

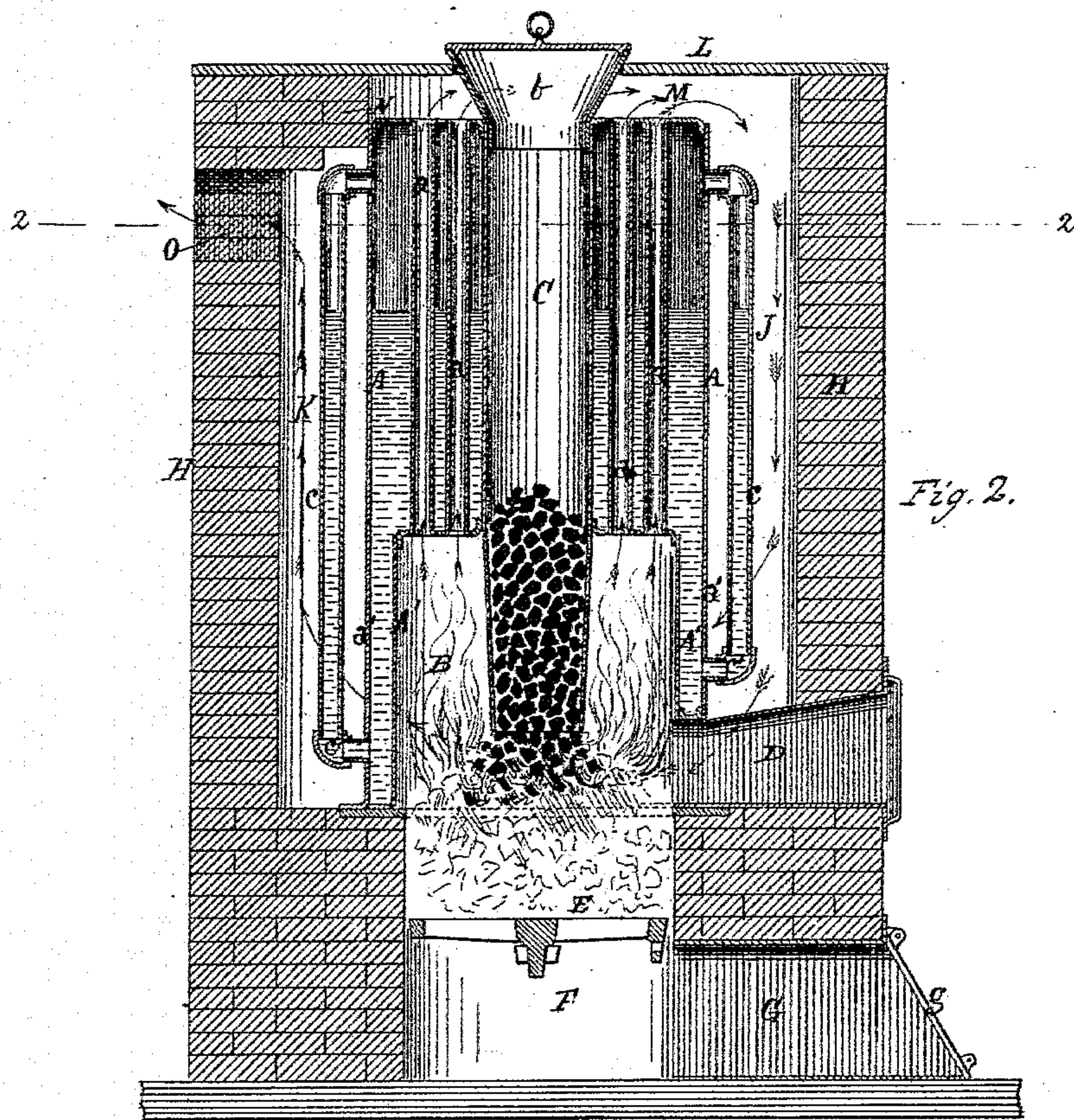
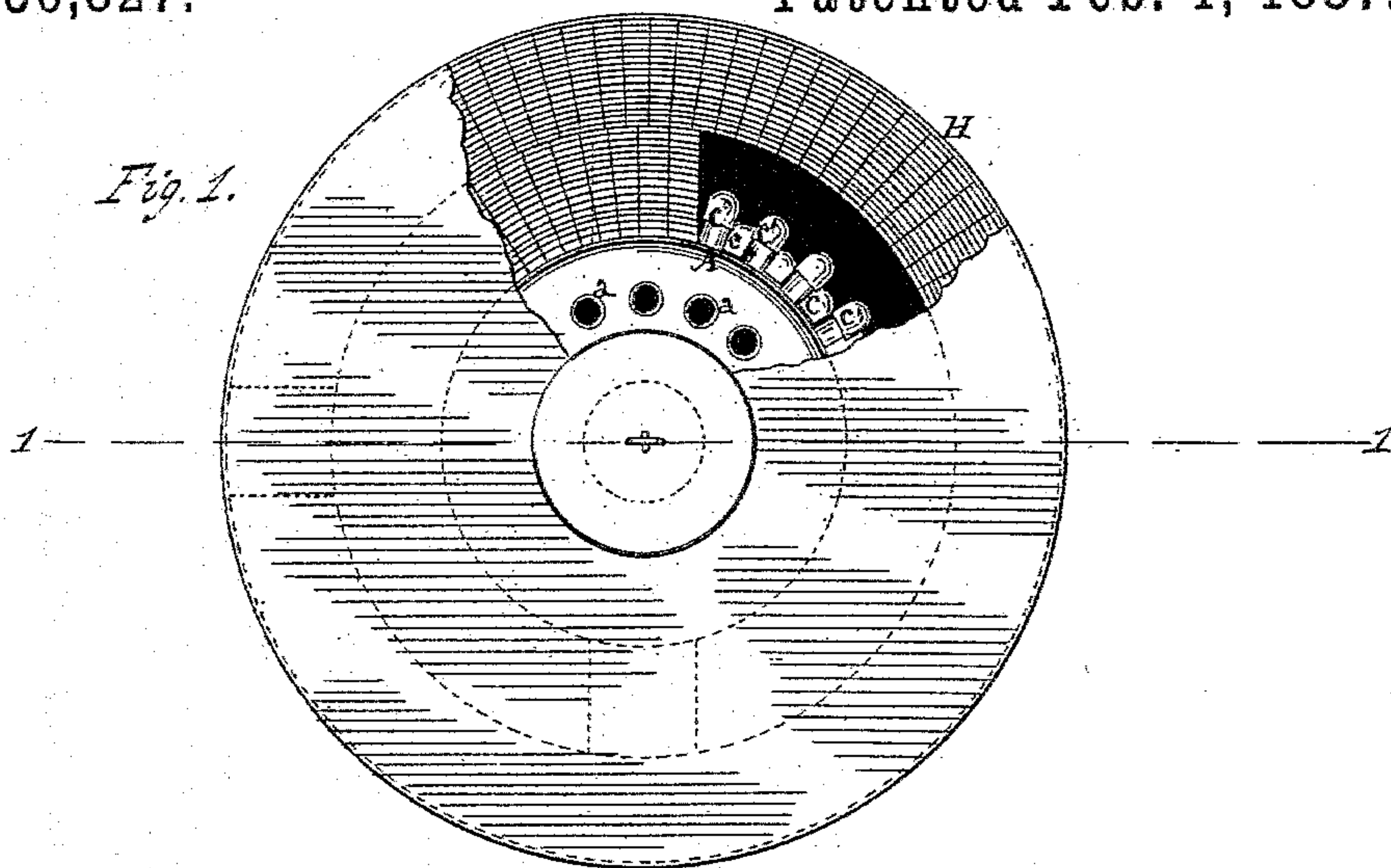
(No Model.)

2 Sheets—Sheet 1.

R. G. FERGUSON.  
STEAM GENERATOR.

No. 356,827.

Patented Feb. 1, 1887.



Witnesses:  
Henry Schlingloff  
*[Signature]*

Robert G. Ferguson  
Inventor:  
*[Signature]*  
H. L. Atkey  
*[Signature]*



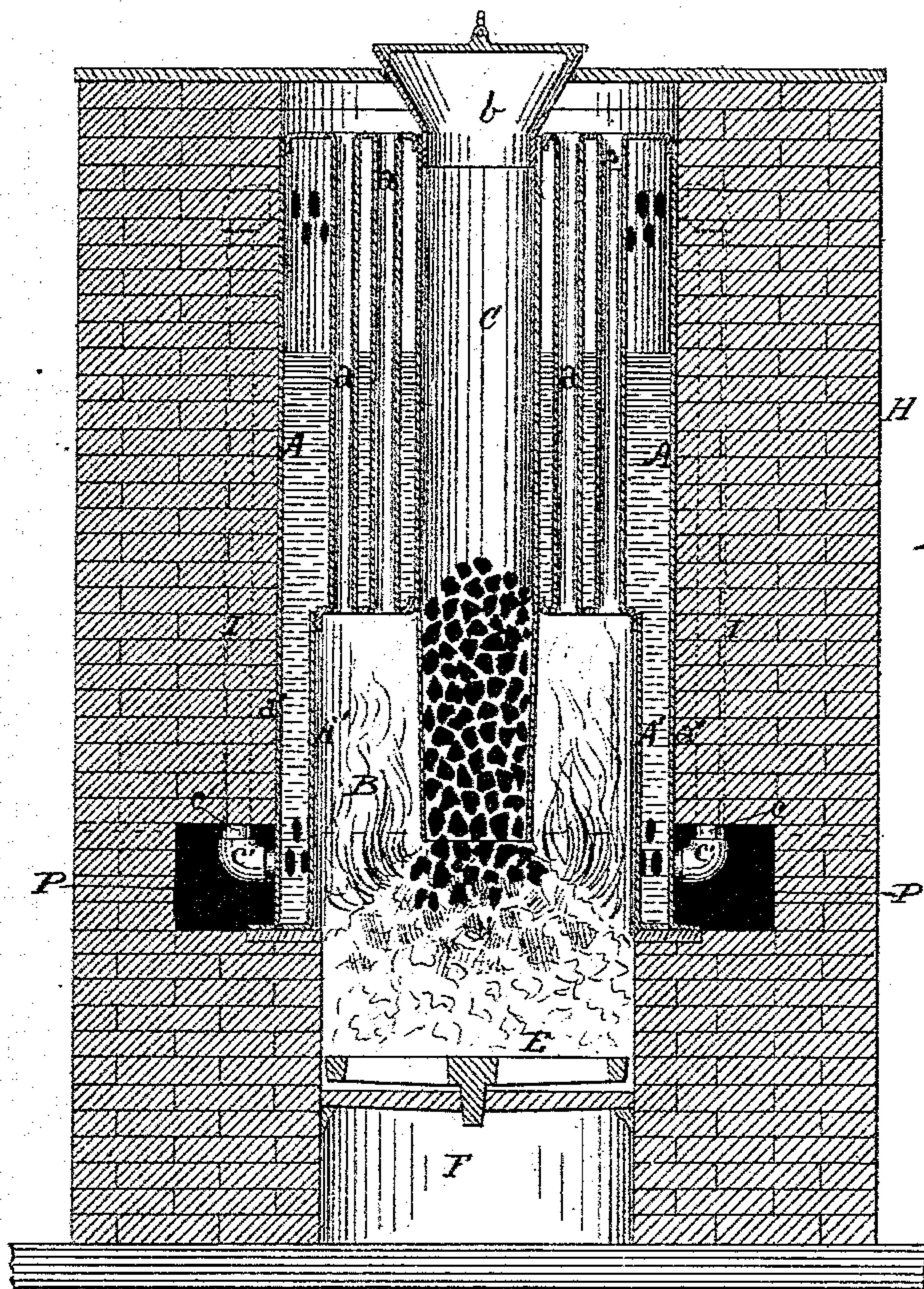
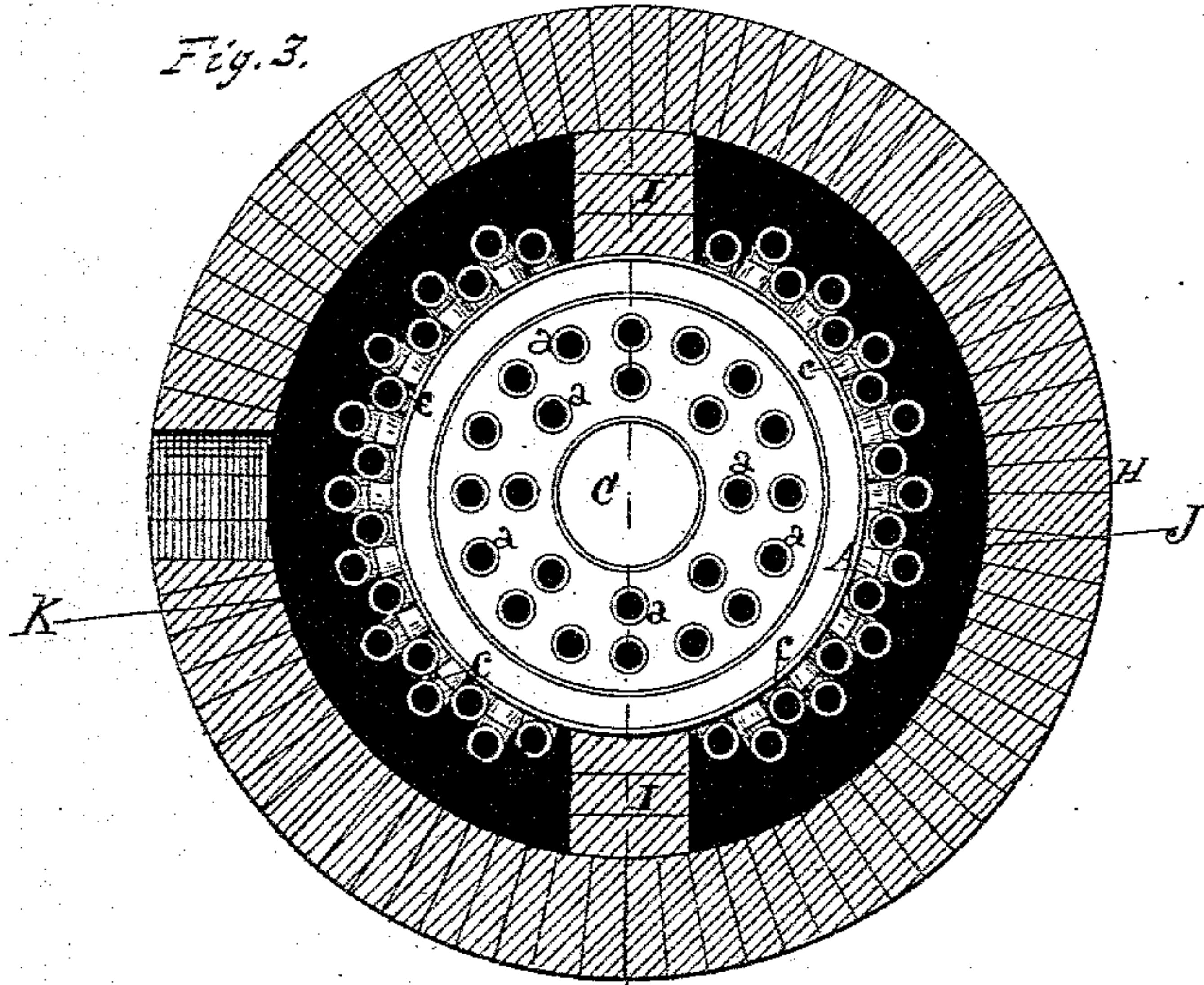
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2 Sheets—Sheet 2.

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Henry Schlinghoff  
*[Signature]*

Robert G. Ferguson  
Inventor.  
By his Attorney:  
Alex. Selkirk



# UNITED STATES PATENT OFFICE.

ROBERT G. FERGUSON, OF SARATOGA, NEW YORK.

## STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 356,827, dated February 1, 1887.

Application filed July 20, 1885. Serial No. 172,178. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT G. FERGUSON, a citizen of the United States, residing at Saratoga, in the county of Saratoga and State of New York, have invented certain new and useful Improvements in Steam-Generators, of which the following is a specification.

My invention relates to certain new devices and elements and combinations of devices and elements hereinafter particularly described, and specifically set forth in the claims.

The objects of my invention are to provide means whereby the heating-surfaces of the generator will be greatly increased and be in better situation than heretofore for being heated by the hot gases from the fire, and also for providing means by which nearly all the heat from the burning fuel will be utilized for heating the several heating-surfaces of the generator instead of passing off to the chimney or smoke-stack in a large measure, as heretofore. I attain these objects by the means illustrated in the accompanying drawings, (in two sheets,) forming a part of this specification, in which—

Figure 1 is a plan view of my improved generator. Fig. 2 is a sectional elevation of the same, taken from front to rear, as at line 1 in Fig. 1. Fig. 3 is a sectional view taken from side to side, as at line 2 in Fig. 1. Fig. 4 is a horizontal sectional view taken at line 3 in Fig. 2.

The same letters of reference refer to like parts throughout the several views.

A represents the shell of a steam generator or boiler. B is the fire box or chamber of the same.

A' is the circular leg of the generator, in which wall *a'* forms the outer wall of the fire-chamber.

*a a* are vertical tubular flues extending from the upper wall of the fire-chamber up to the upper wall or head of the generator, and through which the hot gases drawn from the fire will have passage.

C is the fuel-magazine by means of which fuel will be introduced into the fire-chamber, and *b* is a hopper leading to this magazine from above.

D is a passage-way or opening from the front to the fire-chamber above the grate E, through which opening the fire will be viewed.

F is the ash-pit and G is the passage-way to the same, and is provided with door *g*, provided with any suitable damper. All these parts are old, and therefore require no particular description.

Arranged exterior to shell A of this generator are one or more series of water or steam pipes or tubes, *c c*, which communicate with the chamber-room of the generator-body proper by means of suitable elbow-connections, *c' c'*, as shown. The drawings show two series of these exterior tubes or pipes, *c*, in which those of one series are arranged relatively outside the circular line of the other, and with those of the inner series made with a uniformly shorter length than those of the outer series, so as to terminate above and below at a short distance from the terminal ends of the outer pipes or tubes, that the hot gases will readily have entrance to between these tubes in their passage to the chimney or smoke-pipe. This shell A and its circular leg A', internal tubular flues, *a*, and exterior water pipes or tubes, *c*, together with the fire-chamber B, constitute the generator proper.

H is an outer wall, inclosing this generator, and is shown to be made of brick, though a jacket of cast or sheet iron may be substituted. The interior surface of this wall is made to set off to a short distance from the outer series of pipes, *c*, so as to produce between the generator and the wall a free space about equal to the vertical extension of the generator. Partitions I I, arranged at about midway between the front and rear side of the vertical chamber, are provided at the opposite sides of this generator and extend from shell A to wall H, so as to divide the space between the generator and wall into two chambers, J and K. The drawings show these partitions I to be made of brick, though they may be made of iron, if preferred. These chambers J and K form substantially vertical flues, by means of which the currents of hot gases will be reverted after passing from the tubular flues *a*.

A cast-iron plate, L, provided with a central opening for receiving hopper *b*, is set over the upper end of wall H, at a short distance above the upper end of shell A, thereby producing a horizontal flue-chamber, M, which communicates with the front vertical flue-chamber, J. The upper end of rear flue-chamber, K, is closed



from communication with horizontal flue-chamber M by brick (or an iron plate) stop N, and an exit-opening, O, is provided in the wall at a point opposite the upper end of rear flue, K, for escape of the gases to the chimney or smoke-pipe.

P P are openings made in the lower end of vertical partitions I I, through which the front vertical flue-chamber communicates with the rear flue-chamber, K, at their lower ends.

I prefer to make the inclosing-wall H of brick, as that material is best calculated to retain the heat within the flue-chambers and operates as a good non-conductor between the generator and the room outside. Another advantage is that this brick wall will not be as readily broken as will cast-iron plates in a jacket, or be bent, as will sheet-iron.

The fire is made in fire-chamber B, and the heat radiating from the side portions of the fire will act on wall *a'* between the fire and water in leg A' of the generator and highly heat the same, so as to make the action of the radiant heat from the fire very effective for generating steam, while at the same time the hot gases from the fire will pass up through the several vertical tubular flues *a* and heat the walls thereof, and then be discharged into the horizontal flue-chamber M, and pass thence forward into the front vertical flue-chamber, J, to circulate between the exterior series of water and steam pipes, *c*, in that chamber, and thence have passage through openings P P into the rear flue-chamber, K, to circulate upward between the exterior steam and water pipes, *c*, in said flue, and finally escape through exit-opening O into the chimney or smoke-pipe. In this circuitous passage of the hot gases from the fire-chamber to the exit the greater portion of the heat of the gases will be absorbed by the metal surfaces along which they pass, and be taken up by the metal and communicated to the water and steam in contact with the walls of the tubular flues *a*, shell A, and water-pipes *c*.

By the above-described improvements a small amount of fuel will be made to generate a greater amount of steam than can be generated in steam boilers or generators which have only the walls of the shell and tubular flues for communicating heat to the water; and I am enabled to make a low-pressure boiler as effective for generating steam for heating-radiators as high-pressure boilers as heretofore constructed.

My above-described improvements are applicable to steam boilers or generators for driving engines as well as to generators for heating-radiators for warming purposes.

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

1. The combination, with the tubular boiler and one or more series of water or steam pipes arranged exterior to the shell of the same and communicating with the chamber of the same, of a horizontal flue-chamber, and an exterior wall inclosing vertical flue-chambers containing said series of pipes, and partitions separating said vertical flue-chambers and provided at their lower ends with openings, and the exit-opening to the chimney or smoke-pipe, substantially as and for the purposes set forth.

2. The combination, with a boiler having a water-leg concentric to the fire-chamber, and provided with tubular flues leading from said fire-chamber to a horizontal flue located wholly exterior to the boiler, of one or more series of water or steam pipes which are arranged exterior to the shell of the boiler, and communicate from the water-leg to the upper end portion of the boiler-chamber, and are contained within vertical flues which are between the shell of the boiler and an outer casing, and lead from the horizontal flue to an exit, as set forth.

ROBERT G. FERGUSON.

Witnesses:

THOMAS DOUGLASS,  
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