

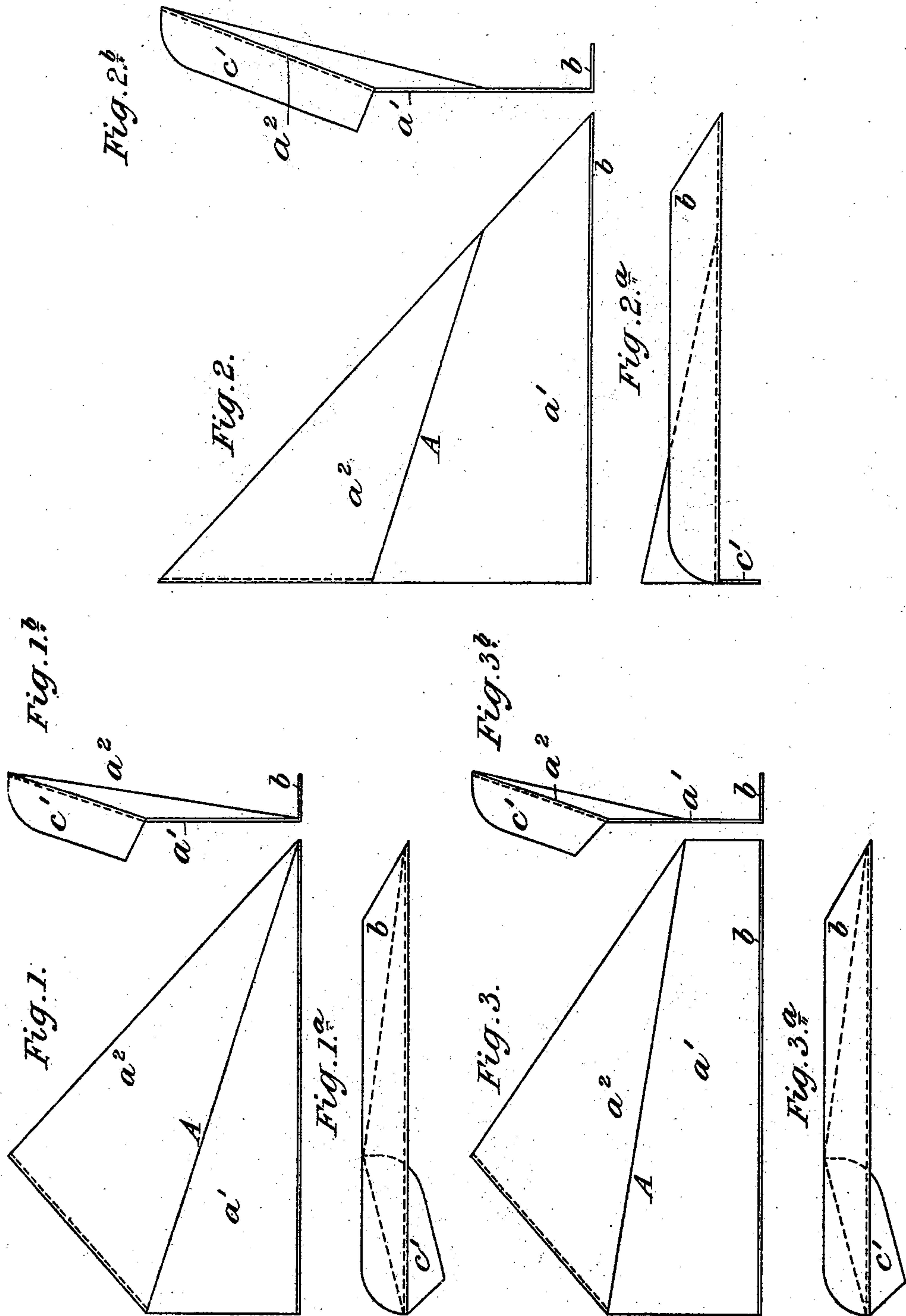
(No Model.)

4 Sheets—Sheet 1.

S. C. DAVIDSON.  
CENTRIFUGAL FAN.

No. 544,758.

Patented Aug. 20, 1895.



WITNESSES.

Fred White  
Thomas J. Wallace

INVENTOR.

Samuel Cleland Davidson,  
By his Attorneys:  
Arthur C. Orason & Co.

(No Model.)

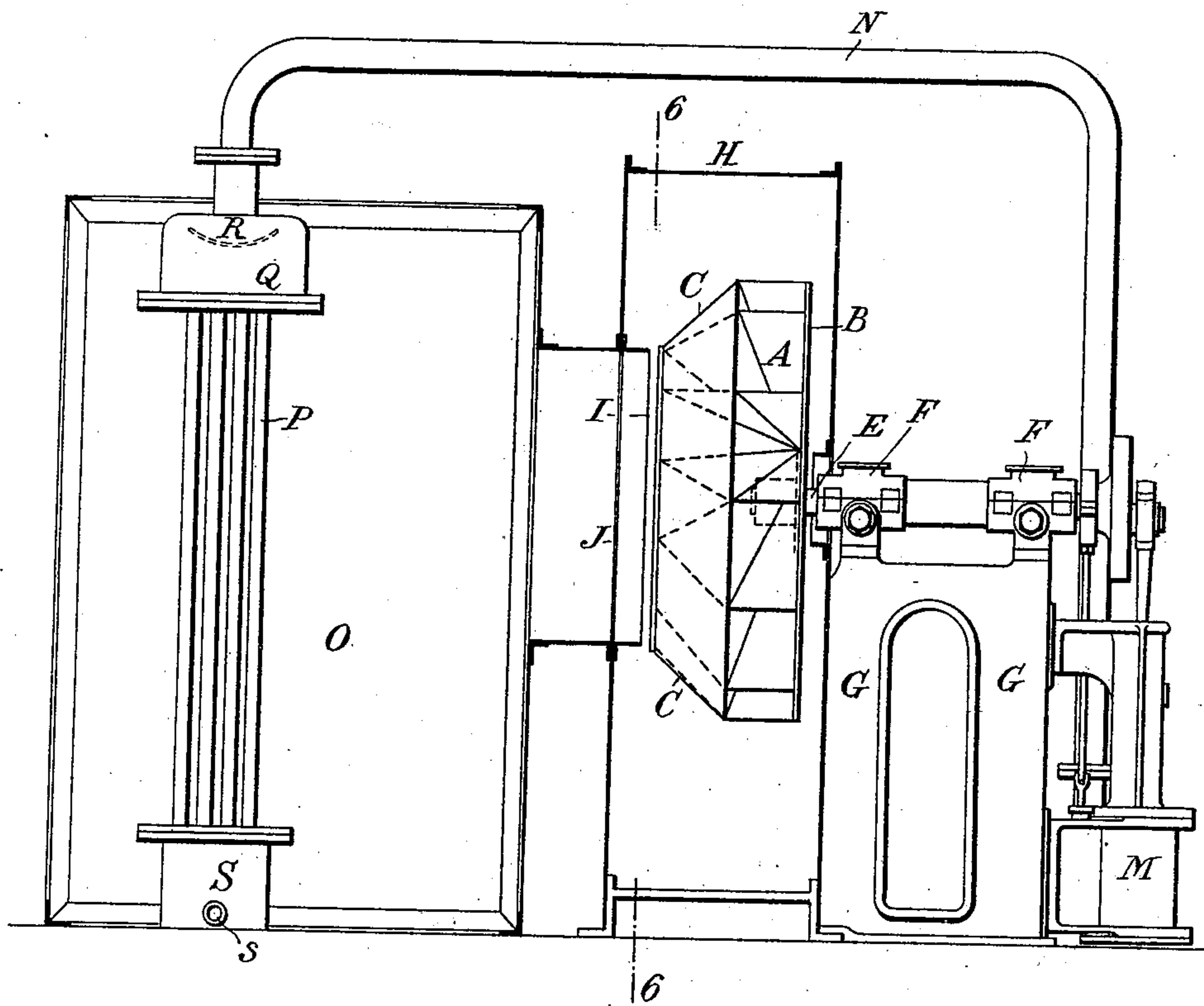
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*Fig. 4.*



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*Arthur C. Draper & Co.*

(No Model.)

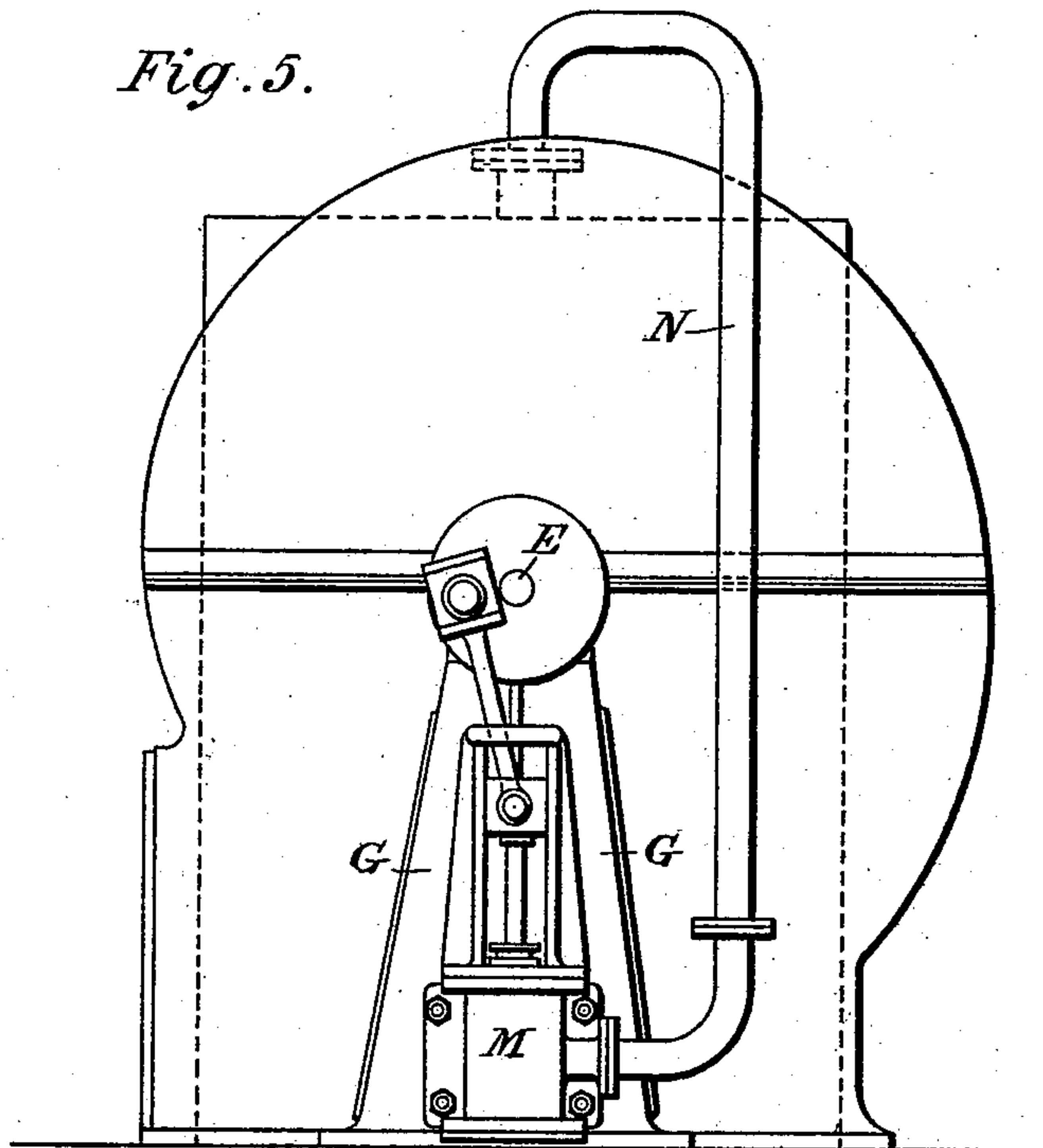
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S. C. DAVIDSON.  
CENTRIFUGAL FAN.

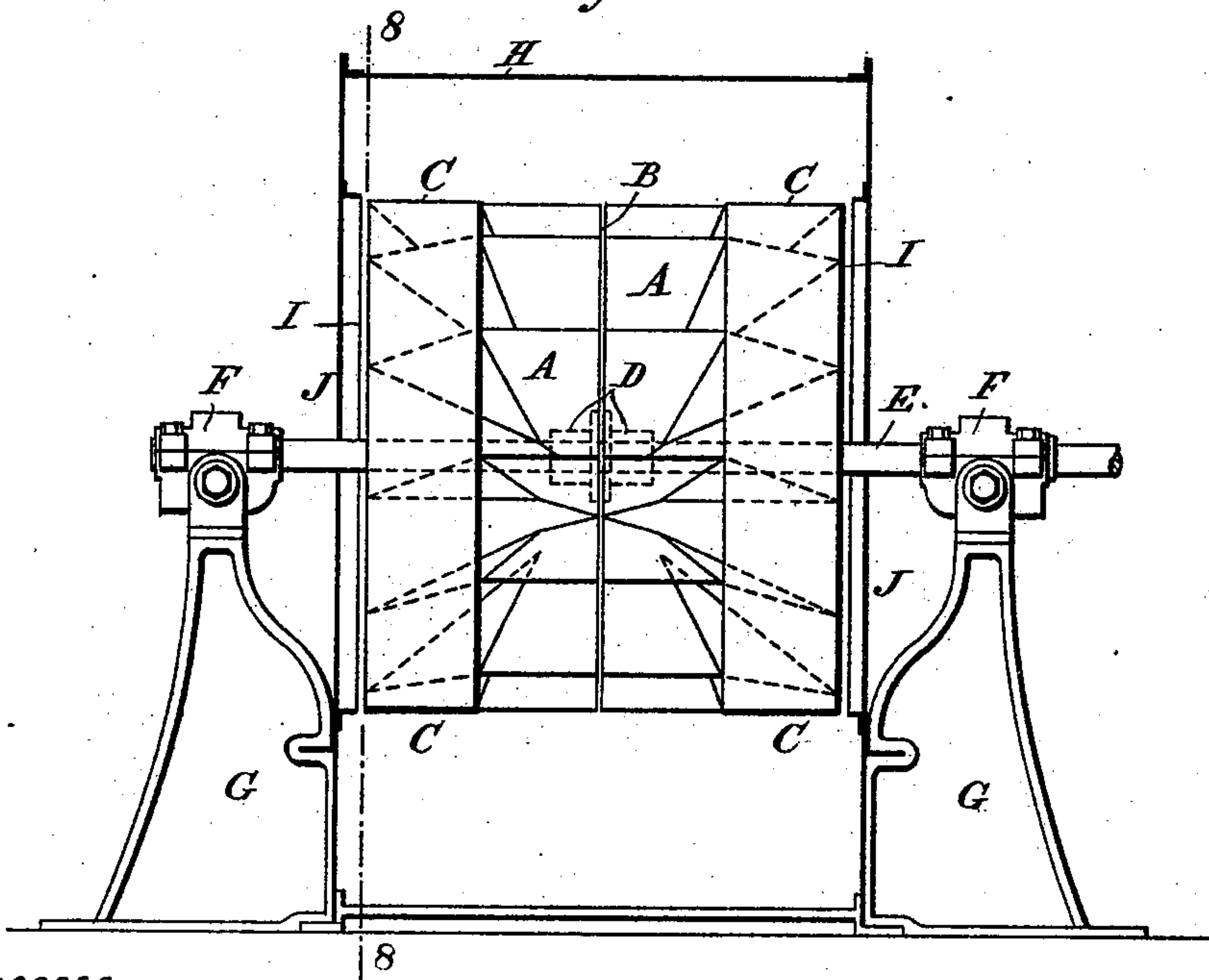
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*Fig. 5.*



*Fig. 7.*



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Fig. 6.

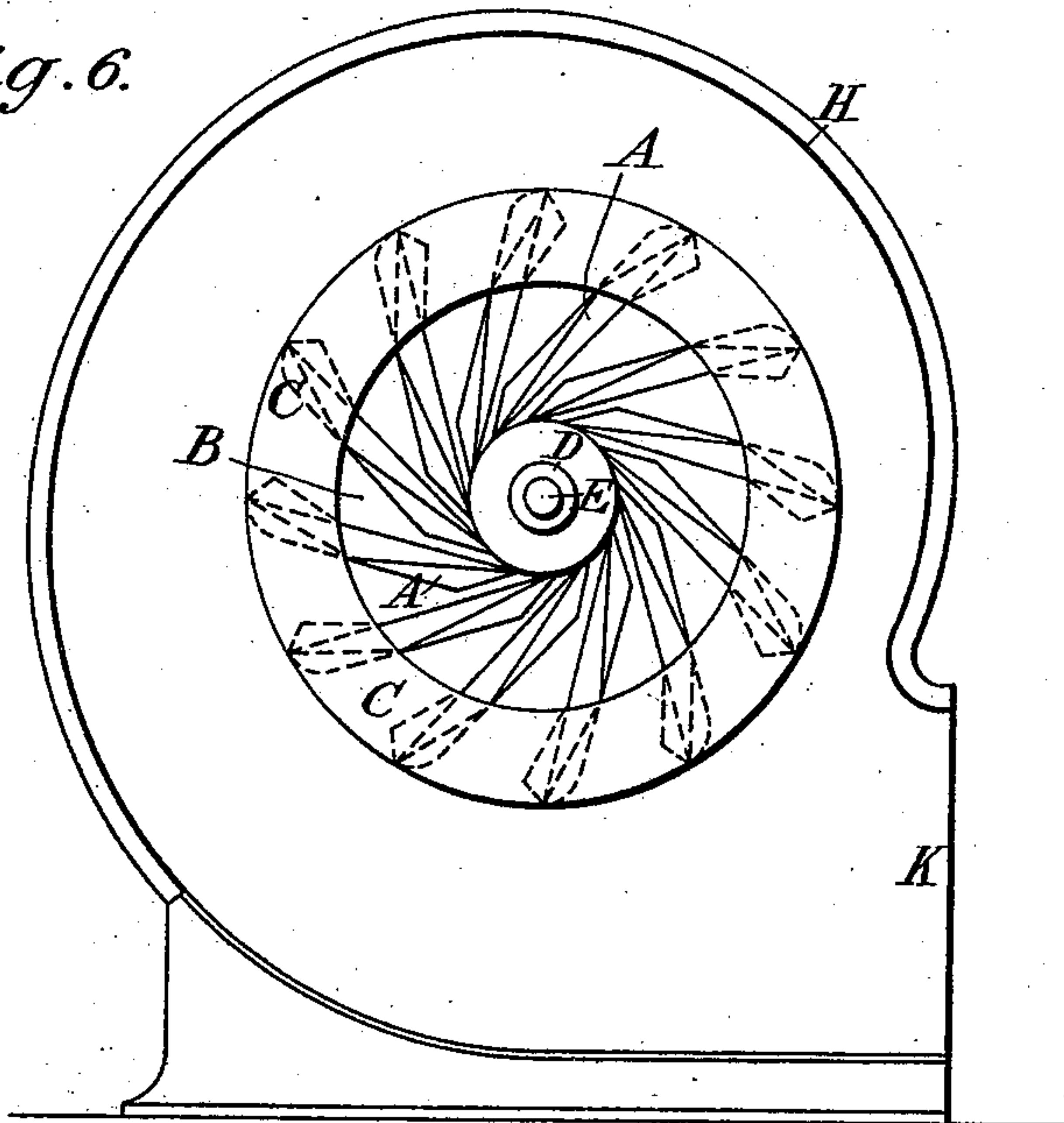
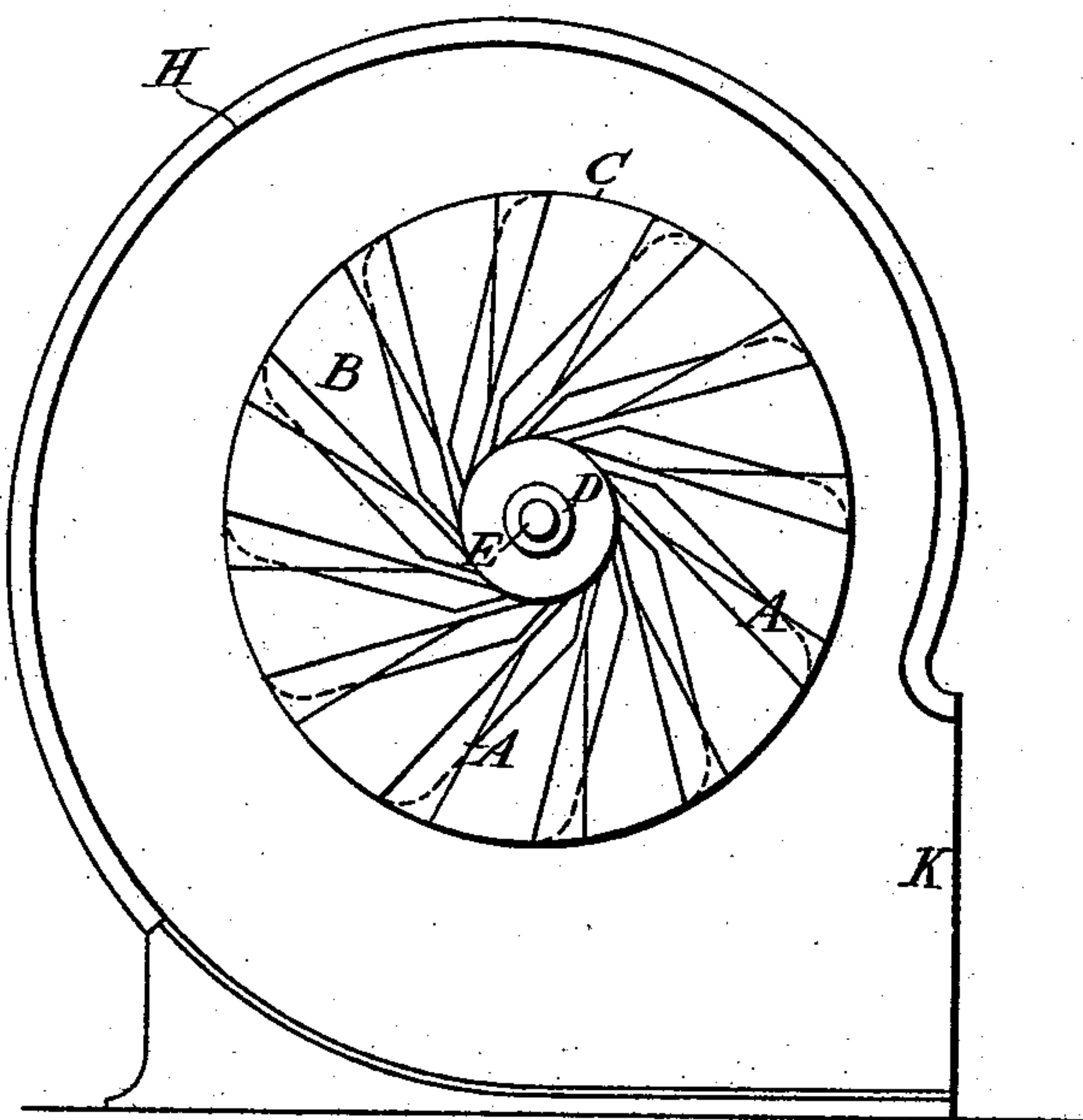


Fig. 8.



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# UNITED STATES PATENT OFFICE.

SAMUEL CLELAND DAVIDSON, OF BELFAST, IRELAND.

## CENTRIFUGAL FAN.

SPECIFICATION forming part of Letters Patent No. 544,758, dated August 20, 1895.

Application filed December 5, 1894. Serial No. 530,884. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL CLELAND DAVIDSON, of Belfast, Ireland, have invented certain new and useful Improvements in and  
5 Relating to Centrifugal Fans, of which the following is a specification.

My invention has more particular reference to centrifugal fans of the class or type in which the suction or exhaust is taken in at  
10 one or both sides and the delivery takes place at the periphery, and in which the vanes or blades are secured at one edge to a disk and at the other edge to an annulus or ring, the said disk being securely fastened to a hub or  
15 center piece keyed on the fan-shaft. Fans of this type are described in the specification of my English patent of January 12, 1889, No. 612.

One object of the present invention is to so  
20 construct and arrange the vanes of such fans that they combine with their centrifugal delivery of air from the periphery of the fan a screw-like intake of the air at the eye of the fan, with capability of employing any re-  
25 quired size of eye up to the full diameter of the fan, and at the same time to give increased strength and stiffness to the fan, and thereby allow of its being driven at exceedingly high speeds without danger.

30 My invention consists of an improved vane for a centrifugal fan, which improved vane is shaped or formed with two planes at a slight angle or inclination to one another, the one plane of substantially triangular form  
35 and acting like the blade of a screw-propeller to draw the air into the eye of the fan, and being secured at its outer edge to an annulus or ring concentric with the fan-shaft, and the other plane acting to discharge the  
40 air centrifugally through the space between the said annulus and a disk secured to the fan-shaft concentrically therewith, the inner edge of this plane being fixed to said disk, said planes intersecting at an angle on a line  
45 common to both extending longitudinally of the vane.

The invention comprises minor improvements in the vanes, the nature of which will be understood from the description herein-  
50 after contained and the accompanying drawings.

In the accompanying drawings, Figure 1 is

a plan, Fig. 1<sup>a</sup> a side elevation, and Fig. 1<sup>b</sup> an end elevation, of one of the improved vanes for a fan, in which the eye is two-thirds the  
55 diameter of the disk and the under plane of the vane is triangular. Figs. 2, 2<sup>a</sup>, and 2<sup>b</sup> show, respectively, a plan and side and end elevations of one of the improved vanes for a fan, in which the eye is the same diameter as  
60 the disk and the under plane is of quadrilateral form. Figs. 3, 3<sup>a</sup>, and 3<sup>b</sup> show, respectively, a plan and side and end elevations of a modification of the shape of vane shown in Figs. 1, 1<sup>a</sup>, and 1<sup>b</sup>, in which the under plane  
65 is quadrilateral, but of different form to that shown in Figs. 2, 2<sup>a</sup>, and 2<sup>b</sup>. Fig. 4 is a side elevation with the fan-casing and air-heating chamber in section; Fig. 5, an end elevation, and Fig. 6 a section, on the line 6 6 of Fig. 4,  
70 of a fan in which my improvements are embodied, and in which the eye is two-thirds the diameter of the disk, and with vanes of the form shown in Figs. 1, 1<sup>a</sup>, and 1<sup>b</sup> on one side of the disk only. The apparatus for heating  
75 the air that passes through the fan is so arranged relatively to the fan that the fan draws the air-supply through the heater. Fig. 7 is a side elevation with the casing in section, and Fig. 8 a section on the line 8 8  
80 of Fig. 7, of a fan in which the eye is the full diameter of the disk, and in which the vanes are on both sides of the disk, and there are air-inlets on both sides of the fan-casing. The air-heating apparatus is not shown in Figs. 7  
85 and 8.

A A are the vanes,  $a'$  being the under planes and  $a^2$  the upper planes of same.

$b$  is the flange on the edge of the plane  $a'$  of each vane, by which it is riveted to the  
90 disk B.

$c'$  is the flange on the edge of the plane  $a^2$  of each vane, by which it is riveted to the annulus or ring C.

In the fan represented in Figs. 4, 5, and 6,  
95 the eye I of which is two-thirds the diameter of the disk B, the annulus C is sloped inward in the form of the cross-section of a hollow cone, as already hereinbefore described, while in the fan represented in Figs. 7 and 8, in  
100 which the eye is the full diameter of the disk B, the annulus C is at right angles to the disk B. The disk B is riveted to the hub or center piece D, which is keyed on the fan-shaft E.



F F are the fan-shaft bearings, carried by the standards or brackets G G.

H is the fan-casing, J the air-inlet in the casing to the eye I of the fan, and K the outlet through which the pressure-blast is delivered.

M is the engine that drives the fan-shaft. It is shown in Figs. 4 and 5 only.

N is the exhaust-pipe from the engine, leading to an expansion-box Q, which is connected by a series of pipes P in the air-heating chamber O with a lower box S, so that the steam or gaseous exhaust from the engine M expands in the box Q, then descends the pipes P to the box S, which is fitted with a drain or exhaust pipe s.

R is a deflecting plate in the box Q. Instead of arranging this air-heating apparatus at the supply side of the fan, as shown, and which is preferred, it may be arranged on the discharge side, in which case the fan-outlet K may lead into a chamber fitted with the air-heating apparatus, this chamber having a suitable blast-outlet, as will be readily understood without further description or illustration. The exhaust admitted to the box Q does not necessarily come from the engine that drives the fan, as it may come from any other available source; or, instead of exhaust, it may be live steam from a boiler.

What I claim, and desire to secure by Letters Patent, is—

1. In a centrifugal fan in which the vanes are secured at one edge to a disk fixed to a center piece on the fan shaft and at the other edge to an annulus or ring as set forth, the disk and annulus being both concentric with the fan shaft, vanes having two planes at a slight angle to one another the one plane of triangular form and acting like the blade of

a screw propeller to draw the air into the eye of the fan and the other plane acting to discharge the air centrifugally through the space between the said disk and the said annulus, said planes intersecting at an angle on a line common to both extending longitudinally of the vane, substantially as set forth and shown.

2. In a vane for a centrifugal fan, an under plane with a flange at right angles at its inner edge for attaching to a disk in combination with an upper plane forming a continuation of said under plane at a slight angle or inclination thereto in the direction that the fan should revolve the said upper plane of triangular form and having a flange at its outer edge for attaching to an annulus and said planes having an angular intersection on a line common to both, substantially as and for the purpose set forth and shown.

3. In a centrifugal fan the combination with the fan shaft and fan casing having an air inlet and a blast outlet, of the disk B rotating with said shaft, vanes A secured at their inner edge to said disk and each of said vanes having two planes of triangular form and at a slight angle to one another, extending longitudinally of the vanes, and meeting each other with an angular intersection, and the annulus C to which said vanes are secured at their outer edge, all substantially as and for the purpose set forth and shown.

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

SAMUEL CLELAND DAVIDSON.

Witnesses:

WILLIAM FREW,

HUGH TAYLOR COULTER.