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C. BRIZZOLARA.

INTERNAL COMBUSTION ENGINE.

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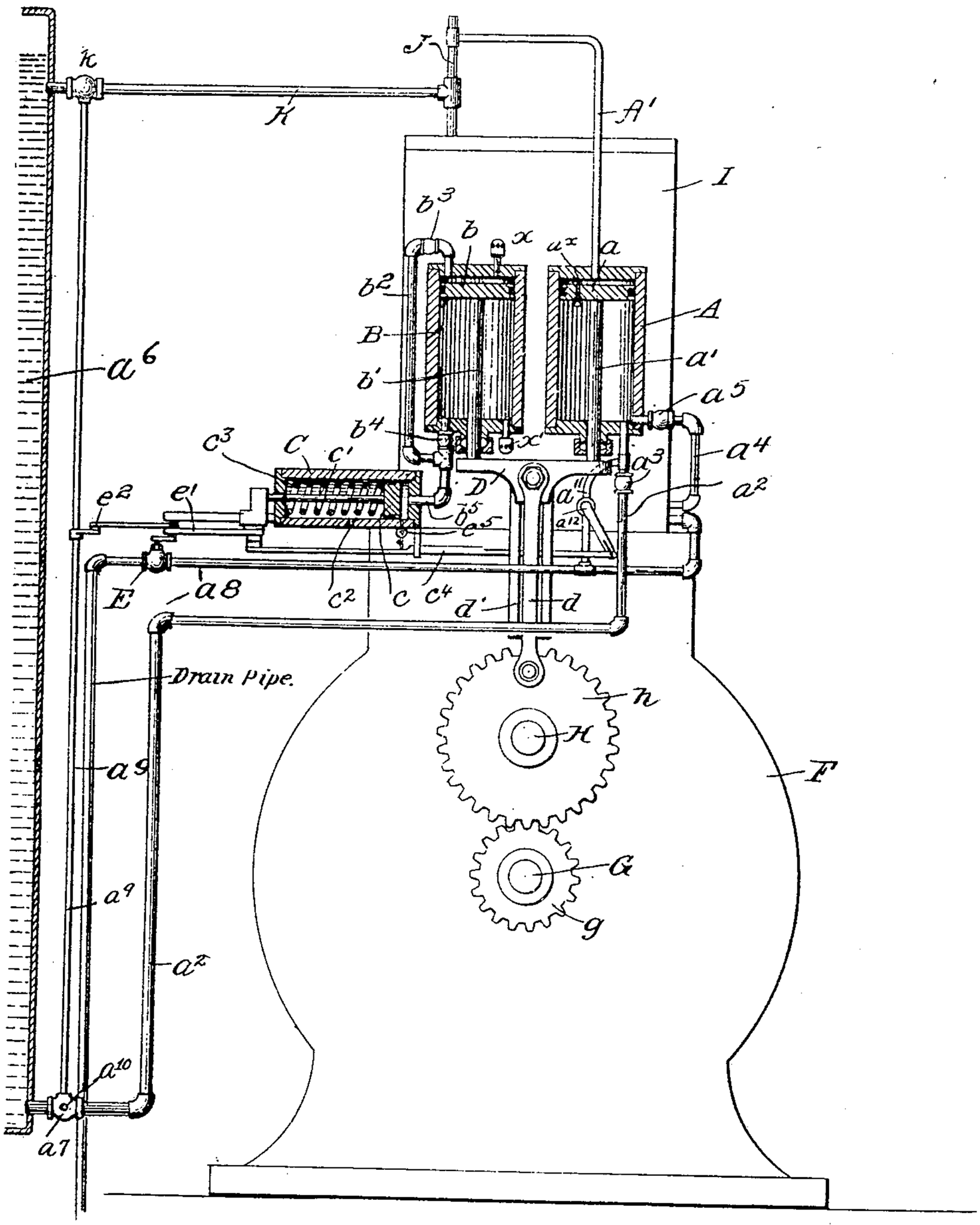

Witnesses

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INTERNAL-COMBUSTION ENGINE.

No. 865,009. Specification of Letters Patent. Patented Sept. 3, 1907.

Application filed March 27, 1907. Serial No. 364,872.

To all whom it may concern:

Be it known that I, CHARLES BRIZZOLARA, a citizen of the United States of America, and a resident of Richmond, in the county of Henrico, State of Virginia; have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a full and clear specification, reference being had to the accompanying drawing, in which is represented a side elevation of an upright gas-engine in outline, showing my invention applied thereto, the attachment being shown in vertical section.

The object of this invention is to provide simple means whereby the water-jacket shall be automatically drained when the engine stops, thus preventing the water freezing in the jacket and cracking the jacket or the cylinder.

As a further improvement the invention consists in additional means whereby the supply of water to the jacket is cut off automatically when the engine stops, and as a still further improvement the invention is designed to provide automatic means for forcibly circulating the water during the operation of the engine, as more fully hereinafter set forth.

Referring to the drawings by letters, G designates one end of the crank shaft of the engine on which is secured a gear g, which gear meshes with a gear h journaled on a stub-shaft H and having attached to it a pitman rod d. The upper end of this pitman rod is connected to a cross head D which slides in vertical ways d' and carries two upwardly extending piston rods lettered respectively a' and b' and carrying respectively pistons a and b, which pistons work respectively in upright cylinders A and B.

The cylinder A is connected at its lower end by a short pipe a^4 with the lowest point of the water-jacket I and this pipe is provided with an outwardly opening check valve a^5. Another pipe a^2 (provided with an inwardly opening check valve a^3) leads from the bottom of this cylinder to the bottom of the water storage tank a^6. A discharge pipe K leads into the upper end of the tank from the upper end of the water-jacket, and this pipe is provided with a vent-pipe J which is always open and extends upward to a point above the maximum water-level in the tank. In the pipe K is a cock k and in the pipe a^2 is a cock a^7, and these cocks are connected by a vertical rod a^9, so that the valves are opened and closed in unison.

A horizontal air cylinder C is suitably supported just below the cylinder B and its inner end is connected to the opposite ends of the air cylinder B by means of pipes b^2 and b^5, these pipes being provided with suitable check valves b^3 and b^4 whereby with each stroke of the piston b air is forced into the inner end of the cylinder C. Suitable inlet check-valves x and x' are provided for the cylinder B. In the cylinder C is a piston c which is kept normally pressed inward by a suitable coil spring c^3 or other device. The piston rod c' projects out through the outer head of the cylinder and its cross-head is connected by a link e' with the stem of a suitable drain-cock E, this drain-cock being placed in the drain-pipe a^8 at a suitable point. The link or pitman e' is also pivotally connected by means of a pitman e^2 with the radial arm on the rod a^9.

It will be observed that during the operation of the engine air will be pumped in against piston c and force it outward against the action of its spring to a point beyond the vent c^2 when the piston will stop owing to the escape through c^2 of the compressed air. The outward movement of the piston c closes the drain cock E and opens the supply cock a^7 and the cock k in the return pipe and thus permits a free circulation of the water from the tank through the jacket and back to the tank. When the engine stops the spring c^3 will force the piston inward and thus close cocks k and a^7 and open the drain cock and thus permit the jacket to drain out through pipe a^8.

It will be observed also that by extending the always-open vent J to a point above the level of the liquid in the tank the air may at all times flow down into the jacket to permit the water to flow therefrom, a vent of this sort being necessary in view of the closing of the return pipe at k. It will be understood also that the piston c shall fit sufficiently loosely in its cylinder to permit the air to gradually escape past it when the engine is stopped and the spring is pressing it inwardly; otherwise the compressed air in the inner end of the cylinder would prevent the piston assuming its normal position.

Instead of permitting the air to escape around the loose piston it is obvious that I may adopt other means for automatically permitting the air to escape when the engine stops; for instance, I may attach a rod c^4 to the cross-head of the piston and provide it with a cam-shaped upper edge which when the piston is forced inwardly by its spring will open an escape valve c^5 and when it is forced outward by the air will close said valve and hold it closed, the depending stem of the valve being provided with a suitable knuckle joint which will permit this action to take place. But any other automatic device may be employed if desired.

If it be desired to drain the pipe a^2 when the cock a^7 is closed by the stopping of the engine, said cock

may be provided with a waste opening a^{10} and the plug of the cock may be of the three-way variety, so as to put this waste opening into communication with pipe a^2 when said pipe is cut off from the tank.

It will be observed also that the upper end of cylinder A may be connected to the vent pipe J by a pipe A′ at a point above the maximum water-level in the tank and the piston a be provided with a small hole controlled by a downwardly opening valve $a^{\times}$ adapted to stand normally open and be closed on the downward stroke of the piston. This construction will permit the water to drain freely from the cylinder A, and if any water gets up past the valve $a^{\times}$ and does not drain down through the opening in which the stem of the valve works it will be forced up through pipe A′ and returned to the tank. If the pipe a^4 does not drain the cylinder A entirely, I may connect pipe a^2 at a point above the check valve a^3 to the drain-pipe a^8 by a pipe a^{11} and provide this connecting pipe with a cock a^{12} and connect the stem of this cock to the valve rod c^4, so that when the engine is at rest the cock a^{12} will be open and the free drainage secured directly from the cylinder A through the said drain-pipe a^8. When the engine is in operation and the valve rod c^4 is drawn outwardly, the cock a^{12} will be closed as is obvious.

Having thus fully described my invention, what I claim and desire to secure by Letters Patent is:—

1. In combination with a water-jacketed engine, a storage tank, return and supply pipes connecting the jacket with the tank, means automatically actuated by starting the engine for opening both said pipes, said means comprising a spring-pressed piston and air-forcing devices, and means for draining this jacket, these latter means being operated by the stopping of the engine.

2. In combination with a water-jacketed engine, a water supply pipe, means for closing the supply pipe upon the stopping of the engine and opening the supply pipe upon the starting of the engine, said means comprising an air-forcing cylinder connected up to the engine, an air-receiving chamber containing a spring-pressed piston and means connecting this piston with a valve in the supply pipe, and devices connected to these latter means for automatically venting the air receiving cylinder when the engine stops.

In testimony whereof I hereunto affix my signature in the presence of two witnesses this 22nd day of March 1907.

CHAS. BRIZZOLARA.

Witnesses:
W. MARSHALL,
DOMINIC LEVERI.