

(No Model.)

3 Sheets—Sheet 1.

S. T. McDOUGALL.  
VAPOR AND STEAM BURNER.

No. 370,486.

Patented Sept. 27, 1887.

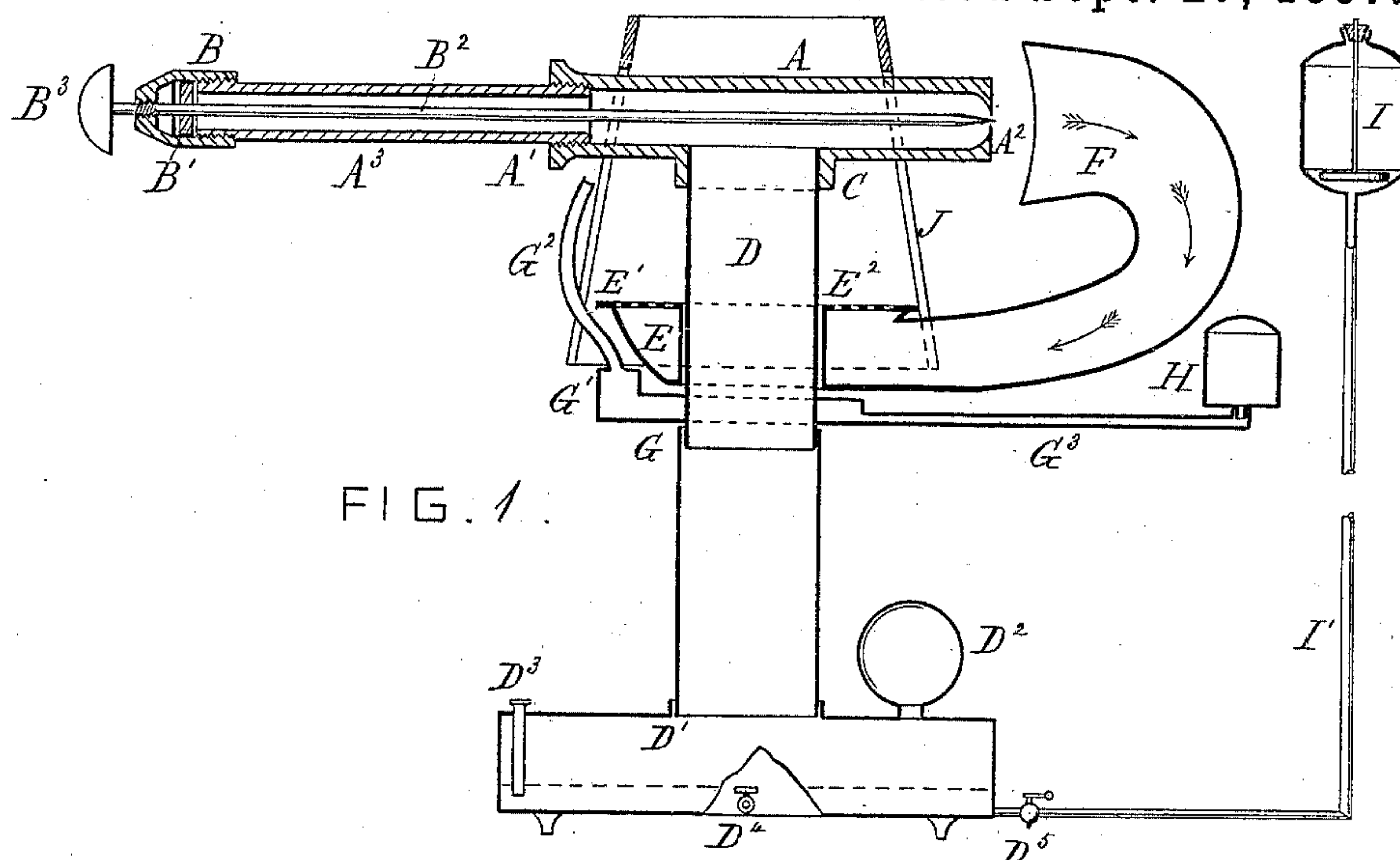


FIG. 1.

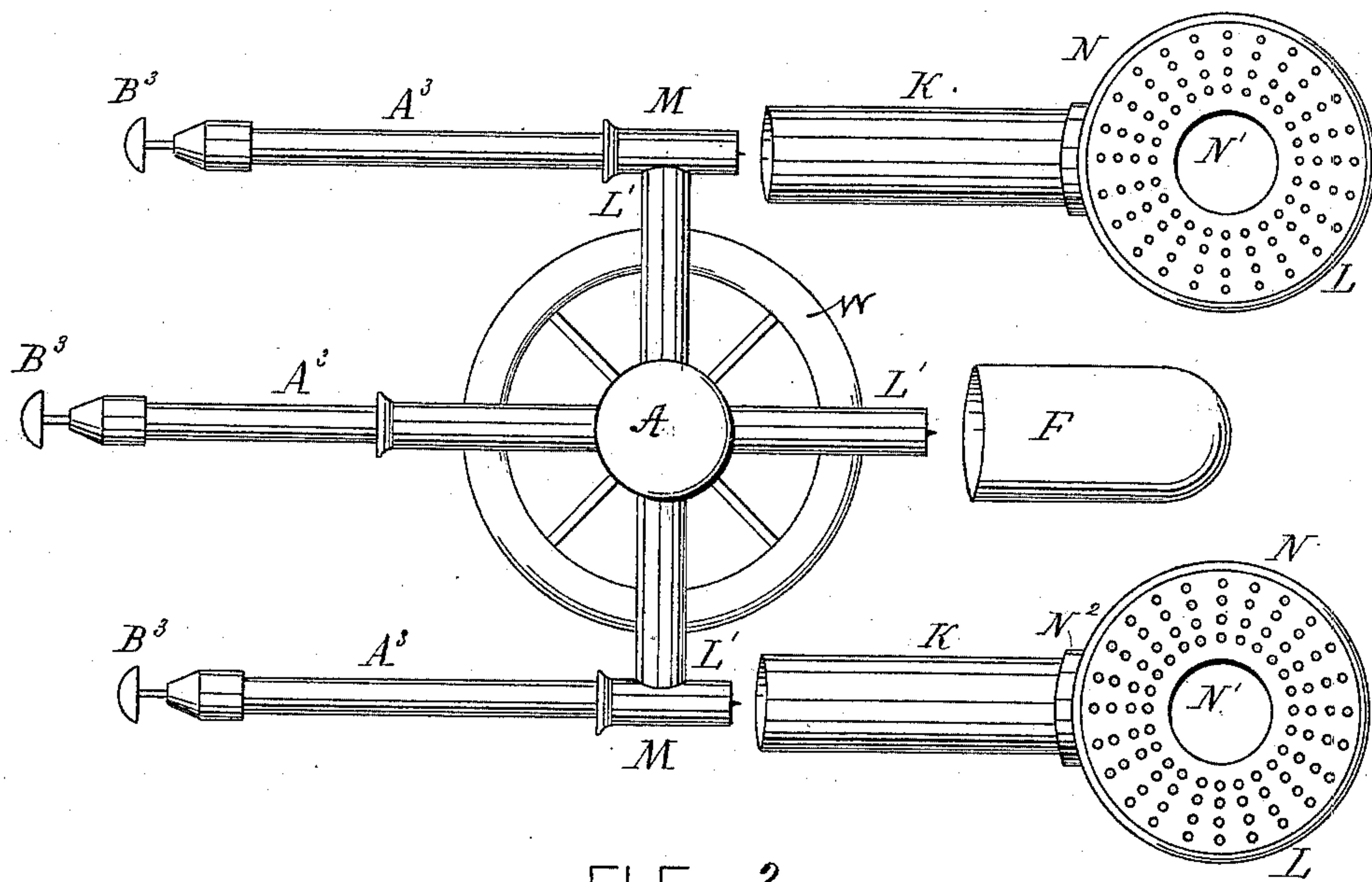


FIG. 2.

Witnesses

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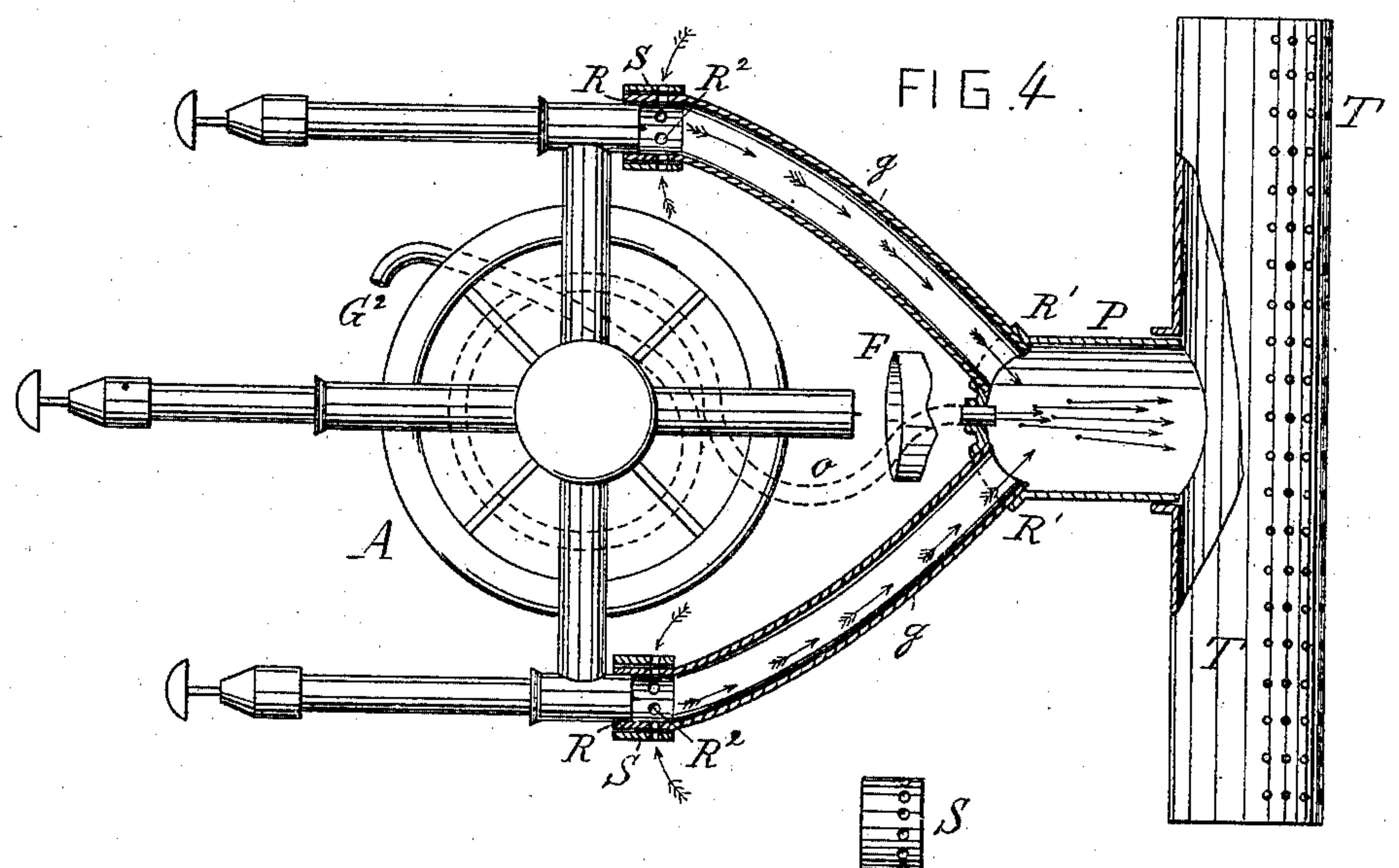
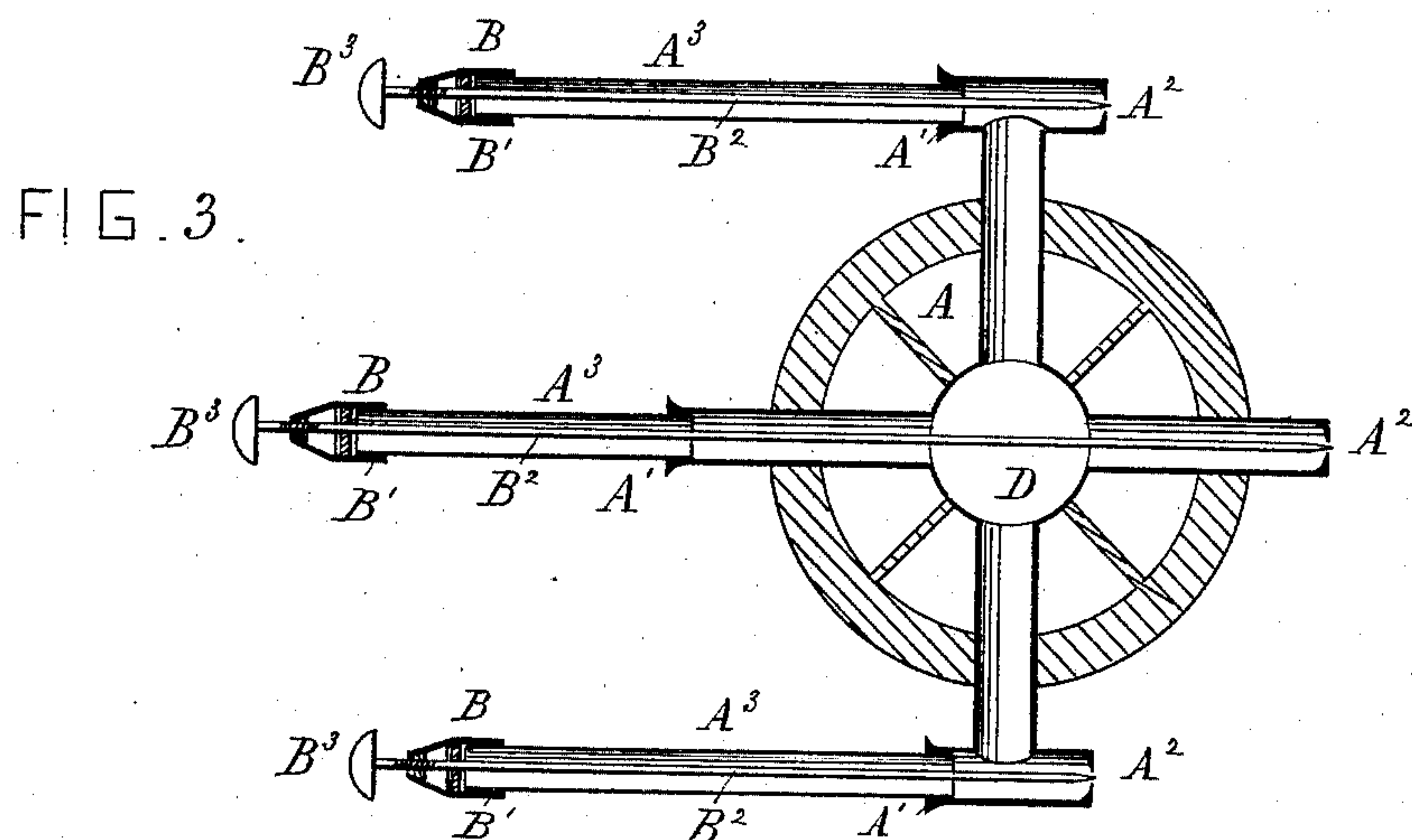
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3 Sheets—Sheet 2.

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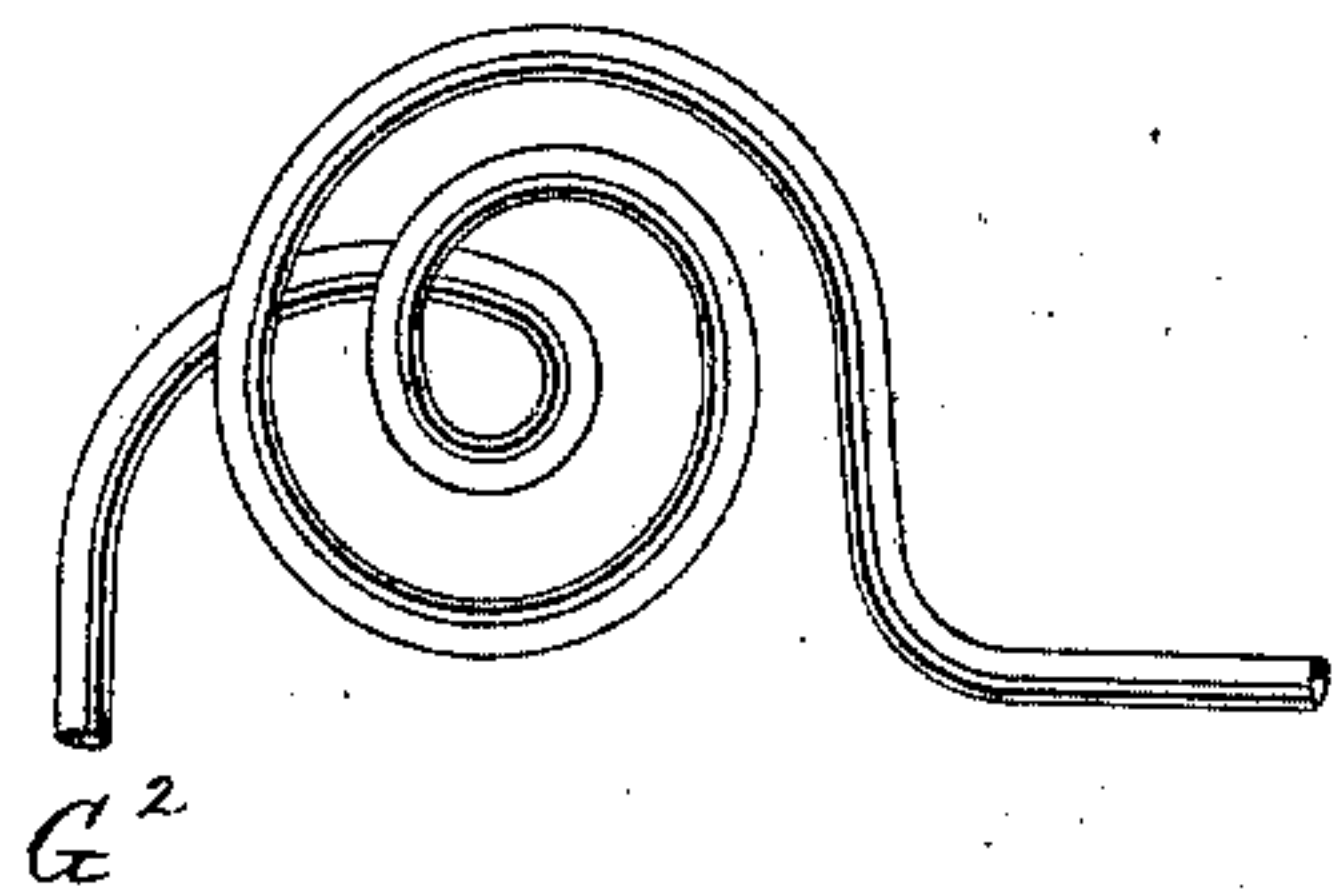


FIG. 8.

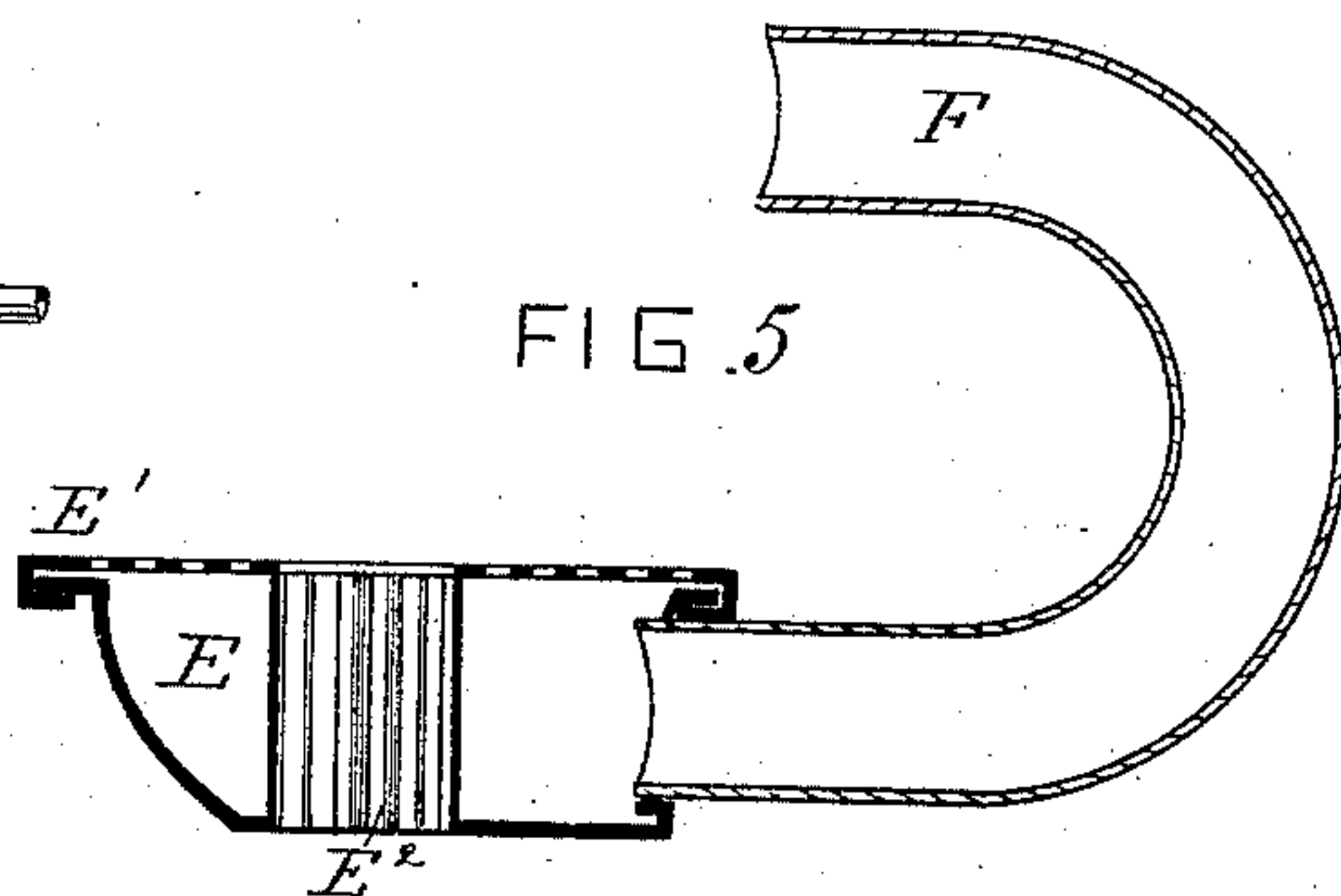


FIG. 5.

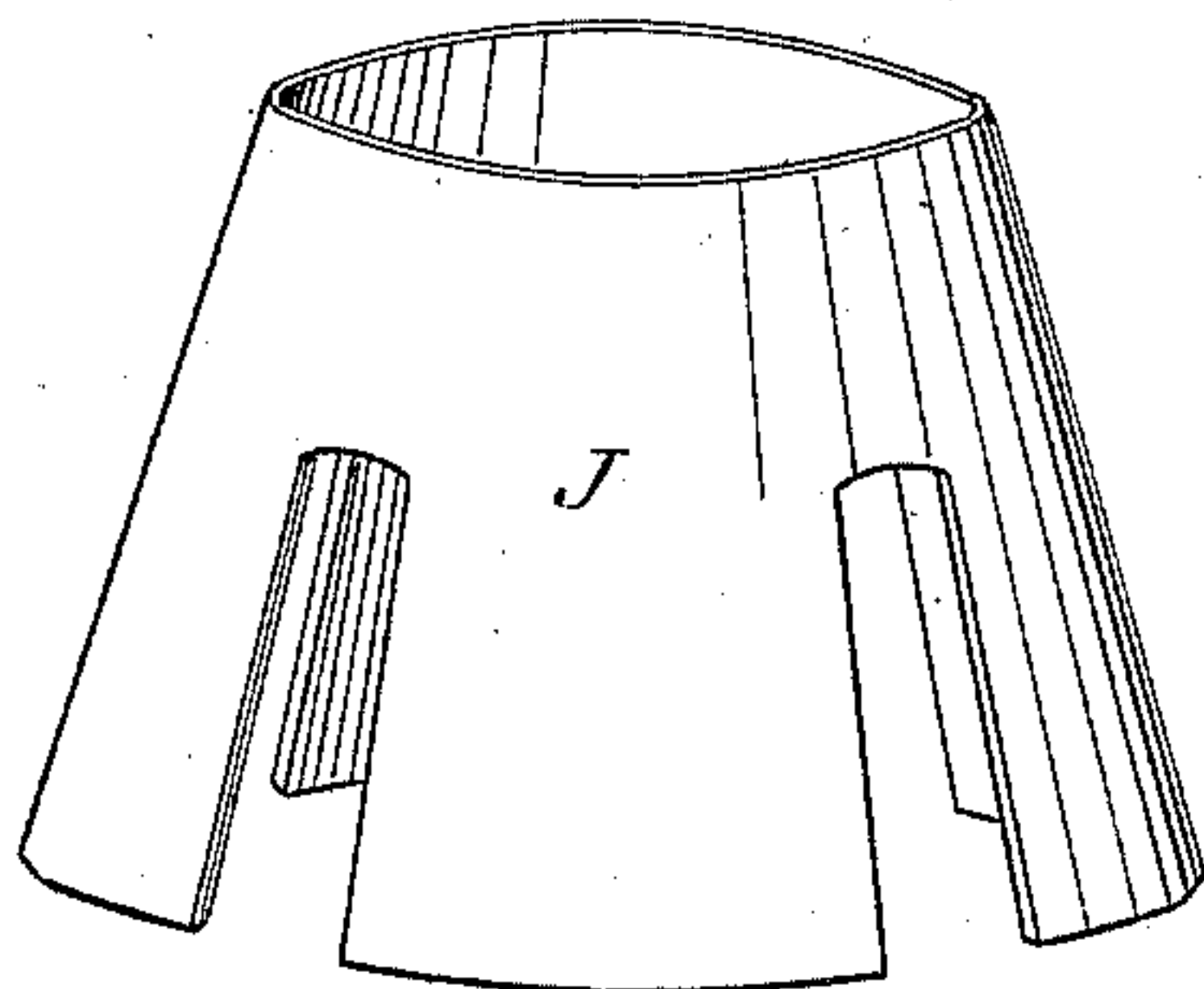


FIG. 4.

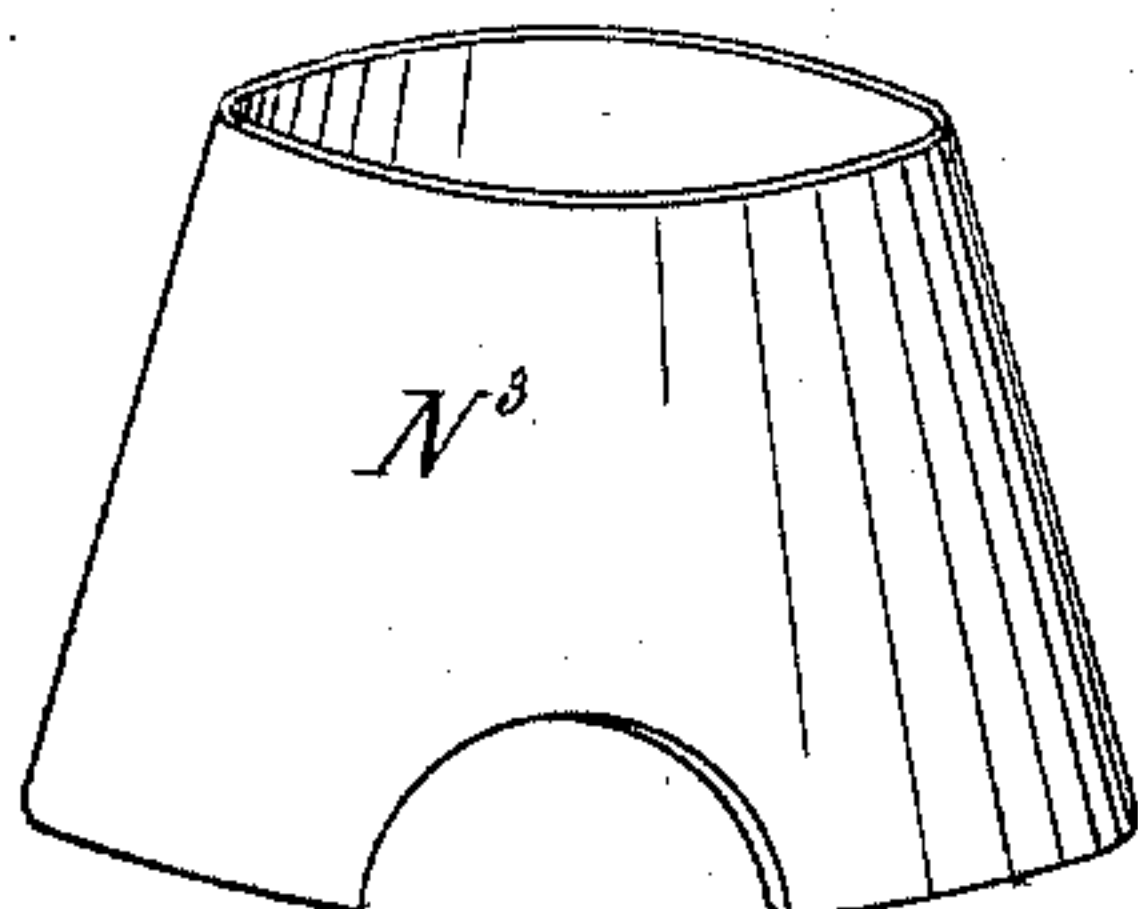
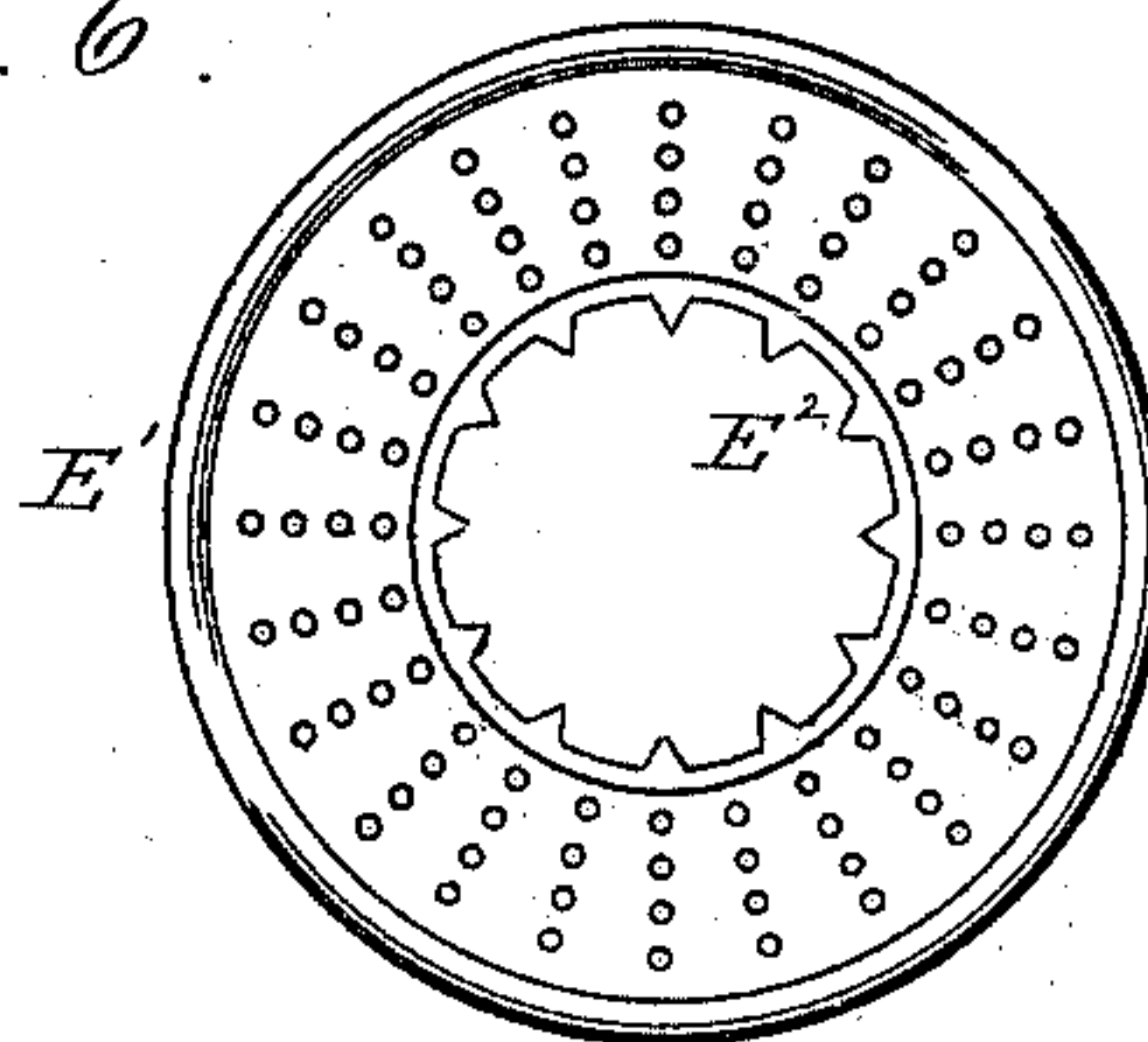
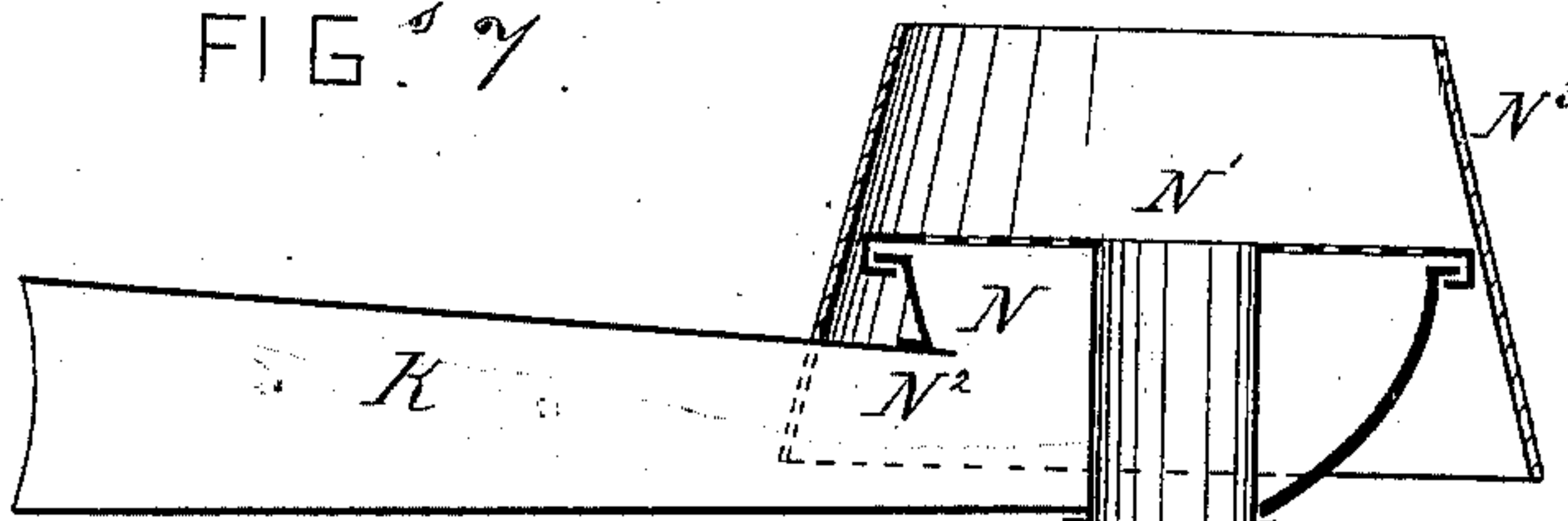


FIG. 7.



Witnesses  
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# UNITED STATES PATENT OFFICE.

SAMUEL T. McDOUGALL, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO JULIA H. JORDAN, OF SAME PLACE.

## VAPOR AND STEAM BURNER.

SPECIFICATION forming part of Letters Patent No. 370,486, dated September 27, 1887.

Application filed December 18, 1885. Renewed February 2, 1887. Serial No. 226,240. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL T. McDOUGALL, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Vapor and Steam Burners for Stoves, Boilers, and other Purposes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming a part of this specification.

My invention relates to improvements in vapor-burners for vaporizing oils and other fluids, and also in combining with them a steam-generator and a superheating or decomposing coil or retort and commingling the products together for burning or explosive purposes.

The object of my invention is to provide a cheap and durable device for attaching to ordinary cooking and heating stoves, ranges, portable stoves, steam and other boilers, gas or vapor engines, and other purposes requiring a powerful heat.

Figure 1 is a central vertical section of my invention. Fig. 2 is a top view of the retort, the commingling-tubes, and side burners, also the pipes, spindles, and stuffing-boxes surrounding the spindles. Fig. 3 is a cross-section of the retort on a line with the center and vapor outlets, showing its interior construction, the spindles, pipes, stuffing-boxes, needle-points, vapor-outlets, and also the top of the oil or liquid pipe connecting with the retort. Fig. 4 is a top view, in section, of the superheating or decomposing coil, side vapor and commingling tubes and burner, and their connection with the retort, and the air-regulator. Fig. 5 is a view in section of the central burner and commingling tube and superheating or decomposing coil. Fig. 6 is a view in section of the top of the central burner, also of the cone surrounding the retort and the top of the burner. Fig. 7 is a view in section of the outside commingling-tube and burner and the cone surrounding it. Fig. 8 is a view in section of the superheating-coil, also shown in dotted lines in Fig. 4.

A, Fig. 1, represents a central section of the generator or retort. This retort is made of

copper or other suitable metal, and is cored or drilled out. At one end a screw-thread is cut, as shown at A'. At the opposite end is a discharging-opening for the vapor, as shown at A<sup>2</sup>. This discharging-opening is preferably made through a steel plug, which is inserted in the retort.

A<sup>3</sup> is a pipe with screw-threads at both ends. One end is screwed into the retort at A'. The other end receives the stuffing-box B, having a corresponding screw-thread. This stuffing-box is made of brass or any suitable metal, and is chambered out inside to receive a cork or other packing, B'.

B<sup>2</sup> is a spindle, made of steel or other metal. At one end of the spindle is a needle-point for closing and opening the vapor-opening in the retort. Near the other end is a screw-thread turning in a corresponding thread in the outer end of the stuffing-box. On the outer end of the spindle B<sup>2</sup> is a thumb-piece, B<sup>3</sup>, to operate the spindle in opening and closing the vapor-outlet, and also for regulating the quantity discharged.

C is a flange or pipe extending a short distance below the bottom of the retort. The other parts of the retort are described hereinafter.

D is the main supply-pipe, and connects the retort A to a bottom vessel, D'. The pipe D rises up from the vessel D', and is attached to the retort A by means of a screw-thread or brazing. I prefer to make pipe D of two pieces, as shown—the upper piece of brass or other heat-conducting metal and the lower piece of non-conducting or of metal having less conducting power. These pieces can be connected at the center by screws or solder. The lower end may be connected to the vessel D' in a similar manner. This rising pipe D may be made in one piece, and in some cases of a non-conducting metal. This depends upon the gravity of the liquid used.

D<sup>2</sup> is an air-chamber. This air-chamber is made of metal or other suitable material and of any size required. The upper part is airtight, the lower part communicating with the interior of the vessel D'. The object of this air-chamber is to equalize the pressure on the retort and to prevent it bursting from too quickly turning the vapor off or from excess-



sive heat applied to the retort when full of oil and the vapor-openings and oil-cock are closed.

D<sup>3</sup> is a filling-pipe and cap.

5 D<sup>4</sup> is a draw-off cock.

D<sup>5</sup> is an inlet-cock and supply-opening from the elevated reservoir I.

The objects of these parts are described hereinafter.

10 E is the central burner. This burner is made of cast-iron or other suitable metal, and is cup-shaped, rising upward, and with an outward flange at the top, as shown at E', and a tube rising up through the center, having  
15 ribs or corrugations inside and a perforated top, as shown at E<sup>2</sup>, Figs. 1, 5, and 6.

F is a commingling-tube, through which the vapor and air or superheated or decomposed water or steam is mingled and carried into the  
20 burner E and burned above the perforations. This tube is made of metal, and can be cast with the burner E in one piece of metal, except the perforated metal top, which I preferably make of perforated brass and fasten it  
25 under the flange E', as shown in Figs. 1 and 5.

G is a small water-vessel surrounding the main supply-pipe D. This vessel has a steam-chamber, G', at one side and steam-pipe G<sup>2</sup> rising up from the top of the steam-chamber  
30 to the retort A, and connects with the coil O. At the opposite side of the water-vessel G is a supply-pipe, G<sup>3</sup>, passing outward to a hydrostatic fountain-reservoir, H, containing water and arranged to regulate the supply to the  
35 vessel G. The fountain or reservoir H is constructed similar to the reservoir used in the student-lamp, having bottom opening and valve, and is filled in a similar manner, the object being more fully described hereinafter.

40 I is an elevated tank or reservoir having a float and rod inside to show the quantity of liquid inside the reservoir. This reservoir is placed at an altitude of three feet (more or less) above the burner. The same pressure  
45 may be obtained by an air or water pressure placed on a line with or under the burner.

I' is a pipe connecting the reservoir I and vessel D' and supplying oil or other fluid to the main pipe D and retort A.

50 J is a cone-shaped casting surrounding the retort A. This casting extends a short distance above the top of the retort A, and below the top of the burner E it has slotted openings from the bottom upward, as shown  
55 at J in sectional Fig. 6, so as to allow the cone to pass down and over the vapor-tubes extending outside the central part of the retort A.

The object of the cone J is to convey air to the burner, and also prevent the flame igniting  
60 the vapor at the needle-point or discharge-openings.

Fig. 2 is a top view of the retort A, the commingling-tubes K K, side burners, N N, and pipes A<sup>3</sup> A<sup>3</sup> A<sup>3</sup>, having stuffing-boxes with  
65 packing and spindles with thumb-pieces. The retort A has a wheel-shaped support, W, having openings or tubes passing through it at

right angles. These tubes extend a short distance outside the rim, as shown at L' L' L' L', at opposite sides of the retort A; and connected  
70 with the tubes L' are short vapor-tubes M M, running parallel with the central vapor-tube and having a screw or thread in one end and a vapor-outlet in the other end. The tubes L' and M can be cast on the retort A, forming one  
75 piece of metal. These short vapor-tubes M are connected with pipes having stuffing-boxes and packing on the outer end and with spindles through the pipes, said spindles having a needle-point at one end and a thumb-piece, B<sup>3</sup>  
80 B<sup>3</sup>, at the outer end, and constructed the same as shown and described in Fig. 1, with the exception of the center spindle passing through the retort to the vapor outlet or orifice, whereas the outside spindles pass only to the outlet in  
85 the short vapor-tubes.

The commingling-tubes K K are made of any suitable metal, one inch (more or less) in diameter and any length required. The end  
90 of these tubes near the retort is open and the vapor and atmospheric air are received at the open end. The opposite end has a metal burner, N, attached to it, as shown in Fig. 2 and sectional Fig. 7. This burner is made of  
95 cast metal, with a tube, N', through the center and a shoulder, N<sup>2</sup>, at one side to receive the tube K. This burner is cup-shaped, and has an outward flange at the top, and is covered with perforated metal, similar to the  
100 burner E, Fig. 1. The burner N can be used without the tube N', if desired.

N<sup>3</sup>, Fig. 7, is a cone-shaped piece of metal, with an opening at one side and fitting around the burner N, and extending above and below  
105 the top of the perforation on the burner and partly over the tube K, as shown in Fig. 7, the object being to convey air to the point of combustion.

The modification shown and described in Fig. 2 is designed to burn vapor and atmospheric air combined. The water-vessel G and  
110 its connections are not used in this modification. They remain on the pipe D. When a more intense heat is desired, they are used and connected with the coil O, as hereinafter described.  
115

Fig. 3 is a cross-section of the retort on a line with the vapor-openings and spindles and showing the interior construction, and also  
120 showing the entrance to the retort from the main pipe D, all the parts shown having been previously described.

Fig. 4 is a top view, in section, of the superheating or decomposing coil, the vapor or commingling tubes and burner, and their con-  
125 nection with and application to the retort.

O is a steam-coil. This coil rests on or near the top of the retort A, or under it. This coil is made of copper, brass, or other suitable metal and of any size required. One end of  
130 this coil connects with the steam-pipe G<sup>2</sup>. The other end connects with the commingling chamber or tube P.

Q Q are vapor or commingling tubes, made



of any suitable metal. One end of these tubes is connected with the short vapor-tubes M M, forming a part of the retort A, as shown at R R. The other ends are connected to the commingling chamber or pipe P, as shown at R' R'. The tubes Q Q have openings through them near one end, as shown at R<sup>2</sup> R<sup>2</sup>. Surrounding these tubes and openings are slides or rings having corresponding openings, as shown at S S, the object being to admit air to the vapor-tubes, if required.

T is a burner, made of iron or other suitable material or metal. This burner has perforations in the top or upper side, as shown at T' T'. The form of this burner and perforations may be varied to suit circumstances, and may be used with or without steam. I do not confine myself to the precise form or manner of generating steam as shown in Fig. 1, as a generator may be placed under, over, or at one side of the retort or any suitable place or source. Neither do I confine myself to the burning of superheated or decomposed water or steam and vapor, or to vapor and atmospheric air, as either can be burned separately or combined, as shown in Figs. 1, 2, and 4. The retort, pipes, spindles, stuffing-boxes, needle-points, and thumb-pieces have been previously described, being the same as shown in Figs. 1, 2, and 3.

Figs. 5, 6, and 7 are sectional views of parts previously described.

The operation of my invention is as follows: The burner having been placed in position and the different parts connected as described, water is supplied to the vessel D' by means of the tube or pipe D<sup>3</sup>, the vessel D' being only partly filled with water, as shown by dotted line. The elevated reservoir I is filled with petroleum or kerosene oil or other hydrocarbon liquid, which will flow down and through the pipe I' when the cock D<sup>5</sup> is opened and up through the water in the bottom of the vessel D', and will fill the vessel D' and main supply-pipe D by allowing the air to escape out at the vapor-opening A<sup>2</sup> by turning the center vapor faucet or spindle, which must be closed again as soon as the pipe D is full. The burner is now ready to operate, if hydrocarbon vapor and atmospheric air are used, as shown in Figs. 1 and 2. When superheated or decomposed water or steam is used in combination with hydrocarbon vapor, the hydrostatic reservoir or fountain H is removed from its connection with the pipe G<sup>3</sup> and is filled with water and returned to its seat on the pipe G<sup>3</sup>. The water will then flow through the pipe G<sup>3</sup> as required and into the vessel G, where it is converted into steam by the heat from the burner E and pipe D. The steam passes into the steam-chamber G' and up through the steam-pipe G<sup>2</sup>, which connects with the coil O on or over the top of the retort A, where it is superheated or decomposed and discharged into the chamber or pipe P and commingled with the vapor discharged from the short tubes M M through the tubes Q Q. It then passes

into the burner T, and is ignited and burned from the upper side of the said burner. Air can be admitted to the tubes Q Q, if required, by turning the ring or slides, as shown at R<sup>2</sup> R<sup>2</sup>, Fig. 4. Air and vapor can be used independent of the steam in the burner T. Steam and vapor can be used independent of the air in all the burners, or all three can be combined and burned. All the commingling-tubes can have the regulating air-ring or slide near the vapor-outlets from the retort. When the burners are used for small portable stoves and for other purposes not requiring large burners, I disconnect and remove the steam-coil O from the steam-pipe G<sup>2</sup>, and also the tubes Q Q from the short vapor-tubes M M and the tube or chamber P and burner T. All being connected together, they are quickly removed and replaced again when required. I arrange the commingling-tubes and burners as shown in Figs. 1 and 2, the open end of the commingling-tubes being one quarter of an inch (more or less) from the vapor-outlet, thus allowing the vapor to flow into the open end of the commingling-tubes with a great pressure, thereby conveying and mingling with the vapor the required atmospheric air necessary to produce perfect combustion. After thorough mingling it passes into the burner and up through the perforation on the top of the burner, where it is ignited. The outside commingling-tubes can be attached to a stove or other suitable support. To start the burner, primary heat is applied to the retort A, close the vapor-outlets in the retort A by means of the spindles and thumb-pieces, remove the cone J, surrounding the center burner, E, and retort A, and place in position a lighting-cup, which is made to partly surround the tube D and rests on the perforation on the top of the burner E, pour into the lighting-cup a table-spoonful (more or less) of alcohol, naphtha, or other suitable material, and ignite it, and immediately admit the oil or other hydrocarbon liquid to be vaporized by turning the cock D<sup>5</sup>. When the alcohol in the lighting-cup is nearly consumed, turn the central thumb-piece B<sup>3</sup> a turn backward and vapor will be supplied to the central burner through the commingling-tube F and burner E, and will be ignited on the top of the perforated plate from the flame of the alcohol in the lighter; or it may be lighted with a match. The lighting-cup must be removed as soon as the vapor is ignited and the cone J replaced. A continuous vaporization and combustion will now be sustained. As soon as the top of the retort A is at a red heat the side burners may be used, if required, by simply turning the side vapor-stops, B<sup>2</sup> B<sup>2</sup>, by means of the thumb-pieces B<sup>3</sup> B<sup>3</sup>, and applying a lighted match to the top of the burners N N. The flame is regulated to any size required by means of the thumb-pieces and spindles, allowing more or less vapor to the burners. The same manner of lighting applies to vapor and air or vapor and steam.

To extinguish the flame close the vapor-



openings by means of the thumb-pieces  $B^3$  and spindles  $B^2$ , and also close the cock  $D^5$ . To draw off the contents of the vessel  $D'$ , pipe  $D$ , and retort  $A$ , open the cock  $D^4$  and one or more of the vapor-openings in the retort, the cock  $D^5$  remaining closed. The contents of the reservoir  $I$  can be drawn off through the vessel  $D'$  and cock  $D^4$  by opening the cock  $D^5$ . A draw-off may be placed at the bottom of the pipe  $I'$ , if desired.

The object of drawing out the contents of the vessel  $D'$ , pipe  $D$ , and retort  $A$  is to remove any heavy matter or oil not vaporizable and also any matter collected and absorbed in the water. To operate the burner again after drawing out the contents, the reservoir  $I$ , vessel  $D'$ , pipe  $D$ , and retort  $A$  must be filled as previously described.

I also construct my vapor-burner for a single flame, the retort having a straight passage-way through it, and without cross openings or side burners, the construction being the same as shown in central vertical section, Fig. 1, with the exception of the vessel  $G$ , fountain  $H$ , and steam-pipe  $G^2$ , and their connecting-pipe. These may or may not be used, as desired. This single burner is operated the same as the central burner previously described. The central burner may be used as a single burner when one flame only is required.

When superheated or decomposed water or steam is used in combination with hydrocarbon vapor, the fountain  $H$  must be supplied with water. When not used, the coil  $O$  may be disconnected from the steam-pipe  $G^2$  and also from the chamber or pipe  $P$ , and tubes  $Q$   $Q$  and burner  $T$  remain; or the tubes  $Q$   $Q$  and burner  $T$  may be removed with the coil  $O$ , and the tubes  $K$   $K$  and burners  $N$   $N$  substituted therefor, in one case forming one long burner in addition to the central burner, and in the other case two round burners in addition to the central burner. I do not limit myself to one, two, or three burners, as any number required may be supplied from one retort by increasing its size and making additional outlets.

The vapor and air tubes  $K$   $K$  may be any length required, as vapor can be carried a considerable distance when united with air, the air being the vehicle to convey it, whereas vapor can only be conveyed a short distance in a closed pipe. The superheated or decomposed water or steam can be admitted to the tubes  $Q$   $Q$  at the same end that the vapor is admitted, and commingled in said tubes before reaching the burner.

The advantages of my invention are apparent from the drawings. The burner is cheaply constructed, simple in its operation, and free from danger of explosion. It can be operated in a threefold capacity—viz., vapor and air, vapor and steam, and vapor, air, and steam combined. It is applicable to stoves, ranges, heaters, steam furnaces and boilers, vapor or gas engines, and other purposes, either as a heating or explosive power.

Having fully described my invention, what

I desire to claim and secure by Letters Patent is—

1. In a vapor and steam burner, the retort  $A$ , having vapor-openings at right angles, and short tubes  $L'$ , extending therefrom and connecting with vapor-tubes  $M$   $M$  at right angles, having vapor-openings through them, said tubes  $M$   $M$  having in one end a vapor-outlet and in the other end a screw-thread, and a spindle,  $B^2$ , having thumb-piece  $B^3$ , substantially as shown and described.

2. In a vapor-burner, the wheel-shaped support  $W$  and retort  $A$ , said retort having vapor-openings through it and placed horizontally on the top of the vertical supply-pipe  $D$ , in combination with the pipes  $A^3$ , having stuffing-boxes  $B$  on one end and screwed into the retort at the other end, and the spindles  $B^2$ , having a thumb-piece,  $B^3$ , at one end and a needle-point at the other end, substantially as described.

3. In a vapor-burner for vaporizing oils and other substances, the retort  $A$ , in combination with the main supply-pipe  $D$ , made in two sections, one a heat-conducting metal and the other a non-conducting metal, substantially as described.

4. In a vapor-burner, the vessel  $D'$ , having filler-pipe  $D^3$ , and air-chamber  $D^2$ , inlet  $D^5$ , and draw-off  $D^4$ , in combination with the main supply-pipe  $D$  and retort  $A$ , substantially as shown and described.

5. The retort  $A$ , support  $W$ , pipe  $D$ , vessel  $D'$ , reservoir  $I$ , and pipe  $I'$ , in combination with the commingling-tubes  $K$   $K$  and  $F$  and burners  $E$  and  $N$   $N$ , having cones  $J$  and  $N^3$   $N^3$ , substantially as described.

6. In a vapor-burner, the retort  $A$ , having wheel-shaped support  $W$ , central burner,  $E$ , having ribs on the central tube,  $E^2$ , in combination with the curved commingling-tube  $F$ , substantially as and for the purpose described.

7. In a vapor-burner, the retort  $A$ , having wheel-shaped support  $W$ , in combination with the side burners,  $N$   $N$ , having an air-tube,  $N'$ , through the center, and the commingling-tubes  $K$   $K$  and  $F$ , substantially as described.

8. In a vapor and steam burner, the vessel  $G$ , having steam-chamber  $G'$ , pipes  $G^2$  and  $G^3$ , and fountain or water-supply  $H$ , in combination with pipe  $D$  and retort  $A$ , substantially as described.

9. A vapor-burner having a single opening through the retort  $A$ , said retort having pipe  $A^3$ , spindle  $B^2$ , stuffing-box and packing, thumb-piece, and needle-point, in combination with the curved commingling tube  $F$  and burner  $E$ , cone  $J$ , main supply-pipe  $D$ , vessel  $D'$ , and reservoir  $I$ , constructed substantially as shown and described.

10. In a vapor and steam burner, the retort  $A$ , having wheel-shaped support  $W$ , the coil  $O$ , and vapor, steam, and air commingling tubes and burners, in combination with the steam-pipe  $G^2$ , vessel  $G$ , pipe  $G^3$ , and fountain  $H$ , substantially as shown and described.

11. In a vapor-burner, the retort  $A$ , pro-



vided with lateral branch tubes L', in combination with short tubes M, the retort A and tubes M provided with needle-valves, substantially as described.

- 5 12. In a vapor and steam burner for burning vapor, air, and superheated or decomposed water or steam, the combination of the following parts, viz: the retort A, having pipes, spindles, stuffing-boxes, and thumb-pieces,  
10 the commingling-tubes K K and F, having

burners N N and E and cones J and N<sup>3</sup>, the main supply-pipe D and vessel D', and pipe I' and reservoir I, the water-fountain H, pipe G<sup>3</sup>, vessel G, steam-pipe G<sup>2</sup>, and the coil O, all constructed and arranged substantially as 15 shown and described.

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