

No. 652,963.

Patented July 3, 1900.

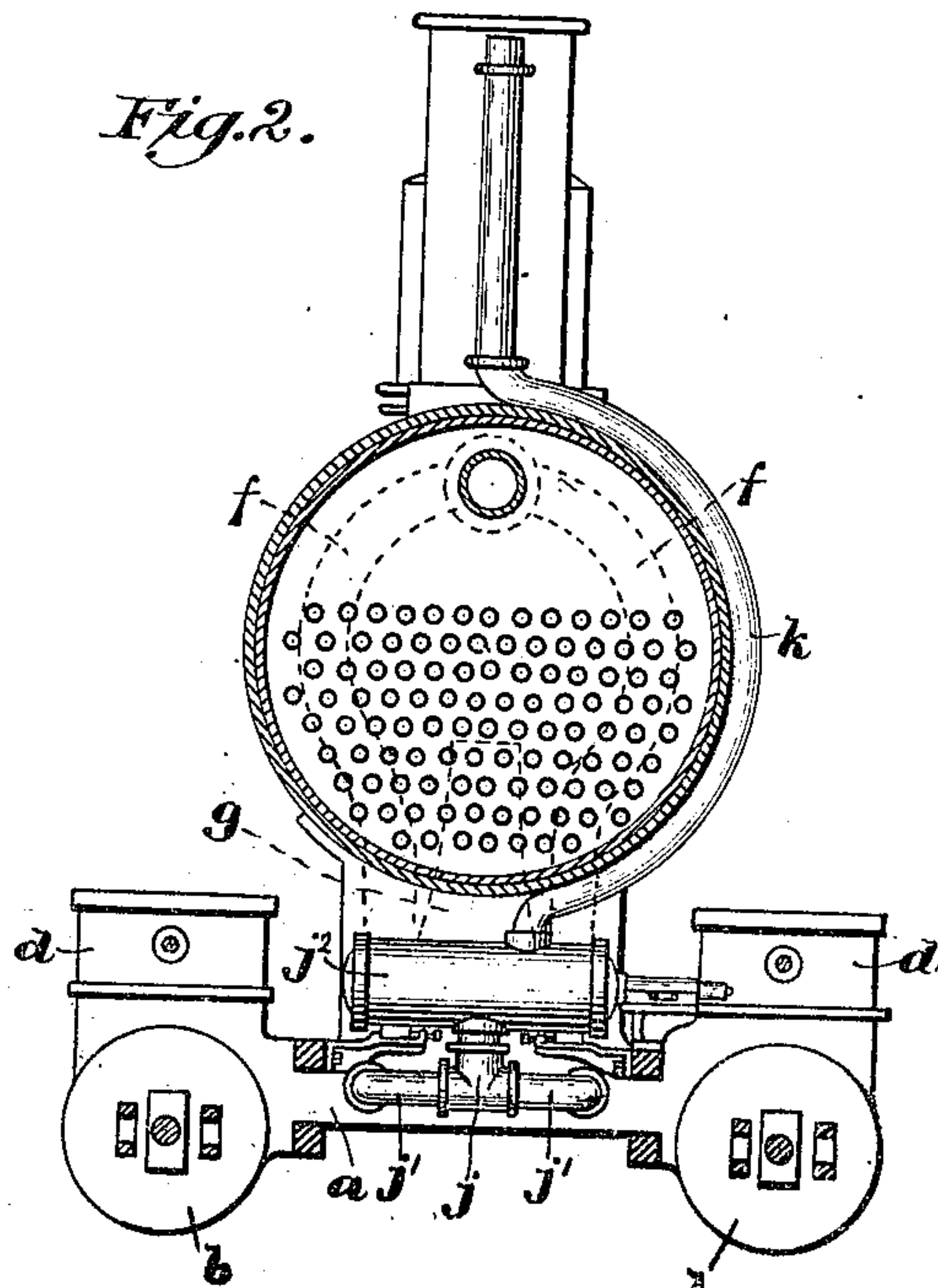
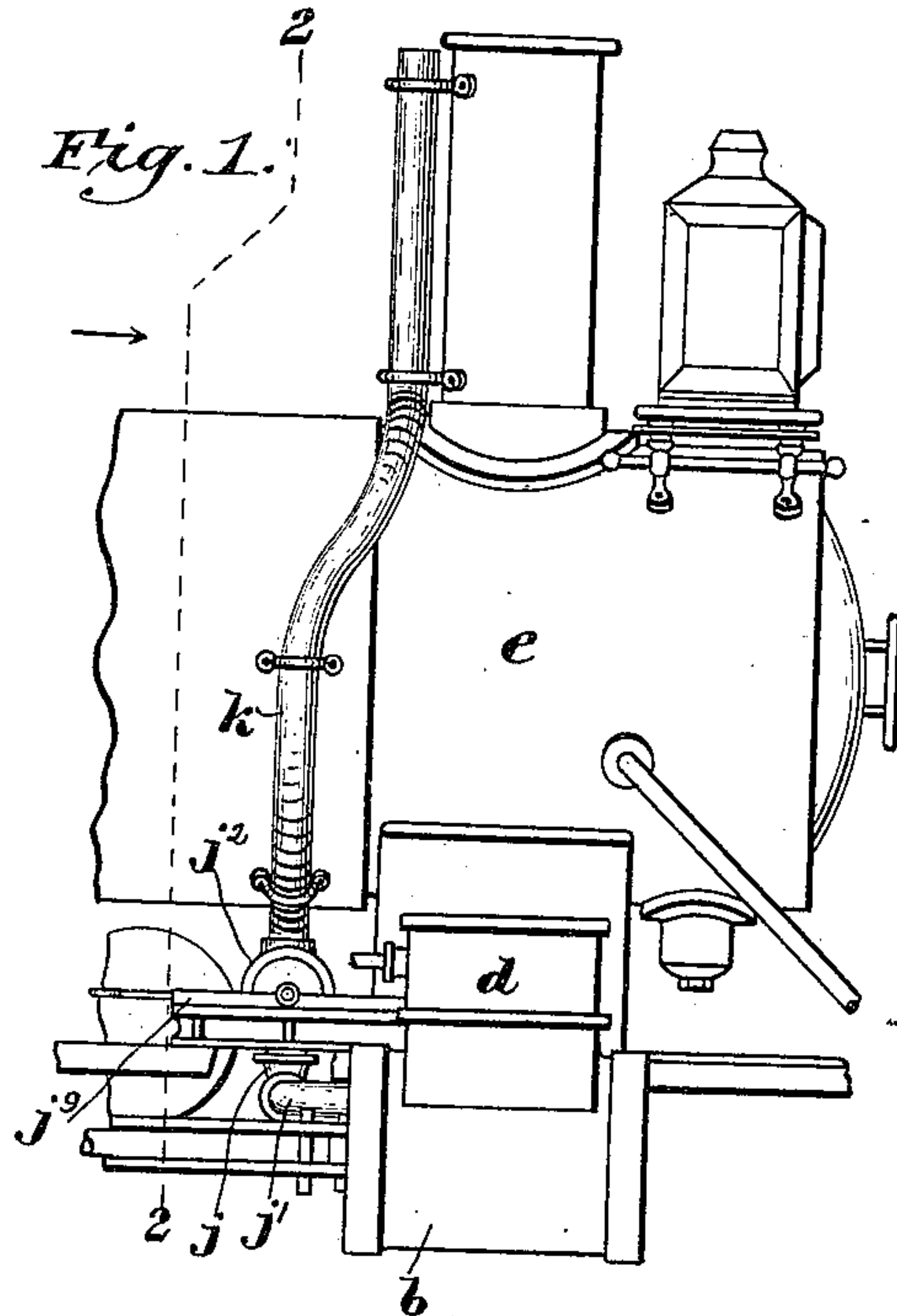
H. H. HUFF.

EXHAUST MECHANISM FOR LOCOMOTIVES.

(Application filed Nov. 6, 1899.)

(No Model.)

2 Sheets—Sheet 1.



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2 Sheets—Sheet 2.

Fig. 3.

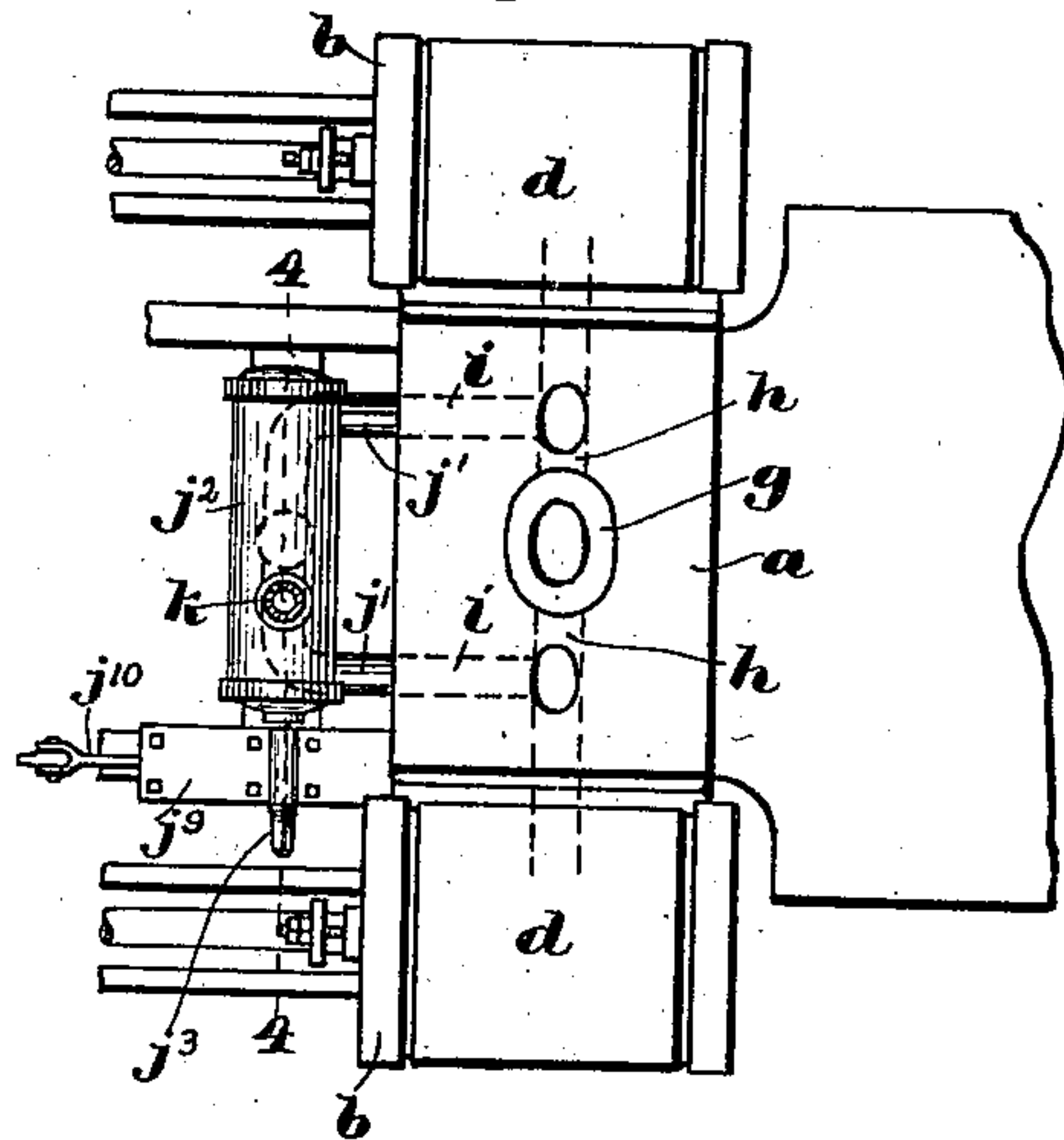


Fig. 4.

Fig. 4<sup>a</sup>.

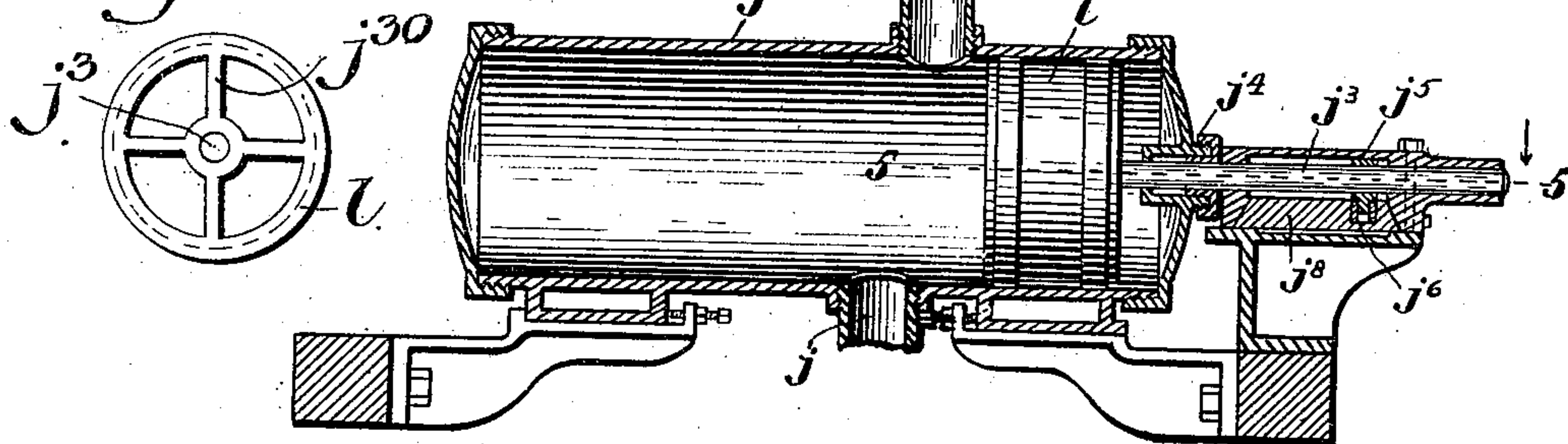
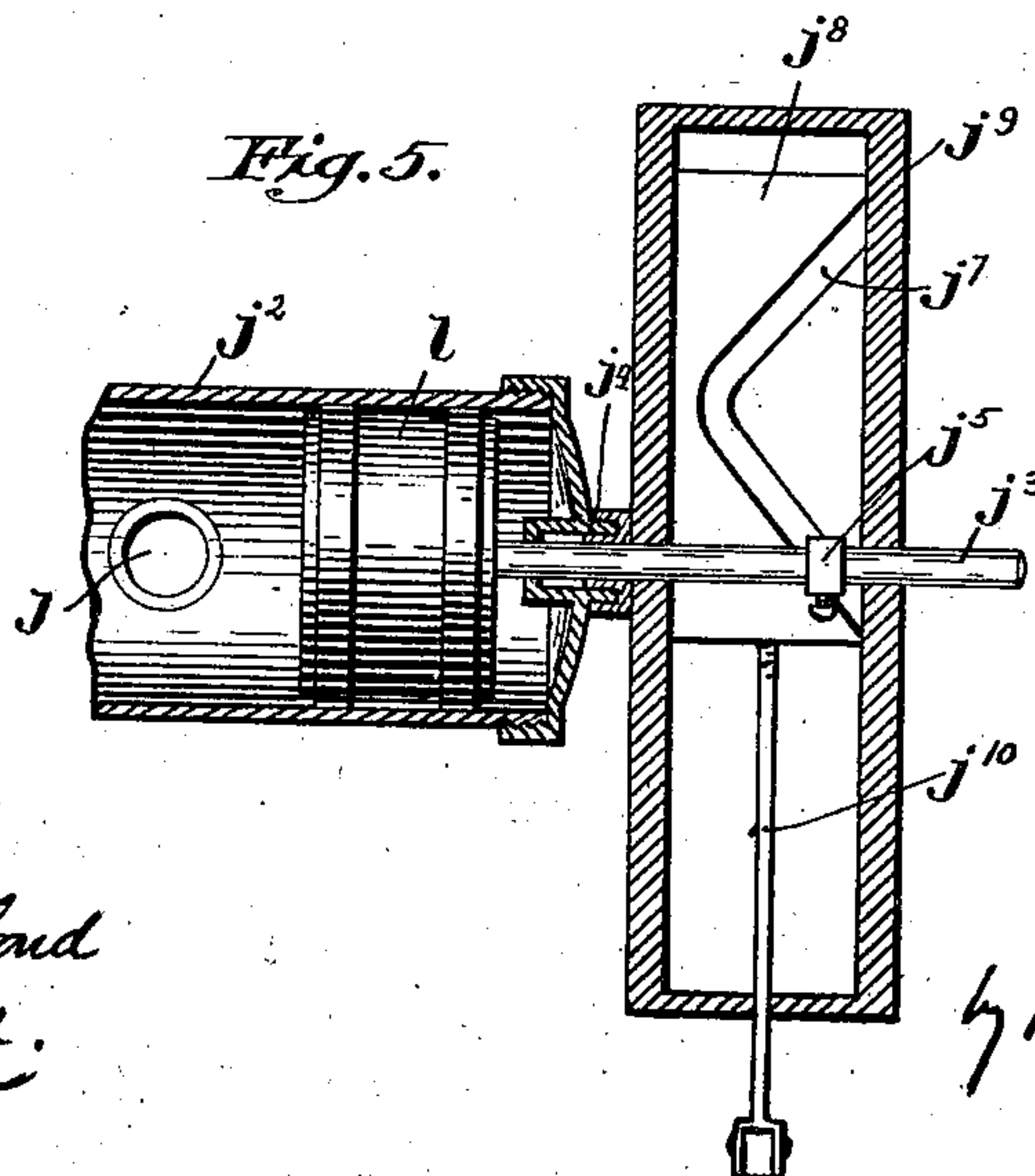


Fig. 5.



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# UNITED STATES PATENT OFFICE.

HENRY H. HUFF, OF BOSTON, MASSACHUSETTS, ASSIGNOR OF TWO-THIRDS  
TO ARTHUR D. CURRAN, OF SAME PLACE, AND SMITH P. BURTON, JR.,  
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## EXHAUST MECHANISM FOR LOCOMOTIVES.

SPECIFICATION forming part of Letters Patent No. 652,963, dated July 3, 1900.

Application filed November 6, 1899. Serial No. 735,900. (No model.)

To all whom it may concern:

Be it known that I, HENRY H. HUFF, of Boston, (Dorchester,) in the county of Suffolk and State of Massachusetts, have invented certain  
5 new and useful Improvements in Exhaust Mechanism for Locomotives, of which the following is a specification.

This invention relates to locomotive or other steam engines having the exhaust-pipes of the  
10 cylinders terminating in a smoke-box and arranged to conduct and discharge the exhaust-steam into a draft-pipe between the exhaust and the smoke-stack in the usual manner.

The invention has for its object to provide  
15 means for diverting a portion of the exhaust-steam from the exhaust-pipe at a point between the cylinder and the exhaust-nozzle, so that the volume of steam from said outlet may be diminished; and thereby diminishing  
20 the force of the draft where the latter is excessive under varying conditions of the operation of the engine, and whereby the back pressure upon the piston is obviated.

The invention also has for its object to provide  
25 means to return the exhaust-steam which has been diverted from the exhaust-pipes in such manner that there may be a continuous flow of exhaust-steam through the exhaust-nozzle and the force of the exhaust proper be  
30 exerted uniformly instead of spasmodically.

The invention has also for its object to provide improved means whereby the volume of  
35 exhaust-steam may be varied in its passage from the cylinders to the exhaust-nozzles, and thus form a variable exhaust.

The invention consists in the improvements which I will now proceed to describe and claim.

Of the accompanying drawings, forming a  
40 part of this specification, Figure 1 represents a side elevation of a portion of the forward part of a locomotive-engine provided with my improvements. Fig. 2 represents a section  
45 on line 2 2 of Fig. 1. Fig. 3 represents a plan view of the saddle-casting to which the cylinders are attached and in which the exhaust-passages are located and to which are attached other devices hereinafter described.

Fig. 4 represents a section on line 4 4 of Fig. 3. Fig. 4<sup>a</sup> represents an end view of the valve. 50  
Fig. 5 represents a section on line 5 5 of Fig. 4.

The same letters of reference indicate the same parts in all of the figures.

In the drawings, *a* represents the saddle-casting, to which the cylinders *b b* are at- 55  
tached.

*dd* represent the steam-chests, *ff* the usual steam-pipes, which conduct steam from the boiler to the steam-chests, and *e* represents the smoke-box, all being of the usual or any 60  
suitable construction.

*g* represents the exhaust-nozzle, which is connected by passages *h h* with the cylinders and receives the exhaust therefrom in the 65  
usual way.

*i i* represent branch passages extending from the passages *h h* to the rear end of the saddle *a*.

*j' j'* represent branches of the pipe *j*, said branches being connected with the passages 70  
*i i* and to the pipe *j*, which communicates with a cylindrical chamber *j*<sup>2</sup>, located close to the rear end of the saddle-casting. The chamber *j*<sup>2</sup> is of sufficient capacity to receive and store  
75 a portion of the exhaust-steam from either cylinder, so that when the chamber is closed and the pipe *j* is its only outlet as well as its only inlet (this being the case when the valve  
80 *l*, hereinafter described, is adjusted to cover an outlet-pipe *k*, leading from the cylinder) the chamber is converted into a reservoir,  
which alternately receives a portion of the ex-  
haust through one of the pipes *j'* and the pipe  
*j* and permits the said portion to return  
85 through the pipe *j* and the other pipe *j'* to the exhaust-nozzle *g*. This return movement from the chamber or reservoir *j*<sup>2</sup> to the exhaust  
takes place between the intervals of the regular exhaust periods. For example, when  
90 the right-hand piston has been forced to the forward end of its cylinder by the live steam the exhaust takes place from the rear end of the same cylinder, and a portion of this exhaust passes into the chamber *j*<sup>2</sup> through one  
of the pipes *j'* and the pipe *j*. At the com- 95  
pletion of this exhaust the accumulation of



steam in the chamber is free to pass from thence through the pipe  $j$  and the other pipe  $j'$  to the exhaust-nozzle. The said nozzle is at this time free for the passage of the steam from the chamber  $j^2$  through it before the escape of the succeeding exhaust, which comes from the opposite or left-hand cylinder and operates through the chamber  $j^2$  in the manner just described.

It will be seen that by the provision of the chamber or reservoir  $j^2$ , connected, as described, with the cylinders and with the exhaust-nozzle, I am enabled to divert a portion of the steam from the exhaust-passage on one side of the engine to that of the opposite side, each exhaust-passage being free when the other is in use, so that a practically-continuous flow of steam through the exhaust nozzle or outlet is assured. Such continuous flow is of advantage when working the engine in "full gear" on a heavy grade or in leaving stations, as the increased opening neutralizes the draft upon the fire and does away with back pressure in the cylinders. Moreover, the continuous supply to the exhaust-nozzle while utilizing all the exhaust-steam obviates the tearing away of the fire which is caused by the ordinary spasmodic action when the supply of exhaust-steam is intermittent.

If desirable, I can do away with the auxiliary exhaust by entirely covering the opening  $j$  into the chamber  $j^2$  with the valve  $l$ , which may be done to advantage when the engine is working light at high speed and needs a stronger draft upon the fire, or I may cover the opening  $j$  partially with the valve  $l$ , so as to vary the volume of the exhaust entering the chamber  $j^2$ , the arrangement being such that a variable-exhaust nozzle is thus provided, the variation corresponding with the position of the valve  $l$  in regard to the opening  $j$ .

In some cases I find it desirable to provide the chamber  $j^2$  with an outlet which permits the discharge into the atmosphere or elsewhere of the steam diverted from the exhaust and entering the said chamber instead of allowing the steam to pass to the exhaust-nozzle. Such outlet is shown in Figs. 1, 2, 3, and 4 as a pipe  $k$ , connected with the upper portion of the chamber  $j^2$  and arranged out of alinement with the pipe  $j$ , the arrangement of the pipe  $k$  being such that the valve  $l$ , which I have before alluded to, may be adjusted to close the pipe  $k$  without closing the pipe  $j$ . When the pipes  $j$  and  $k$  are both open, as shown in Fig. 4, the portion of the exhaust that enters the chamber  $j^2$  escapes through

the pipe  $k$ , so that the force of the exhaust through the nozzle  $g$  is diminished.

The valve  $l$  is preferably a ring or hollow cylinder, as shown in Fig. 4<sup>a</sup>, so that said valve will not reduce the area of the chamber  $j^2$ , steam passing freely through said valve and filling practically all parts of the cylinder when the valve is adjusted to close the outlet  $k$ . Suitable connections are provided between the valve  $l$  and the reverse-lever of the locomotive for moving the valve, said connections including a rod or stem  $j^3$ , attached to the spider-frame  $j^4$  of the valve  $l$  and extending through a stuffing-box or packed bearing  $j^5$ , formed in one end of the chamber  $j^2$ , and a collar  $j^6$ , adjustably attached to the stem  $j^3$  by a suitable set-screw or other means and having a stud or roll  $j^7$ , which enters a cam-groove  $j^8$  in a slide  $j^9$ . Said slide is movable in a fixed guide or casing  $j^{10}$  and has a rod  $j^{11}$ , which is suitably connected with the reverse-lever of the engine, the arrangement being preferably such that when the engine is working full gear the valve  $l$  is in the position to close the outlet  $k$ , and thus cause the chamber  $j^2$  to alternately receive exhaust-steam and supply it to the exhaust-nozzle, as above described.

Owing to the fact that the means for obtaining the continuous supply of exhaust-steam to the exhaust-nozzle and for varying the exhaust are located entirely outside of the smoke-box of the engine, corrosion that would be caused by the heat, oil, and cinders, is obviated.

I claim—

1. The combination with the cylinders, exhaust-passages, and exhaust-nozzle, of a reservoir, and connections between said reservoir and the exhaust-passages, the connections being such that the reservoir is caused to alternately receive and deliver exhaust-steam through said connections, and means for controlling the passage of steam into and out of said reservoir.

2. The combination with the cylinders, exhaust-passages, and exhaust-nozzle, of a reservoir, pipes  $j'$  communicating with the two exhaust-passages, a single pipe  $j$  connecting the pipes  $j'$  with the reservoir, and a valve adapted to open and close the pipe  $j$ .

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

HENRY H. HUFF.

Witnesses:

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