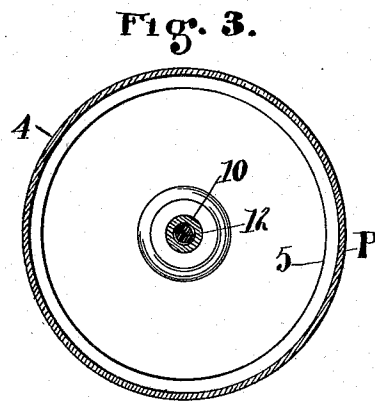
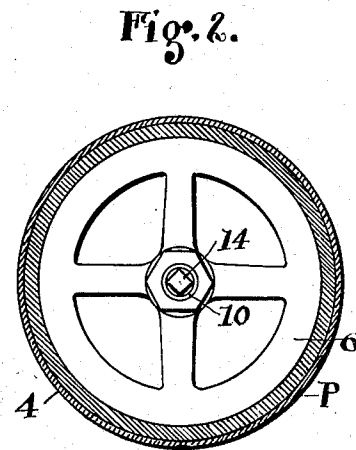
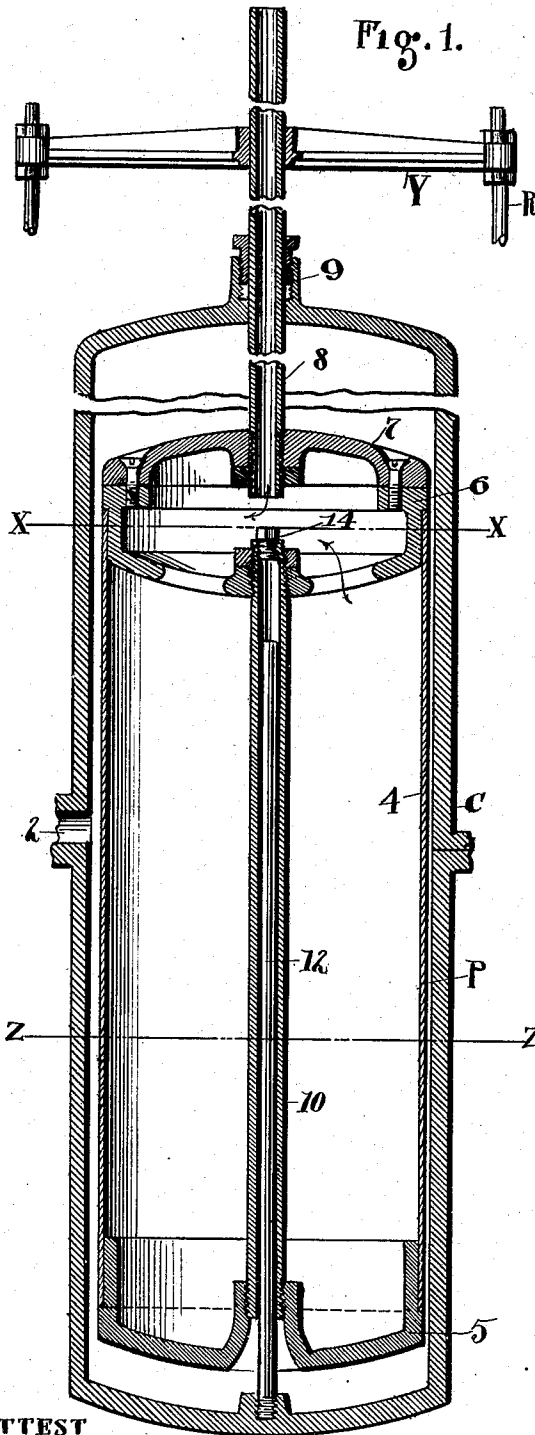


F. B. HUBBARD.
 PISTON FOR HOT AIR ENGINES.
 APPLICATION FILED DEC. 24, 1908.

942,261.

Patented Dec. 7, 1909.



ATTEST
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UNITED STATES PATENT OFFICE.

FRANK B. HUBBARD, OF MIDDLEFIELD, OHIO.

PISTON FOR HOT-AIR ENGINES.

942,261.

Specification of Letters Patent.

Patented Dec. 7, 1909.

Application filed December 24, 1908. Serial No. 469,165.

To all whom it may concern:

Be it known that I, FRANK B. HUBBARD, a citizen of the United States, residing at Middlefield, in the county of Geauga and State of Ohio, have invented certain new and useful Improvements in Pistons for Hot-Air Engines, of which the following is specification.

My invention relates to improvements in pistons for hot air engines, all substantially as shown and described and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a sectional elevation of one style of piston embodying my invention, and Fig. 2 is a cross section thereof on line $x-x$, Fig. 1. Fig. 3 is a cross section on line $z-z$, Fig. 1.

The pistons as thus shown are designed more especially for use in hot air engines but are not necessarily limited to such use.

In Figs. 1 to 3 the piston indicated as a whole by P is also known as the transfer piston.

Cylinder C is a stationary upright part as usual, and piston P has a limited stroke therein, with space about the same for the play of air and its ultimate expulsion under expansion at opening 2. Structurally said piston comprises a shell or body 4 of tubular shape, two heads 5 and 6 on which said body is engaged, and a cap 7 over the upper end thereof and fixed upon head 6 by screws, in this instance. An air space is provided between head 6 and cap 7 which is open to the interior of the piston through openings in head 6, and the interior of the piston is open to the outer air to exhaust heated air therefrom by way of a pipe 8 fixed in cap 7 and having a packed bearing at 9 in the top of cylinder C. The piston is thus provided with free ventilation to the outside atmosphere from its interior, but the space about the same in cylinder C has its only outlet through opening or passage 2, whence

the flow of heated air is conveyed and discharged through pipe into cylinder C'. The piston P is centered and guided in its strokes from its bottom by a tube 10 connecting heads 5 and 6 and a guide rod 12 extending thereinto from the bottom of cylinder C, and from its top by the tube 8 in bearing 9, so that said cylinder is supported with a free air space at all times about the same in the cylinder, air being supplied thereto as usual, not shown. A screw plug 14 closes the upper end of tube 10 and prevents escape of air.

Y represents a yoke fixed upon tube 8 and rods R thereon have the usual operating connections, not shown.

What I claim is:—

1. In a hot air engine, a transfer mechanism for the hot air comprising a tubular cylinder, a tubular piston therein having closed ends and a tube centrally connecting said ends, a guide member fixed in one end of said cylinder and extending into said tube, and a ventilating guide tube connected with the other end of said piston and having a bearing in the end of said cylinder.

2. The combination of the cylinder, a double ended tubular piston therein and a tube connecting said ends, a guide rod fixed in the bottom of said cylinder extending into said tube and a guide tube fixed in the upper end of said piston slidably mounted in the upper end of said cylinder, the said piston supported apart from the wall of the cylinder all around by said parts, and a plug closing the upper end of said connecting tube.

In testimony whereof I affix my signature in presence of two witnesses.

FRANK B. HUBBARD.

Witnesses:

R. B. MOSER,
E. M. FISHER.