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PATENTED JAN. 29, 1907.

W. B. BURCHALL.

INTERNAL COMBUSTION ENGINE.

APPLICATION FILED NOV. 12, 1903. RENEWED JAN. 8, 1907.

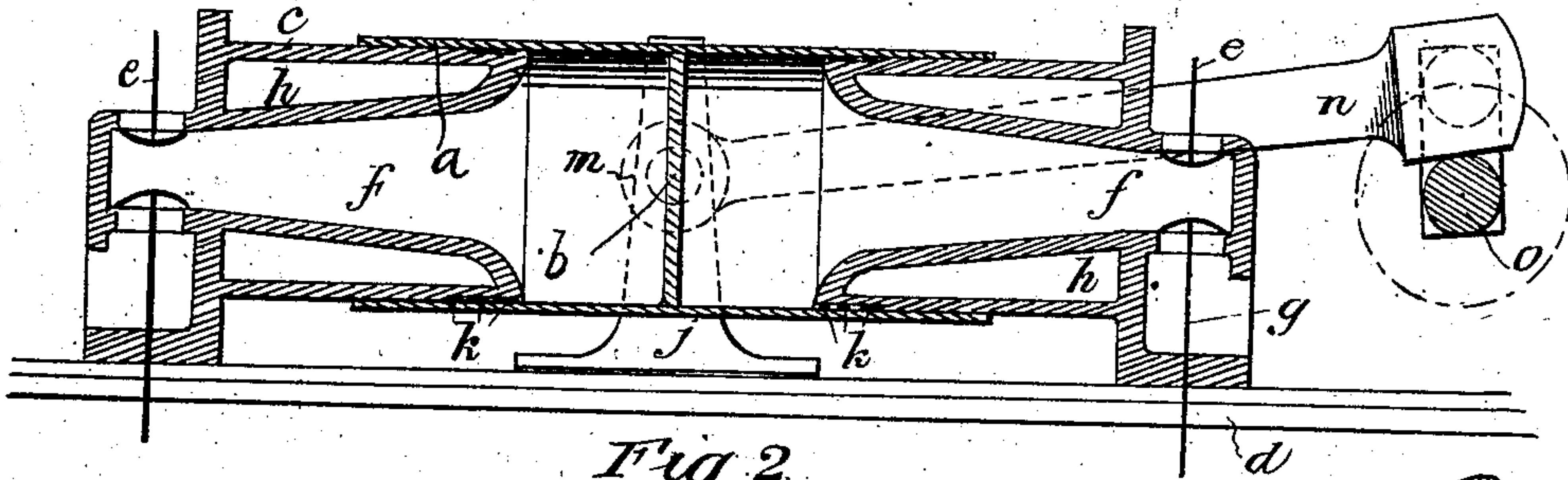


Fig. 2

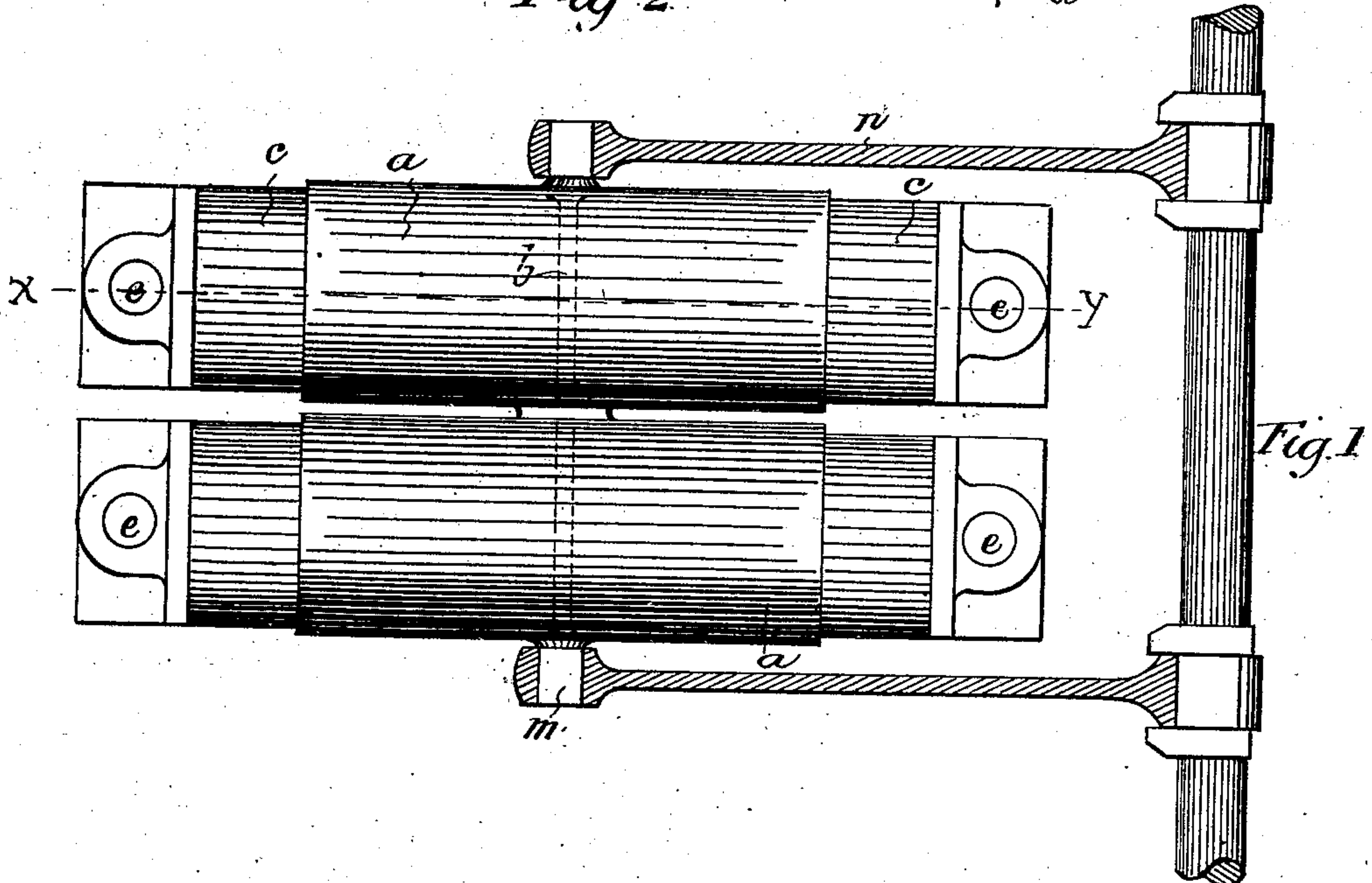


Fig. 1

Witnesses
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UNITED STATES PATENT OFFICE.

WILLIAM BALLANTYNE BURCHALL, OF STOCKPORT, ENGLAND.

INTERNAL-COMBUSTION ENGINE.

No. 842,844.

Specification of Letters Patent.

Patented Jan. 29, 1907.

Application filed November 12, 1903. Renewed January 8, 1907. Serial No. 351,396.

To all whom it may concern:

Be it known that I, WILLIAM BALLANTYNE BURCHALL, of Dungowan, Bredbury, Stockport, in the county of Cheshire, England, engineer, have invented certain new and useful Improvements in and Connected with Internal-Combustion Engines, the Same being also Applicable to Steam-Engines, of which the following is a specification.

10 This invention, which relates to improvements in and connected with internal-combustion engines, the same being also applicable to steam-engines, has for its object to so construct such engines as to render them
15 double-acting without the use of piston-rods, glands, and stuffing-boxes; to reduce the number and weight of reciprocating parts in relative proportion to the number of impulses obtained in the cylinders; to construct the sliding surfaces of the cylinders and pistons so as to be truly cylindrical and so that by the absence of bosses or projections these surfaces may not be distorted when under the influence of great heat; to
20 obtain more equable ratios of expansion of cylinders and pistons when heated; also, to provide means whereby the pressure due to weights of reciprocating parts and obliquity of connecting-rods may be received by other
25 surfaces than those of the cylinders and pistons and in such manner that these do not tend to wear from their original form and to obtain by arrangement and combination of such cylinders and pistons regularity of turning moment, balancing of motor impulses
30 and inertia forces, and freedom from vibration.

In engines constructed according to this invention use is made of an open-ended cylinder having a transverse partition. This
40 cylinder is mounted and caused to move to and fro on fixed pistons. These latter are fitted with valves and ports, so that gas or fluid may be admitted to one or both ends of the cylinder, as desired, in order to cause the
45 cylinder to move to and fro. In internal-combustion engines such cylinders may be constructed with a water-jacket, and such transverse partitions may be cooled by means of air or water circulating in cavities
50 in the partition, and such fixed pistons may be cooled by means of air or water circulating

in annular spaces in the pistons. In steam-engines such annular spaces may be used as steam-jackets.

The accompanying drawings illustrate diagrammatically the construction and application according to this invention.

In all diagrams like letters indicate like parts.

Figure 1 shows arrangement in plan of two such cylinders with transverse partition and with such partition common to both cylinders. It also shows fixed pistons and crankshaft with two cranks in line and connecting-rods in section. Fig. 2 shows a longitudinal vertical section of such cylinder and pistons, with cylinder support and slide, also connecting-rod and crank-shaft, taken on the line *xy*, Fig. 1.

Referring to Figs. 1 and 2, the arrangements shown are such as would be used on a double-acting internal-combustion engine working on the Otto cycle principle. The open-ended cylinder *a*, constructed with a transverse partition *b*, is mounted and moves to and fro on stationary pistons *c c*, which are fixed to the base or sole plate *d*. Fluid, elastic or non-elastic, is admitted to the ends of the cylinder through inlet-valves *e e* and ports *f f*, and the waste products are allowed to escape by means of the valves *g g*.

The pistons *c c* are or may be constructed with annular spaces *h h* and are fitted with expansion-rings *k k*. The valves *e* and *g* and firing-gear when attached may be of any efficient design, and this gear is so arranged that the impulses obtained cause the cylinder *a a* to move to and fro on the pistons *c c*. This motion is transmitted through the connecting-rods *n* to the crank-shaft *o* by the intermediary of pins *m m*, integral with or otherwise suitably connected to the cylinders.

As shown in Fig. 2, the cylinder may be mounted to slide on a plane surface *J*; but this would only be necessary in engines having heavy reciprocating parts.

I claim—

In an engine, the combination with a base-plate, a pair of oppositely-arranged stationary pistons spaced apart on said base-plate and having an open inner end and a tapering bore extending from the inner end to the outer end of the pistons, a cooling-jacket sur-

rounding the bore of the piston and extending outwardly from the inner end of each piston, an open-ended cylinder having a transverse partition-wall therein and mounted to slide on said cooling-jackets, expansion-rings between said jackets and said cylinder, a guide projecting from the base-plate intermediate of the pistons and adapted for sliding engagement with the cylinder, and inlet

and outlet valves in the extreme outer ends of said pistons.

In testimony whereof I have hereunto affixed my signature in presence of two witnesses.

WILLIAM BALLANTYNE BURCHALL.

Witnesses:

JOHN LIDDLE,

JOSEPH HENRY PEARSON.