No. 646,406. Patented Apr. 3, 1900.

C. A. ANDERSON, E. A. ERICKSON & J. WICKSTROM.

HOT AIR FAN MOTOR.

(Application filed May 17, 1899.)

(No Model.) 2 Sheets—Sheet 1.

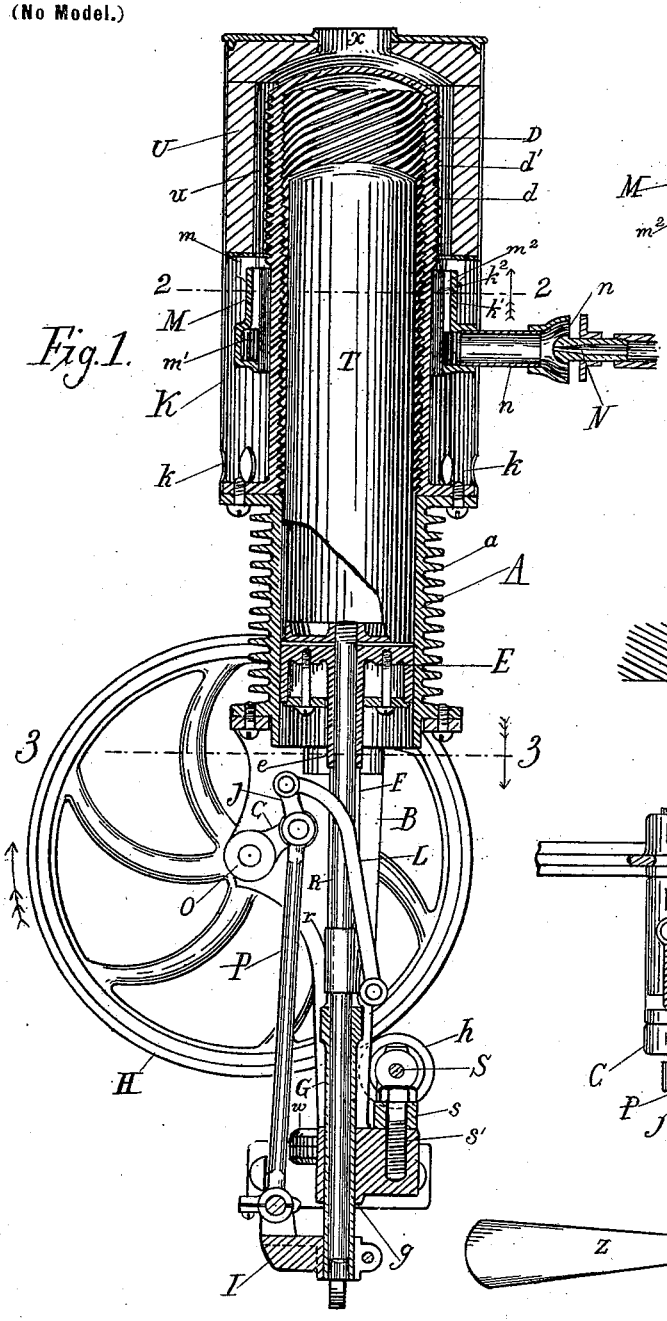

Fig. 1.

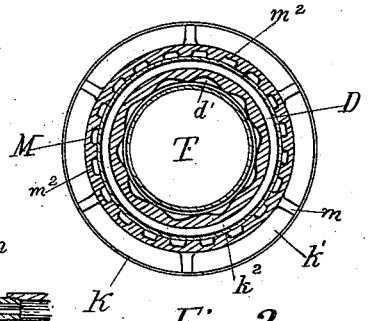

Fig. 2.

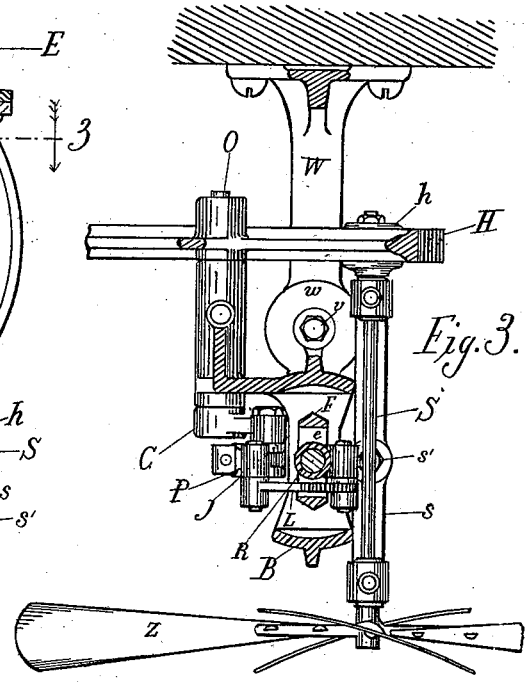

Fig. 3.

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Fig. 4.

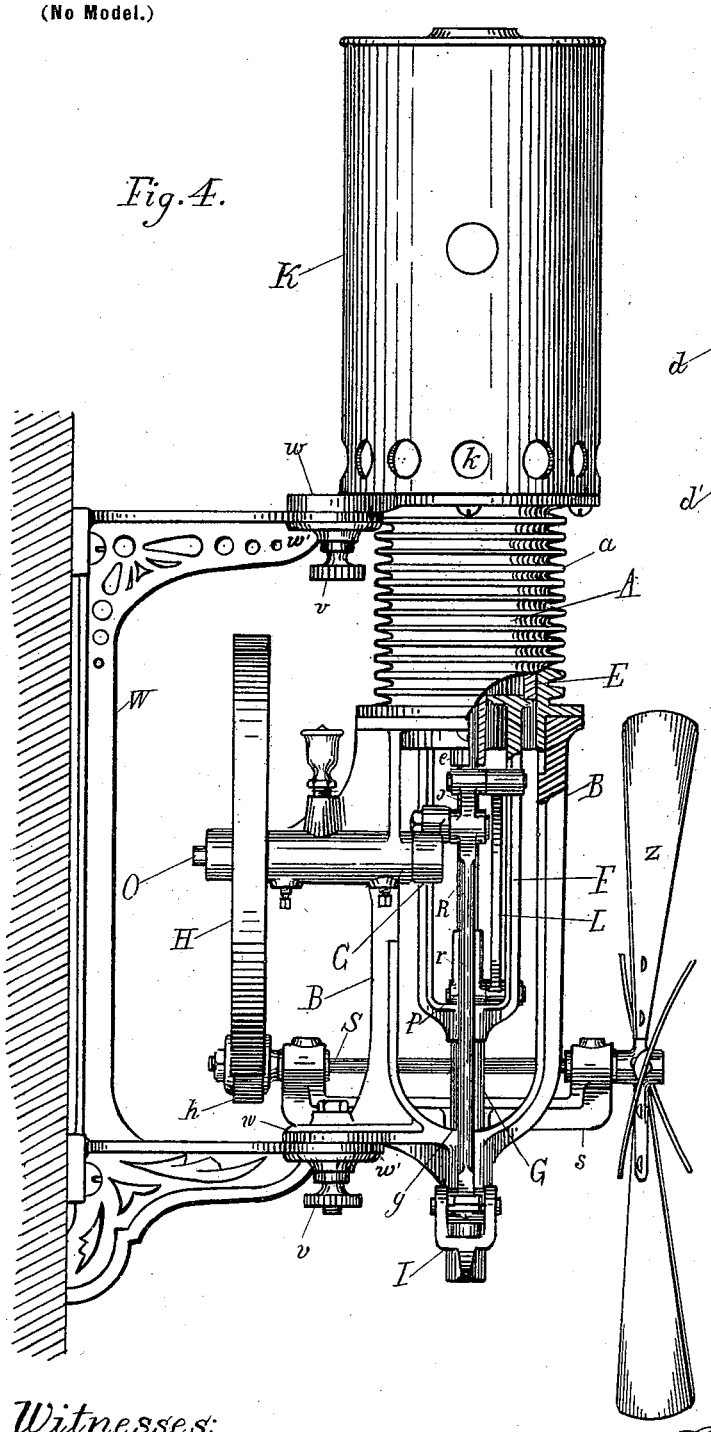
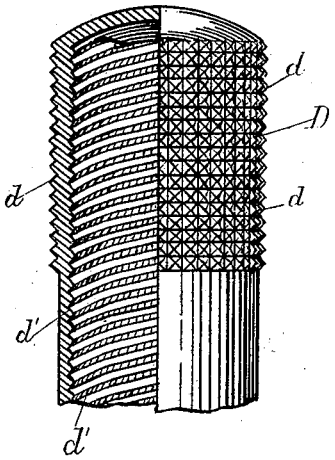


Fig. 5.



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UNITED STATES PATENT OFFICE.

CHARLES A. ANDERSON, ERICK A. ERICKSON, AND JOHN WICKSTROM,
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HOT-AIR FAN-MOTOR.

SPECIFICATION forming part of Letters Patent No. 646,406, dated April 3, 1900.

Application filed May 17, 1899. Serial No. 717,231. (No model.)

To all whom it may concern:

Be it known that we, CHARLES A. ANDERSON, ERICK A. ERICKSON, and JOHN WICKSTROM, citizens of the United States, residing in Chicago, county of Cook, State of Illinois, have invented certain new and useful Improvements in Hot-Air Fan-Motors, of which the following is a specification.

This invention relates to an apparatus having means to heat and to cool air or any other expansive and contractive substance, said heating and cooling being performed alternately, thereby increasing and decreasing its volume and pressure in a working cylinder, said cylinder having a transfer and a power piston connected to the crank on a drive-shaft for the purpose of displacing said air or substance and of utilizing the power thus developed by the expansion and contraction of said air or substance within the cylinder.

The objects of our invention are to provide a device that will convert as much heat as possible into mechanical power, said device to have a simple, inexpensive, and accurately-operating mechanism for the purpose of moving the transfer and the power pistons, to apply the heat to said motor or device by means of a burner located above the power and cooling cylinder and having a fan-blower journaled below said power and cooling cylinder, and to provide means to rotate said fan-blower from the motor. Our principal object in locating the burner above the cylinder and of journaling the fan-blower below is to keep the burner or source of heat as far away from fan-blower as possible, and most important of all to permit the products of combustion and what heat there may be to ascend upward and to not intermingle with the air-current produced by the rotating of the fan-blower; furthermore, to cause the flow of air to partially pass over the power and cooling cylinder, thus aiding to maintain it at a comparatively-low temperature. We attain these results by the mechanism and the arrangements shown in accompanying drawings, in which—

Figure 1 is a vertical section of the entire machine. Fig. 2 is a section on line 2 2 looking in the direction of the arrow. Fig. 3 is a section on line 3 3 looking in direction of the arrow. Fig. 4 is a side elevation, partially in section. Fig. 5 is a view of heating-chamber, partially in section.

Similar letters refer to similar parts throughout the several views, in which—

A is the power and cooling cylinder, provided with annular projecting flanges *a*.

B is the supporting-frame for the various parts of the mechanism.

E is the power-piston, located in the power-cylinder A.

F is a fork secured to the power-piston E by means of bolts. G is a hollow guide extending from said fork F and sliding through an opening *g* in frame B. I is a bifurcated transverse extension secured to said guide G.

P is a pitman pivotally connected at one of its ends to bifurcated extension I and at its other end to a crank C on drive-shaft O. Pitman P has an extension J, to which a link L is pivotally connected at one of its ends and at its other end to a transverse extension or collar *r*, secured on rod R, said rod extending and sliding with one of its ends through the hollow guide G and with its other end extending through and sliding in an opening *e* in piston E. On said rod R is rigidly secured a hollow transfer-piston T, above the power-piston E, said transfer-piston T being somewhat smaller and extending partially into power and cooling cylinder A and partially into heating-chamber D, secured to the top of power or cooling cylinder A.

The heating-chamber D is provided on its inner surface with spiral grooves *d'* and on its outer surface with longitudinal and transverse grooves *d*. The heating-chamber D is surrounded with a casing K. A ring-formed burner M is interposed between the heating-chamber D and casing K. Said burner M is held in place by means of extensions M, projecting from burner M and secured on the walls of casing K. Burner M is provided with a gas-inlet N, an air-inlet *n*, and a tube *n'* to convey the gas and air to the circular cavity *m'* in burner M. From cavity *m'* is passage M^2 to convey gas and air to top of burner M. The casing K is provided in its lower end with openings *k* and in its upper end with a non-conductive lining U.

u is a passage or space between lining U and heating-chamber D.

X is a vent on top of casing K.

The burner M is of a somewhat-larger inside diameter than the outside of heating-chamber D and of smaller outside diameter than the inside of casing K, thus leaving passages for air, k' k'', on the sides of burner M.

On drive-shaft O is secured a driving-wheel H, engaging the friction-pulley h, secured to one end of shaft S. A dish-fan or fan-blower Z is secured to the other end of shaft S. Shaft S is journaled in a bracket s, secured to frame B by means of adjusting-screw s'. Cylinder A and frame B are provided with dish-shaped extensions w w', resting on and held in place against similar-shaped extensions on bracket W by means of thumb-screws v v'.

The operation of the machine is as follows: By admitting gas under ordinary pressure through gas-inlet N it will draw a suitable amount of air with it through air-inlet n and through the tube n' into the cavity m' of burner M, from whence it proceeds through passages m'' to top of burner M, where it is ignited, the flame burning in space u and the products of combustion passing off into the atmosphere through vent X. The flame by heating the passage u and heating-chamber D will cause a current of ascending air, creating a draft through openings k, k', and k'', thus aiding to supply sufficient air for the complete combustion of the gas. Upon the heating-chamber D being sufficiently heated it will be seen that by having turned the drive-wheel in the direction indicated by the arrow the link L will have caused the transfer-piston to assume position shown in Fig. 1, thus having transferred the air between the power-piston and the lower end of transfer-piston to the upper part of heating-chamber D, the air in its upward course passing through the spiral grooves d', thereby acquiring a rotary motion, and consequently by reason of the centrifugal force brought in close contact with the inner surface of heating-chamber D the air by reason of said contact becomes highly heated and increases in volume and pressure, which acts on piston E and through the medium of fork F, hollow guide G, bifurcated extension I, pitman P to crank C on drive-shaft O, thereby imparting motion and momentum to drive-wheel H, friction-pulley h, shaft S, and fan-blower Z. When power-piston E has nearly completed its outstroke, the link L will cause transfer-piston T to begin its instroke in advance of power-piston E, thereby transferring the air from the hot portion of heater D to the cold space formed between the power-piston E and transfer-piston T. The air being cooled in its passage by coming in contact with the cold inner surface of cylinder A will decrease in volume and form a partial vacuum in the cylinder A, thus causing the atmospheric pressure to drive the power-piston E to its inner or upper center. The power thus developed is acting on power-piston E and through the mechanism described above on the fan-blower Z, secured on shaft S. It will also be seen and understood that the whole machine can be made to swing on the extensions w w' and secured by the lock or thumb screws v v', thus causing the fan to blow the air-current in the direction that may be desired.

Having fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a hot-air fan-motor the combination of a power-cylinder, a heating-chamber, a power-piston in said power-cylinder, a transfer-piston extending partially into said power-cylinder and partially into said heating-chamber, of spiral grooves on the inside of said heating-chamber substantially as described.

2. In a hot-air fan-motor the combination of a power-cylinder, a heating-chamber having on its inner side spiral grooves, and having on its outer side longitudinal and transverse grooves, substantially as described.

3. In a hot-air fan-motor the combination of a power-cylinder, a heating-chamber, a power-piston, and a transfer-piston, a fork secured at one of its ends to said power-piston and at its other end having a hollow guide, a frame secured at one of its ends to said power-cylinder and at its other end forming a bearing for said hollow guide, a transverse extension secured to said hollow guide, a pitman pivoted at one of its ends to said extension, and at its other end to a crank on drive-shaft, an extension on said pitman, a link pivoted to said extension with one of its ends and at its other end pivotally connected to a rod extending into and sliding in said hollow guide, and with its other end extending through and sliding in an opening in said power-piston substantially as described.

4. In a hot-air fan-motor having a power-cylinder, a heating-chamber, a power-piston in said power-cylinder, a transfer-piston extending into said power-cylinder and into said heating-chamber, an extension secured at one of its ends to said power-piston and at its other end forming a hollow guide, a frame secured with one of its ends to the power-cylinder, and having in its other end a bearing for said guide, a transverse extension secured to said hollow guide, a pitman pivotally connected with one of its ends to said transverse extension and at its other end to a crank on a drive-shaft, a rod sliding in said hollow guide with one of its ends, and with its other end extending through and sliding in an opening in said power-piston, a link connected at one of its ends to said pitman, and at its other end to a transverse extension on said rod, substantially as described.

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