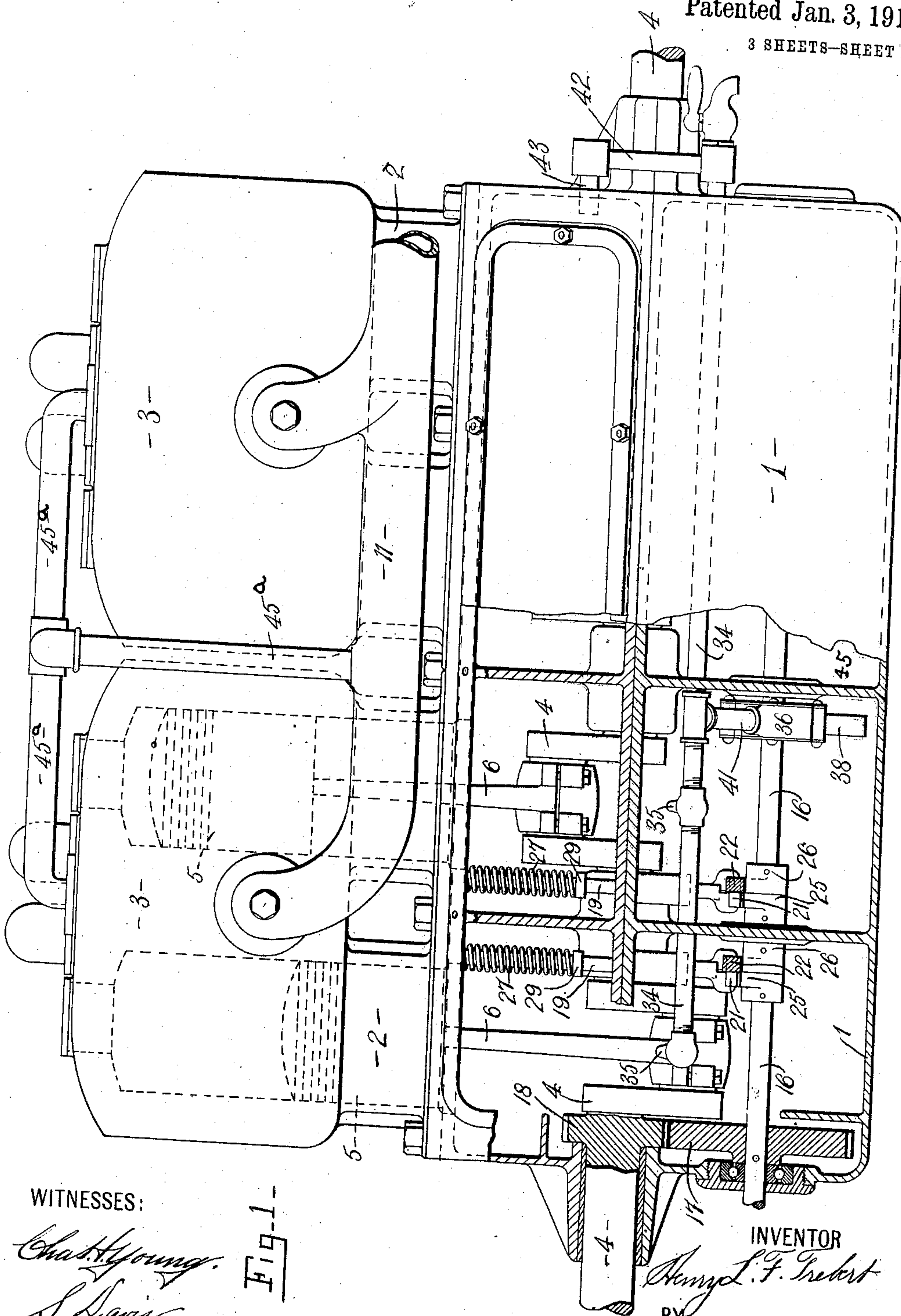


H. L. F. TREBERT.  
INTERNAL COMBUSTION ENGINE.  
APPLICATION FILED MAR. 27, 1908.

980,366.

Patented Jan. 3, 1911.  
3 SHEETS—SHEET 1.



WITNESSES:

*Chas. Young.*  
*S. Davis.*

FIG. 1-

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3 SHEETS—SHEET 2.

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Fig-3-

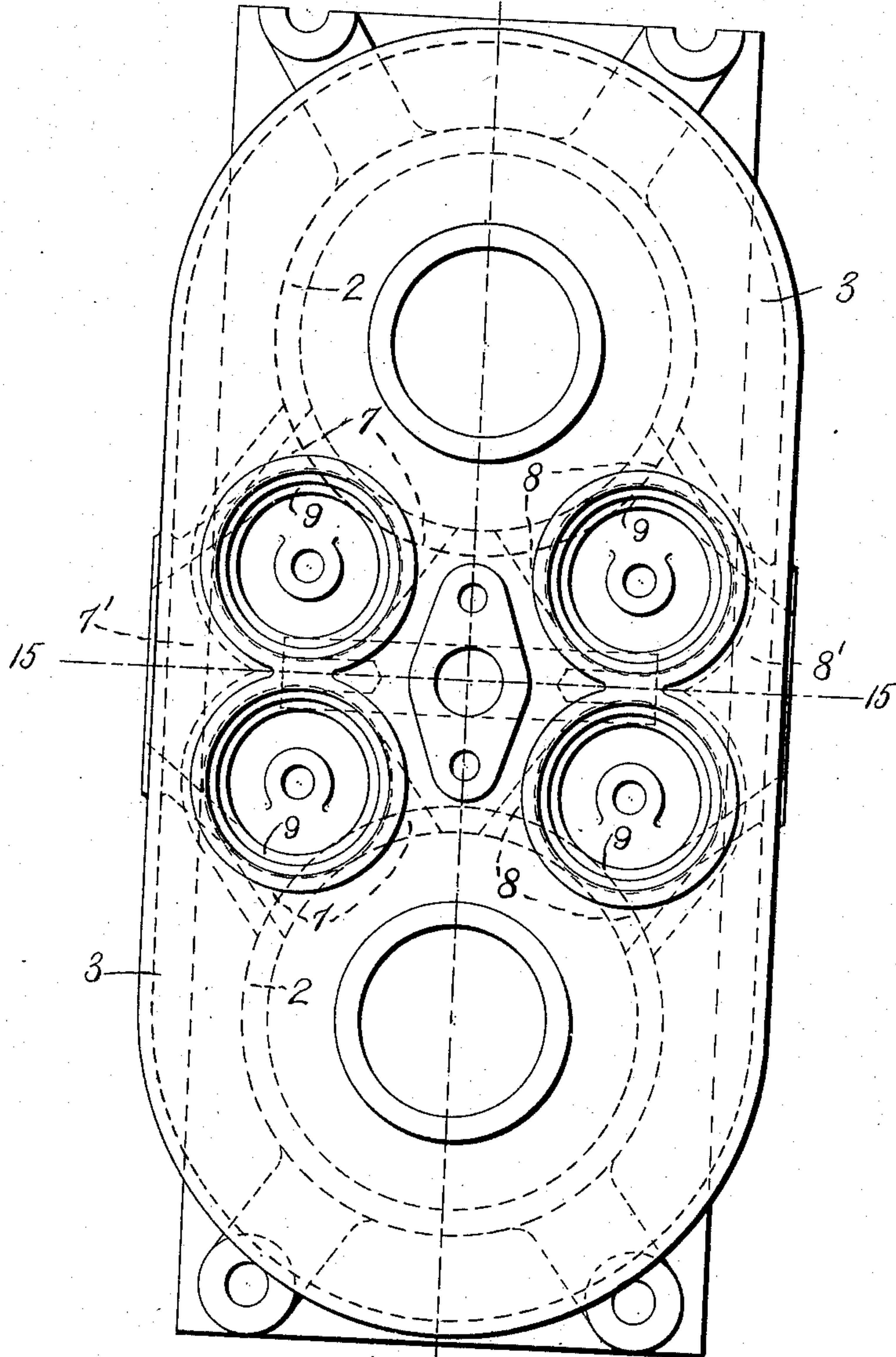
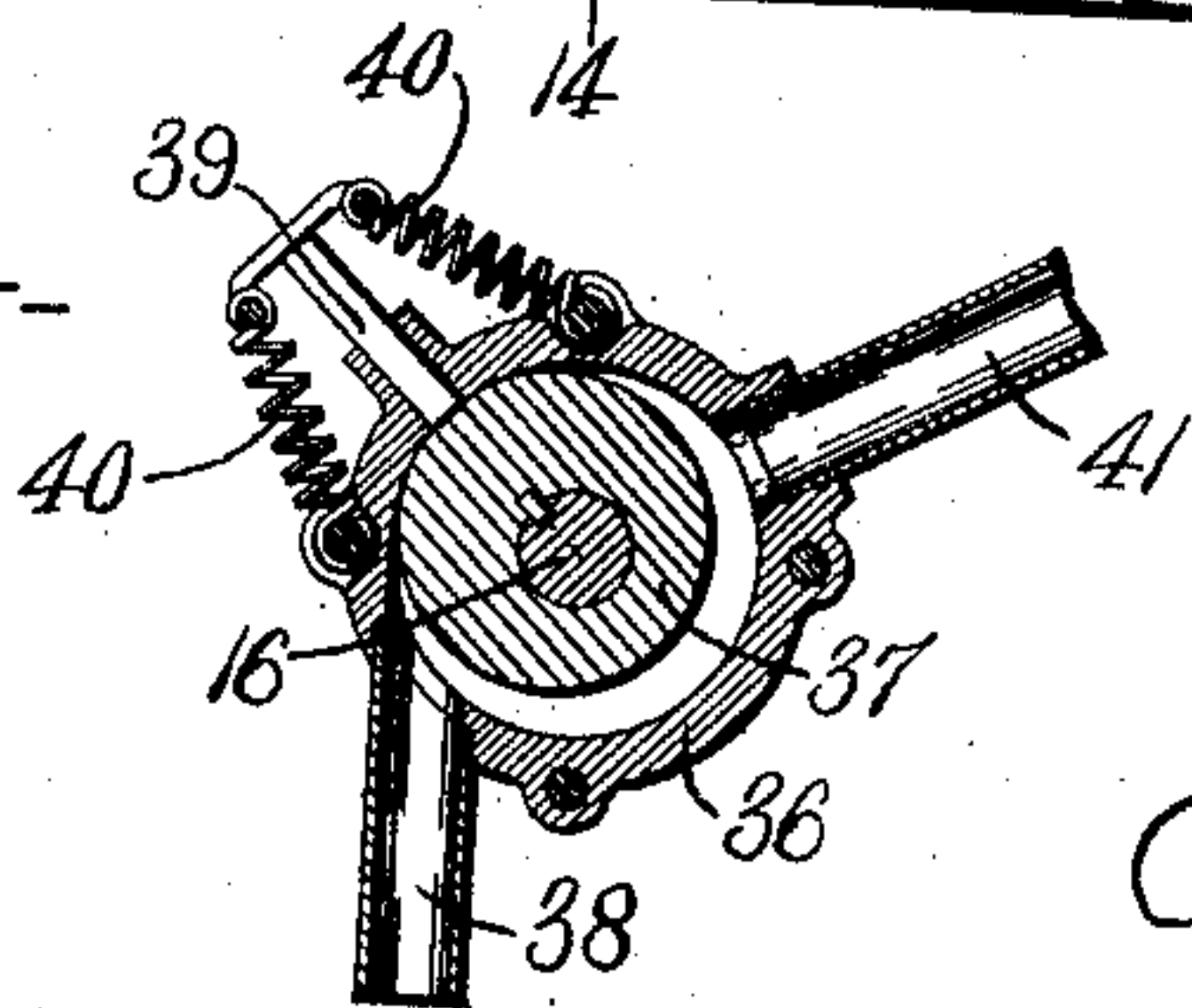


Fig-4-



WITNESSES:

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INVENTOR

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# UNITED STATES PATENT OFFICE.

HENRY L. F. TREBERT, OF ROCHESTER, NEW YORK.

INTERNAL-COMBUSTION ENGINE.

980,366.

Specification of Letters Patent.

Patented Jan. 3, 1911.

Application filed March 27, 1908. Serial No. 423,495.

*To all whom it may concern:*

Be it known that I, HENRY L. F. TREBERT, of Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Internal-Combustion Engine, of which the following is a specification.

My present invention relates to engines and it has for its object to provide an internal combustion engine which is particularly simple of construction and efficient and durable in use, having regard to general features of engine building favorable to these ends.

With this and other objects in view the invention consists in certain improvements and combinations of parts all as will be hereinafter described, the novel features being pointed out in the claims at the end of this specification.

In describing this invention, reference is had to the accompanying drawing in which like characters designate corresponding parts in all the views.

Figure 1 is a side elevation of my engine partly broken away and partly in section. Fig. 2 is a transverse sectional view thereof. Fig. 3 is a top plan of a pair of cylinders. Fig. 4 is a detail view showing the pump.

The illustrated embodiment of my invention comprises a four-cylinder engine having jacketed cylinders cast in pairs, the jackets being rounding at their ends, conforming to the contour of the cylinders, and the central portions thereof being flat.

1 is the crank-case which may be of any desirable form, size and construction.

2 are the cylinders mounted on the crank-case.

3 are water-jackets cast integral with the cylinders.

4 is the crank-shaft journaled in the crank-case.

5 are pistons movable in the cylinders and connected by pitmen 6 to the crank-shaft.

7 and 8 are, respectively, inlet and exhaust ports located within the jacket 3 and formed integral therewith, said ports having substantially upright portions formed with valve seats 9, and outwardly-extending portions uniting in single conduits 7' and 8' which open through the sides of the jacket 3 and are connected, respectively, to inlet and exhaust pipes 10 and 11. 12 and 13 are valves movable into and out of engagement with said seats 9.

As best seen in Figs. 2 and 3 the inlet

and exhaust ports and the valves therein of each pair of cylinders are grouped between the cylinders, the inlet and exhaust ports of each cylinder being located on opposite sides of the vertical plane (indicated in Fig. 3 by line 14) in which are located the axes of the crank-shaft and the cylinder, and the inlet and exhaust ports of either cylinder with respect to those of the other cylinder being located at one side of the plane (indicated by line 15) extending about midway between the cylinders and intersecting the first-mentioned plane (indicated by line 14) at a right angle. Also arranged in the planes indicated by line 15 are partition members or walls forty-five that divide the crank-case 1 (which may be said to be common to all the cylinders) into individual crank compartments for each cylinder and these partitions also preferably form bearing supports for the crank shaft 4.

16 is the cam-shaft which is located in the base of the crank-case beneath the crank-shaft, and preferably also journaled in the partitions 45 being connected to the crank-shaft by intermeshing gears 17, 18 mounted, respectively, on said shafts, the axis of the cam-shaft being located in the vertical plane (indicated in Fig. 3 by line 14) in which the axes of the crank-shaft and the cylinders are located but on the opposite side of the crank shaft from that of the cylinders for purposes that will hereinafter appear.

The connections between the cam-shaft and the inlet and exhaust valves comprise parts or rods 19, 20 located on opposite sides of the engine and extending through the jacket 3 of the cylinders, these rods being connected at their upper ends to the valves 12, 13, respectively, and at their lower ends which come on opposite sides of the axis of the crank shaft to rock-arms 21, 22, are pivoted at their ends at 23, 24, to the opposite inner sides of the crank-case, to extend crosswise of the cam-shaft 16 and engage, respectively, cams 25, 26, thereon. These rods are moved in one direction by the cams 25, 26 acting on rock arms 21—22, and in the other direction by springs 27 located in the crank-case and bearing against the top plate 28 of the crank-case and against shoulders 29 on said rods.

As clearly shown in Fig. 1 the grouping of the valve seats between the cylinders brings the pairs of valve stems for each on



opposite sides of but adjacent to the crank-case partitions 45. This necessarily brings the cams 21—22 to a similar position and as the cam shaft is journaled in these partitions the strain of the valve operations is brought very close to the bearings which is desirable in that a relatively light cam shaft may be employed that will still be rigidly braced against its work. Also, by arranging the cam shaft below the crank shaft, as previously described, it is out of the way of the latter, it is utilized for operating both the series of intake and the series of exhaust valves arranged, respectively, on opposite sides of the plane 14—14 and a continuous shaft may be used for all of the crank compartments.

30 is the timer which is here shown as carried on a shaft 31 extending obliquely upwardly relatively to the axes of the cylinders, and outwardly through a side of the crank-case in which it is journaled, the lower end of said shaft being journaled in the bottom of the crank-case and provided with a spiral gear 32 which meshes with a similar gear 33 on the crank-shaft. The lower end of the shaft upon which most of the strain falls is therefore well lubricated by oil in the bottom of the crank-case while the timer is rendered more accessible, particularly when the engine is installed in the hold of a motor boat.

34 is an oil conduit arranged in the crank-case 1 substantially parallel to the crank-shaft 4, and provided with jets or nozzles 35 directed obliquely upwardly toward the cranks of said shaft 4 in order that the jets of oil ejected therefrom may strike the cranks of the crank-shaft 4; when said cranks are approaching their highest position and splash some of the oil into the cylinders. As here shown, the oil is supplied to the conduit 34 from the base of the crank-case (which serves as a lubricating oil reservoir) by a rotary pump mounted on the cam-shaft 16. Said pump consists of a casing 36 non-rotatably mounted on the cam-shaft and a piston 37 rotatable with the cam-shaft within the casing 36. This casing 36 is formed with a downwardly-extending inlet pipe 38 which terminates close to the bottom of the crank-case. The piston 37 consists of a disk eccentrically mounted on the cam-shaft 16, the highest point thereof engaging the annular inner wall of the casing. An abutment or blade 39 is movable reciprocally through the peripheral wall of the casing into the piston chamber thereof, and the end of said abutment 39 engages the periphery of the piston disk 37. This abutment 39 is moved inwardly by springs 40 and is moved outwardly by the piston disk 37. Said oil conduit 34 is connected to the casing 36 of the pump by a pipe 41. A suitable gage 42 is located exteriorly, and at one end, of the

crank-case 1, this gage having one end communicating with the conduit 34 and its other end having an outlet into the crank-case through a pipe 43. By the means just described, the engine can be lubricated with a small amount of oil in the crank-case, and it will be noted that the parts thereof are simple in their construction and arrangement and that all parts with the exception of the gage are located within the crank-case.

44 is the inlet pipe for the water, said pipe entering the jacket near the bottom thereof; and 45<sup>a</sup> is the exit pipe for the water, said exit pipe being located at the top of the jacket and communicating with the exhaust pipe 11 for the exploded gases.

An engine constructed as described, is compact in its organization and is particularly applicable for motor boats.

What I claim, is:—

1. The combination with an engine having a cylinder, a fluid holding crank-case, a piston, a connecting rod, a crank shaft in the crank-case and valves, of a valve operating cam shaft arranged in the plane of the axis of the crank shaft and of the cylinder and adjacent the bottom of the crank-case, the crank shaft being arranged between the cam shaft and cylinder and a lubricating device mounted on the cam shaft to draw oil from the crank-case.
2. The combination with an engine having a cylinder, a piston, a connecting rod, a crank shaft and valves, of a valve operating cam shaft arranged in the plane of the axis of the crank shaft and of the cylinder, the crank shaft being arranged between the cam shaft and cylinder.
3. The combination with an engine having a crank-case, a piston, a connecting rod, a crank shaft in the crank-case and valves, of a valve operating cam shaft arranged in the plane of the axis of the crank shaft and of the cylinder and adjacent the bottom of the crank-case, the crank shaft being arranged between the cam shaft and cylinder and a timer shaft having one end journaled in the bottom of the crank-case and driven by the cam shaft.
4. The combination with an engine having a cylinder, a fluid holding crank-case, a piston, a connecting rod, a crank shaft in the crank-case and valves, of a valve operating cam shaft arranged in the plane of the axis of the crank shaft and of the cylinder and adjacent the bottom of the crank-case, the crank shaft being arranged between the cam shaft and cylinder and a lubricating device mounted on the cam shaft within the crank-case.
5. In an engine, the combination with a cylinder, a piston, a connecting rod, a pair of valves having stems and a crank shaft arranged between the valve stems, of a valve operating cam shaft arranged in the plane



of the axis of the cylinder and of the crank shaft and on the opposite side of the latter from that of the cylinder and driving connections between the cam shaft and valves.

5 6. In an engine, the combination with a cylinder, a crank case, a piston, a connecting rod, a pair of valves having stems projecting into the crank case and a crank shaft arranged between the valve stems, of a valve  
10 operating cam shaft arranged in the crank case in the plane of the axis of the cylinder and of the crank shaft and on the opposite side of the latter from the cylinder and driving connections between the cam shaft  
15 and valves comprising arms pivoted to the side of the crank-case and vibrated by the cam shaft, said arms being operatively connected with the valve stems.

20 7. The combination with a multiple cylinder engine having crank-case compartments for each cylinder; of a continuous valve operating cam shaft extending through all of said crank-case compartments in the plane of the axes of the cylinders and crank  
25 shaft, the latter being arranged between the cam shaft and cylinders.

30 8. The combination with a multiple cylinder engine having two adjacent cylinders and crank compartments, the latter separated by a wall or partition, of valves for both cylinders grouped in pairs between the latter, said valves having stems arranged in pairs, one pair for each cylinder, on opposite sides of and adjacent to the crank compartment partition and a cam shaft for operating  
35 said valves extending through both crank compartments and journaled in the partition.

40 9. In an internal-combustion engine, a crank-case, a crank-shaft journaled in the crank-case, jacketed cylinders cast in pairs and mounted on the crank-case and having inlet and exhaust ports located within the jacket of the cylinders, said ports having up-  
45 right portions formed with valve seats, and outwardly-extending portions at their lower ends opening through the sides of the jacket, the inlet and exhaust ports of the pair of cylinders being grouped together between  
50 said cylinders, and the inlet and exhaust ports of each cylinder being located on opposite sides of the vertical plane in which are located the axes of the crank-shaft and the cylinders, pistons movable in the cylinders and connected to the crank-shaft, valves

in said ports, a cam-shaft in the crank-case located below the crank-shaft, the cam-shaft being connected to the crank-shaft, and connections between the valves and the cam-shaft, including rods connected at their upper ends to the valves and at their lower ends to the cam-shaft, substantially as and for the purpose set forth.

10. In an internal-combustion engine, a crank-case, a crank-shaft journaled in the crank-case, a cylinder carried by the crank-case and having inlet and exhaust ports located on opposite sides of the plane in which are located the axes of the crank-shaft and the cylinder, a piston movable in the cylinder and connected to the crank-shaft, valves in said ports, a cam-shaft arranged in the crank-case and having its axis located in said plane, the cam-shaft being connected to the crank-shaft, connections between the valves and the cam-shaft, comprising parts arranged on opposite sides of said plane and connected to the valves and to the cam-shaft, a timer, and connections between the timer and the cam-shaft, including a shaft connected at one end to the cam-shaft and at its other end to the timer, said shaft being arranged obliquely relatively to the axis of the cylinder, substantially as and for the purpose described.

11. The combination with a multiple cylinder engine having two adjacent cylinders and crank compartments, the latter separated by a wall or partition and a crank shaft, of valves for both cylinders grouped in pairs between the latter, said valves having stems arranged in pairs, one pair for each cylinder, the units of each pair being respectively arranged on opposite sides of and adjacent to the crank compartment partition, a cam shaft extending through both crank compartments in a plane common to the axis of the crank shaft and cylinders, the crank shaft being between the cam shaft and cylinders, and devices operated by the cam shaft for actuating the valve stems.

In testimony whereof, I have hereunto signed my name in the presence of two attesting witnesses, at Rochester, in the county of Monroe, in the State of New York, this 11th day of January, 1908.

HENRY L. F. TREBERT.

Witnesses:

F. J. DECKER,

M. C. FUHRMANN.