No. 713,990. Patented Nov. 18, 1902.

J. KEITH.

ROTARY FAN.

Application filed May 20, 1902.

(No Model.) 2 Sheets—Sheet 1.

Fig 2.

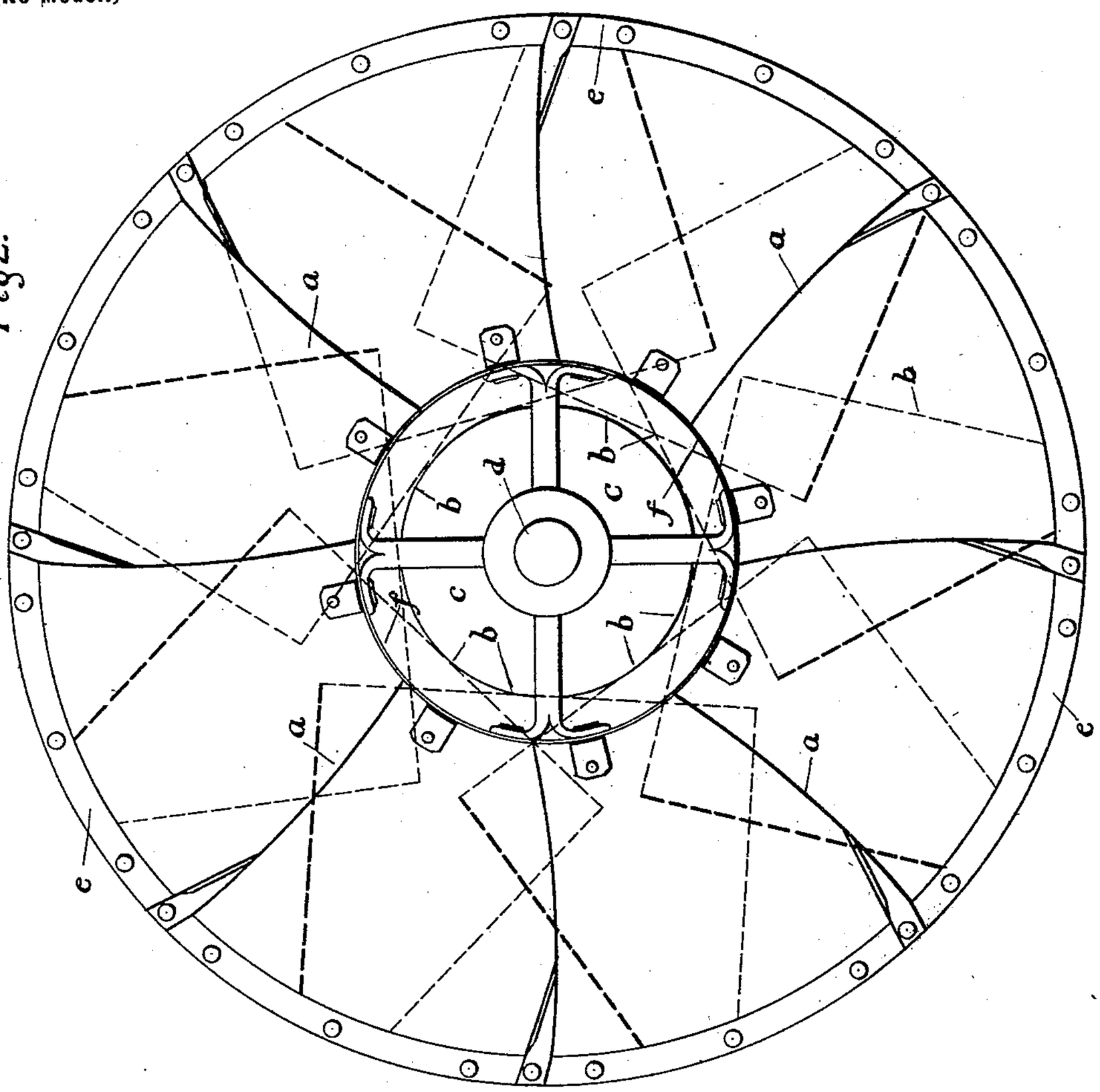

Fig 1.

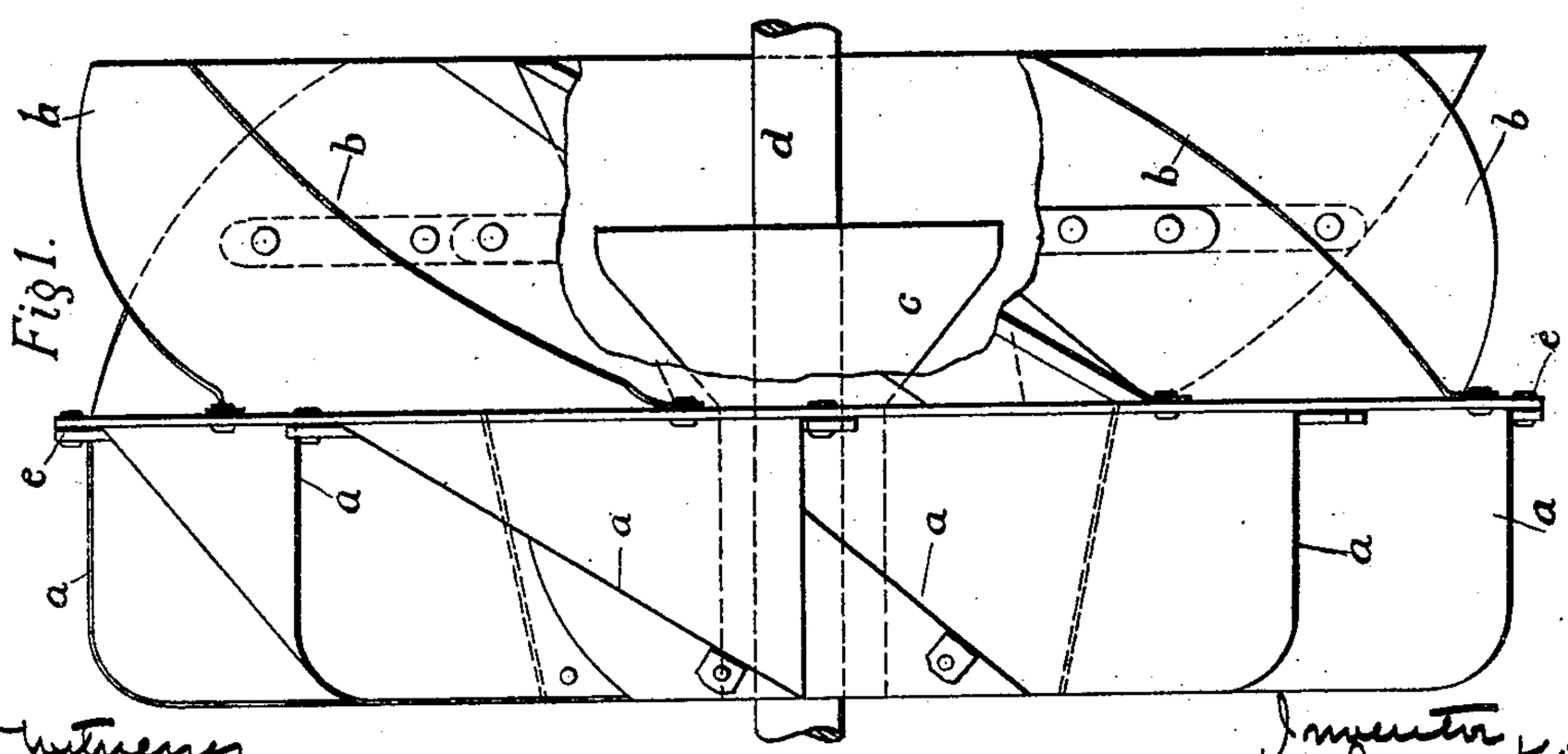

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Fig 4.

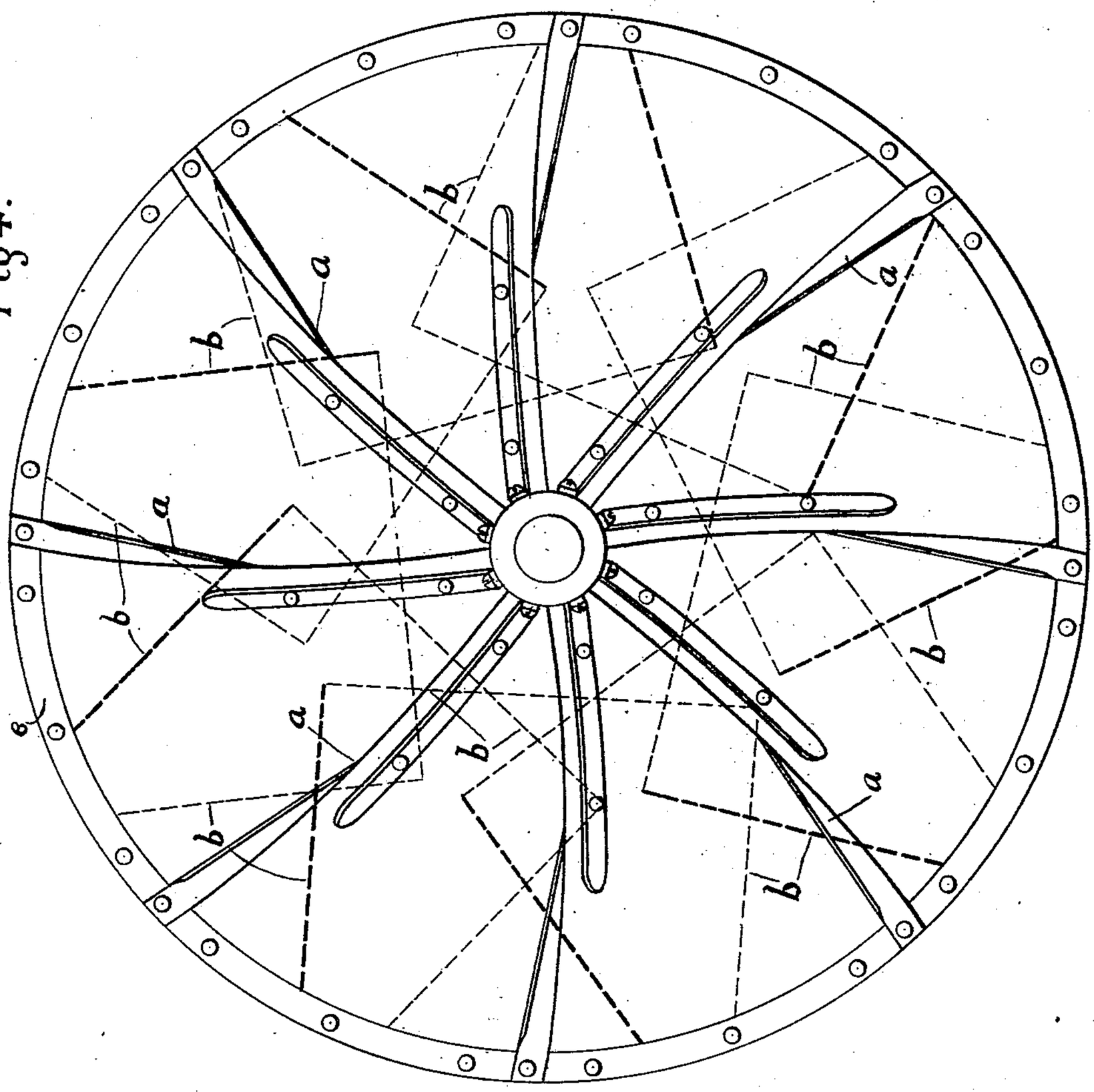
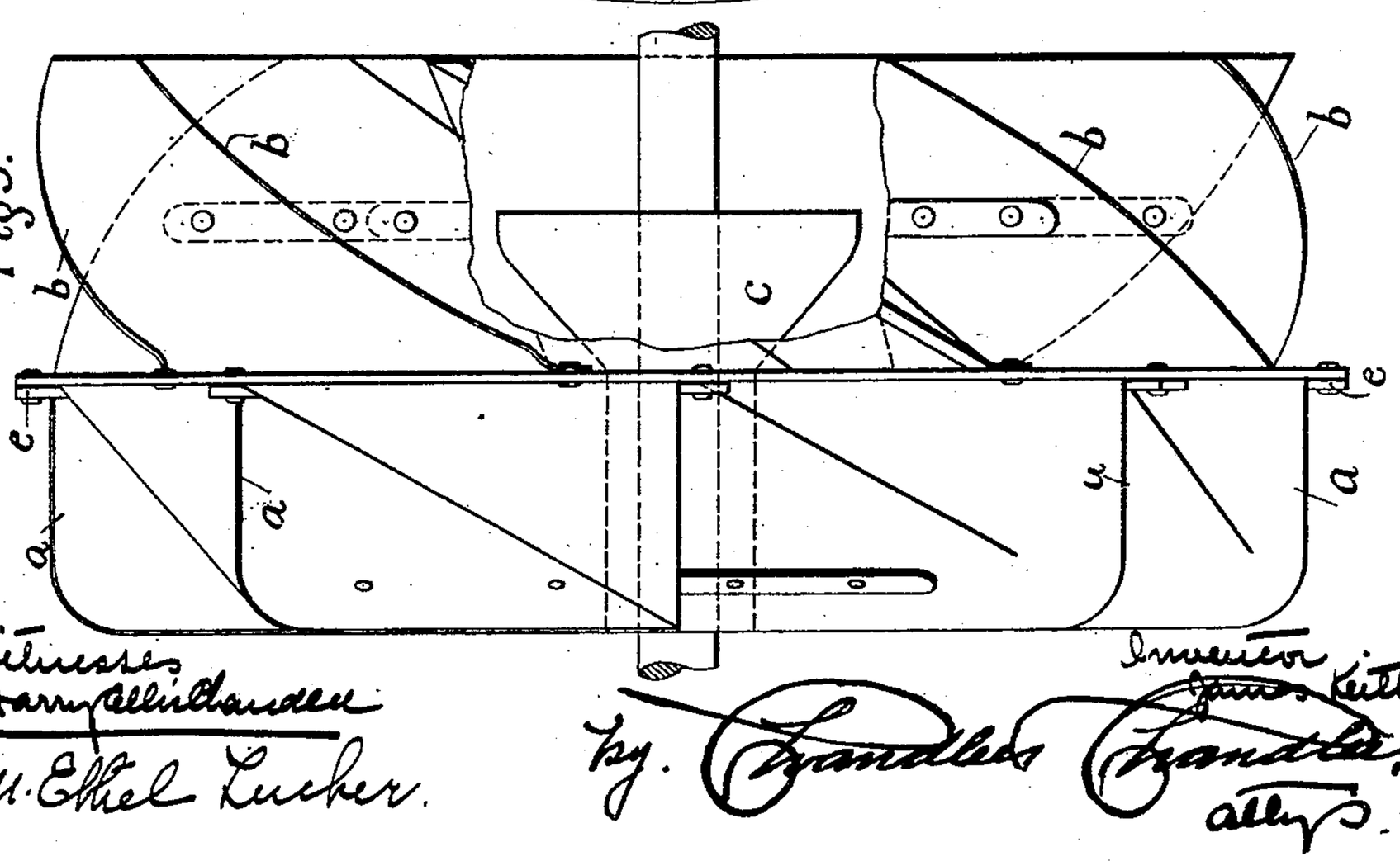


Fig 3.



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UNITED STATES PATENT OFFICE.

JAMES KEITH, OF LONDON, ENGLAND.

ROTARY FAN.

SPECIFICATION forming part of Letters Patent No. 713,990, dated November 18, 1902.

Application filed May 20, 1902. Serial No. 108,256. (No model.)

To all whom it may concern:

Be it known that I, JAMES KEITH, a subject of the King of the United Kingdom of Great Britain and Ireland, residing at 27 Farrington avenue, London, England, have invented certain new and useful Improvements in Rotary Fans, (for which application for patent has been made in Great Britain, No. 6,267, dated March 13, 1902,) of which the following is a specification.

The subject of this invention is a duplex fan composed of a set of blades of the Blackman or scooped type formed around an open drum or shell center and a set of blades of the screw type so arranged around and behind the Blackman type of blades or around a cone on a single rotating shaft that the one set of blades serve to draw in air and deliver it to the second set of blades, by means of which the propulsive or compressive action is reinforced, and a larger volume of air or a greater pressure is obtained for a given size and speed, than is attainable with the ordinary single fan.

In the accompanying drawings, Figure 1 is a side elevation of the complete duplex fan. Fig. 2 is an elevation showing the inlet side of the fan with the blades of the Blackman or scooped type. Figs. 3 and 4 are corresponding views showing a modification of the duplex fan.

In the embodiment of the invention shown by Figs. 1 and 2 the duplex fan is composed of a set of blades *a* of the Blackman or scooped type extending from an open drum or shell center *f*, fixed by arms to a hub which is mounted upon a central rotatable shaft *d*, the outer edges of the blades being attached to a rim *e* in the usual way. The fan comprises also a second set of blades *b*, which are of the screw type or are approximately parallel with the shaft *d* and are attached to the shaft *d* or to the open drum or shell center *f*, in which a cone is or may be fixed. When the cone *c* is used, it increases in diameter toward the discharge side of the fan, and it tends to direct the air which passes through the blades *a* and the open drum or shell center *f* toward the most effective position at the outer ends of the blades *b*, while also preventing return flow of the air through the center of the fan. The blades *b* are preferably more numerous than the blades *a*, so that they cross or partly cross the delivery edges thereof, and the blades *a* and *b* and the open drum or shell center *f* thus fill as far as possible the area of the circle in which they rotate, while leaving at the same time sufficient space for the free and untrammeled entrance and exit of the air. By this arrangement the effective area of the blades *a*, which is toward the periphery of the fan, is retained, the area near the center of rotation being of little effective value, and an inlet is provided through which additional air is induced by the blades *b* and directed by the cone *c* when used toward the said screw-blades *b*, by which it is delivered. The conical boss *c* when used is carried through the central parts of the fan for directing the inflowing air toward the blades *b* and for preventing return flow of the air discharged by the fan.

In Fig. 2 the dotted lines show the screw-blades *b*, whose feed edges (indicated by thicker lines) cross the discharge side of the scooped blades *a*.

In the modification shown by Figs. 3 and 4 the duplex fan is of the same construction as that described; but the scooped fan-blades *a* instead of ending at and being attached to the open drum or shell center *f* are continued toward the front part of the central conical boss *c* on the shaft.

A duplex fan constructed as described differs essentially from two independent fans running on the same axis, inasmuch as in the latter case the second fan may only act to retard the flow of the air from the first fan and if the fans be open will have no reinforcing effect, while in the duplex fan the one set of blades delivers the air induced by their rotation directly to the second set of blades, by means of which its forward propulsion is reinforced and a greater pressure or greater volume of air results, according as the central boss is made larger or smaller.

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

1. A duplex fan composed of two sets of fan-blades on the same rotating shaft of which one set is of the scooped or Blackman type and is arranged to deliver air induced by its

rotation to the second set of blades which are of the screw type, the Blackman type of blades being formed around an open drum or shell center wherein an annular opening is formed on the inlet side of the fan to lead in the air to the second set of air-blades which are closed centrally against return flow of the air by a central conical boss.

2. A duplex fan composed of two sets of fan-blades on the same rotating shaft of which one set is of the scooped or Blackman type, and is arranged to deliver air induced by its rotation to the second set of blades which are of the screw type, the blades being secured around a central conical boss which serves to induce the air to the fan-blades and prevents return flow of air through the center of the fan.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

JAMES KEITH.

Witnesses:

WALLACE FAIRWEATHER,

JNO. ARMSTRONG, Jr.