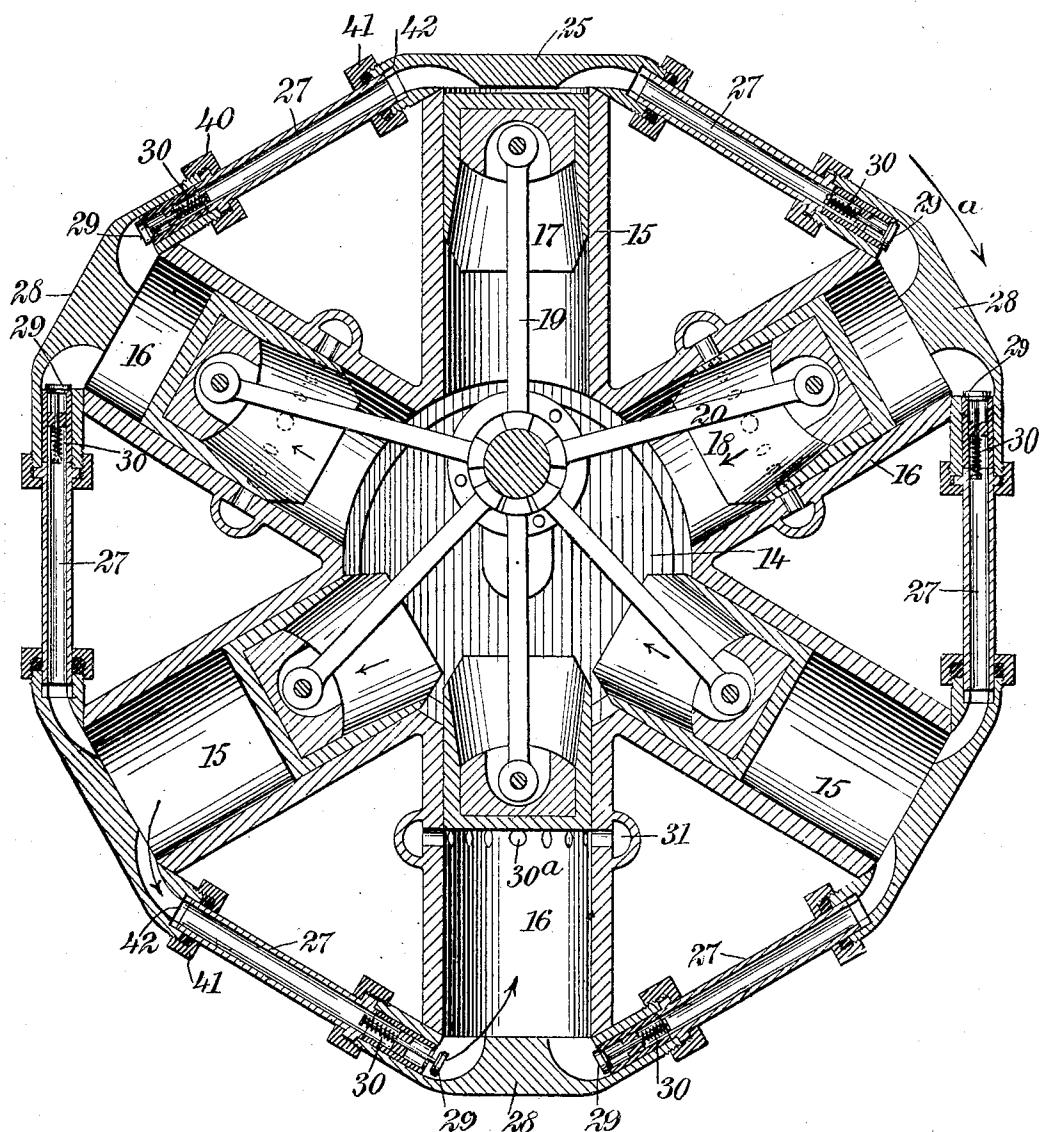


No. 809,082.

PATENTED JAN. 2, 1906.

T. WRIGHT.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED FEB. 17, 1904.

2 SHEETS—SHEET 1.



WITNESSES:

John B. Bergstrom

Isaac B. Owens

FIG. 1

INVENTOR

Thomas Wright

BY

Mumford

ATTORNEYS

No. 809,082.

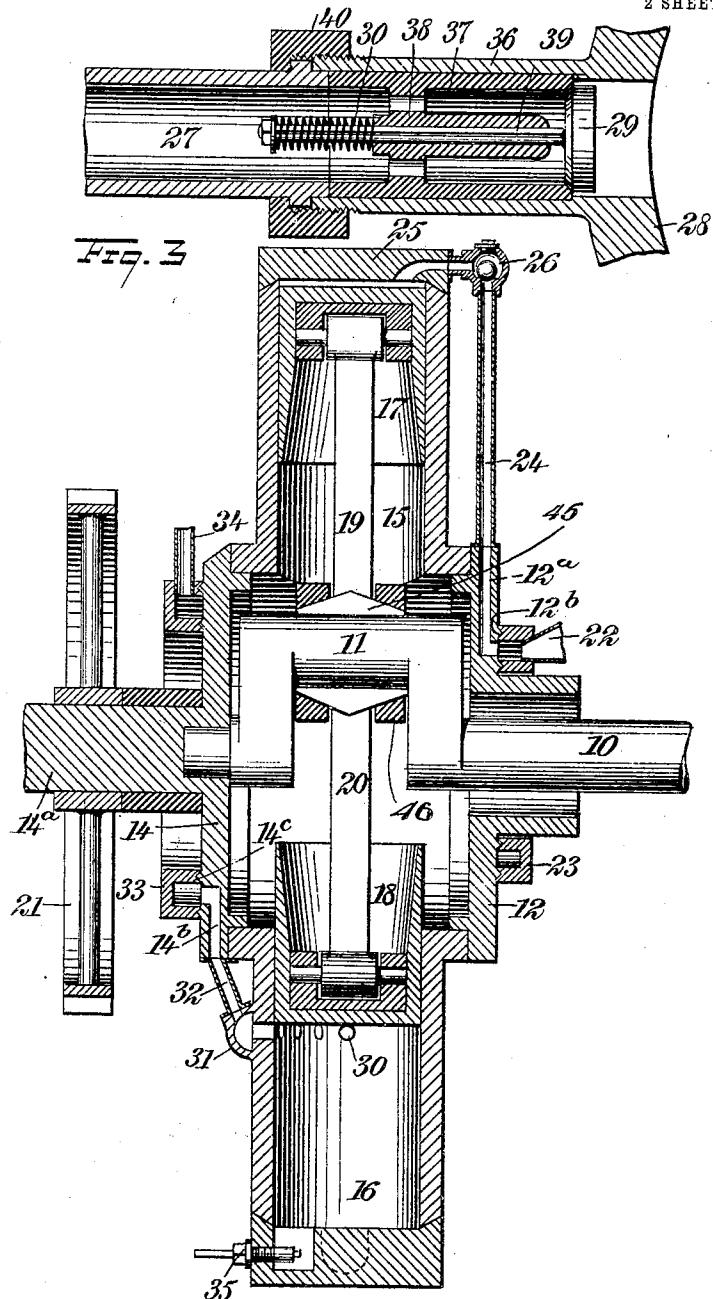
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WITNESSES:

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FIG. 2

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Thomas Wright

BY

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UNITED STATES PATENT OFFICE.

THOMAS WRIGHT, OF JERSEY CITY, NEW JERSEY.

INTERNAL-COMBUSTION ENGINE.

No. 809,082.

Specification of Letters Patent.

Patented Jan. 2, 1906.

Application filed February 17, 1904. Serial No. 193,961.

To all whom it may concern:

Be it known that I, THOMAS WRIGHT, a citizen of the United States, and a resident of Jersey City, in the county of Hudson and State 5 of New Jersey, have invented a new and Improved Internal-Combustion Engine, of which the following is a full, clear, and exact description.

This invention relates to an internal-combustion engine of the type in which a plurality of cylinders are arranged to swing around a stationary cranked shaft, the movement of the engine being taken from a part connected to move with the cylinders.

15 The leading feature of my present invention resides in the arrangement of a number of pump-cylinders alternately with the power-cylinders and in providing valve-controlled communications between each pump-cylinder 20 and the two adjacent power-cylinders. By this organization of the elements of the engine the direction of rotation may be reversed at will, the pumps acting to supply either the power-cylinders to their right or to their left, 25 according to the direction of movement. Spring-seated valves may be employed, dispensing entirely with mechanical valve-driving gear, and by the provision of exhaust-ports at the end of the stroke in the power- 30 cylinders and the arrangement of the pump communications at the outer ends of the power-cylinders the engine may be given a two-cycle action, with a thorough scavenging and cooling of the cylinders at the end of each stroke.

35 The invention involves various other features of major or minor importance, and all will be fully set forth hereinafter.

This specification is an exact description of one example of my invention, while the claims 40 define the actual scope thereof.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

45 Figure 1 is a vertical cross-section of the engine. Fig. 2 is a vertical longitudinal section of the same, and Fig. 3 is an enlarged detail view of one of the cylinder inlet-valves.

10 indicates a suitably-sustained stationary 50 shaft having thereon a crank 11. Mounted suitably on the shaft 10 or on any other desired support are the webs 12 and 14 of the pump-cylinders 15 and power-cylinders 16. These cylinders are arranged alternately 55 around the center of the shaft 10, and, as here shown, there are three pump-cylinders and

three power-cylinders. The pump-pistons 17 and power-pistons 18 have rods 19 and 20 connected with the crank 11, so that the cylinders may turn around the center of the shaft 60 10, and the power-pistons 18, acting through the rods 20 on the crank 11, will cause the continued movement of the engine. The motive power is taken from the cylinders, for example, through the medium of a hub-like 65 projection 14^a on the web 14, to which a gear 21 is attached. Preferably the rods 19 and 20 are formed with enlargements 45, which are fitted snugly to the wrist-pin of the crank 11 and held thereon by means of suitably-formed 70 rings 46, (see Fig. 2,) the arrangement being such as will permit the necessary independent movement of the enlargements of the rods with respect to the crank and rings.

22 (see Fig. 2) indicates the source of the 75 mixture of air and fuel constituting the combustible charge. This is illustrated as in the form of a pipe or duct leading to a stationary annular chamber 23, which is adapted to be suitably supported independently of the moving parts of the engine. The web 12 has passages 12^a therein, the receiving ends of which are inclosed by the annular chamber 23, and in this manner the passages 12^a are continually in communication with the source of fuel. 80 Any suitable fluid-tight connection may be effected between the parts 12 and 23 which will allow the free rotation of the part 12 with respect to the chamber 23. In the drawings I have shown V-shaped ribs 12^b formed on 85 the web 12 and engaging in annular grooves in the walls of the chamber 23. From the passages 12^a pipes 24 pass, respectively, outward to the heads 25 of the pump-cylinders. These pipes are provided with any desired 90 form of check-valves 26, said valves opening into the pump-cylinders, as indicated in Fig. 2. In this manner the explosive or combustible mixture is continually supplied to the outer ends of the pump-cylinders. 95

As shown best in Fig. 1, each pump-cylinder has free communication with two pipes 27. These pipes pass from opposite sides of the respective cylinders to the heads 28 of the power-cylinders. Puppet or other valves 29 100 command the pipes 27, said valves being located at the heads 28 and opening thereinto, as shown. The valves 29 are yieldingly seated by springs 30 engaging with their stems, preferably in a manner hereinafter fully set 105 forth. At their inner portions the cylinders 16 are provided with exhaust-ports 30^a, which 110

communicate with ducts 31, formed on the outer walls of the cylinders, and said ducts in turn communicate with pipes 32, (see Fig. 2,) which lead to passages 14^b in the web 14. 5 Said passages 14^b are similar to the passages 12^a and communicate with a stationary annular chamber 33, supported in any desired manner and similar to the chamber 23. 34 indicates an exhaust-pipe passing from the chamber 33. Said chamber may have any desired 10 air-tight connection with the web 14 allowing a free rotation of the web. In the drawings I have shown ribs 14^c engaging in corresponding grooves in the walls of the chamber 33.

In the operation of the engine, assuming that the cylinders are moving in the direction of the arrow *a* in Fig. 1 and that the pistons are moving in the cylinders in the 20 direction of the arrows respectively applied thereto, it will be seen that the upper right-hand power-piston is moving under the force of an explosion within its cylinder, imparting to the engine an impulse in the direction of 25 the arrow *a*. Simultaneously the lower right-hand pump-piston is moving inward to draw into its cylinder a charge of the combustible material. The lowermost power-cylinder has its exhaust-ports uncovered, and the lower 30 left-hand pump is forcing a fresh charge through the connecting-pipe 27 into the said lowermost power-cylinder, causing the products of previous combustion therein to be forced out through the exhaust-ports and cooling the cylinder-walls. The left-hand power-piston is moving outward to compress the 35 charge therein, and the uppermost pump is at the end of its stroke, having previously forced into the left-hand power-cylinder the 40 charge being compressed therein. It will be observed, therefore, that throughout the operation of the engine one of the three power-cylinders is having a charge compressed therein, the second is exhausted, and the third is 45 compressing the charge. The power-cylinders are supplied with the charge respectively by the pumps immediately pressing them in the direction of revolution. All the charge is drawn through the pipe 24 and past the 50 valve 26 into one of the pumps upon the return movement of the piston, the valve 26 closes, and the charge is forced out through the pipe 27, leading to the power-cylinder with which the pump is associated. The charge 55 cannot pass to the other adjacent power-cylinder, since compression is already going on therein and the compression is higher than in the first-named power-cylinder. The said pump reaches the end of its discharging movement and begins to return before the power-piston to which the pump is related has finished the compression-stroke, and consequently the valve 29, controlling the communication between the pump and power cylinder, closes 60 both under the influence of the suction-stroke

of the pump and the continued compression-stroke of the power-piston. After the final compression of the charge it is ignited, the power-piston moves outward under the impulse of the explosion, and the above operation is repeated in the power-cylinder by the blowing thereinto of the fresh charges, which scavenges and cools the cylinder as explained. 70

It will be observed that owing to the connections between the pump and power cylinders as set forth heretofore and to the arrangement of the cylinders with respect to the crank 11 the engine may be reversed at will by advancing or retarding the sparking or other igniting means, so that the explosion 80 will occur at one side or the other of the vertical center of the crank 11.

35 indicates (see Fig. 2) the sparking plugs which preferably I employ for the purposes of ignition. Any suitable mechanism may be 85 used in connection with these plugs for controlling the spark in the manner essential to the various operations of the engine, or, if desired, any other form of igniting means may be employed. 90

As shown best in Fig. 3, the power-cylinder heads 28 have tubular extensions 36 formed thereon, and in said extensions are fitted the sleeves 37, carrying the valves 29. Said sleeves are formed with spiders 38, constituting the 95 guides of the valve-stems 39, and to said stems the before-referred-to springs 30 are applied, which serve yieldingly to seat the valves. The valves are seated on the inner ends of the tubular seats or sleeves 37, and the pipes 27 100 are joined to the tubular extensions 36 by means of screw-couplings 40, as shown. At the ends of the pipes 27 adjacent to the pump-cylinder heads 25 connection is effected through the medium of stuffing-boxes 41 and 105 tubular extensions 42, which allow longitudinal movement of the pipes not only to provide for expansion and contraction of the pipes, but also to enable the pipes to be placed in and removed from their proper position in 110 the machine.

Various changes in the form, proportions, and minor details of my invention may be resorted to at will without departing from the spirit and scope thereof. Hence I consider 115 myself entitled to all such variations as may lie within the intent of my claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In an internal-combustion engine, the 120 combination of a plurality of working cylinders, a plurality of pump-cylinders arranged alternately with respect to the working cylinders, a crank-shaft common to all of the cylinders, means for supporting all of the cylinders to turn around the center of said shaft, pistons operating in the cylinders, connections between the pistons and the crank, means controlling fluid movement between the various cylinders, said means comprising connections 125 130

65 both under the influence of the suction-stroke

between the pump-cylinders and the two working cylinders adjacent thereto, and valves controlling said connections and seating against pressure in the working cylinders.

5 2. In an internal-combustion engine, the combination of a plurality of working cylinders, a plurality of pump-cylinders arranged alternately with respect to the working cylinders, a crank-shaft common to all of the cylinders, means for supporting the cylinders to turn around the center of the shaft, pistons operating in the cylinders, connections between the pistons and the crank, means for controlling fluid movement to and from the cylinders, said means including exhaust-ports in the working cylinders at the limit of the working stroke of their pistons, connections extending from the heads of the pump-cylinders to the heads of the working cylinders at 20 each side of the pump-cylinders, and valves controlling said connections and seating against pressure within the working cylinders.

3. In an internal-combustion engine, the combination of a working cylinder, a pump-cylinder arranged at each side thereof, a crank-shaft common to the cylinders, means for supporting the cylinders to turn around the center of the crank-shaft, pistons operating in the cylinders, connections between the pistons and crank-shaft, means controlling fluid movement in the cylinders, said means including connections between the outer ends of the pump-cylinders and the outer end of the working cylinder, valves in said connections seating against pressure in the working cylinders, and an exhaust-port in the working cylinder at the end of the expansion-stroke of the piston.

4. In an internal-combustion engine, the combination of a plurality of working cylinders

ders and an equal number of pump-cylinders respectively arranged between the working cylinders, a crank-shaft central to all of the cylinders, means for supporting the cylinders to turn around the center of the crank-shaft, 45 pistons operating in the cylinders, connections between the pistons and crank-shaft, means for controlling fluid movement to and from the cylinders, said means including exhaust-ports in the working cylinders at the limit of 50 the expansion-strokes of the pistons thereof, connections between each pump-cylinder and the two working cylinders adjacent thereto, and valves controlling said connections.

5. In an internal-combustion engine, the combination of a plurality of working cylinders and an equal number of pump-cylinders respectively arranged between the working cylinders, a crank-shaft central to all of the cylinders, means for supporting the cylinders 60 to turn around the center of the crank-shaft, pistons operating in the cylinders, connections between the pistons and crank-shaft, means for controlling fluid movement to and from the cylinders, said means including exhaust-ports in the working cylinders at the limit of 65 the expansion-strokes of the pistons thereof, connections between each pump-cylinder and the two working cylinders adjacent thereto, and valves controlling said connections, said 70 valves being located respectively adjacent to the working cylinders and seating against the pressure therein.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOMAS WRIGHT.

Witnesses:

JOHN F. WRIGHT,
EUGENE T. WRIGHT.