

J. BEHM.

OIL AND AIR MIXING AND GAS GENERATING APPARATUS.

(Application filed Jan. 16, 1902.)

(No Model.)

2 Sheets—Sheet 1.

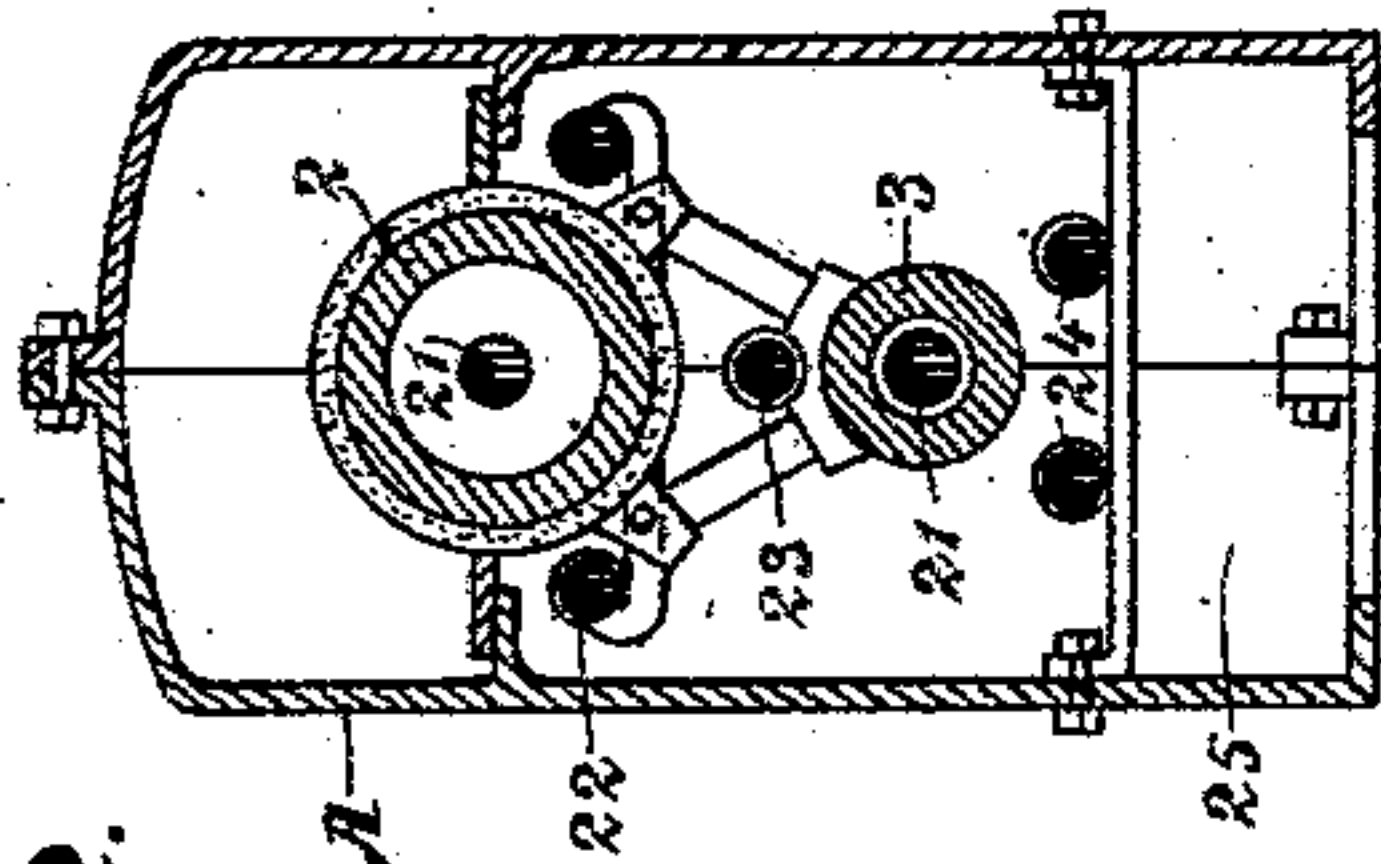


Fig. 2.

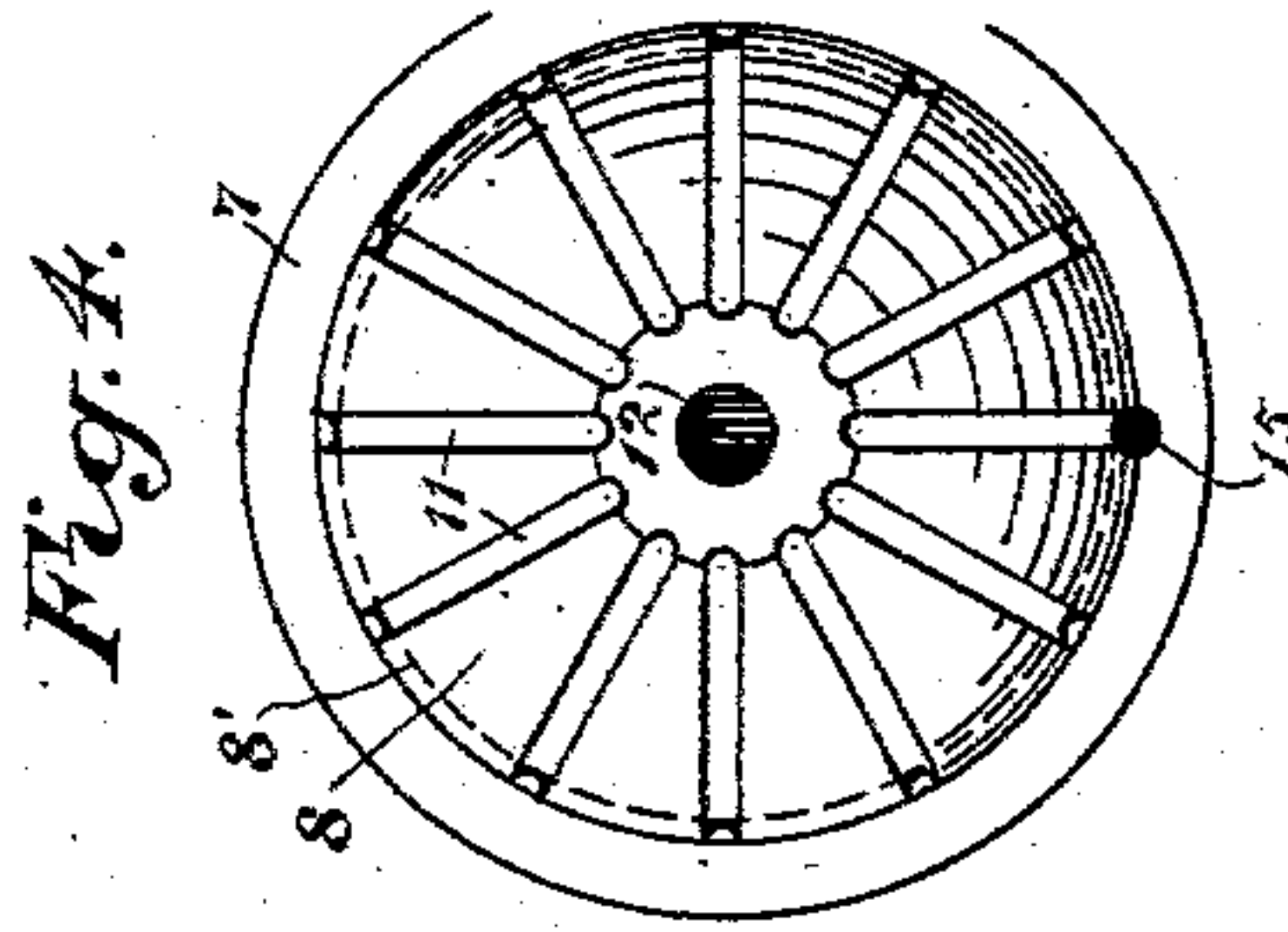


Fig. 4.

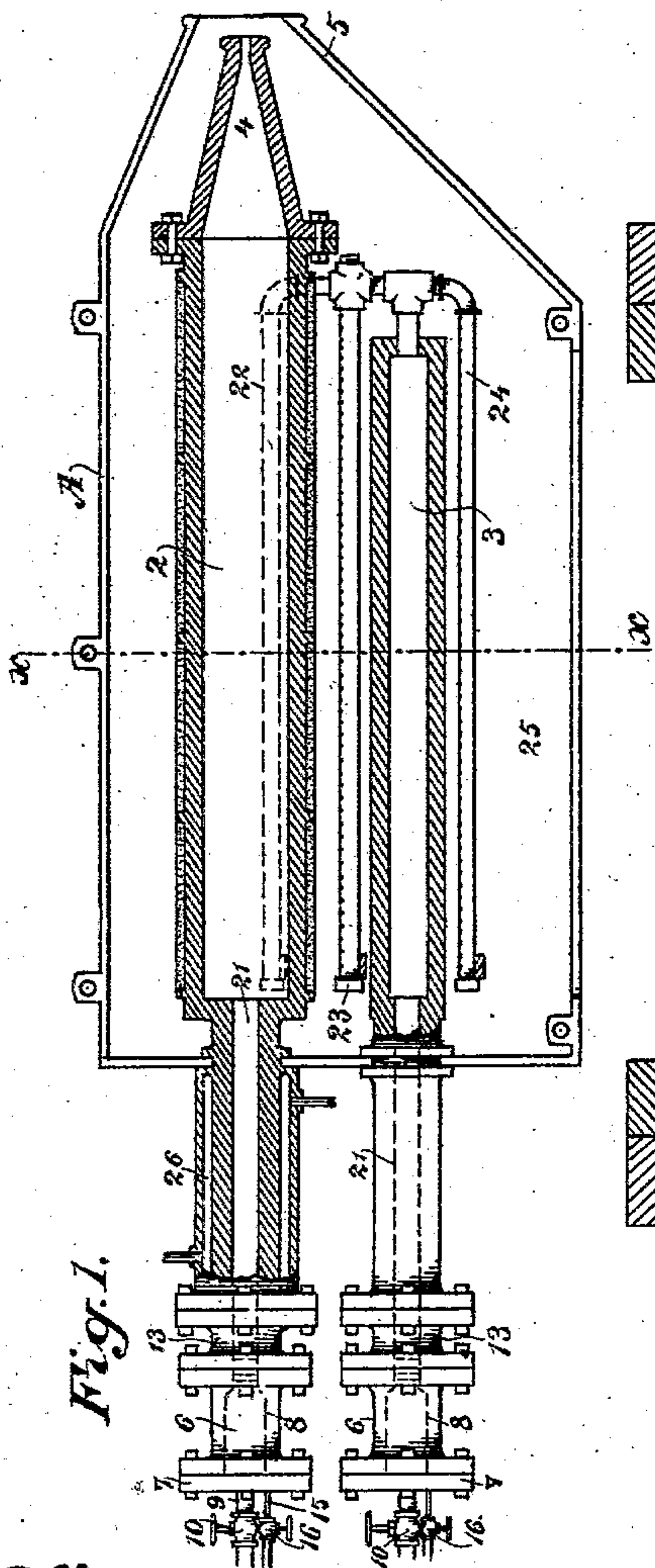


Fig. 1.

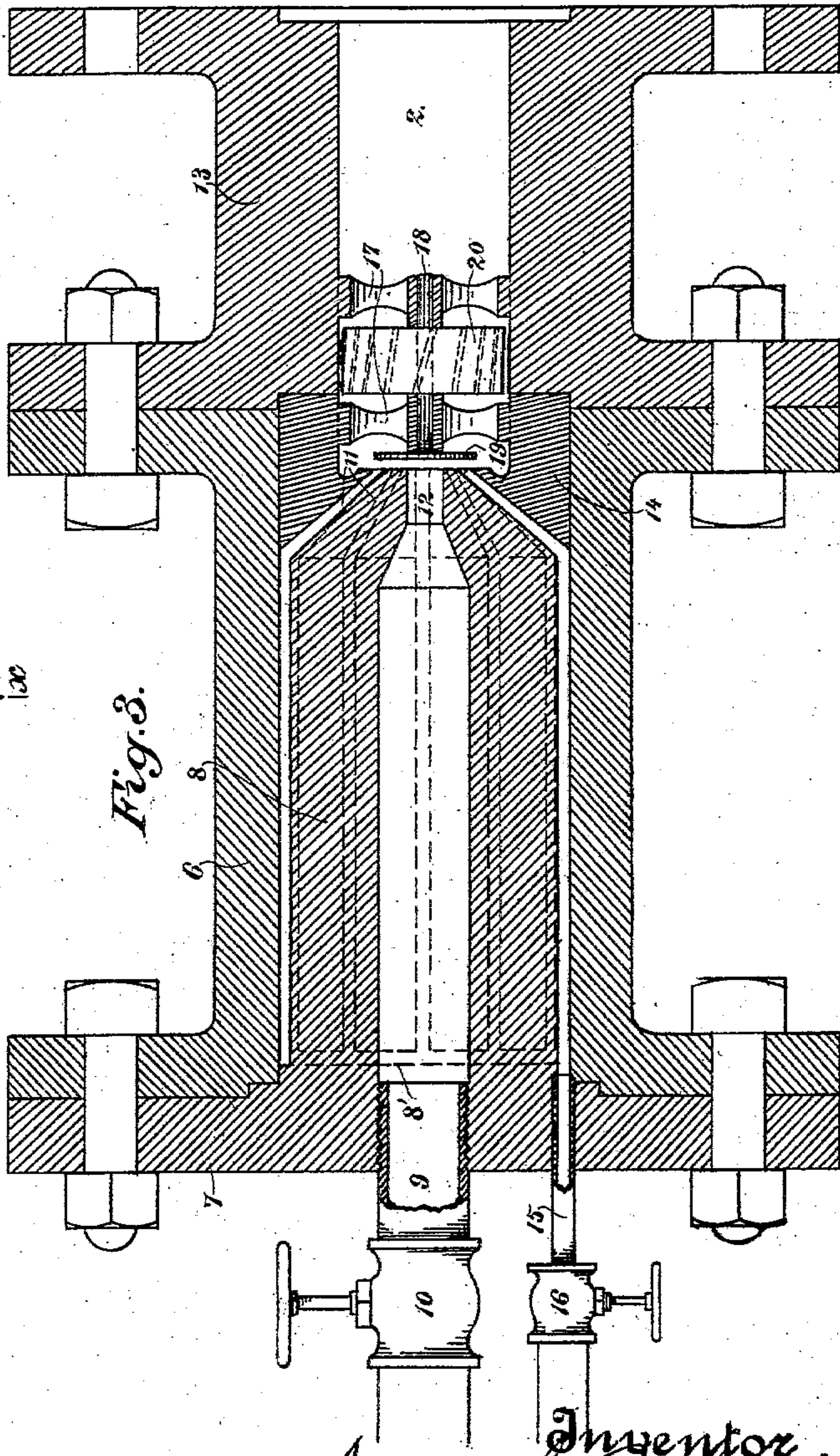


Fig. 3.

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OIL AND AIR MIXING AND GAS GENERATING APPARATUS.

(Application filed Jan. 18, 1902.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 5.

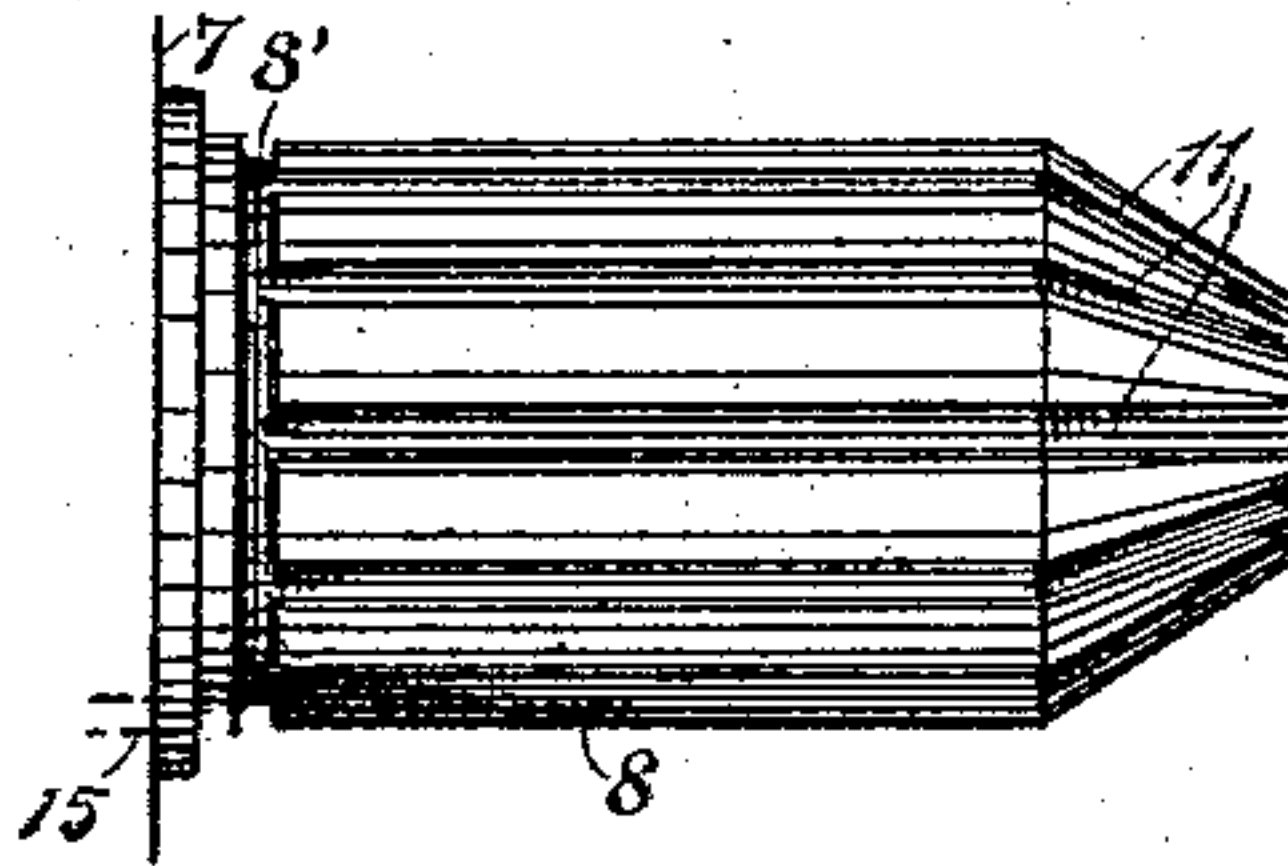


Fig. 6.

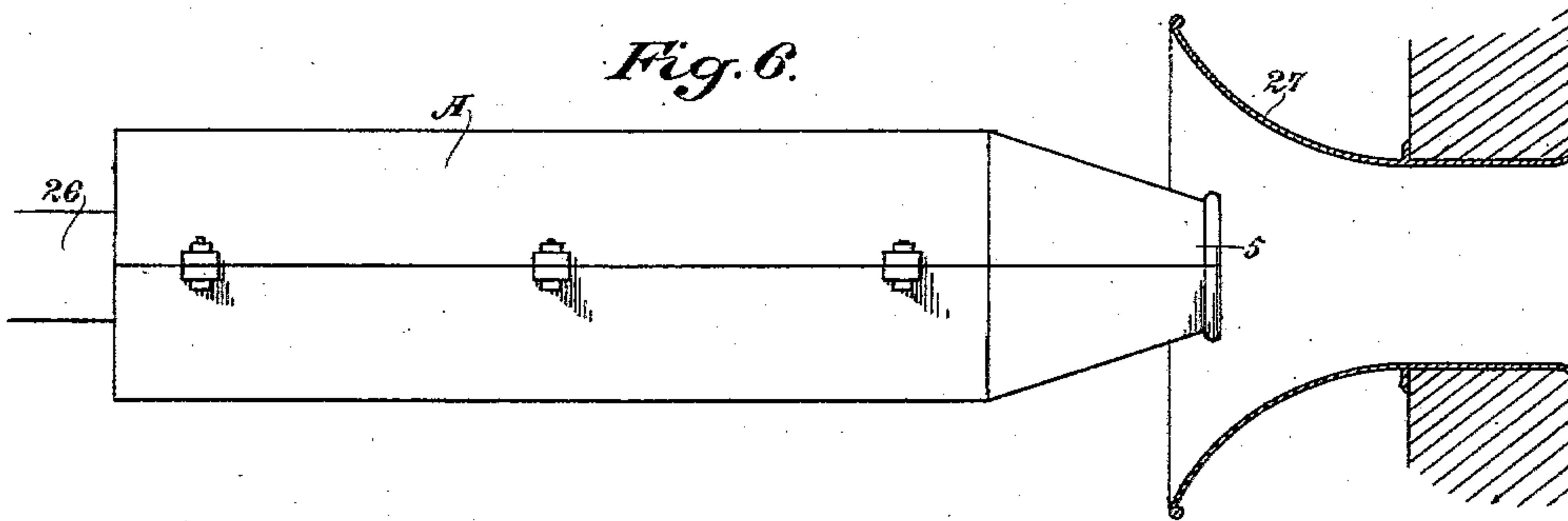


Fig. 7.

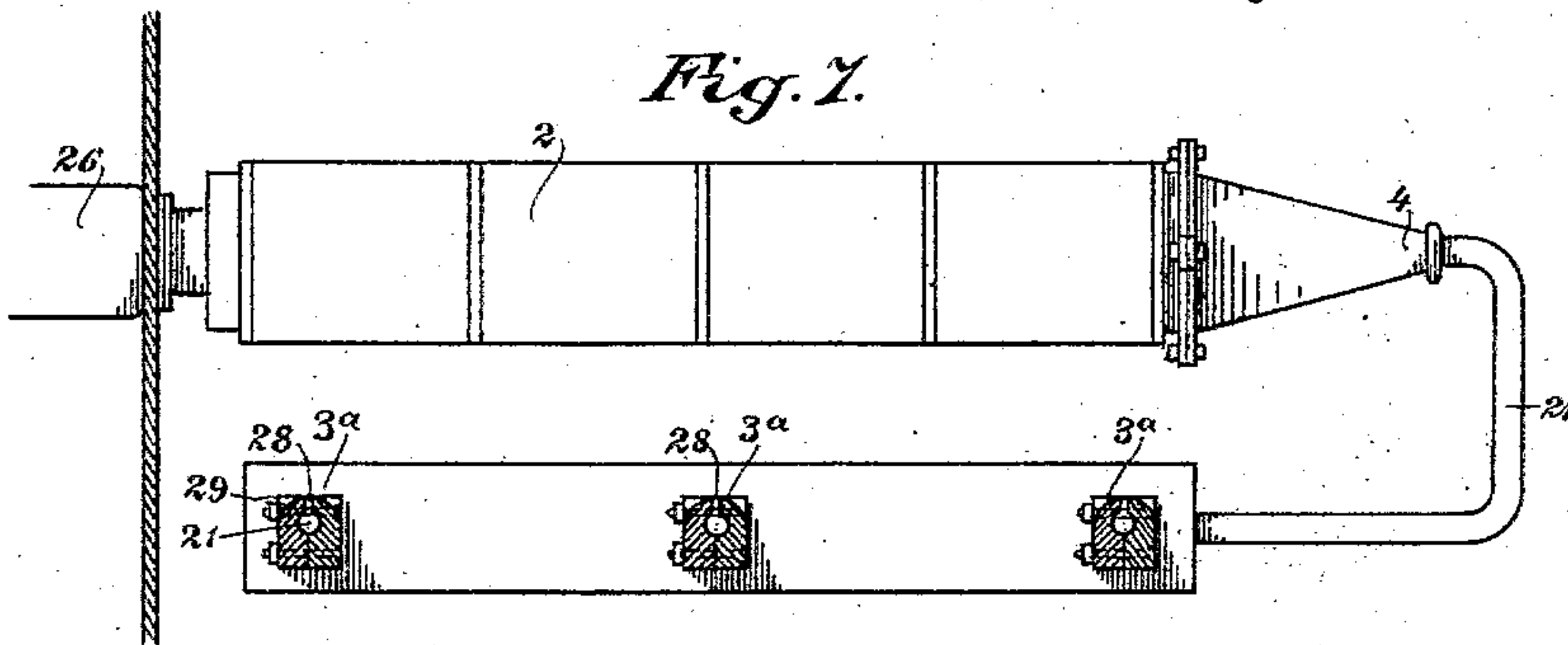


Fig. 8.

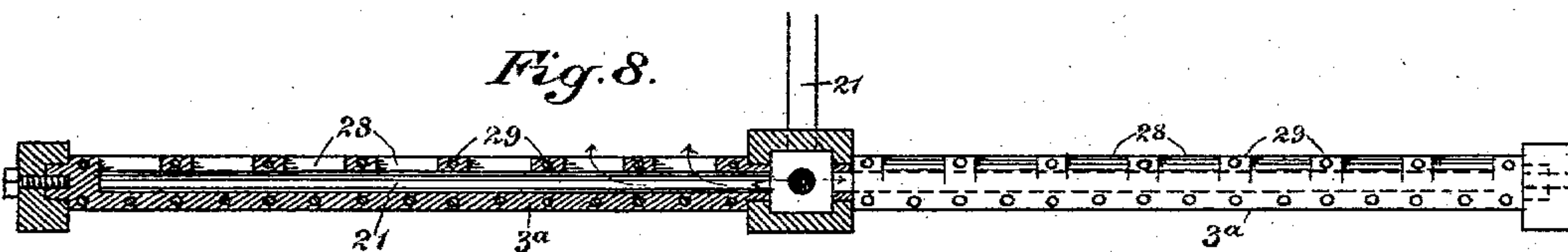
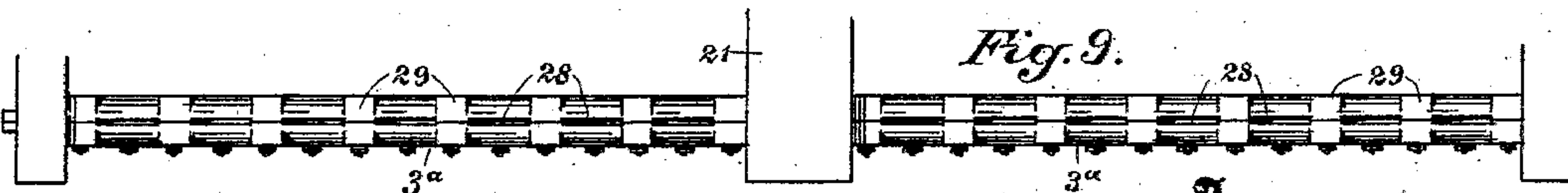


Fig. 9.



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# UNITED STATES PATENT OFFICE.

JOSEPH BEHM, OF SAN FRANCISCO, CALIFORNIA.

## OIL AND AIR MIXING AND GAS-GENERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 704,732, dated July 15, 1902.

Application filed January 16, 1902. Serial No. 90,031. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH BEHM, a citizen of the United States, residing in the city and county of San Francisco, State of California, have invented an Improvement in Oil and Air Mixing and Gas-Generating Apparatus; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to apparatus for burning petroleum-oil.

It consists in mechanism for separating and introducing compressed air and the oil and for comminuting the oil and intermingling or mixing it with the air and heating the mixture and jets through which it is discharged, with means for delivering it to the point where combustion is to take place.

My invention also comprises details of construction, which will be more fully explained by reference to the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section, partially in elevation, through the apparatus. Fig. 2 is a section on line *x x* of Fig. 1. Fig. 3 is a detail section of the mixing part of the apparatus. Fig. 4 is an end view of the cone of the mixing part. Fig. 5 is a detail view of the same. Fig. 6 shows the apparatus as applied to a blast-furnace. Fig. 7 shows it when used for heating steam-boilers. Fig. 8 is a front view of the modified heater, one part being shown in section. Fig. 9 is a top view of the same.

The object of my invention is to provide a more perfect means for intermingling or mixing air and oil products and preparing them for burning, and preferably partially-refined oil.

As here shown, A is an exterior case of any suitable or desired form and dimensions and adapted to contain the cylindrical tubes 2 and 3, one of which is located above the other, and both are suitably supported within the casing. The upper tube 2 has a conical discharge-nozzle at 4, through which the mixed air and oil are discharged, and the casing A has its front also reduced into a conical form, as at 5, with the opening larger in diameter and approximately concentric with the nozzle 4.

The air and oil are mixed and introduced

into the rear of the cylinders 2 and 3 in the following manner:

6 is a sleeve having bolt-flanges at each end, and at one end is fitted a cap 7, having an inwardly-projecting tubular cylindrical portion 8, into the rear end of which an air-inlet pipe 9 is fitted, the discharge from this pipe being controlled by a suitable valve, as at 10. The annular chamber 8 may be of smaller diameter than the interior of the sleeve 6, and its front end is made convergent or conical on the outside, and this conical front has tapering channels made in it, as shown at 11, all converging toward the end. The interior of the tube is also converged to the discharge-passage 12; but in some cases the part 8 may fill the interior of 6, and the channels 11 extend to the rear end of the cylindrical part. A second flanged sleeve 13 is bolted to the end of the sleeve 6, as shown, and is chambered to receive an annular circular piece 14, which slips into the part 6 and is held in place when the part 13 has been bolted to 6. The end of this piece 14 which is contiguous to the channels 11 of the part 8 is made concave, with the same taper as the front end of 8, so that it fits against the conical portion, and thus leaves only the open channels 11, the ends of which, converging as shown, discharge around the opening 12. Oil is admitted into the annular space or channels 8' around 8 through a pipe 15, having a controlling-valve, as at 16, and the oil thus admitted, under such pressure as may be desirable, fills the channels or space between the outside of the part 8 and the interior of the sleeve 6 and flows down through the grooves or channels 11, while the air admitted under pressure into the interior of 8 is discharged through the passage 12. Within the sleeve 13, just in front of the conical end of 8, are fixed two spiders 17, which are here shown as having circular rims with central hubs and light connecting-arms, leaving open spaces between the hubs and the rims. Through the hub a spindle 18 passes and has upon the end adjacent to the conical front of 8 a thin flat disk 19. Between the spiders 17 is fitted a propeller-wheel 20 of any suitable form, so that when a jet of air is discharged through the passage 12 it will pass through the openings



of the spiders 17 and impinging against the wheel 20 will cause it to revolve, thus revolving the disk 19, which is fixed upon the end of the same shaft or spindle. The operation of this portion will then be as follows: The oil and the air being concentrated and discharged against the disk 19 while the latter is rapidly revolving, the oil will be thrown outward into the chamber within which the disk revolves and finely subdivided and at the same time mixed with the air, the mixture passing through the spiders and being delivered through the passage 21 into the rear of the chamber 2 or 3 to which it appertains. I have here described but one of these devices, because each of the chambers 2 and 3 has a like device for supplying them. This portion of the apparatus is here shown as located behind the main chamber A, and the passage 21 is formed within a sleeve which is bolted to the outer end of the sleeve 13 and extends through the rear of the case A to its attachment with the part 2 or 3 to which it belongs.

Upon each side of the vaporizer 2 are located perforated pipes 22, and beneath this chamber is located another similar pipe 23. Upon each side and beneath the chamber 3 are located similar perforated pipes 24, as plainly shown in Fig. 2. Within the casing and beneath these vaporizers 2 and 3 is a space 25, adapted to receive any suitable fuel for the preliminary heating up of the apparatus.

In such an apparatus as I have described it is desirable to use an oil which has been partially purified and relieved of the heavy asphaltic base and other impurities, which would soon clog and obstruct such an apparatus as here described, and with the higher grade of oil the inlet may be reduced by making the cylinder 8 to fit closely within 6 and continuing the channels 11 to the inlet end, where they may connect with an annular groove, into which the oil is admitted from the valve-controlled pipe 15. This enables the user to control the supply and regulate it at will.

It will be understood that the generating-chamber A may be independent from the combustion-chamber, as when used for blast or other furnaces, or it may be a part of the furnace itself; but in my construction it is well to protect the mixing-chambers, heretofore described, from the heat of the generator, and this is effected by means of a water-jacket 26, which surrounds the section 13 or 21 contiguous to this part of the apparatus, and a continuous supply and discharge will keep this part cool and prevent the mixer from being unduly heated.

If the apparatus is to be used in conjunction with a blast or equivalent furnace, it is desirable to supply air to enter the furnace with the gas generated within the apparatus, and this is effected by means of convergent openings 27, into which the nozzles 4 or 5 are inserted so as to have annular channels around

them, and the blast from these nozzles will produce an inward draft of air through the openings 27 sufficient for the perfect combustion of the gas.

When the apparatus is to be used in connection with a steam-boiler or similar furnace, the separate casing A may be dispensed with and the generator 2 located within the furnace-walls, and the connection from the mixer through the passage 21 would then be through the front wall of the furnace. With this construction the form of the heater 3 will be changed, as shown at 3<sup>a</sup>, in which the tube is preferably made in sections divided longitudinally and vertically and having slits 28 made along the top and intermediate rectangular portions 29, through which bolts may pass to secure the sections together. In this construction the mixed oil and air enters the pipe or pipes 3<sup>a</sup> and passing out through the slits will heat the upper generator 2, and the discharge from one or more of these generators will fill the furnace with flame. In this construction air may be admitted by the usual or any suitably-controlled openings.

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

1. The combination in an oil-burner of independent generating-chambers one located above the other and one of said chambers having a discharge-nozzle, a casing inclosing both chambers, means for admitting air and oil into each of said chambers and means for heating the chambers.

2. The combination in an oil-burner of independent generating-chambers and an exterior containing-casing, one of said chambers being located above the other and having a discharge-nozzle at the front, connections with the rear of said chambers, means for introducing air and oil to each of said connections, means for mixing the air and oil and delivering it into the generating-chambers and means for heating said chambers.

3. The combination in an oil-burning apparatus of independent superposed generating-chambers, an exterior casing within which they are contained, the uppermost of said chambers having a discharge-nozzle at the front, burner-openings and connections between the lowermost chamber and said openings through which gas is discharged and ignited whereby the chambers are continuously heated, and means for mixing oil and compressed air and supplying them to the generators.

4. The combination in an oil-burning apparatus of independent superposed generating-chambers, an exterior casing within which they are contained, means for mixing and supplying compressed air and oil to the rear of said chambers, the lowermost having burner-openings to serve as a heater for the upper one, and means for protecting the mixing devices from the heat of the generator, including water-jackets surrounding the con-



necting-passages and inlet and outlet circulating-pipes therefor.

5 5. The combination in an oil-burning apparatus of generating-chambers and exterior casing, means for supplying oil and air to said chambers, consisting of sleeves, interior tubes each having a central opening and exterior channels within the sleeve, air-pipes connecting with the central space and oil-pipes with  
10 the exterior channels, and convergent tapering passages at the front connecting the channels with the chamber into which the air is discharged, and means therein for mixing the oil and air.

15 6. In an oil-burning apparatus, the generating-chambers the supply and mixing device consisting of sleeves, interior tubes with the rear of which the compressed-air pipes connect, said tubes having a passage between  
20 them and the exterior sleeves, oil-pipes delivering into said passage, conical convergent front ends with convergent channels formed upon the front of the tubes; a revoluble disk against which the compressed air  
25 and the oil are discharged, and by the rotation of which they are mixed.

7. In an oil-burning apparatus, a central tube, means for supplying compressed air thereto, exterior channels and means for supplying oil thereto, an opening at the front for  
30 the discharge of air and convergent tapering

passages connecting the oil-channels with the air-receiving space, a propeller-wheel the shaft of which is journaled in said receiving-space, so that the passing air-jet will revolve  
35 the propeller and a disk carried by the propeller-shaft contiguous to the air and oil discharge passages and acting as a mixer therefor.

8. In an oil-burning apparatus, the generating-chambers and exterior containing casing, means for mixing air and oil and supplying it into said chambers consisting of a revoluble propeller-wheel located in the passage connecting with the generators, a disk  
40 carried upon the rear end of the shaft of said propeller, a tubular conductor through which compressed air is discharged against the disk, an annular chamber surrounding said conductor, means for delivering oil into said  
45 chamber and convergent tapering channels connecting said chamber with the space in which the revoluble disk is rotated whereby the oil is subdivided and mixed with the air before delivering into the generators.  
50 55

In witness whereof I have hereunto set my hand.

JOSEPH BEHM.

Witnesses:

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JESSIE C. BRODIE.