

(No Model.)

E. F. GORDON & H. HOBBS.
STEAM GENERATOR.

2 Sheets—Sheet 1.

No. 291,185.

Patented Jan. 1, 1884.

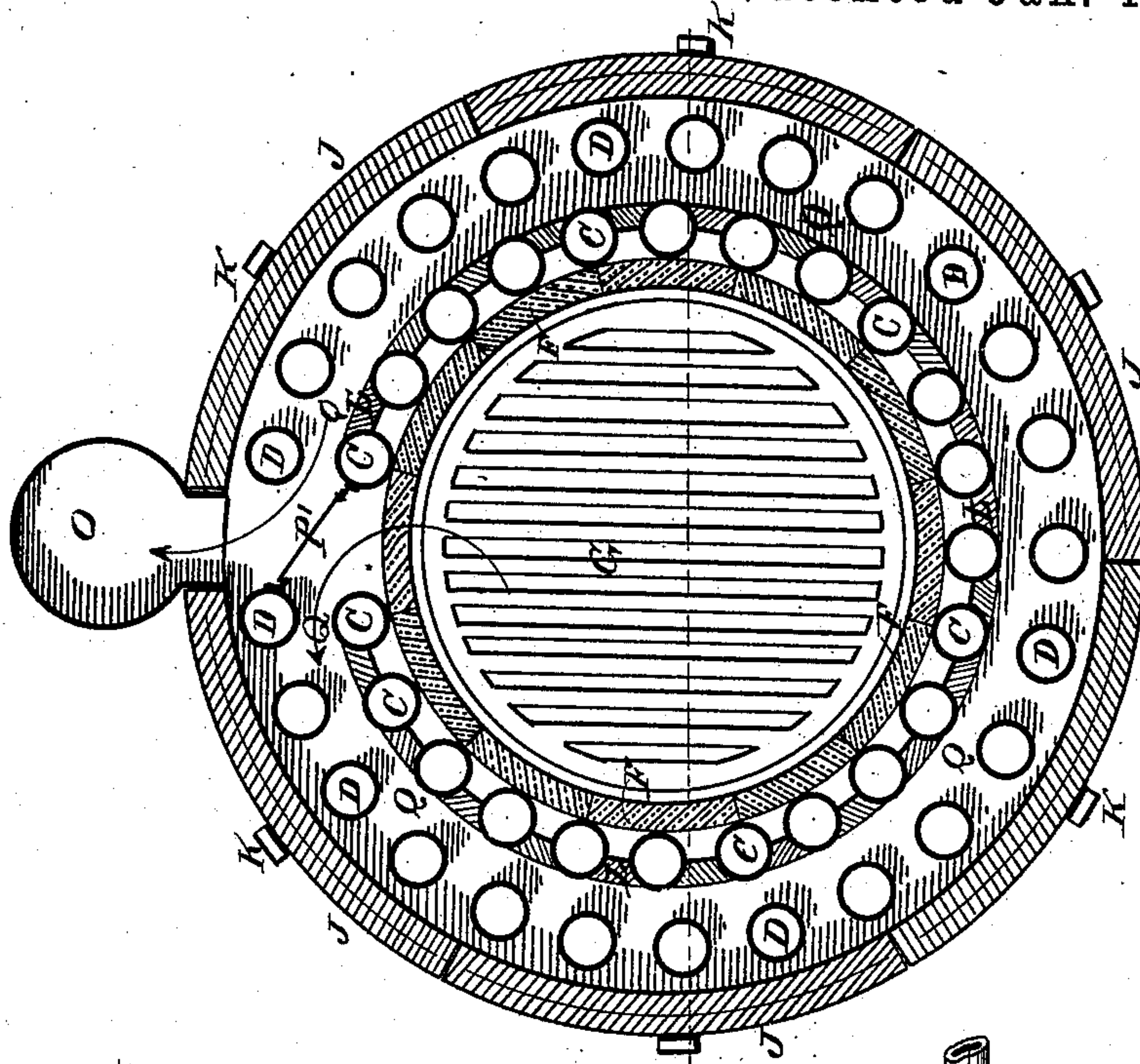


Fig. 2.

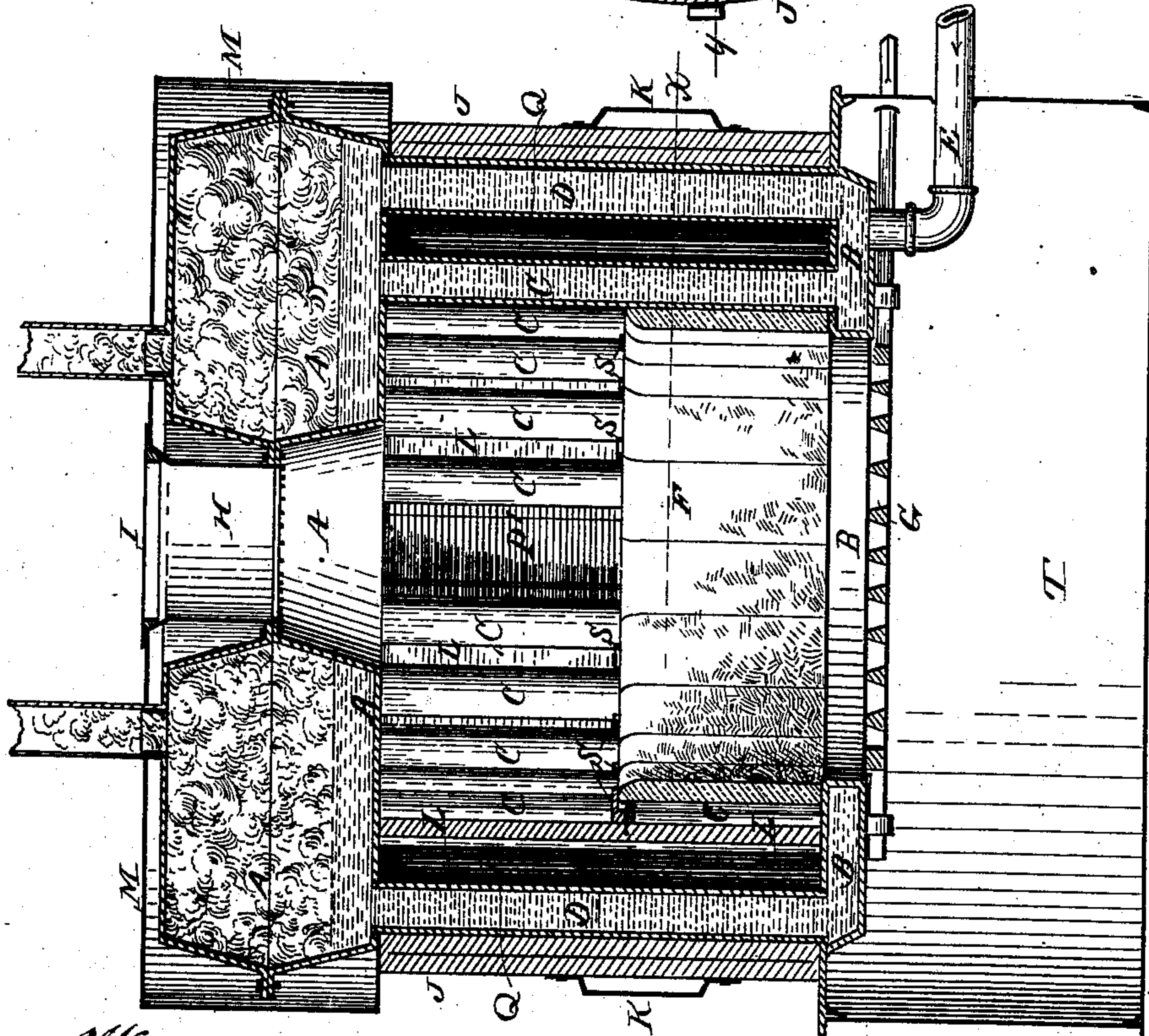


Fig. 1.

Witnesses:
J. O. Bishop.
L. S. Hayes.

Inventors:
Edward F. Gordon,
Horatio Hobbs,
by Attorney, R. H. Peck.

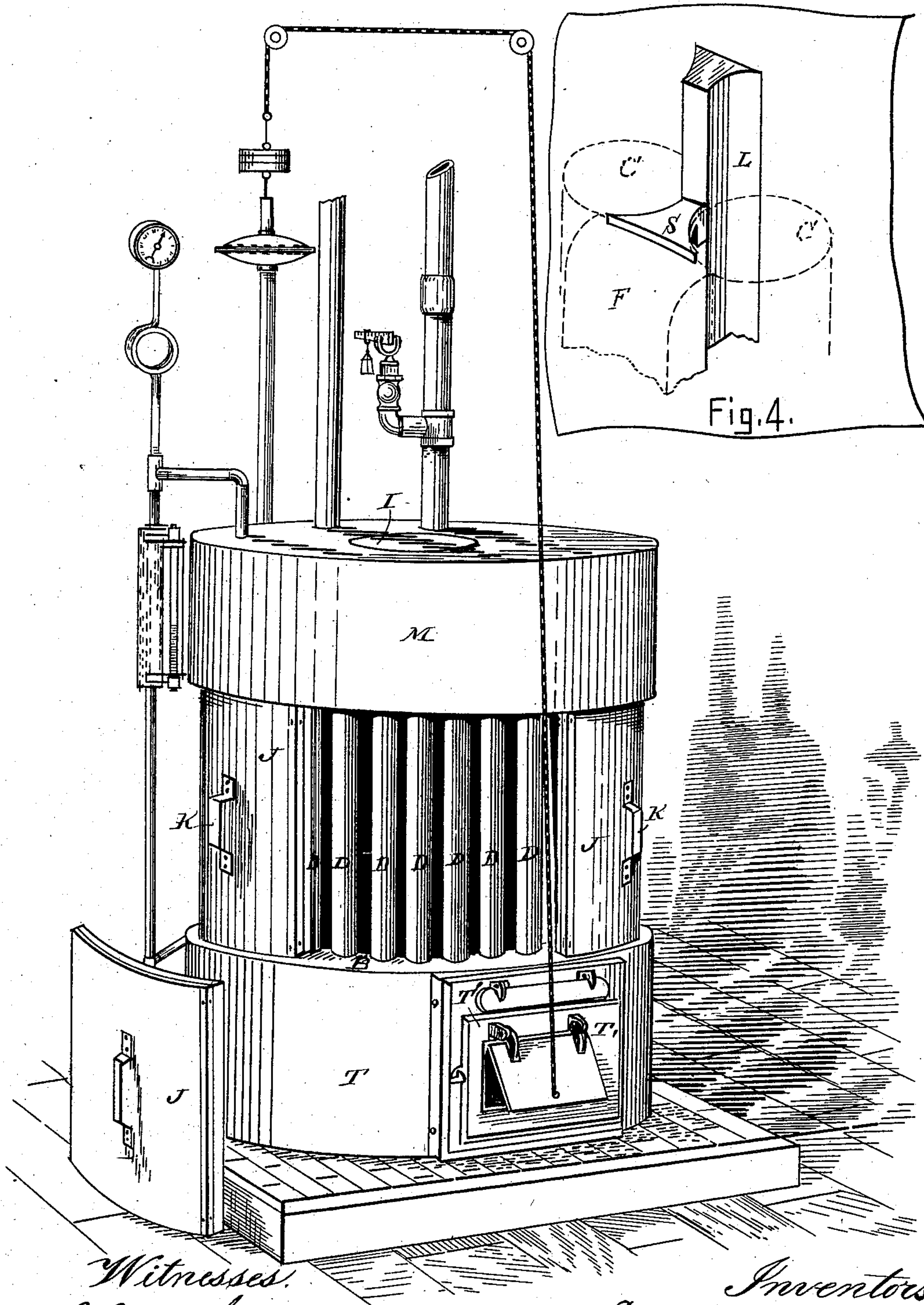
(No Model.)

2 Sheets—Sheet 2.

E. F. GORDON & H. HOBBS.
STEAM GENERATOR.

No. 291,185.

Patented Jan. 1, 1884.



Witnesses.
J. O. Bishop
E. S. Keyes

Fig. 3.

Inventors
Edward F. Gordon,
Horatio Hobbs,
by Attorney A. H. Reicher

UNITED STATES PATENT OFFICE.

EDWARD F. GORDON AND HORATIO HOBBS, OF CONCORD, N. H.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 291,155, dated January 1, 1884

Application filed April 9, 1883. (No model.)

To all whom it may concern:

Be it known that we, EDWARD F. GORDON and HORATIO HOBBS, citizens of the United States, residing at Concord, in the county of Merrimac and State of New Hampshire, have jointly invented certain new and useful Improvements in Steam-Generators; and we do hereby declare that the same are fully described in the following specification and illustrated in the accompanying drawings.

This invention is in the nature of an improvement upon that for which Letters Patent No. 271,329 were granted to us January 30, 1883. In that invention we arranged a series of hollow castings in a circle around the fire-pot, each casting being wedge-formed, with a central aperture through it horizontally, so that when all these sections were united in position the apertures formed one continuous annular horizontal flue. With our present improvements we retain the annular horizontal flue and fire, but construct the apparatus in a radically different manner from our former invention, omitting the wedge-shaped cast-metal sections, and, in fact, all laterally-connected sections, and employing either wrought metal alone or partly wrought and partly cast metal. The water-ring below and the steam and water chamber above the fire-pot are connected by water-tubes arranged in two concentric rings, between which the heated products of combustion pass entirely around the fire in a horizontal plane to the funnel, acting on all sides of such annular flue meanwhile, to heat the water contained in said tubes, chamber, and water-ring. External to these tubes is a casing made in sections and capable of being removed from time to time in order to clear out the flue, access thereto being had through the spaces between the tubes of the outer ring. Fixed vertical bars occupy the spaces between adjacent tubes of the inner circle. The steam-chamber is surrounded by a sheet-metal jacket inclosing an air-space tending to preserve the steam from condensation. The removable sections are each formed, by preference, of three curved plates of sheet metal united at the edges with spaces between them—the inner space having a filling of asbestos.

Figures 1 and 2 of the drawings represent, respectively, a vertical central and a horizon-

tal central section of our improved generator. Fig. 3 is a perspective view thereof, showing one of the casing-sections removed; and Fig. 4, a detail of means of closing the space between the vertical tubes of the inner series and between the fire-brick and tubes.

In the drawings, A represents an annular steam-chamber, partly filled with water, which rises to the desired height through vertical tubes C D, extending upward from the water-ring B, fed by the inlet-pipe E.

F is the fire-brick supported on a ledge of the water-ring. G is the grate, to which fuel is supplied through a central aperture, H, in the top, closed when in use by a cover, I.

T is the ash-pit, provided with a door, T', for draft and for removal of the ashes; and M, a top casing or jacket, which incloses the steam-chamber, the hot air in it tending to prevent condensation of the steam.

J J represent removable sections of a casing exterior to the vertical pipes D. Each section J, as shown in the drawings, is provided with one or more handles, K, and each has an asbestos filling, protecting it from the action of the heat, and also an air-space within it.

The tubes C D are arranged in two concentric circles, and expanded into their seats, so as to make perfect joints in the chamber A and ring B. Those of the inner row are protected, up ten or twelve inches, by the fire-brick F, at the top of which blocks S are employed, to prevent coal or ashes passing down between the tubes and brick. In addition, a series of vertical castings, L, are introduced, alternating with the tubes C, and filling the curved spaces between them at the central line, where said tubes approach nearest to each other, and outwardly from said line, fitting to said tubes far enough to form with the tubes C a solid wall, as best shown in Figs. 2 and 4, thus separating the combustion-chamber from the flue, that each may perform its functions perfectly. The bars L and blocks S are preferably united by a wire projecting from one casting passing through a hole in the other, and bent so as to draw them and hold them together in contact with the tubes. These castings L, with the tubes C, form a close wall around the fire-space, against which the heat impinges, chiefly upon the fully-exposed in-

ner half of each tube of the inner series above the fire-brick and stop-blocks S, as it does on the under side of the chamber A, so that a large percentage of the heat is absorbed before it leaves the combustion-chamber, tending to rapidly convert the water into steam, and producing an active circulation of the water through the several tubes. In front of the funnel O one of the tubes in each row is omitted, together with two of the castings L, and a deflector provided with a damper, P', is placed obliquely across the direct way to the funnel. When the damper is closed, the caloric-current is deflected from a direct course, as denoted by the arrows, Fig. 2, and caused to traverse the annular flue Q—that is, to travel horizontally entirely around the fire-pot between the two rows of tubes, impinging meanwhile against all the tubes of each row, and parting with its heat at every touch, so that all the heat is utilized and the structure made most compact and symmetrical. The vertical tubes C D present their convex surfaces successively to and crosswise of the caloric current, which passes horizontally through the annular flue Q, the entire current passing in contact with every tube of each series. (See Fig. 2.) Thus by their transverse position and successive arrangement said tubes absorb far more of the heat than they could do if running parallel to said current. Sufficient space is allowed between the tubes D of the outer row to give access to the flue Q, so that it may be freed of ashes and soot with a brush or scraper by removing the casing-sections J one after another. (See Fig. 3.) This is of great importance in utilizing the heat, since a coating of soot or ashes is an effective sheath to prevent proper action of the heat on the parts A, B, C, and D.

The top of the water-ring B may well be cast in one with the projecting horizontal top of the ash-pit, apertures being formed at intervals for insertion and expansion of the vertical tubes C D, and the bottom of this ring, of either cast or wrought iron, riveted to the top.

The steam-chamber A may be of wrought or of cast metal, the upper and lower parts being usually riveted together, the seams luted with litharge, as will be clear from Fig. 1.

The water-ring and steam-chamber may have flat tops and bottoms and vertical sides, having outward flanges to rivet in place after the tubes C D have been set.

We are aware of the patent to Rains, August 14, 1860, showing a central fire-pot and two complete annular series of vertical water-pipes connecting the water-ring and steam-chamber, and having shortened space-pieces

between the tubes of the inner row, and extending in front thereof, so as largely to shield them from the action of the fire. Said patent, however, showed no removable casing for cleaning the flues, no fire-brick around the fire-pot, no deflector or damper, and hence no general horizontal current through an annular flue transverse to the tubes therein. On the contrary, the gaseous products of combustion divided into numerous currents, passed over the shortened space-pieces, and between the upper ends of the inner tubes, (a small fraction of the whole current at each point;) then moved downwardly parallel with and between the tubes of the inner and outer row, to pass beneath a curtain-like cylinder of sheet metal, which cut off such currents from further contact with said tubes, and caused the smoke and gases to rise between said sheet-metal cylinder and the outer case to escape at the funnel. We make no claim to such an apparatus or arrangement of devices; but

We claim as our invention—

1. A steam-generator having the water-ring and steam-chamber united by two concentric series of independent water-pipes surrounding the fire-pot, with an annular space between them, forming a horizontal flue, in combination with a deflector arranged to deflect the entire caloric-current and cause it to traverse the annular flue entirely around the fire-pot, substantially as and for the purpose set forth.
2. In a steam-generator having an annular water-ring and steam-chamber united by two concentric series of distinct water-pipes, and provided with a deflector adapted to direct the entire caloric-current into the annular flue, that it may pass horizontally around the fire-pot, as described, the vertical bars L, fitting the space between adjacent tubes of the inner row, for the purpose set forth.
3. In a steam-generator, an annular water-ring and a water and steam space communicating therewith through a double row of vertical pipes, which stand at each side of a horizontal annular flue and present their convex surfaces transversely to the caloric-current through said flue, in combination with an exterior casing made in sections, so as to be removable, substantially as and for the purpose set forth.

In testimony whereof we hereto affix our signatures in presence of two witnesses.

EDWARD F. GORDON.
HORATIO HOBBS.

Witnesses:

JAMES A. CILLEY,
NATHL. E. MARTIN.