(No Model.)

W. M. FISHER.
Steam Boiler.

No. 232,481. Patented Sept. 21, 1880.

Fig. 1.

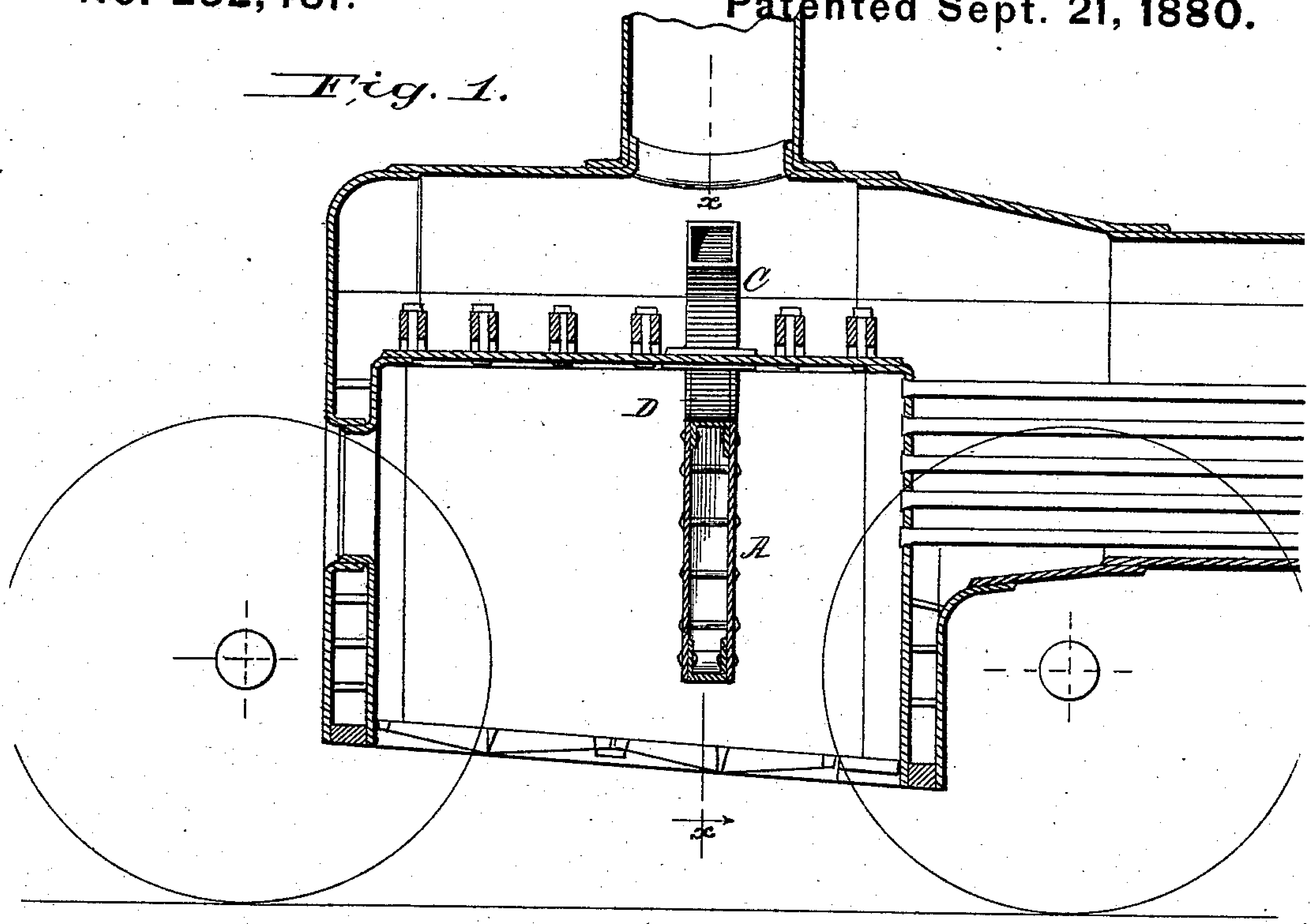


Fig. 2.

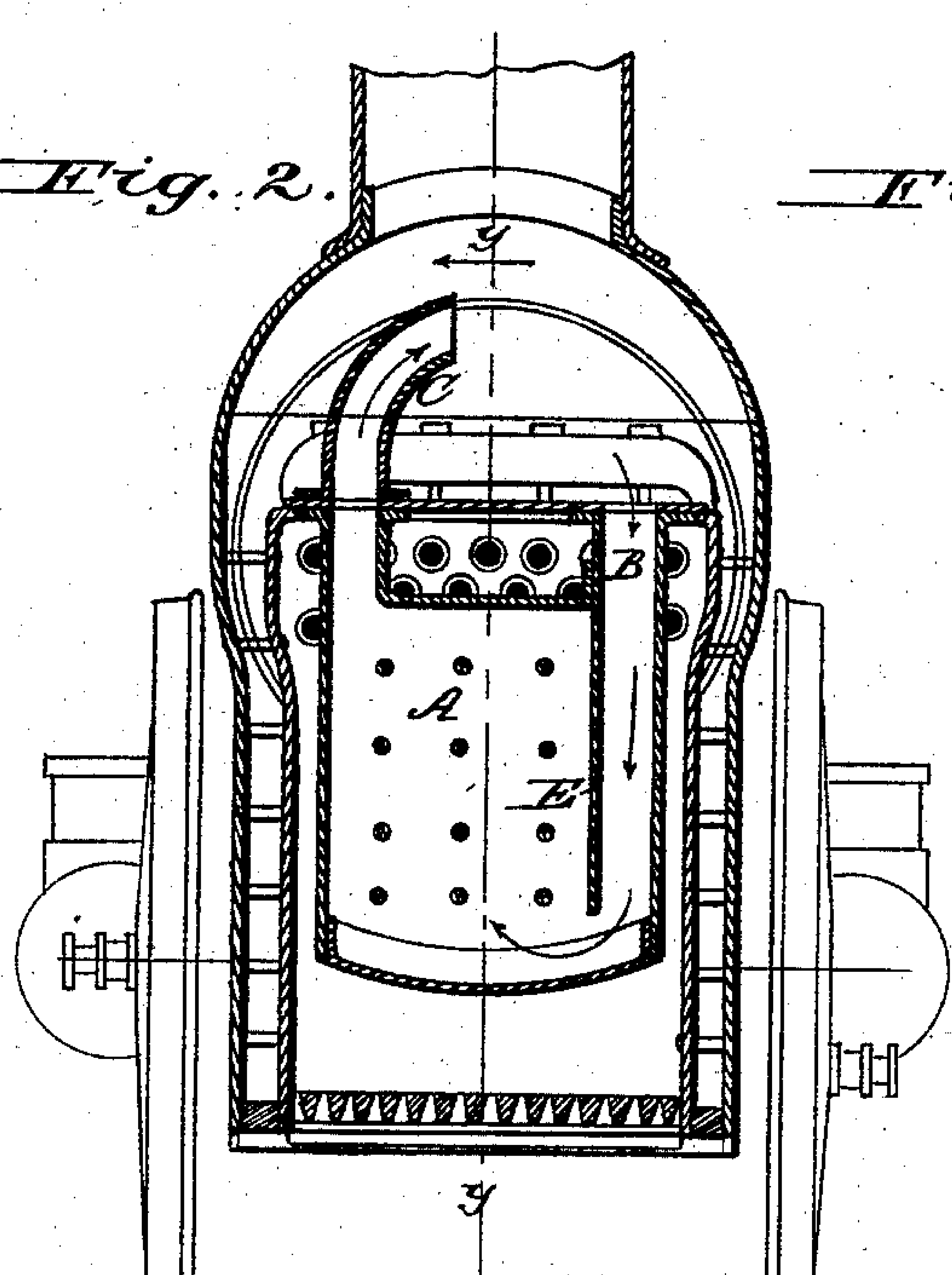
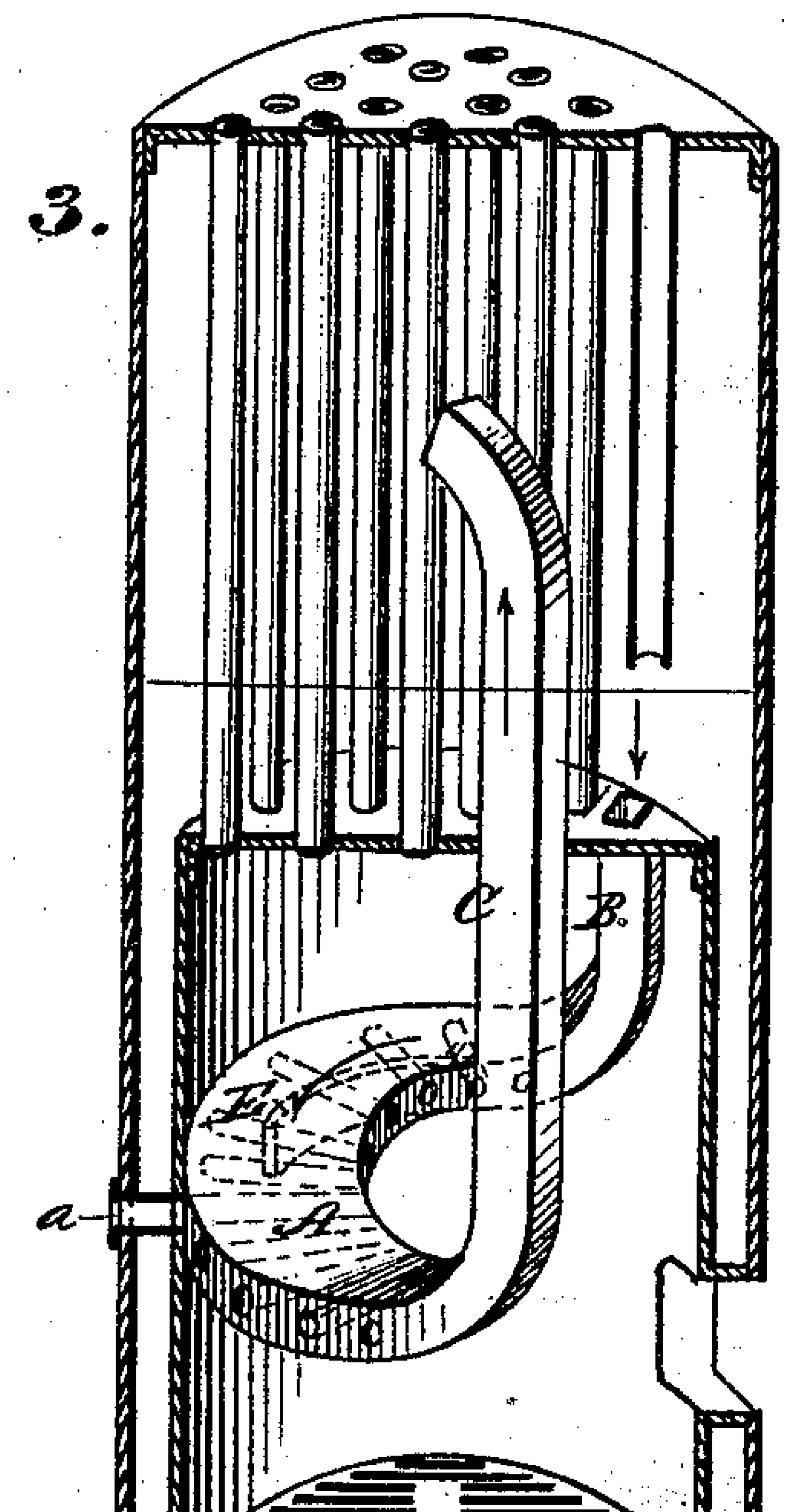


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM M. FISHER, OF CINCINNATI, OHIO.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 232,481, dated September 21, 1880.

Application filed June 16, 1880. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MACK FISHER, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

One object of this invention is to provide for the application of a combined circulator and evaporator operating upon the principle of the one described in United States Letters Patent No. 225,051, granted to me March 2, 1880, to boiler-furnaces which do not admit of a shortening of the grate-surface or the addition of a second combustion-chamber to the existing fire-chamber.

Another object of the invention is to greatly relieve the descending column of water from the reaction of the ascending current of water and steam, and thereby promote and increase the current through the circulator.

To these ends my invention consists in suspending such a circulator and evaporator in the fire-chamber above the grate-surface; also, in placing a current-directing plate in the body of the circulator at the side from which the short leg projects, and extending from the top to near the bottom of the circulator, so as to, in effect, continue the short leg inward into the main body of the circulator.

In order that my invention may be fully understood, I have illustrated in the annexed drawings, and will proceed to describe, its application to a locomotive-boiler and to an upright boiler, and will allude to its use in other connections.

Figure 1 is a sectional side elevation of my invention as applied to a locomotive-boiler. Fig. 2 is a cross-section of the same.

In these figures, A refers to the circulator, suspended by its legs B and C from the crown-sheet of the fire-box some distance in advance of the forward flue-sheet. The width of the circulator is somewhat less than the width of the fire-box, in order that the hot gases may freely pass around the sides of the circulator as well as under it and over its top, between the legs, where a gap, D, is formed between the body of the circulator and the crown-sheet. The open upper end of leg B simply covers an opening in the crown-sheet, while the open-ended leg C extends through the crown-sheet into the water, terminating either near the water-line or in the steam-space, and having its end curved, as indicated.

The bottom of the circulator, preferably somewhat curved to facilitate the flow, is sufficiently elevated above the grate to admit the bed of fuel, provide for properly stoking the fuel beyond the circulator, and allow portions of the hot gases to pass under it from the front to the rear of the fire-box.

The circulator shown is made flat and hung vertically. It is obvious that it may be made of different form and differently suspended without changing its general mode of operation. Thus it may be made angular in vertical cross-section, and it may be hung obliquely to a vertical plane.

In order to promote the proper circulation from the short leg B to the long leg C, I place a current-directing plate, E, in the body of the circulator at the side of the short leg. This plate extends from the top of the circulator to near the bottom of the same, there being, however, ample space between its lower end and the bottom of the circulator for a free exit of all the water passing down the short leg. The effect of this construction is to extend the short leg inward to near the bottom of the circulator, and to divide the main body of the water in the circulator from the column descending the short leg. The plate acts to direct the steam generated in the main body of the circulator toward the long leg thereof and prevent it from interfering to any extent with the descent of the water down the short leg, and thus serves as a current-directing plate.

This pendent circulator may be applied to all descriptions of boilers and furnaces, as well as to evaporating-pans and the like. Fig. 3 shows a modification thereof to adapt it to an upright boiler. The main body thereof is here arranged horizontally, the long and short legs curving up from it to the lower flue-sheet and up into the water-space or steam-space, respect-

ively, with a gap between them for the passage of the hot gases to the flues. In this use of the circulator I prefer to construct it with hollow stay-bolts *a*, which have communications through to the exterior shell of the fire-chamber, so as to admit air to the gases to effect a more perfect combustion A current-directing plate is used in the main body of the circulator, extending inward some distance from the short leg, as indicated.

A space may be left between the edge of the circulator and the wall of the fire-chamber for the passage of a portion of the hot gases, the main portion of which, however, passes through the gap between the legs of the circulator.

Having thus described my invention, what I claim as new is—

1. The combination, substantially as before set forth, of the fire-chamber of a furnace and the combined circulator and evaporator suspended above the grate-surface thereof, and having a short leg at one end connecting with the lower portion of the water above the fire-chamber and a long leg at the other end extending into the water to near the water-line or into the steam-space.

2. A combined circulator and evaporator for steam-boilers and other contrivances for vaporizing or evaporating liquids, having a short leg at one end connecting with the lower portion of the water in the boiler, a long leg at the other end extending to near the water-line or into the steam-space, and a current-directing plate, all substantially as before set forth.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM MACK FISHER.

Witnesses:

B. E. J. EILS,

C. A. NEALE.