

No. 690,018.

Patented Dec. 31, 1901.

S. C. DAVIDSON.  
CENTRIFUGAL FAN OR PUMP.

(Application filed Oct. 11, 1898. Renewed Mar. 6, 1900.)

(No Model.)

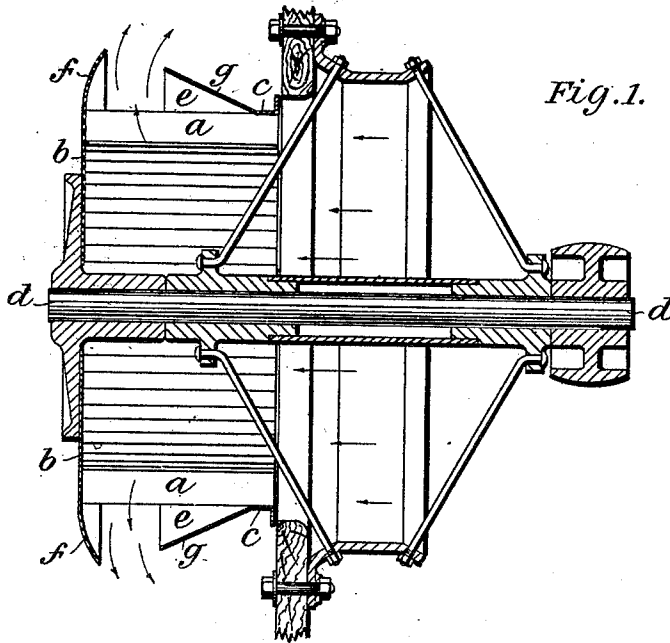


Fig. 1.

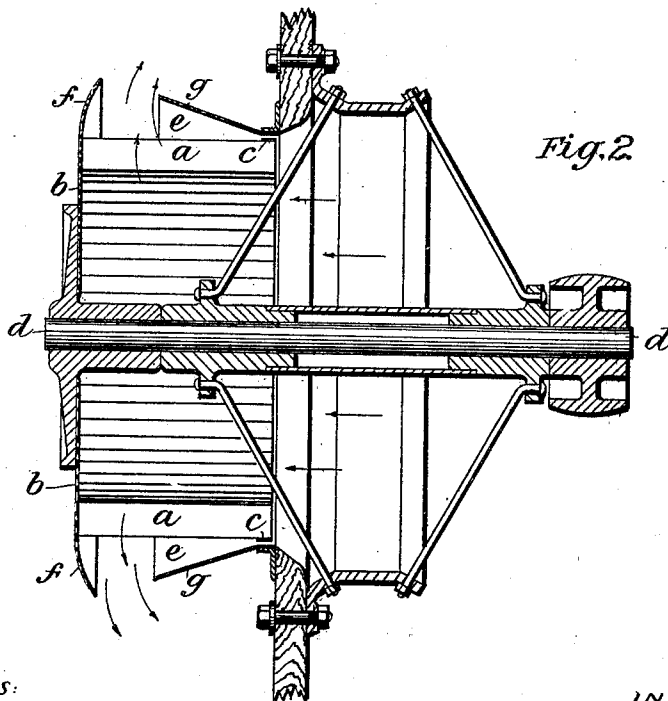


Fig. 2.

WITNESSES:

*Ed White*  
*Thomas F. Wallace*

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. 690,018, dated December 31, 1901.

Application filed October 11, 1898. Renewed March 6, 1900. Serial No. 7,597. (No model.)

*To all whom it may concern:*

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

My improvements relate to centrifugal fans or pumps (hereinafter referred to as the "fans") in which the fluid operated on is taken in axially and discharged circumferentially, and particularly to those wherein the fluid has a free discharge from the fan all around its periphery and wherein blades are employed which are of considerably greater axial length than radial depth and the ports between which are freely open toward the entering fluid, no side plates being employed therewith for closing the ends of the blades.

In fans of the aforesaid type the fluid after it is discharged circumferentially from the outer edges or tips of the blades in approximately tangentially-directed streams from the ports or spaces between the blades has more or less of an eddy-space intervening between each of said streams, owing to the obstruction due to the thickness or form of each individual blade which separates the streams axially; and the object, among others, of my present invention is to so control and guide the fluid after it has been discharged from the outer edges or tips of the blades, as above described, that said outwardly-flowing streams shall be gradually condensed or concentrated within an outwardly-narrowing and continuous opening or channel (hereinafter referred to as the "concentrating-channel") around the outer circumference of said blades, whereby the fluid after issuing from the ports between the blades is so far concentrated in passing through said concentrating-channel that at time of its discharge therefrom it is free from said eddy-spaces, whereby an improved efficiency is obtained in said fans when in other respects said fans operate with a free or uncased discharge all round their circumference, while the strength and velocity of discharge from the fan are increased by the employment of the concentrating-channel, owing to the open area of its outer circumference being less than that of its inner circumference.

According to my present invention fans or pumps of the type and construction hereinbefore described are constructed with a concentrating-channel around same which may either be attached to the fan and revolve therewith, or one side of same may be applied as a separately-mounted fixture around the aperture through which the fluid is admitted into the fan. Said concentrating-channel, as regards one side thereof, is formed by an extension of the disk on which the blades are mounted beyond the outer circumference of said blades, and the opposite side by a rim or annulus formed approximately as the cross-section of a hollow cone, the narrow end of which is in one modification of my invention attached to the outer circumference of the opposite ends of the blades from that which is attached to the disk and revolves therewith and in another modification attached as a fixture around the opening or aperture through which the fluid enters the fan, and in both modifications said annulus is not of less diameter at its narrowest part than the outer circumference of said blades, so that an intake opening or eye to the fan can be employed therewith of approximately equal diameter to that of the outer circumference of the blades. The outer edges of the disk and of said annulus consequently converge toward one another, but are kept at such a distance apart that the open space between them forms a continuous and open channel or exit around said concentrating-channel, and I preferably make the circumferential area of this channel equal to or less than the area of the intake opening or eye of the fan. When said fans are constructed with said concentrating-channel and are used for drawing the fluid they are operating on from a building and to deliver same with free discharge into the open air, said concentrating-channel not only improves the strength and velocity of discharge from the fan in calm weather, but if a strong wind be blowing against the side of the building on which the discharge is being made the outwardly-extended part of the disk tends to deflect the wind from the blades into same direction as that of the air being discharged from the fan without retarding said discharge to any ap-

precleable extent, which is an important advantage on large exposed buildings, such as factories.

In the accompanying drawings, Figure 1 is a longitudinal section of a centrifugal fan or pump in which my present invention is embodied, the concentrating-channel being constituted by rims or annuli at the ends of the blades and revolving therewith. Fig. 2 is a longitudinal section illustrating a modification in which one side or rim of the concentrating-channel is applied around the fan or pump as a fixture, so as not to revolve with the fan, while the other side or rim is a continuation of the disk of the fan and revolves therewith.

The arrows in both figures indicate the course of the fluid which passes through the fan or pump.

Referring first to Fig. 1, *a a* represent the blades. They are fixed at one end to a disk *b* and at the other end, which is the intake end, to a ring *c*, which connects all the blades together at this end. *d* is the revolving shaft on which the disk *b*, carrying the blades, is mounted. In all the modifications represented the eye or intake of the fan is shown of the same diameter as that of the circumference of the outer edges or tips of the blades, and although I prefer that the diameter of said eye should be equal to that of said circumference of the tips of the blades it may be somewhat smaller. *e* is the concentrating-channel, formed by the two rims *f g*. The rim *f* is an extension of the disk *b* and is bent slightly inward. The rim *g* is attached to the ring *c* and slopes toward the rim *f*, so that the two rims *f* and *g* converge toward each other at their outer edges.

In the modification shown in Fig. 2 the rim *f* is an extension of the disk *b* of the fan, so as to revolve therewith, while the rim *g*, forming the other side of the collecting-chamber, is applied around the fan or pump as a fixture, or the rim *f* may be applied as a fixture as well as the rim *g*.

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

1. In centrifugal fans and pumps wherein the fluid operated upon is admitted axially and discharged circumferentially with a free or unincased discharge therefrom all around the periphery of the fan or pump, a concentrating-channel around the periphery of the fan or pump, one side of said channel being an outward extension of the disk on which the blades are mounted, and beyond the outer circumference of said blades and the other side being an annulus in the form of the cross-section of a hollow cone concentric with the fan or pump, the narrow end of said cone being around the orifice through

which the fluid enters the fan or pump without extending within the outer circumference of the blades over the ends of the ports between said blades, substantially as hereinbefore described.

2. In centrifugal fans and pumps wherein the fluid operated upon is admitted centrally and discharged circumferentially with a free or unincased discharge therefrom all around the periphery of the fan or pump, a concentrating-channel around the periphery of the fan or pump, one side of said channel being an outward extension of the disk on which the blades are mounted, and beyond the outer circumference of said blades, and the other side being an annulus in the form of the cross-section of a hollow cone concentric with the fan or pump, the narrow end of said cone being attached to the outer periphery of the fan or pump around the opposite ends of the blades from those which are attached to said disk, and so as to revolve therewith, and without extending inward toward the center of the fan or pump over the ends of the ports between said blades, substantially as set forth.

3. In centrifugal fans and pumps wherein the fluid operated upon is admitted centrally and discharged circumferentially with a free or unincased discharge therefrom all around the periphery of the fan or pump, the combination of blades which are of considerably greater axial length than radial depth, a disk upon which said blades are mounted at one end, said disk extending the whole way from the fan or pump shaft outward and preventing the passage of fluid at this end of the fan or pump, an intake opening or eye to said fan or pump of a diameter approximately equal to that of the circumference of the outer edges of said blades, the intermediate spaces or ports between said blades being open at their ends toward the inflowing fluid, and a concentrating-channel around the periphery of the fan or pump one side of said channel being an outward extension of said disk beyond the outer circumference of said blades and the other side being an annulus in the form of the cross-section of a hollow cone concentric with the fan or pump, the narrow end of said cone being around said intake opening or eye without extending within the outer circumference of the blades over the ends of said ports, substantially as hereinbefore described.

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

SAMUEL CLELAND DAVIDSON.

Witnesses:

HUGH G. COULTER,  
GEORGE E. WARD.