

(No Model.)

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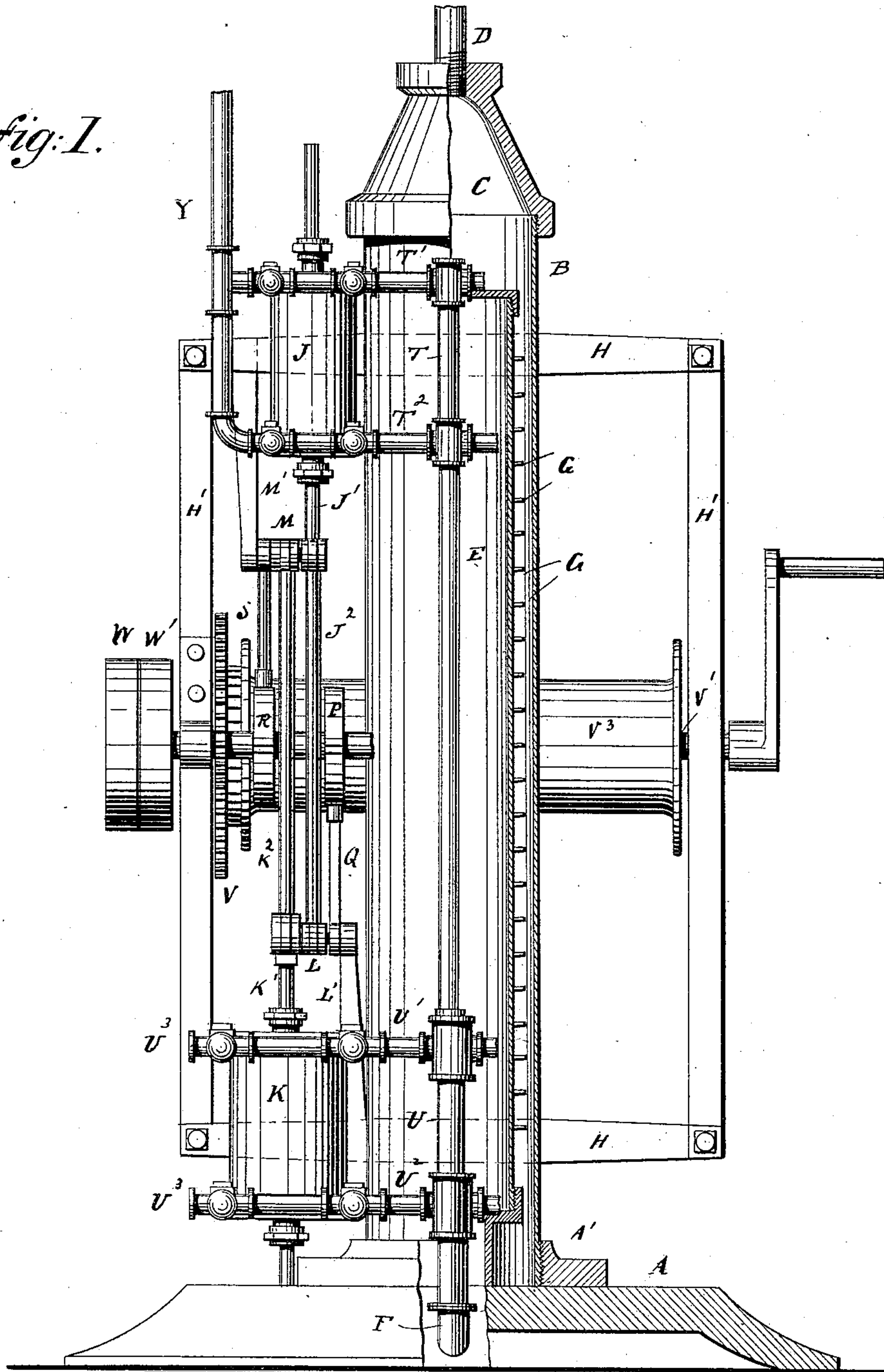
B. S. DUNN.

GAS AND AIR COMMINGLER.

No. 379,769.

Patented Mar. 20, 1888.

*Fig. 1.*



WITNESSES:

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(No Model.)

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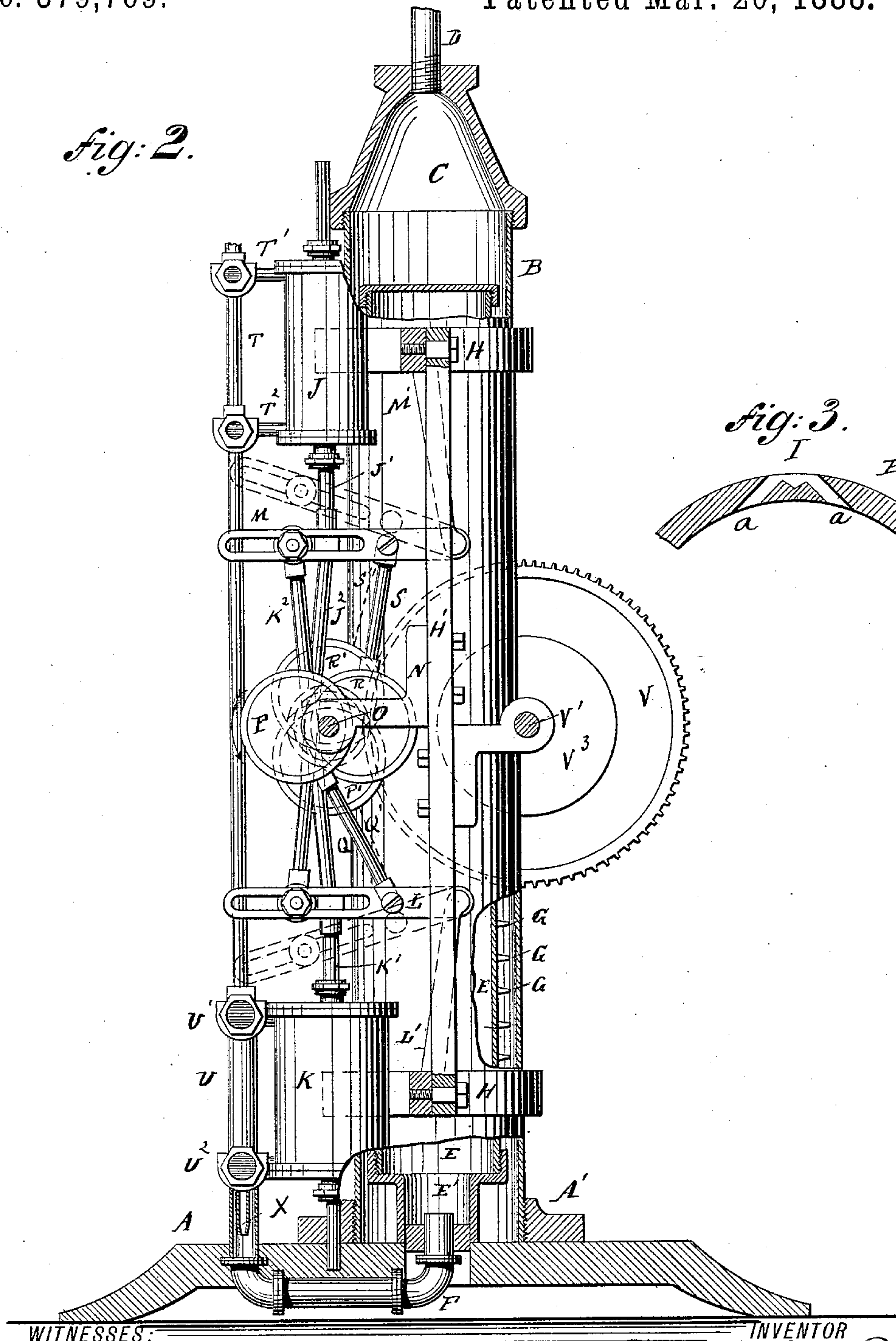
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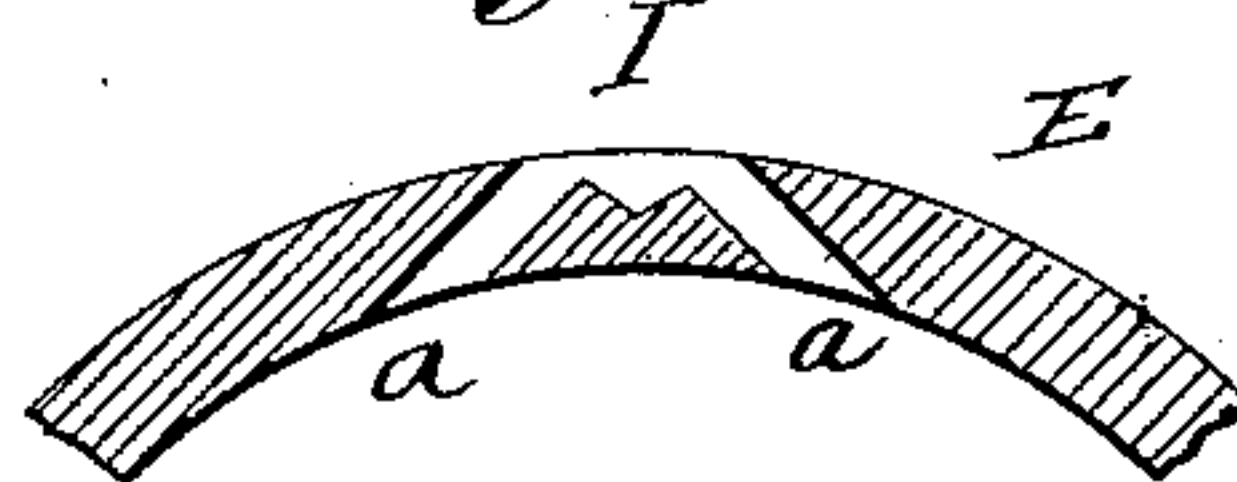
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*Fig. 2.*



*Fig. 3.*



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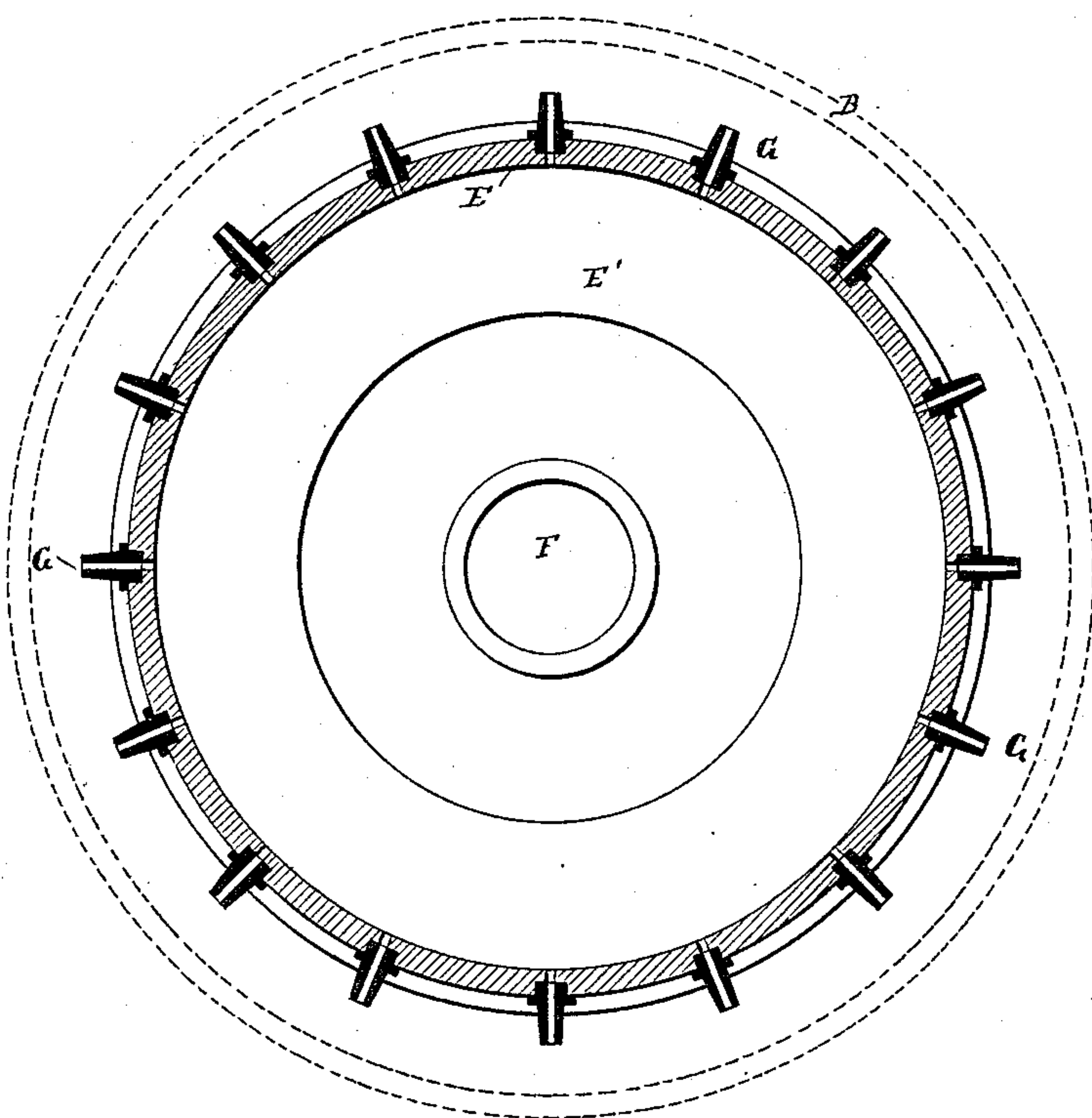
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Fig. 4.



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# UNITED STATES PATENT OFFICE.

BALLARD SMITH DUNN, OF NEW YORK, N. Y.

## GAS AND AIR COMMINGLER.

SPECIFICATION forming part of Letters Patent No. 379,769, dated March 20, 1888.

Application filed September 14, 1887. Serial No. 249,613. (No model.)

*To all whom it may concern:*

Be it known that I, BALLARD SMITH DUNN, of the city, county, and State of New York, have invented a certain new and useful Improvement in Gas and Air Comminglers, of which the following is a specification.

The object of my invention is to provide a new and improved apparatus for thoroughly mixing or commingling illuminating or like gas with air in such a manner that a permanent mixture is obtained, that can be burned in a suitable burner and can be used for heating purposes, for generating steam, and for all purposes for which solid, liquid, or gaseous fuels are now used.

The invention consists in the combination, with an exterior tube, of an interior tube in the same and provided with an inlet-tube and numerous outlet tips or apertures, which inlet-tube contains a gas-injecting pipe.

The invention also consists in the construction and combination of parts and details, as will be fully described and set forth hereinafter, and finally pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of my improved gas and air commingler, half being shown in vertical section and parts broken out. Fig. 2 is a side view of the apparatus, parts being broken out and others being in section. Fig. 3 is a detail cross-sectional view of part of the interior vessel, showing one of the outlet-apertures. Fig. 4 is an enlarged horizontal sectional view of the interior tube.

Similar letters of reference indicate corresponding parts.

On the base A the socket-piece A' is secured, which is screw-threaded internally, and into said socket-piece the lower externally screw-threaded end of a wrought iron or steel tube, B, is screwed firmly and securely, so as to form an absolutely tight joint.

Upon the upper end of the tube B the cap-piece C is screwed, in the top of which one end of the pipe D is screwed, which serves for conducting the mixture of gas and air to the burner. Within the tube B, I place another tube, E, of less diameter, and which extends to within a short distance from the top and bottom of the exterior tube, B. The upper end of the interior tube E is closed, and the

lower end is secured in a socket-piece, E', through the closed bottom of which the inlet-pipe F, for the mixture of gas and air, projects.

In the walls of the inner tube, E, a very great number of tips, G, are secured, which project from the outer surface of said inner tube, or in place of said tips the said inner tube may be provided with apertures I, formed with two channels, *a*, which are inclined toward each other from the inside to the outside, so that the two jets issuing from the channels must cross and interrupt each other.

On the outside of the exterior tube, B, two cross-bars, H, are secured at the top and bottom, respectively, the ends of which cross-bars are united by the vertical bars H', as shown. On the upper bar H two gas pump cylinders, J, are secured, one at or near each end, and on the lower cross-bar H two air-pump cylinders, K, are secured, one at or near each end, all said cylinders standing vertically.

The gas-cylinders J contain pistons, from which the piston-rods J' project through stuffing-boxes in the lower ends of the cylinders, the ends of said piston-rods being pivoted to connecting-rods J<sup>2</sup>, the lower ends of which are pivoted adjustably to levers L, pivoted on upwardly-projecting arms L' of the lower cross-bar, H. Said levers L are provided with longitudinal slots, through which the bolts project that pivot the connecting-rods to the levers, which bolts can be adjusted greater or less distances from the swinging ends of the levers, according to the desired stroke of the pump-pistons.

The air-pump cylinders K contain pistons, from which piston-rods K' project through stuffing-boxes in tops of the cylinders, the upper ends of said piston-rods being pivoted to the lower ends of connecting-rods K<sup>2</sup>, pivoted at their upper ends to levers M, pivoted to arms M', projecting downward from the upper cross-bar, H, which levers M are also slotted longitudinally for adjustment of the connecting-rods, as set forth above.

From the vertical bars H' the arms N project toward the front, and in said arms the horizontal shaft O is journaled, on which the eccentric-disks P P' and R R' are rigidly mounted, said eccentric-disks being surrounded



by straps, to which the rods Q Q' and S S' are secured, the rods Q Q' being pivoted to the levers L and the rods S S' being pivoted to the levers M. The upper and lower ends of the gas-pump cylinders J are connected with the gas-pipe T by the pipes T' and T<sup>2</sup>, said pipes T' and T<sup>2</sup> having the proper valves.

The pipe Y serves for conducting the gas to the pumps. The upper and lower ends of the air-pump cylinders are connected by the pipes U' and U<sup>2</sup> with the air-pipe U, said pipes U' and U<sup>2</sup> having suitable valves. The air is drawn into the air-pump cylinders through the necks U<sup>3</sup>. The end of the pipe U is connected with the pipe F, which conducts the mixture of gas and air into the inner tube, E, as shown in Fig. 2.

The gas-pipe T, for conducting the compressed gas, has less diameter than the pipe U, and extends into the same, the end of that part of the pipe T within the pipe U being a short distance below the bottom valves of the bottom or air-pump cylinders, and the end of said pipe T is tapered so as to form an injector-nozzle, X, within the pipe U, as shown in Fig. 2, through which the gas is forcibly ejected into the center of a column of compressed air.

On one end of the shaft O belt-pulleys W may be mounted for the purpose of driving the entire mechanism by power; or the shaft O may carry a pinion engaged with the cog-wheel V on the shaft V', which shaft V' is to be rotated by the unwinding of a rope or cable wound on a drum, V<sup>3</sup>, on the shaft V', a suitable weight being secured to the other end of the rope.

I have shown two pumps—that is, one gas-pump and one air-pump—at one side of the standard, the same number of pumps to be at the other side; but it is evident that more may be provided.

The operation is as follows: The shaft O is rotated, and from the same the levers M and L are rocked and the pumps operated. At each stroke the air-pumps compress a quantity of air and force it into the pipe U, and in the same manner each gas-pump compresses a quantity of gas at each stroke and forces it into the pipe T. The compressed gas passes out of the tapered end of the pipe T and is forcibly injected into the compressed air in the pipe U, whereby the compressed gas and air are mixed, this mixture passing through the pipe F into the bottom of the inner tube, E. As this tube is closed at the top, and as fresh quantities of the compressed mixture of compressed gas and compressed air are being continuously forced into the said inner pipe, E, this mixture is forcibly ejected, through the tips G or corresponding apertures, into the exterior tube, B, and as the jets of gas and air mixture, passing through the tips or apertures, strike the inner surface of the exterior tube they are forcibly torn asunder and into

the most minute particles, whereby a most perfect mixture of the gas and air is obtained, a mixture which is absolutely permanent and can be burned in any suitable gas-burner.

The apparatus is very simple in construction, as the exterior tube, B, in which the complete mixing of the gas and air takes place, also serves as a support for the entire mechanism.

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

1. In a gas and air commingler, the combination, with an exterior vessel provided with an outlet or burner pipe, of an interior vessel in the exterior vessel, which interior vessel is provided with numerous outlet apertures or tips, an inlet-pipe connected with the interior vessel, and an injector-tube in said inlet-pipe, substantially as herein shown and described.

2. In a gas and air commingler, the combination, with an exterior vessel having an outlet or burner pipe, of an interior vessel in the exterior vessel and provided with numerous small outlet apertures or tips, an inlet-pipe connected with the interior vessel, air-forcing pumps connected with said inlet-pipe, a gas-conducting pipe having a tapered end projecting into said inlet-pipe, and of gas-compressing pumps connecting with the said gas-conducting pipes, substantially as herein shown and described.

3. In a gas and air commingler, the combination, with an exterior tube, of a tube in the same provided with numerous outlet apertures, cross-bars secured on the exterior tube, and air and gas pumps, and mechanism for operating the same supported by the cross-bars, which pumps are connected with the mixing-tubes, substantially as herein shown and described.

4. In a gas and air commingler, the combination, with an exterior tube, of a tube in the same provided with numerous outlet apertures, cross-bars on the exterior tube, end bars connecting the ends of the cross-bars, gas and air pumps on the frame formed of the cross and end bars, which pumps are connected with the mixing-tube in the exterior tube, rocking levers on the frame and connected with the pump piston-rods, and eccentrics on a shaft on the frame for operating the rocking levers, substantially as herein shown and described.

5. In a gas and air commingler, the combination, with a vertical tube containing a tube provided with numerous outlet apertures, of pumps and operating mechanism supported by said vertical tube, substantially as herein shown and described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

BALLARD SMITH DUNN.

Witnesses:

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LEWIS B. WHITE.