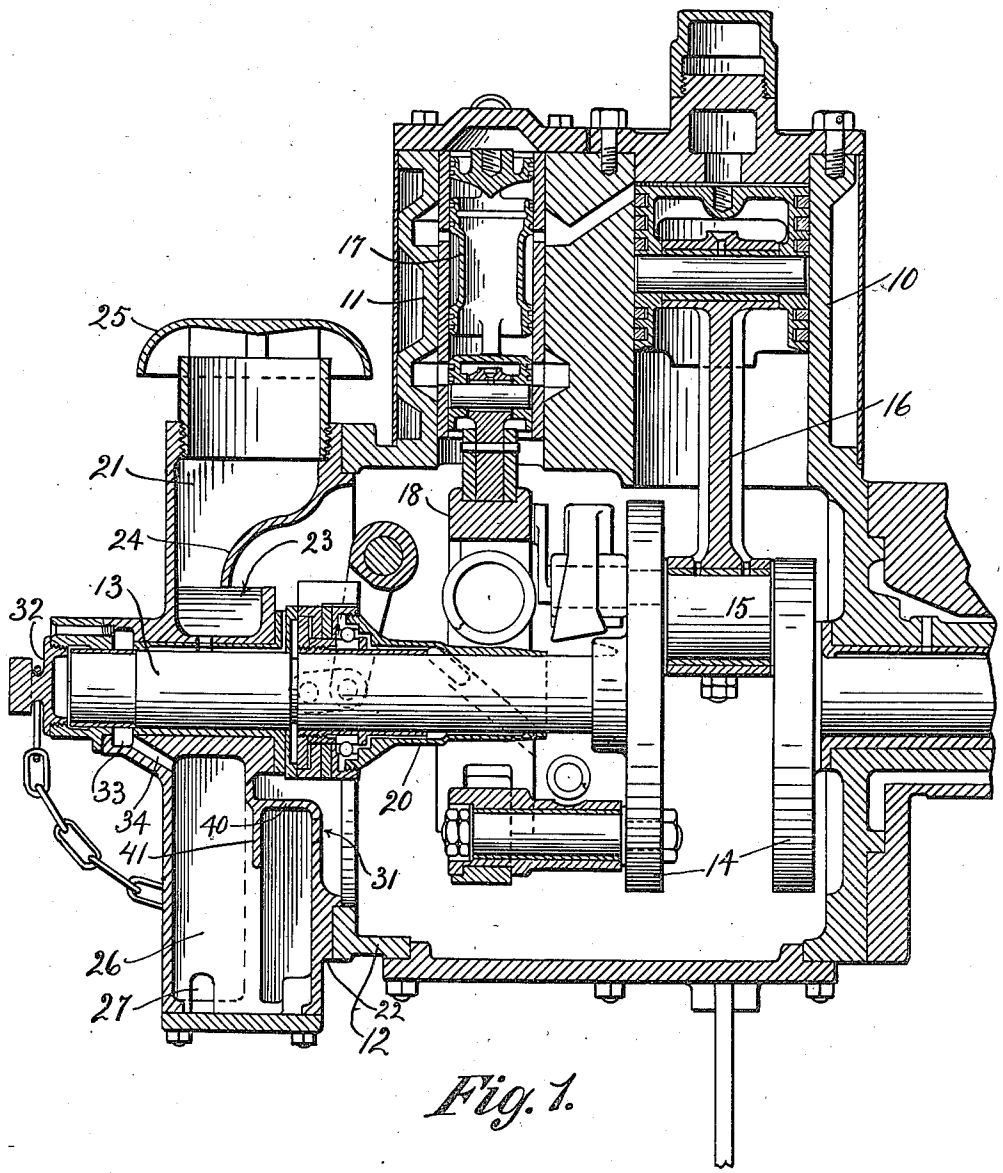


Fig. 1.

Witnesses:
W. H. Cotton
E. M. Klatcher

Inventor:
Nathan M. Lower
By Gilson & Gilson
Attorneys.

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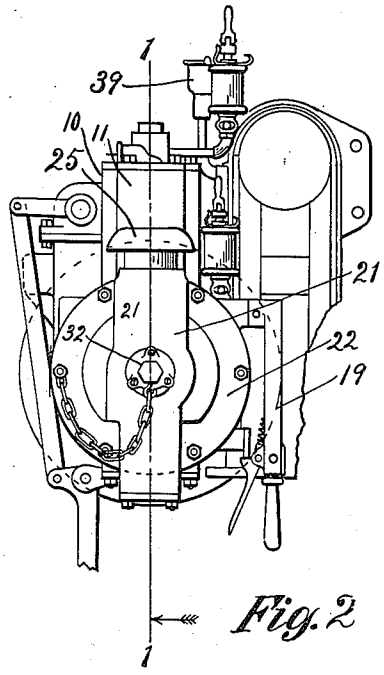


Fig. 2

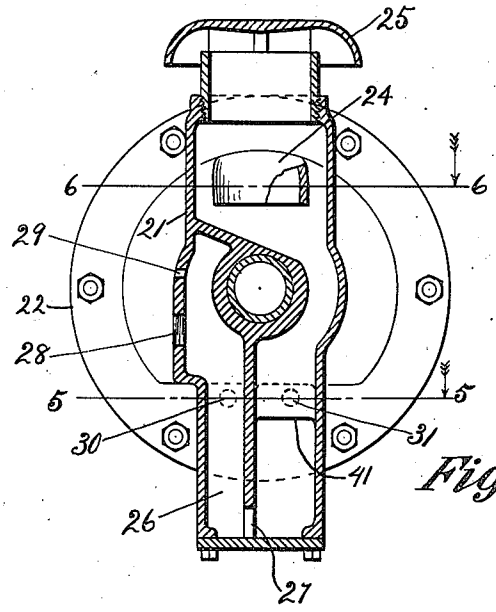


Fig. 4

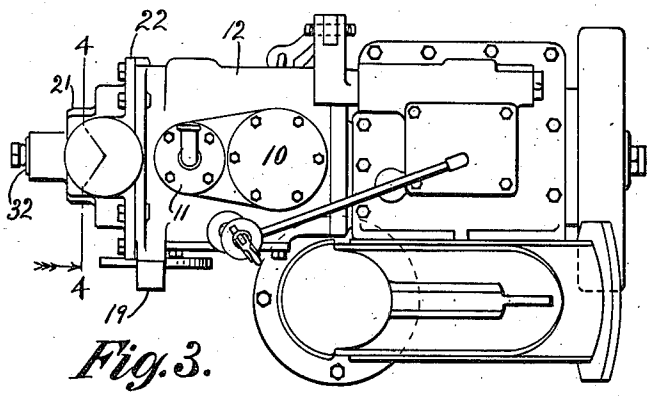


Fig. 3.

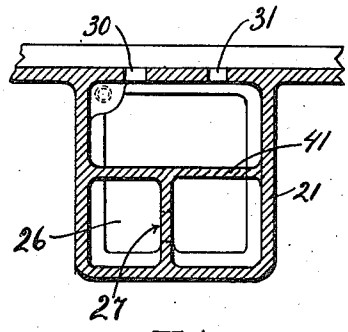


Fig. 5.

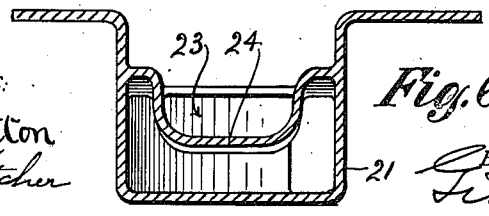


Fig. 6.

WITNESSES:

W. H. Cotton

E. M. Klatcher

INVENTOR.

Nathan M. Lower

BY

Fillson & Fillson

ATTORNEYS.

N. M. LOWER.

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5 SHEETS—SHEET 3.

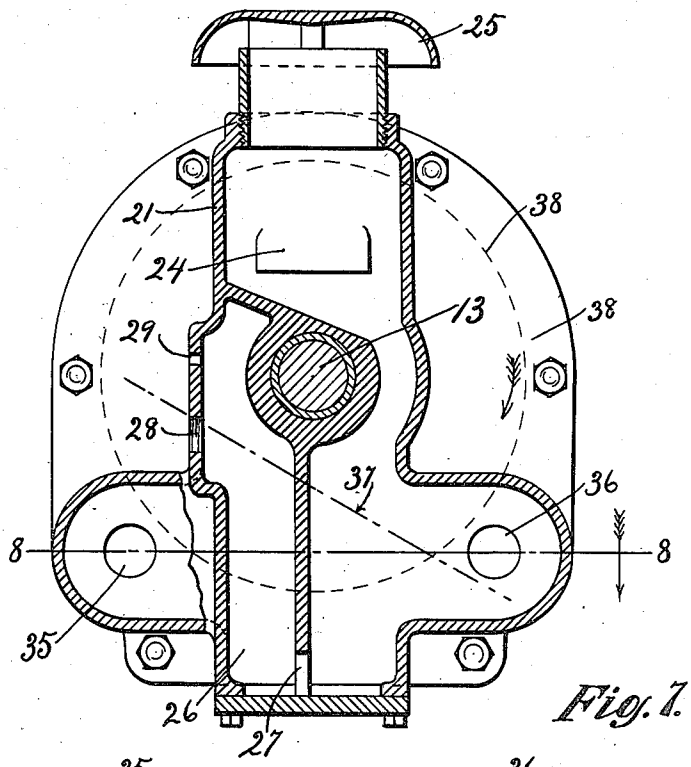


Fig. 1.

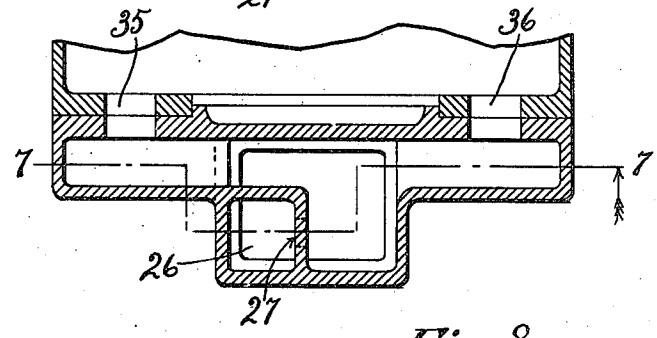


Fig. 8.

WITNESSES:

W. H. Cotton

E. M. Hatcher

INVENTOR.

Nathan M. Lower.

BY

Gilson & Gilson

ATTORNEYS.

N. M. LOWER.

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5 SHEETS—SHEET 4.

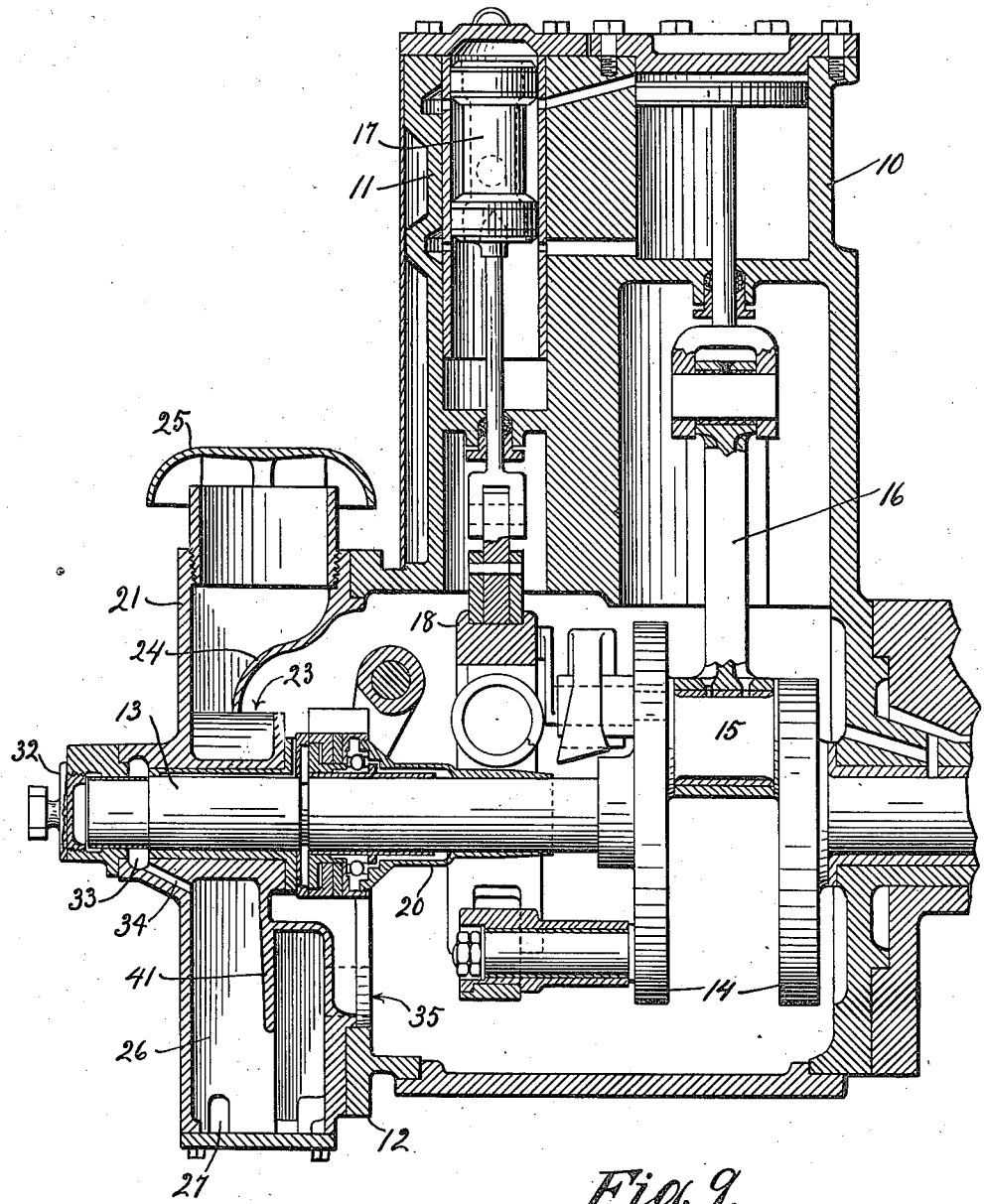


Fig. 9.

Witnesses:
W. H. Cotton
E. M. Klatcher

Inventor:
Nathan M. Lower

By Gillson & Gillson
Attorneys.

N. M. LOWER.

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5 SHEETS—SHEET 5.

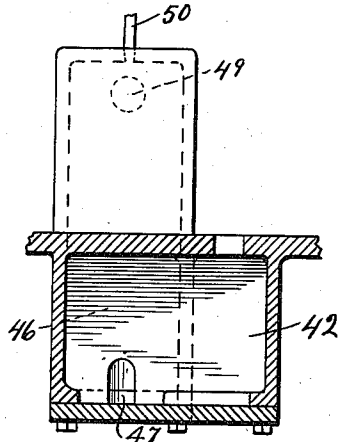


Fig. 11.

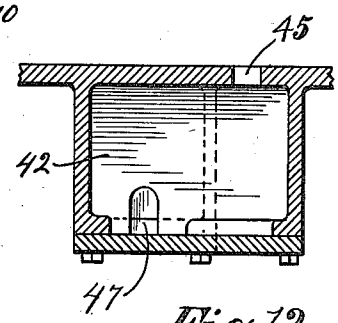


Fig. 12.

Fig. 10.

WITNESSES:

W. H. Cotton

E. M. Klatcher

INVENTOR.

Nathan M. Lower

BY

Gilson & Gilson

ATTORNEYS.

UNITED STATES PATENT OFFICE.

NATHAN M. LOWER, OF SCHENECTADY, NEW YORK, ASSIGNOR TO LOCOMOTIVE STOKER COMPANY, OF SCHENECTADY, NEW YORK, A CORPORATION OF PENNSYLVANIA.

OIL-SEPARATOR FOR STEAM-ENGINES.

1,144,331. Specification of Letters Patent. Patented June 22, 1915.

Application filed February 19, 1914. Serial No. 819,767.

To all whom it may concern:

Be it known that I, NATHAN M. LOWER, a citizen of the United States, and resident of Schenectady, county of Schenectady, and State of New York, have invented certain new and useful Improvements in Oil-Separators for Steam-Engines, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to steam engines of the type in which the crank shaft is inclosed in a casing and the lubrication is accomplished by the splash system.

In engines of this type the crank case is partially filled with oil, and the movement of the crank and eccentric, by splashing the oil, lubricates the various bearings including the walls of the cylinder and valve casing. There is always a leakage of steam from the cylinder and valve chest into the crank case, and the water due to its condensation becomes mixed with the oil and tends to fill the casing.

An opening is necessarily provided for the transfer of air to and from the crank casing because of the suction and air displacement incident to the reciprocation of the parts; this action being more pronounced in single-acting engines. The constant splashing of the liquid causes an admixture of air therewith and develops a spray which is carried out of the casing through the air port.

In order to avoid the loss of oil, to maintain in the crank case a high percentage of oil as compared with the water with view to more efficient lubrication, and for the purpose of preventing the discharge of oil and water with the air, it becomes desirable to secure a separation of the oil and water from the air within the engine, and of the water from the oil, discharging the water from the engine and retaining the oil therein.

These objects are attained by means of the construction hereinafter described, and as illustrated in the accompanying drawings, in which—

Figure 1 is a detail vertical central section of a single acting engine on the line 1—1 of Fig. 2; Fig. 2 is a detail end elevation thereof; Fig. 3 is a plan view of the engine; Fig. 4 is a sectional view on the line 4—4 of Fig. 3; Figs. 5 and 6 are detail sections on the lines 5—5 and 6—6, respectively, of Fig. 4; Fig. 7 is a detail vertical sectional view of the crank case of an engine and the crank disk thereof showing a modification, taken on the line 7—7 of Fig. 8; Fig. 8 is a detail sectional view on the line 8—8 of Fig. 7; Fig. 9 is a vertical longitudinal section of a double acting engine provided with the improved separator; Fig. 10 is an end elevation partly in section, of an engine showing a further modification; and Figs. 11 and 12 are detail sections on the lines 11—11 and 12—12, respectively, of Fig. 10.

The engine cylinder is represented at 10, and the valve casing thereof at 11.

At 12 there is shown the crank case to which the lower ends of the cylinder and valve casing open, and through which passes the crank shaft 13 which is journaled in suitable boxes within the ends of the casing.

At 14 there is shown a pair of crank disks forming part of the shaft 13; at 15 the wrist pin; at 16 the piston pitman; at 17 the engine valve; and at 18 the eccentric, controlled by a suitable governor for actuating the valve.

In the engine as illustrated there is also present mechanism, including a hand lever 19 controlling a shiftable sleeve 20 on the crank shaft, for regulating the governor, but as this feature is not claimed in the present application it need not be further described, and, with the parts previously referred to, may be of any desired form of construction.

The separator comprises a casing 21 which closes one end of the crank case 12, being provided with a flange 22 bolted thereto. This casing also constitutes the bearing for one end of the crank shaft, and is open at the top to provide the breathing port for the engine, permitting the ingress and egress of air due to the piston movement. A port 23 in the inner wall of the casing 21, above the shaft journal, permits the air to enter the crank case and the discharge therefrom of the intermixed oil and water. This port is covered by a hood 24 which deflects the material descharged into the casing 21 downwardly and toward the outer wall of the casing, the liquids falling to the bottom of the casing, which is below the crank shaft, and the air escaping from the top.

The upper portion of the chamber of the casing 21 being of considerable capacity, the movement of vapors therethrough is slow,

with the result, in connection with the downward discharge through the port 23, of freeing the air from the liquids. The open upper end of the casing 21 is preferably provided with a ported cap 25 to prevent the entrance of dust and dirt. Within the lower end of the casing 21 there is provided a trap 26 for the water, this trap being preferably formed as a compartment of the casing. Adjacent its lower end the trap is provided with a port 27 open to the chamber of the casing 21 to admit the water, which, by reason of its greater specific gravity and absence of agitation, is separated out from the oil. A discharge port 28 leads from the upper portion of the trap 26, and is here represented as a threaded aperture adapted to receive the nipple of a drain pipe (not shown). At a still greater elevation the trap is provided with a vent port 29 to prevent siphonic action through the drain pipe.

The inner wall of the casing of the separator is ported, as shown at 30, 31, to permit the return flow of oil, from which the water has been separated by gravity, to the crank case 12. Preferably, as shown, a plate extends from the wall within which the ports 30, 31 are located into the chamber of the separator and above these ports and a screen 41, here shown as imperforate, depends from this plate, the plate and screen forming a hood over-hanging the ports. The screen 41 is therefore interposed between the passage leading from the induction port 23, to the lower portion of the separating chamber. Material descending through this passage is composed of an admixture of oil and water. There being no agitation within this chamber, the water will be precipitated and the oil freed from the water will rise back of the screen and pass into the crank case through the ports 30, 31.

A cap 32 is applied to the outer end of the box within which the shaft 13 is journaled in the casing 21 to prevent the escape of oil therefrom. Back of this cap the box is provided with an annular channel 33, within which the oil which works past the bearing may accumulate, and a drain duct 34 leads from this channel to the chamber of the casing 21.

In the modification of Figs. 7 and 8, two ports 35, 36, are provided in the wall between the crank case and separator chamber, the former to provide for the outflow of the liquid from and the other to permit its return to the crank case. This circulation is induced by the building up of the liquid at one side of the crank chamber due to the rotary movement of the parts carried by the crank shaft, as indicated by the dotted line 37 and the arrow applied to the crank disk 38. There being a considerable head of liquid at the side of the chamber where the port 35 is located, and little or no head at the side where the port 36 is placed, the circulation necessarily results. As the water will be quickly precipitated within the quiet of the separating chamber the return flow will be of oil, freed, or substantially freed from water. This arrangement may be preferred where the air movement is slight, as in a double-acting engine.

While the oil separator as applied to a double-acting engine, as represented in Fig. 9, is shown as of the same form as in Figs. 1 to 6, it is obvious that the air vent may be reduced in size, as comparatively slight compression is developed in the crank case of an engine of this type.

Before starting the engine the crank case 12 will be supplied with oil to a sufficient depth to cause the necessary splash by the action of the crank 15 and other movable parts, and the oil supply may be renewed as by means of a cup 39. The separator chamber is of sufficient size to insure slow movement of vapors and liquids therein, thereby facilitating the precipitation of the heavier materials.

I claim as my invention—

1. In combination, an engine having a closed crank case, such case being vented, and means for eliminating oil from the spray passing out at the vent, a chamber for receiving the oil so separated and having a return port open to the crank case.

2. In combination, an engine having a closed crank case, such case being vented, means for separating liquids from the spray discharge from the vent, and means for separating the oil content out of such liquid and returning it to the crank case.

3. In combination, a steam engine having a closed crank case, an oil separator comprising a casing having ports at different elevations communicating with the crank case, a hood within the casing over the outer end of the upper port, and a water trap in the lower end of the casing having a discharge port.

4. In combination, a steam engine having a closed crank case, an oil separator comprising a vented casing having ports at different elevations communicating with the crank case, a hood within the casing over the upper port, and a water trap in the lower end of the casing having a discharge port.

5. In combination, a steam engine having a closed crank case, an oil separating chamber connected with the crank case by induction and eduction ports and having a vent opening, the passage leading to the vent opening being of greater cross-sectional area than the induction passage.

6. In combination, a steam engine having a closed crank case, and a separator adapted to receive spray from the crank case and

having a vent, an outlet for water, and a port for returning oil to the crank case.

7. In combination, a steam engine having a closed crank case, and an oil separator comprising a casing having ports communicating with the crank case at different elevations, a duct leading from the bearing of the engine shaft to the casing, and a water trap having a discharge outlet.

8. In a steam engine, a closed crank case, an oil separating chamber at the end of the crank case and communicating therewith through ports located below the crank shaft of the engine and on opposite sides thereof.

9. In a steam engine, a closed crank case, an oil separating chamber communicating therewith through ports located below the crank shaft of the engine and on opposite sides thereof.

10. In a steam engine having a closed crank case, in combination, an oil separating chamber, an upstanding wall having a port above the engine shaft leading to the chamber and a port below the shaft leading therefrom and a hood within the chamber over-hanging the last named port.

11. In a steam engine, in combination, a crank case, an oil separating chamber, a port leading from the crank case to the chamber, a port at a lower level leading from the chamber to the crank case, and a plate in the chamber over-hanging the last named port.

12. In a steam engine, in combination, a crank case, an oil separating chamber having a port delivering to and a passage leading from the crank case, and a screen interposed between the passage and the port.

NATHAN M. LOWER.

Witnesses:
R. H. GIBBES,
H. R. HEGEMAN.