L. KESSLER.

CALORIC ENGINE.

APPLICATION FILED FEB. 8, 1911.

1,044,536.

Patented Nov. 19, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

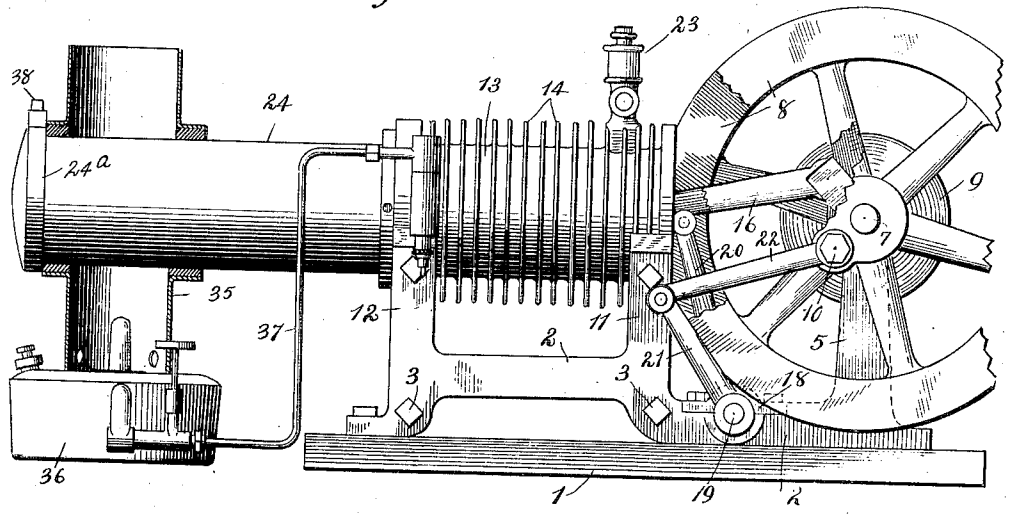
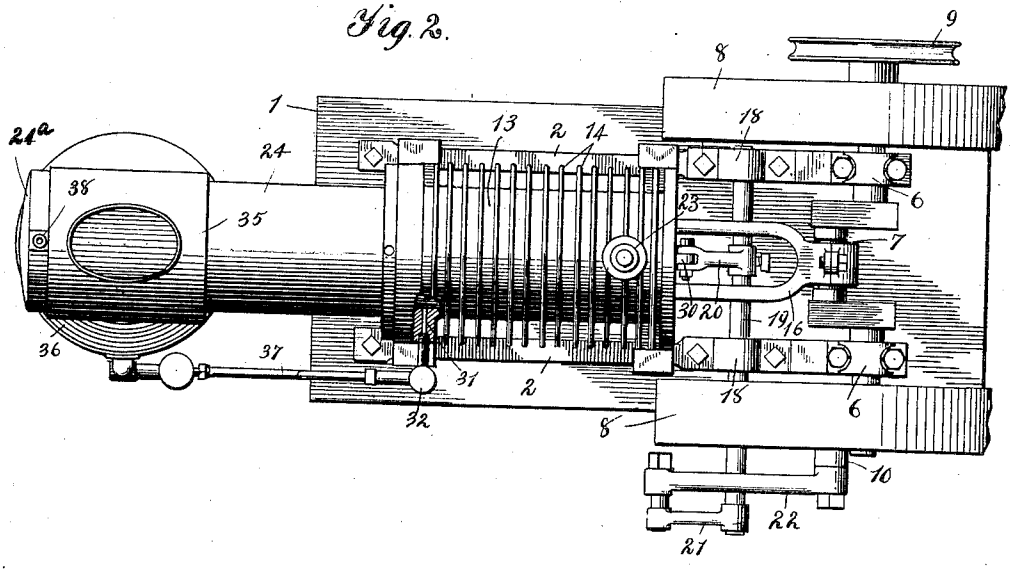



Fig. 2.

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2 SHEETS—SHEET 2.

*Fig. 3.*

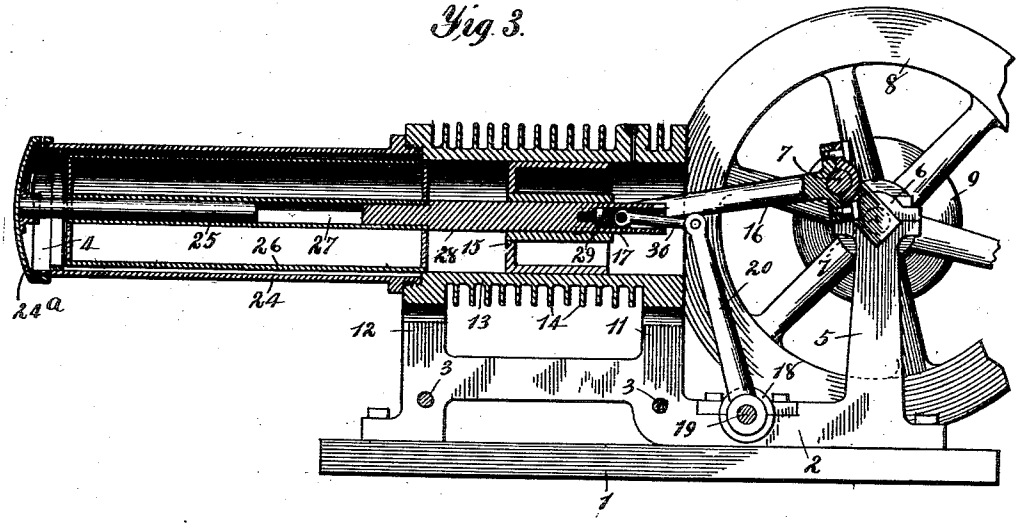



*Fig. 4.*

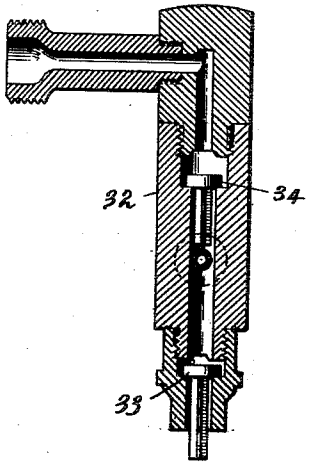
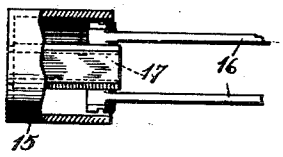



*Fig. 5.*

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# UNITED STATES PATENT OFFICE.

LOUIS KESSLER, OF CHICAGO, ILLINOIS.

## CALORIC ENGINE.

1,044,536. Specification of Letters Patent. Patented Nov. 19, 1912.

Application filed February 8, 1911. Serial No. 607,380.

*To all whom it may concern:*

Be it known that I, LOUIS KESSLER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Caloric Engines, of which the following is a specification.

My invention relates to improvements in thermo-pneumatic motors, and has for its objects the simplification of both the structure and operation of such a motor so that it will be efficient in operation, and may be economically manufactured. I attain these objects by the mechanism illustrated in the accompanying drawing, in which—

Figure 1 is a side elevation of my motor; Fig. 2 is a plan thereof; Fig. 3 is a vertical, central, longitudinal section; Fig. 4 is a central section of the valve casing enlarged, and Fig. 5 is a view showing manner of attaching the connecting rod.

Similar reference numerals refer to similar parts throughout the several views.

The motor is mounted on a convenient base, 1, of suitable size, longitudinally of which are bolted parallel brackets, 2, which are braced by suitable cross bars or bolts, 3, and have extending vertically from each end and approximately the center, risers 5, 11 and 12. The tops of the right hand or rear pair of risers, 5, are provided with suitable alining bearings, 6, for the ends of a crank shaft, 7. The crank of the crank shaft is disposed between the bearings, 6, and upon the ends of the shaft which extend beyond each bearing are mounted fly wheels, 8. A grooved pulley, 9, is mounted upon the shaft, 7, outside one of the fly wheels, and a crank bolt, 10, projects laterally from the hub of the opposite fly wheel for purposes to be described hereinafter. Mounted between the intermediate and front risers, 11 and 12, and supported thereby, is a cylinder, 13, having radiating cooling flanges 14, extending therefrom. A piston, 15, having a bore 17 extending longitudinally thereof, is mounted in said cylinder, 13, and is connected with the crank, 7, by a yoked or bifurcated connecting rod, 16, the two arms of which are pivoted to the rear or outer end of the piston upon each side of the center thereof. Alining bearings 18 are provided in the brackets, 2, between the risers, 5 and 11, in which is mounted a rocker shaft, 19. From the outer end of this rocker shaft, extends upwardly an arm, 21, the upper end of which is connected by a link 22, with the crank bolt, 10, of the left-hand fly wheel. A suitable oil cup, 23, is located upon the cylinder near the inner end thereof for lubricating the piston 15 through a suitable oil-passage in the walls of the cylinder.

To the head or rear end of the cylinder, 13, is secured a tube, 24, the interior of which is practically a continuation of the inner walls of the cylinder 13, having, however, a bore slightly greater in cross diameter than the corresponding bore of the cylinder 13. The outer end of the tube, 24, is closed by a suitable cap plate, $24^a$, from which, along the axis of the tube, extends a rod 25, one end of which is fixed in the cap, $24^a$. Mounted within the remote end of the tube, 24, is an annular collar, 4, the bore of which is of the same diameter as the bore of the cylinder 13. Mounted to slide upon the rod, 25, is a closed hollow cylindrical plunger, 26, which is of slightly smaller cross diameter than the bore of the tube, 24, and has a central chamber, 27, extending from its outer end to a point near its inner end, for the reception of the rod, 25. The cross diameter of the plunger, 26, is such as to leave but a small clearance between it and the inner walls of the cylinder, 13, and collar, 4. From the inner or rear end of the cylindrical plunger, 26, a rod, 28, extends through the bore in the piston, 15, and into the rear end of said rod, is screwed a nut, 29, the outer end of which has pivotally connected therewith one end of a link, 30, the other end of which is pivoted to the upper end of the arm, 20, which is fixed upon the rocker shaft, 19, which latter connects, as before described, with the crank shaft, 7. through the arm, 21, link, 22, and left hand fly wheel, 8. The arm, 20, and link, 30, move between the bifurcated or yoked portion of the connecting rod, 16. A passage, 31, leads from the forward portion of the cylinder, 13, through the cylinder wall, and to the outer end of this passage is secured a tubular valve casing, 32, in the lower end of which is an inlet puppet-valve, 33, and in the upper portion of which is an outlet valve, 34, to which is connected the lamp to be hereafter described. About the remote or outer end of the tube, 24, is provided a casing forming a heating chamber, 35, and under the lower end of this casing is fixed a suitable lamp or furnace, 36. A tube, 37,

running from the casing, 32, above the outlet valve, 34, to the furnace, 36, utilizes such exhaust as there is to force the draft of the furnace and also serves to relieve such pressure as develops when the piston and plunger approach each other. As a modification, I may place an inlet valve 38 upon the cap 24ª which communicates with the tube beyond the collar, 4, in which case I do not supply any inlet valve in the cylinder, 13.

The connection of the piston, 15, with the crank shaft, 7, and the plunger, 26, with the arms, 20 and 21, link, 22, and left hand fly wheel is such that the plunger, 26, precedes the piston, 15, by a quarter of a turn of the shaft, or has a lead of half of the distance through which said plunger reciprocates, and the plunger is so proportioned as to length that the paths of reciprocation of the piston and plunger coincide through half their extent and the plunger comes closely adjacent to the piston at the end of its inward stroke.

It will now be seen that when the piston 15 has proceeded half of its outward stroke, the plunger, 26, has reached the outer or remote end of the tube 24, and has entered the collar, 4. As the piston completes its outward movement the plunger travels backwardly one half its stroke, and in doing so, the air passes from the piston and the rear end of the tube, between the cylinder and the inner wall of the tube, where is is brought in contact in a thin layer with the heated walls of the tube surrounded by the furnace. By the time the piston, 15, is in position to return, sufficient air has been heated and expanded in the tube 24 to develop a pressure which operates upon the piston to drive it upon its return or expansion stroke.

When the expansion stroke of the piston is completed, the plunger has completed its journey toward the cylinder and has already moved half of its journey toward the outer or hot end of the tube, which has caused the heated air to be forced in a thin layer through the constructed space between it and the outer walls of the tube, into the cylinder. This causes a contraction of the air which reduces its pressure below the pressure of the atmosphere thereby producing a vacuum between the inner ends of piston and plunger and permitting the atmospheric pressure to operate with full force upon the outer end of the piston and to force it toward the outer end of the cylinder.

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

1. A thermo pneumatic motor comprising a cylinder having cooling flanges extending therefrom, a tube of slightly larger bore than the cylinder extending from one end of the latter, said tube being constructed with thin walls so as to be readily heated, a piston mounted in said cylinder, a plunger mounted in said tube, and having a cross-diameter slightly less than the bore of the tube, means for synchronizing said piston and said plunger whereby said plunger comes closely adjacent to said piston during part of their stroke and follows same, during part of the expansion stroke of said piston.

2. A thermo pneumatic motor comprising a cylinder, a tube connected with the outer end of said cylinder, a piston mounted in one end of said cylinder, a plunger mounted in the other end of the cylinder and in said tube, a crank shaft, means for coupling said piston and said plunger to said shaft so as to cause the paths of reciprocation of said plunger and piston to partially coincide, for part of their strokes, and said plunger to come closely adjacent to and follow said piston through said coinciding portions of their paths during the first part of the expansion stroke.

3. A thermo pneumatic motor comprising a cylinder, a tube of slightly larger bore than the cylinder and connected to and alining with said cylinder, a piston mounted in said cylinder, said piston having a central passage therein, a plunger mounted in front of said piston, a rod extending from said plunger slidably through said piston passage, a crank shaft, a yoked connecting rod between said piston and said shaft, a rocker shaft, arms carried thereby, links connecting said arms respectively with said crank shaft and said plunger rod, said rods and said plunger being so proportioned as to cause the path of reciprocation of said plunger to extend into said cylinder, and said plunger to come closely adjacent to and follow said piston through the first half of the expansion stroke.

4. A thermo pneumatic motor comprising a cylinder, an air tube of slightly larger bore connected thereto and alining therewith, a portion of said tube being constricted near its remote end, a piston mounted in said cylinder, a plunger mounted in said tube, a cam shaft, means for connecting said piston and plunger to said shaft so as to synchronize their action and cause the path of reciprocation of said plunger to extend into said cylinder at one end and into said constricted area at the other, and means for heating the remote end of said tube.

5. In a thermo pneumatic motor, the combination of a piston, a plunger, a crank shaft, a cylinder, a tube connected thereto and alining therewith of slightly larger bore than said plunger, guide means mounted therein for guiding said plunger, an annular collar near the remote end of said tube for reducing the bore thereof, and means for connecting said piston and plunger with

said crank shaft whereby the path of reciprocation extends into said cylinder at one end and into the area of reduced bore at the other.

6. In a thermo-pneumatic motor, comprising a cylinder, a tube connected and communicating with said cylinder and having a bore slightly greater than the bore of the cylinder, a piston mounted in said cylinder, a plunger mounted to reciprocate in said cylinder and tube, the diameter of said plunger corresponding to the bore of said cylinder, means for driving said piston and plunger whereby they will approach each other, follow each other, and move in opposite directions, during different periods in their respective strokes, a valve communicating with said cylinder, a lamp adapted to supply heat to the exterior of said tube and piping leading from said valve to said lamp for the purpose set forth.

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

LOUIS KESSLER.

Witnesses:
H. De Los Higman,
Chas. F. Bassett.