(No Model.)

2 Sheets—Sheet 1.

F. M. RITES.

STEAM ENGINE.

No. 383,322. Patented May 22, 1888.

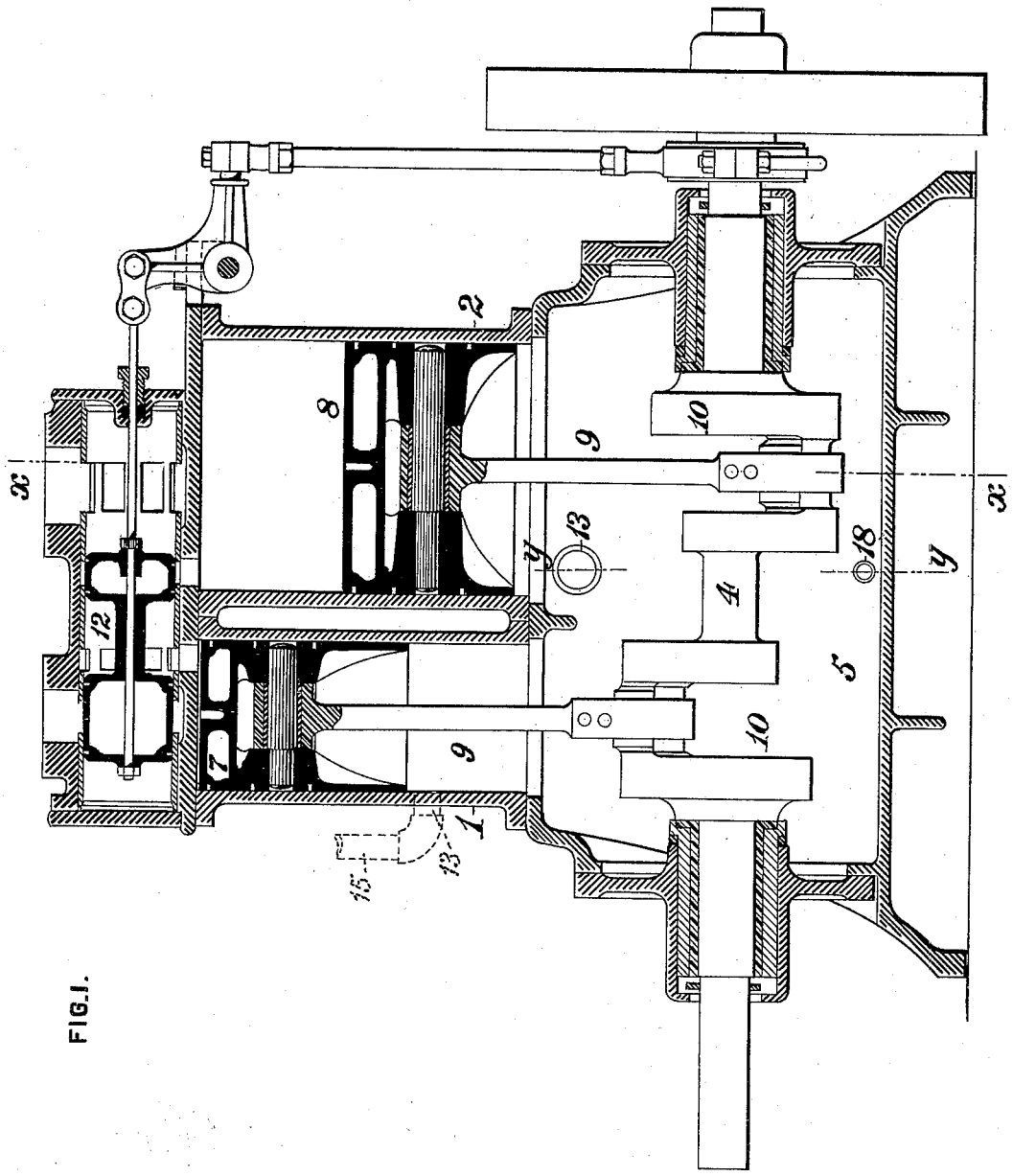

FIG. 1.

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(No Model.) 2 Sheets—Sheet 2.

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STEAM ENGINE.

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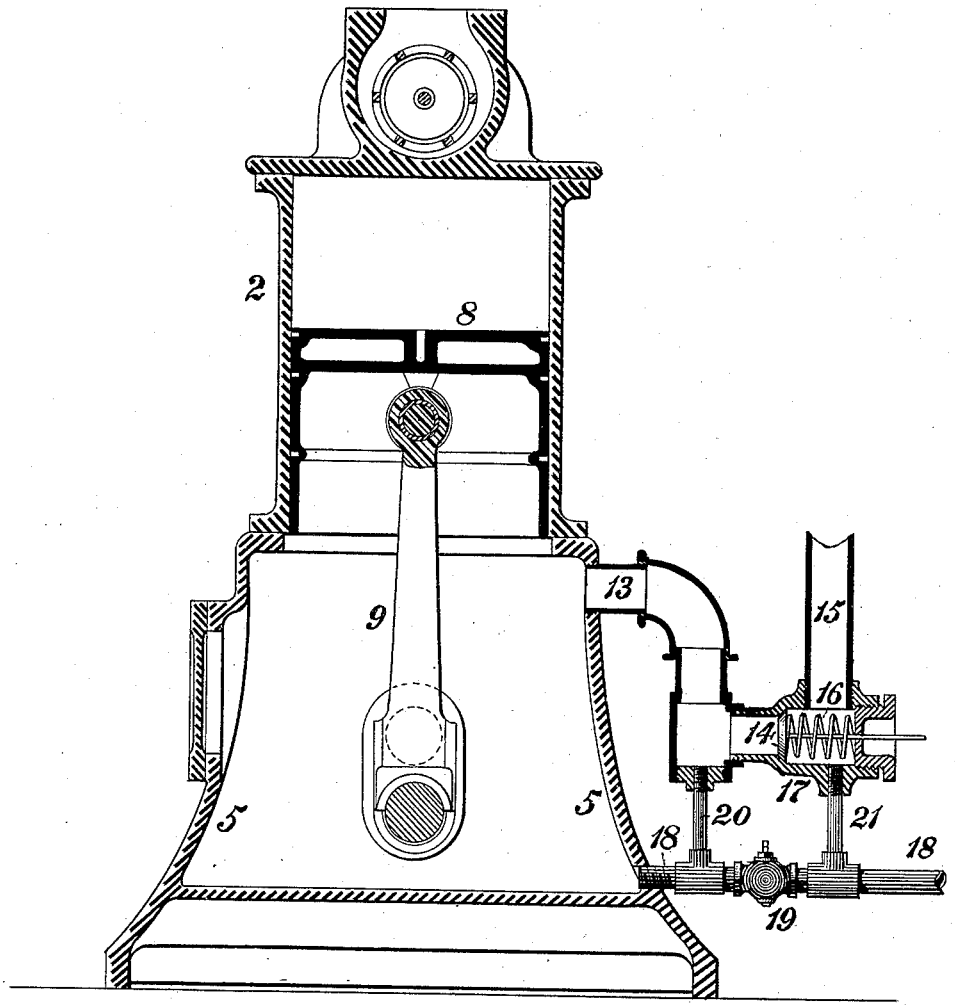
FIG. 2.



WITNESSES:

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UNITED STATES PATENT OFFICE.

FRANCIS M. RITES, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO THE WESTINGHOUSE MACHINE COMPANY, OF SAME PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 383,322, dated May 22, 1888.

Application filed January 17, 1888. Serial No. 260,975. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS M. RITES, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Steam-Engines, of which improvement the following is a specification.

My invention relates to single-acting engines of the class or type in which a cylinder or cylinders are connected to and communicate at one end with a closed crank case or chamber, within which the crank-shaft rotates, and which serves as a receptacle for lubricating material.

The object of my invention is to prevent the projection of oil and water from the crank-case by the movements of the piston or pistons and to enable a slight partial vacuum to be maintained in the crank-case, so that the lubricating material may be carried at a higher level therein.

To this end my invention, generally stated, consists in the combination, with a closed crank-case, of a vent-passage adapted to be opened only for short periods and at the point of least displacement.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal central section through a compound engine embodying my invention; and Fig. 2, a vertical transverse section through the same at the line *x x* of Fig. 1, except as to the right-hand side of the crank-case, which is shown as cut at the line *y y* of Fig. 1.

My invention is illustrated as applied in a compound single-acting engine, which in its principal structural features, and more particularly as to its distribution-valve mechanism, which embodies certain improvements which will constitute the subject-matter of a separate application by H. H. Westinghouse and myself, is not claimed as of my present invention. A high-pressure cylinder, 1, and a low-pressure cylinder, 2, of larger diameter, each of which is open at its lower end, are secured upon the top of a closed crank-case, 5, which forms the bed or support of the engine, and likewise serves as a tank or receptacle for the lubricating material, preferably a mixture of oil and water, of the journals of the crank-shaft 4, and the pins of the two double cranks 10 thereof, which crank-pins are coupled by connecting-rods 9 to the pistons 7 8 of the high and low pressure cylinders 1 2. Steam is supplied to and exhausted from the cylinders by a distribution-valve, 12, which may be of any suitable and preferred construction.

In single-acting engines of the type to which my invention relates it has been found in practice that by the movements of the pistons, acting in the manner of a blowing-engine, an objectionable tendency is exerted to force the lubricating material out of the crank-case, the pistons drawing air thereinto in their upward strokes and expelling it violently in their downward strokes, the air in its discharge carrying with it considerable portions of the lubricating-liquid. To obviate such objection, and to admit of the formation of a slight partial vacuum in the crank-case, I provide the latter with a vent passage or opening, 13, adapted to be closed during the whole of the traverse of the larger piston, 8, except for a short period at and adjoining the bottom of its stroke.

The preferred means for governing the opening and closure of the vent-passage 13 consists, as shown in the transverse section, Fig. 2, of a check or non-return valve, 14, which opens outwardly and controls communication between the vent-passage and a vapor-discharge pipe, 15, leading therefrom to the atmosphere. The valve 14 is held normally to its seat by a light spring, 16, and, in order to enable the lubricating material to be maintained at as high a level in the crank-case as is desirable for effective operation, is located in a chamber or casing, 17, at the lower portion of the vent-passage 13, with the lower line of its seat at a level with that selected as the normal level of the lubricating material, such being ordinarily at or slightly below the bottom line of the crank-shaft. A liquid-discharge pipe, 18, governed by a cock or valve, 19, leads out of the crank-case 5 at or near its bottom line and is connected between the crank-case and the valves 14 and 19 with the discharge-passage 13 by means of a pipe, 20. The valve-chamber 17 and discharge-pipe 18 are also connected beyond or on the outer sides of the valves 14 and 19 by a pipe, 21.

Under the above construction the upward movement of the larger piston, 8, supplemented by the tension of the spring 16, holds the check-valve 14 to its seat and tends to form a slight partial vacuum in the crank-case, while its downward movement at and adjoining the terminal of its downward stroke opens the valve and expels a slight quantity of air, together with any steam which may have leaked into the crank-case. The violent action of the successive ingress and egress of a comparatively large volume of air, which would in the absence of preventive means be occasioned, and which causes the ejection of a portion of the lubricating material with the air at each downward stroke of the larger piston, is thus prevented, and the production of a slight partial average vacuum in the crank-case enables the lubricating material to be carried at as high a level as desired therein by counteracting its tendency to escape therefrom at the end bearings of the crank-shaft. In the event of the level of the lubricating material becoming unduly high—as by condensation of steam which has leaked into the crank-case—the excess passes by the pipes 18 and 20 to the check-valve 14 and escapes with vapor or air past the same on its opening through the pipes 21 and 18 to a suitable receptacle.

The lubricating material may be wholly or partially drawn off from the crank-case through the liquid-discharge pipe 18, as may from time to time be desired, by means of the valve 19.

In the modification indicated in dotted lines in Fig. 1 the vent-passage 13, which is unprovided with a check-valve and is connected directly with a vapor-pipe, 15, is located in the side of the high-pressure cylinder 1 with its upper level in line with or closely adjoining the bottom of the high-pressure piston 7 when at the upper limit of its stroke, so as to be closed by the latter during nearly all of the upward stroke of the larger piston, 8, and opened at and for a short period before the close of its downward stroke. A vent-passage so located in connection with a high-pressure piston, by which it is alternately opened and closed, serves, as in the instance first described, to prevent the successive inspiration and ejection of air in such volume as to exert the objectionable action before recited.

I claim as my invention and desire to secure by Letters Patent—

1. In a single-acting engine, the combination of a closed crank-case, a cylinder fixed to and communicating by an open end with the crank-case, a vent-passage leading out of the crank-case, and a valve governing said passage and adapted to open the same at and adjoining the terminal of the downward stroke of a piston working in the cylinder, substantially as set forth.

2. In a single-acting engine, the combination of a closed crank-case, a cylinder fixed to and communicating by an open end with the crank-case, a vent-passage leading out of the crank-case, and an outwardly-opening check or non-return valve governing said vent-passage, substantially as set forth.

3. In a single-acting engine, the combination of a closed crank-case, a cylinder fixed to and communicating by an open end with the crank-case, a vent-passage leading out of the crank-case, an outwardly-opening check or non-return valve governing said vent-passage, and a vapor-discharge pipe leading upwardly from the valve-casing to the atmosphere, substantially as set forth.

4. In a single-acting engine, the combination of a closed crank-case, a cylinder fixed to and communicating by an open end with the crank-case, a vent-passage leading out of the crank-case, an outwardly-opening check or non-return valve governing said vent-passage, a vapor-discharge pipe leading upwardly from the valve-casing to the atmosphere, and a liquid-discharge pipe leading downwardly from the valve-casing to the atmosphere, substantially as set forth.

5. In a single-acting engine, the combination of a closed crank-case, a cylinder fixed to and communicating by an open end with the crank-case, a vent-passage leading out of the crank-case above the level of lubricating material therein, a liquid-discharge pipe leading out of the crank-case below the level of lubricating material and communicating with the vent-passage, an outwardly-opening check or non-return valve governing the vent-passage, and a vapor-discharge pipe and a liquid-discharge pipe leading outwardly and upwardly and downwardly, respectively, from the valve-casing to the atmosphere, substantially as set forth.

6. In a single acting engine, the combination of a closed crank-case, a cylinder fixed to and communicating by an open end with the crank-case, a vent-passage leading out of the crank-case above the level of lubricating material therein, a liquid-discharge pipe leading out of the crank-case below the level of lubricating material and communicating with the vent-passage, an outwardly-opening check or non-return valve governing the vent-passage and located at or adjacent to the level of lubricating material, a vapor-discharge pipe leading upwardly from the valve-casing to the atmosphere, a valve governing the liquid-discharge pipe beyond or on the outer side of its connection with the vent-passage, and a pipe leading from the check-valve casing to the liquid-discharge pipe beyond or on the outer side of the valve of the latter pipe, substantially as set forth.

In testimony whereof I have hereunto set my hand.

FRANCIS M. RITES.

Witnesses:

J. SNOWDEN BELL,

F. E. GAITHER.