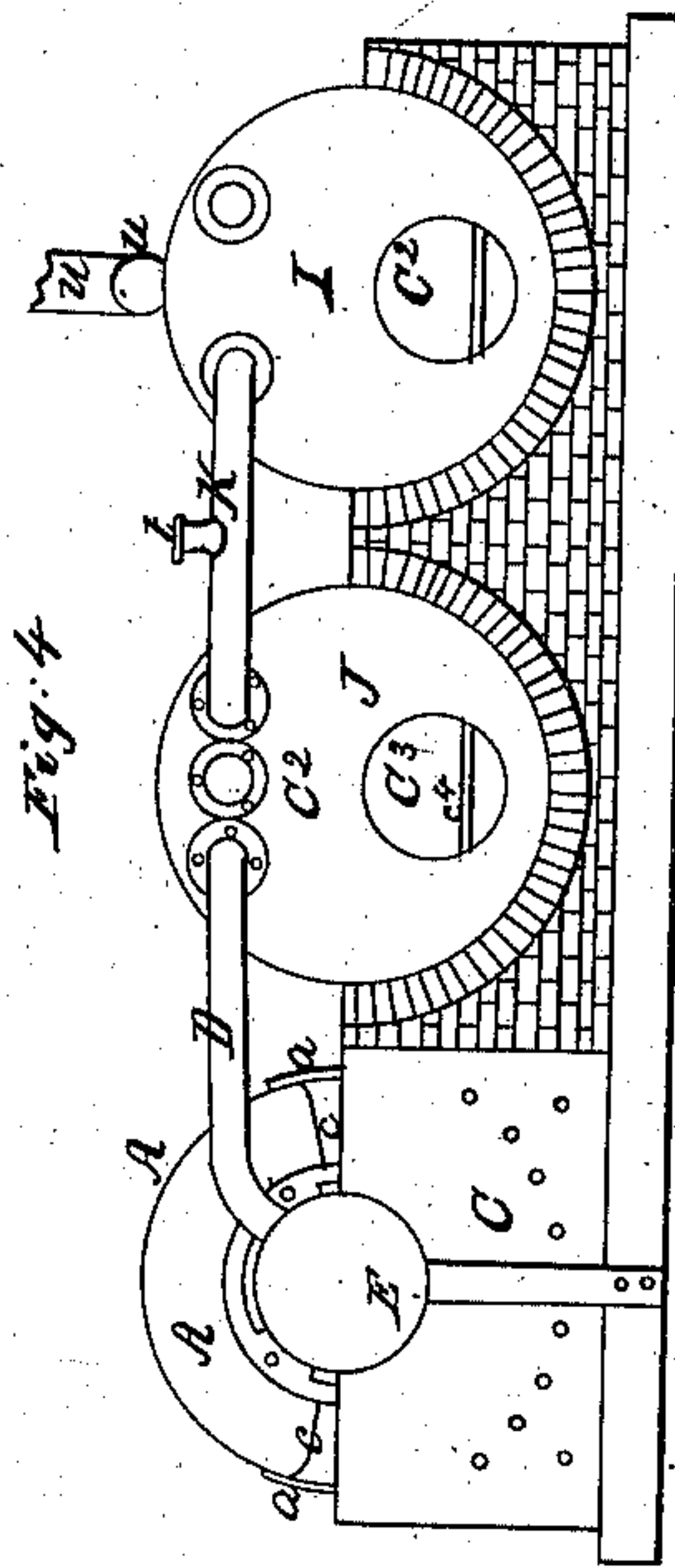
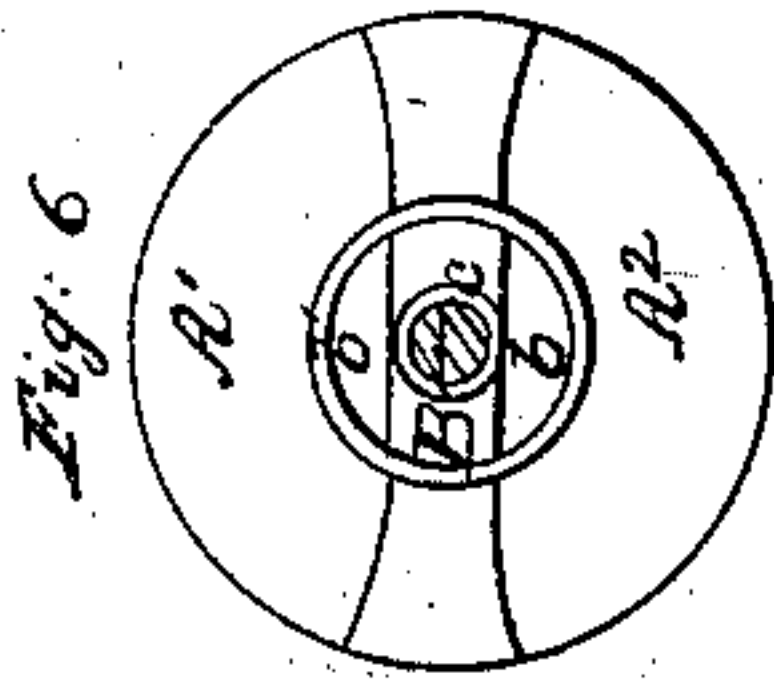
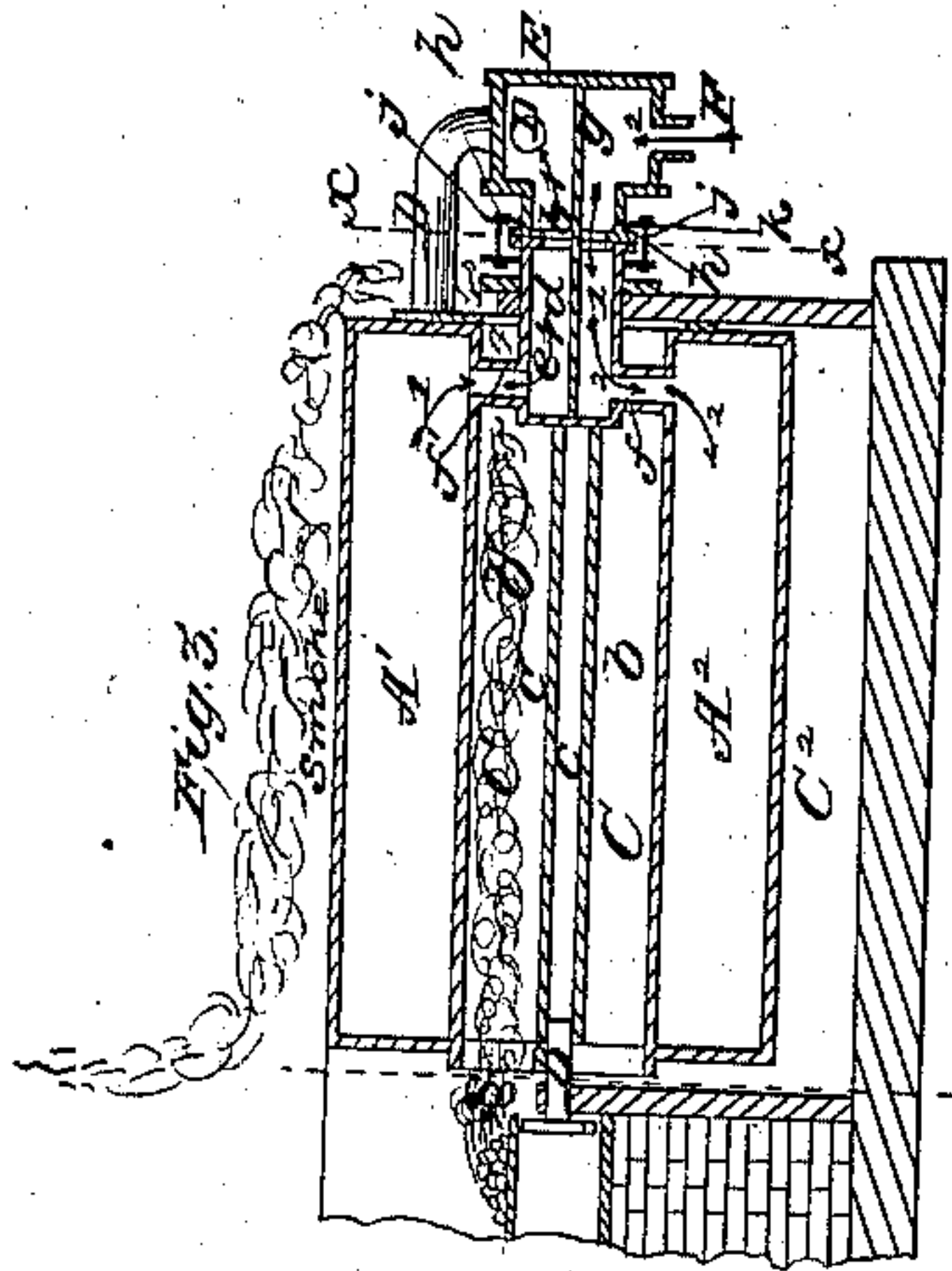
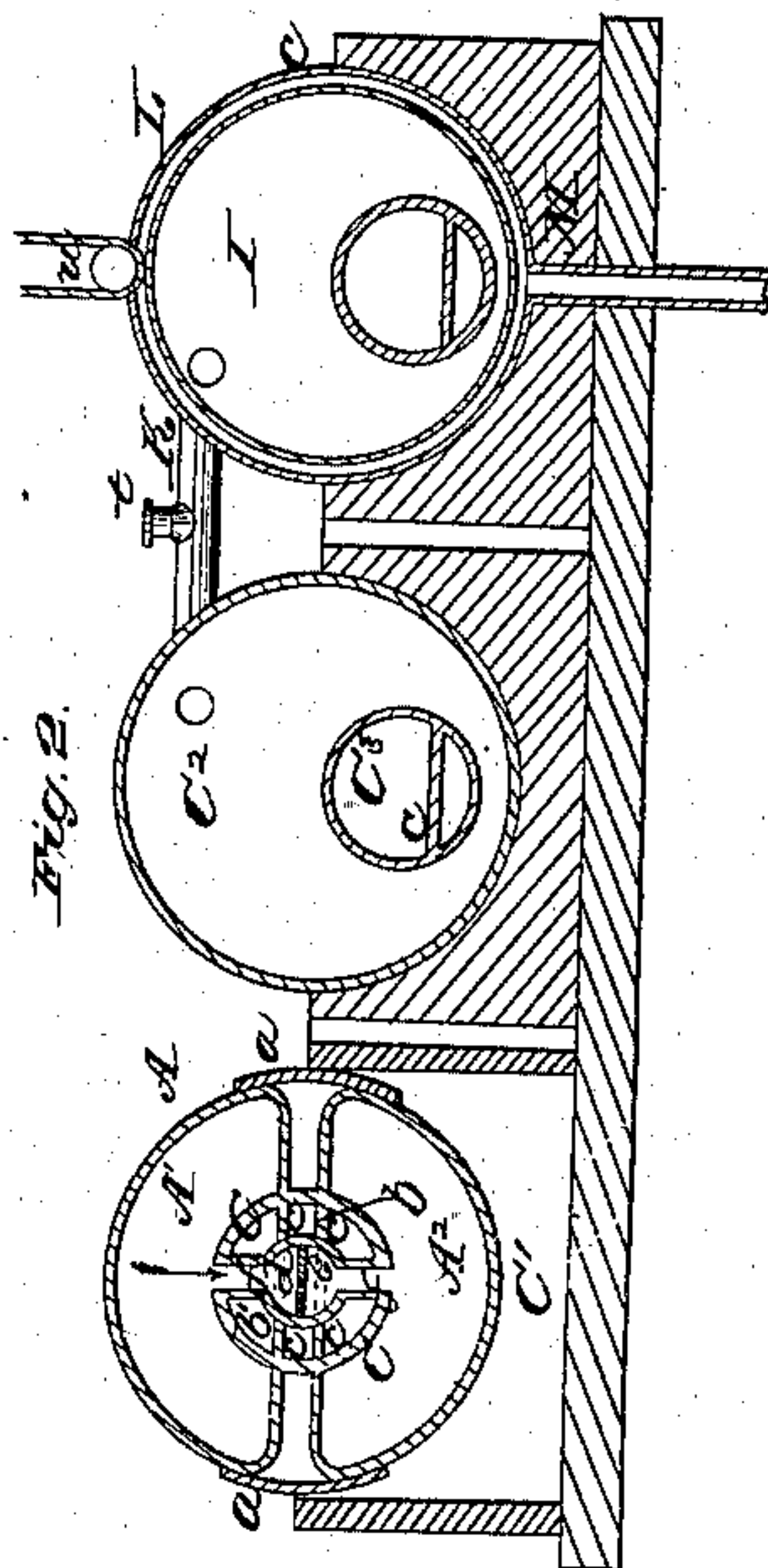
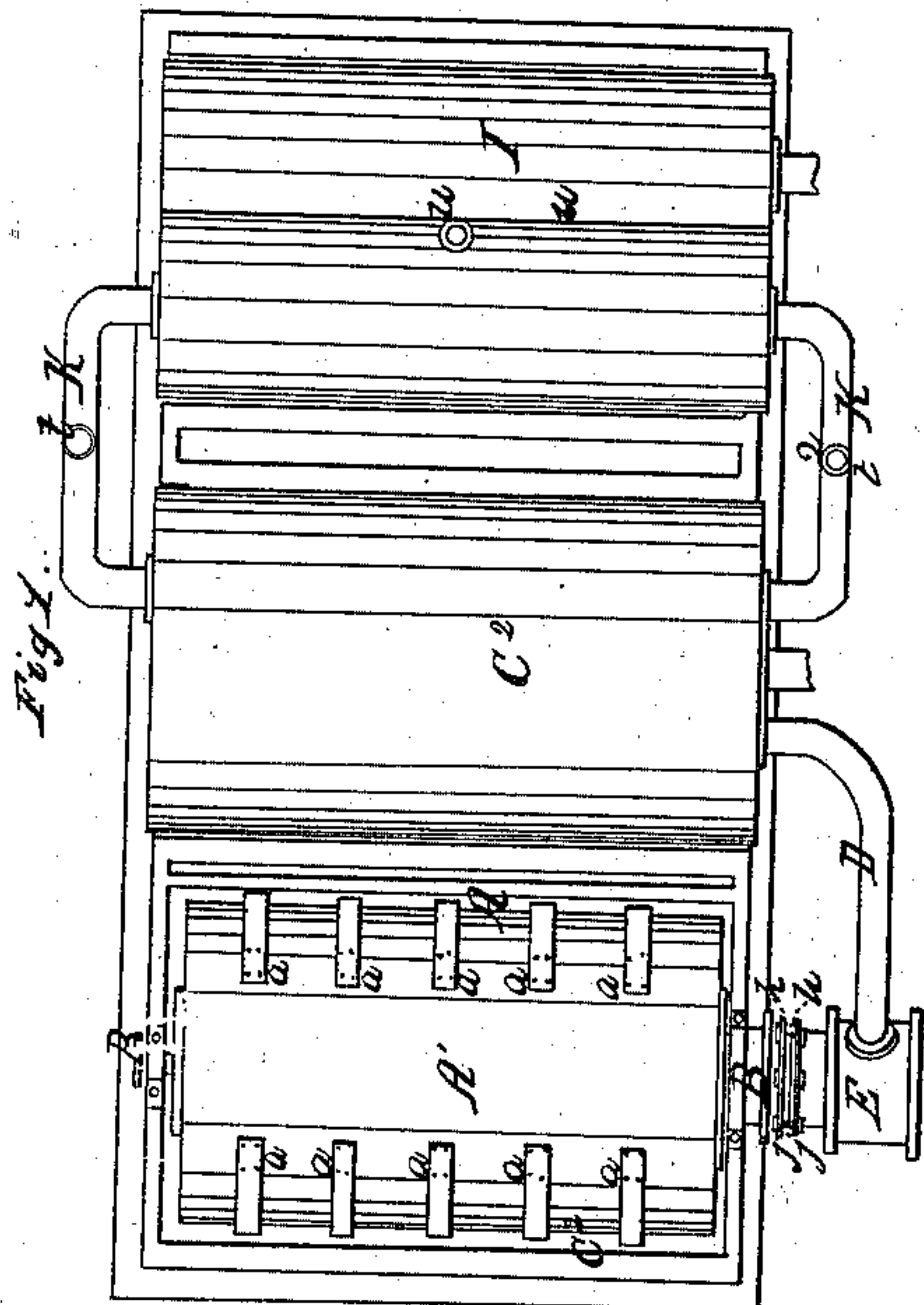


*Hidden & Peeres,*

*Air Engine,*

*No 21,133,*

*Patented Aug. 10, 1858.*





# UNITED STATES PATENT OFFICE.

W. HIDDEN AND J. REEVES, OF NEW YORK, N. Y.

## APPARATUS FOR HEATING AND COOLING AIR TO BE USED AS A MOTIVE POWER.

Specification of Letters Patent No. 21,133, dated August 10, 1858.

*To all whom it may concern:*

Be it known that we, WARREN HIDDEN and JOHN REEVES, of the city, county, and State of New York, have invented a new and useful Improvement in Apparatuses for Generating Hot Air for Use as a Motive Power; and we do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1, shows a plan of our improvements. Fig. 2, a vertical transverse section of the same. Fig. 3, a longitudinal section of the same. Fig. 4, an end view. Fig. 5, a transverse section in the line  $x, x$ , of Fig. 3. Fig. 6, is a transverse section in the line  $y, y$ , of Fig. 3.

Similar letters of reference in each of the several figures indicate corresponding parts.

The nature of our invention consists in heating air in one section of a rotating or reciprocating cylinder, and at the same time condensing the exhausted air, from the engine, in another section of the same cylinder, and at intervals changing the condensing section into a heater, and the heating section into a condenser, by revolving or reciprocating the cylinder so as to alternately have the upper section occupy the place of the lower section in a tank of water, and the lower section to occupy the place of the upper one in proper relation to a furnace flue. With this arrangement the heating and condensing processes are carried on at the same time continuously, within a very small compass; the air being heated in the upper chamber and continuously supplied directly therefrom to the engine, and after it has performed its functions returning back to the condensing or lower chamber and condensing. And owing to the cylinder revolving, or reciprocating and reversing the location of the chambers, the lower chamber becoming the upper chamber, and the upper chamber the lower, the condensed air is again heated and supplied to the auxiliary heating receiver, or to the engine direct, to perform its functions and again returns to the condensing chamber to be condensed, etc. Thus the operation goes on continuously, fresh supplies of air being admitted at proper intervals by suitable valves, etc., as will be presently more fully set forth.

To enable others skilled in the art to

make and use our invention, we will proceed to describe its construction and operation.

A, in the accompanying drawing represents a rotating or reciprocating heater, and condenser of air; being formed of two hollow segmental chambers  $A', A^2$ , of a cylinder. These segments are placed above one another and held separate by means of metal straps  $a, a$ . The approximating sides of these segmental chambers are made concave or semi-circular from end to end, so that a circular space C, shall exist between them. This space is open at both ends and divided into two compartments or flues  $b, b'$ , by two horizontal partitions  $c, c$ , which extend from end to end of the chambers  $A', A^2$ . By thus dividing the space and having it open at each end, two fire flues are provided which can be alternately used by being brought opposite a stationary furnace flue  $s$ , as presently described; and by effecting this division by means of two partitions a current of cold air is constantly kept circulating between the flues, and consequently the fire flue  $b$ , is not materially affected by the heat from the fire flue  $b'$ , when the chamber  $A^2$ , is serving as a condenser, and  $A'$ , as a heater of hot air, nor is the flue  $b'$ , affected by the heat from  $b$ , when the chamber  $A'$ , is serving as a condenser and  $A^2$ , as a heater. Thus separating the flues is important in order that the condensing of the air may be effected immediately below the heating chamber as shown.

The heating and condensing cylinder thus constructed is hung within a hollow tank  $C'$ , filled with water, on short journals B,  $B'$ , so as to be capable of revolving and to be always partly immersed in water, as shown in Fig. 3. The journal B, is solid, but  $B'$ , is hollow and peculiar in construction, being divided by a central partition  $d$ , so as to form two passages  $e, e'$ , one of which  $e$ , communicates with the chamber  $A'$ , by a branch tube  $f$ , and the other  $e'$ , with the chamber  $A^2$ , by a branch tube  $f'$ , as shown. The passage  $f'$ , serves to pass the heated air from the chamber  $A'$ , to the engine, or an intermediate receiver or auxiliary heater  $C^2$ , by means of a pipe D, leading from a stationary hollow hub E, which is divided centrally by a partition  $g$ , similarly to the hollow journal so that its passages shall correspond with the passages of the same. And the passage  $f'$ , serves to introduce the exhausted air into the condenser, said air en-



tering the passage  $e'$ , and branch of the hollow journal, by means of a tube F, connecting with the stationary hollow hub.

The hub E, is made stationary, and the hollow journal capable of revolving so that the position of said chamber  $A'$ , may be changed thereby, alternately, from a heater to a condenser, and the chamber  $A^2$ , alternately, from a condenser to a heater. The inner end of the hollow hub and also the outer end of the journal, is furnished with a ground cap plate  $h$ , in which passages  $i, i$ , are formed corresponding with those of the hub and journal, as shown in the drawings. And the two ground ends are brought and held snugly together, by coupling ring plates  $j, j$ , which encircle the necks of the journal and hub loosely, occupying a place behind the flanges  $k, k$ , of the same. The joint formed between the hub and journal should be sufficiently tight to prevent the escape of hot air, but not interfere with the free rotation, or reciprocation of the heater and condenser, independently of the hub.

The receiver or auxiliary heater  $C^2$ , is stationary and is of cylindrical form with a flue  $C^3$  and a grate  $C^4$  from end to end so that a fire may be built in it and the fire or flame may circulate through it and thus heat the air to a greater extent, than it is heated by the heater A. The smoke from the flues  $b, b'$ , passes from the receiving end of the heater to the discharge end and escapes into a casing or jacket not shown in the drawing and then passes off through a smoke stack into the open atmosphere. The drawing shows the course the smoke takes through the jacket before escaping.

With the foregoing arrangement, the operation is as follows: The chamber  $A^2$ , being immersed in water, and the chamber  $A'$ , filled with air, and the fire started, and its flame circulating through flue  $b'$ , the air in the upper chamber is heated and passed off into the auxiliary heating receiver  $C^2$ , or directly to the engine cylinder as indicated by arrows 1; having performed its functions,

it exhausts and returns and enters the chamber  $A'$ , which by certain mechanism has been turned down and  $A^2$ , turned up, and the flue  $b$ , brought in line with the furnace flue S. The exhaust air in  $A'$ , condenses forming a vacuum that acts on the piston of the engine cylinder with the same effect as is obtained by the vacuum in a steam condenser, to make the vacuum more perfect the exhaust pipe may pass through a chest of cold water which will condense the air in a great measure before it enters the rotary cylinder A. The condensed air with an additional supply of fresh air which is to be admitted by suitable valves as may be found necessary at every revolution or vibration of the cylinder is heated and passed into the cylinder and thus the operation proceeds continuously. The length of the intervening time between each rotation or vibration of the cylinder A, is to be governed by the vacuum in the condensing chamber, and can only be determined from practice.

What we claim as our invention and desire to secure by Letters Patent, is—

Heating air in one section of a rotating or reciprocating cylinder, and at the same time condensing the exhausted air, from the engine, in another section of the same cylinder, and at intervals changing the condensing section into a heater, and the heating section into a condenser, by revolving or reciprocating the cylinder so as to alternately have the upper section occupy the place of the lower section in a tank of water, and the lower section to occupy the place of the upper one in proper relation to a furnace flue, substantially as and for the purposes set forth.

WARREN HIDDEN.

JOHN REEVES.

Witnesses as to Warren Hidden:

EDW. P. PETERS,

JOSEPH ESAL.

Witnesses as to John Reeves:

G. YORKE ATLEE,

H. H. YOUNG.