

(No Model.)

2 Sheets—Sheet 1.

J. H. HOADLEY.
PORCUPINE STEAM GENERATOR.

No. 474,386.

Patented May 10, 1892.

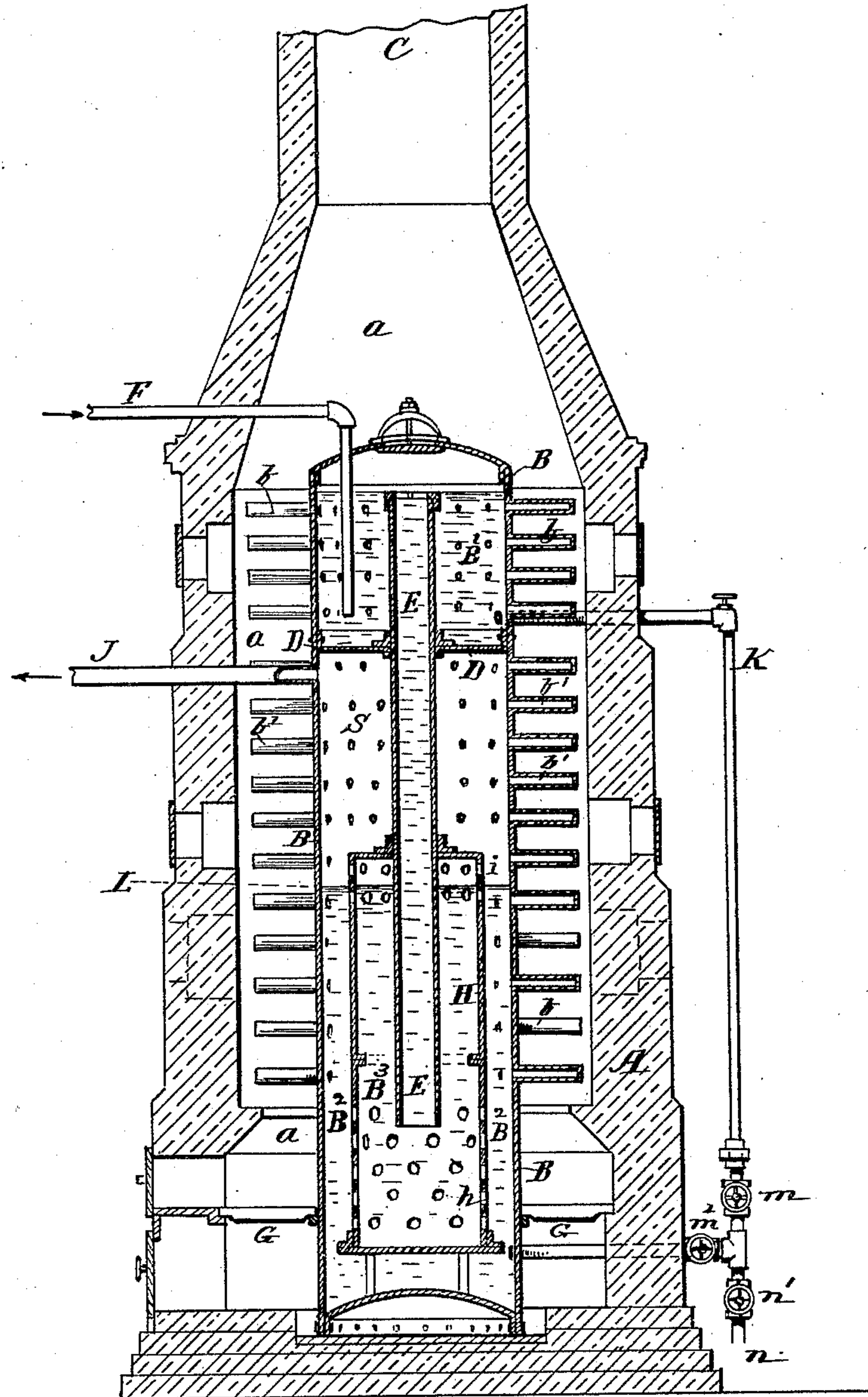


FIG. 1

WITNESSES.

Ella P. Blenus
Simon C. King

INVENTOR

Joseph H. Hoadley
By Chas. H. Curleigh
Attorney

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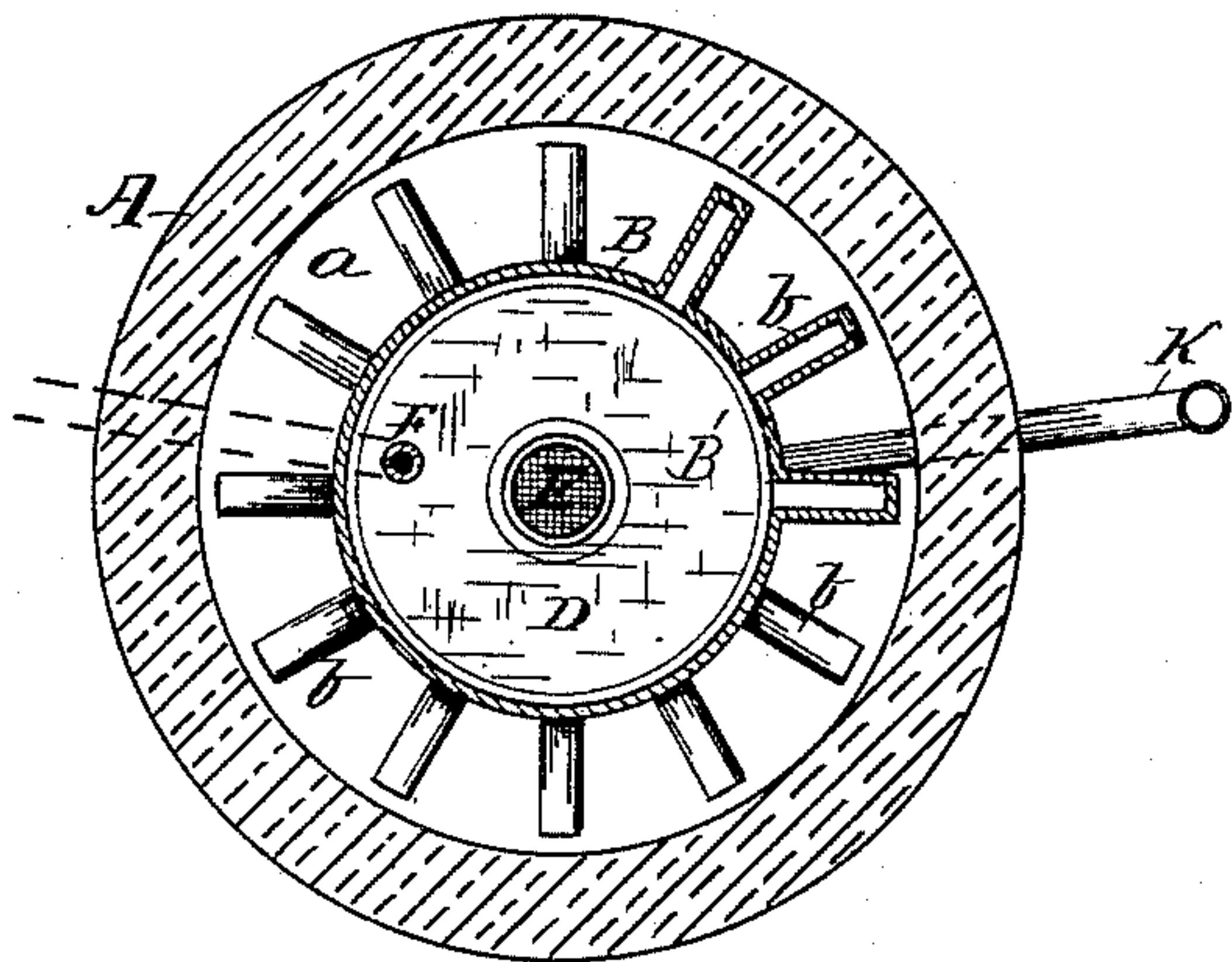


FIG. 2

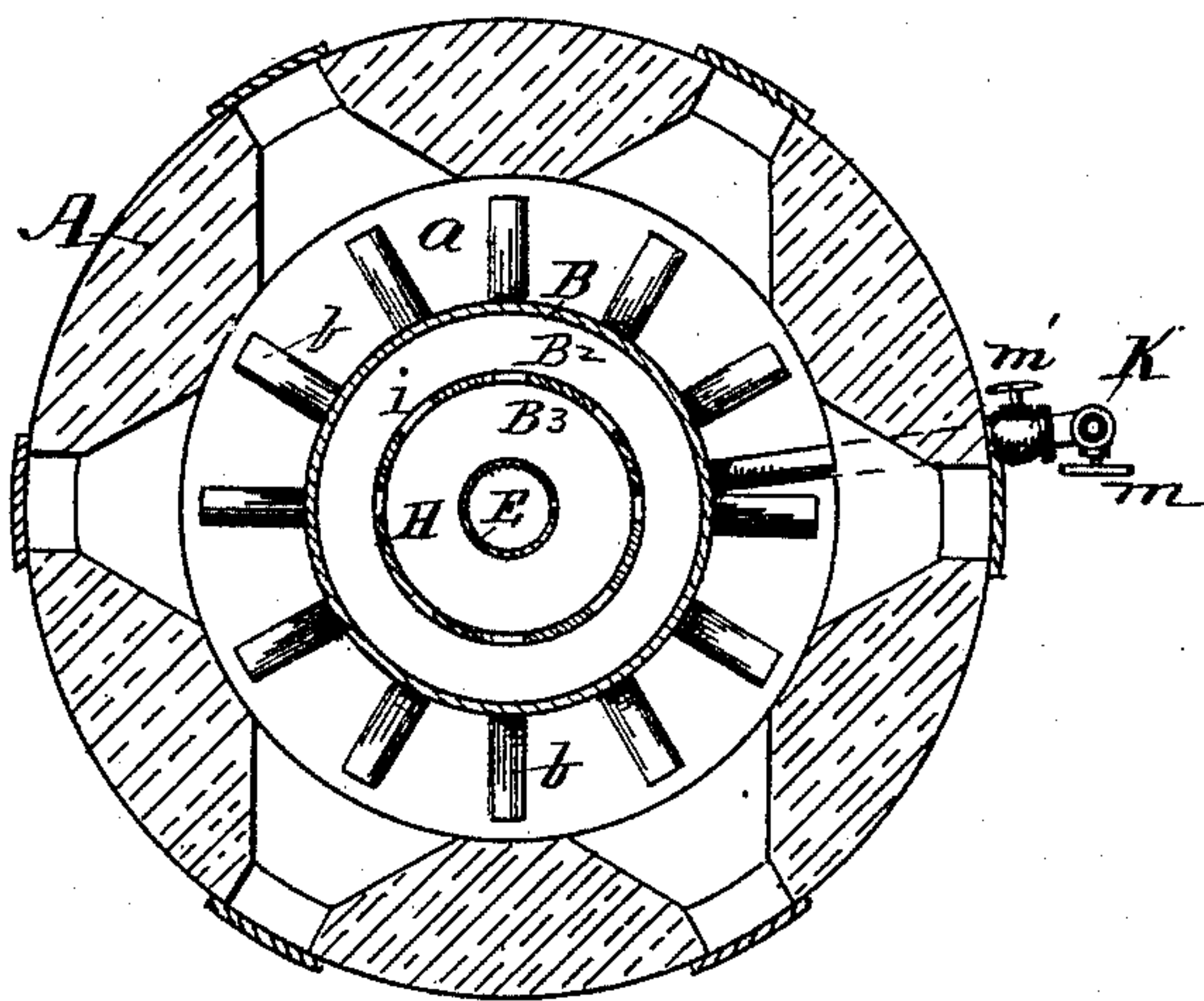


FIG. 3

Witnesses

Ella P. Glenus
Simon E. King

Inventor

Joseph H. Hoadley
By Chas. H. Burleigh
Attorney

UNITED STATES PATENT OFFICE.

JOSEPH H. HOADLEY, OF SAN FRANCISCO, CALIFORNIA.

PORCUPINE STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 474,386, dated May 10, 1892.

Application filed November 27, 1891. Serial No. 413,161. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH H. HOADLEY, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented a new and useful Improvement in Porcupine Steam-Generators, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

This invention relates to that class of steam-generators commonly known as "porcupine" boilers, and composed of an upright shell having a series of radial or outwardly-projecting heating-tubes disposed about the exterior and communicating with the interior thereof, the whole being erected within a surrounding fire-chamber or furnace, the upper part of which terminates in the chimney flue or stack.

The object of my invention is to provide a boiler of the porcupine variety, having its steam-space disposed at the hot part of the furnace, and a means for utilizing the escaping gases for the primary heating of the incoming water at the upper part of the flue, chamber, or stack.

Another object is to provide a boiler of the class named having at its top a water-compartment and a steam-chamber below the same and with an overflow-pipe from said top compartment to the lower chamber.

Another object is to provide a safety-pipe or means for the ready delivery of the water from the upper chamber into the lower heating-chamber when desired.

These objects I attain by the mechanism illustrated in the drawings and explained in the following description, the particular subject-matter claimed being hereinafter definitely specified.

In the drawings, Figure 1 is a vertical section of a porcupine steam-boiler and its furnace, illustrating the nature of my invention. Fig. 2 is a horizontal section of the same at the top end of the boiler, and Fig. 3 is a horizontal section through the lower chamber at or near the water-level line.

In referring to parts, A denotes the brick-work of the furnace, which may be of the usual construction employed for this class of steam-boilers.

B indicates the boiler-shell, which stands in upright position within the furnace or fire-chamber *a*, with its porcupine or heating tubes *b b'* projecting outward from the shell radially across the annular space, through which the hot gases or products of combustion rise from the fire upon the grate *G* to the exit-flue of the chimney *C*. The tubes *b b'* are of well-known form and structure, and any desired number thereof may be used in any instance.

The interior of the boiler *B* is divided by a diaphragm-plate or close horizontal partition *D*, placed about one-fourth (more or less) of the boiler's length from the top end, and firmly attached to the shell, thus separating the interior into an upper compartment *B'* and a lower chamber *B²*. A cylindrical trunk, overflow-pipe, or conductor *E* is arranged through the partition-plate *D*, its top end open into the compartment *B'* near the top thereof and its lower end open to the interior of the boiler, preferably well down below the water-level.

H indicates an interior shell that surrounds the lower part of the pipe *E*, its top preferably somewhat above the water-level and its bottom near the bottom of the chamber *B²*. Said shell *H* is perforated through the lower and upper parts of its cylindrical body, as at *h* and *i*, to give free passage for water or steam from the chamber *B³* to the chamber *B²*. Said interior shell *H* serves as a guard for effecting a more uniform distribution of the water at lower temperatures to the hot surfaces of the shell *B*; but said inner shell *H* is not absolutely essential to the successful operation of my invention, which may in some instances, when desired, be employed in boilers in which this perforated inner shell *H* is omitted.

F indicates the feed-pipe, which delivers the feed-water into the compartment *B²* at the top of the boiler, which compartment is filled or nearly filled with water and in which, together with its projecting tubes, the water receives its primary heating while at its minimum temperature by the action of the escaping gases before they pass off through the chimney-flue. From the upper part of the compartment *B'* the water overflows into the trunk or stand-pipe *E* and descends into the

lower or boiling chamber B², where it is maintained at the level L, substantially as shown, thereby affording a steam-space S within the boiler below the water-compartment B' and above the water-space in chamber B² and having therefrom the projecting porcupine-tubes b' for superheating the steam, which by reason of this arrangement of the steam-space are disposed at or near that part of the furnace giving the maximum degree of heat. The steam-supply pipe J leads from the steam-space S a little below the diaphragm D. A pipe K leads from the lower part of the water-compartment B² into the lower part of the boiler, and suitable stop-valves *m m'* are provided therein; also, a blow-off pipe *n* and stop-valve *n'* are preferably combined therewith. The pipe K serves as a safety apparatus, whereby the contents of the top water-compartment can be quickly transferred to the lower chamber to supply any suddenly-discovered deficiency of water in the boiling-chamber.

The advantages incident to my invention are the attainment, in the class of steam-boilers named, of a more thorough utilization of the heat and the presentation of the incoming water to the primary action of the exhausted gases before they pass up the chimney; also, the disposition of the steam superheaters at the hot part of the furnace and below the primary water-compartment, and, further, the avoidance of excessive strains, due to the delivery of cool water upon the fire-surface plates near the lower part of the boiler, as the water, when delivered from the trunk E at that point, is at a temperature just ready to be expanded into steam as it is carried to the fire-sheets. Hence an economical and rapidly-steaming generator is produced.

I claim as my invention herein, to be secured by Letters Patent—

1. The upright cylindrical boiler-shell having within its upper end an inclosed compartment into which the feed-water is delivered, a series of radial or outwardly-projecting heating-tubes communicating with said compartment, a lower boiling-chamber having a steam-space below said water-compartment, and a stand-pipe or conductor extending through said steam-space and leading from the upper part of said top compartment to

the lower compartment, substantially as set forth.

2. A boiler of the porcupine class, comprising a main body-shell provided externally with projecting heating-tubes and having internally, at positions substantially as described, a partition or diaphragm separating the interior space of the body-shell into an upper water-compartment and a lower steaming-compartment, and an open hollow trunk arranged through said diaphragm and extending up within said water-compartment to a position near but somewhat below the top head of the boiler, for the purpose set forth.

3. A boiler of the class named, having a steam-space disposed between an upper water-compartment and a lower water-space, provided with a series of radial or outwardly-projecting tubes communicating with said steam-space and extending into the combustion-chamber of the furnace at its hottest part for the superheating of the steam, and a trunk or conductor from said upper water-compartment to said lower water-space for conveying the water past said steam-space, as set forth.

4. The combination, substantially as described, of the external boiler-shell having the projecting heater-tubes, the close diaphragm separating the interior of the shell into upper and lower compartments, the water-feed pipe, the interior chamber formed by the inner perforated shell, and the overflow pipe or trunk leading from the upper part of the top compartment downward into said internal chamber and open at its ends, for the purpose set forth.

5. The combination, with the boiler having the water-compartment at its top, the lower chamber, and the overflow-pipe from the upper part of said compartment to the lower chamber, of the safety-pipe from the lower part of said top compartment into the lower chamber and the stop-valves *m m'* in said pipe, substantially as and for the purpose set forth.

Witness my hand this 24th day of November, A. D. 1891.

JOSEPH H. HOADLEY.

Witnesses:

WILLIAM A. HAYES, 2d,
EDWARD E. CURRIER.