

(No Model.)

W. J. KING.

HOLLOW GRATE AND FEED WATER HEATER.

No. 379,790.

Patented Mar. 20, 1888.

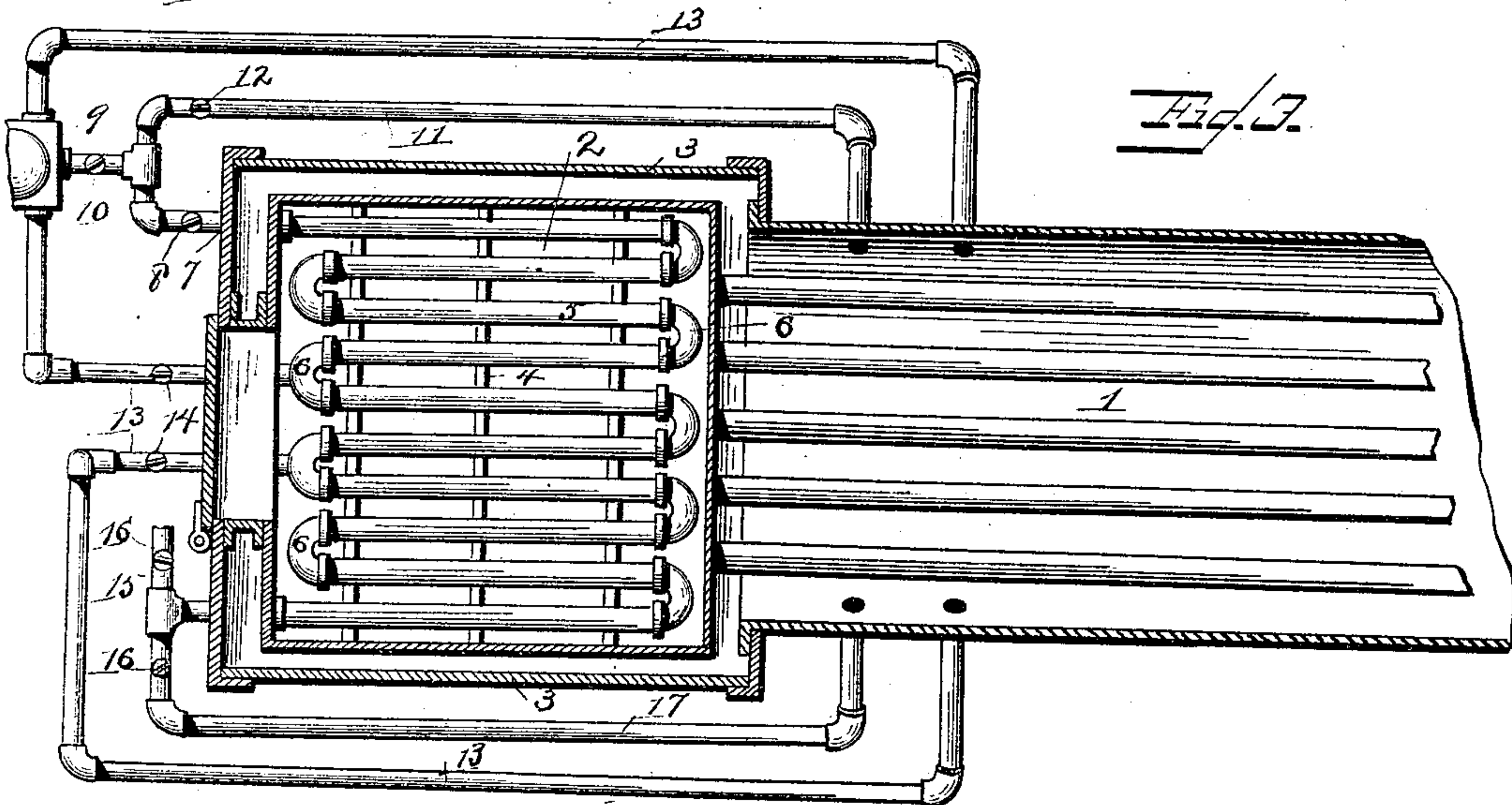
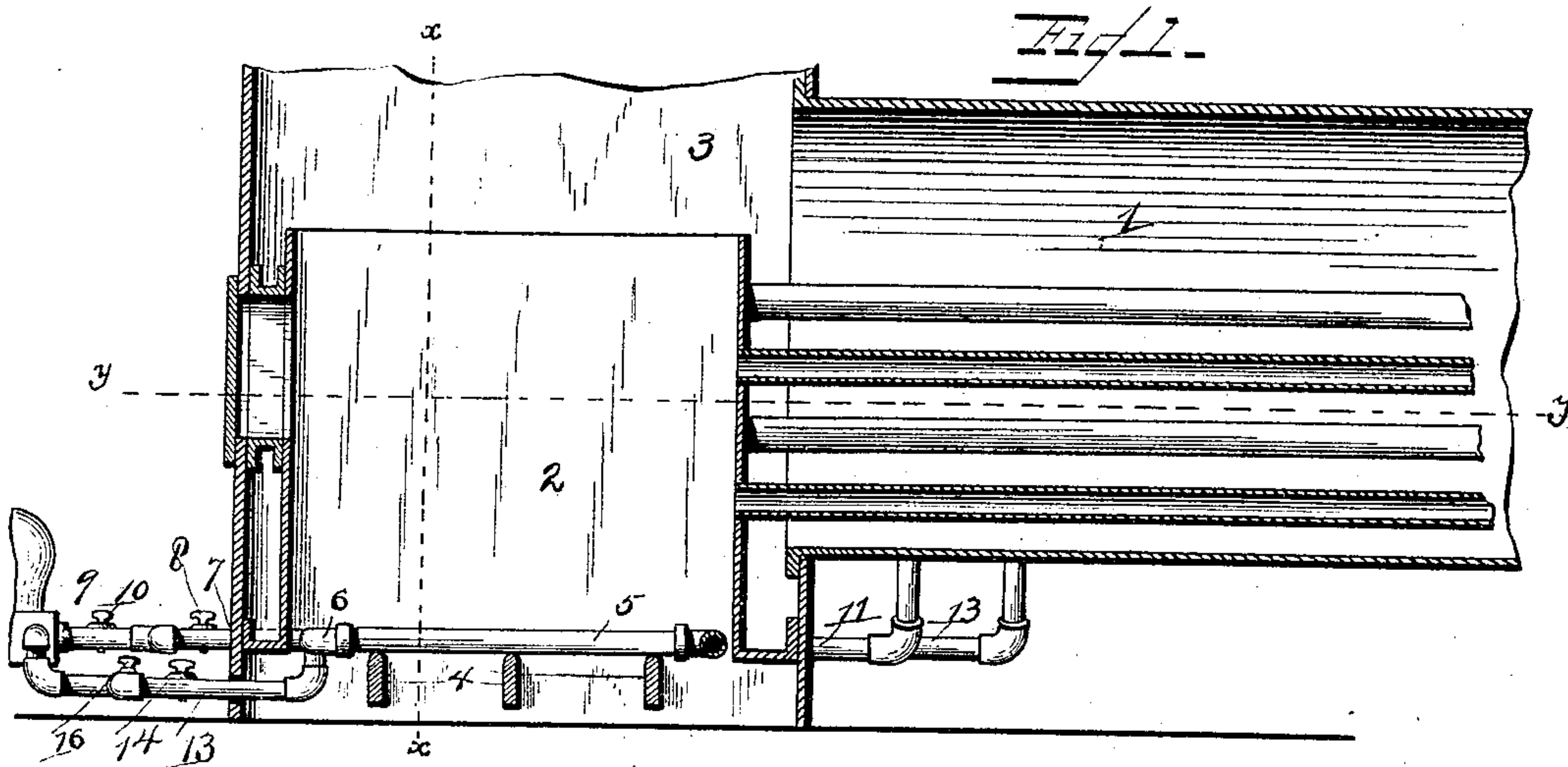
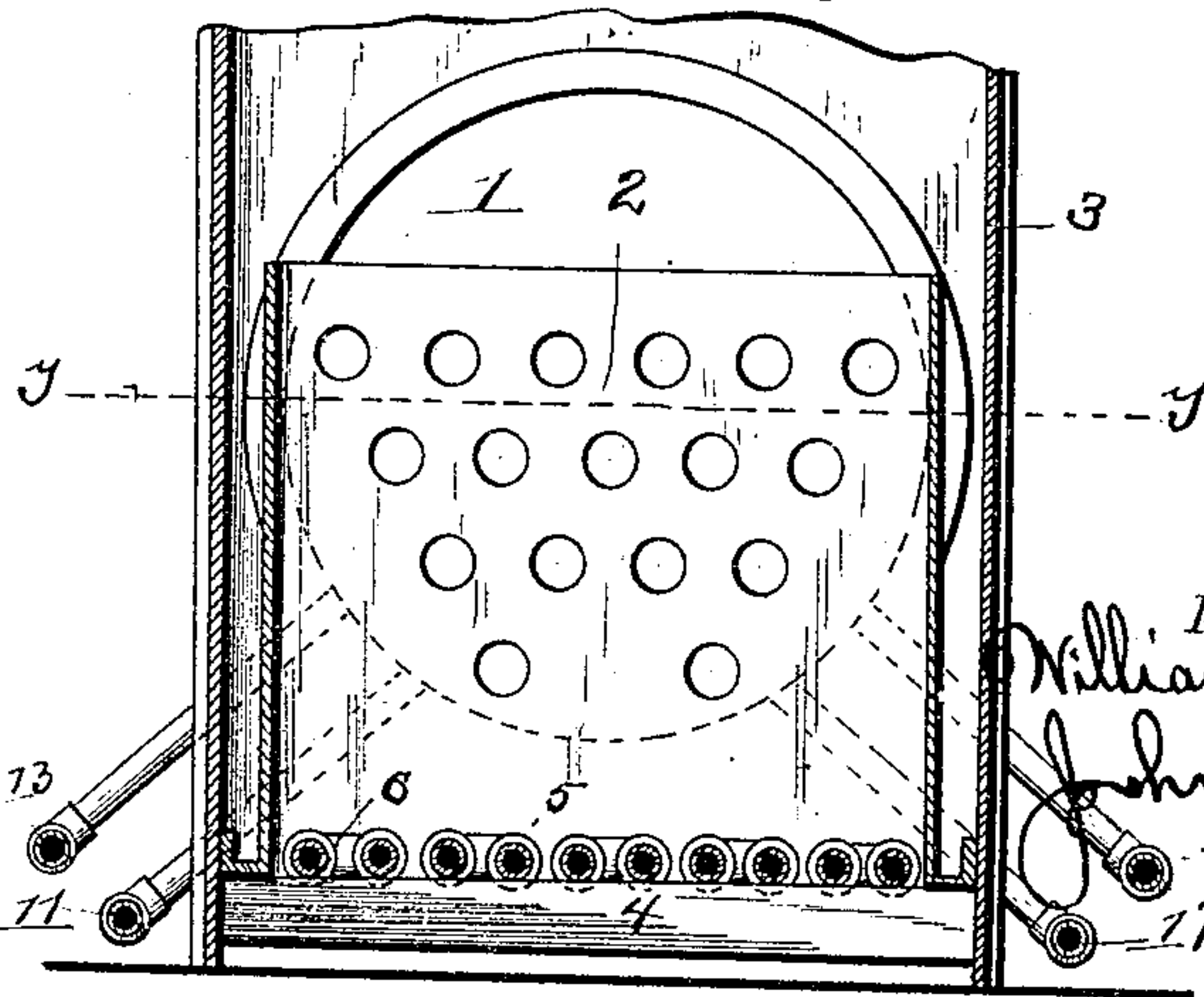


Fig. 2.



WITNESSES.

J. S. Cour.

Howell Bartle.

INVENTOR.

William J. King.

Johnson & Johnson

his Attorneys.

UNITED STATES PATENT OFFICE.

WILLIAM JESSEE KING, OF BUCHANAN, TENNESSEE, ASSIGNOR OF TWO-THIRDS TO CARROLD LAFAYETTE ETHERIDGE AND THOMAS HARDEN WHITLOCK, BOTH OF SAME PLACE.

HOLLOW GRATE AND FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 379,790, dated March 20, 1888.

Application filed December 23, 1887. Serial No. 258,783. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM JESSEE KING, a citizen of the United States, residing at Buchanan, in the county of Henry and State of Tennessee, have invented new and useful Improvements in a Hollow Grate and Feed-Water Heater, of which the following is a specification.

This invention has relation to combined water-grates and feed-water heaters; and it has for its objects to provide such a grate in which the water may either pass through the hollow grate-bars or pipes from the pump, inspirator, or other means for forcing the feed-water into the boiler, or may circulate from the boiler through the hollow grate-bars or pipes back into the boiler, and to provide means whereby the central bars or pipes of the grate may be kept filled with water in spite of the greater heat and consequent greater generation of steam in these bars or pipes than in the side bars or pipes, and to provide a strong support for the tubular grate bars or pipes, as will hereinafter be more fully set forth, and pointed out in the claims.

In the drawings, Figure 1 is a longitudinal vertical sectional view of so much of a steam-boiler as illustrates my invention. Fig. 2 is a transverse vertical sectional view taken on line *xx*, Fig. 1; and Fig. 3 is a horizontal sectional view taken on lines *yy*, Figs. 1 and 2, giving a diagram of the entire system of grate bars or pipes and of the various pipes and cocks connected to them.

The boiler is indicated by the numeral 1 and the furnace by the numeral 2, and these parts, as well as the jacket 3, may be of any suitable construction.

Under the furnace are secured transversely a number of grate-supporting bars, 4, upon which the pipes 5 or tubular grate-bars are supported, the said pipes or tubular grate-bars being preferably arranged in the same manner as the pipes of a steam-radiator, consisting of the straight pipes and the elbows or joints 6, which unite the ends of the same.

One of the side bars or pipes is extended out through the jacket of the furnace, as shown at 7, and is provided with a stop-cock, 8, and a pump or inspirator, 9, is connected to this

pipe with its discharge-pipe, upon which is a stop-cock, 10, the end of another pipe, 11, which is likewise provided with a stop-cock, 12, being connected to the discharge of the pump or inspirator and extending to the boiler, which it enters.

Two pipes, 13, extend through the front of the furnace and jacket to the boiler, having stop-cocks 14 upon them, and the other side bar or pipe is provided with an extension, 15, which has a T-joint secured to its end, which is provided with stop-cocks 16 at each side of the pipe extension, one of the stop-cocks at the open branch of the pipe serving as a blow-off cock, while the other cock serves to close a pipe, 17, extending to the boiler.

When the boiler is to be fed with cold water, the stop-cock 8 upon the side pipe is closed and the pump or inspirator is operated, the cock upon the discharge-pipe and the cock 12 upon the pipe leading into the boiler being opened, and cold water may thus be fed into the boiler.

When the fire in the furnace is burning and the boiler-grate is to be fed, the cock 12 upon the pipe leading into the boiler is closed and the discharge-pipe and the extension of the side pipe are opened, so that the water pumped into the pipe extension may pass through the same and through the entire grate formed by the pipes, the stop-cocks 14 upon the extensions 13, extending from the central coils of the grate, being closed, so that the water will pass through the grate and into the boiler by the pipe at the other side pipe, the blow-off cock being closed and the cock of the boiler-pipe being opened.

It will be seen that by having the feed-water thus circulating through the tubular grate bars or pipes it will serve to keep the said bars or pipes cool, and at the same time be sufficiently heated to generate steam when it enters the boiler, the grate thus effecting a saving in fuel by heating the feed-water on its passage to the boiler without consuming any more fuel than would be used for heating the water in the boiler if it was forced into the boiler heated from an outside source to the same degree as the water coming from the grate.

When the boiler has been sufficiently sup- 100

plied with water, the pumping is stopped and the stop-cock of the pump or inspirator is closed and the stop-cocks of the central pipes are opened, when it will be seen that the water from the boiler will pass through the grate, through the pipes extending from the boiler to the central coils, and back to the boiler through the side pipes and their connecting-pipes, the water thus serving to prevent burning of the tubular grate bars or pipes and at the same time being heated.

The central coils are provided with the pipes to the boiler for the purpose of keeping them filled with water, as the intense heat at the center of the furnace would otherwise convert the water in the central pipes to steam, and consequently injure the pipes if the side pipes were only relied upon to supply and carry off the water to and from the grate.

As the grate will by its construction receive water at the center, where the heat is most intense, and deliver the water to the boiler either at one or both sides, the pipes of the grate will at all times be full and will thus prevent the fire from injuring them as rapidly as it would if the water was allowed to pass through the entire grate from one side to the other, as in such a case the water would be converted into steam and would not be able to preserve the pipes from burning.

By having the supporting-bars secured transversely under the grate-pipes, the grate is enabled to bear the weight of the fuel upon it, and at the same time the pipes resting loosely upon the transverse bars may expand and contract as they are heated or cooled off without any hinderance, so that they will at all times retain their relative positions without doubling or bending or straining their connection with the boiler.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States—

1. The grate-pipes 5, supported freely upon the fixed cross-bars 4 within the furnace. 2, the end branches of said pipes connecting with the boiler outside of the furnace by the pipes 11 and 17, and the middle grate-pipes connecting with the boiler outside of the furnace by the pipes 13, whereby the expansion and contraction of the grate-pipes are relieved from undue strain at their connection with the boiler, as herein set forth.

2. In a boiler-furnace, a water-grate and feed-water heater consisting of a flat grate of parallel pipes connected at their ends by suitable joints and having an inlet at one end and an outlet at the other end and provided with inlets at the middle coils, as shown and set forth.

3. In a boiler-furnace, the combination of the transverse supporting-bars in the bottom of the furnace, parallel longitudinal pipes supported upon the bars and connected at their ends to form a flat coil, a pump or inspirator having a stop-cock upon its pipe and communicating with a pipe extension at one end of the pipe-coil, having a stop-cock and with a pipe extending to the boiler and provided with a stop-cock, pipes having stop-cocks and extending from the boiler to the middle coils of the grate, and a pipe extending from the other end of the pipe-coil to the boiler, provided with a stop-cock and with a blow-off cock, as shown and described.

WILLIAM JESSEE KING.

Witnesses:

C. V. BURTON,
R. B. FIELDS.