

(No Model.)

2 Sheets—Sheet 1.

J. B. JOHNSTON.  
WATER TUBE BOILER.

No. 454,215.

Patented June 16, 1891.

Fig. 2.

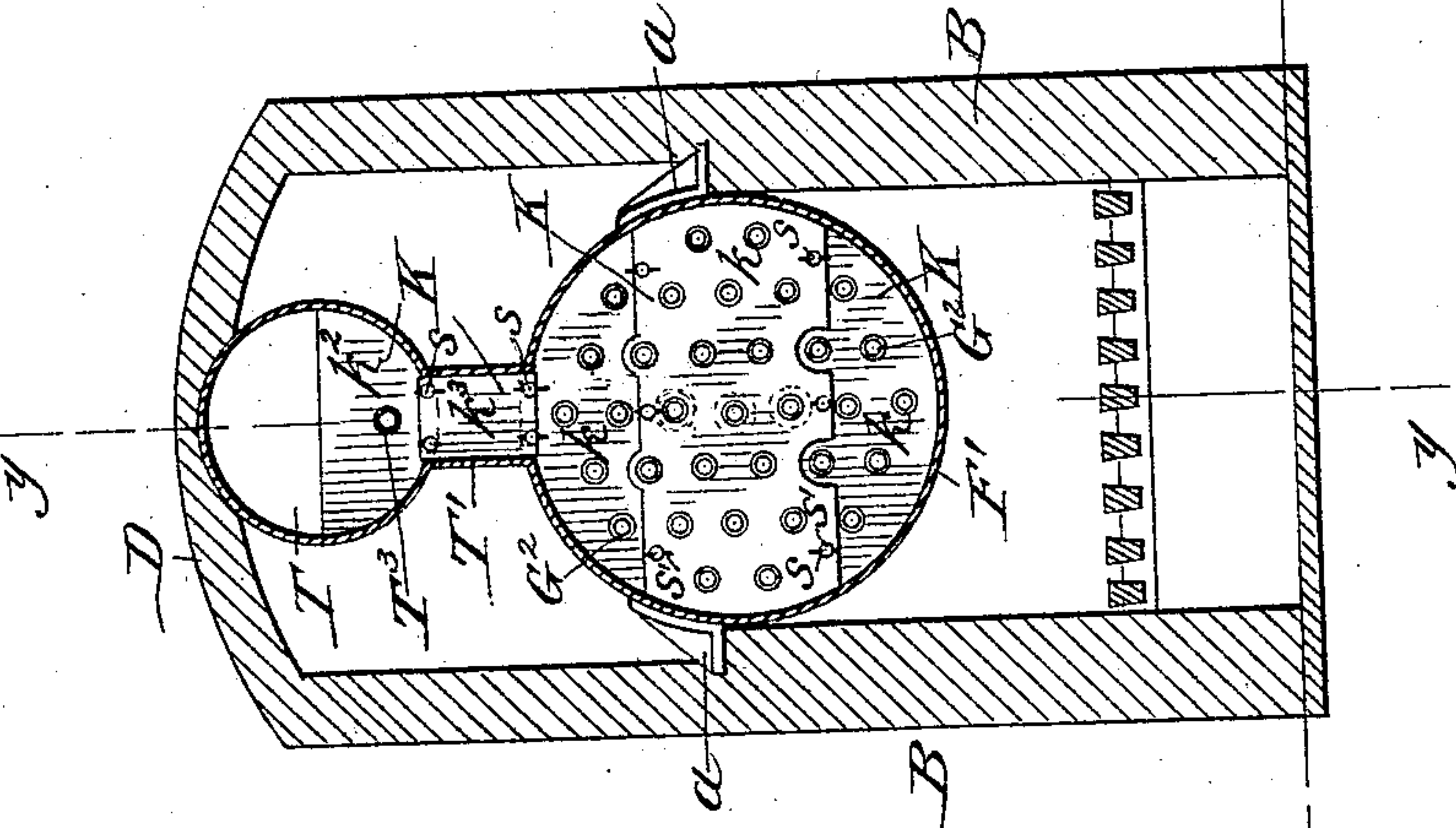
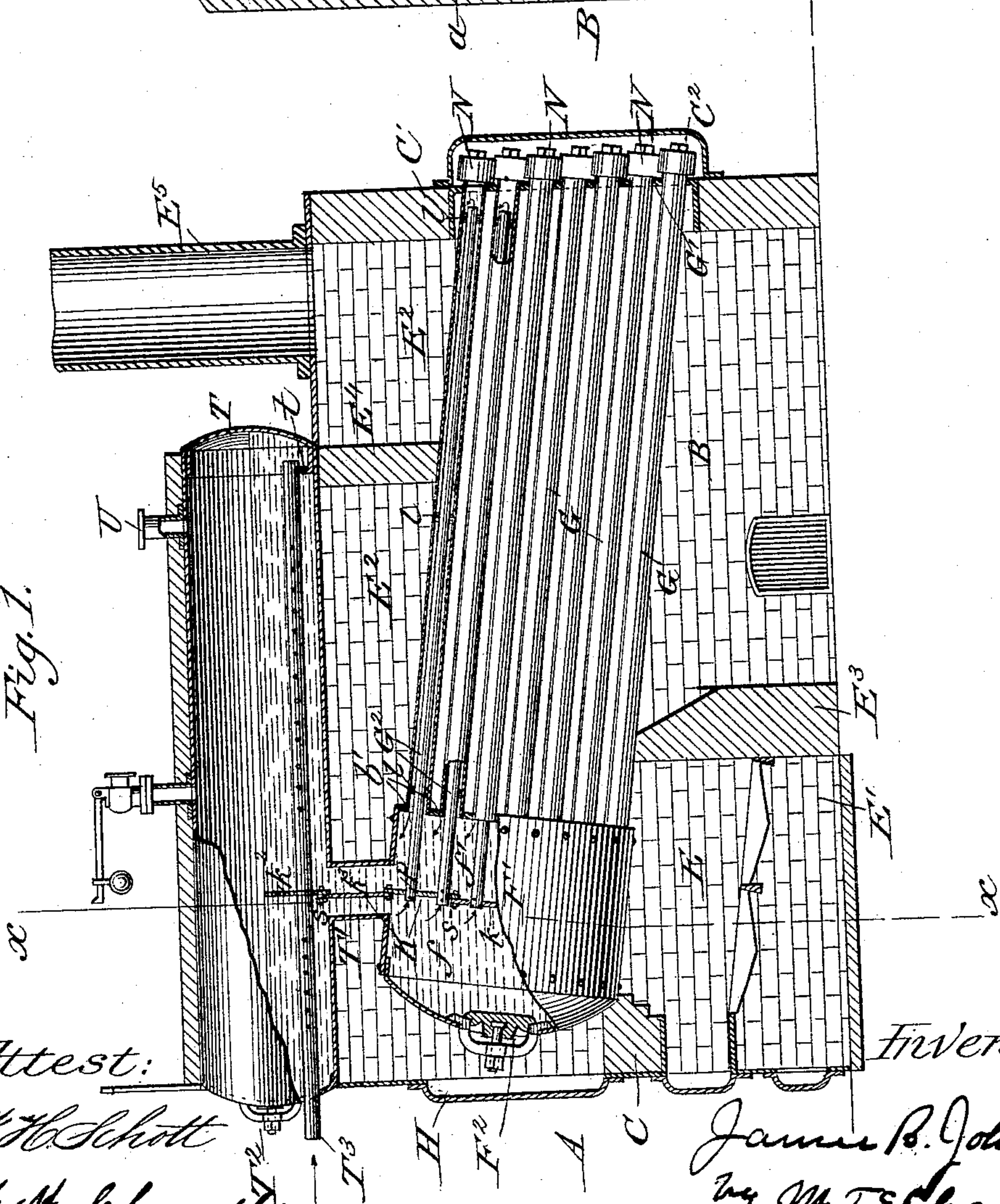


Fig. 1.



Attest:

J. H. Schott  
M. M. Chandler

Inventor

James B. Johnston  
by M. T. E. Chandler  
Att'y

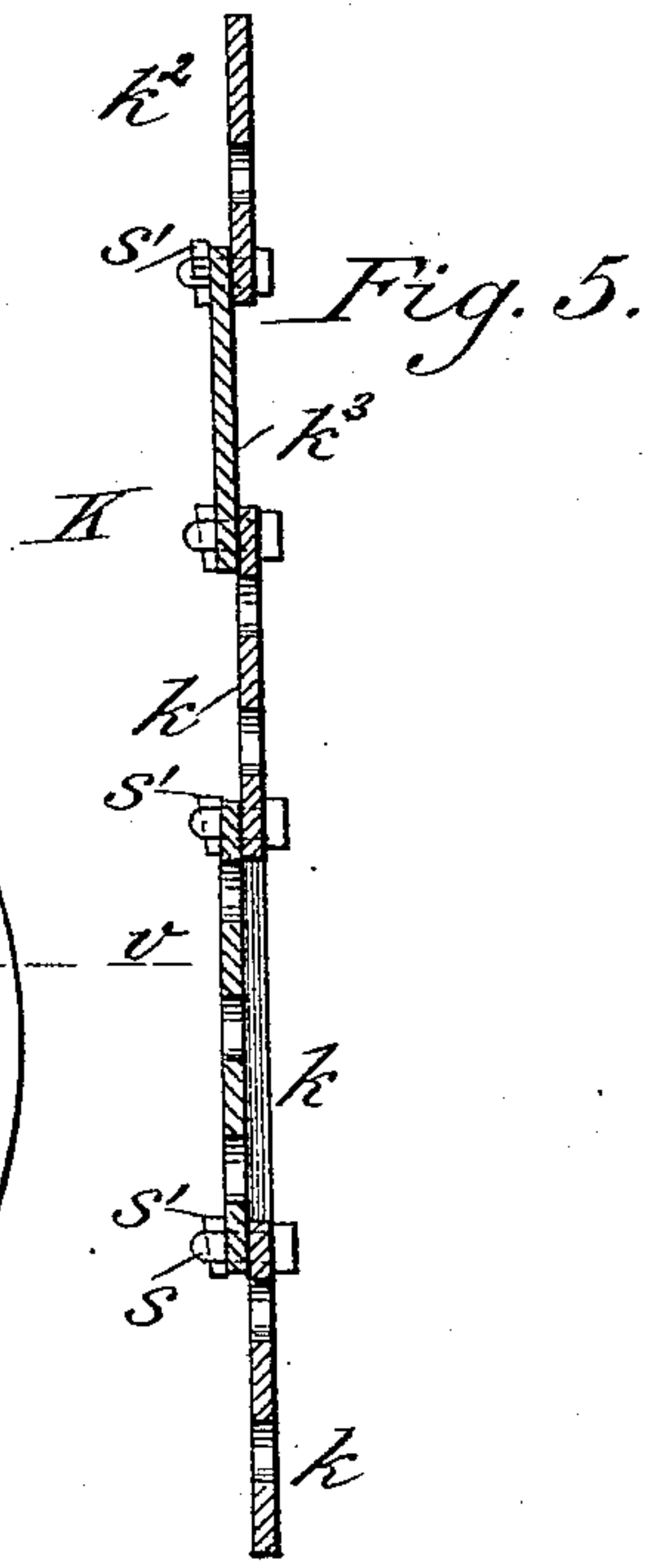
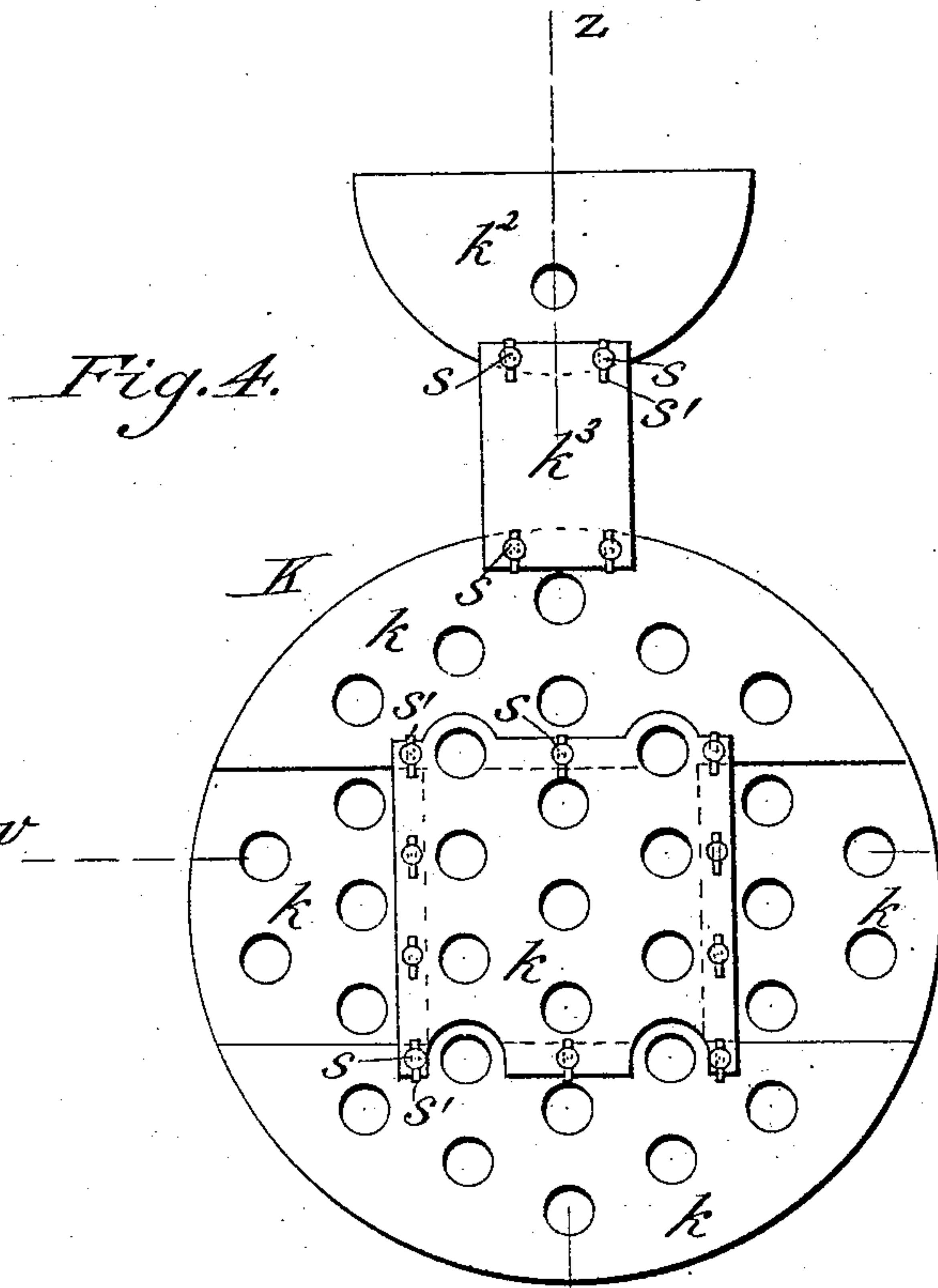
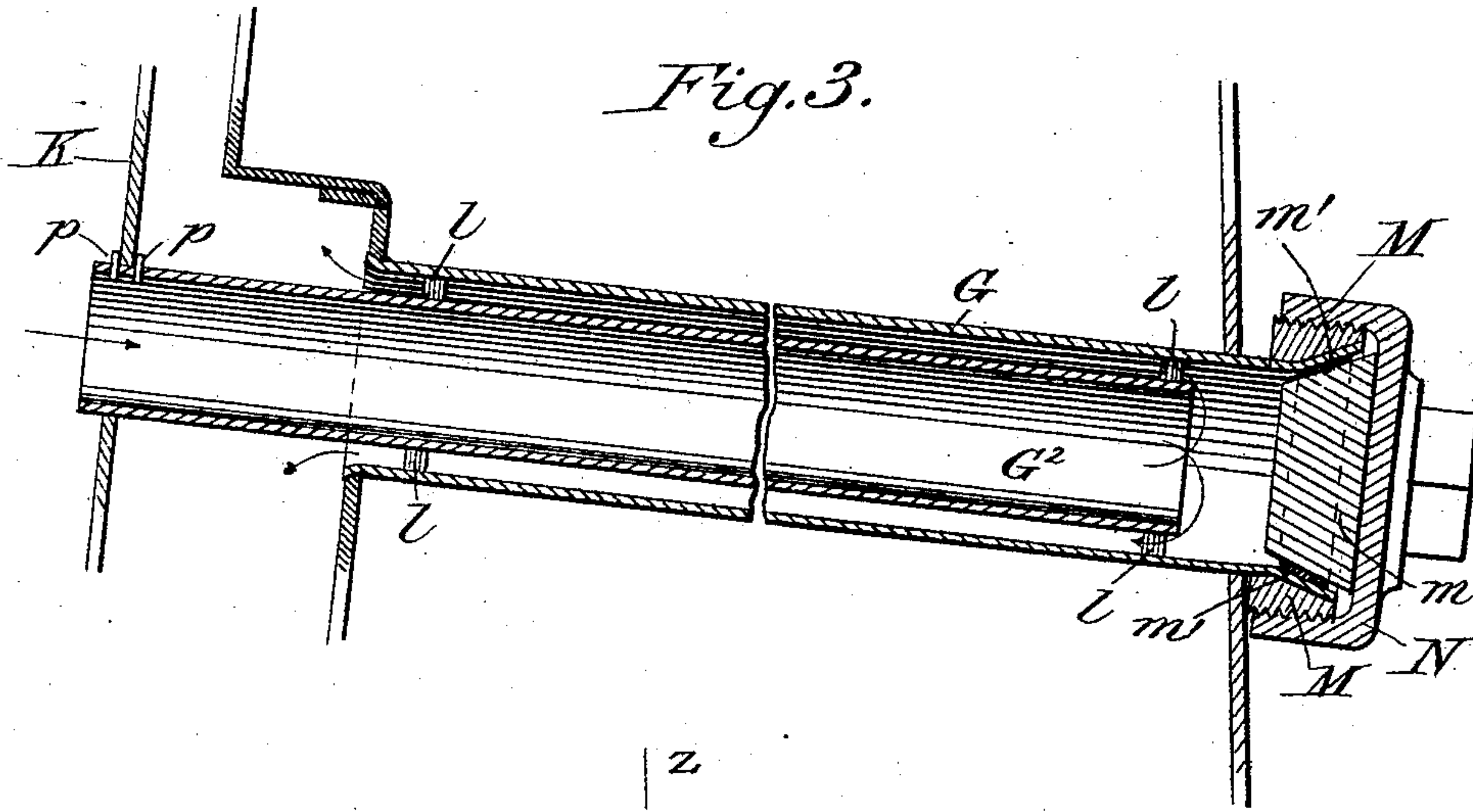
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2 Sheets—Sheet 2.

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Attest: *H. H. Schott*  
*M. H. Chandler*

*Fig. 6.*

*Inventor*  
*James B. Johnston*  
*by M. T. E. Chandler*  
*attys*



# UNITED STATES PATENT OFFICE.

JAMES B. JOHNSTON, OF MUSKEGON, MICHIGAN.

## WATER-TUBE BOILER.

SPECIFICATION forming part of Letters Patent No. 454,215, dated June 16, 1891.

Application filed January 31, 1891. Serial No. 379,811. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES B. JOHNSTON, a citizen of the United States, residing at Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Steam-Boilers, of which the following is a full, clear, and exact description, 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 of reference marked thereon, which form a part of this specification.

This invention relates to improvements in steam-boilers of that class commonly known as "water-tube boilers," and has for its object the construction of a boiler in which water is first fed into a water-tank or steam-drum in such a manner as to be spread over as much space as possible, so that the cold water will be gradually introduced into the hot water, and of a generating-chamber and tubes to which water can be fed from the tank situated above the same, so as to enter a compartment of the generating-chamber and be conducted therefrom by interior pipes into exterior pipes, where it is exposed to the action of the heat in the combustion-chamber of the furnace, and when after being so exposed and converted into steam be conducted by the said exterior pipes to another compartment of the generating-chamber, and thence be conducted by suitable connections to the water-tank or steam-drum, thereby securing a rapid circulation, which will insure a rapid generation of steam.

The invention consists of a furnace of suitable construction adapted to the purpose, a generating-chamber divided into two compartments by a sectional partition, the exterior water-tubes emptying into the inner of the said compartments, and interior tubes leading from the outer of the said compartments and passing through the inner one into the exterior tube and extending into the same nearly its entire length.

The invention further consists in the novel construction, combination, and arrangement of parts, such as will be hereinafter more fully described, pointed out in the appended

claim, and illustrated in the accompanying drawings.

In the accompanying drawings, in which similar letters of reference designate corresponding parts, Figure 1 is a longitudinal vertical section of a boiler embodying the invention. Fig. 2 is a transverse vertical section on the line  $x x$  of Fig. 1. Fig. 3 is a longitudinal section through the exterior and interior tubes, showing them in their relative positions and the means whereby they are so retained, and it also shows the device for closing the rear end of the exterior tube. Fig. 4 is a front elevation of the partition which divides the generating-chamber into two compartments. Fig. 5 is a transverse vertical section on the line  $z z$  of Fig. 4. Fig. 6 is a transverse horizontal section on the line  $v v$  of the same figure.

Referring to the drawings, A represents a furnace of any suitable construction adapted to the purpose, consisting of the side walls B B, the front and back walls C and C', respectively, and the arched top D. In the front lower part of the furnace is the fire-box E, and beneath it is the ash-pit E'. They are separated from the combustion-chamber E<sup>2</sup> by the bridge E<sup>3</sup>.

E<sup>4</sup> is an arch supporting the rear end of the water-tank T and separating the upper part of the combustion-chamber from the uptake E<sup>5</sup>, serving to deflect the products of combustion which may have arisen in the front part of the chamber downward, so that they may again come in contact with the water-tubes and the heat be utilized to the greatest extent.

To the sides of the generating-chamber are attached the supports  $a a$ , which rest upon projections of the side walls and serve to sustain the chamber in its proper position. In the back plate  $b'$  of the generating-chamber are secured in the ordinary manner the exterior water-tubes G G, the rear ends of which are supported in the plate G', seated in an opening in the back wall C' of the furnace. It will be observed that the water-tubes are set at a slight inclination, the front ends being higher than the rear ones. Such a position tends to give a more rapid circulation,



as the heated water or steam will always pass out the upper ends and the colder water will enter the lower ends, a regular current upward through the tubes always existing.

5 In the front end of the generating-chamber is a man-hole provided with a suitable cover  $F^2$ , which allows ready access to the chamber. Communication from the exterior of the furnace to the said man-hole is had by means of  
10 the door H.

In the upper part of the furnace, having its rear end resting upon the arch  $E^4$  and its front end in the wall C, is the water-tank or steam-drum T, connected with the generating-chamber by the pipe  $T'$ . Access to the interior of  
15 the tank is had through the man-hole  $T^2$ . Water is supplied to the tank by the supply-pipe  $T^3$ , which enters the front end of the same and extends nearly its entire length and  
20 rests its rear end on a support  $t$ . This pipe is perforated its whole length—that is, as much of it as is in the tank—so as to distribute the water over as much space as possible, and thereby gradually introduce the cold water into the hot water. The tank is partly divided  
25 into two compartments by the semicircular partition  $k^2$ , vertically placed over the opening of the pipe  $T'$ .

The generating-chamber is divided into two  
30 compartments  $f$  and  $f'$  by the vertical partition K, which is connected with the partition  $k^2$  of the tank by the plate  $k^3$ , placed within the pipe  $T'$ . The general outline of these partitions and the connecting-plate is such that  
35 the edges will set closely against the adjacent walls. The partition K is formed of sections  $k$  of such size as may be readily removed through the man-hole  $F^2$ . It may be divided into only three pieces, as is shown in Fig. 2;  
40 but five, as shown in Figs. 4, 5, and 6, is the preferred number. Connections between the several sections of the partitions K and  $k^2$  and the plate  $k^3$  is made by overlapping the adjacent edges and passing through them the  
45 bolts  $s$   $s$ , which have perforated ends, in which are seated the keys  $s'$   $s'$ . The partition K also forms a support for the front ends of the interior water-tubes  $G^2$   $G^2$ , which will be described farther on. These tubes serve to mutually support the partition in its upright position. It might be well to state here that the joints between the sections of the lower partition and between the partitions and the sides of the tank and chamber need not be  
55 water-tight, as the latter only serve to separate two currents of water and not to divide the water into separate bodies.

The object of having the partition K in sections is to allow its removal whenever it  
60 is desired to have access to the front ends of the tubes G, for if it were in one piece it could not be removed and the space between it and the sheet  $b'$  would be too narrow to allow a ready manipulation of tools therein.

65 G G represent water-tubes, which have their front ends secured in the plate  $b$ , which

forms the back of the generating-chamber  $F'$ , and open into the compartment  $f'$ . Their rear ends are secured in the plate  $G'$ , seated in an opening formed in the rear wall  $C'$ ,  
70 which is covered by the door  $C^2$ . The means used to secure the front ends of the tubes in the plate  $b'$  are those which are ordinarily used. As it is often necessary to have access to the rear ends of the tubes for examining their interior and for cleaning, a different means is adopted for securing the said rear ends in place and also for closing the opening at the same time. Before the tube  
80 is placed in position a collar M, having its outer periphery threaded, is placed upon it, and then the tube is placed in position and secured to the plate  $b$  at its forward end. A wedge-shaped plug  $m$  and a rubber gasket  $m'$  are placed in the flared opening in the  
85 lower end of the tube. A cap N, having its interior periphery threaded, is placed over the opening and is screwed to the collar M, thereby securing the plug in place and securing the tube against any tendency that it may  
90 have to be drawn into the furnace.

$G^2$   $G^2$  are smaller water-tubes carried for nearly their entire length within the tubes G G, their ends reaching almost to the ends of the inclosing tubes at the rear and are  
95 supported therein by the lugs  $l$   $l$ . The front ends of these tubes pass through the compartment  $f'$  and are seated in the partition K and open into the compartment  $f$ . The pins  $p$   $p$  hold them in their proper relative  
100 positions.

The operation of the device is as follows: Fire having been started in the fire-box, the products of combustion on their way to the uptake will pass around the tubes G G, and  
105 as these tubes are the first ones heated the water in the annular space formed between the interior and the exterior tubes will consequently be heated first. The steam there created will rise in the exterior tube and flow  
110 into the chamber  $f'$ , thence through the connecting-pipe into the tank or steam-drum T, from which it can be taken by means of the outlet U. As the water leaves the tubes G G, the water in the tubes  $G^2$   $G^2$  must flow  
115 from the lower ends of the latter into the former and be heated in turn. This will cause an inflowing current into the compartment  $f$  from the tank and an outflowing current from the compartment  $f'$  into the tank.  
120 These currents will be separated from each other by the partitions K and  $k^2$  and the connecting-plate  $k^3$ , so that they cannot mingle and interfere with each other's movements and thereby cause a very rapid circulation  
125 and a quick generation of steam.

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

In a steam-boiler, the combination of the  
130 generating-chamber, the sectional partition separating the said chamber into two com-



partments, the tank situated over the said  
chamber, the partition partly dividing the  
said tank into two compartments, the pipe  
connecting the chamber and the tank, the  
5 plate secured within the said pipe and con-  
necting the partitions of the tank and the  
generating-chamber, the interior tubes lead-  
ing from the outer of the compartments of the  
generating-chamber, and the exterior tubes  
10 partly inclosing the said interior tubes and

leading from the same and opening into the  
inner of the compartments of the generating-  
chamber, substantially as described.

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

JAMES B. JOHNSTON.

Witnesses:

F. H. SCHOTT,  
W. H. BARNES.