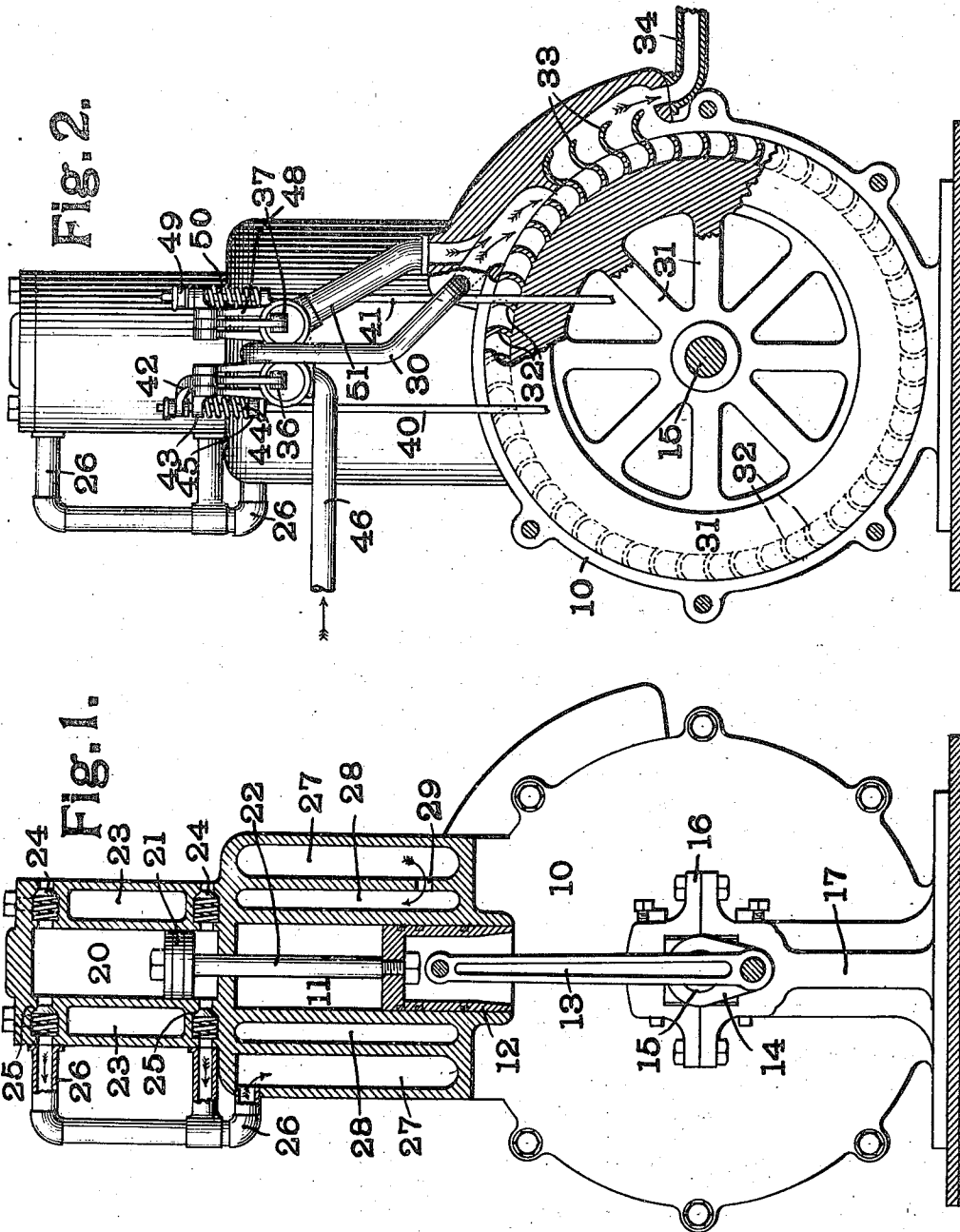


W. G. THUMMEL.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED APR. 10, 1911.

Patented May 20, 1913.

2 SHEETS-SHEET 1.

1,062,308.



WITNESSES:

L. L. Mead,
W. A. Alexander

INVENTOR

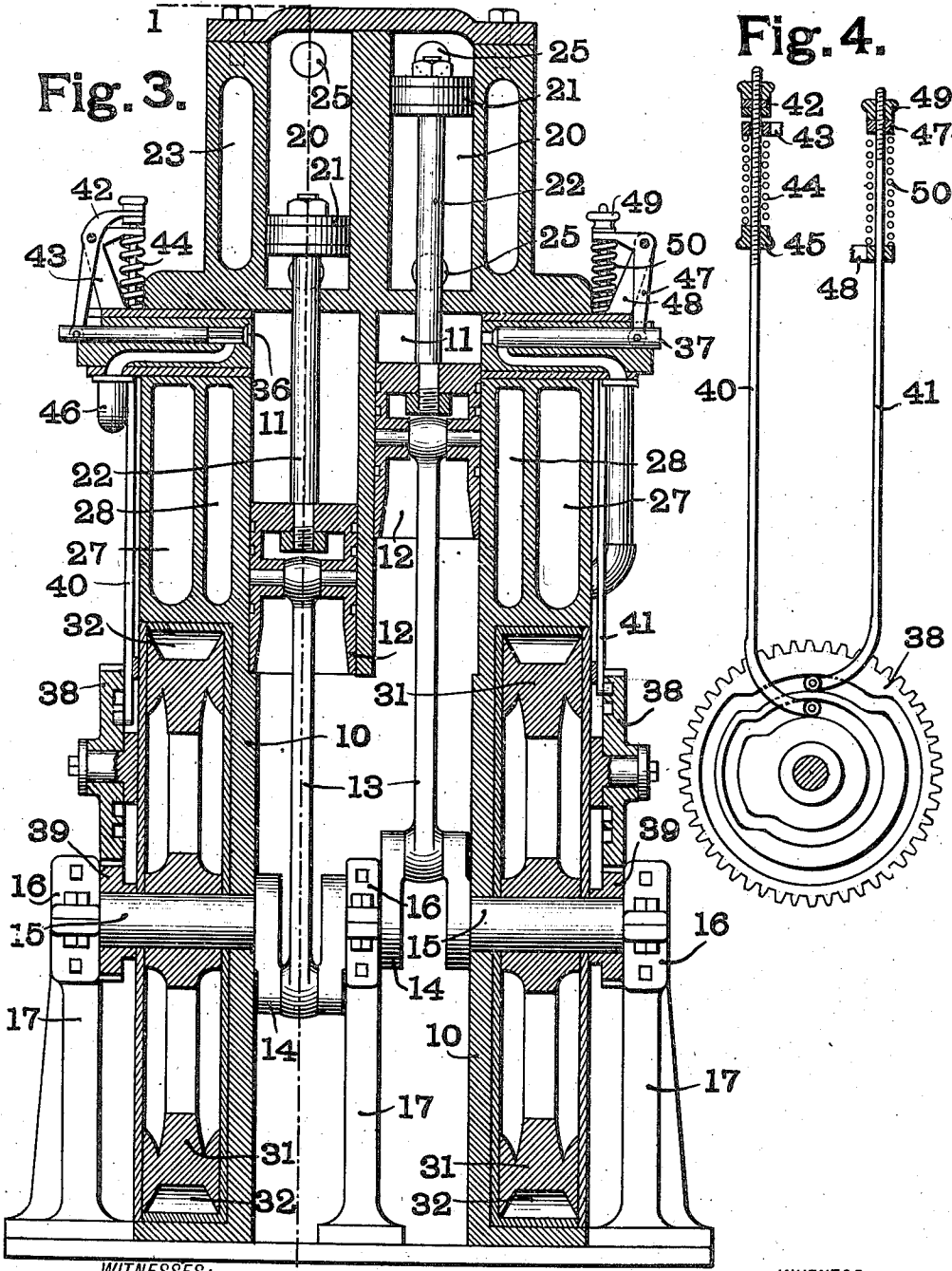
William G. Thummel
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UNITED STATES PATENT OFFICE.

WILLIAM G. THUMMEL, OF ST. LOUIS, MISSOURI.

INTERNAL-COMBUSTION ENGINE.

1,062,308.

Specification of Letters Patent.

Patented May 20, 1913.

Application filed April 10, 1911. Serial No. 619,973.

To all whom it may concern:

Be it known that I, WILLIAM G. THUMMEL, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented a certain new and useful Internal-Combustion Engine, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

One object of my invention is to so construct an internal combustion engine that the heat ordinarily lost in cooling the cylinder sufficiently to allow it to be lubricated can be utilized to increase the power of the engine. With this end in view I provide the engine with one or more turbine fly wheels to which compressed air is admitted after being expanded by the heat of the cylinder or cylinders.

Another object of my invention is to utilize the exhaust products of combustion to increase the power of the engine and this I accomplish by leading said products of combustion to the turbine fly wheels above referred to.

In the accompanying drawings which illustrate one form of engine made in accordance with my invention, Figure 1 is a vertical section on the line 1—1 of Fig. 3; Fig. 2 is a side-view partly in section and partly in elevation; Fig. 3 is an enlarged cross section taken at right angles to Fig. 1 and Fig. 4 is an enlarged detailed view showing the valve operating mechanism.

Like marks of reference refer to similar parts in the several views in the drawings. 10 represents the casing of the machine. Formed in the casing 10 are a pair of cylinders 11 containing pistons 12. Each of the pistons 12 is connected by means of a pitman rod 13 with a crank arm 14 on the crank shaft 15 which passes through the lower part of the casing 10 and is supported in boxes 16 carried by standards 17. Arranged in the casing above the cylinders 11 are cylinders 20 which are adapted to form an air compressor. In each of the cylinders 20 is a piston 21 connected by means of a piston rod 22 with the piston 12 in the corresponding cylinder 11. The cylinders 20 are surrounded with a water jacket 23 for cooling the same. The cylinders 20 are provided with the usual inlet

and discharge valves 24 and 25 respectively as best shown in Fig. 1. Leading from the discharge valves 25 are pipes 26 which carry the compressed air to the space surrounding the cylinders 11 so that the air may cool the said cylinders and at the same time be expanded to furnish additional power. In order to accomplish this I surround the cylinders 11 with an air jacket preferably divided into two parts 27 and 28 respectively and connected by means of passages 29. The compressed air after passing through the part 27 passes through the passage 29 into the part 28 and from thence is delivered by means of a discharge pipe 30, Fig. 2, to a turbine fly wheel which will now be described.

Mounted upon the crank shaft 15 are a pair of fly wheels 31 which are inclosed in the casing 10 and provided upon their periphery with buckets 32 so as to form a turbine. These buckets 32 cooperate with buckets 33 formed in the casing 10 and from which the exhaust air and products of combustion escape through the discharge pipe 34. Each of the cylinders 11 is provided with a supply valve 36 and a discharge valve 37, best shown in Fig. 3. These valves 36 and 37 are operated from cam wheels 38 which are mounted upon the casing 10 and driven by means of spur wheels 39 mounted on the shaft 15 as shown in Fig. 3, operated from the cam wheel 38 by a pair of reciprocating rods 40 and 41, shown in detail in Fig. 4. The rod 40 is secured at its upper end to a bell crank lever 42 pivoted on a bracket 43 and attached to the stem of the inlet valve 36. The valve 36 is normally held against movement by means of a coil spring 44 surrounding the said rod and bearing at one end against the bracket 43 and at the other against an adjustable nut 45, as shown in Fig. 4. Fuel from any suitable source is supplied to the valve 36 by means of a pipe 46. The rod 41 passes through one arm of a bell crank lever 47 which is pivoted to a bracket 48 and the other arm of which is attached to the discharge valve 37. Bearing upon the arm of the bell crank lever 47 is an adjustable nut 49 and between the said arm and the bracket 48 is placed a coil spring 50. It will be evident, therefore, that while the rod 41 will positively operate to open the valve 37 the said valve may be opened from pressure within the cylinder 11 without moving the rod 41. The

valve 37 therefore not only operates as a positively actuated valve but also operates automatically to remove pressure within the cylinder 11 when it exceeds a predetermined amount the said amount being determined by the tension of the coil spring 50. The products of combustion from the cylinder 11 whether discharged after expansion by the positive operation of the valve 37 or before expansion by the automatic operation of said valve, pass through a pipe 51 leading to the turbine fly wheel 31 as best shown in Fig. 2.

The operation of my engine will be evident from the above description. The fuel is led through the pipe 46 to the cylinders 11 so that when it is exploded it will actuate the engine in the same manner as any ordinary internal combustion engine, and thus drive the crank shaft 15. At the same time the air compressors 20 will furnish compressed air which cools the cylinders of the engine and at the same time the air is expanded and delivered to the turbine fly wheels 31 so that the heat absorbed from the cylinders in place of being wasted is utilized to assist in driving the shaft 15. In like manner the products of combustion are led through the pipe 51 to the turbine fly wheels 31 so as to assist in driving the engine.

It will be understood that the products of combustion in the combustion chambers 11 will not be completely expanded at the end of the stroke of the piston 12 but will contain considerable energy which is usually wasted by being discharged into the atmosphere or into a muffler to reduce the noise caused by such discharge. In my construction the use of the muffler is not only obviated but the excess energy from the products of combustion which is usually wasted is

utilized for useful work by the discharge of the products of combustion against the turbine fly wheel.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. The combination with the cylinder of an internal combustion engine, of an air compressor arranged in tandem therewith, said cylinder and air compressor having a common head, whereby the heat from the head of said cylinder is dissipated by said air compressor, an air jacket surrounding said cylinder and receiving the air from said compressor, and an auxiliary motor receiving the air from said jacket.

2. The combination with the cylinder of an internal combustion engine, of an auxiliary fluid pressure motor, a valve opening automatically to connect said cylinder and auxiliary motor to reduce the pressure in the former to a predetermined amount at the beginning of the power stroke, and mechanically operated means for opening said valve to exhaust said cylinder into said auxiliary motor at the end of the power stroke.

3. In an internal combustion engine, the combination with a casing having cylinders in its upper part and bifurcated at its lower part, of a pair of turbines housed in the bifurcations and mounted upon the crankshaft of the engine, and means for delivering the products of combustion from said cylinders to said turbines.

In testimony whereof, I have hereunto set my hand and affixed my seal in the presence of the two subscribing witnesses.

WM. G. THUMMEL. [L. S.]

Witnesses:

W. A. ALEXANDER,
ELIZABETH BAILEY.