No. 855,697. PATENTED JUNE 4, 1907.

L. B. COUSANS.

AIR COMPRESSOR.

APPLICATION FILED FEB. 28, 1905.

2 SHEETS—SHEET 1.

FIG. 1.

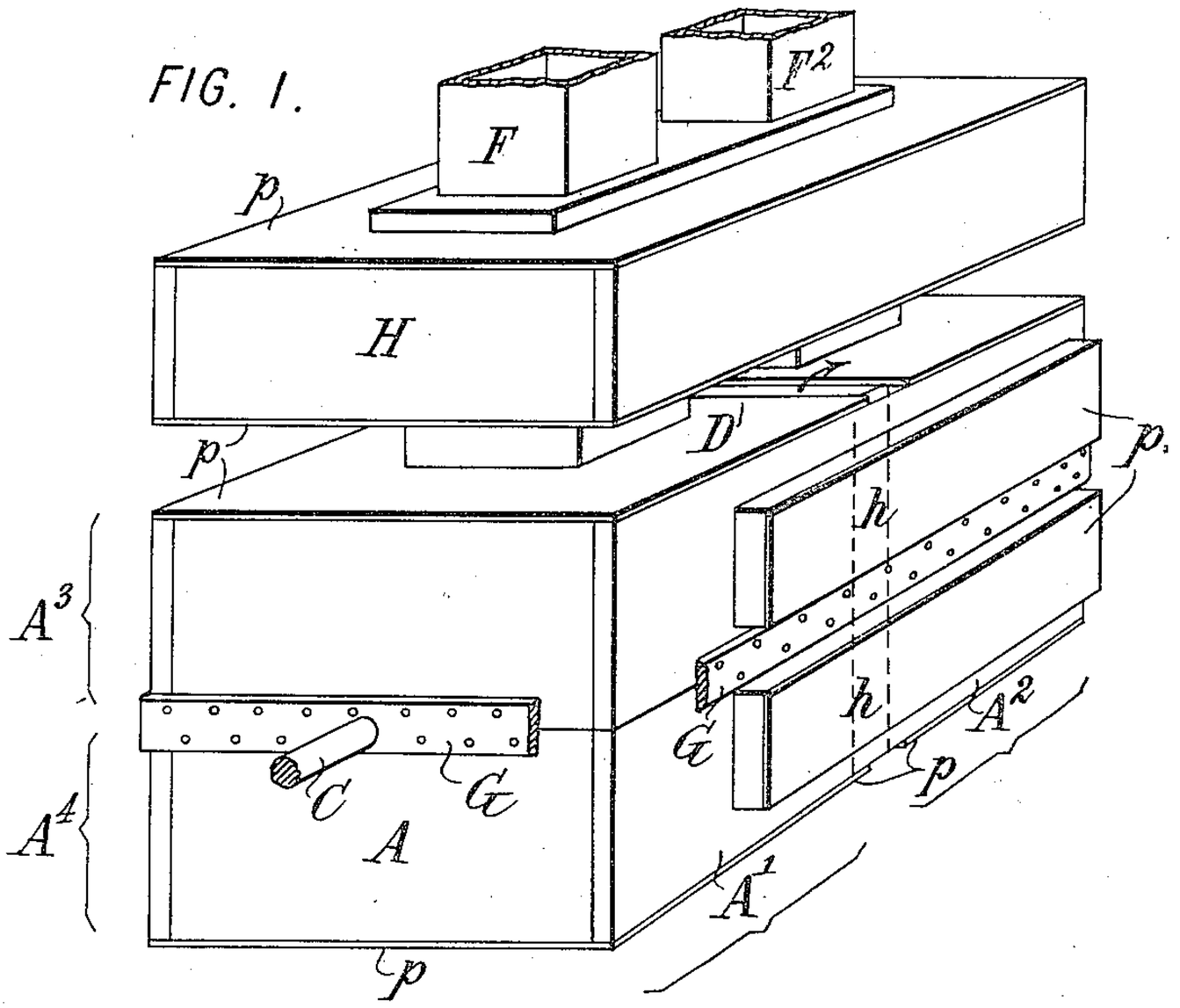
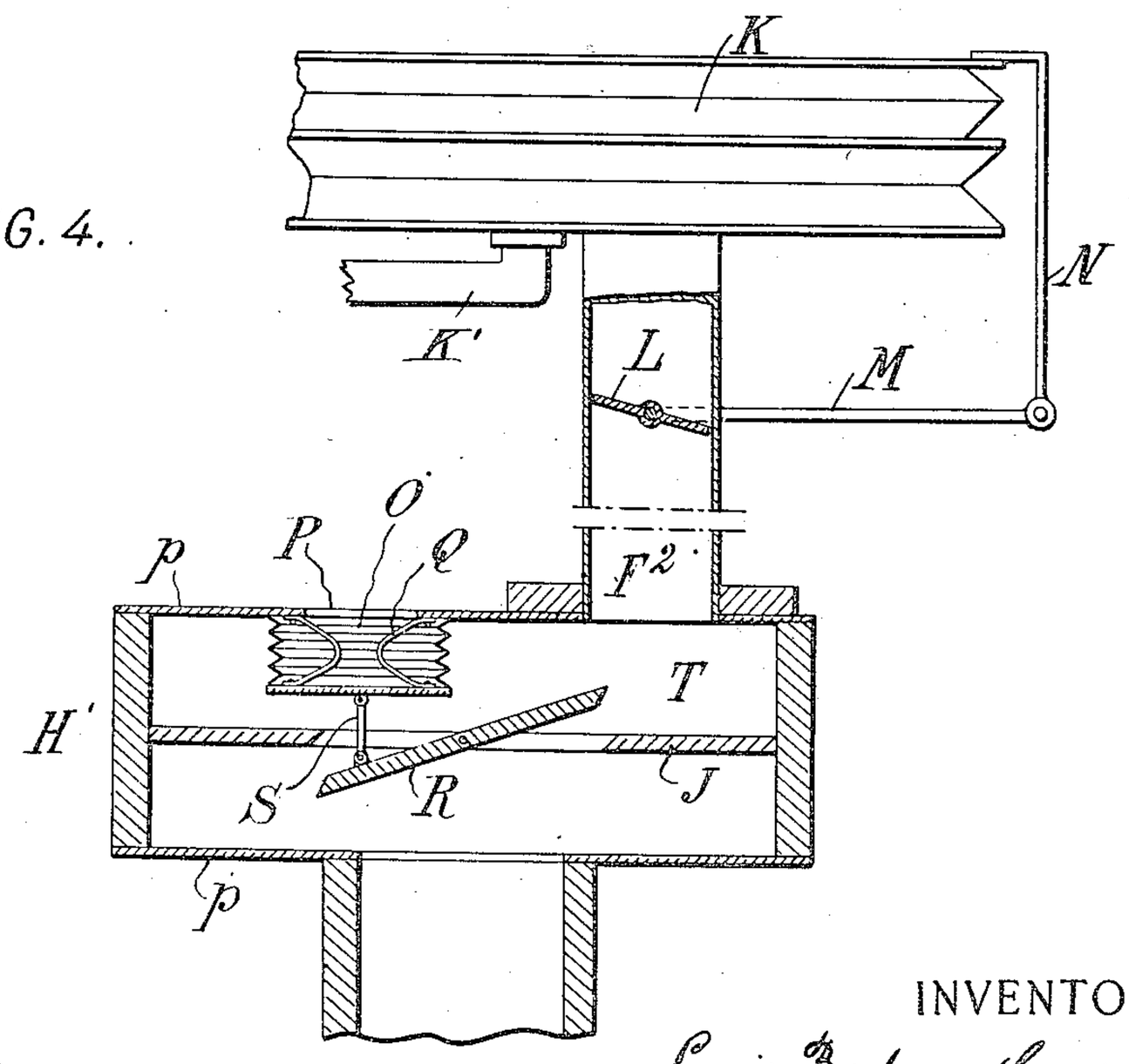


FIG. 4.



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2 SHEETS—SHEET 2.

FIG. 3.

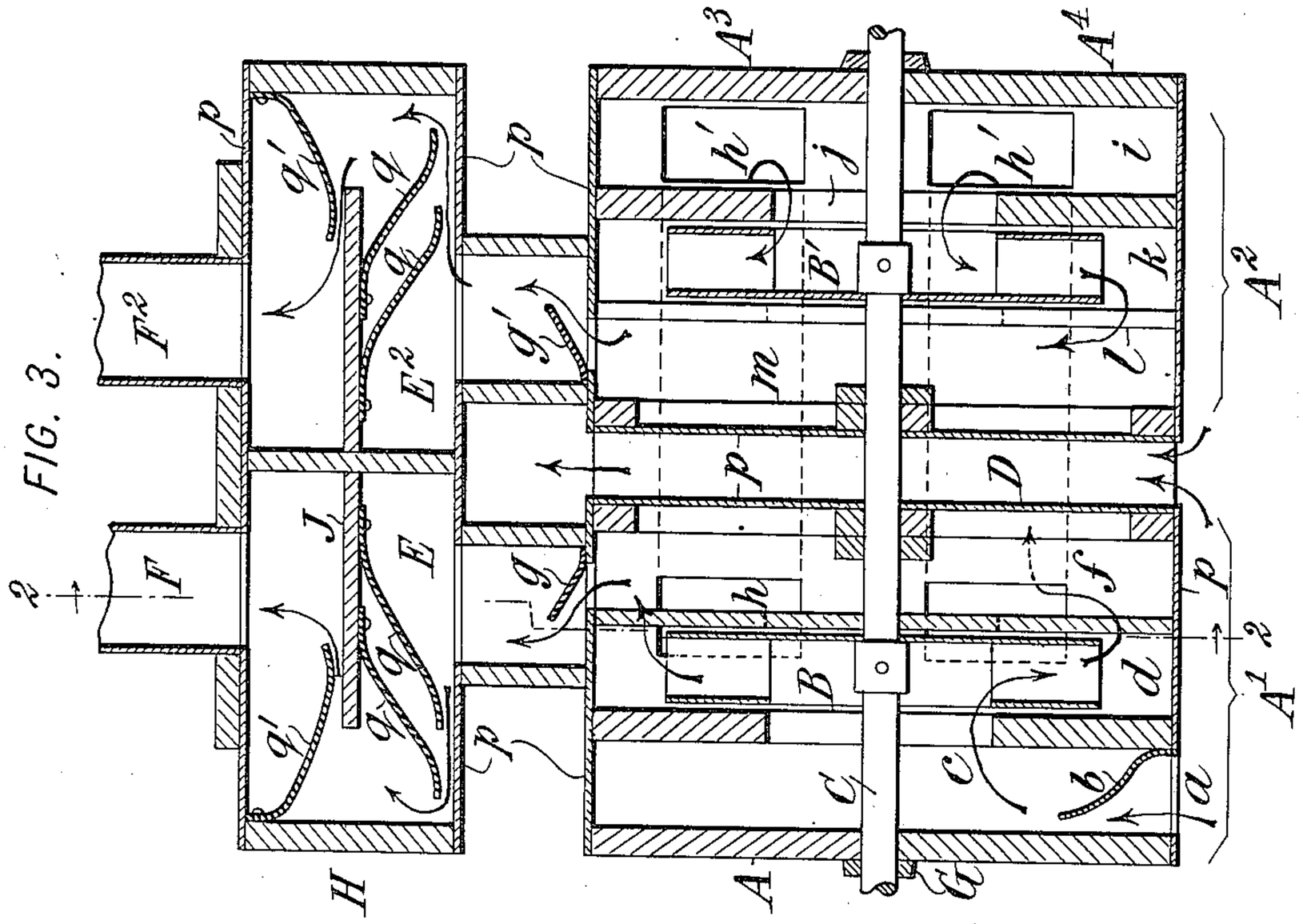
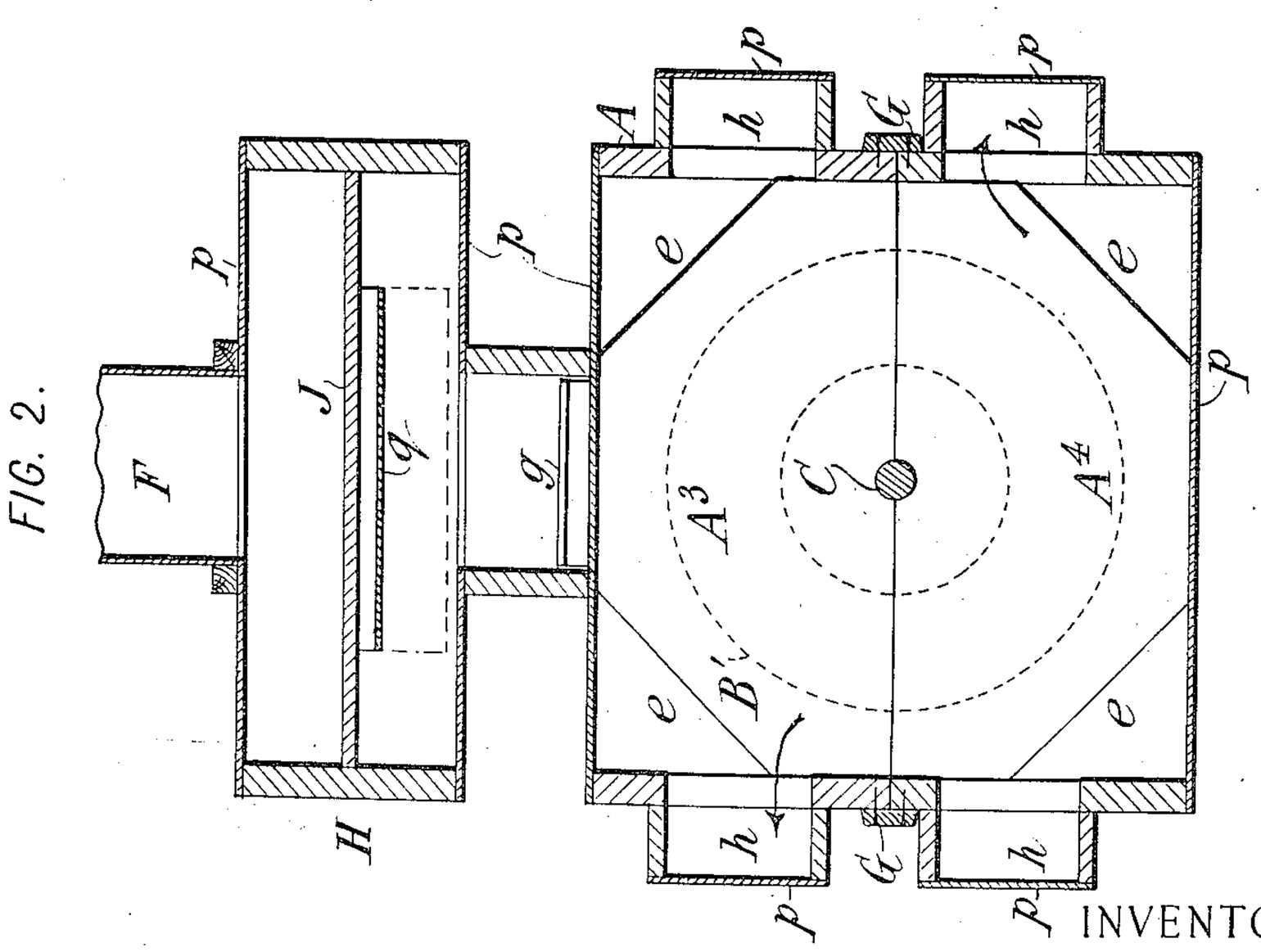


FIG. 2.



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UNITED STATES PATENT OFFICE.

LOUIS BERTRAM COUSANS, OF LINCOLN, ENGLAND.

AIR-COMPRESSOR.

No. 855,697. Specification of Letters Patent. Patented June 4, 1907.

Application filed February 28, 1905. Serial No. 247,771.

To all whom it may concern:

Be it known that I, LOUIS BERTRAM COUSANS, a subject of the King of Great Britain and Ireland, residing in Lincoln, England, have invented certain new and useful Improvements in Air-Compressors, of which the following is a specification.

This invention relates to air compressors or blowers designed especially for use in blowing pipe organs or other wind instruments.

It relates to the type of air compressors set forth in the application for United States Letters Patent of Reginald Arthur Cousans and myself, filed November 30, 1903, Serial No. 183,305.

The present invention provides certain improvements in construction designed to provide more perfect joints; to radiate the heat generated in the process of compression; to minimize the noise created by the operation of the fans; and to maintain a constant pressure in the wind trunks or conveyers irrespective of variations of pressure in the compressor.

The accompanying drawings show an organ blower embodying the preferred construction provided by this invention.

Figure 1 is a perspective view of the blower or air compressor as a whole. Fig. 2 is a vertical transverse section. Fig. 3 is a vertical longitudinal section. Fig. 4 illustrates a detail.

Referring to the drawings, let A designate the main box or casing of the compressor within which revolve two centrifugal fans B B′ fixed on a shaft C, which passes out at either or both ends of the casing A and to which power is applied from any suitable source, such as an electro motor, for driving the fans. The casing A is made in two parts A^1 and A^2 separated by a space D forming a circulating flue for facilitating the cooling of the slightly compressed air. The air enters the part A^1 of the casing at *a*, Fig. 3, where a valve *b* of felt or covered with felt is applied in such manner as to be opened more or less by the varying volume of inflowing air. The air then passes through an opening or eye *c* into the inlet chamber of the first fan B which whirls the air and thereby forces it into the outer portion of a chamber *d* from which it escapes through openings *e e* into a chamber *f*. From this chamber part of the air escapes directly upward through a felt-covered valve *g* into a trunk or box E for supplying an organ with air at relatively low pressure. The remaining air from the chamber *f* passes through conduits *h h*, arranged preferably to extend along the exterior of the casing and thereby to bridge the space between the two parts A^1 and A^2 of the casing, so that air is conducted by these conduits to the inlet openings *h′ h′* admitting it to the inlet chamber *i* of the part A^2 of the casing. From this chamber *i* it passes through an eye *j* into the open center of the fan B′, which, again whirling the air, raises it to higher pressure and forces it into the outer portion of the fan chamber *k* from which it flows through openings *l l* (corresponding in shape to the openings *e e*) into the outlet chamber *m* from which it passes upward by lifting the felted valve *g′*, into the high pressure chest or box E^2. From the chests E and E^2 respectively the air passes out to the organ through the discharge conduits F and F^2, the former supplying those portions of the organ which require air at low pressure, and the latter those portions of the organ which require air at relatively high pressure.

The casing A may be constructed of metal or wood or of a combination of wood and metal. It is preferably of square section, as shown in Fig. 2, although it may be polygonal. A circular section is believed to be not desirable, on account of the loss of energy due to rotation of air therein.

The casing A, or either part A^1 or A^2 thereof, is divided in a plane parallel to and substantially coincident with the axis of rotation of the shaft C, this plane being preferably horizontal as shown. Thus the casing is divided into two sections, which may be separated to insert or remove the shaft and fans or to gain access to the interior chambers. The upper section is lettered A^3 and the lower section A^4. It is desirable that the joint between these sections be made tight so as to avoid leakage of air and so that no shrinkage of the wooden casing shall cause this joint to open. For this purpose the sections are united by a strip G of wood or other shrinkable material which bridges the joint, its portion overlapping each of the sections being fastened thereto by screws, nails or otherwise. As the wooden strips G G gradually shrink they draw the sections A^3 A^4 tightly together. Thus any cause which would tend to shrink

the sections and thereby to open the joint between them, tends equally to shrink the strip, which tightens the joint.

It is important in an organ blower that the temperature of the air delivered to the various bellows of the instrument should be maintained as nearly constant as possible, irrespective of the varying pressures to which the bellows are weighted. Since the compression of the air accomplished by the fans is accompanied by the heating thereof, it is desirable to provide means for cooling the air. To this end I make the casing A in part of sheet-metal so as to afford ready conduction of heat to the external atmosphere, and in part of wood to prevent the resonance which would be present in a casing made entirely of metal. In the drawings the several plates lettered *p p* are of sheet-metal, and these are separated from each other by the wooden vertical sides. Thus vibration of the metal is reduced to a minimum while a sufficient area of metal is provided to conduct away the heat generated.

The conduits *h h* are provided with metal plates *p p* on their outer sides so that the heat of the compressed air may be radiated to the atmosphere while the compressed air is flowing from the first fan to the second.

It is for the purpose of promoting the cooling of the air that the space or flue D between the integrally connected parts A^1 A^2 of the casing is provided. This space is left open at the bottom as shown in Fig. 3 so that the air can freely enter beneath, ascend through the space, and escape freely at the top. The sides of this space or flue are made of sheet-metal plates *p p*, as shown, affording ready conduction of heat. This space D has the further advantage in a blower delivering air under two different pressures that it separates the low pressure and high pressure air chambers and prevents the heat of the high pressure air being transmitted to the low pressure air, and thereby contributes to the maintenance of a constant and nearly uniform temperature.

For the satisfactory blowing of organs it is important that all noise generated by the compressor, as well as that conducted by the trunks to the organ, should be minimized. For this purpose I prefer to employ the inlet valve *b* coated with porous felt, which in general is similar to the silencing inlet valve set forth in said application 183,305. I further apply the valves *g g'* at the outlets from the air compressor, which also are made of felt or are felt-covered so as to be noiseless in their operation. These valves are very light, and move easily and freely to admit the passage of air, and close automatically as the flow of air diminishes, in order to obstruct and diminish the transmission of noise from the compressor through the trunks or conduits. By their porosity they permit the passage of small quantities of air even when they are closed.

The chambers E E^2 are for the purpose of still further reducing noise, and also to assist in the radiation of heat. These chambers may be formed in one casing or blanket box H as shown, or be separately formed, as preferred. I have shown their sides as made of wood and their top and bottom plates of metal *p p* for radiating heat. Within each chamber is a fixed deflecting plate J around which the air is forced to flow in passing from the inlet to the outlet. Hung beneath the plate J are silencing valves *q q* made of or coated with felt. These valves are very light so that they are easily lifted to permit the air current to pass them. Preferably another similar valve *q'* is united to the upper part of each chamber so that its free edge rests upon the plate J, this valve also being lifted by the current of air flowing through the chamber. The valves *q q'* are, as shown, mounted in portions of the chamber where the flow of air is substantially horizontal. Obviously they might be in any other horizontal portion of the air conduit to like effect.

The two centrifugal fans B B' are arranged with their inlet sides facing in opposite directions, in order to balance the end thrusts, as set forth in said application for patent Serial No. 183,305.

It will be understood that F and F^2 are trunks which may be of great length leading from the blower in a basement or cellar to an organ in a distant part of the building. It is customary to provide adjacent to the bellows within the organ or immediately connected thereto a valve which shall automatically close when the bellows shall have received a certain quantity of wind. Such an arrangement is shown in the application above referred to. Such an arrangement is illustrated diagrammatically in Fig. 4, where K is the organ bellows K' the pipe leading therefrom to the organ and L a valve the spindle of which is connected by an arm M and a link N to the upper end of the bellows K. The bellows K is weighted for a certain pressure and tends to collapse and thereby to open the valve as the wind is drawn from the bellows more rapidly. As the demand on the bellows is slackened the supply of wind from the blower increases until at a certain point of expansion of the bellows the valve L is nearly closed and only a small quantity of wind, sufficient to supply the leakage or to supply the small demand, is admitted. The wind, however, is received from the blower at a considerable pressure and makes a hissing noise in passing through the valve L. This hissing is more pronounced as the playing of the organ is lower or when it ceases, and therefore causes a considerable disturbance. It is proposed to eliminate

this objectionable effect by cutting off the supply at the blower so that even though there should be a certain hissing noise it will be at a point far removed from the organ so as not to disturb the listeners. The arrangement for example may be introduced in the blanket box. For example the blanket box may be of the style indicated at H′ in Fig. 4, and the arrangement may consist of a supplementary bellows O open at P to the outer air and provided with a weight or springs Q or both tending to hold open the valve R to which it is connected by a link S. Now as the valve L closes the pressure in the upper chamber T of the blanket box increases sufficiently to collapse the bellows O and to close the valve R either entirely or to such an extent as to admit the passage of only sufficient wind to supply the leakage and small demand at the bellows K. This wind not being under any greater pressure than the air in the bellows will pass quietly through the valve L. This is a point of great practical importance. This arrangement may be used with or without the blanket box H.

Though I have described with great particularity of detail a complete apparatus embodying the invention, yet it is not to be understood therefrom that the invention is limited to the specific embodiment described. Various modifications thereof in detail and in the arrangement and combination of the parts may be made by those skilled in the art without departure from the invention.

I claim as my invention:—

1. An air blower comprising two fans, and a casing inclosing them constructed in two parts A′ and A² constructed integrally with each other, with an intervening flue D closed at the sides and open at bottom and top to allow a circulation of outer air between the two parts of the casing for cooling the air within the casing.

2. An air blower comprising two fans acting serially on the air to raise it to two different pressures, a chamber receiving low pressure air from the first fan and a chamber receiving high pressure air from the second fan, said chambers being separated from each other by a space D which is closed at the sides so as to form a flue and allow a circulation of outer air between said chambers to avoid conduction of heat from one to the other.

3. An air blower combined with a deflection chamber through which the compressed air from the blower flows, and deflecting plates in said chamber, said chamber constructed in part of metal plates for promoting radiation of heat from the compressed air, and in part of wood separating the metal plates from each other to limit the vibration of the metal plates and the noise therefrom.

4. An air blower combined with a deflection chamber through which the compressed air from the blower flows, said chamber provided with silencing valves for obstructing the passage of sound, said valves being held open by the passage of air from the blower and automatically closed when no air is passing, thereby cutting off the sound of the blower.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

LOUIS BERTRAM COUSANS.

Witnesses:
DOMINGO A. USINA,
FRED WHITE.