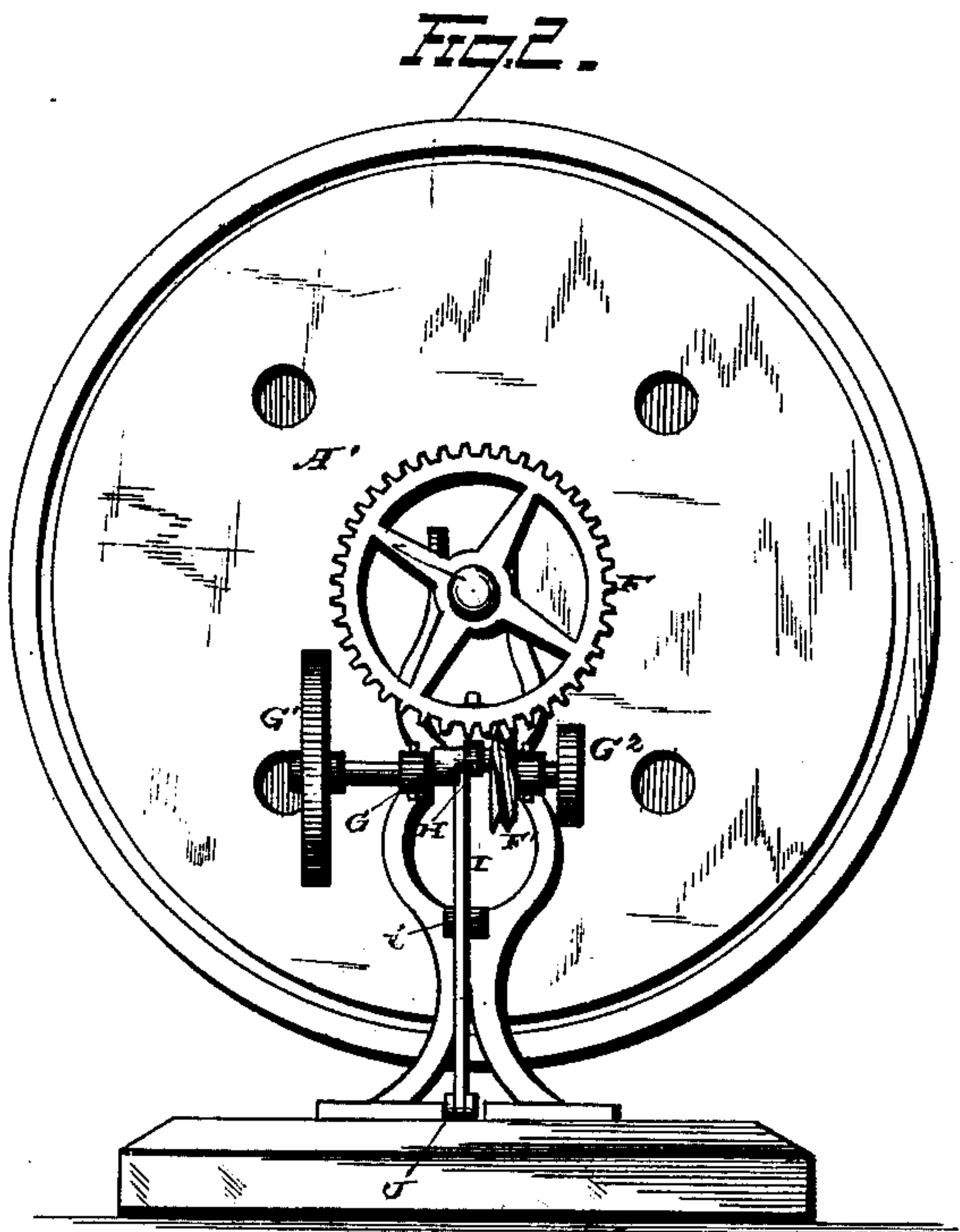
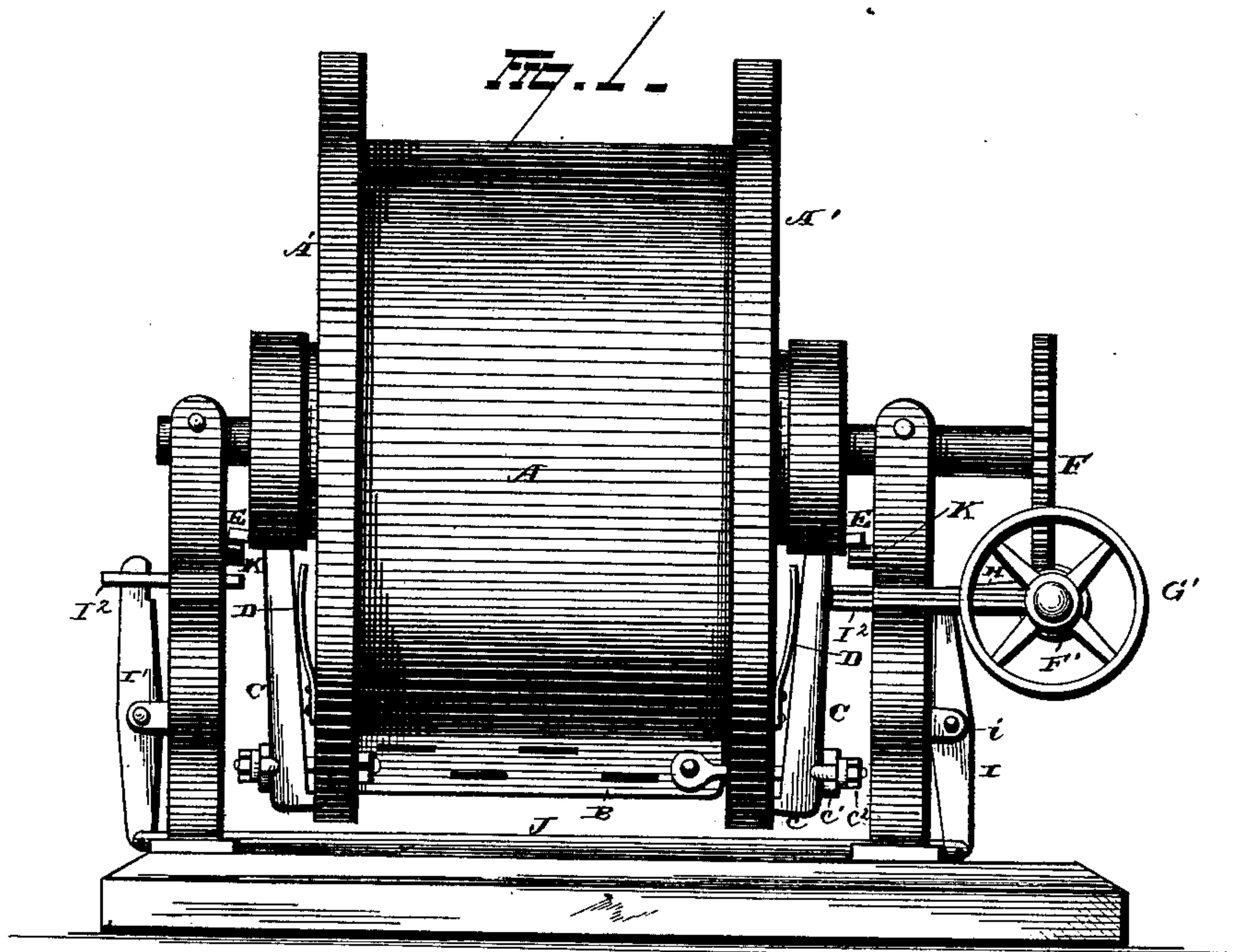


F. REINHOLD.
Thermal Motor.

No. 231,449.

Patented Aug. 24, 1880.



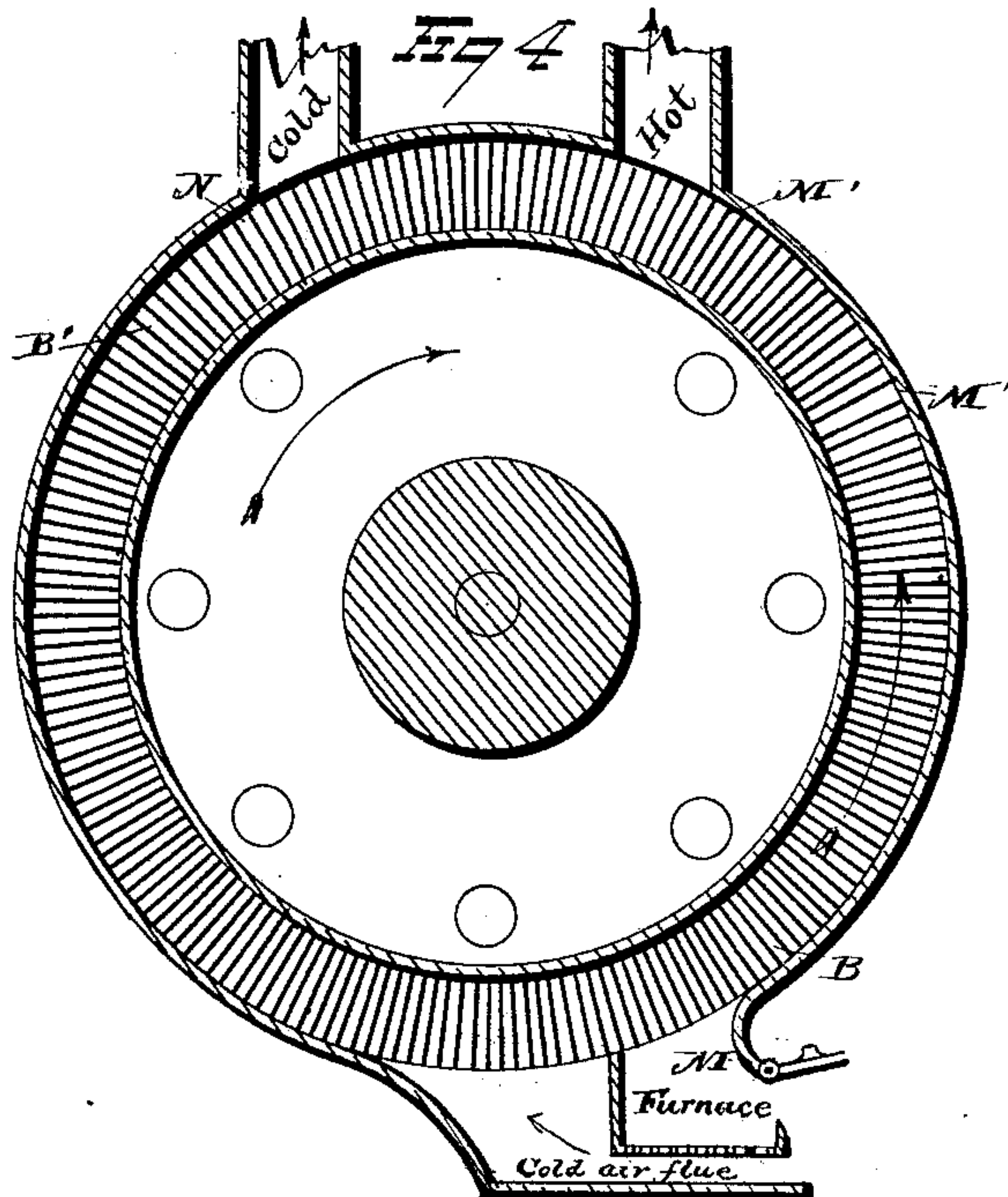
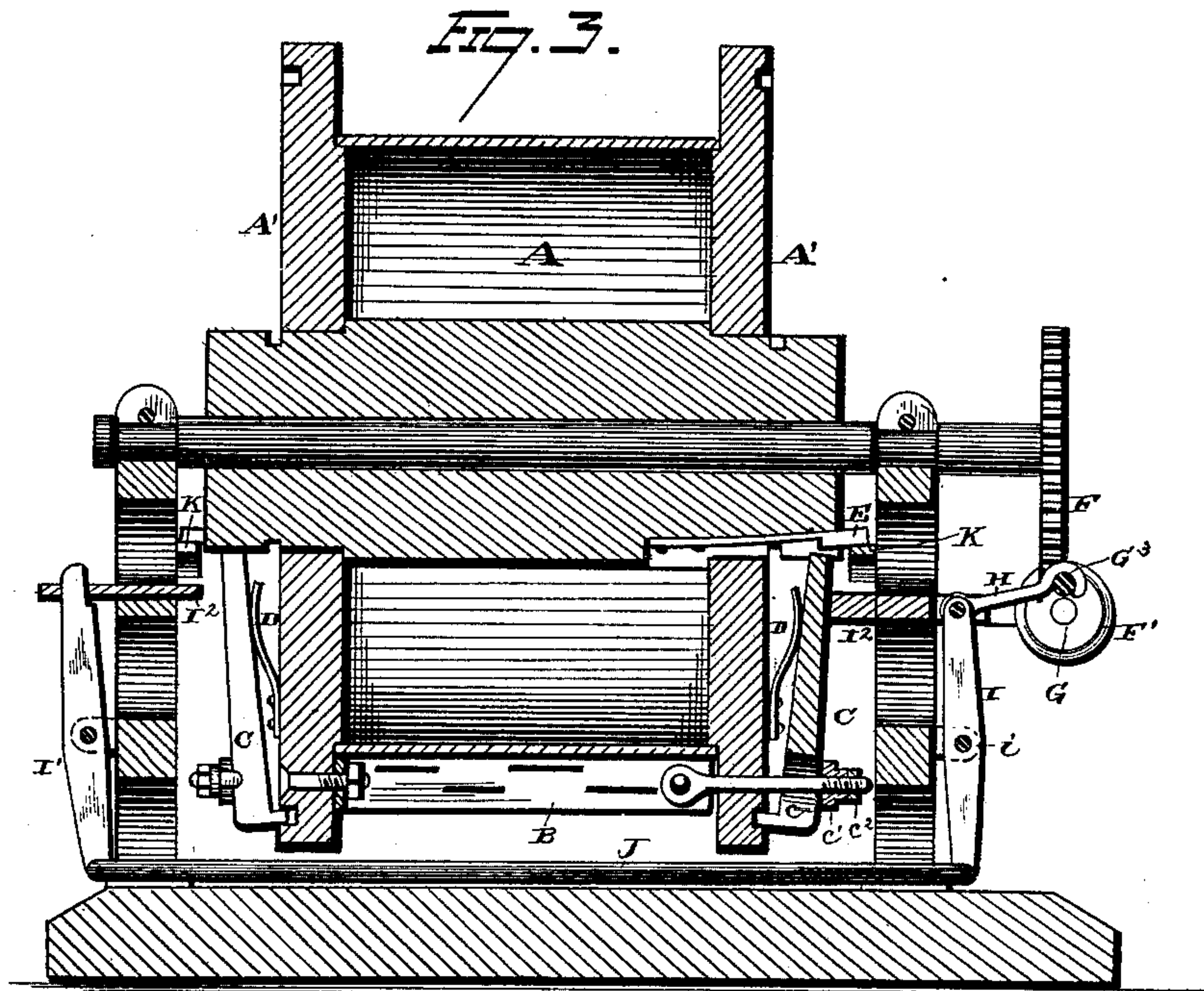
WITNESSES
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A. M. Bright.

INVENTOR
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UNITED STATES PATENT OFFICE.

FRANZ REINHOLD, OF DETROIT, MICHIGAN, ASSIGNOR TO HIMSELF, ALBERT KAPS, AND JOHN PETZ, OF SAME PLACE.

THERMAL MOTOR.

SPECIFICATION forming part of Letters Patent No. 231,449, dated August 24, 1880.

Application filed January 17, 1880.

To all whom it may concern:

Be it known that I, FRANZ REINHOLD, of Detroit, county of Wayne, State of Michigan, have invented a new and useful Improvement in Thermal Motors; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to a new motor; and it consists in the combinations of devices and appliances as hereinafter set forth and claimed.

In the drawings, Figure 1 is a front elevation of a machine embodying my invention, with the hot and cold air flues removed so as to illustrate the operative mechanism. Fig. 2 is an end view of the same, adjacent to that side from which the power is applied to operate other machinery. Fig. 3 is a longitudinal section containing the axle. Fig. 4 is a cross-section at right angles to the axle.

This invention is designed to derive a motive power from the expansion and contraction of metallic rods or straps as the same are alternately acted upon by heat and cold; and in embodying my invention I contemplate such a construction as shall, by the action of the heat and the expansion and contraction of the metal, cause the straps or rods of metal to be automatically brought alternately within the influence of the hot and cold media by a revolving motion about an axis.

A is a hollow cylindrical drum. A' are its heads. B represents straps, rods, or bars of metal, which are attached rigidly to one head and pass loosely through the other head, while B' represents similar straps, rods, or bars attached rigidly to the other head and passing freely through the first. The free end of each of the bars B passes through or loosely embraces a lever, C, just in advance of its fulcrum *c*, and is provided with a cross-head and nut, *c'* *c*², or equivalent.

A spring, D, is interposed between the long end of the lever and the cylinder-head. Adjacent to the end of the long arm of the lever is a spring-catch, E, which engages the end of the lever and holds it back when it has been

forced back by the contraction of the metal rod B.

On the axle is fixed a worm-gear wheel, F, which meshes with a worm, F', on the power-shaft G.

G' is a fly-wheel, and G² a pulley, from which the power may be communicated to and drive other machinery.

A crank, G³, is, by a pitman, H, connected with the upper end of the lever or walking-beam I, which latter, being pivoted at *i*, is at its other end, by a connecting-rod, J, united to the lower end of a similar lever or walking-beam, I'.

From the upper ends of the levers I and I' arms I² project inward toward the cylinder-heads, so as to receive the thrusts of the levers B and B' as they are respectively released from their catches and impelled outward by their respective springs.

Stationary cams K are provided, which, as the cylinder A revolves, serve to lift the spring-catches and release the levers.

Any suitable furnace and cold-air mechanism may be employed for alternately heating and cooling the rods or straps; and to this end M may be a furnace and M' its smoke-flue, while N may be a cold-air flue, within which flues the straps or rods may be caused to revolve in succession, as shown, becoming first heated and expanded in the hot flue, and then cooled and contracted in the cold flue.

The operation of the device will now be understood. We will suppose the rods to be cool and in their contracted state, in which condition all the levers I I' will, by contraction of the rods, have been brought back and engaged each with its own spring-catch. Now, when a fire is started in the furnace M the heat will expand all those bars or straps in the hot flue, and if the cylinder is now started to revolve by hand the first spring-catch that comes in contact with the cam K will be disengaged from its lever C, the lever will be forced outward by its spring, and the power of the spring will force the lever or walking-beam I' backward, and this, through the connecting-rod J, will actuate the lever I, pitman H, and driving-pulley. At the same time the worm-gear will revolve the cylinder far enough to cause

the next adjacent lever, B, to be disengaged by the cam K, and its spring will force the levers I I' back to their first position, and at the same time exert the force of the spring to further actuate the driving-pulley and also revolve the cylinder A. As these rods or straps come successively into the cold flue they are contracted, and exert their almost irresistible force in retracting the springs and again engaging the levers with their respective catches.

This operation being continuous, the machinery is kept in motion, the bars are automatically brought in and out from the heating medium, and, with a small consumption of fuel, powerful springs are, by contraction of the metal rods, rapidly retracted and released, so as to exert their force in impelling the machinery. In this way, with a small heat a very considerable power may be developed and applied.

The heating medium may be hot air or a hot liquid, and so the cooling medium may be either cold air or a cold liquid. The mechanism for causing the cylinder to revolve may also be automatic, as shown, or that power may be exerted by some external means.

The cylinder A may be made of light material and open, so as to cool quickly.

The bars or straps may, if necessary, be provided with openings through them, so that the draft may not be impeded, and so that the bars may be heated rapidly while in the flue, although removed some distance from the fire in the furnace.

What I claim is—

1. A thermal motor consisting of a series of metallic rods, bars, or straps so arranged with

respect to power-springs and alternate heating and cooling media, substantially as described, as by the expansion or contraction of the metal bars, rods, or straps to retract the springs, and mechanism for releasing the springs and applying their elasticity in the propulsion of machinery, substantially as set forth.

2. The combination, in a thermal motor, of a series of rods, bars, or straps arranged about an axle, heating and cooling media, and mechanism whereby the expansion and contraction of the metal cause the bars, straps, or rods to be brought automatically and successively in the heating and cooling media alternately, substantially as and for the purposes described.

3. The combination of metal rod or strap B with the lever, its spring and catch, so that by the contraction of the rod or strap the lever is drawn back and the spring retracted and held until relieved at the proper point to exert its force in propelling the drive-pulley, substantially as and for the purposes described.

4. The combination of the rod or strap B with its lever, spring, and catch, and in connection therewith a cam for releasing the catch and mechanism for receiving the thrust of the spring and applying it in the propulsion of the drive-pulley, substantially as and for the purposes described.

In testimony whereof I sign this specification in the presence of two witnesses.

FRANZ REINHOLD.

Witnesses:

S. E. THOMAS,

WILL. M. PORTER.