

No. 860,077.

PATENTED JULY 16, 1907.

H. H. BENN.
BOILER FURNACE.
APPLICATION FILED SEPT. 28, 1906.

3 SHEETS—SHEET 1.

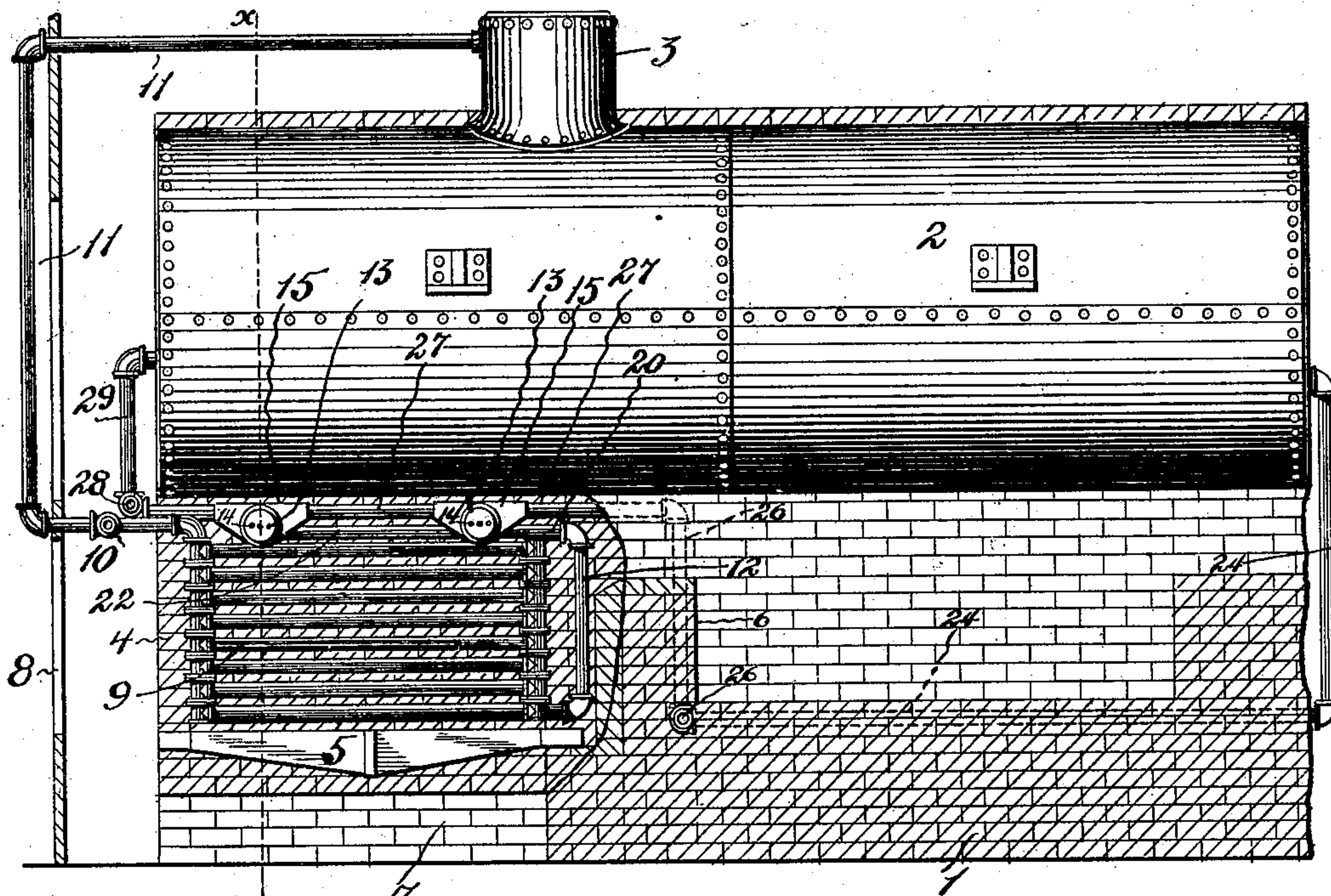


Fig. 1.

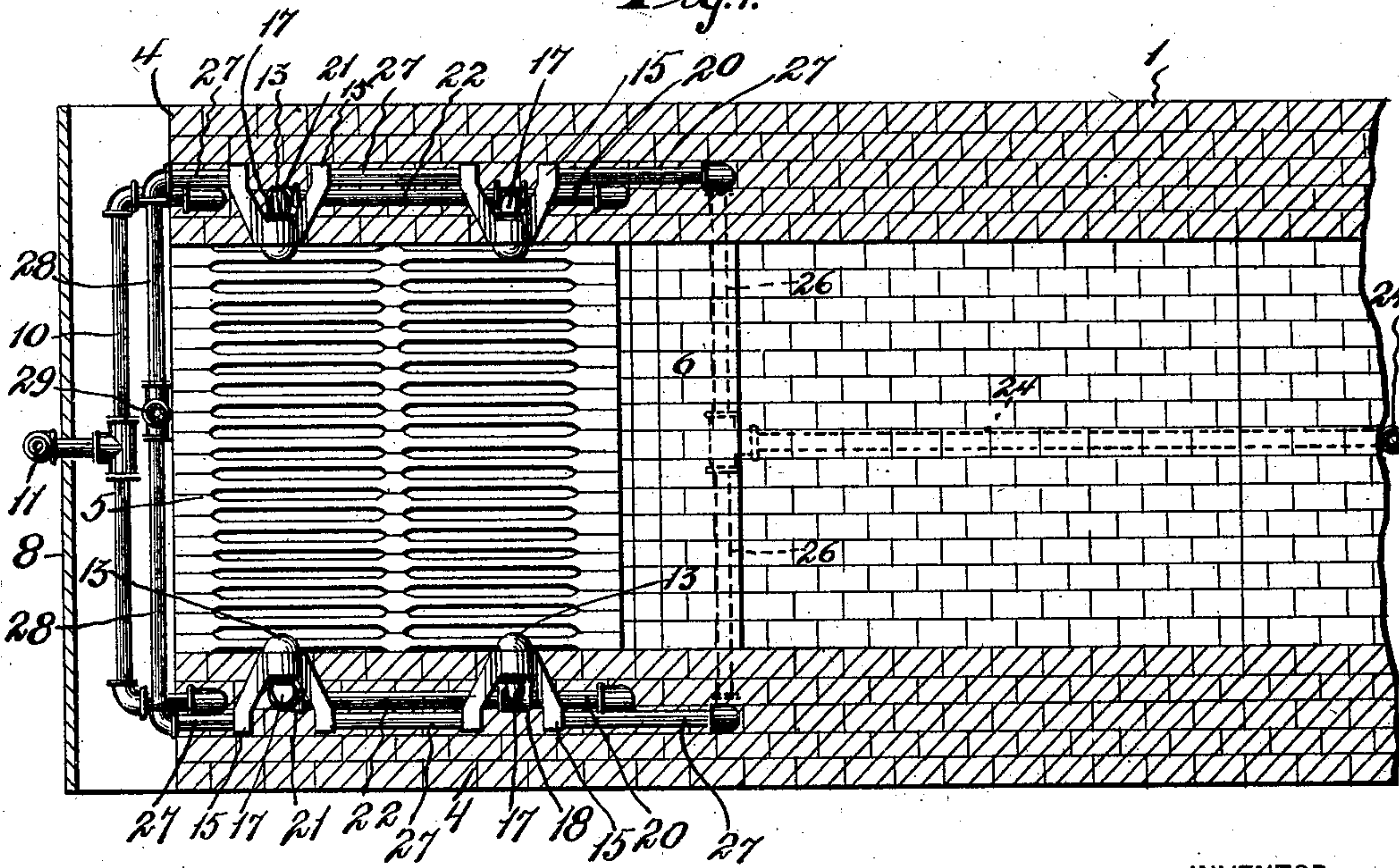


Fig. 2.

WITNESSES

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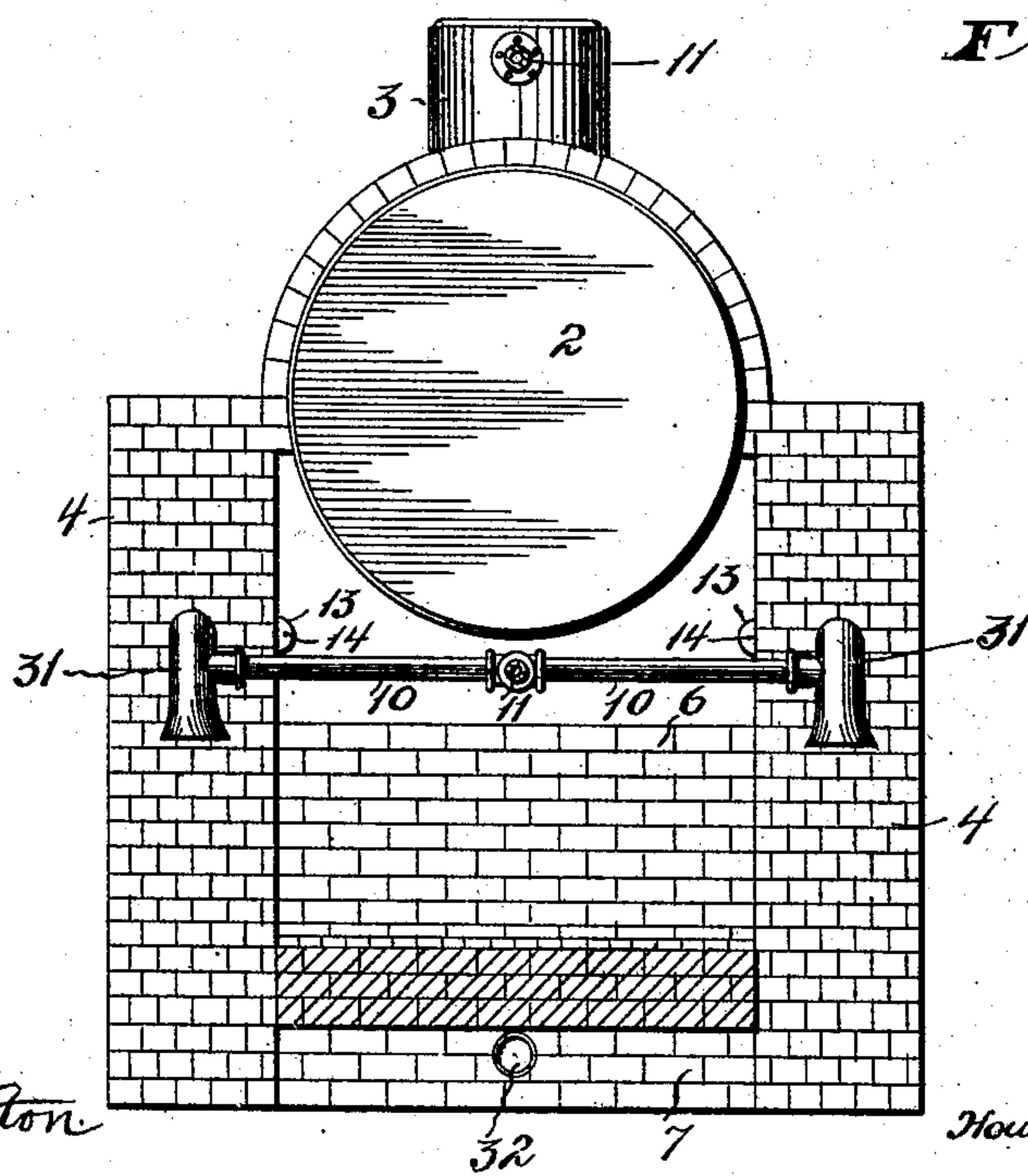
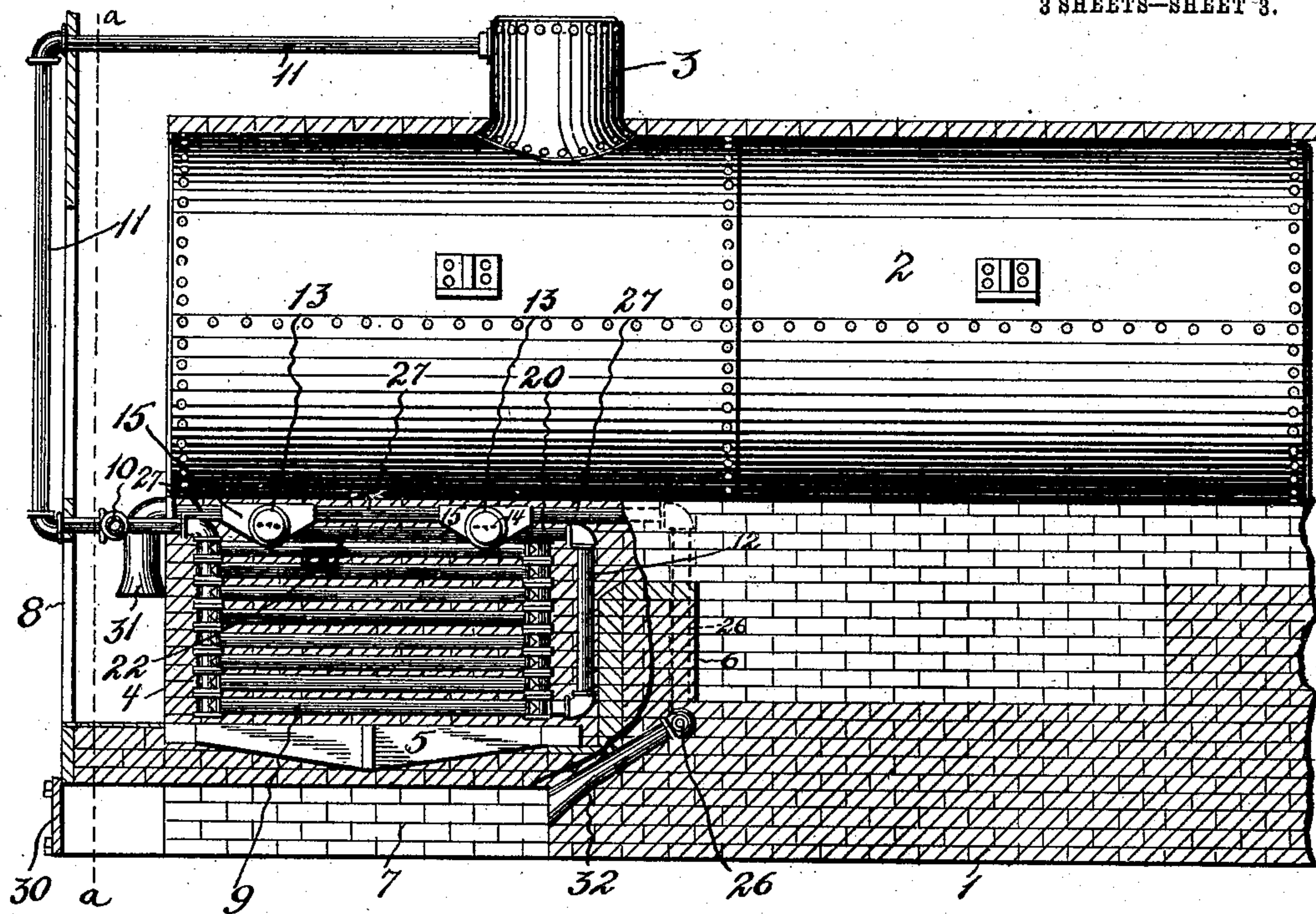
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WITNESSES

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UNITED STATES PATENT OFFICE.

HOWARD H. BENN, OF COLUMBUS, OHIO, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF FORTY-FIVE ONE-HUNDREDTHS TO WILLIAM TURPIE, OF COLUMBUS, OHIO, AND FRANCIS B. DE WITT, OF AU GRES, MICHIGAN.

BOILER-FURNACE.

No. 860,077.

Specification of Letters Patent.

Patented July 16, 1907.

Application filed September 28, 1906. Serial No. 336,554.

To all whom it may concern,

Be it known that I, HOWARD H. BENN, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Boiler-Furnaces, of which the following is a specification.

My invention relates to new and useful improvements in boiler furnaces.

The object of the invention is to provide suitable mechanism for causing a complete combustion of the products in the fire chamber and thus to a certain extent consuming the smoke arising therefrom.

Another feature resides in carrying out this operation without introducing undesirable gases or chilling the fire, which occurs where air from the boiler room is directed on or over the fire.

Finally the object of the invention is to provide a device of the character described that will be strong, durable and efficient and one in which the several parts will not be liable to get out of working order.

With the above and other objects in view, the invention consists of the novel details of construction and operation, a preferable embodiment of which is described in the specification and illustrated in the accompanying drawings, wherein:

Figure 1 is a longitudinal vertical sectional view of a boiler furnace, showing a portion of one of the walls of the fire box broken away to show the superheating coil and the steam nozzles, Fig. 2 is a longitudinal cross sectional view, Fig. 3 is a transverse vertical sectional view taken on the line *x x* of Fig. 1, Fig. 4 is a vertical central sectional view of one of the nozzles, Fig. 5 is a horizontal cross sectional view of the same taken on the line *y y* of Fig. 4, Fig. 6 is a longitudinal vertical sectional view similar to Fig. 1, and showing a slightly modified form, and, Fig. 7 is a transverse vertical sectional view taken on the line *a a* of Fig. 6.

In the drawings the numeral 1 designates the boiler furnace, 2 a suitable boiler, 3 the steam dome of the same, 4 the side walls of the fire box, 5 the grate, 6 the bridge wall and 7 the ash pit. These parts together with the boiler front 8 are of the usual construction, so that in applying my invention it is unnecessary to make any radical changes in the construction of the boiler furnace.

In each of the side walls 4 of the fire box, a suitable steam superheating coil 9 is vertically arranged, the said coil being suitably connected at its upper end to a transversely extending steam branch pipe 10, the latter having connection by a steam pipe 11 with the steam dome 3. The steam pipe 11 is preferably connected with the branch pipe 10 centrally of its length, so that a single pipe from the dome will supply steam to the

coils 9 on each side of the fire box. Each of the coils are connected at their lower and rear ends with vertically extending pipes 12 which serve to convey the superheated steam to the nozzles 13. These nozzles preferably are arranged two in each side wall 4 and disposed horizontally near the front and rear portions of the fire box as clearly illustrated in the drawings. As illustrated more clearly in Figs. 4 and 5, the nozzles 13 are tubular in form and provided with a plurality of spray openings 14 at their closed ends. Each nozzle is externally screw threaded, so as to be passed through the walls of a horizontally disposed hollow nozzle casing 15. These casings are substantially V-shaped in cross section and each is disposed with its face or exposed portion substantially flush with the inner side of the side wall 4. As shown in Figs. 4 and 5 the casing provides a space surrounding the nozzle and by introducing a suitable cooling agent into the casing the nozzle is cooled to a certain extent and prevented from burning out. The rear end of each nozzle is internally screw threaded to receive a threaded thimble 16, which latter is screwed into an elbow 17 directed downwardly and standing in the open portion of the casing. The rear-most nozzles or those nearest the bridge wall 6 have their elbows 17 connected to T-couplings 18 by short vertically disposed thimbles 19. Each of the T-couplings is connected to the vertical pipe 12 extending from the coil by a horizontally extending pipe 20, while the elbows 17 of the forward nozzles are suitably connected to elbows 21 each arranged on the end of a horizontal pipe 22 extending from the couplings 18. In this way the steam is supplied to the nozzles after having passed through the superheating coils and sprayed on to the fire in a comparatively dry state. This spraying of the steam on to the fire liberates certain gases and causes the combustion of others, whereby the smoke arising from the fire is consumed by the proper combustion of the products and burning of the gases.

If some means were not provided for cooling the nozzles, the intense heat from the fire would soon burn them out. Several methods have been used for cooling the nozzles and surrounding parts, the most common of which is to circulate a cooling agent about the nozzles. However, it has been the custom to admit this cooling agent into the fire box, together with the superheated steam, over the fire. Where air is used and admitted over the fire bed, it has a tendency to cool the same, especially when it is considered that if taken from the boiler room, the temperature will be from 80 to 90 degrees. Of course air at this temperature or even a higher temperature ejected on to a bed of fire having a temperature of from 2,000 to 3,000 de-

grees, would almost surely tend to cool the fire and have a detrimental effect.

In my drawings I have shown two characters of cooling agents, which, however, are applied in the same manner, the principle being to conduct the cooling agents through the nozzle casings and about the nozzles without bringing the same in contact with the superheated steam or permitting any portion of it to enter the fire box above the fire. In the first case, as illustrated in Figs. 1 to 3, inclusive, a suitable pipe 24 conveys water from the boiler 2 below the water line down and through the masonry of the boiler furnace to the bridge wall 6, as clearly shown in full and dotted lines in Figs. 1 and 2. The pipe 24 has connection with horizontally disposed branch pipes 26 extending to each side through the base of the bridge wall. The pipes 26 are also extended upwardly through the side walls of the furnace to horizontal forwardly extending pipes 27 to which the nozzle casings 15 are connected, so that the water from the boiler passes through the pipes 24, 26 and 27 and in passing through the pipes 27 circulates through the casings 15 about the nozzles 13 cooling the same to such an extent as to prevent burning. At their forward ends the pipes 27 are connected to transversely extending branch pipes 28 which communicate with a vertically extending pipe 29 entering the boiler below the water level and permitting the water to circulate as described.

In Figs. 6 and 7, I have shown a slightly modified construction in which air is employed. In carrying out this form, the ash pit 7 is closed by a door 30 so as to prevent air from the boiler room passing into the same. At the forward ends of the pipes 27 downwardly curved air admitting funnels 31 are arranged back of the boiler front 8 and on the vertical faces of the side walls 4 and in lieu of the pipes 24 a downwardly extending flaring pipe 32 is provided. This

pipe 32 is connected to the pipes 26 centrally thereof at the base of the bridge wall 6, while its lower flaring end opens into the ash pit 7. By this arrangement air entering the boiler front is drawn in through the funnels 31 to the pipes 27, thereby passing through the nozzle casings about the nozzles and cooling the same. The air in so passing is heated and travels through the pipes 26 to the pipe 32 into the ash pit, from which it passes up through the grate 5 properly heated and supplying the proper draft and air to the fire.

It is to be observed that in both cases the cooling agent while freely circulating through the nozzle casings and about the nozzles, is prevented from coming in contact with the superheated steam or the fire from above.

What I claim, is:

1. In a boiler furnace, the combination with a steam super-heating coil arranged in the wall of the furnace, of nozzles having connection with the coil for directing sprays of super-heated steam upon the fire, said nozzles projecting through the wall of the furnace and entirely filling the openings through which they project, casings partially surrounding said nozzles, and an air supply pipe leading to said casings, said air supply pipe being open at one end to the atmosphere and open at the other end to the ash pit of the furnace.

2. A spraying device for boiler furnaces, comprising a hollow closed casing which consists of a body portion and two leg portions, means for conducting a cooling agent to one of the leg portions and from the other of said leg portions, a nozzle which passes through the body portion and has jet openings formed therein upon the exterior of said body portion, and a steam connection for said nozzle which lies between the two leg portions of the spraying device.

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

HOWARD H. BENN.

Witnesses:

FRANK G. CAMPBELL,
CARL STOUGHTON.