J. KIRBY.

CENTRIFUGAL FAN, PUMP, AND THE LIKE.

APPLICATION FILED APR. 11, 1908.

939,140.

Patented Nov. 2, 1909.

FIG. 1.

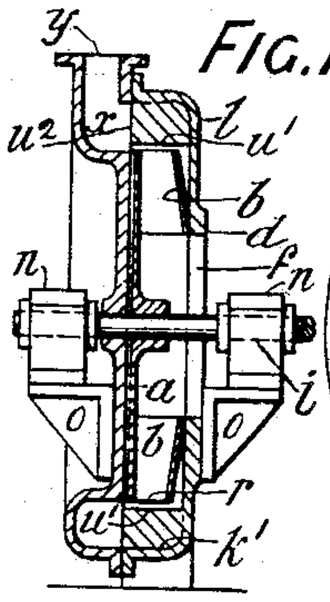


FIG. 2.

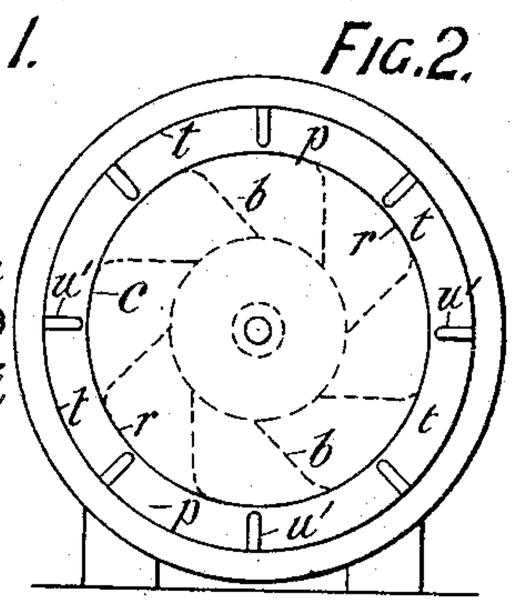


FIG. 3.

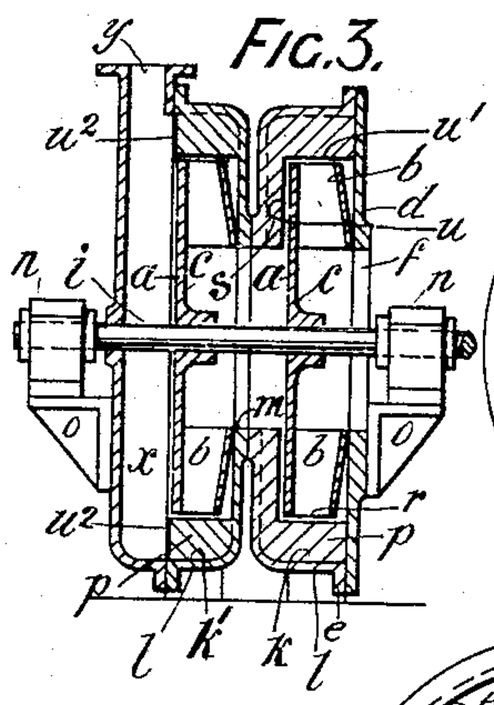


FIG. 4.

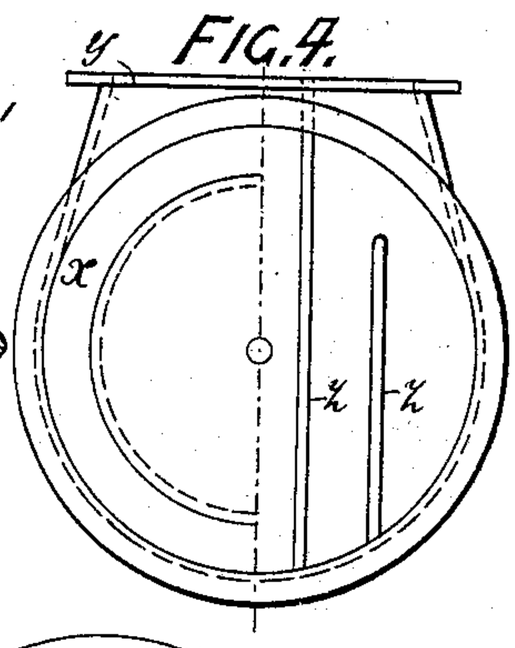


FIG. 5.

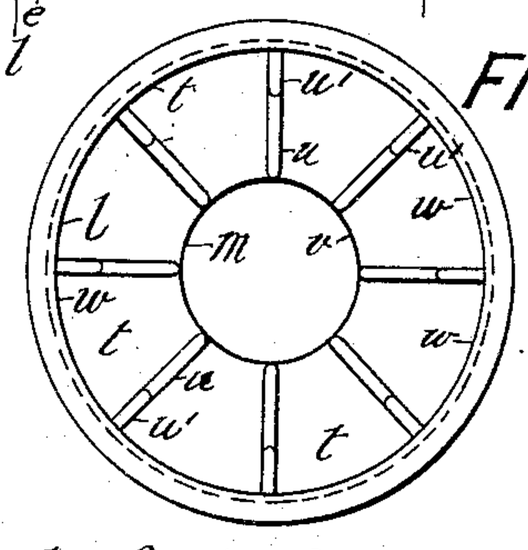


FIG. 6.

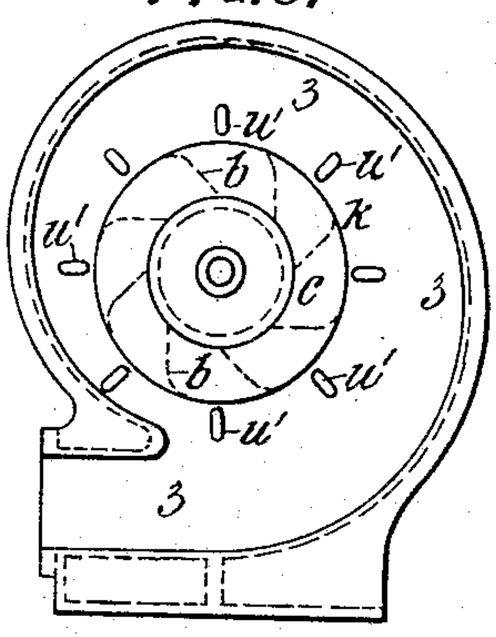


FIG. 7.

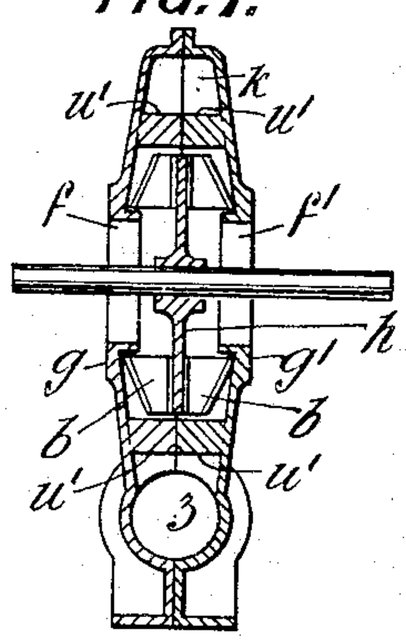


FIG. 8.

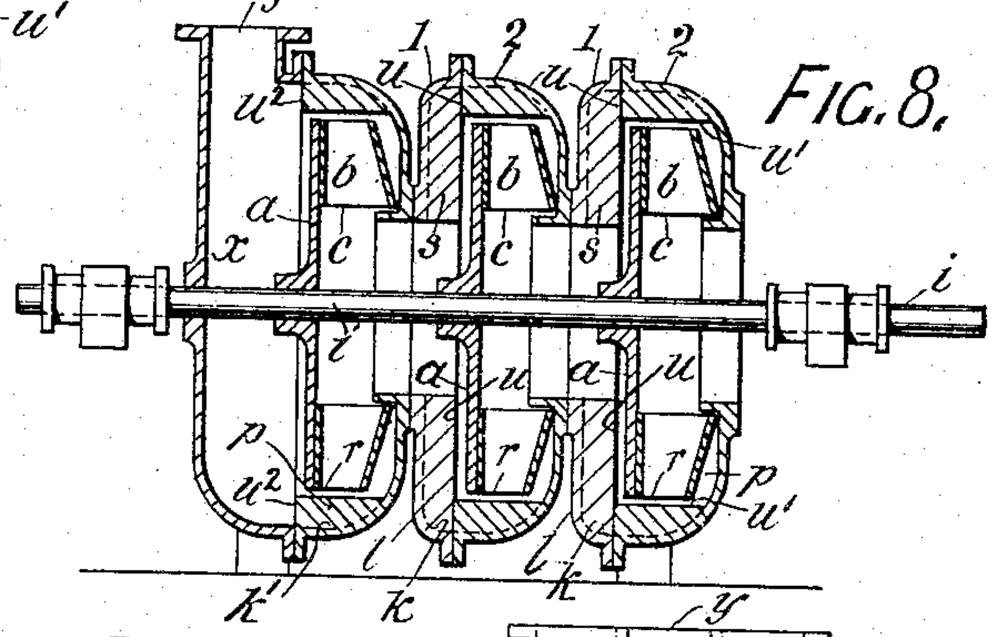


FIG. 9.

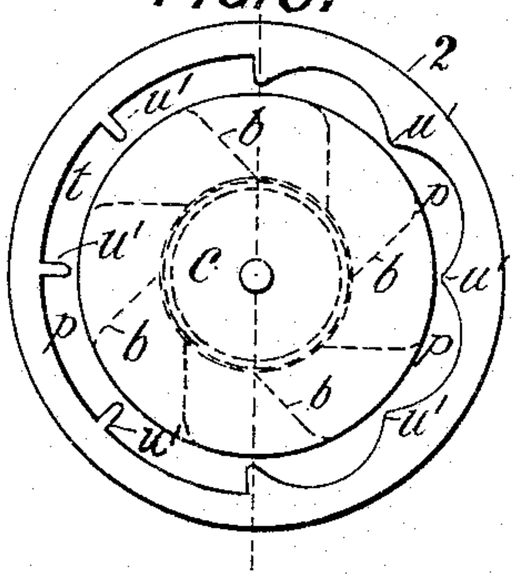


FIG. 10.

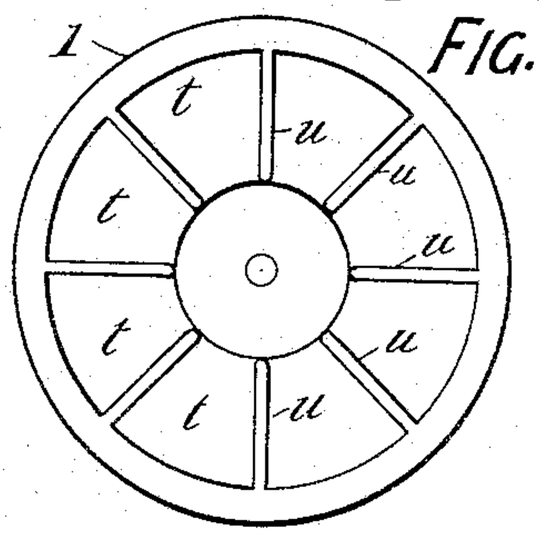
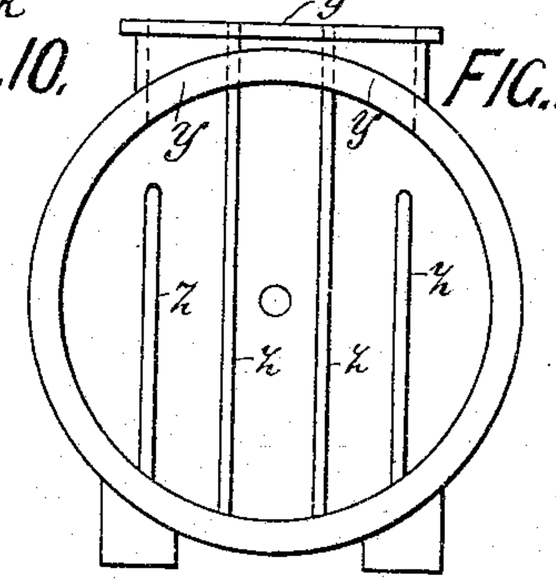


FIG. 11.



WITNESSES.

Robert Edwin Peacock Craven.

Edwin Craven

INVENTOR

John. Kirby

By

Wm. D. Edmonds

ATTORNEY.

UNITED STATES PATENT OFFICE.

JOHN KIRBY, OF LEEDS, ENGLAND, ASSIGNOR TO WILLIAM ROSS, OF TROY, NEW YORK.

CENTRIFUGAL FAN, PUMP, AND THE LIKE.

939,140. Specification of Letters Patent. Patented Nov. 2, 1909.

Application filed April 11, 1908. Serial No. 426,498.

To all whom it may concern:

Be it known that I, JOHN KIRBY, a subject of the King of Great Britain and Ireland, residing at Leeds, in the county of York, England, have invented Improvements in Centrifugal Fans, Pumps, and the Like, of which the following is a specification.

This invention relates to centrifugal fans, pumps and the like and has for object, in the case of single fans and pumps to effect the delivery of air or fluid from the discharge orifice of such fans or pumps in a quiescent manner, *i. e.* without swirl, and in the case of multicellular fans and pumps in which the cells are arranged in series, to insure that fluid will be passed from one fan or pump cell or chamber through the communicating orifice to the next succeeding fan or pump cell or chamber in a quiescent state and finally be emitted from the discharge orifice in a similar manner.

In the accompanying drawings Figure 1 is a cross sectional elevation of a single fan according to this invention. Fig. 2 is an end view of the casing surrounding the fan, with the delivery part removed. Fig. 3 is a sectional elevation of a multicellular fan according to this invention and Figs. 4 and 5 are details thereof hereinafter referred to. Fig. 6 is a view of one half of the casing of a single fan having twin suction orifices. Fig. 7 is a cross sectional elevation of such a fan. Fig. 8 is a sectional elevation of a modified form of multicellular fan and Figs. 9, 10 and 11 are details thereof.

A convenient form of fan for effecting the before mentioned purpose, may have the back plate *a* which carries the vanes *b* the full diameter of the fan *c* and formed in one piece with the center boss, by which the fan is carried, as shown in Fig. 1. The vanes *b* are further supported by an annular front plate *d* having an external diameter corresponding to the diameter of the back plate *e* and furnished with a central inlet orifice *f* of the same diameter as the diameter of the circle formed by the inner edges of the fan vanes *b*. When the suction of the fan is through central orifices *f* and f^1 on both sides *g* and g^1, as shown in Figs. 6 and 7, such fan is formed with a central plate or arms *h* having vanes *b* on both sides thereof and which vanes may be formed in one piece with the central plate or arms *h* or may be secured thereto. In a multicellular fan or pump, Fig. 3, the requisite number of these fans *c* are secured on the main shaft *i* and revolve in separate cells or chambers *k* formed by shells or casings *l* which communicate with each other through central openings *m* formed therein. The shells or casings *l* are so constructed that they can readily be put together and taken apart for facilitating the assembling and securing of the fans *c* in their proper positions on the main shaft *i* which is journaled in suitable bearings *n* carried by brackets *o* located outside the fan or pump casing *l*.

The chambers *k* surrounding each fan *c* according to this invention are made much larger than the fan *c* in order to provide an annular space *p* surrounding the periphery *r* of each fan *c* and a suitable space or passage *s* behind the back plate *a* thereof for the passage of fluid under pressure to the next cell or chamber k^1. The above mentioned annular spaces *p* and passages *s* are divided into several compartments *t* by radial ribs *u*, Figs. 3 and 5, placed at equal distances apart and extending from the edge *v* of the central orifice *m* of the chamber *k* to the outer wall *w* thereof. The portions of the ribs *u* which extend behind the back plate *a* of the fan *c* are almost as wide as the space or passage *s* between the back of the fan *c* and the side of the chamber *k*, and the portions of the ribs u^1 which extend over and clear of the periphery *r* of the fan *c* are as wide as or rather wider than the width of the fan *c*.

The delivery chamber k^1 of a single fan or pump or the last chamber k^1 of a multicellular fan or pump is provided with radial ribs u^1 only in the annular space *p* surrounding the fan *c* and the outer edges u^2 of such ribs u^1 communicate with the discharge orifice *x* which may be annular in form, of the requisite breadth and depth and provided with a discharge outlet *y* of rectangular or other cross section.

Instead of forming the last chamber k^1 with an annular discharge orifice *x* as above described it may have one or more suitable ribs *z*, Figs. 4 and 11, running across it in the direction of the discharge outlet orifice.

The casings *l* instead of being formed in one piece with the radial ribs *u* and u^1, may be made in two parts 1 and 2, Figs. 8, 9 and 10, connected together, as shown in Fig. 8, the part 1 having the radial ribs *u* formed

in its chamber k behind the back e of the fan, as hereinbefore described, while the part 2 of the casing may have the radial ribs u^1 over the periphery of the fan c formed in its chamber, so that when secured together, the radial ribs u and u^1 will come together and form whole ribs, see Fig. 8.

The casings g and g^1 of a single fan, Figs. 6 and 7, having a volute discharge 3, have radial ribs u^1 formed in the chambers k in each half of the casing over the periphery of the fan c in the volute discharge 3, so that when secured together they form whole ribs u^1 extending across the volute discharge orifice 3.

The action of a multicellular fan or pump constructed in accordance with this invention is as follows:—The fluid on entering the central orifice of the first fan is discharged from its periphery in a centrifugal manner into the radial compartments formed around it and along the radial passages at the back of the fan when it becomes changed into the quiescent state and passes into the central orifice of the next fan by which it is delivered in a like manner to the next compartments and fan and so on until it is discharged by the last fan into the compartments formed in the annular space surrounding it, from whence it passes direct into the annular discharge orifice in a quiescent state.

What I claim is:—

1. A centrifugal fan comprising an impeller, a casing formed in two sections, such sections together surrounding the impeller and inclosing a peripheral fluid-receiving chamber in free communication with the space through which the impeller revolves, radial ribs formed in one of said sections and extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs dividing said chamber into radial compartments, and a discharge passage formed in the other of said sections.

2. A centrifugal fan comprising an impeller, a casing formed in two sections, such sections together surrounding the impeller and inclosing a peripheral fluid-receiving chamber in free communication with the space through which the impeller revolves, and radial ribs in both of said casing sections adapted to register to form guides together extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs dividing said chamber into radial compartments.

3. A centrifugal fan comprising an impeller, a casing having an inlet orifice at one side and communicating with a discharge chamber at the other side, said casing surrounding said impeller and inclosing a peripheral fluid-receiving chamber in free communication with the space through which the impeller revolves, radially arranged ribs extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs dividing said chamber into radial compartments, and ribs formed in said discharge chamber.

4. A centrifugal fan comprising an impeller, a casing having an inlet orifice at one side and communicating with a discharge chamber at the other side, said casing surrounding said impeller and inclosing a peripheral fluid-receiving chamber in free communication with the space through which the impeller revolves, radially arranged ribs extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs dividing said chamber into radial compartments, and substantially parallel ribs formed in said discharge chamber.

5. A centrifugal fan comprising an impeller, a casing formed in two sections, such sections together surrounding the impeller and inclosing a peripheral fluid-receiving chamber in free communication with the space through which the impeller revolves, radial ribs formed in one of said sections and extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs dividing said chamber into radial compartments, and a discharge chamber formed in the other of said sections.

6. A centrifugal fan comprising an impeller, a casing formed in two sections, such sections together surrounding the impeller and inclosing a peripheral fluid-receiving chamber in free communication with the space through which the impeller revolves, radial ribs formed in one of said sections and extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs dividing said chamber into radial compartments, a discharge chamber formed in the other of said sections, and ribs formed in said discharge chamber.

7. A centrifugal fan comprising an impeller, a casing formed in two sections, such sections together surrounding the impeller and inclosing a peripheral fluid-receiving chamber in free communication with the space through which the impeller revolves, radial ribs formed in one of said sections and extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs dividing said chamber into radial compartments, a

discharge chamber formed in the other of said sections, and substantially parallel ribs formed in said discharge chamber.

8. A multi-cellular centrifugal fan comprising a plurality of impellers, casings surrounding each of said impellers and each inclosing a peripheral fluid-receiving chamber in free communication with the space through which the corresponding impeller revolves, and the casings of the respective impellers being also in communication one with another, and radially arranged ribs in each casing extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs dividing said chambers into radial compartments into which the fluid is unrestrictedly driven by the impellers.

9. A multi-cellular centrifugal fan comprising a plurality of impellers, a plurality of casings each formed in two sections together surrounding the respective impellers and inclosing peripheral fluid-receiving chambers in free communication with the space through which the corresponding impeller revolves, said fluid-receiving chambers being also in communication one with another, and radial ribs in both of said casing sections adapted to register to form guides together extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs dividing said chambers into radial compartments into which the fluid is unrestrictedly driven by the impellers.

10. A multi-cellular centrifugal fan comprising a plurality of impellers, a plurality of casings each formed in two sections together surrounding the respective impellers and inclosing peripheral fluid-receiving chambers in free communication with the space through which the corresponding impeller revolves, said fluid-receiving chambers being also in communication one with another, radial ribs formed in said casing sections except the last and extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs dividing said chambers into radial compartments into which the fluid is unrestrictedly driven by the impellers, and a discharge chamber formed in the last of said sections.

11. A multi-cellular centrifugal fan comprising a plurality of impellers, a plurality of casings each formed in two sections together surrounding the respective impellers and inclosing peripheral fluid-receiving chambers in free communication with the space through which the corresponding impeller revolves, said fluid receiving chambers being also in communication one with another, radial ribs formed in said casing sections except the last and extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs dividing said chambers into radial compartments into which the fluid is unrestrictedly driven by the impellers, a discharge chamber formed in the last of said sections, and ribs formed in said discharge chamber.

12. A multi-cellular centrifugal fan comprising a plurality of impellers, a plurality of casings each formed in two sections together surrounding the respective impellers and inclosing peripheral fluid-receiving chambers in free communication with the space through which the corresponding impeller revolves, said fluid-receiving chambers being also in communication one with another, radial ribs formed in said casing sections except the last and extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs dividing said chambers into radial compartments into which the fluid is unrestrictedly driven by the impellers, a discharge chamber formed in the last of said sections, and substantially parallel ribs formed in said discharge chamber.

13. A multi-cellular centrifugal fan comprising a plurality of impellers, casings surrounding each of said impellers and each inclosing a peripheral fluid-receiving chamber in free communication with the space through which the corresponding impeller revolves, and the casings of the respective impellers being also in communication one with another, and radially arranged ribs in each casing extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes and extending radially inward down one side of the respective impeller, said ribs dividing said chambers into radial compartments into which the fluid is unrestrictedly driven by the impellers.

14. A multi-cellular centrifugal fan comprising a plurality of impellers, casings surrounding each of said impellers and each inclosing a peripheral fluid-receiving chamber in free communication with the space through which the corresponding impeller revolves, and the casings of the respective impellers being also in communication one with another, and radially arranged ribs in each casing extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs in the case of all casings except the last extending radially inward down one side of the impeller, and said ribs dividing said chambers into radial compartments into which the fluid is unrestrictedly driven by the impellers.

15. A multi-cellular centrifugal fan comprising a plurality of impellers, casings surrounding each of said impellers and each inclosing a peripheral fluid receiving chamber in free communication with the space through which the corresponding impeller revolves, and the casings of the respective impellers being also in communication one with another, and radially arranged ribs in each casing extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs in the case of all casings except the last extending radially inward down one side of the impeller, and said ribs dividing said chambers into radial compartments into which the fluid is unrestrictedly driven by the impellers, a discharge chamber formed in the last of the casing sections and ribs formed in said discharge chamber.

16. A multi-cellular fan comprising a plurality of impellers, casings surrounding each of said impellers and each inclosing a peripheral fluid-receiving chamber in free communication with the space through which the corresponding impeller revolves, and the casings of the respective impellers being also in communication one with another, and radially arranged ribs in each casing extending for the whole width in an axial direction of said fluid receiving chamber over and close to the peripheral edges of the impeller vanes, said ribs in the case of all casings except the last extending radially inward down one side of the impeller, and said ribs dividing said chambers into radial compartments into which the fluid is unrestrictedly driven by the impellers, a discharge chamber formed in the last of the casing sections and substantially parallel ribs formed in said discharge chamber.

Signed at Leeds, England, this thirty-first day of March 1908.

JOHN KIRBY.

Witnesses:

ROBERT EDWIN PEACOCK CRAVEN,

EDWIN CRAVEN.