

No. 675,375.

Patented June 4, 1901.

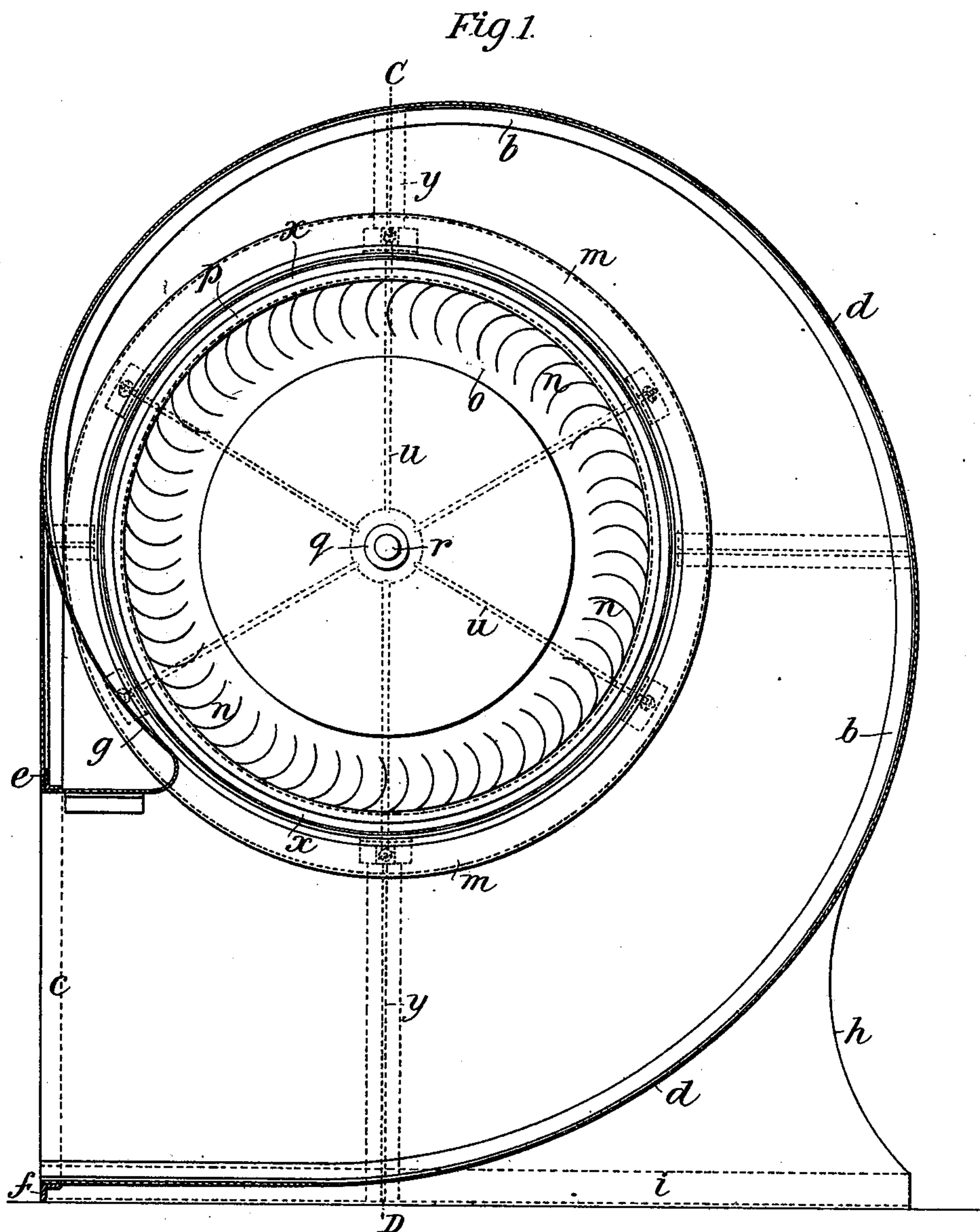
S. C. DAVIDSON.

CENTRIFUGAL FAN OR PUMP.

(Application filed Mar. 28, 1899. Renewed Mar. 6, 1900.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

*Ired White*  
*Thomas F. Wallace*

INVENTOR:

*Samuel Cleland Davidson,*  
By his Attorneys:

*Arthur T. Fraser & Co.*

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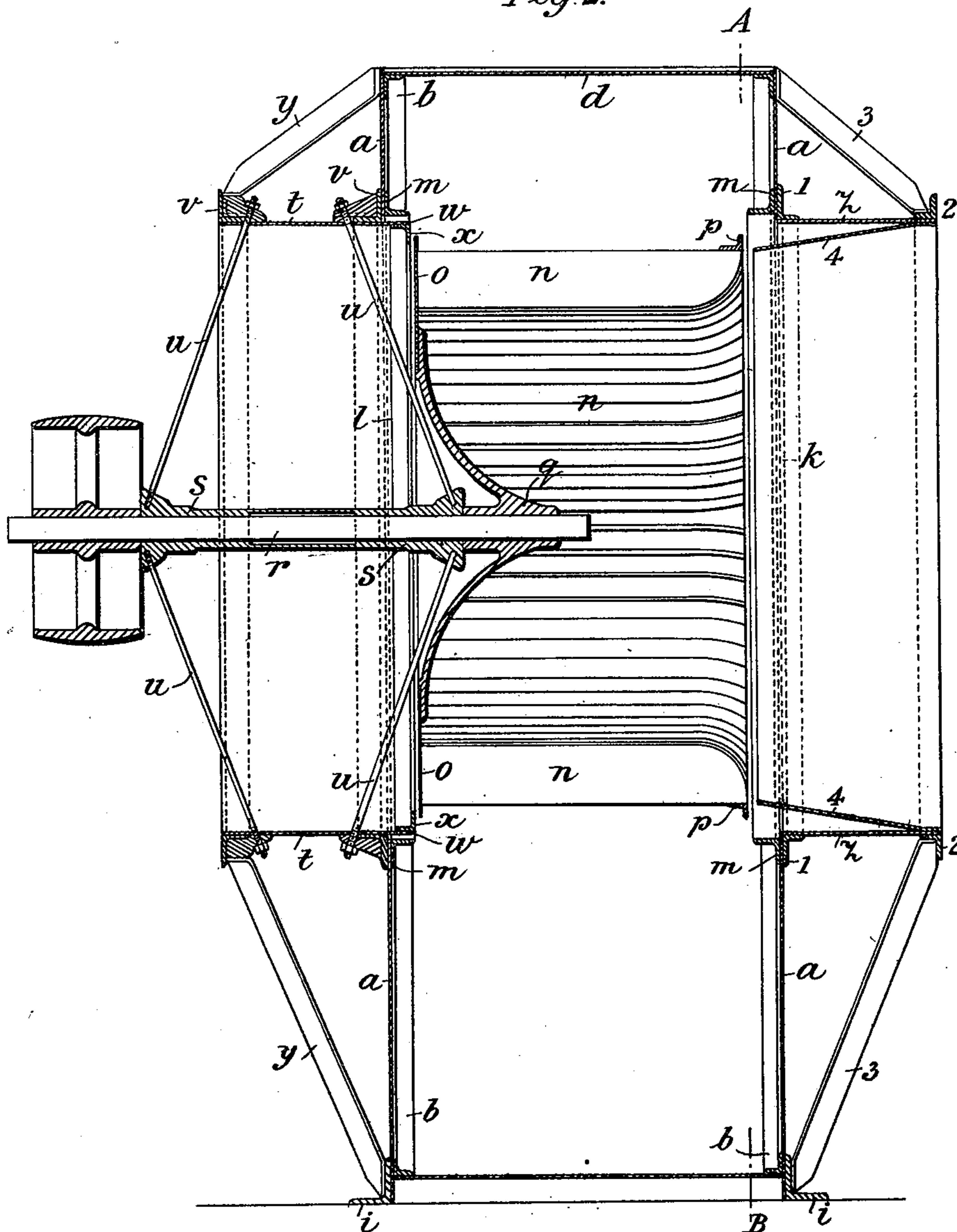
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2 Sheets—Sheet 2.

Fig 2.



WITNESSES:

*Ired White*  
*Thomas F. Halladay*

INVENTOR:

*Samuel Cleland Davidson*  
By his Attorneys:

*Allen C. Fraser & Co*



# UNITED STATES PATENT OFFICE.

SAMUEL CLELAND DAVIDSON, OF BELFAST, IRELAND.

## CENTRIFUGAL FAN OR PUMP.

SPECIFICATION forming part of Letters Patent No. 675,375, dated June 4, 1901.

Application filed March 28, 1899. Renewed March 6, 1900. Serial No. 7,598. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL CLELAND DAVIDSON, of Sirocco Engineering Works, Belfast, Ireland, have invented certain new and useful Improvements in Centrifugal Fans or Pumps, of which the following is a specification.

My invention has reference to centrifugal fans and pumps; and the improvements relate more particularly to the construction of the inclosing cover or casing (hereinafter called the "casing") of the type of centrifugal fans or pumps (hereinafter referred to as the "fans") in which the fluid operated on is drawn in axially and discharged circumferentially into and through the casing, which consists, mainly, of a spirally-formed duct or passage around the fan. In the construction of said casing as hitherto ordinarily made the inlet-aperture therein for admitting the fluid to the eye of the fan is considerably smaller than and usually about one-half the diameter of that of the clear outer circumference of the fan, and the insertion of the fan into its position or its withdrawal from the casing has consequently to be provided for by having the main body of the casing made in two or more detachable sections, which have to be taken asunder to admit of the fan being inserted into or withdrawn from the interior of said casing. This construction of the casing with detachable sections involves a greater cost in manufacture, and its strength and rigidity are less than if it were made as one integral structure and so that the fan could nevertheless be inserted or withdrawn without having to take asunder any portion of the main body of the casing itself.

Accordingly the objects, among others, of my invention are to so construct the main body of the casing that it shall consist of one integral part or parts fixedly connected together and at the same time be provided with a convenient and suitable arrangement whereby the fan can be inserted into or withdrawn from the interior of the casing and its strength and rigidity increased at a less cost of manufacture than if it were made in two or more component sections detachable from one another.

According to my invention the inclosing casing from the circumference of the fan out-

ward is constructed as one integral part or parts fixedly connected together, with two circular apertures of equal diameter concentric with the fan, (hereinafter called the "apertures,") one on each side of said casing and one, or under certain circumstances each, of which apertures admits the fluid into the eye of the fan through an annular mouthpiece mounted around it, while an annular bracket containing the fan spindle or shaft is mounted around the other aperture. Both apertures are of sufficient diameter to freely allow of the fan being inserted through same into or withdrawn from the interior of the casing, and each being of equal diameter to the other and the casing surrounding same being duplicated for connection thereto of the bracket containing the bearing of the fan-shaft or for the annular mouthpiece through which the fluid is admitted into the eye of the fan these can be applied on either side of the casing, as may be required, to suit the position in which the fan may have to be located in actual operation, and it is of much practical advantage to have the fan-casing and mountings thereon so constructed that the bracket for the fan-bearing on the one side and the annular mouthpiece on the opposite side can be reversed when necessary without involving any structural changes or adjustments in the casing itself. The annular mouthpiece around the apertures through which the fluid enters the eye of the fan consists of a projecting ring (hereinafter called the "fixed" ring) of equal diameter to that of said aperture, bolted or otherwise securely attached to the casing, and within this fixed ring another ring, (hereinafter called the "cone" ring,) which tapers from the mouth of said fixed ring inward toward the fan in the form of a hollow cone, so that the inner diameter of the open space within said cone ring corresponds with the diameter of the intake opening or eye to the fan-blades. This construction of said cone ring causes a gradual concentration of the current of fluid passing into the fan up to the entry into said eye, whereby the detrimental effects of what is known as "vena contracta" at the entrance of said current into the fan-eye is reduced to a minimum. Around the opposite aperture to that through which the fluid enters the eye of the fan is mounted an out-



wardly-projecting ring or annular bracket, (hereinafter called the "annular" bracket,) in which the bearing wherein the fan-spindle rotates is centrally supported by stays acting  
5 under tension between the ends of said bearing and the annular bracket, which on the end next the fan has an inwardly-turned flange the interior diameter of which is less than the exterior diameter of the fan-disk, so that the  
10 outer edge of the latter projects beyond the inner edge of the former, whereby the passage of air between them is prevented.

My improved construction of casing is suitable for employment with any type of centrifugal fan; but in the accompanying drawings it is illustrated as adapted to a special construction in which the intake opening or eye thereto is of equal diameter to that of the fan itself.

20 In the accompanying drawings, Figure 1 is a sectional elevation at right angles to the axis of the fan through the line A B of Fig. 2. Fig. 2 is a cross-section through the axis of the fan on the line C D of Fig. 1.

25 *a a* are the two vertical sides of the fan-casing, and *b b* are two continuous angle-irons, to which said sides *a a* are respectively attached. *c* is the delivery nozzle or port.

30 *d* is a sheet riveted to the angle-irons *b b* and constituting the circumferential wall of the casing and also forming the outer wall of the spiral duct between the fan and the casing. The angle-irons *b b* form the outer angles or corners of the spiral duct and extend from the angle-iron *e* at the top side of the  
35 nozzle *c* all around the casing to the angle-iron *f* at the lower side of said nozzle; but for convenience of manufacture the said angle-irons *b b* are carried vertically from the top side *e* of the nozzle, and therefore diverge at this part from the starting-point of the spiral curvature of the spiral duct, the continuation of which from the top of said vertical line is effected by means of a bent sheet *g*. This  
45 sheet may be conveniently secured in position by attachment at one end to the angle-iron *e* and by flanges secured to the vertical sides *a a* of the casing. The two sheets forming said vertical sides *a a* are carried down,  
50 so as to constitute a pedestal *h*, and riveted thereto are outer angle-irons *i i*, by which the base of the fan may be firmly secured to the ground or floor by bolts or otherwise. The necessity for a basement-pedestal, which hitherto has usually been made in the form of an iron casting, is thus obviated, the result being a lighter and cheaper construction of fan-casing than hitherto made.

60 *k l* are apertures in the two vertical sides *a a*, respectively. They are concentric with the fan and are preferably of equal diameter, as shown, and sufficiently large to admit of the fan being readily passed through either aperture, as may be required, so that when  
65 the fan has to be inserted into or withdrawn from the casing this can be done through one of the apertures *k l* and so that the annular

bracket *t* and fixed ring *z* may be applied to either aperture, as may be required to suit the place or position in which the fan has to  
70 work. Around each of the apertures *k l* and on the inner face of the casing sides *a a*, in order to strengthen the same, I mount an angle-iron *m* and firmly rivet or otherwise secure it to the corresponding side *a* of the cas-  
75 ing.

*n n* are the fan-blades. They are mounted at one end on a disk *o*, and at their other or intake ends they are secured to each other by an inclosing iron ring *p*. The disk *o* is shown  
80 as mounted upon a conical center piece or boss *q*.

*r* is the fan-spindle. It rotates in bearings *s s*, which are centrally supported within an annular bracket *t* by means of adjustable  
85 stay-rods *u u*, acting under tension and extending between the bearings *s s* and the bracket *t*. This bracket is strengthened by external angle-iron rings *v v*, mounted upon its outer face, and it is bolted by means of  
90 the inner of these rings *v* to the side *a* of the casing around the aperture *l*. The bracket *t* extends inwardly beyond the said ring *v* to the point *w*, and around such extended portion an angle-iron ring *x* is mounted. One  
95 of the flanges of this ring *x* is turned inward toward the center of the aperture, so that the diameter of the open circle between the inner edges of the ring *x* is less than the outer edges of the fan or of the fan-disk *o*.  
100

*y y* are connecting struts or stays extending from the outer angle-iron ring *v* of the bracket *t* to the outer edge or corner of the casing. These struts or stays *y y* firmly hold  
105 the bracket *t* and its centrally-located bearings *s s* in proper position relatively to the casing and with perfect rigidity.

Around the aperture *k*, through which the entering fluid is admitted to the eye of the fan, is a fixed ring or annular mouthpiece *z*,  
110 attached to the side *a* of the casing by means of the angle-iron ring 1. 2 is another angle-iron ring around the outer edge of the fixed ring *z*, and 3 3 are struts or stays extending from the ring 2 to the outer edge or corner of  
115 the casing for a similar purpose to that described with reference to the struts *y y*.

4 is an annular cone or funnel within the fixed ring *z*. It tapers inwardly from the outer edge of the ring *z*, so that the diameter  
120 of the inner end of the cone ring 4 shall correspond with that of the intake opening or eye of the fan-blades. The cone ring 4 is temporarily removed when the fan is being inserted or withdrawn.  
125

The struts or stays *y y*, in combination with the fixed annular bracket *t* on one side of the fan-casing, and the struts or stays 3 3, in combination with the fixed ring *z* on the other  
130 side of the fan-casing, practically make the whole framework of the casing a sort of lattice-girder, whereby lightness of construction is combined, with rigidity and strength. This combination in conjunction with the facility



with which the fan can be inserted into or withdrawn from the casing and with which the annular mouthpiece or funnel for the inflow of the fluid and the annular bracket for the bearing for the driving-shaft of the fan can be optionally applied to either side of the fan-casing, so that the fan can be driven on either side of the casing as required, without necessitating any alteration of the casing itself, is of much practical importance and utility.

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

1. In a centrifugal fan or pump, a casing having an opening in its side of sufficient size to admit the passage of the rotary member therethrough, a ring attached to the casing around such opening, and a removable tapering ring or funnel fitting within said ring, and having its end of lesser diameter adjacent to the eye of said rotary member.

2. In a centrifugal fan or pump having a spirally-formed casing around its circumference, the combination with a casing having the main body thereof in one integral part and a fluid-inlet aperture on one side of said casing concentric with the fan or pump and sufficiently large for the fan or pump to be inserted or withdrawn through same, of a projecting cylindrical ring attached to said casing around said aperture and a detachable annular cone ring within said projecting ring fitting closely at its outer edge within said projecting ring and tapering inward therefrom to the eye of the fan or pump and corresponding in diameter at its inner edge with such eye, substantially as and for the purpose set forth.

3. In a centrifugal fan or pump, a casing having an aperture in one side thereof, in combination with an annular bracket fixed around said aperture, centrally-located bearings for the spindle of the rotary member of said fan, and stay-rods under tensile strain between said bearings and said bracket.

4. In a centrifugal fan or pump, a casing having an aperture in one side thereof, in combination with an annular bracket fixed around said aperture, centrally-located bear-

ings for the spindle of the rotary member of said fan, stay-rods under tensile strain between said bearings and said bracket, and means for adjusting said rods to center said bearings.

5. In a centrifugal fan or pump having a spirally-formed casing around its circumference, the main body of said casing being formed as one integral part and having a fluid-inlet aperture at one side of said casing and an aperture at the other side of said casing, both said apertures being concentric with the fan or pump, the combination with the second-named aperture of an annular bracket fixed around said aperture, centrally-located bearings for the fan or pump spindle and stay-rods under tensile strain between said bearings and said bracket, substantially as and for the purpose set forth.

6. In a centrifugal fan or pump, a casing having an aperture in one side thereof, concentric with the rotary member of the fan, a projecting ring attached to the casing and extending around said aperture, and struts extending from the outer edges of said projecting ring to the corresponding outer edges of the casing.

7. In a centrifugal fan or pump having a spirally-formed casing around its circumference, the main body of said casing being formed as one integral part and having an aperture on both sides of said casing concentric with the fan or pump and of sufficiently large diameter to admit or withdraw the fan through either the combination with projecting rings attached to the casing around said apertures of struts extending from the outer edges of said projecting rings to the corresponding outer edges or corners of the casing, substantially as and for the purpose set forth.

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

SAMUEL CLELAND DAVIDSON.

Witnesses:

HUGH TAYLOR COULTER,  
GEORGE GOOLD WARD.