Oct. 26, 1926.

1,604,328

G. H. WALKER

CENTRIFUGAL FAN

Filed May 20, 1925 3 Sheets-Sheet 1

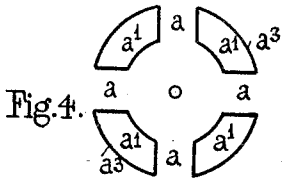


Fig.4.

Fig.1.

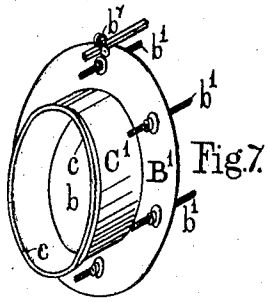


Fig.7.

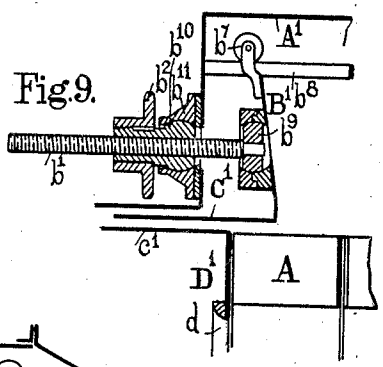


Fig.9.

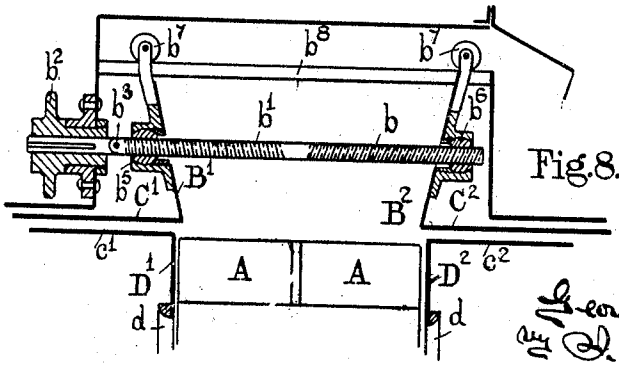


Fig.8.

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Oct. 26, 1926.

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CENTRIFUGAL FAN

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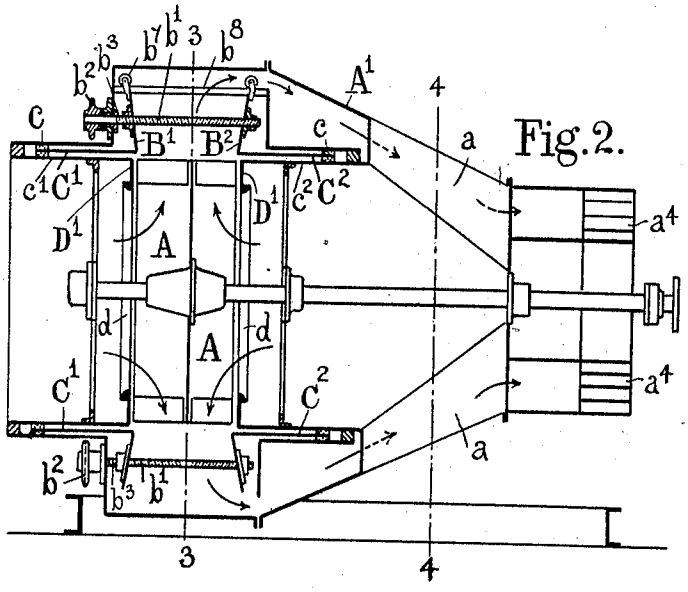


Fig.2.

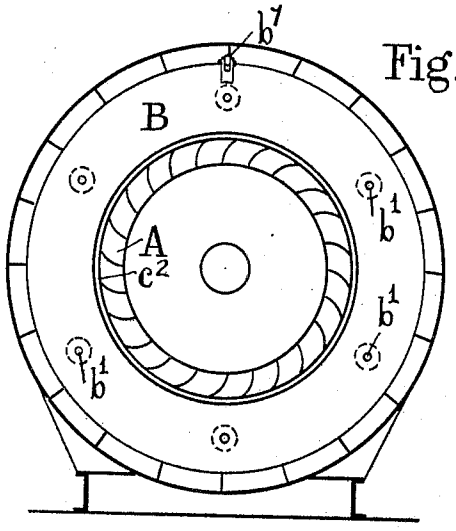


Fig.3.

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Oct. 26, 1926.

1,604,328

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CENTRIFUGAL FAN

Filed May 20, 1925 3 Sheets-Sheet 3

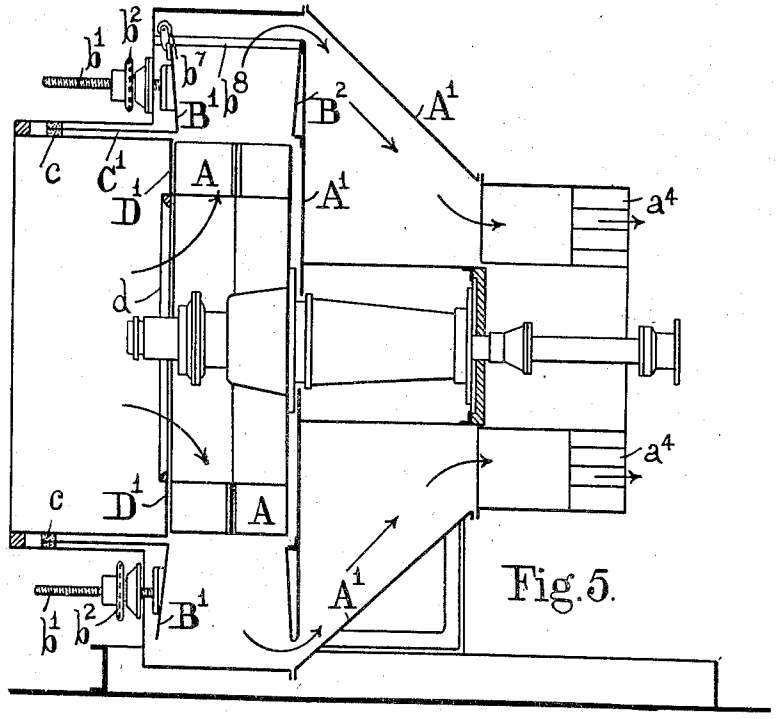


Fig.5.

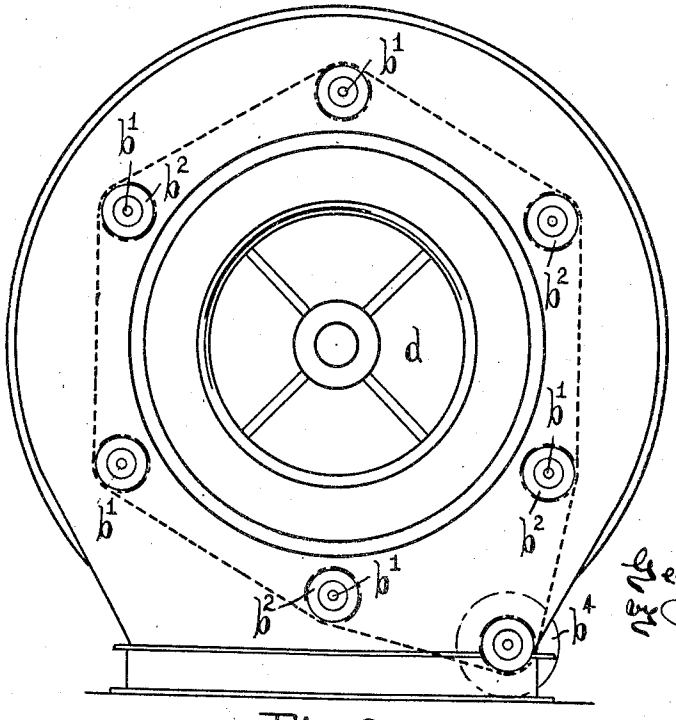


Fig.6.

INVENTOR.
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Patented Oct. 26, 1926. 1,604,328

UNITED STATES PATENT OFFICE.

GEORGE HENRY WALKER, OF WORCESTER, ENGLAND, ASSIGNOR TO HEENAN & FROUDE LIMITED, OF MANCHESTER, ENGLAND.

CENTRIFUGAL FAN.

Application filed May 20, 1925, Serial No. 31,679, and in Great Britain July 1, 1924.

This invention relates to improvements in centrifugal fans of the type in which the impeller is wholly or partially enclosed by a casing and in which means are provided for regulating the volume of air discharged by the impeller and for regulating the power absorbed by the fan.

According to the invention the impeller is surrounded by two discs each having a hole or aperture in the centre so that when in position around the impeller they permit the latter to rotate while at the same time they enclose the flow of air between the two faces, the axial distance between the two discs being adjustable to vary the distance between their faces to regulate the amount of air or gas discharged by the fan.

The invention will be described with reference to the accompanying drawings.

Fig. 1 is a front elevation showing the fan coupled to an engine mounted on a torque reaction bench.

Fig. 2 is a longitudinal section through fan provided with two adjustable discs.

Fig. 3 is a section on line 3—3 Fig. 2.

Fig. 4 is a section on line 4—4 Fig. 2.

Fig. 5 is a longitudinal section through a fan provided with one adjustable disc.

Fig. 6 is an end view of same.

Fig. 7 is a perspective view of adjustable disc.

Fig. 8 is an enlarged sectional view of adjustable discs shown in Fig. 5.

Fig. 9 is an enlarged sectional view of adjustable discs shown in Fig. 5.

In the form of the invention shown in Figs. 2, 3, 4 and 8 the impeller A, which is of the double inlet centrifugal fan type, is surrounded by two axially adjustable discs B^1, B^2 each provided with a hole or aperture in the centre slightly larger in diameter than the diameter of the impeller A. Each disc B^1 B^2 is mounted on a large tube C^1 C^2 of the same internal diameter as the aperture in the discs B^1 B^2 so that when in position around the impeller A they permit the latter to rotate while at the same time they enclose the flow of air or gas between the faces of the two discs B^1 B^2.

The axial distance between the discs B^1 B^2 is adjustable to vary the distance between them to regulate the amount of air or gas discharged by the impeller A.

The large tubes C^1 C^2 are formed to slide in annular rings c^1 c^2 provided at the ends with strips or rings c of felt or other suitable packing to prevent the escape of air or gas through the rings. Valances D^1 D^2 surrounding the sides of the impeller A are permanently attached to the inner ends of the rings c^1, c^2 holes d being formed therein for the passage of the air or gas. These valances D^1 D^2 serve with the large tubes C^1 C^2 to enclose the impeller A and prevent or minimize the setting up of eddy currents thereby decreasing the useless consumption of power by such currents.

The adjustment of the discs B^1 B^2 may be made by means of a number of right and left hand screwed rods b^1 operated by a chain or other suitable gearing b^2 and universal coupling b^3 from a hand wheel b^4 or other suitable means either by hand or automatically. As shown in Fig. 1 the hand wheel b^4 is preferably arranged adjacent to the other control members on the torque reaction bench E being connected through a shaft e and flexible coupling e^1.

To relieve the screwed rods b^1 of any bending moment they preferably engage with two spherically seated nuts b^5, b^6 carrying respectively the discs B^1 B^2 and which transmit the thrust of the screwed rods b^1 thereto. The nuts b^5 b^6 are prevented from rotating by any suitable means and as they are located axially by their spherical seatings, it follows that rotation of the screwed rods b^1 through the gearing b^2 and universal coupling b^3, will cause the nuts to travel in opposite directions along the screwed rods, and thus control the axial position of the discs B^1 B^2 and the large tubes C^1 C^2. Other means of axial adjustment of the discs b^1 b^2 and large tubes C^1 C^2 may however be adopted but the means described above is that which is at present preferred

The weight of the discs B^1, B^2 and of the large tube C^1, C^2 is preferably carried by rollers b^7 running on a fixed track or rails b^8.

With a fan of the double inlet type it is necessary to construct one side of the casing A^1 with a number of air passages a communicating from the external atmosphere to the suction eye of the impeller A on the same side.

These passages a radiate outwardly from the axis of the impeller shaft, and the spaces between them form intermediate passages a^1 for the air or gas discharged by the impeller A. By enclosing these spaces with

plates a^3 the air or gas may be conveyed to a position near the axis of the impeller shaft, from which it may be caused to emerge through suitable wind straighteners a^4, and the resulting blast may be put to any useful purpose.

The various orifices, ducts and passages and the surrounding plates may be replaced by ducts of other shape and the casing A^1 may be of volute or other shape as desired. Where the casing A^1 is of volute form the air or gas has a free ingress to both suction eyes of impeller A, and the air or gas discharged may be conducted to any desired point.

In the form of the invention shown in Figs. 5, 6 and 9 only the disc B^1 is mounted with the tube C^1 so as to be adjustable longitudinally, the other disc B^2 being permanently attached to the impeller casing A^1. In this construction the screwed rods b^1 are provided with spherical heads b^9 non-rotatably connected with the sliding disc B^1 and engaging with a nut b^{10} held rotatably in a spherical seating b^{11} fixed to the impeller casing A^1. The rotation of the nut b^{10} by means of the gear wheel b^2 controls the axial position of the disc B^1 and large tube C^1. Figs. 5 and 6 show a fan of the single inlet type the air or gas entering the eye of the impeller from one side only.

In both constructions shown the distance between the faces of discs B^1 B^2 when they are widest apart corresponds with the effective width of the impeller A, and in this position the amount of air or gas discharged is a maximum, but when they are brought close together the amount of air or gas discharged is a minimum, and may by suitable design be made practically zero.

The discs B^1 B^2 are of slightly conical formation so that the annular space between them at a point close to the impeller A is narrower than at the outer diameter of the discs. Thus the air or gas on leaving the impeller and entering the annulus between the discs, is flowing at maximum velocity, but is slowed down gradually during its passage to the outer diameter of the annulus. Thereby the kinetic energy of the air at the impeller discharge is to a large extent recovered in the form of pressure at the outer diameter of the annulus.

A centrifugal fan constructed in accordance with the above description is particularly suitable for use as an air brake, in conjunction with a torque reaction bench or cradle, when absorbing and measuring the power developed by an internal combustion engine, or other prime mover.

What I claim as my invention and desire to protect by Letters Patent is:—

1. In a centrifugal fan of the type referred to the combination with the impeller of a tube slightly larger in diameter than the impeller, means for moving the tube axially whereby the tube may be moved from the position where the impeller is unmasked through any intermediate position to the position where the impeller is completely masked, a divergent disc mounted on the inner end of said tube and a second divergent disc at the opposite side of the impeller, the gas escaping from the impeller between the two discs so that its velocity will be gradually slowed down and the kinetic energy of the gas at the impeller discharge will be recovered in the form of pressure.

2. In a centrifugal fan of the type referred to the combination with the impeller of a tube slightly larger in diameter than the impeller, means for moving the tube axially whereby the tube may be moved from the position where the impeller is unmasked through any intermediate position to the position where the impeller is completely masked, a divergent disc mounted on the inner end of said tube, a hollow ring in which the tube slides, and a second divergent disc at the opposite side of the impeller, the gas escaping from the impeller between the two discs so that its velocity will be gradually slowed down and the kinetic energy of the gas at the impeller discharge will be recovered in the form of pressure.

3. In a centrifugal fan of the type referred to the combination with the impeller of a tube slightly larger in diameter than the impeller, means for moving the tube axially whereby the tube may be moved from the position where the impeller is unmasked through any intermediate position to the position where the impeller is completely masked, a hollow ring in which the tube slides, a divergent disc mounted on the inner end of said tube, a second divergent disc at the opposite side of the impeller, the gas escaping from the impeller between the two discs so that its velocity will be gradually slowed down and the kinetic energy of the gas at the impeller discharge will be recovered in the form of pressure, a casing around the impeller and passages in said casing to direct the gas in a direction parallel to the axis of the impeller and deliver it adjacent to a prime mover driving the impeller.

4. In a centrifugal fan of the type referred to the combination with the impeller of a tube slightly larger in diameter than the impeller, a second tube of the same diameter as the first tube, arranged at the other side of the impeller, a hollow ring in which the first tube slides, a second hollow ring in which the other tube slides, means for moving the tubes axially whereby they may be moved from the position where the impeller is unmasked through any inter-

mediate position, to the position where the impeller is completely masked, a divergent disc mounted on the inner end of the first tube, a second divergent disc mounted on the end of the second tube, the gas escaping from the impeller between the two discs so that its velocity will be gradually slowed down and the kinetic energy of the gas at the impeller discharge will be recovered in the form of pressure, a casing around the impeller and passages in said casing to direct the gas in a direction parallel to the axis of the impeller and deliver it adjacent to a prime mover driving the impeller.

In testimony whereof I have hereunto set my hand.

GEORGE H. WALKER.