

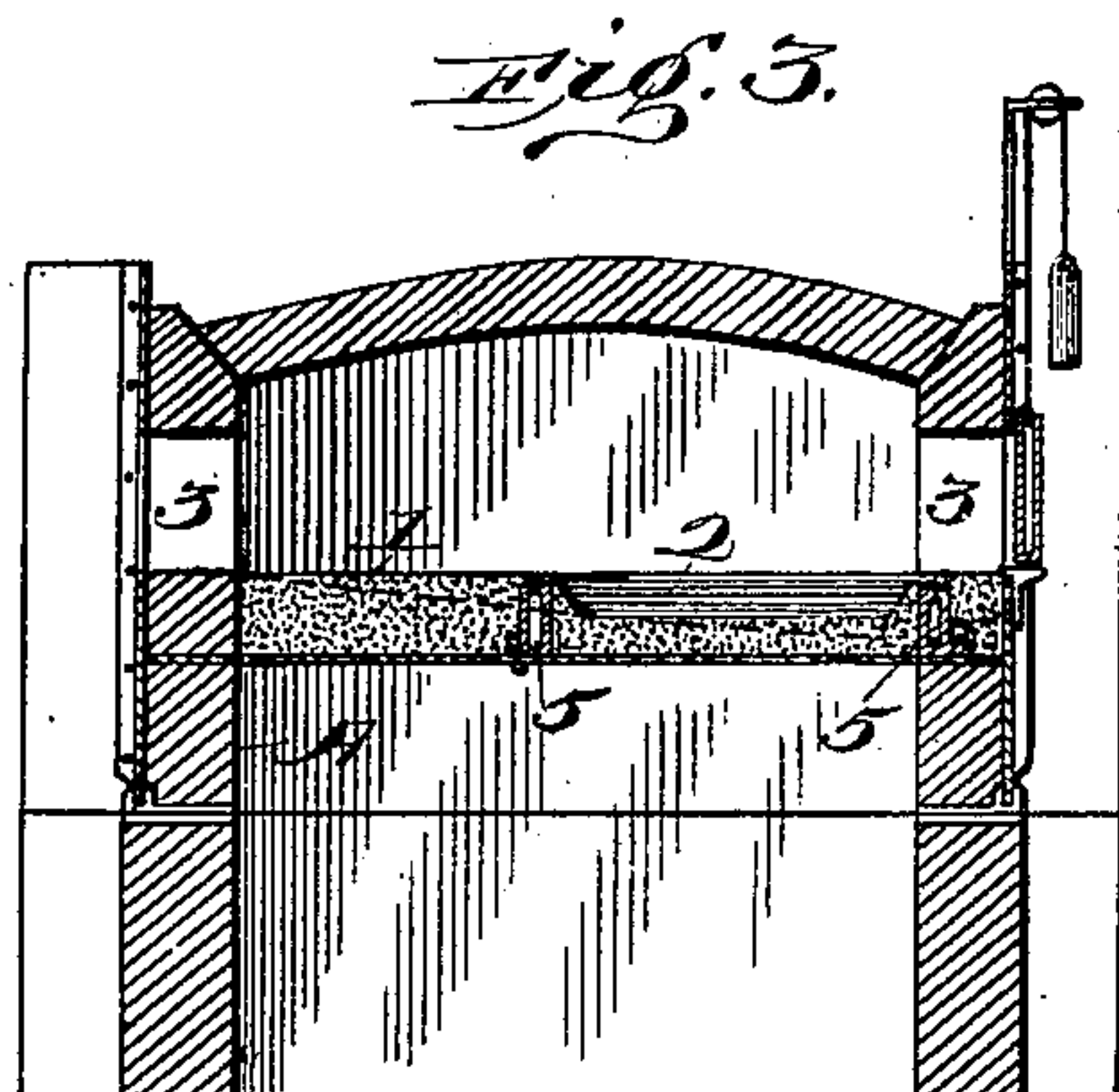
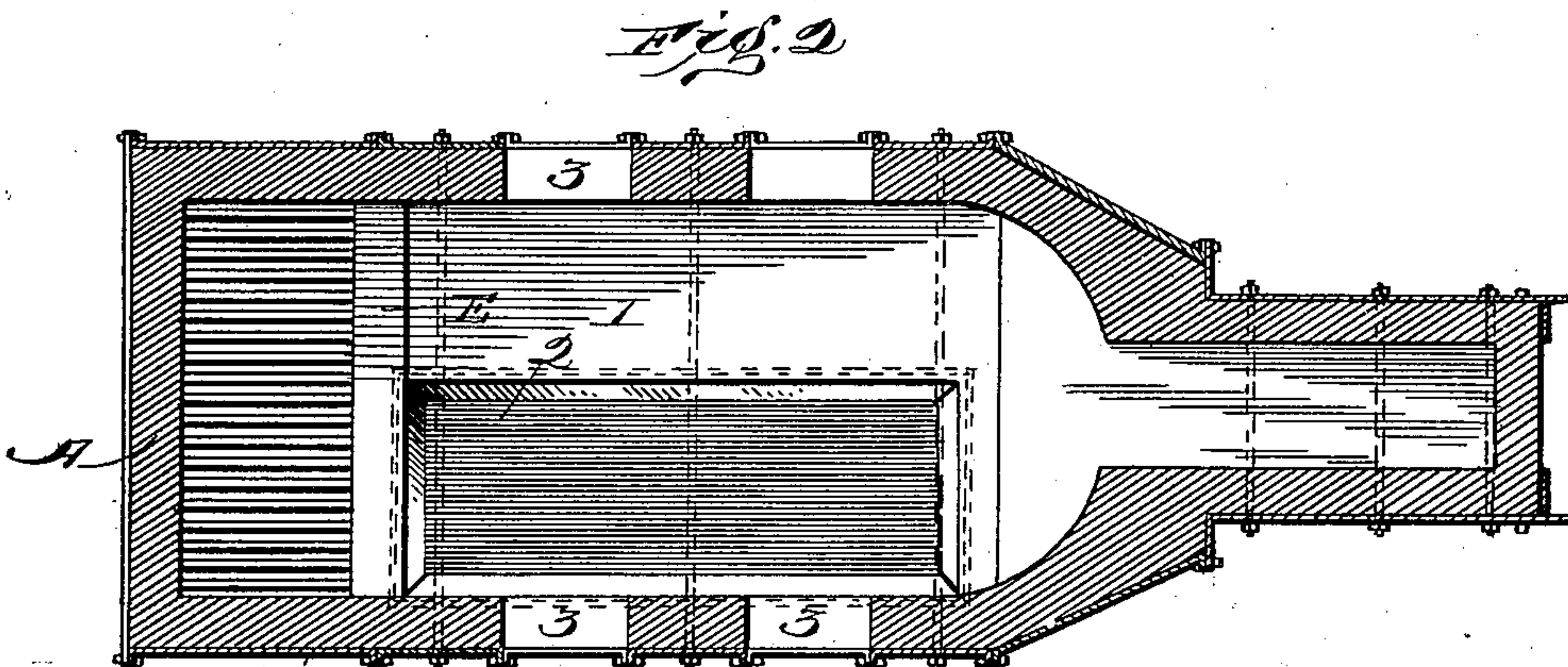
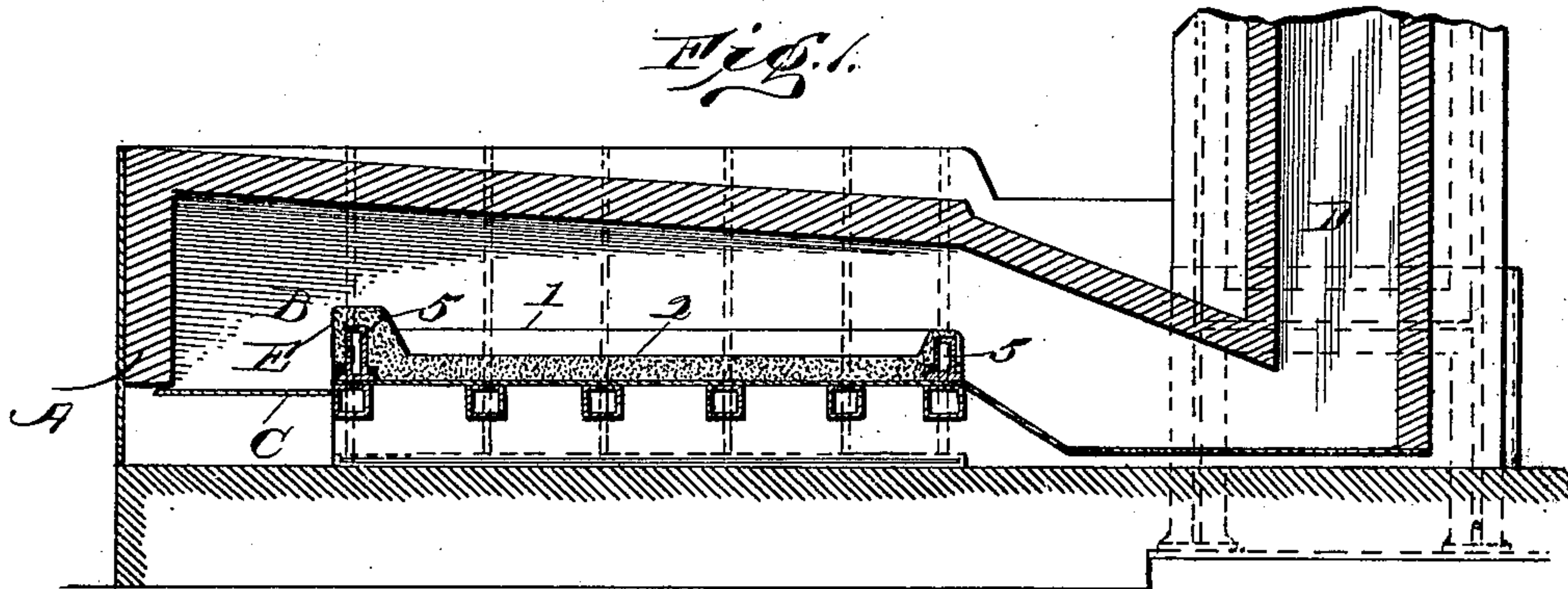
No. 665,851.

Patented Jan. 8, 1901.

J. F. BROADBENT.  
FURNACE.

(Application filed June 15, 1898.)

(No Model.)



Witnesses:  
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# UNITED STATES PATENT OFFICE.

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## FURNACE.

SPECIFICATION forming part of Letters Patent No. 665,851, dated January 8, 1901.

Application filed June 15, 1898. Serial No. 683,535. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN FRANKLIN BROADBENT, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Furnaces; and I do 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 the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to an improvement in metallurgical furnaces, and to that particular class commonly known as "reheating-furnaces." Heretofore furnaces of this character have generally had either a shallow basin, such as used in puddling-furnaces and open-hearth steel-melting furnaces, or they have been nearly level, but sloping gradually from door to back and from fire-bridge to the flue end in order to let the cinder flow to a common point, so that it can be tapped out when necessary.

My present invention is primarily designed for the working of steel scrap or similar material by what is known as the "bath" process; and it consists in a furnace having a heating-surface and a bath adjacent thereto, one being slightly elevated above the other. The basin in which the bath is held is preferably filled with some suitable mixture of furnace or mill cinder and various chemicals, and the mixture is kept in a fluid state. The steel or steel-scrap is charged on the more elevated portion, preferably from one side of the furnace, and heated to a bright-red heat and then drawn, pushed, or carried into the molten bath and allowed to remain there until the operator is satisfied that it has been sufficiently treated or decarbonized to aid the welding of said steel or iron, when it is removed, preferably from the other side of the furnace, to the rolls or hammers.

It further consists in certain novel features of construction and combinations of parts, which will hereinafter be described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a longitudinal sectional view. Fig. 2 is a horizontal section, and Fig. 3 is a transverse section.

A represents the wall of the furnace; B, the combustion-chamber; C, the grate; D, the flue, and E the forward bridge-wall.

The numeral 1 indicates the hearth, which extends approximately the length of the furnace, and 2 indicates a basin extending along-side the hearth, preferably parallel therewith. By this arrangement the products of combustion have a full sweep from the bridge-wall lengthwise of the hearth and basin to the flue D at the opposite or rear end. The hearth 1, it will be observed, is on a plane more or less above the basin, and it may be approximately level or have a slight gradual slope and merge into the basin, as preferred. On each side of the furnace doors 3 3 are preferably provided, they being arranged usually in corresponding positions on opposite sides. The object of these doors is for the insertion and removal of the material being treated at points out of the direct passage of the products of combustion. The steel, iron, or whatever the material treated may be is placed upon the hearth by the operator and heated, as explained, to a red heat, after which it is pushed into the bath located at the side of the hearth. The advantage of locating the hearth and basin side by side rather than end to end, as heretofore, resides in the fact that by means of this arrangement access can more easily be had to both the hearth and basin at the same time through a single opening in the side than in the former arrangement of furnaces in the prior art, where it was difficult, if not absolutely impossible, to gain access to both hearth and basin from one end. Thus by means of my improvement material from the hearth may be slid therefrom into the basin or raised from the basin to the hearth by an operator stationed at one side or the other of the furnace by a direct pull or push upon the material being treated without interfering with or getting into the direct path of the products of combustion. Here it is retained immersed in the molten mass until it becomes decarbonized, or sufficiently so to



increase the welding properties of said steel or iron, after which it may be removed by operators through the doors on the opposite side of the furnace, and another charge, which  
 5 meanwhile has been treated on the hearth, is dropped into the bath, and so the process continues with the least interruption possible and the utmost economy of time and space. Thus it will be seen that the main thing is to  
 10 maintain an approximately level or slightly-sloping heating-surface and a fluid bath in one and the same furnace in proximity to each other.

The basis of the bath is composed either of  
 15 slag or cinder, the earths or refuse from the process of changing cast-iron to wrought-iron by puddling, or the refuse from what is known as the "squeezer," or refuse from rolls, commonly known as "scale." These may be used  
 20 singly or jointly or mixed with small quantities of iron ore, (oxid of iron,) borax, salt, (sodium,) oxid of lead, (litharge,) cryolite, and many other ingredients of more or less or no value. The idea is to restore to the steel  
 25 some of the impurities (earths) that have been extracted from the original metal and to make the outside at least of the nature of wrought-iron when heated—that is, covered with a coating of earths, oxid of iron, &c.—so that dur-  
 30 ing its journey from the furnace this coating, being an oxid, protects the surface of the steel from the air and prevents the formation of almost pure oxid of iron in the shape of scale forming, and when the steel is crushed or  
 35 pressed together in the rolls this coating either flies or crumbles away, leaving the clean surfaces of the steel to meet and unite, or it acts as a sort of cement for welding. Briefly, I  
 40 want to accomplish in large pieces just exactly what a blacksmith does in a small way.

While I have shown and described the hearth and basin located on different levels and extending longitudinally of the furnace, it is evident that the two surfaces might be  
 45 made into one continuous transversely-sloping surface by a slight modification, as shown in dotted lines in Fig. 3, and also that these two surfaces might extend transversely of the bottom of the furnace as well as longitu-  
 50 dinally.

As a means of chilling any of the molten metal or mixture that may tend to leak through the material composing the bottom of the furnace I have provided a water seal

5 around the basin, it being designed to hold 55 running water for the purpose named.

It is evident that slight additional changes other than those alluded to might be made in the form and arrangement of the several parts described without departure from the spirit 60 and scope of my invention as claimed, and hence I do not wish to be limited to the precise construction herein set forth; but

Having thus described my invention, what I claim as new, and desire to secure by Letters 65 Patent, is—

1. A furnace having a combustion-chamber at one end and provided with a hearth and basin lying side by side and over which the products of combustion from the combustion- 70 chamber pass, the hearth lying in a plane above that of the basin whereby material from the hearth may be slid therefrom into the basin or raised from the basin to the hearth by an operator stationed at one side or the other 75 of the furnace, by a direct pull or push upon the material being treated, without being in the direct path of or interfering in any way with the products of combustion and doors opening on the hearth and basin. 80

2. In a furnace, the combination with combustion-chamber and flue located at opposite ends, and side walls having doors at opposite points therein and a bridge-wall adjacent to the combustion-chamber, of a basin and 85 hearth extending longitudinally of the furnace and lying side by side at a point immediately inward from the bridge-wall and between the oppositely-located doors, said basin being on a lower level than the hearth. 90

3. A furnace, the working chamber of which is provided with a hearth and a basin lying side by side the basin and hearth having a water-chamber interposed between them through the longitudinal center of the furnace. 95

4. A furnace, the working chamber of which is composed of a hearth and basin lying side by side, the basin surrounded by a water-chamber, a portion of which extends through the approximate longitudinal center of the 100 chamber beneath the center thereof.

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

JOHN FRANKLIN BROADBENT.

Witnesses:

VERNON E. HODGES,  
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