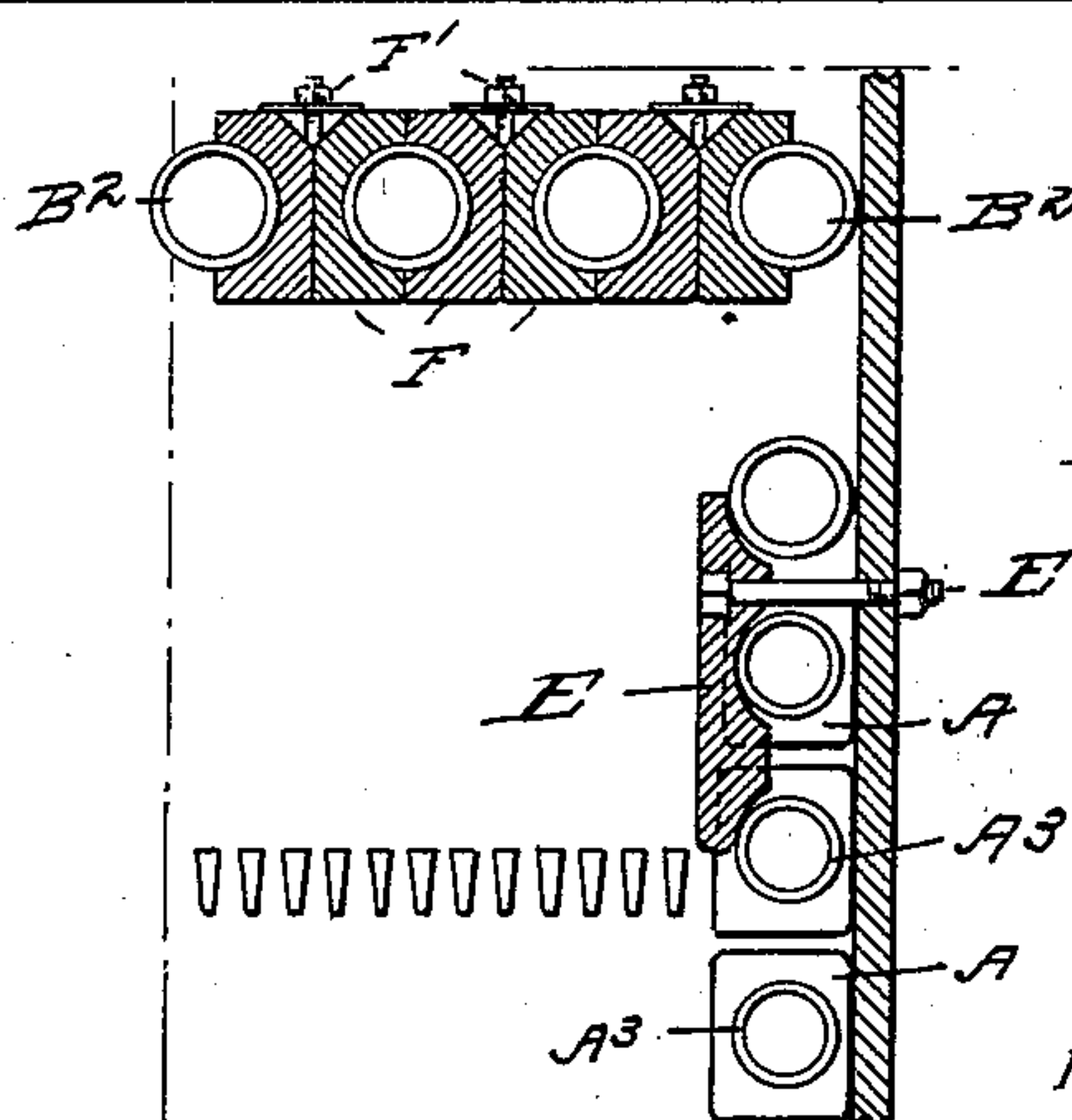
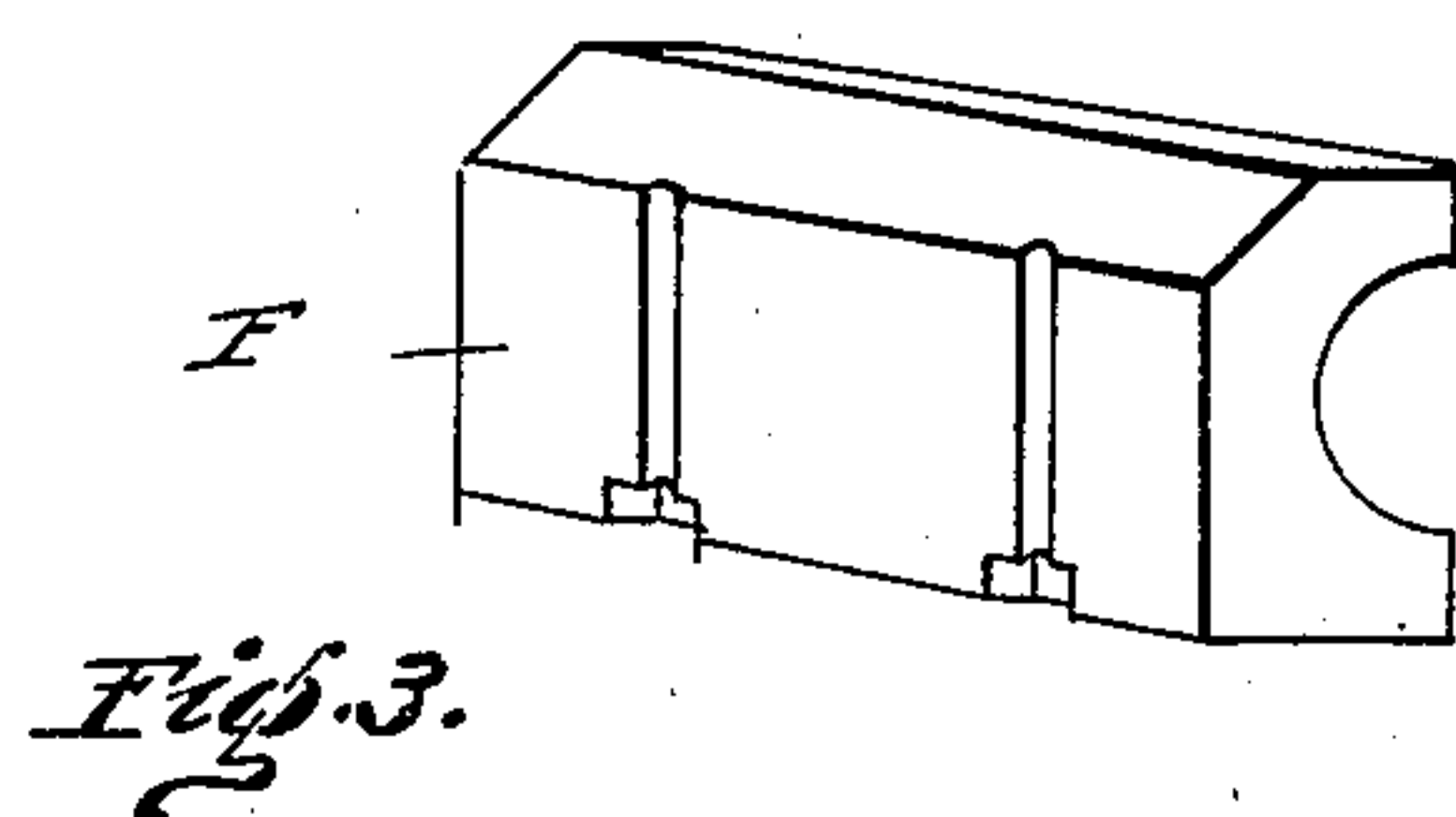
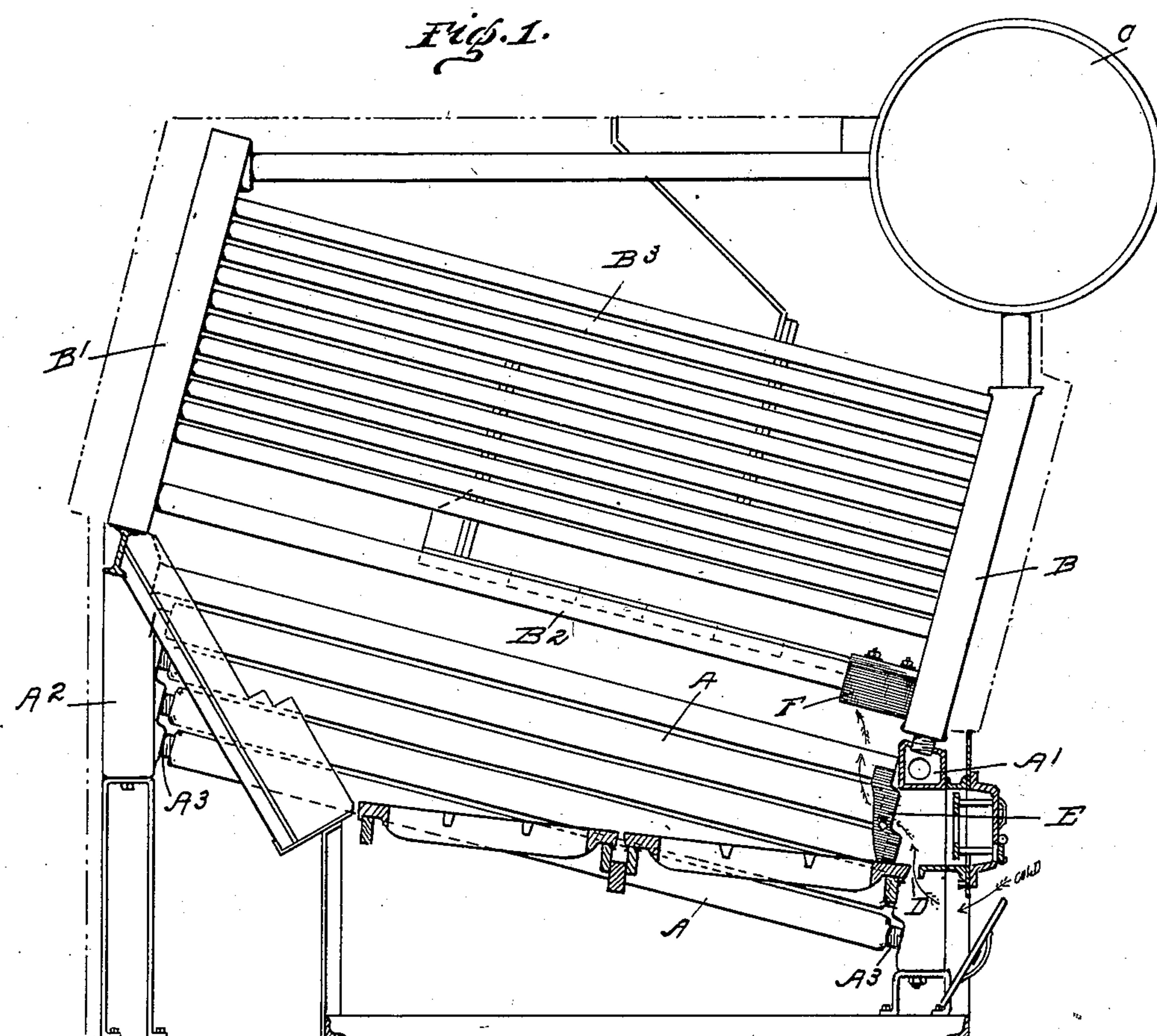


No. 730,765.

PATENTED JUNE 9, 1903.

G. HANSEN.  
WATER TUBE BOILER.  
APPLICATION FILED OCT. 28, 1902.

NO MODEL.



WITNESSES:

M. N. H. Huler

A. L. Doyle.

INVENTOR.

BY GUNDEL HANSEN  
Murdock, Talcott & Co.  
ATTORNEYS.



# UNITED STATES PATENT OFFICE.

GUNDER HANSEN, OF SAN FRANCISCO, CALIFORNIA.

## WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 730,765, dated June 9, 1903.

Application filed October 28, 1902. Serial No. 129,150. (No model.)

*To all whom it may concern:*

Be it known that I, GUNDER HANSEN, a citizen of the United States, residing at 154 Hawthorn street, in the city of San Francisco, county of San Francisco, and State of California, have invented certain new and useful Improvements in Water-Tube Boilers; and I do hereby declare the following to be a full, clear, and exact description of the said invention, such as will enable others skilled in the art to which it most nearly appertains to make, use, and practice the same.

This invention relates to improvements in water-tube boilers, particularly to the protection of the tube-joints therein subjected to the strains of expansion and contraction due to the changes of temperature within the furnace.

All water-tube boilers wherein the water circulates through a mass of tubes extending between hollow heads are subject to the great disadvantage of leakage at the joint of the tube with the head. This weak feature in many instances more than offsets the many advantages of this type of boiler. These leaks invariably occur near the furnace-doors. This is due to the cold air rushing in when the doors are open for stoking, chilling the tubes and causing contraction sufficient to open the joint between the tube and the head. The corrosive action of the water escaping through the leak in the influence of intense heat, together with the internal pressure, soon cripples the whole boiler. The average life of a set of tubes in the boiler upon which I have experimented has heretofore been about seven months. Since the application of this invention, the tubes have stood constant work for nearly a year without appreciable deterioration.

The object of this invention is to protect the tube-joints from thermal changes producing expansion and contraction.

The invention consists, broadly, of a fire-resisting substance outlined to conform to the contour of the joints of the tubes with the head, into which they are set, whereby the joint is protected from the direct heat of the furnace and the chilling-drafts entering the furnace.

In the drawings, Figure 1 is a side elevation, partly in cross-section, of a marine boiler of

the water-tube type, showing the application of this invention. Fig. 2 is a front elevation in cross-section of one side of the furnace above the grate-bars, showing the circulation-tubes forming the side of the furnace and a few tubes in the first tier of the boiler with this invention applied thereto. Fig. 3 is an isometrical perspective of one of the bricks for protection of the horizontal tubes, showing the recess for the attaching-bolt.

The same general principles enter into the construction of all water-tube boilers and all are more or less subject to the disadvantage which it is the object of this invention to overcome.

As illustrated, the furnace is provided with the usual grate-bars, bridge-wall, and stoke-doors, the sides being formed by the drums A, attached to the standing drums A' A<sup>2</sup> by the nipples A<sup>3</sup>, front and back, respectively. From these drums the water circulates upward into the hollow heads B and B', between which the tier of tubes B<sup>2</sup>, forming the top of the furnace, and the mass of tubes B<sup>3</sup> extend around, and between which the products of combustion are caused to circulate before escaping through the smoke-stack. Under the influence of the accumulating pressure in the steam-drum C and the evaporation of the water a constant circulation within the boiler is maintained. The joint of the tubes with their various coöperative members being the weakest point in the structure, the forces of destruction culminate at this point, particularly in the locations of fluctuating temperature. For instance, in the front of the furnace, in the path of the cold air entering through the furnace-doors and through the dead-rise D, the nipples A<sup>3</sup> and joints of the tubes B<sup>2</sup> with the head B give constant trouble. This is due to the fact that the tubes become heated and expanded by the furnace-fires and then chilled and contracted by the cold drafts as the damper is changed or the doors opened. This constant expansion and contraction must result in opening the joint, with its obvious consequences. These consequences are entirely obviated by the operation of this invention, which consists of protecting the nipples A<sup>3</sup> by the member E, (preferably cast-iron,) which conforms to the outline of the joint and is held in place by



the bolt E' passing through the side of the furnace. The member E serves the double purpose of protecting the joint from the corrosive action of the fire and by reason of its mass becoming heated maintains an even temperature at this point during the interval that the door may be open. These same results are accomplished by the members F, which being located in a higher temperature are preferably molded of fire-brick in sections of suitable form to allow of their convenient application to the joint. In this instance they are held in pairs between the tubes by the bolts F'. Obviously the exact form will vary with the type of boiler or its location therein. It has proven unnecessary to protect the joints not subjected to cold drafts, because the expansion and contraction therein are practically *nil*.

Having determined that it is the expansion and contraction in the joints of water-tube boilers that cause them to leak, and having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a water-tube boiler, the combination with a casing, drums located therein, and boiler-tubes connected to said drums by nipples, of a covering member conforming to the shapes of said tubes and nipples, and means for securing said covering member around said nipples and the adjacent ends of said tubes, as set forth.

2. In a water-tube boiler, means for protecting the joints therein from abnormal thermal fluctuations, comprising a covering member formed in sections and having portions conforming to the shape of said joints, and bolts interposed between the meeting faces of said sections, said meeting faces being channeled or recessed to receive said bolts, as set forth.

In testimony whereof I have hereunto set my hand this 30th day of September, 1902.

GUNDER HANSEN.

Witnesses:

BALDWIN VALE,  
G. F. HATTON.