No. 865,202. PATENTED SEPT. 3, 1907.

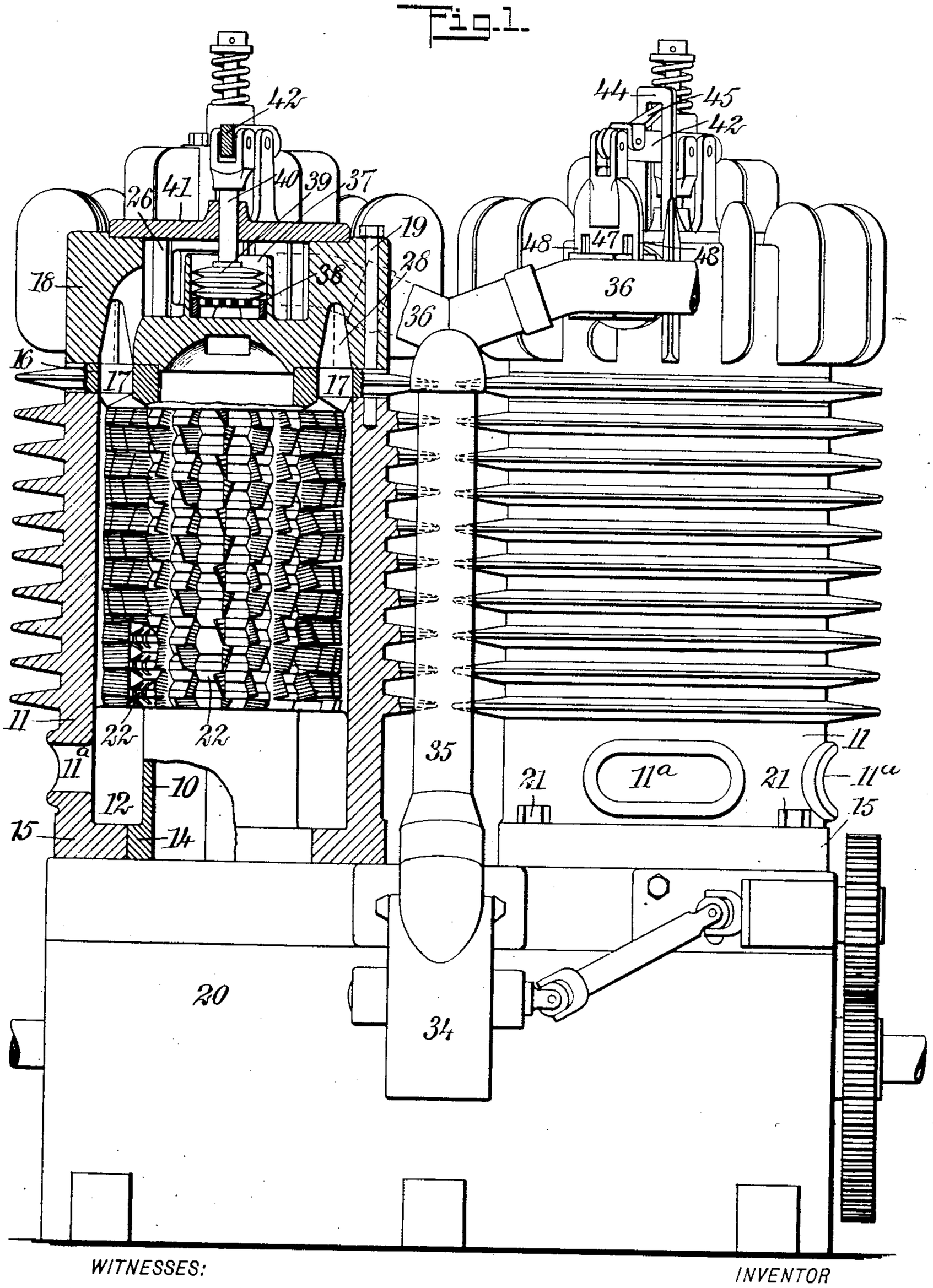
C. J. MUNDHENK.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED FEB. 14, 1906.

3 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

L. Almquist.

Isaac B. Owens.

INVENTOR

Charles J. Mundhenk

BY Munn & Co

ATTORNEYS

No. 865,202.

PATENTED SEPT. 3, 1907.

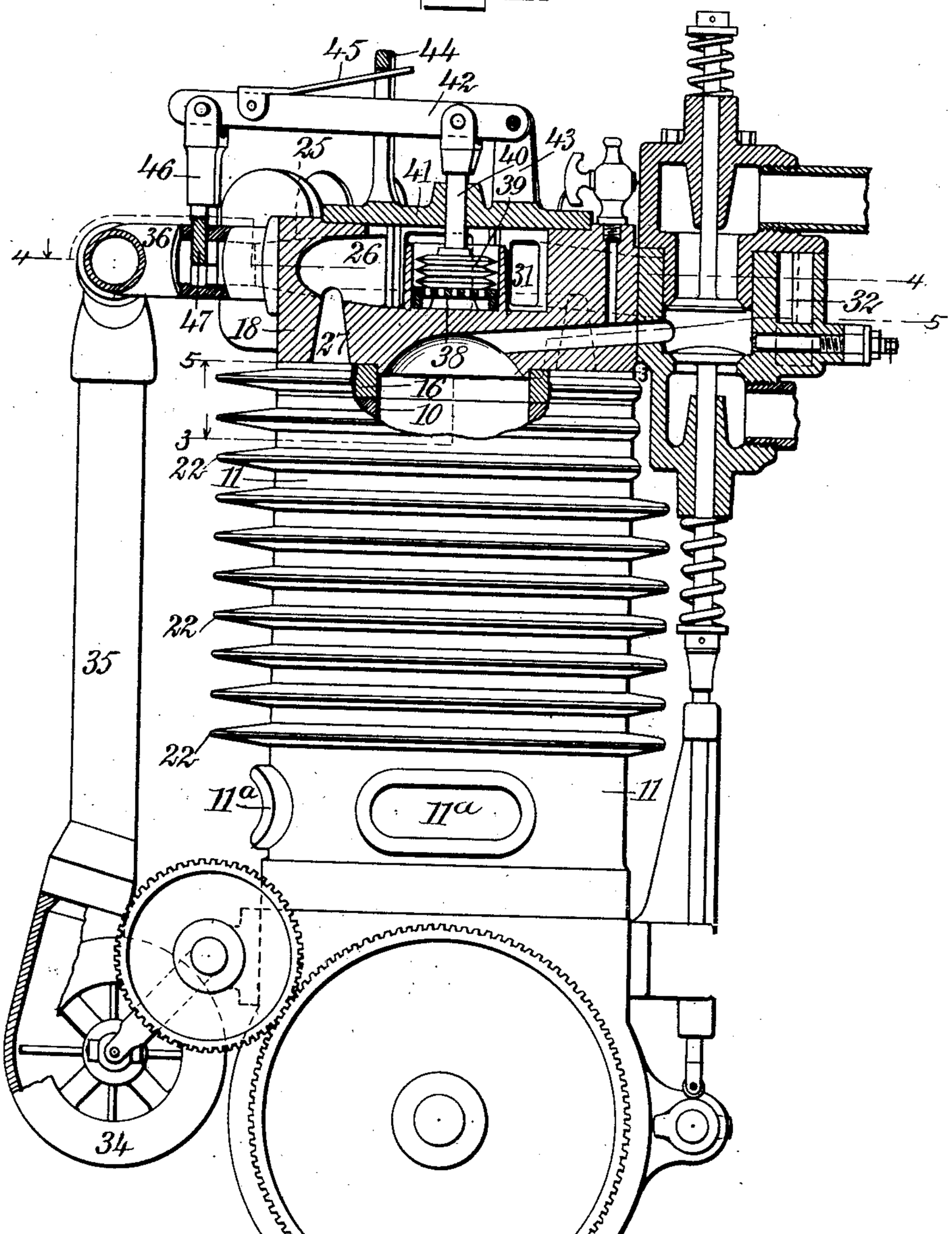
C. J. MUNDHENK.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED FEB. 14, 1906.

3 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

L. Almquist.

Isaac B. Owens.

INVENTOR

Charles J. Mundhenk

BY

Munn & Co

ATTORNEYS

No. 865,202. PATENTED SEPT. 3, 1907.

C. J. MUNDHENK.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED FEB. 14, 1906.

3 SHEETS—SHEET 3.

Fig. 3.

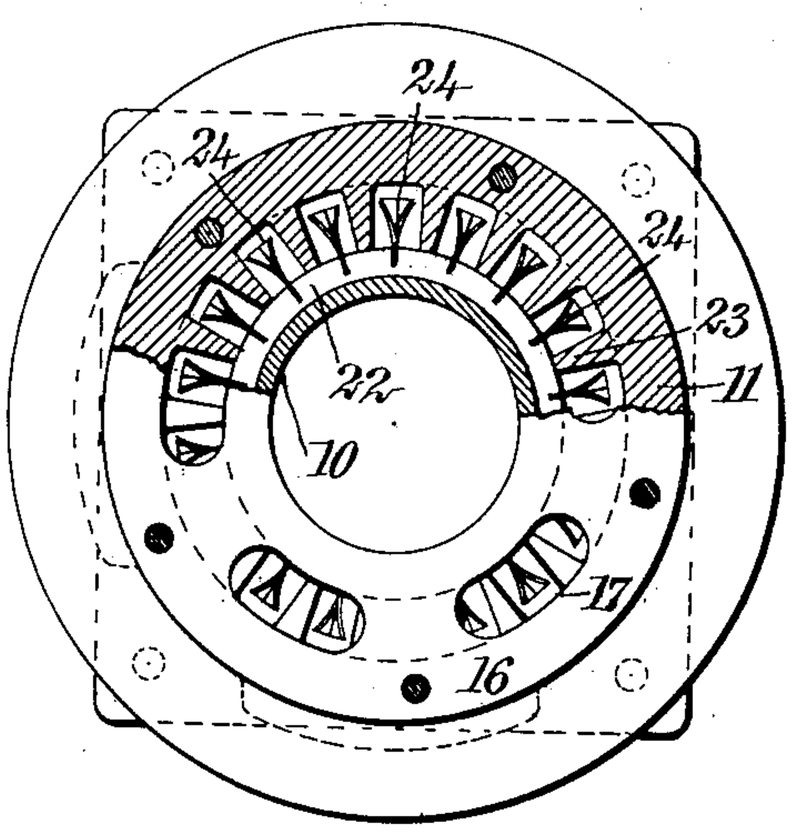


Fig. 4.

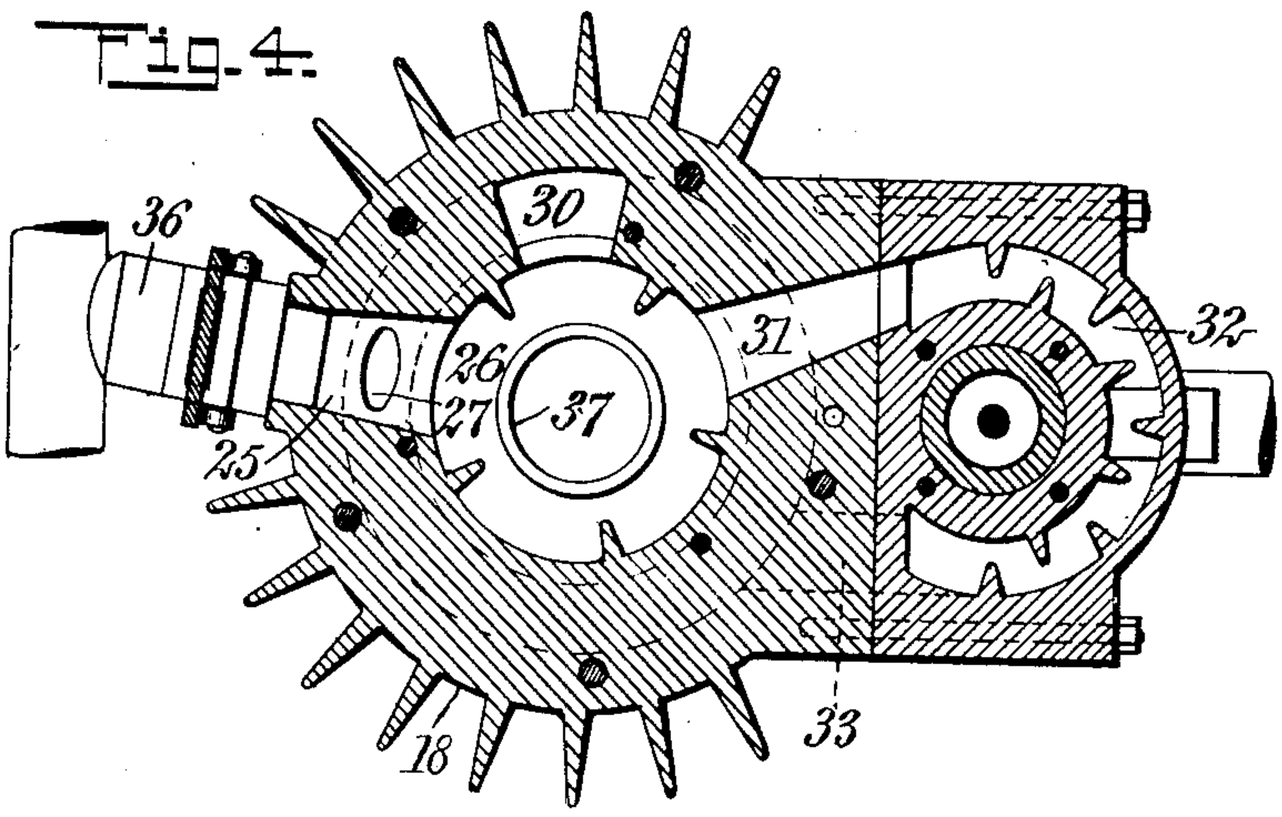
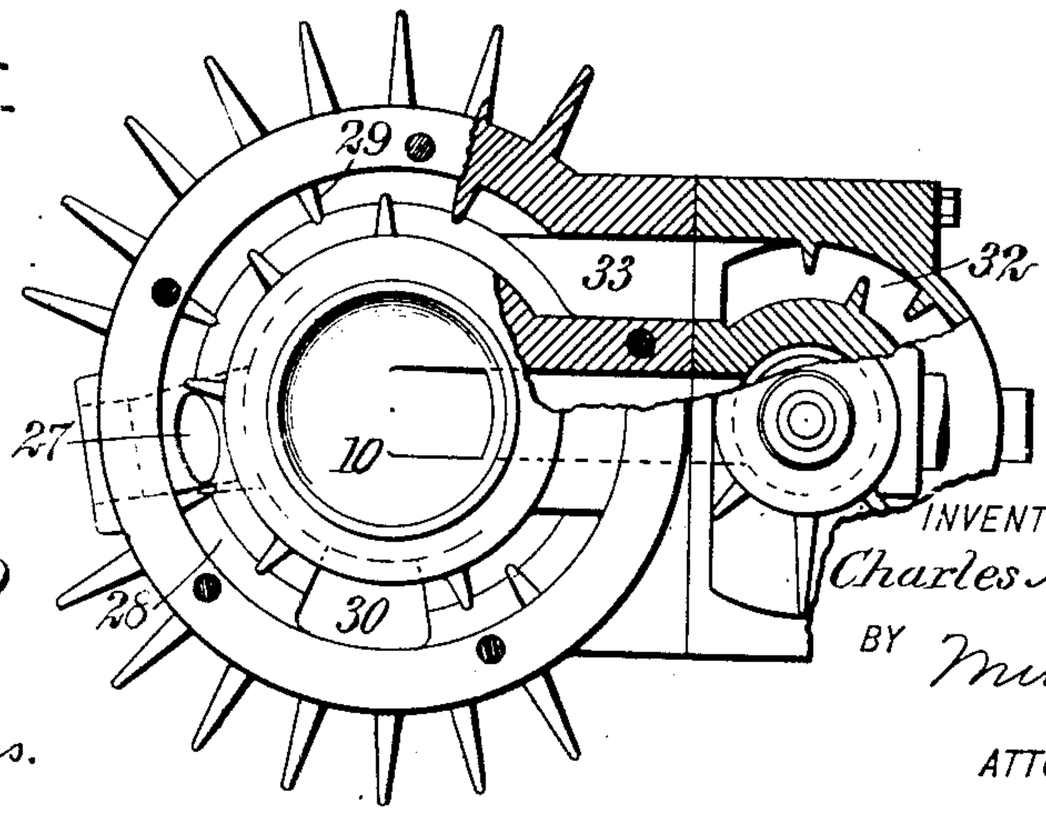


Fig. 5.



WITNESSES:

L. Blanquist.

Jean B. Owens.

INVENTOR

Charles J. Mundhenk

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

CHARLES J. MUNDHENK, OF FREEPORT, ILLINOIS.

INTERNAL-COMBUSTION ENGINE.

No. 865,202. Specification of Letters Patent. Patented Sept. 3, 1907.

Application filed February 14, 1906. Serial No. 301,009.

To all whom it may concern:

Be it known that I, CHARLES J. MUNDHENK, a citizen of the United States, and a resident of Freeport, in the county of Stephenson and State of Illinois, have invented a new and Improved Internal-Combustion Engine, of which the following is a full, clear, and exact description.

The underlying object of my invention is to so construct a gas, oil or other internal combustion engine as to permit effectual and controllable cooling thereof by an air blast, as contra-distinguished from water cooling. I attain this end by a peculiar cylinder and jacket formation, producing an inclosed chamber or series of chambers through which the air blast is circulated, and in which chambers are arranged radiating devices effectually dissipating the heat from the cylinder proper, and at the same time effecting an arrangement which insures maintaining the cylinder proper in true form and avoiding any warping or any other movement of the cylinder out of its proper form. I also provide a thermostatically controlled means by which the blast is automatically regulated, thus maintaining the engine at precisely that temperature best calculated for effective operation and avoiding excessive cooling, which occasions a marked loss of thermal efficiency.

Various other features of major or minor importance are involved, and all will be fully set forth hereinafter and particularly pointed out in the claims.

Reference is to be had to the accompanying drawings which illustrate as an example the preferred embodiment of my invention, in which drawings

Figure 1 is a side elevation of a two cylinder engine embodying my invention, in which view one of the cylinder heads and jacket are shown in section; Fig. 2 is an end elevation of the engine with parts of the head and valve housing in section; Fig. 3 is a plan view of the cylinder with the head removed, and with parts in section on the line 3—3 of Fig. 2; Fig. 4 is a sectional plan through the head and valve housing on the line 4—4 of Fig. 2; and Fig. 5 is a plan view of the under or inner side of the cylinder head with parts in section on the line 5—5 of Fig. 2.

10 indicates the cylinder proper or liner, and 11 the jacket, the walls of which are spaced from the walls of the cylinder to form a chamber indicated at 12 in the drawings, particularly Fig. 1. The lower end of the cylinder 10, according to the construction here shown, is formed with a flange 14 which fits snugly within the flanged lower end 15 of the jacket 11, thus securely connecting the parts 10 and 11 at their lower ends. At its upper end the cylinder 10 is formed with a flange 16 having openings 17 therein. This flange rests on the upper end of the jacket 11, and bearing on the flange is the cylinder head 18 which is fastened through the flange 16 into the jacket 11 by means of bolts 19, as shown, thus firmly clamping together the jacket, cylinder head and the cylinder flange, and securing the upper end of the cylinder in fixed relation to the jacket. Said jacket in turn is fastened down on to the base or frame 20 of the engine by means of bolts 21, shown at the right hand end of Fig. 1. In case the engine is not of the vertical type, as here illustrated, the frame construction and the manner of fastening the cylinder and jacket thereto will be varied to suit the type of the engine.

The cylinder 10 is provided exteriorly with annular ribs 22, shown in Figs. 1 and 2, and the jacket 11 is provided interiorly with longitudinally extending ribs 23. These ribs 23 abut evenly and firmly against the outer edges of the ribs 22, and in this manner the cylinder 10 is firmly braced against the jacket. The cylinder 10 should be of relatively light construction, and the jacket of relatively heavy construction, the arrangement of the engaging ribs 22 and 23 bracing the light cylinder preventing distortion thereof due to expansion, and yet allowing ready and thorough cooling, since the comparatively light walls of the cylinder owing to their deficiency in mass will retain little heat. It is in this principle that one of the essentialities of my invention resides.

Fastened in the annular ribs 22 of the cylinder 10 are a number of sheet metal strips 24. The ribs are grooved longitudinally of the cylinder and the sheet metal strips 24 are firmly fastened in the grooves so as to insure high conductivity between the cylinder and the metal strips. These metal strips project outward from the cylinder, as shown in Figs. 1 and 3, and are situated respectively between the ribs 23. The outer edges of the strips are slit, as the drawings show, and bent off in staggered relation so that they will be thoroughly subjected to the air currents flowing between the cylinder and jacket. The air circulated through the jacket must pass in intimate contact with the ribs 22 and 23, carrying off the heat developed in the cylinder and maintaining the cylinder at the proper temperature. This cooling effect is materially assisted by the strips 24 which absorb the heat from the cylinder, and in turn gives the heat off to the air flowing through the jacket. The air escapes from the jacket by openings 11^a in the lower part thereof.

The cylinder head 18 is formed, as shown best in Fig. 4, with a passage 25 extending transversely from the side of the head into a chamber 26 formed in the head. Said chamber 26 has an opening 27 extending downward to an annular chamber 28 formed in the under side of the cylinder head, (see Fig. 5). Said chamber 28 extends around the head, and is provided interiorly with radiating ribs 29. The chamber matches with the openings 17 in the flange 16, as shown best in Fig. 1, and an air blast blown in through the opening 25 is divided between the chamber 26 in the

upper part of the cylinder head and the chamber 28, from which latter chamber said blast passes down through the jacket 11, as before explained. The head 18 is also provided with an opening or passage 30 (see Figs. 4 and 5) which extends from the chamber 26 down to the chamber 28 for the purpose of assisting in conducting the air thereto.

Extending from the chamber 26 is a passage 31 which leads to a chamber 32 surrounding the housing of the admission and exhaust valves, as shown best in Figs. 2, 4 and 5. Said chamber 32 is interiorly ribbed, and passing from the side opposite the passage 31 is a passage 33, shown best in Fig. 5, which extends back into the cylinder head but communicates with the chamber 28 instead of the chamber 26. The air, therefore, entering through the passage 25 is divided, part going direct to the chamber 28 and jacket 11 through the openings 27 and 30, and the remainder after passing the chamber 26 moves through the passage 31 into the chamber 32, and thence to the chamber 28 and jacket by way of the passage 33. In this manner part of the air current is utilized to cool the cylinder head and the valves, and from thence is sent to the jacket. The air may be supplied in any convenient or suitable manner. Preferably, however, from a blower 34 which is driven from the crank shaft by a suitable gear shown in Figs. 1 and 2, and which discharges its fluid into a conduit 35 having branches 36 which lead to the passages 25 of the two cylinders of the engine.

The means which I have provided for automatically regulating the temperature at which the engine is operated are shown best in Figs. 1 and 2, from which it will be seen that the chamber 26 of the cylinder head 18 is provided centrally with an annular wall 37 which forms a pocket, and in this pocket is located a perforate rack-plate 38 supporting an element 39 which expands according to the degree of heat to which it is subjected. This element 39 may be any of the well known devices, but is preferably a device made up of one or more units each composed of two resilient disks joined to form a circular inclosure containing a highly volatile substance, so that as the heat increases the vapor is formed and expands to expand the element, thus imparting motion to the device connected therewith. Joined to said element 39 is a stem 40 which passes through a cap-plate 41 closing the chamber 26, and joined to a lever 42 fulcrumed on a branch 43 rising from said cap-plate. The lever passes through a yoke 44 attached to the cap plate, and spring 45 is applied to the lever tending to throw the same down to or below the position shown in Fig. 1.

Pivoted to the free end of the lever 42 is a link 46 supporting a gate 47. This gate operates in the branch or blast supply pipe 36 so as to throttle the air and regulate the flow according to the position of the gate. Said gate as shown best in Fig. 1, is provided at each side with guide legs 48 which run against the outer sides of the supply pipe, guiding the movement of the gate. By proper adjustment of the parts the gate 47 may be caused to regulate the flow of air in such a manner as to uniformly maintain the temperature of the engine at the desired degree, the element 39 expanding with excessive heat, thus increasing the opening of the gate 47 and permitting a greater volume of air to flow into the engine reducing the temperature proportionately, and upon the reduction of the temperature below the predetermined degree the contraction of the element 39 permits the spring 45 to return the gate to or toward closed position, thus cutting off the air supply and permitting the temperature to rise.

Having thus described the preferred form of my invention, what I actually claim and desire to secure by Letters Patent is:

1. An engine having a cylinder, a jacket surrounding the same and spaced therefrom, internal ribs connected with the jacket and running longitudinally thereof, annular ribs connected with the cylinder, the ribs of the cylinder engaging the ribs of the jacket to brace the cylinder against the jacket, and radiating strips connected with the cylinder and projecting outward between the longitudinal ribs of the jacket.

2. An engine having a cylinder, a jacket surrounding the same and spaced therefrom, a plurality of parallel ribs carried by the cylinder and extending outwardly therefrom, a plurality of ribs carried by the jacket and extending inwardly therefrom and in engagement with the ribs of the cylinder, the two sets of ribs being arranged at an angle to each other, and radiating strips carried by the cylinder and projecting outwardly therefrom and between the ribs of the jacket, said radiating strips having their outer edges split and bent in staggered relation.

3. An engine having a cylinder, a jacket surrounding the same and spaced therefrom, a plurality of parallel ribs carried by the jacket and extending inwardly toward the cylinder, and a plurality of radiating strips substantially parallel to said ribs, and carried by the cylinder and extending outwardly therefrom into the spaces between said ribs, each of said strips being formed of sheet metal inserted within a groove in the wall of the cylinder and having its outer edge provided with slits, the portions between said slits being bent at divergent angles.

4. An engine having a cylinder of thin material and having outwardly-directed flanges adjacent each end thereof, a jacket having an inwardly-directed flange at one end and adapted to fit the outwardly-directed flange at one end of the cylinder, the body of said jacket adapted to fit the outwardly-directed flange at the opposite end of the cylinder, means intermediate said cylinder and jacket for properly bracing the former, said means comprising a plurality of outwardly-directed ribs on the cylinder, a plurality of inwardly-directed ribs on the jacket and at an angle to the first mentioned ribs, and means for circulating a cooling medium between said cylinder and said jacket.

5. An engine, comprising a cylinder, a jacket surrounding the same, means intermediate said cylinder and said jacket for spacing and bracing the jacket, outwardly-directed flanges adjacent the ends of the cylinder, and in engagement with the jacket means for circulating a cooling medium between said cylinder and said jacket, and a plurality of radiating strips upon the cylinder intermediate the bracing and spacing means, each of said strips being formed of sheet metal and having its outer edge extending in an irregular line.

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

CHARLES J. MUNDHENK.

Witnesses:
R. R. TIFFANY,
GRACE STONICK.