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INTERNAL COMBUSTION ENGINE.

APPLICATION FILED JULY 26, 1919.

1,367,194. Patented Feb. 1, 1921.

Fig. 2

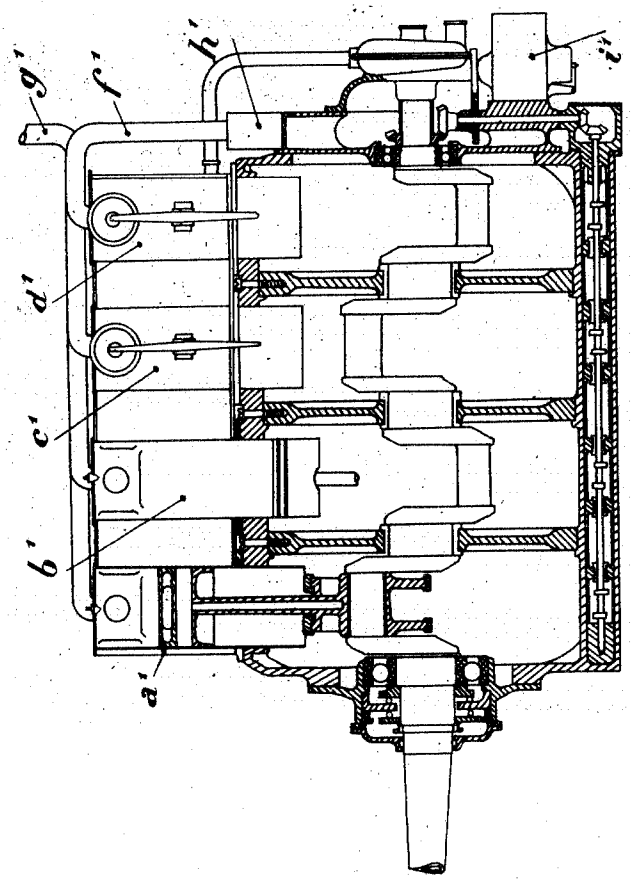
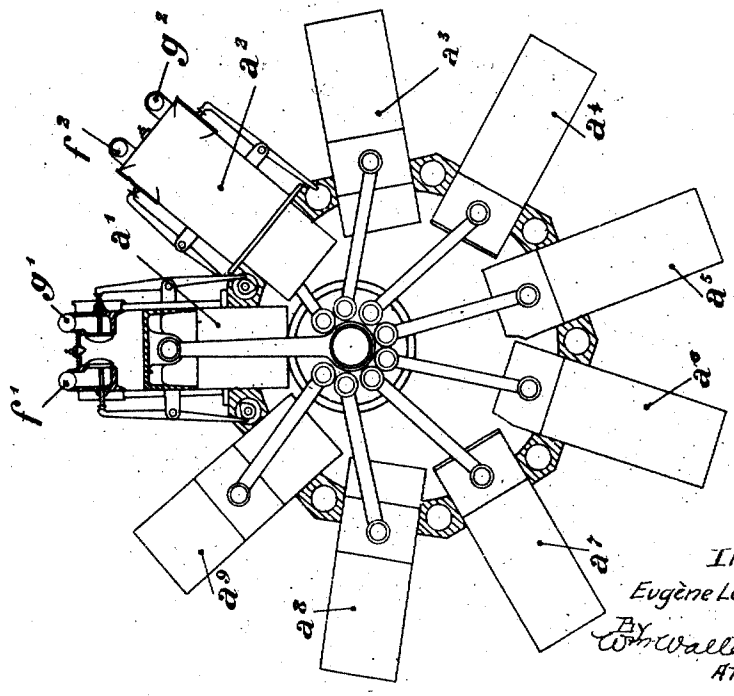


Fig. 1



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INTERNAL-COMBUSTION ENGINE.

1,367,194. Specification of Letters Patent. Patented Feb. 1, 1921.

Application filed July 26, 1919. Serial No. 313,601.

To all whom it may concern:

Be it known that I, EUGÈNE LOUIS LEFRANC, citizen of the French Republic, residing at 41 Rue La Boétie, Paris, in the Republic of France, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification.

This invention relates to a motor composed of a plurality of groups of cylinders arranged in parallel planes, each group being composed of an uneven number of cylinders arranged radially.

Internal combustion engines of the above type are already known in which the different cylinders of the engine, so far as the combustion, exhaust and firing and, generally speaking, the essential functions of the engine are concerned, are combined star fashion or, in other words, the cylinders in the same star are connected by a single manifold or admission pipe fed from one or more carbureters, and by an exhaust collector, said cylinders in the same star being supplied with current by one or more magnetos, each star forming thus a self contained unit.

This invention has for its object a different grouping or combination of the cylinders in a motor of the above type, and consists in coupling together into a group all the cylinders contained in the same radial plane passing through the axis of the motor shaft.

It will be seen that by this means the motor is no more considered as a series of stars but as a series of groups of alined cylinders, said groups being arranged radially in an uneven number about a crankshaft.

The engine comprises two, three, four or any other number of groups of cylinders mounted about a crankshaft of the usual type which would be used in a motor comprising one bank of cylinders in a number equal to the number of cylinders of each group.

The different functions: carbureting, firing and exhaust, are produced according to the usual methods in motors with one line of cylinders, in the cylinders of each line or bank which are connected to each other by suitable pipes.

In the accompanying drawing which shows by way of example an embodiment of the invention:

Figure 1 is a section at right angles to the axis of the motor shaft, partly in elevation, and

Fig. 2 is a section along the said axis, partly in elevation.

In the example shown, the motor comprises nine groups a^1, a^2, a^3 . . . a^9, of monobloc cylinders arranged radially at an angle of 40 degrees with respect to each other, about a crankshaft of the standard type for four cylinder engines. a^1, b^1, c^1, d^1, show the four cylinders of the first group.

The valves are arranged so as to permit the exhaust and admission of the gases on the top of the cylinders which gives a very convenient arrangement for the exhaust pipe and insures the cooling thereof by allowing to place the pipes outside the bonnet of an aeroplane upon which the engine would be mounted.

It will be seen that each group of four cylinders arranged in a radial plane is provided with its admission pipe such as f^1, f^2, its exhaust pipe such as g^1, g^2, its carbureter such as h^1, and its firing device such as i^1.

If desired, the ends of the admission or exhaust pipes may be connected to each other and extend to a single carbureter or a single silencer.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An internal combustion engine comprising a crankshaft having at least four cranks, a crank case in which said crankshaft is rotatably supported, an uneven number of longitudinal rows of cylinders mounted radially on said crank case, said cylinders forming star like groups in each of which the axis of the cylinders are in a plane normal to the axis of the crank shaft, each row comprising a number of cylinders corresponding to the number of the cranks, pistons working in said cylinders, means for operatively connecting the pistons to the respective cranks, admission pipes connected to the rows of cylinders, respectively, exhaust pipes connected to the rows of cylinders, respectively, admission valves and exhaust valves on said cylinders, cam shafts extending longitudinally between the rows of cylinders, means for operatively connecting the cam shafts to the valves, driving connections at one end of the engine for operatively connecting the cam shafts to the crank shaft, igniting

means at the same end of the engine for each row of cylinders and means for operatively connecting said igniting means to said driving connections.

2. An internal combustion engine comprising a crankshaft having at least four cranks, a crank case in which said crankshaft is rotatably supported, an uneven number of longitudinal rows of cylinders mounted radially on said crank case, said cylinders forming star like groups in each of which the axis of the cylinders are in a plane normal to the axis of the crank shaft, each row comprising a number of cylinders corresponding to the number of the cranks, pistons working in said cylinders, means for operatively connecting the pistons to the respective cranks, admission pipes leading to the outer ends of the cylinders in each row, respectively, exhaust pipes leading to the outer ends of the cylinders in each row, respectively, valves mounted laterally on said cylinders, cam shafts extending longitudinally between the rows of cylinders, means for operatively connecting the cam shafts to the valves, driving connections at one end of the engine for operatively connecting the cam shafts to the crank shaft, igniting means at the same end of the engine for each row of cylinders and means operatively connecting said igniting means to said driving connections.

3. An internal combustion engine comprising a crankshaft having at least four cranks, a crank case in which said crankshaft is rotatably supported, an uneven number of longitudinal rows of cylinders mounted radially on said crank case, said cylinders forming star like groups in each of which the axis of the cylinders are in a plane normal to the axis of the crank shaft, each row comprising a number of cylinders corresponding to the number of the cranks, pistons working in said cylinders, means for operatively connecting the pistons to the respective cranks, admission pipes leading to the outer ends of the cylinders in each row, respectively, exhaust pipes leading to the outer ends of the cylinders in each row, respectively, valves mounted laterally on said cylinders, cam shafts extending longitudinally between the rows of cylinders, two arm levers pivoted on the lateral wall of the cylinders for operatively connecting the cam shafts to the valves, driving connections at one end of the engine for operatively connecting the cam shafts to the crank shaft, igniting means at the same end of the engine for each row of cylinders and means for operatively connecting said igniting means to said driving connections.

4. An internal combustion engine comprising a crankshaft having at least four cranks, a crank case in which said crank shaft is rotatably supported, an uneven number of longitudinal rows of cylinders mounted radially on said crank case, said cylinders forming star like groups in each of which the axis of the cylinders are in a plane normal to the axis of the crank shaft, each row comprising a number of cylinders corresponding to the number of the cranks, pistons working in said cylinders, means for operatively connecting the pistons to the respective cranks, admission pipes connected to the rows of cylinders, respectively, carbureters connected to said admission pipes, respectively, exhaust pipes connected to the rows of cylinders respectively, admission valves and exhaust valves on said cylinders, cam shafts extending longitudinally between the rows of cylinders, means for operatively connecting the cam shafts to the valves, driving connections at one end of the engine for operatively connecting the cam shafts to the crank shaft, igniting means at the same end of the engine for each row of cylinders and means for operatively connecting said igniting means to said driving connections.

5. An internal combustion engine comprising a crankshaft having at least four cranks, a crank case in which said crankshaft is rotatably supported, an uneven number of longitudinal rows of cylinders mounted radially on said crank case, said cylinders forming star like groups in each of which the axis of the cylinders are in a plane normal to the axis of the crank shaft, each row comprising a number of cylinders corresponding to the number of the cranks, pistons working in said cylinders, means for operatively connecting the pistons to the respective cranks, admission pipes connected to the rows of cylinders, respectively, exhaust pipes connected to the rows of cylinders respectively, admission valves and exhaust valves on said cylinders, cam shafts extending longitudinally between the rows of cylinders, means for operatively connecting each of the cam shafts to the admission valves on one adjacent row of cylinders and to the exhaust valves on the other adjacent row of cylinders, driving connections at one end of the engine for operatively connecting the cam shafts to the crank shaft, igniting means at the same end of the engine for each row of cylinders and means for operatively connecting said igniting means to said driving connections.

In testimony whereof I have signed my name to this specification.

EUGÈNE LOUIS LEFRANC.