

(No Model.)

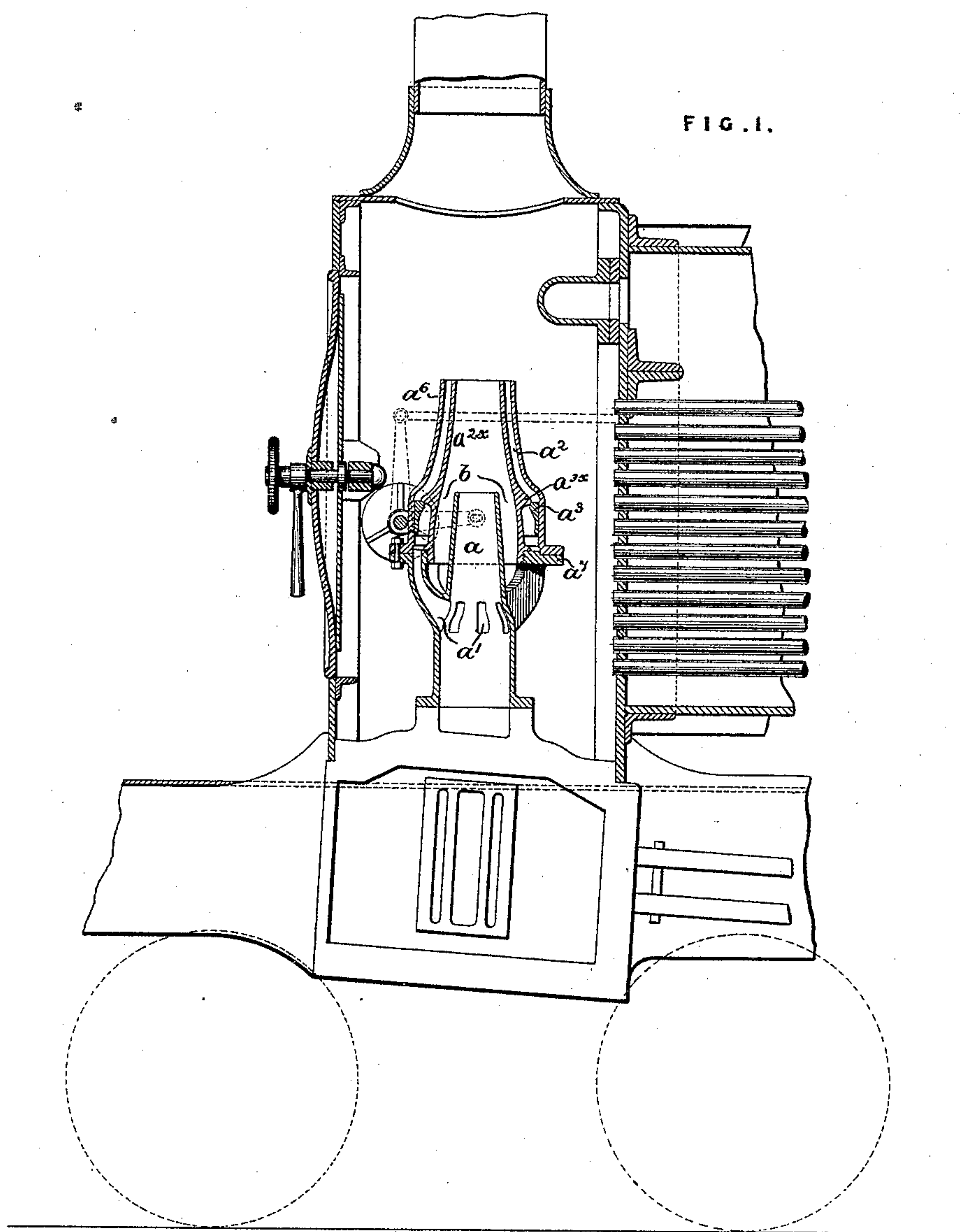
5 Sheets—Sheet 1.

H. APPLEBY.

BLAST PIPE.

No. 391,931.

Patented Oct. 30, 1888.



INVENTOR:

WITNESSES:

*E. B. Bolton.*

*J. D. Cardinger.*

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*By Henry Council*

*Attorneys*

(No Model.)

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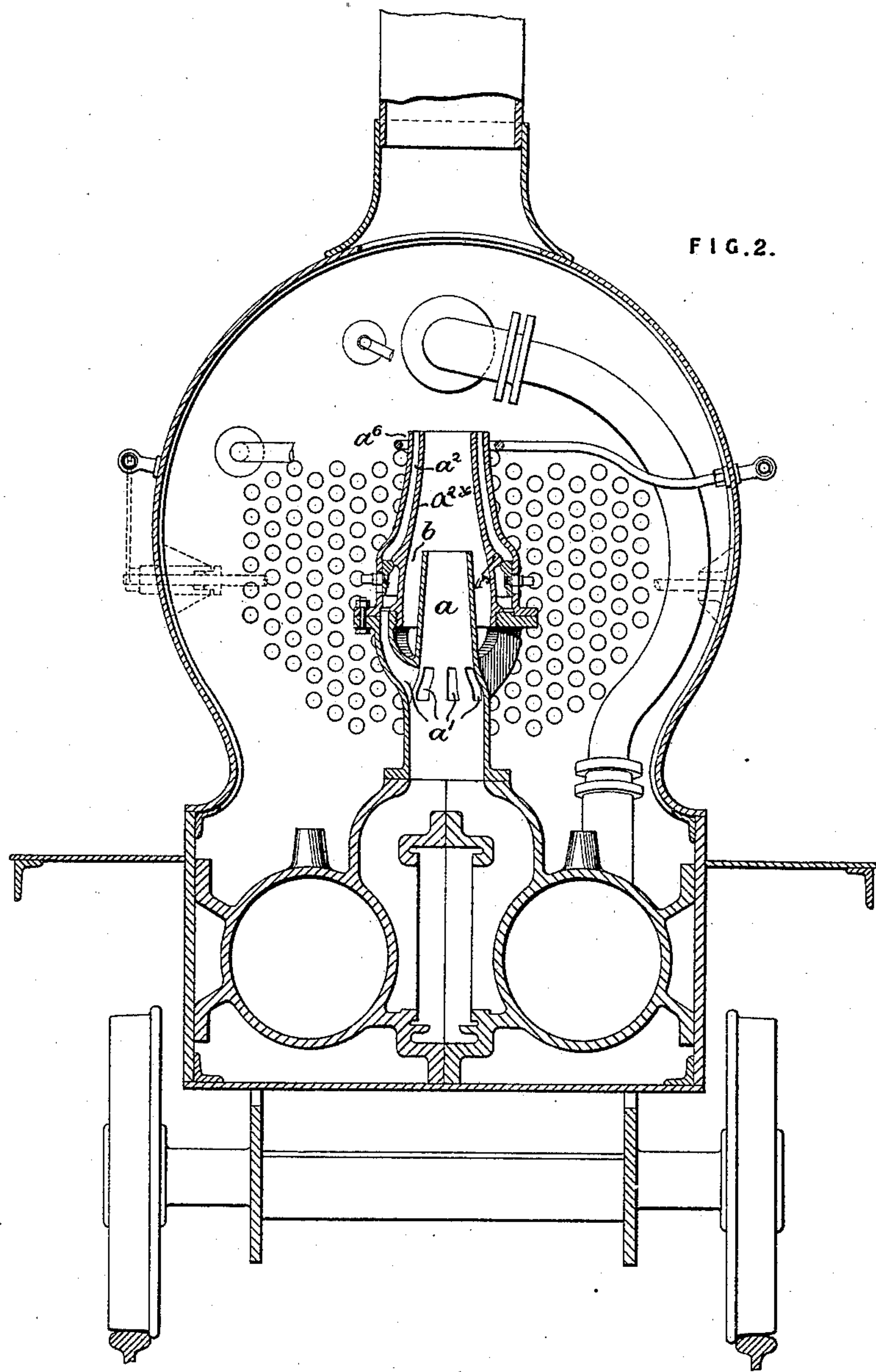


FIG. 2.

INVENTOR:

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(No Model.)

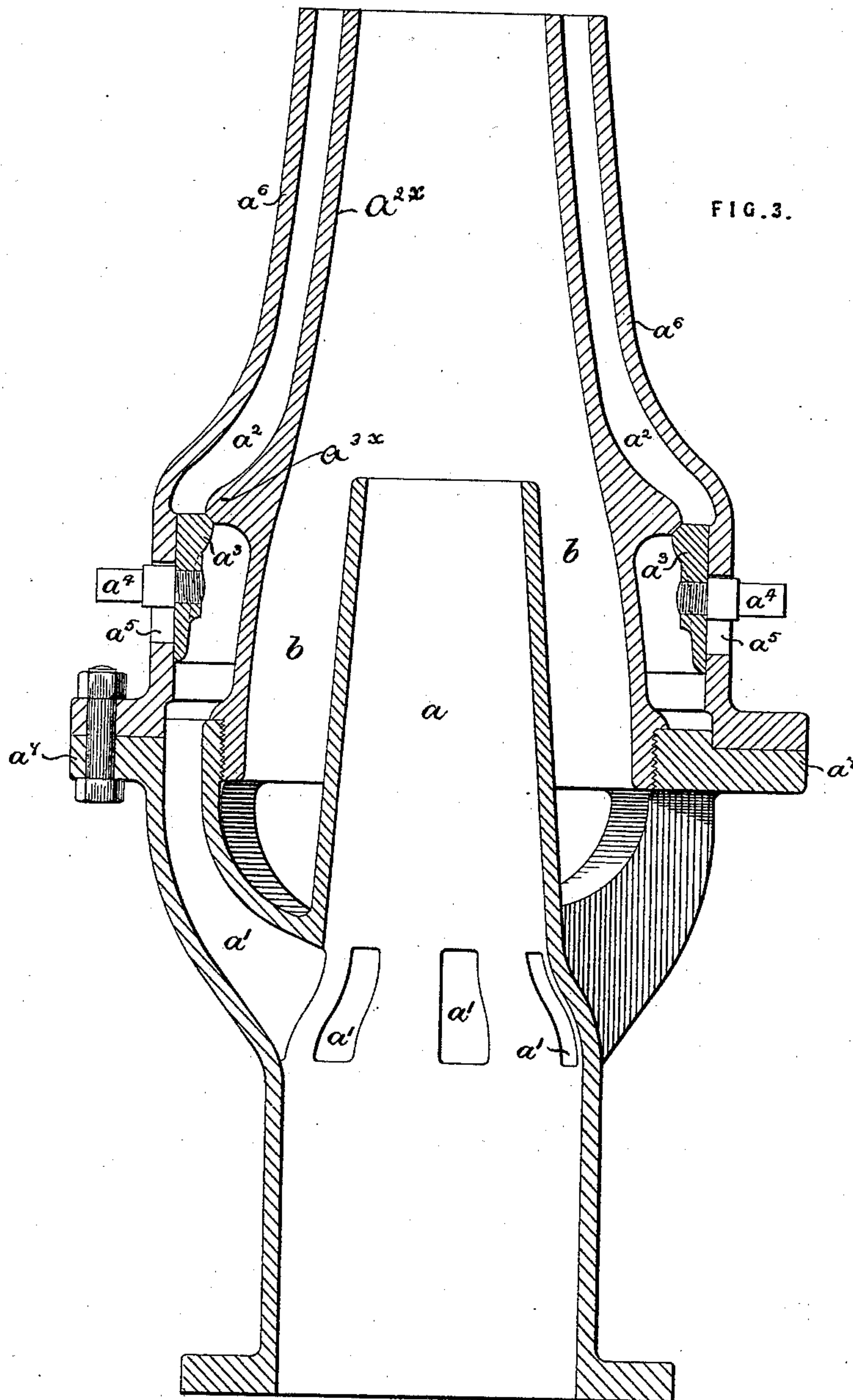
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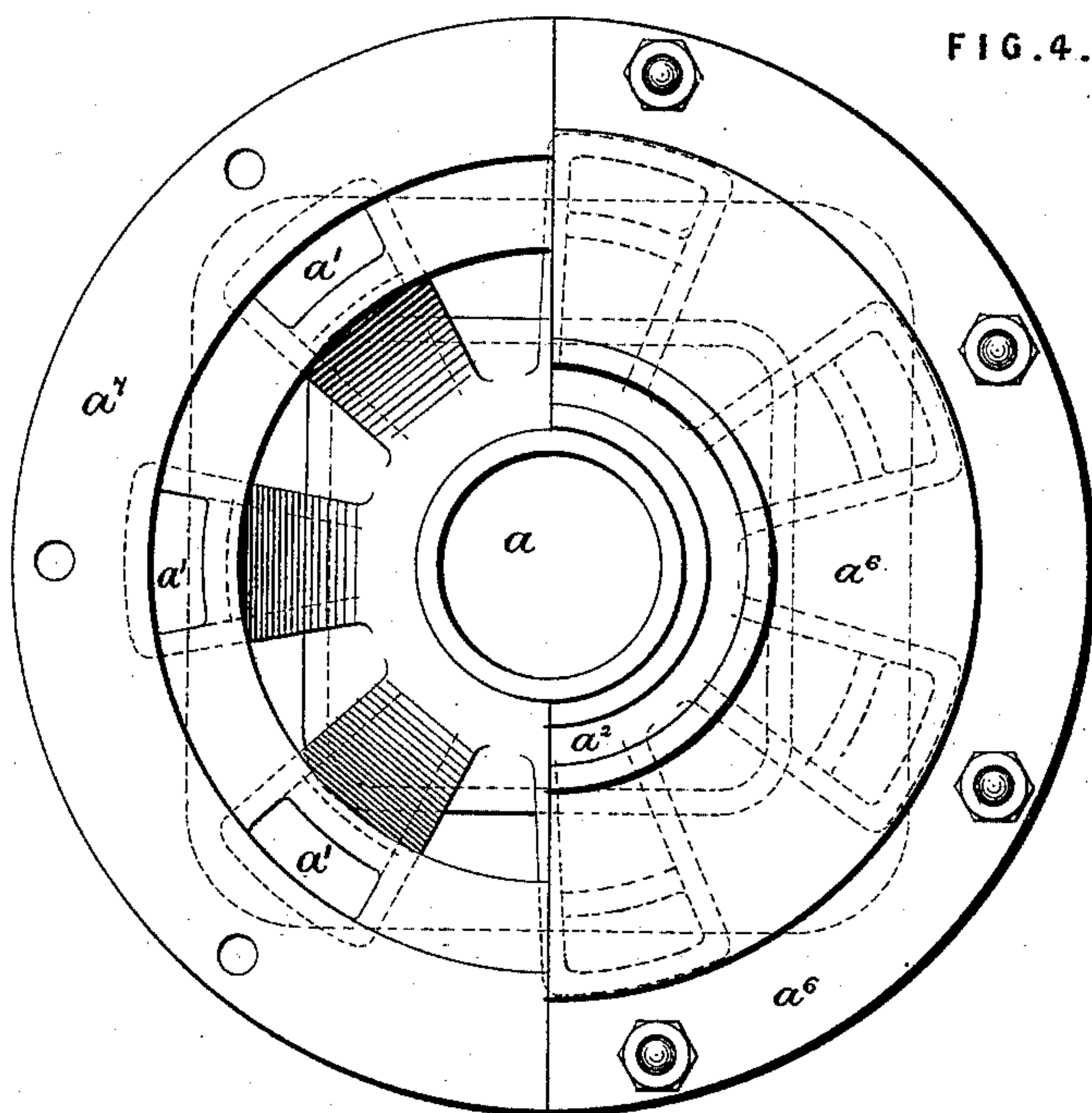
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INVENTOR:

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(No Model.)

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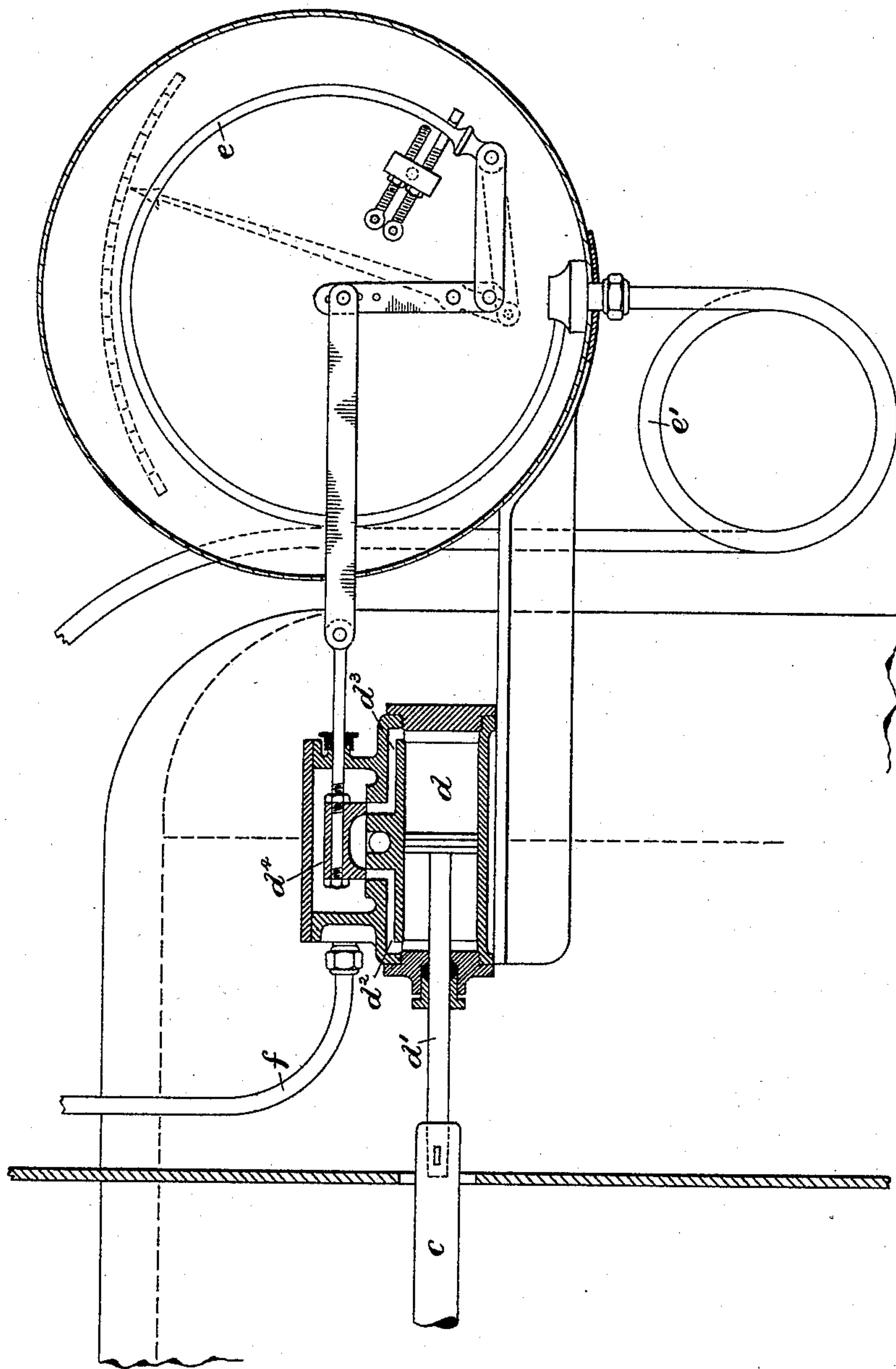
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FIG. 5.



INVENTOR:

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# UNITED STATES PATENT OFFICE.

HENRY APPLEBY, OF LIMERICK, IRELAND.

## BLAST-PIPE.

SPECIFICATION forming part of Letters Patent No. 391,931, dated October 30, 1888.

Application filed October 12, 1887. Serial No. 252,125. (No model.) Patented in England July 19, 1887, No. 10,123.

*To all whom it may concern:*

Be it known that I, HENRY APPLEBY, a subject of the Queen of Great Britain and Ireland, residing at Limerick, Ireland, have invented  
5 new and useful Improvements in and connected with Blast-Pipes, (for which I have applied for Letters Patent of Great Britain, No. 10,128, of July 19, 1887,) of which the following is a specification.

10 This invention relates to improvements in blast-pipes for locomotive and other boilers, in which a steam jet or blast—usually the exhaust-steam escaping from the cylinders—is employed for inducing the requisite draft  
15 through the furnace and heating-tubes, and in the means whereby such draft may be varied and regulated according to the duty to be performed. My invention is, however, applicable under other circumstances where it is  
20 desired to set a body of air in motion with the aid of a steam-jet. When applied to a locomotive or other boiler, I sometimes provide means whereby “live” steam may be conveyed from the boiler direct to the blast-pipe  
25 for use in creating a draft when the engine is standing and when exhaust-steam from the cylinders is not available for the purpose.

My invention relates to that type of blast-pipes having an air-inlet arranged below the  
30 outlet from the central steam-nozzle; and in order that it may be readily understood I will proceed to describe the same with reference to the accompanying drawings, whereof—

Figures 1 and 2 represent in longitudinal  
35 and transverse section, respectively, the smoke-box end of a locomotive engine furnished with a blast-pipe constructed and applied according to my improved method. In Figs. 3 and 4 is represented to an enlarged scale and in  
40 fuller detail the mode in which I prefer to construct the blast-pipe itself, the former of these being a sectional elevation and the latter a part plan and part horizontal section. Fig. 5 is a view on a large scale illustrating the device for automatically controlling the valve of  
45 the blast-pipe.

The blast-pipe consists of a central steam-nozzle,  $a$ , of suitable length, provided at some distance below its upper or delivery extremity  
50 with a series of lateral passages,  $a'$ , which lead to an annular steam-passage,  $a^2$ , surrounding and by preference extending some distance

above or beyond the extremity of the central nozzle,  $a$ . Between the central nozzle and the outer steam-passage,  $a^2$ , is an annular chamber  
55 or passage,  $b$ , open to the atmosphere below and serving to convey the air or other gases contained in the lower portion of the smoke-box into the blast-pipe, where they become subjected to the influence of the steam issuing  
60 from the central nozzle,  $a$ . The outer annular steam-passage,  $a^2$ , is fitted with an annular valve,  $a^3$ , whereby the escape of steam from the main supply-pipe through such supplementary passage may be partially or wholly  
65 intercepted. The annular valve  $a^3$  has a ring-like form and plays over the inner face of the outer casing,  $a^6$ , in the direction of its axis, said casing serving as a guide, and it finds a seat at  $a^{3*}$  on the inner casing,  $a^{2*}$ . This valve  
70 is furnished with studs  $a^4$ , which work in slots  $a^5$  in the outer casing,  $a^6$ , and by means of suitable connections, as indicated by way of example in dotted lines in Figs. 1 and 2, may be raised or lowered from the foot-plate of the  
75 locomotive or other convenient position. The outer casing,  $a^6$ , is securely attached to the flange  $a^7$  and does not partake of a rotative movement.

Assuming my improved blast pipe to be applied to a locomotive, the apparatus occupies  
80 the usual position in front of the outlet ends of the fire-tubes, the air-inlet to the intermediate passage,  $b$ , being situated at or about the level of the lower rows of fire-tubes and the  
85 upper extremity of the outer steam-passage,  $a^2$ , being at or about the level of the upper rows of fire-tubes. Under these circumstances the draft through the lower and upper tubes is equalized. When the steam-passage  $a^2$  is  
90 closed, the whole of the exhaust-steam is forced through the central nozzle,  $a$ , and the blast, owing to such concentration, is intensified. Furthermore, the jet acts with greater effect upon the gases drawn from the lower portion  
95 of the smoke-box through the intermediate passage,  $b$ . When, on the other hand, the steam-passage  $a^2$  is partially or fully opened, a portion of the steam escapes through the supplementary passage  $a^2$ , the collective area for  
100 delivery is increased, and the blast modified. Moreover, the portion of the steam which escapes by way of the passage  $a^2$  has no effect upon the gases contained in the smoke-box



until the upper extremity of the blast-pipe is reached, at which level the influence of the current, already diffused, is comparatively ineffective.

5 In conjunction with a blast-pipe of the kind hereinbefore described I sometimes employ means whereby the apparatus may be wholly or partially worked with live steam from the boiler. For this purpose I provide the  
10 apparatus near its base with a nozzle, to which a steam-pipe may be attached, and whereby the blast-pipe may be worked when exhaust-steam from the cylinders is not available for the purpose.

15 When it is desired to render the action of the apparatus automatically adjustable, I provide means, which I have illustrated in Fig. 5, whereby the annular valve  $a^3$  or its equivalent is opened or closed as the steam rises  
20 above or falls below its normal pressure, such means being operated by the varying steam-pressure in the boiler.

In Fig. 5  $c$  is the rod whereby motion is communicated to the blast-pipe-regulating  
25 valve  $a^3$ , the said rod being worked by an automatic apparatus consisting of a steam-cylinder,  $d$ , containing a piston connected by a rod,  $d'$ , to the shaft or rod  $c$ . The steam-passages  $d^2$   $d^3$  are normally closed by a slide-valve,  $d^4$ ,  
30 the latter being attached by means of suitable connections to the free end of a bent tube,  $e$ , to which steam is admitted from the boiler through a pipe,  $e'$ . The steam-chest of the cylinder  $d$  is supplied with steam from the  
35 boiler by means of a pipe,  $f$ . The movement of the free end of the tube  $e$  in either direction as variation in the internal pressure takes place causes steam to be admitted to the steam-cylinder  $d$  upon one side or the other of the  
40 piston, and thus operates the regulating-valve of the blast-pipe.

I do not in this application broadly claim the annular passages  $b$  and  $a^2$ , surrounding the central nozzle of a blast-pipe, and a valve controlling the passage  $a^2$ , as this is illustrated in  
45 the pending application of Appleby and Robinson, Serial No. 247,650, and claimed therein.

Observing that the present application for Letters Patent is made within the term of pri-  
50 ority of seven months prescribed by Article 4 of the International Convention for the Pro-

tection of Industrial Property, of March 20, 1883, a British patent for the invention having been applied for on the 19th of July, 1887, No. 10,128,

I claim as my invention and desire to secure by Letters Patent—

1. In a blast-pipe, the combination, with a central steam-nozzle, of a surrounding annular steam-passage communicating therewith, 60 an intermediate annular air-passage open at its lower end, and a valve arranged to work in an axial direction and serving to control the escape of steam by way of said outer or supplementary steam-passage. 65

2. In a blast-pipe, the combination of the central nozzle,  $a$ , provided with tubular branches  $a'$ , the outer casing,  $a^6$ , secured to the tops of said branches, the inner casing,  $a^{2x}$ , provided with a valve-seat,  $a^{3x}$ , on its outer 70 face in the annular passage  $a^2$ , and the valve  $a^3$ , mounted in the passage  $a^2$  and arranged to move to and from its seat in the direction of its axis and that of the nozzle  $a$ , substantially as set forth. 75

3. The combination, with a blast-pipe having two steam-passages, an air or gas passage, and a regulating-valve controlling one of said passages, of a steam-cylinder, a piston therein connected with said regulating-valve of the 80 blast-pipe, a valve controlling the admission of steam from the boiler to the opposite ends of said cylinder, a vent-tube, as  $e$ , open to the steam in the boiler, and a connector which couples the said tube  $e$  to the valve of said 85 steam-cylinder, substantially as set forth.

4. In a blast-pipe, the combination, with the regulating-valve of the same, of means whereby said valve is actuated by the pressure in the boiler and automatically regulated ac- 90 cording to the variations in said pressure, said means consisting of a steam cylinder open to the boiler and its valve, a piston in said cylinder, connecting with the regulating-valve of the blast-pipe, and a bent tube open to the 95 steam in the boiler and connected with and actuating the valve of said cylinder, substantially as set forth.

HENRY APPLEBY.

Witnesses:

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CHAS. H. SHORT.