

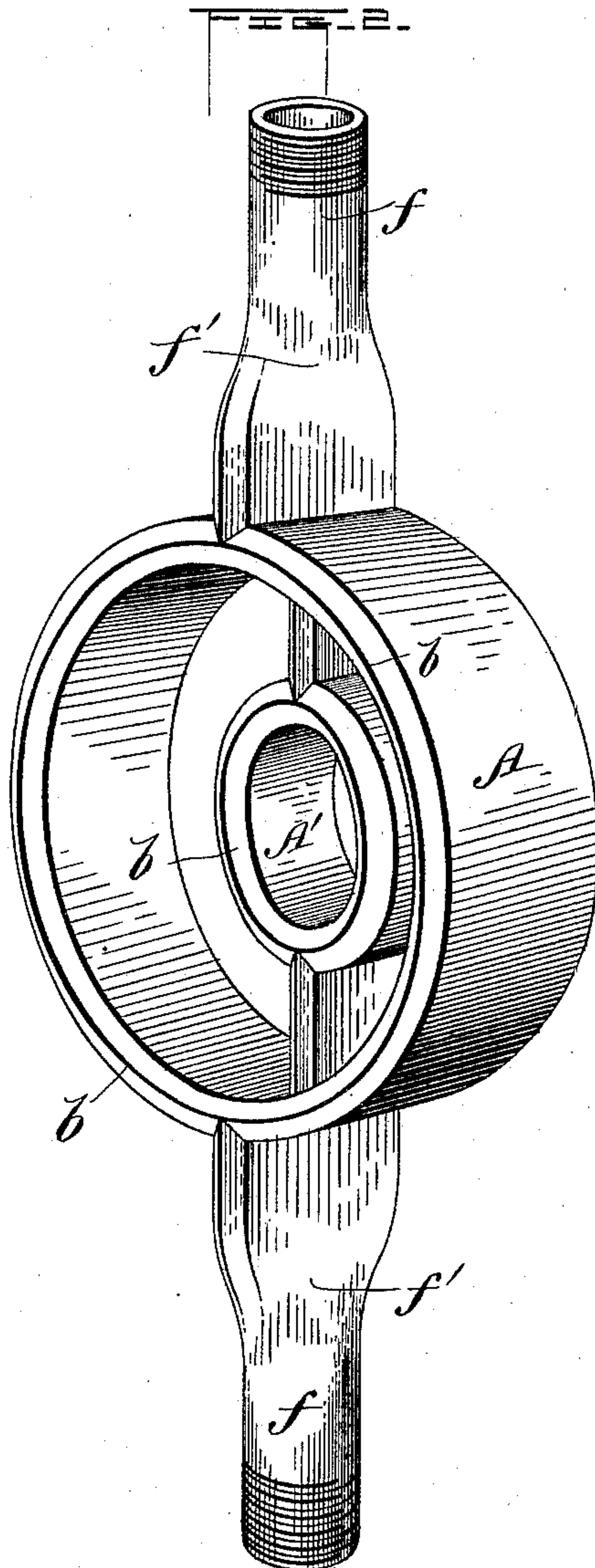
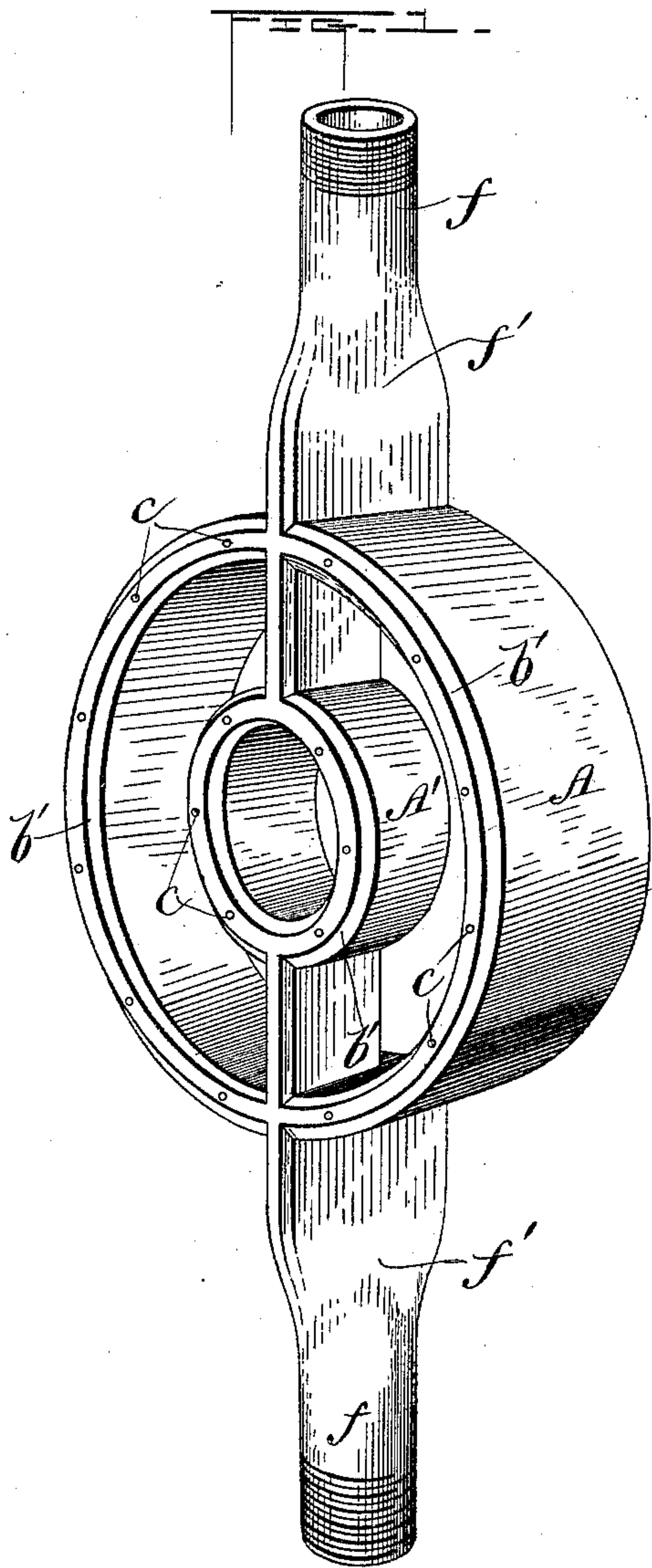
(No Model.)

3 Sheets—Sheet 1.

W. McCLAVE.
STEAM JET BLOWER FOR FURNACES.

No. 467,427.

Patented Jan. 19, 1892.



WITNESSES:

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E. J. Fenwick

INVENTOR:

William McClave
by his Attorney
Mason, Fenwick & Lawrence

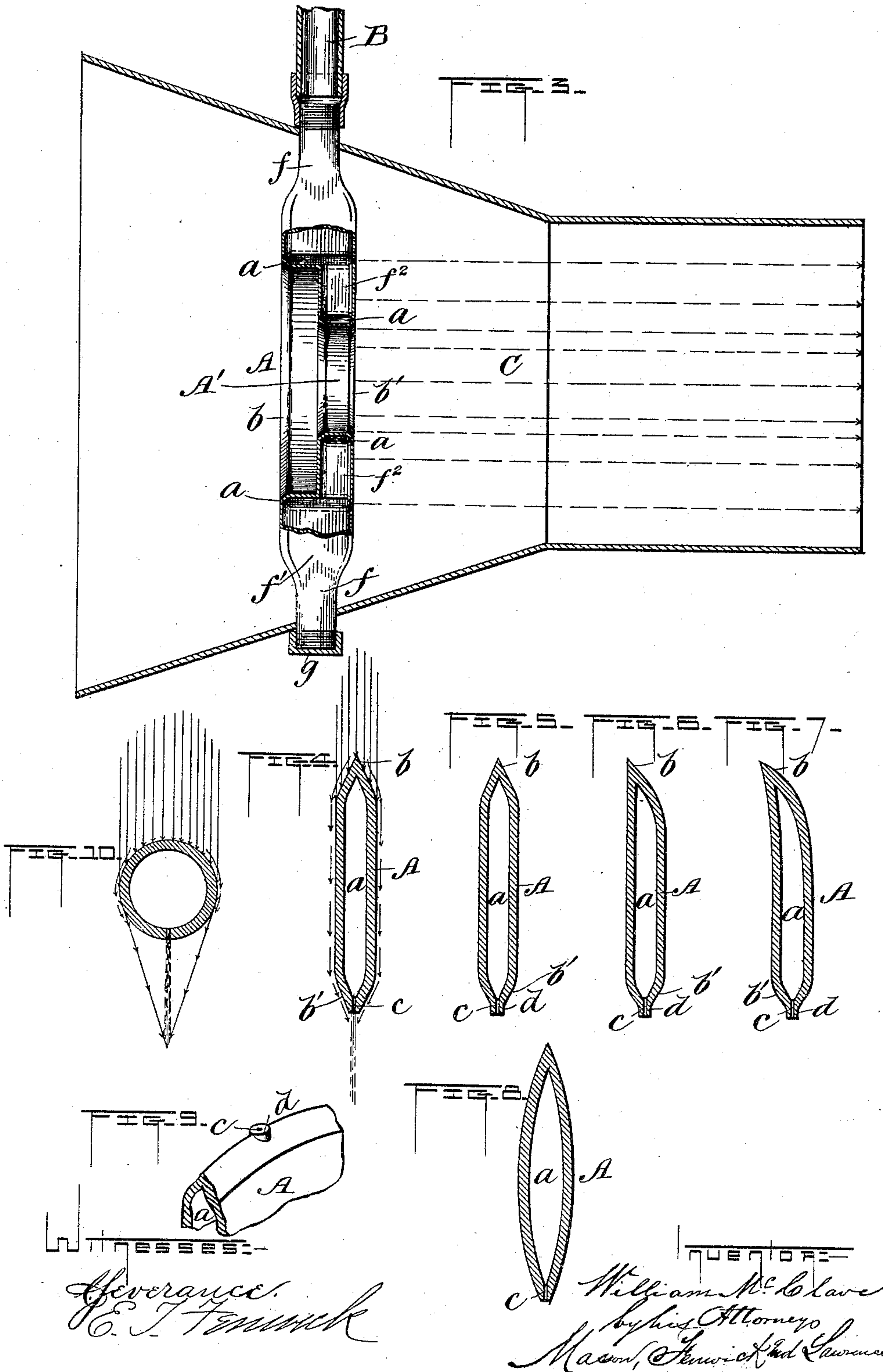
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3 Sheets—Sheet 2.

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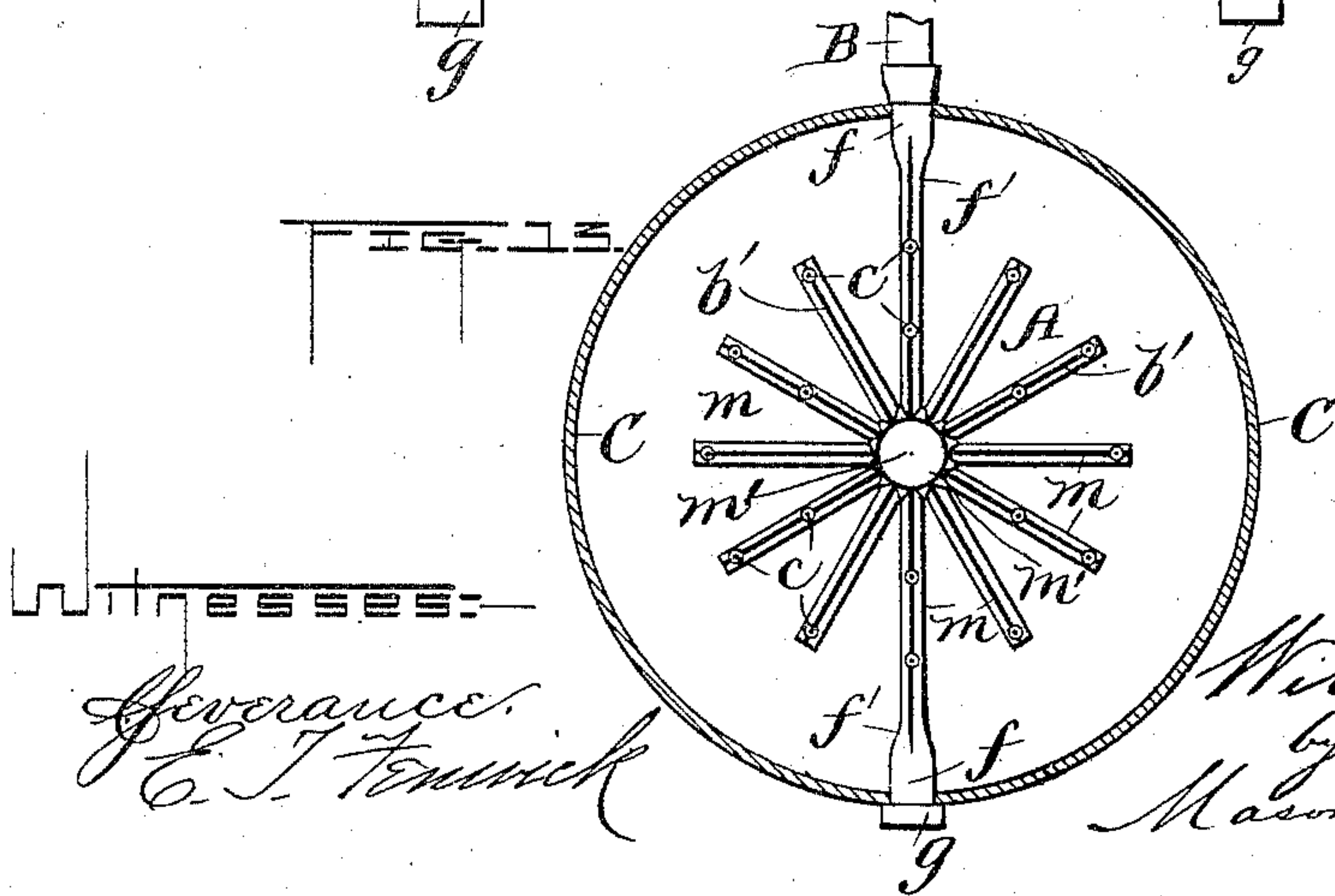
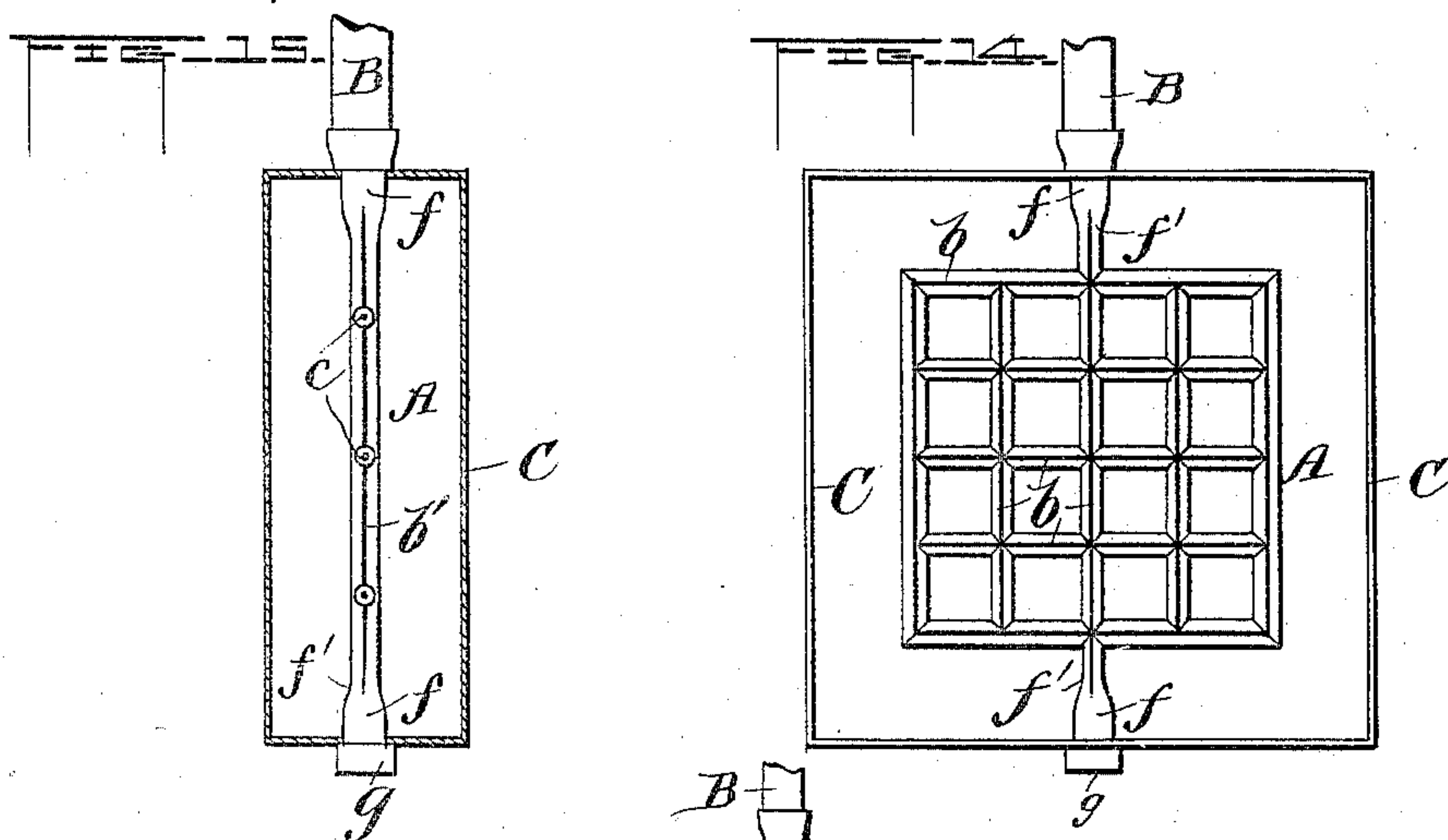
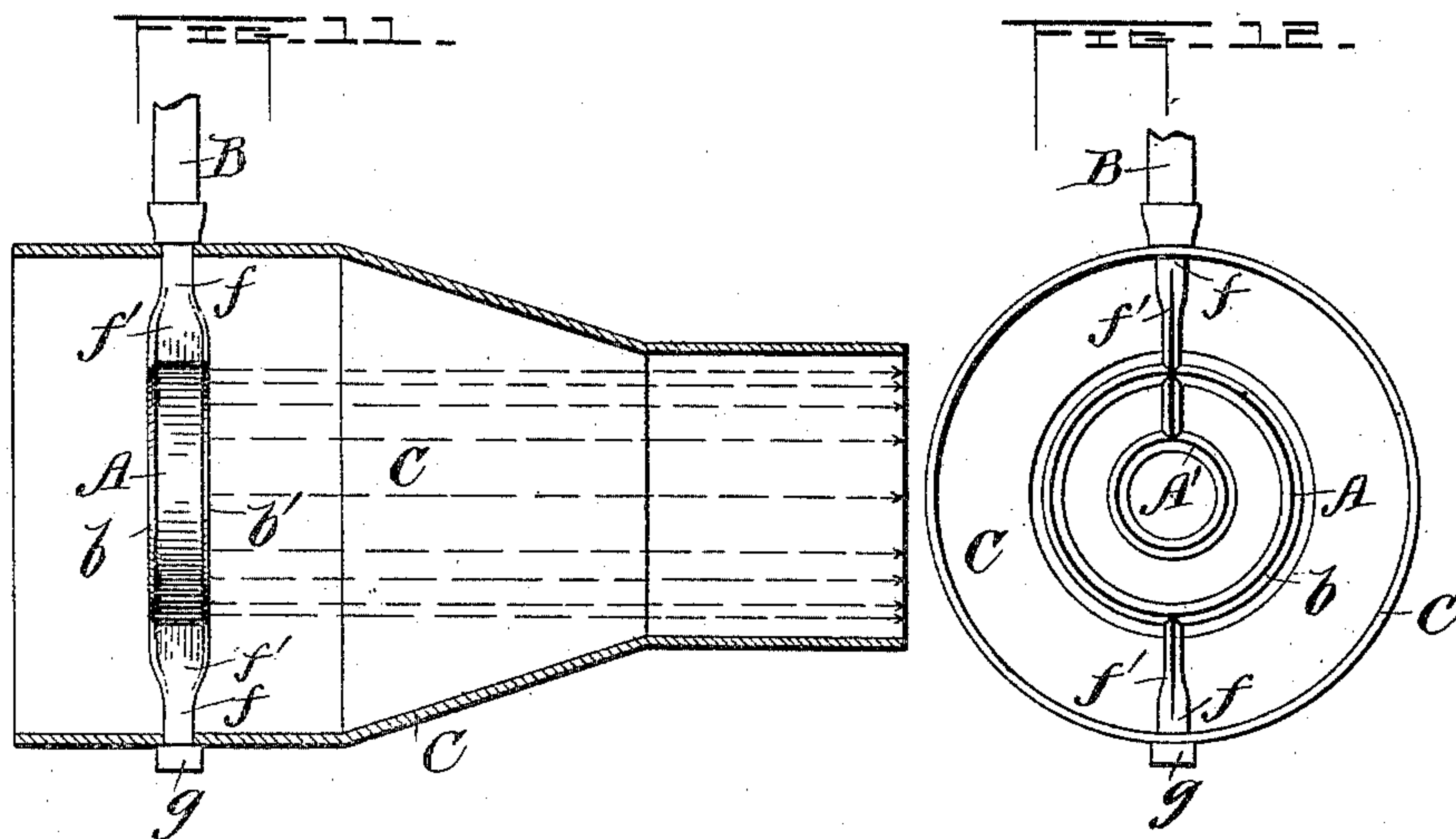
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STEAM JET BLOWER FOR FURNACES.

No. 467,427.

Patented Jan. 19, 1892.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM MCCLAVE, OF SCRANTON, PENNSYLVANIA.

STEAM-JET BLOWER FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 467,427, dated January 19, 1892.

Application filed October 28, 1891. Serial No. 410,074. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MCCLAVE, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Jet Blowers for Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates especially to steam-jetting devices for steam-blowers of the types illustrated in Letters Patents Nos. 281,774 and 318,008, granted to me July 24, 1883, and May 19, 1885, or any other types of steam-jet blowers whereby jets of steam cause a body of air from the outside of the furnace to be drawn into an air duct or tube of any suitable form, and this air mingled with the steam to be forced into the furnace through the mass of burning fuel of the fire-bed, thereby facilitating the combustion of the fuel and producing other beneficial results.

My improvements will be fully understood from the following description, claims, and accompanying drawings.

Figure 1 is a perspective view illustrating in ring form my improved steam-jetting device for a steam-blower as seen from its forward end. Fig. 2 is also a perspective view of the same as seen from its rear end. Fig. 3 is a vertical longitudinal section of a combined conical and cylindrical air-duct of a furnace with my improved steam-jetting delivery device for a steam-jet blower applied thereto, the air-duct being in section and its connections partly in section and in elevation. Figs. 4, 5, 6, 7, and 8 are sectional or profile views of my improved steam-jetting device for a steam-jet blower in the several cross-sectional forms that it is preferably constructed. Fig. 9 is a perspective view of a portion of the steam-jetting device for a steam-blower as formed with an air-cutting ridge and projecting steam-jet bosses, only one of a series of bosses being shown. Fig. 10 is a diagram illustrating the difference between the action of the steam-jets upon the air with a ring-jetting device of ordinary construction and a flattened-ring form of jetting device similar to mine shown in Fig. 4 and

in other figures of the drawings. Fig. 11 is a section similar to Fig. 3, but showing a single ring-shaped steam-jetting device for a steam-jet blower and a cylindrical air-duct with an intermediate conical or converged discharging portion. Fig. 12 is a rear end view of a steam-jetting device similar to that shown in Fig. 3, but with only one connecting-arm between the inner and outer steam-jetting rings. Fig. 13 is a vertical cross-section of an air-duct and my improved steam-jetting device for a steam-jet blower made in rectangular form, the steam-jetting device of the blower being divided into numerous small open hollow squares; and Fig. 15 is a cross-section of an oblong air-duct and a front elevation of my improved steam-jetting device for a steam-jet blower in form of a long flat tube with tapered front and rear edges and with projecting steam-jet bosses at its front end.

The main feature of my invention, as shown in the drawings, is a steam-jetting device A for a steam-jet blower, either of ring or other geometrical form (but preferably of ring form) made with a flat or narrow chamber *a* for the reception and circulation of the steam, which enters it from a steam-pipe B, leading from the boiler or other source of supply, said flat or narrow chambered steam-jetting device being formed with edges *b b'*, which, to produce the best results, should be tapered, substantially as illustrated in the drawings, so as to allow the air which is drawn into the air-duct C by the jets of steam to pass to the furnace with the least possible obstruction and diversion from the straight course in which it started in entering the air-duct, and thus to insure the closest possible relation of said air to the steam-jet passages *c* and to the jets of steam issuing from the said jet-passages *c* at the front of the chamber *a* of the steam-jetting device. This desirable action of the air is illustrated in Fig. 4 of the drawings, wherein the air is shown as being brought in contact with the jets of steam almost immediately at the point where the steam is projected from the delivery end of the jetting device. Thus controlling the air in its passage through the duct C enables the steam-jets to project the air into the furnace with its full initial velocity or force from about the time the steam emerges from the

jet-passages until its initial velocity is about fully utilized for projecting, forcing, or drawing air into the furnace.

The steam-jetting device shown in Fig. 6, which in this illustration is of ring form, may in its section from end to end have one side flat from its rear to near its front end, and its inner side near its rear end may be slightly curved; or it may have a slightly convex and concave form, or a reverse curvature may be given to its sides near its rear end, as shown in Fig. 7, so that it shall have a bell-shaped mouth, or it may be in form of a double convex lens, as shown in Fig. 8.

It is very important to have the front end of the steam-jetting device made with jet-passages of cylindrical bore at and for a sufficient distance back from their outlet ends to insure the formation of well-defined parallel-sided steam-jets before they issue from said passages. To this end these passages are made either directly in the solid V-shaped front end of the steam-jetting device, as shown in Figs. 4 and 8, or in spaced bosses *d*, formed on the tapered solid front end of the steam-jetting device, as shown in Figs. 5, 6, 7, and 9, or formed in the plane or flattened surface of the tapered solid front end of the said steam-jetting device, as shown in Figs. 1 and 3, or in nipples screwed into the tapered solid front end of the jetting device.

It will be understood that the length of the cylindrically-bored or parallel-sided portions of the passages only requires to be sufficient to form the steam into parallel-sided jets before the jets issue from the outlets. Therefore if the length of the cylindrical or parallel-sided portions is about equal to the diameter of the outlets, the desired result—viz., the projection of the steam with great velocity and to the greatest possible distance into the air within the casing of the blower in order to induct the greatest possible quantity of air by the friction of the jets—will be accomplished. This proportion may be varied from the minimum given, so as to have the length much greater than the diameter of the outlets.

In the drawings the hollow connecting-arms *f* of the steam-jetting device for a steam-blower are shown at *f'* as drawn down to nearly a flat tubular form from a cylindrical tubular form. By this means the connecting-arms can be inserted through the ordinary circular holes of the casing forming the air-duct. To effect this the circular parts of the arms are made of sufficient length beyond the inner surface of the casing forming the duct to permit the steam-jetting device for the steam-jet blower to be lowered and raised in said holes of the duct until the connection is effected and the said device secured centrally in the air-duct. As usual, one of the arms may have a screw-cap *g*, on removal of which the steam-jetting device can be cleaned by blowing out with the steam of the boiler or other source of supply.

In Fig. 12 the single ring shown in Fig. 11 has a central ring *A'* arranged within it, the same as in Figs. 1, 2, and 3; but the said inner ring is connected with the outer ring by a single hollow arm *f²*, instead of by two hollow arms *f² f²*, as in said figures, and while this is so the removable cap *g* for permitting the steam to be blown through the arms *ff'* of the steam-jetting device is provided. The construction shown in Figs. 14 and 15 is similar in effect to the constructions shown in Figs. 1, 2, 3, &c., the only difference being in the geometrical construction of the blower-casing and the arrangement of the steam-jets on straight lines and in squares. In these views the tapered front and rear ends are retained on the steam-jetting devices of the steam-jet blower.

In Fig. 13 the steam-jetting device of the blower is constructed of a series of radial arms *m*, united in a hollow hub *m'*, one series of the arms having two steam-jet passages *c* and the other series a single jet-passage *c*. If desired, a single jet nozzle or passage may be applied centrally in the closed front end of the hollow hub.

By setting the steam-jet passages in the order shown in Fig. 13 a very effective action of the combination of jets for producing a blast is produced, and by arranging the jets in squares and on straight lines, as in Fig. 14, a very effective and powerful blower is obtained.

For light work a blower similar to Fig. 15 will answer a good purpose. It is usual in steam-blowers to either use an air-duct in form of a simple truncated cone without the cylindrical extension shown in Fig. 3, or a truncated cone with a cylindrical extension, as *C* in Fig. 3, or an intermediate conical portion, as in Fig. 11, and sometimes to use a square or oblong box having parallel sides, as in Figs. 14 and 15, or to use a simple cylinder with parallel sides. My invention is applicable to all such air-ducts with useful results.

By referring to Fig. 10 it will be seen that in the use of the ordinary ring-shaped steam-jetting device formed of a tube having a steam-chamber of a cross-sectional form, which is a true circle, great obstruction to the passage of the air through the duct is offered; also, that the body of air coming in contact with this ring at its rear end and passing along the inner and outer surfaces of the ring is divided and displaced laterally in such a manner that it meets the jets of steam at points so remote from the points from where they start and receive their initial velocity or determined lines of projection that a greater part of their effective power for forcing the air into the furnace is lost, and by referring to Fig. 4, representing a profile view of a flattened or narrow ring-shaped steam-jetting device, it will be seen that this is avoided, as the air comes in contact with the steam almost immediately at the points where it receives its initial velocity or determined lines of projection.

Where a narrow or flattened steam-chamber α of a ring-blower has its discharging-passages in form of long narrow slits and the steam emerges on reverse inclined lines from these slits at the extreme knife-edges of two disks, between which the slits are formed, the effective force of the steam is far less than when the steam is projected from circular jet-passages having bores of cylindrical form and of a proper length, for when the steam passes from a lenticular or other long flat chamber on reversely-inclined lines forming its escape-passage the tendency of one portion of the steam passing to said passage is to interfere with the other portion of steam passing to said passage, and the consequence is the destruction of the effective projecting force of the steam for drawing in a body of air, the steam soon expanding and forming a cloud, which tends to retard rather than compel the passage of the air into the furnace. My invention of having the steam-circulation chamber narrow or flattened and its passages of a determined cylindrical form or with parallel sides and said chamber of considerable length from the inside of the steam-chamber of the steam-jetting device to the outside front delivering end thereof, together with the spacing of these passages, renders the employment of the lenticular or flat steam-blower practical and very beneficial, the use of such blower offering the minimum obstruction to the passage of the air through the air-duct and allowing the air to come in immediate contact with the steam-jets, thereby insuring a powerful and effective blast.

It is not absolutely necessary to set the steam-jetting device of the blower into the air-duct, for if it is set a slight distance in rear of the same a very effective blast is produced; but while this is so experience has proved that the best arrangement is to set the blower far enough within the duct to have the initial velocity of the steam carry the air into the ash-pit of the furnace before the steam-jets break and form an obstructing cloud within the air-duct.

The blower may have one of its connecting-arms omitted, and in such construction it can be suspended by a branch pipe of the steam-supply pipe, as in my patent, No. 281,774, and when thus arranged a special blow-out opening can be provided in the blower and closed by a removable screw-plug.

What I claim as my invention is—

1. A steam-jetting device for a steam-blower

for boiler-furnaces and similar purposes, having a flat or narrow steam reception or circulation chamber between its rear and front ends and separate steam jet or nipple passages at its front end, said passages being cylindrically bored or parallel-sided to a suitable extent, substantially as described.

2. A steam-jetting device for a steam-blower, having a flat or narrow steam reception or circulation chamber between its front and rear ends, tapered rear and front ends, and separate steam-jet passages or nipples at its front end, which are cylindrically bored or parallel-sided to a suitable extent, substantially as described.

3. A steam-jetting device for a steam-blower, having a flat or narrow steam reception or circulation chamber between its front and rear ends and tapered at its front and rear ends and having spaced bosses on its front end, said bosses being cylindrically bored to a suitable extent, substantially as described.

4. The flattened or narrowed steam-jetting device having a tapered rear end, separate steam-jet passages or nipples at its front end, and one or more partly-flat and partly-circular connecting ends, in combination with the air-duct having circular holes through which said end or ends pass, substantially as described.

5. A plurality of flattened or narrow steam-jet devices, all in communication, said devices respectively having tapered rear ends and separate steam-jet passages or nipples at their front ends, which are cylindrically bored or parallel-sided to a suitable extent, substantially as described.

6. The flattened steam-jetting device having a single taper at its rear end and separate jet passages or nipples at its front end, which are cylindrically bored or parallel-sided to a suitable extent, substantially as described.

7. The flattened steam-jetting device having a single taper at its rear end and a concave and convex or reversed curved form near said rear end and provided with separate jet passages or nipples at its front end, which are cylindrically bored or parallel-sided to a suitable extent, substantially as described.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

WILLIAM MCCLAVE.

Witnesses:

E. T. FENWICK,
C. SEVERANCE.