

I. W. AMMON.
CALORIC ENGINE HEATER.
APPLICATION FILED MAR. 28, 1904.

3 SHEETS—SHEET 1.

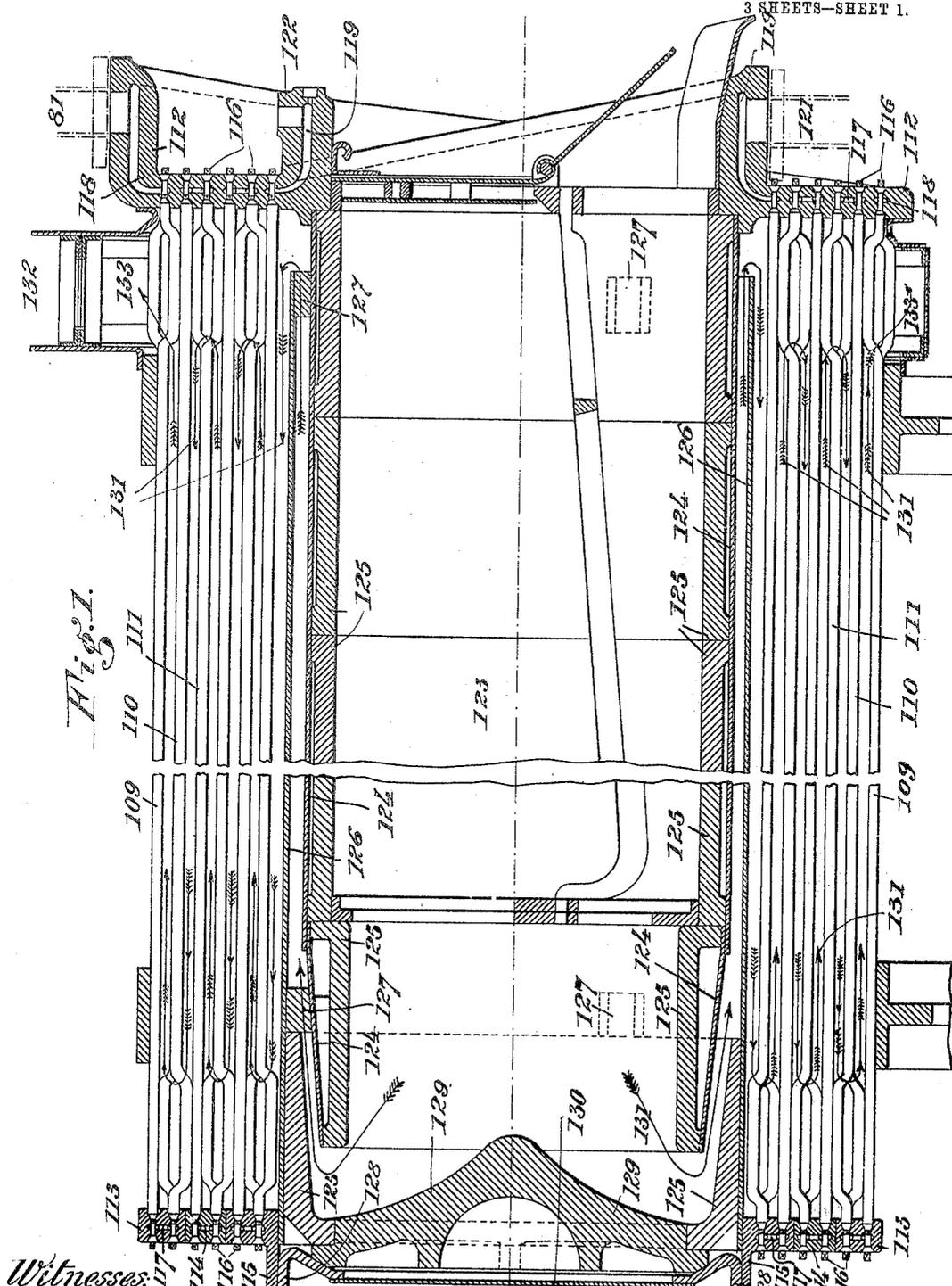


Fig. 1.

Witnesses:
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Frank [unclear]

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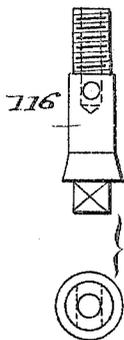
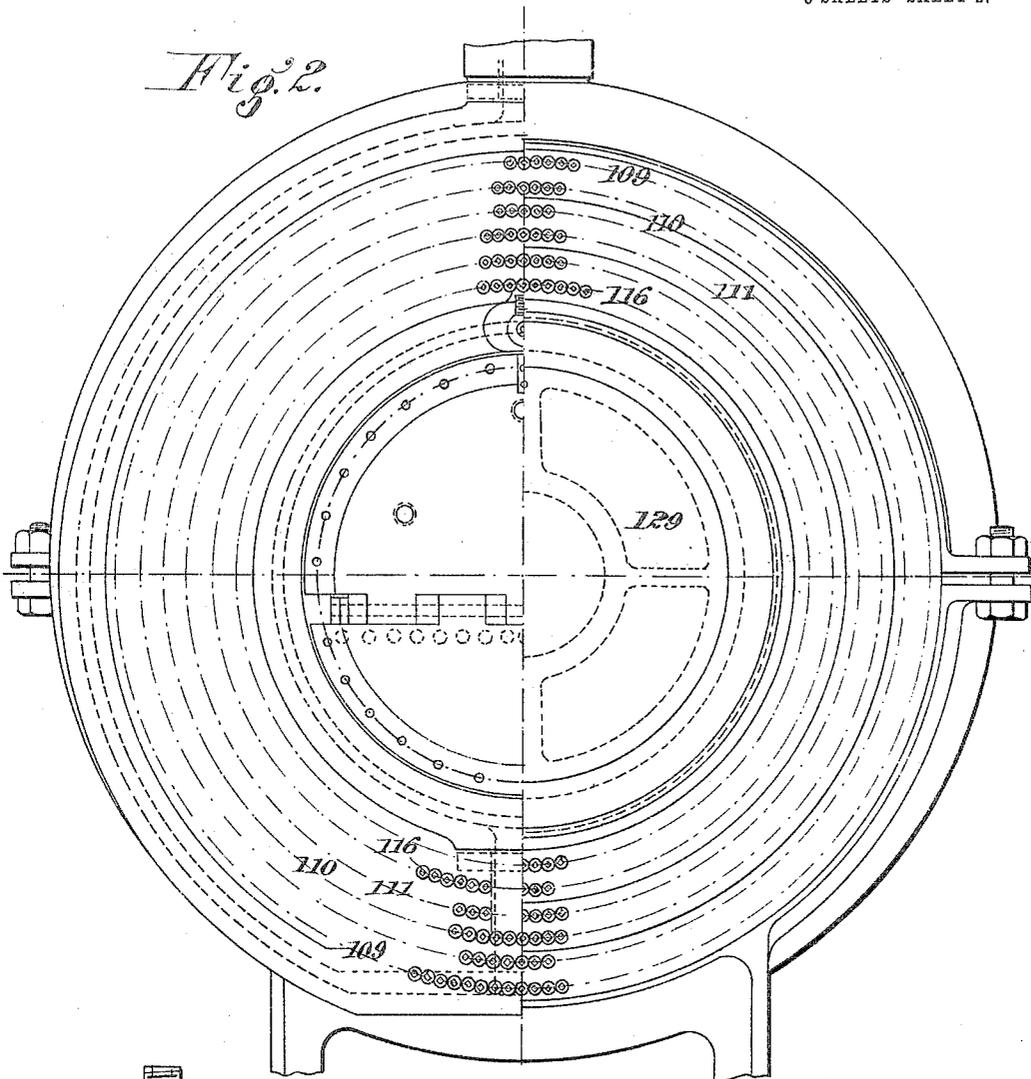


Fig. 5.

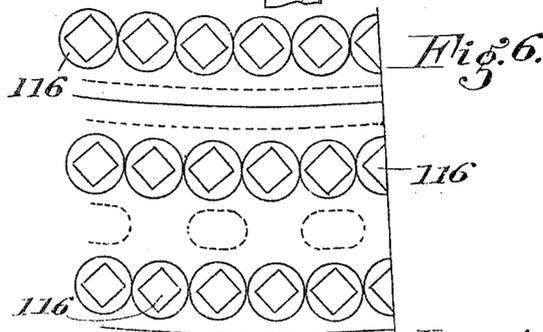


Fig. 6.

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Fig. 3.

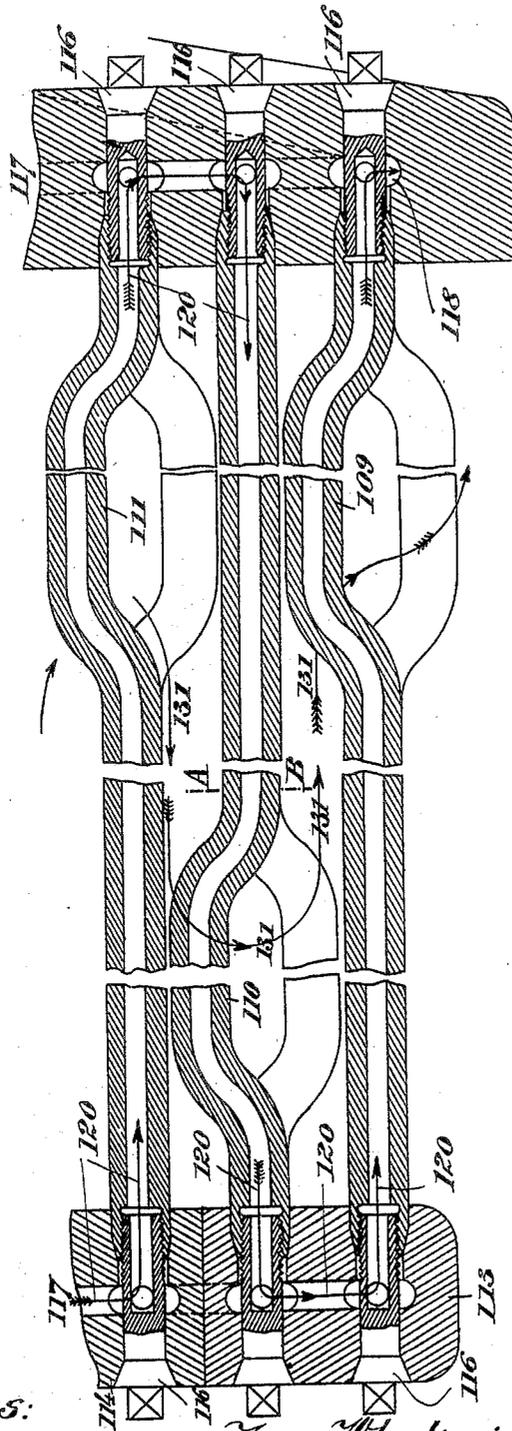
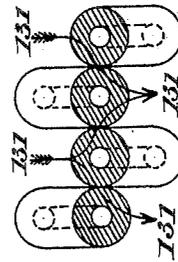


Fig. 4.



Witnesses:
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UNITED STATES PATENT OFFICE.

IVAN WLADIMIROVITCH AMMON, OF ST. PETERSBURG, RUSSIA.

CALORIC-ENGINE HEATER.

No. 802,440.

Specification of Letters Patent.

Patented Oct. 24, 1905.

Original application filed September 24, 1903, Serial No. 174,411. Divided and this application filed March 23, 1904. Serial No. 200,474.

To all whom it may concern:

Be it known that I, IVAN WLADIMIROVITCH AMMON, a subject of the Russian Emperor, and a resident of St. Petersburg, Russia, have invented a certain new and useful Caloric-Engine Heater, (this application being a division of my prior application filed September 24, 1903, Serial No. 174,411,) of which the following is a specification.

This invention relates to a caloric-engine heater to be used with the engine claimed in my prior application, Serial No. 174,411, and its construction is based upon the following: The air passes through pipes having rather a small bore, and the products of combustion, not the flame, come in contact with the outside of these pipes.

In the annexed drawings, Figure 1 shows the longitudinal section of the apparatus. Fig. 2 shows right and left hand end views thereof; Fig. 3, the longitudinal section of the tubes upon a large scale, and Fig. 4 section through four tubes of a same row and following A B of Fig. 2. Figs. 5 and 6 show details.

This apparatus comprises a row of iron tubes placed close together in a circle to form a cylinder 109. Inside this cylinder is placed a second of the same construction, but having a smaller diameter. A certain space must be left between these two cylinders. Inside the second cylinder is placed a third, 111, and so on. The ends of all these tubes are conical and entering conical openings in the cast-steel boxes 112 113 114 115, Figs. 1 and 3, are fixed therein by a union or ferrule 116, Fig. 5. Two holes are made in each ferrule, one in the axial direction, but not right through from end to end. The other passes through the ferrule at right angles to the former. These two holes unite the inside of the tubes to the ring-shaped channels 117 118 119, Figs. 1 and 3, permitting the air to pass from one row of tubes to the other. These channels must be arranged so that air compressed by the compressors enters through the pipe 81 into the channel 118, passes successively through all the rows of tubes, as shown by the arrows 120, then enters the channel 119, and from thence through the pipes 121 to enter finally into the small or high-pressure cylinder of the motor. A boss 122 is provided upon the channel 119 to receive a manometer and a safety-valve. Inside the whole of this set of tubes is placed the fire-box 123, formed of an iron cylinder 124, furnished interiorly with fire-bricks 125. Round this cylinder and separated by a small

space from the same is placed a second iron cylinder 126, protecting the tubes from direct contact with the fire. In the space separating these two cylinders are placed and fixed the iron blocks 127, upon which bears the inner surface of the cylinder 126. The ends of these two cylinders bear upon the boxes 115 112. The iron ring 128 maintains the reflector 129, made of fire-clay, and its center is closed by an iron plate 130. If this ring be taken off, the whole fire-box can be withdrawn for cleaning or to change the bricks. In every other sense the fire-box is of an ordinary construction and, if required, can be prepared for any kind of heating. The products of combustion leave the box in the direction shown by the arrows 131 and having passed through space comprised between the cylinders 124 to 126 commence to lick the tubes and pass from row to row between the ends of the tubes bent for this purpose, Figs. 1, 3, 4. After passing through all the rows these products escape by the chimney 132 after passing through the smoke-box 133, as shown by the arrows 131. As the tubes of the various rows expand unequally, owing to the heating, one of the boxes holding them is made of several rings 113 114 115, placed one inside the other. When the tubes expand, the rings move, and thus avoid the irregular tensions of the tubes. In order that the contact of the tubes between themselves be more intimate when put in place, they are ground down with red lead, and besides this the inner row is covered upon its inside with fire-clay. The heating apparatus can be placed vertically or horizontally, and for heating different combustibles may be used, such as coal, petroleum, combustion products from blast-furnaces, &c.

When it is required to start the motor, it is necessary to fill with compressed air by means of the hand air-pump the pipe connecting the compressors with the heating apparatus, then light the furnace, and when it is sufficiently heated open the inlet-cock into the heater. The motor then starts working. The heating in the furnace should be as regular as possible. That is why it is preferable not to admit a forced draft therein. When the motor stops, the first thing to do is to open the furnace-doors, thereby reducing the inside temperature. Then the inlet-cock into the heater is closed. Then by opening the cocks fitted to the small cylinders of each compressor all the air remaining above the compressor-pistons is allowed to escape.

Having now fully described my said invention, what I claim, and desire to secure by Letters Patent, is—

1. An air-heater including a furnace, concentrically - arranged communicating pipes forming separated rows surrounding said furnace and longitudinally arranged with respect thereto, the pipes of each row being in lateral contact and forming a series of cylindric compartments, the innermost compartment communicating with said furnace, the outermost compartment having an outlet, the pipes of each row being bent out of longitudinal alinement at alternate ends forming passages connecting the compartments in series and providing a continuous path throughout the length of each compartment for the products of combustion.

2. An air-heater including a furnace, concentrically-arranged pipes forming separated rows surrounding said furnace, the pipes of each row being connected with each other and forming a series of cylindric compartments, the innermost compartment communicating with said furnace, the outermost compartment having the pipes of one row being bent out of longitudinal alinement at one end and those of an adjoining row at the opposite end, and the bends of adjoining pipes in each row being bent in opposite directions, thus forming passages connecting the compartments in series and providing a continuous path throughout the length of each compartment for the products of combustion.

3. An air-heater including a furnace, pipes arranged in rows surrounding said furnace, said rows being spaced apart, the pipes of each row being connected and forming a series of compartments, the innermost compartment communicating with the furnace, the outermost compartment having the pipes of one row being bent out of longitudinal alinement at one end and those of an adjoining row at the opposite end, and the bends of adjoining pipes in each row being bent in opposite directions, thus forming passages connecting the compartments in series and providing a continuous path throughout the length of each compartment for the products of combustion.

4. An air-heater including a furnace, separated rows of pipes adjacent said furnace, the pipes of each row being laterally connected and forming a series of compartments, the compartment at one end of the series communicating with the furnace, the compartment at the other end of the series having the pipes of one row being bent out of longitudinal alinement at one end and those of an adjoining row at the opposite end, and the bends of adjoining pipes in each row being bent in opposite directions, thus forming passages connecting the compartments in series and providing a continuous path throughout the length of each compartment for the products of combustion.

5. An air-heater including a furnace, concentrically-separated rows of pipes surrounding said furnace and longitudinally arranged with respect thereto, the pipes of each row being connected and forming a series of cylindric compartments, a stationary wall at one end of the furnace in which the adjacent ends of each row of pipes are mounted, ports in said wall connecting the pipe rows in series, a wall at the opposite end of said furnace having separable sections each section adapted to receive the ends of two adjacent rows of pipes and having ports connecting said pipes of said rows, said separable sections permitting variable expansion of said pipes.

6. An air-heater including a furnace, separated rows of pipes surrounding said furnace, the pipes of each row being connected and forming a series of compartments, a stationary wall in which the adjacent ends of each row of pipes are mounted, ports in said wall connecting the pipe rows in series, a wall adapted to receive the opposite ends of said pipes and having separable sections, ports in said sections connecting said pipes, said separable sections permitting variable expansion of said pipes.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

IVAN WLADIMIROVITCH AMMON.

Witnesses:

N. D. FORNIN,
JOHN MUELLER.