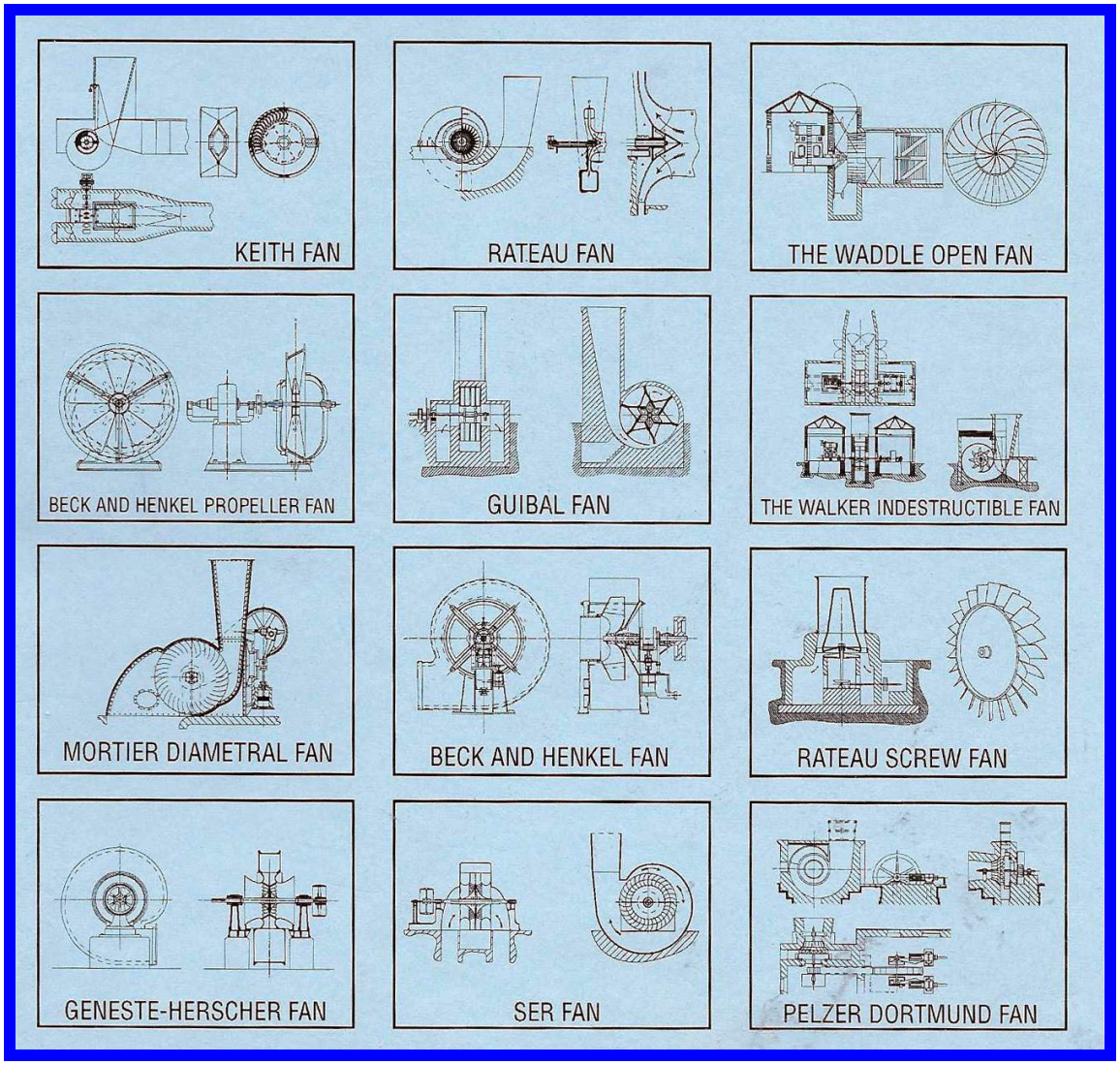
EARLY EUROPEAN FANS PART-1

From A History of Fans,
W T W Cory 1996

A Picture History



The earliest reference to mechanical ventilation was by Georgius Agricola in his book De Re Metallica first published in 1556. He described the use of bellows and crude fans in German underground metal mines in a manner which makes one assume that they were then well established. These early fans were, of course, made of wood with radial paddle vanes fitted to a spindle which rotated in a casing. Thus they were the first centrifugal fans and were rotated by animals, men or water mills.

Much of the early history of fans is inextricably linked with that of mines, but up to about 1860, their ascendancy over other solutions was not certain. John Smeaton (1724-1792) used reciprocating pumps for exhausting the foul air from coal mines in Northern England. In 1813 John Buddle (1773-1843) wrote to the Sunderland Society describing the methods which he had used in the collieries of North East England for generating the necessary air currents and thus the prevention of accidents from 'firedamp'. His exhausting piston pump had been installed in Hebburn Colliery in 1807. Buddle also stated that "the standard air-course, or current of air, which I employ in the ventilation of collieries under my care, abounding in inflammable gas, equals from 5400 to 7200 cubic feet per minute". Allowing for the factor of exaggeration always present in any engineer's claims, we may note that 2.5 to 3.4m^3/s (for those too-long metricated) is an exceedingly small amount and that nowadays flows 100 times as great would be considered necessary in such mines. Other reciprocating ventilation machines were patented by Struve and Nixon with pistons up to 7.6m diameter.

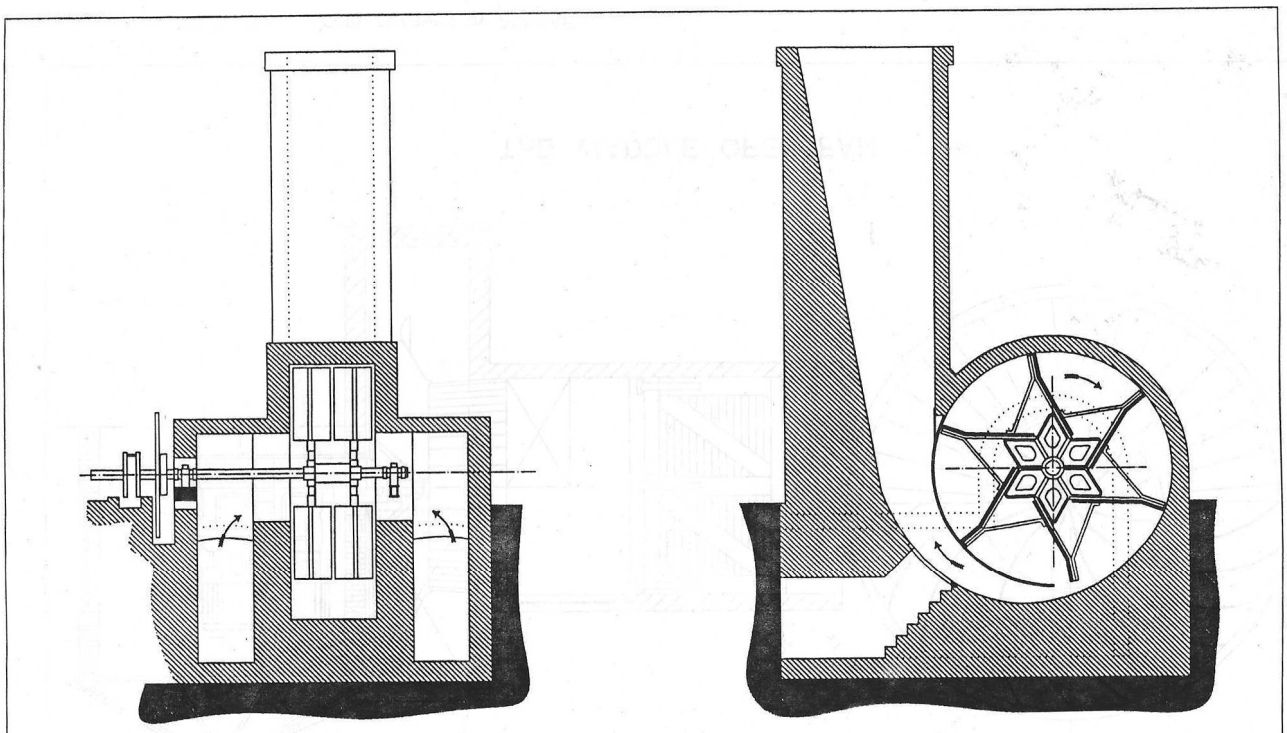
All these machines suffered from slow piston speeds and much valve maintenance. To overcome their deficiencies rotary air pumps were introduced, the most successful being those invented by Lemielle and used extensively in Belgium from about 1850. Several were exported to England, starting the ventilation export trade. Each comprised a vertical drum revolving eccentrically within a cylindrical chamber. Spaces of varying capacity were created, causing air to enter from the upcast shaft. By further movement of the drum, the return air was discharged to atmosphere.

The most alarming method of mine ventilation was to place a furnace at the bottom of the upcast shaft. By burning coal (what else?) a current of air to support the combustion was induced through the mine. The 'stack-effect' of a deep mine meant that the pressure developed was then greater, and the method could not be used in shallow mines. Even so, a furnace was only capable of developing about 750 Pa and Buddle had to use 'split ventilation' - dividing the workings into a number of parallel circuits to reduce the system resistance.

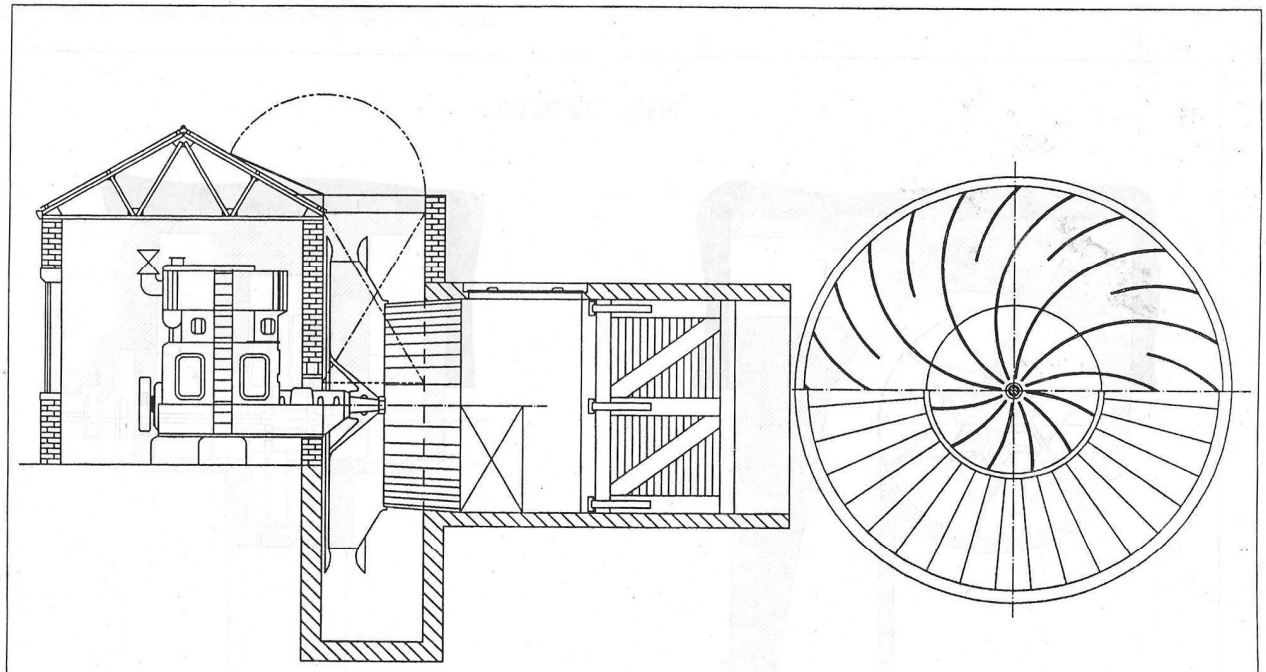
After the fans in German metal mines described by Agricola, their use went into decline for almost 250 years. It was not until 1827 that a mine ventilating fan was re-introduced to a colliery near Paisley, Scotland. This had a number of inclined blades fixed to a vertical shaft rotating within a circular casing. The fan was fitted over the top of the upcast shaft and air was drawn through it and discharged to atmosphere. It could be argued that this was the first axial flow fan.

At the same time mines in France and Germany experimented with fans working on the Archimedean screw principle. These failed not only from a lack of knowledge of the aerodynamic theory but also because the metallurgy of the time did not permit them to run at the speeds necessary for an acceptable flowrate and pressure. Attention therefore turned again to the centrifugal fan. The impeller of this was inherently stronger whilst the pressure developed was augmented by the centrifugal force applied to the air, in addition to the blade action. Lower rotational speeds, within the capacity of a typical steam engine, enabled useful duties to be performed.

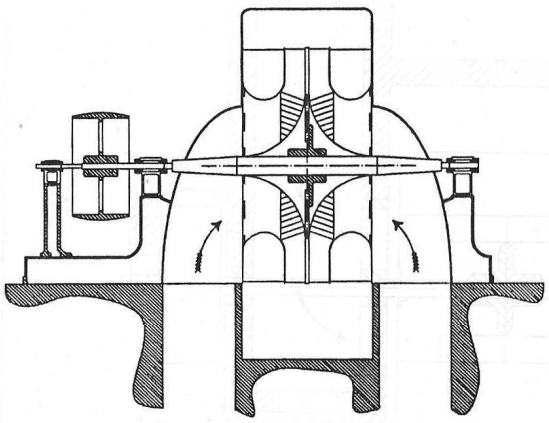
The usage of fans in mine ventilation was predominant for many years and the works of Rateau, Guibal, Davidson and Keith are all testimony to this. Descriptions of these and other early fans are given in the paper together with performance characteristics where known. Whilst development of the centrifugal fan had reached a high degree of sophistication by the 1890's, the propeller or axial fan was in its infancy. Here we must acknowledge the work of Blackman and Sturtevant. Of more recent times the influences of Howden, Woods and Stork in both axial and centrifugal fans are all apparent.

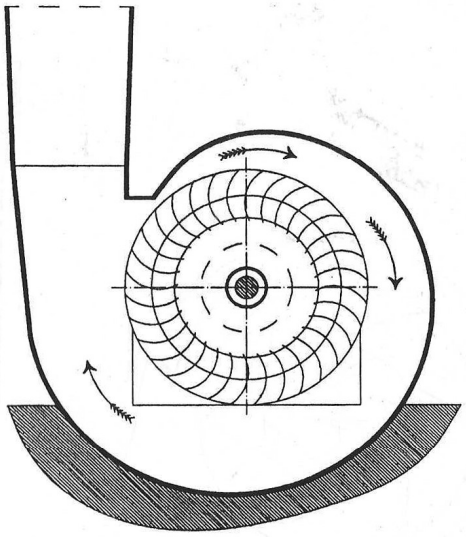


GUIBAL FAN

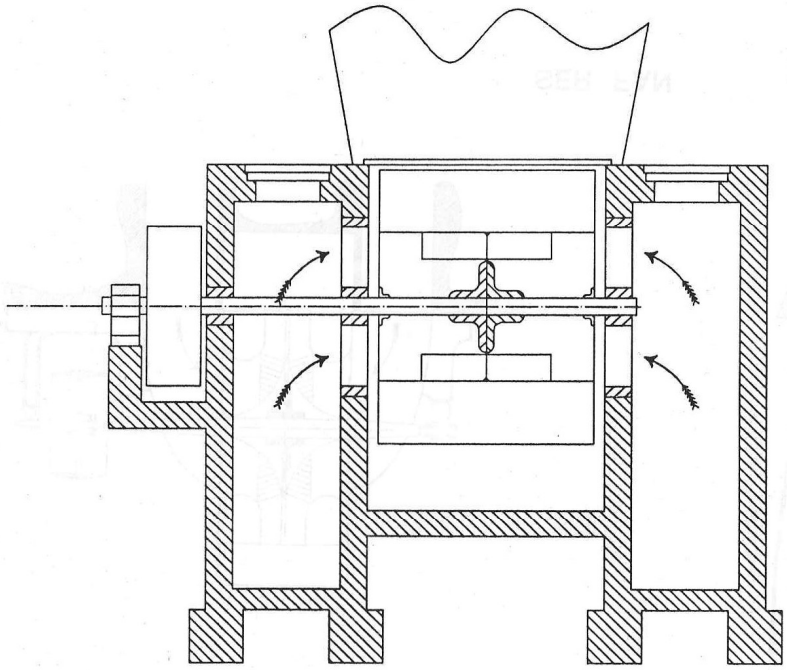


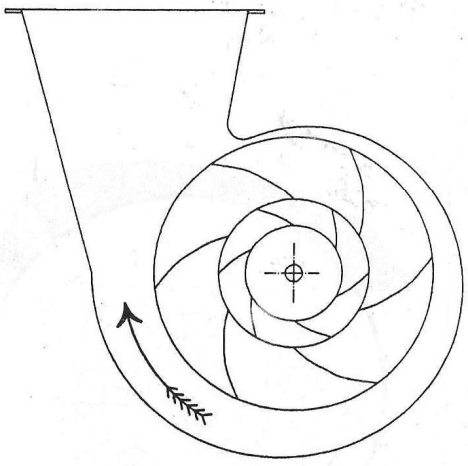
THE WADDLE OPEN FAN



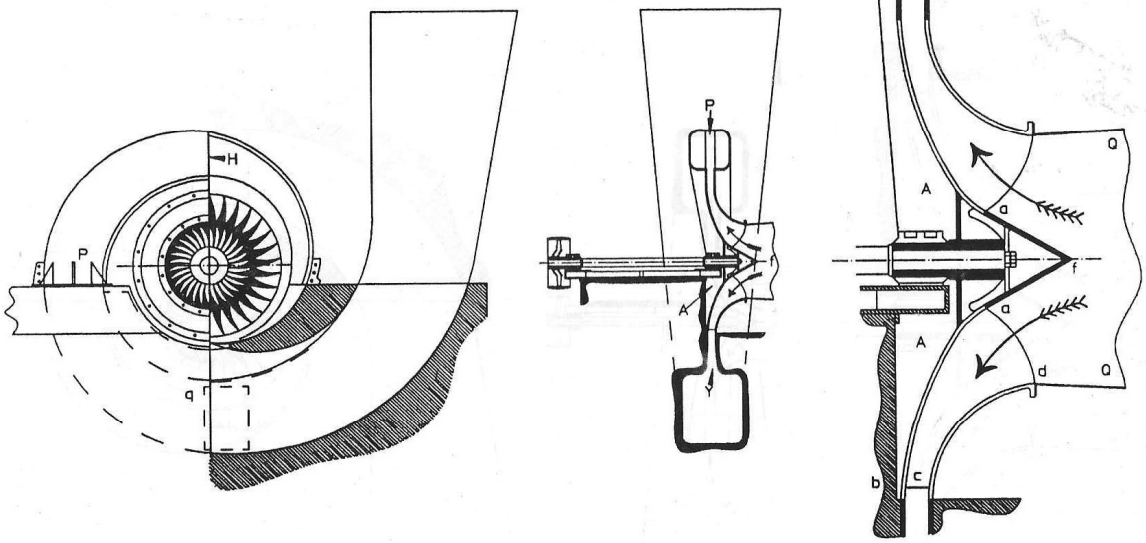


SER FAN

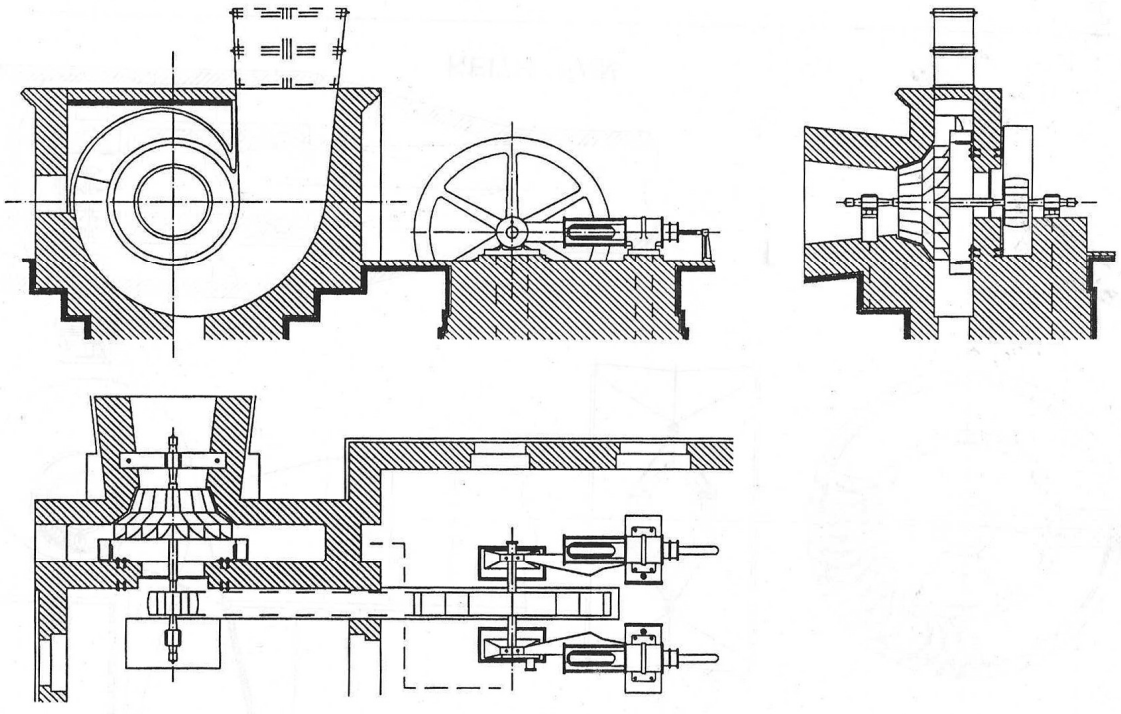




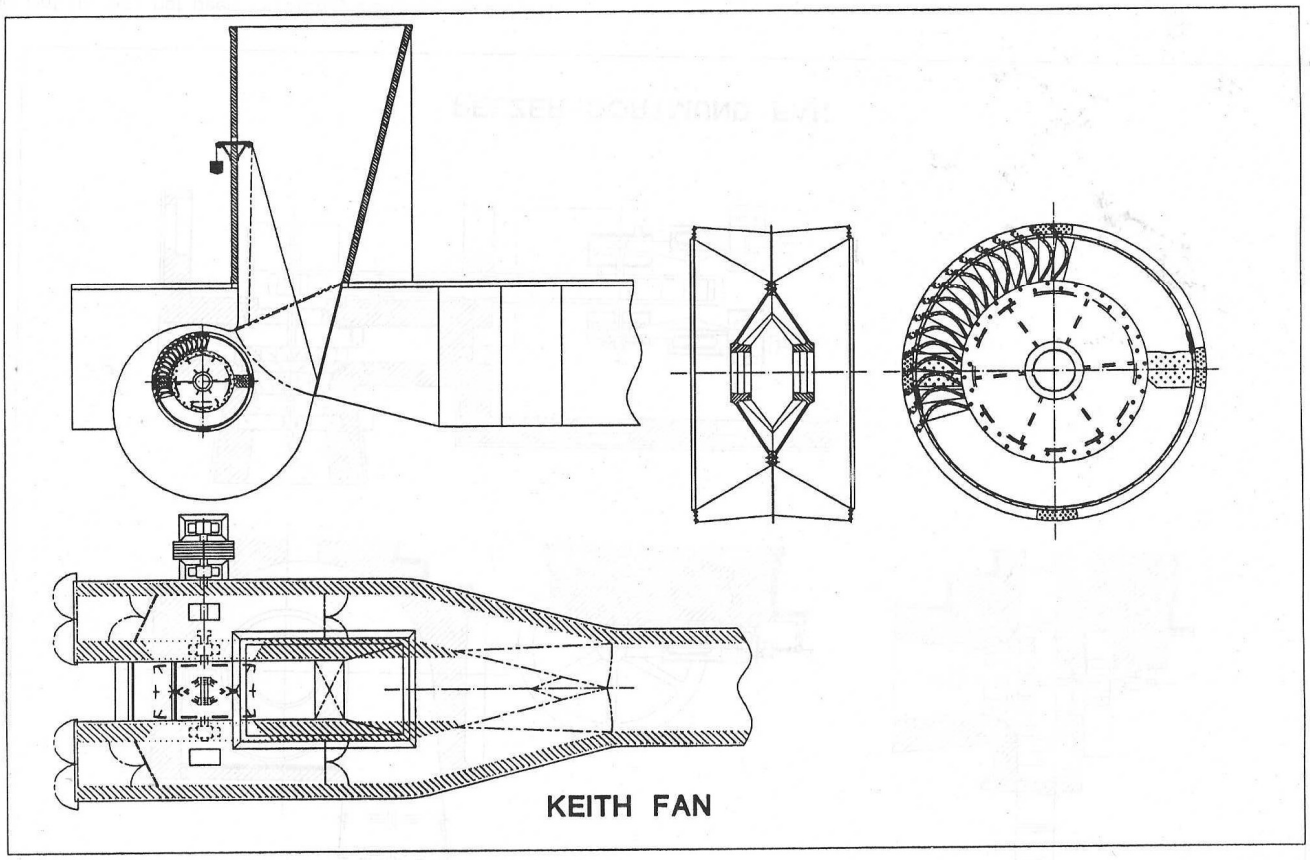
CAPELL FAN



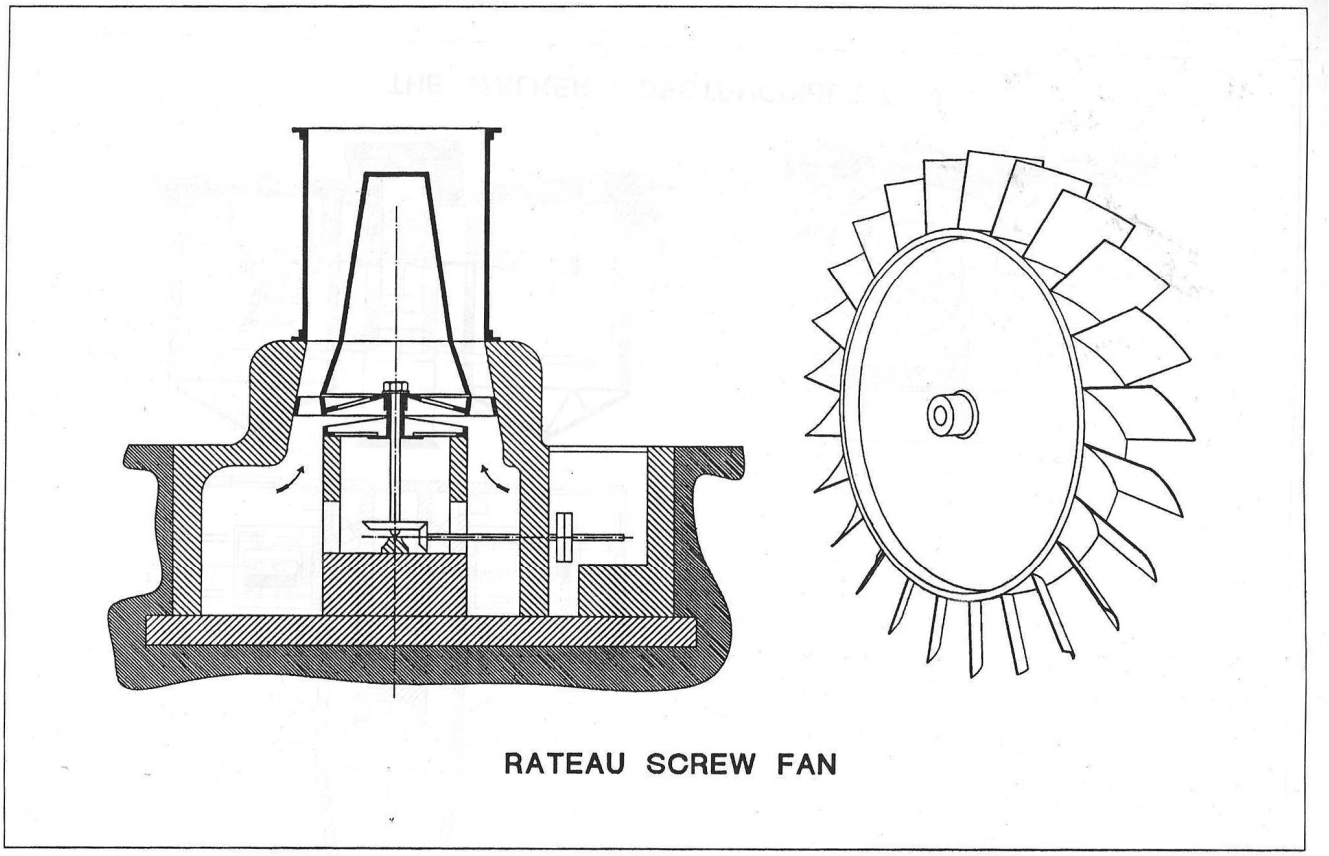
RATEAU FAN



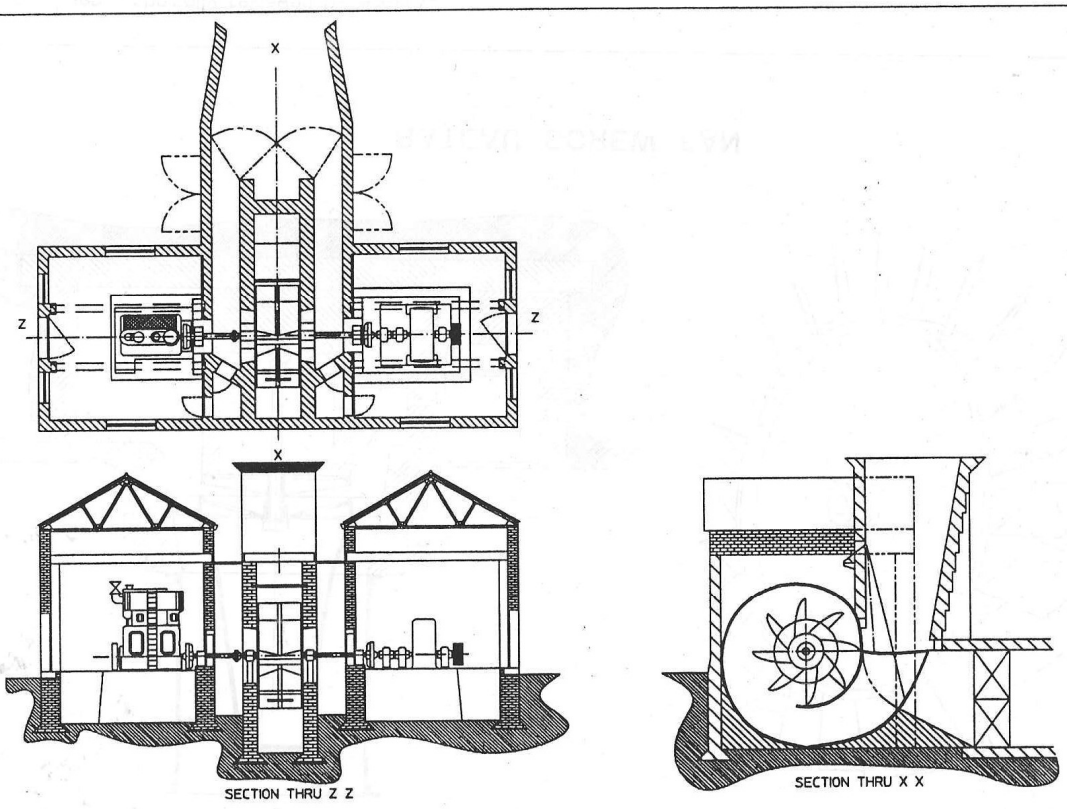
PELZER DORTMUND FAN



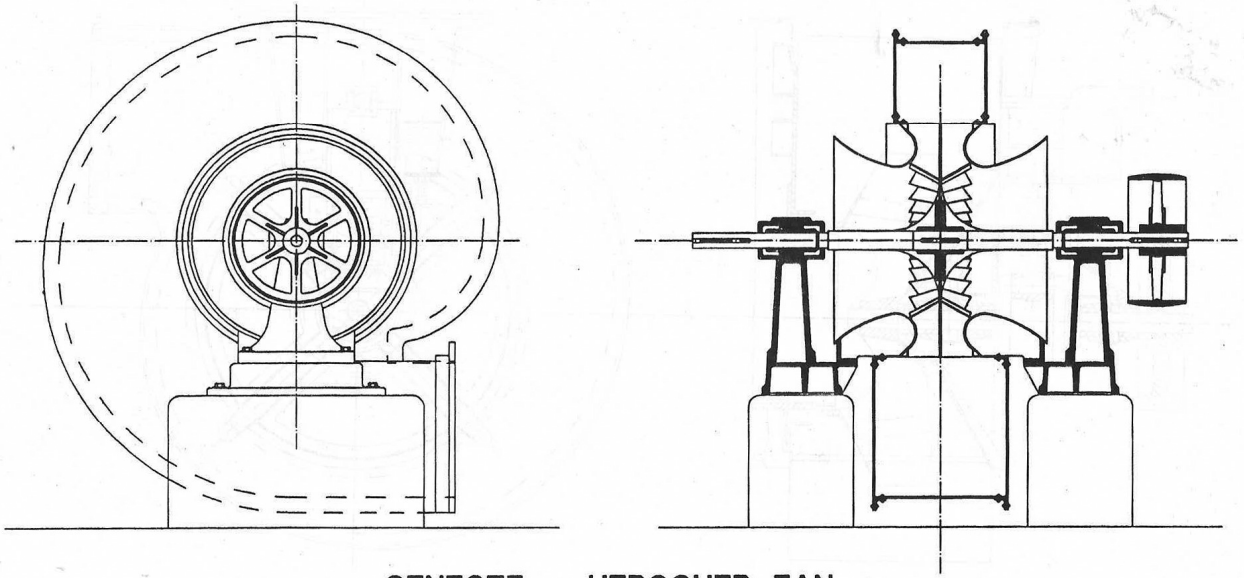
KEITH FAN



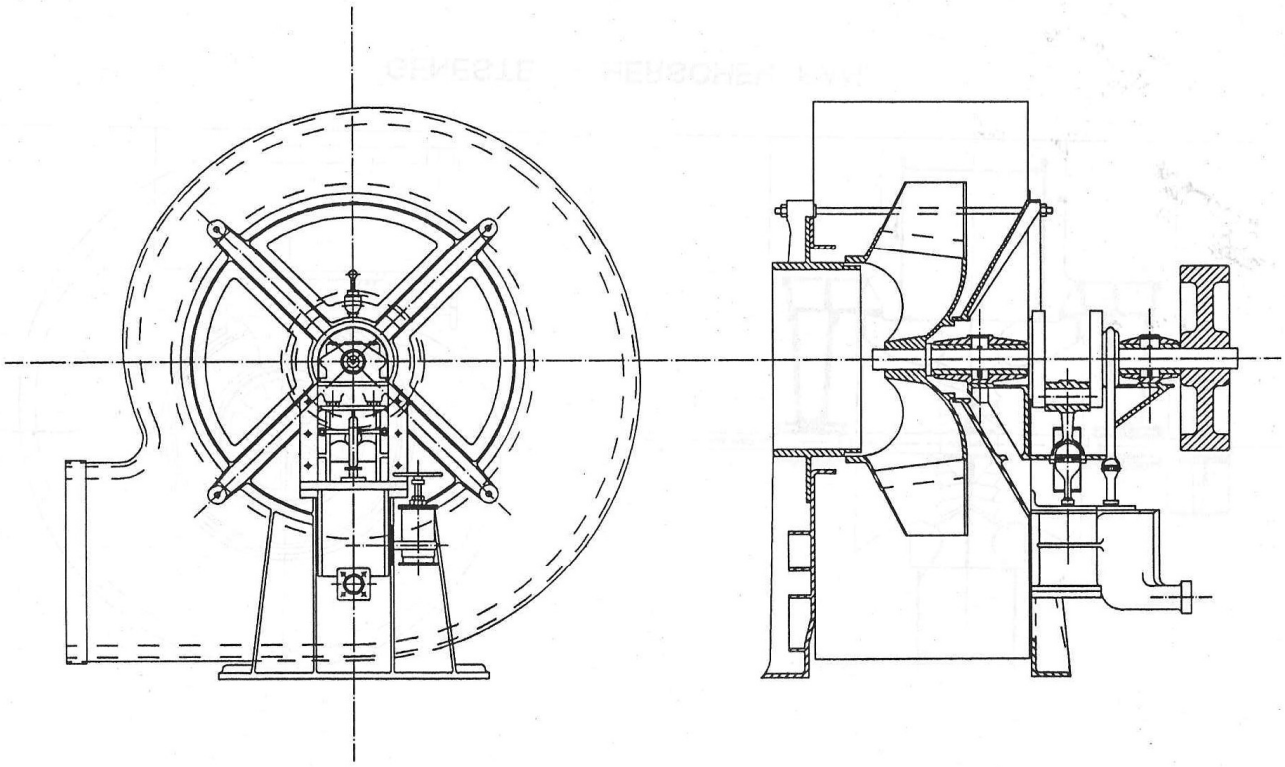
RATEAU SCREW FAN



THE WALKER INDESTRUCTIBLE FAN



GENESTE – HERSCHER FAN.



BECK AND HENKEL FAN

EARLY EUROPEAN FANS
From Traite de Chauffage
H Rietschel 1911

In French (from the German)

TRAITÉ

THÉORIQUE ET PRATIQUE

DE CHAUFFAGE

ET

DE VENTILATION

Guide pour le calcul et l'établissement des projets et installations de Chauffage et de Ventilation

A L'USAGE DES INGÉNIEURS, CONSTRUCTEURS, ARCHITECTES ENTREPRENEURS, ETC.

PAR

LE Dr H. RIETSCHEL

Ingénieur,
Conseiller intime du gouvernement,
Professeur à l'École des Hautes Études techniques de Berlin.

TRADUIT DE L'ALLEMAND SUR LA 4e ÉDITION

PAR

LÉON LASSON

DEUXIÈME PARTIE

TABLES ET PLANCHES

PARIS ET LIÉGE

LIBRAIRIE POLYTECHNIQUE CH. BÉRANGER, ÉDITEUR

SUCCESSEUR DE BAUDRY ET Cie

PARIS, 15, RUE DES SAINTS-PÈRES, 15

MAISON A LIÉGE, 21, RUE DE LA RÉGENCE

1911

PLANCHE 7

Ventilateurs.

Figure 1. Ventilateur centrifuge à commande électrique. *a* moteur électrique, *b* palettes ; *c* enveloppe. (Siemens-Schuckert-Werke, G. m. b. H.).

» **2. Ventilateur centrifuge « Sirocco » à commande par courroie.** *a* poulie, *b* palettes, *c* enveloppe. (White, Child & Beney).

» **3. Ventilateur Double Blackman à commande par courroie.** *a* poulie, *b* ailettes. (James W. Blackburn).

» **4. Ventilateur Blackman à commande par courroie.** *a* poulie, *b* ailettes. (James W. Blackburn).

» **5. Ventilateur propulseur « Sirocco » à commande électrique.** *a* moteur électrique, *b* ailettes. (White, Child & Beney).

» **6. Déplaceur d'air à commande électrique**, suspendu au plafond. *a* moteur électrique, *b* éventail. (Allgemeine Elektrizitäts Gesellschaft).

» **7. Ventilateur à hélice à commande électrique devant un orifice de soufflerie.** *a* moteur électrique, *b* hélice. (Allgemeine Elektrizitäts-Gesellschaft).

Fig. 1.

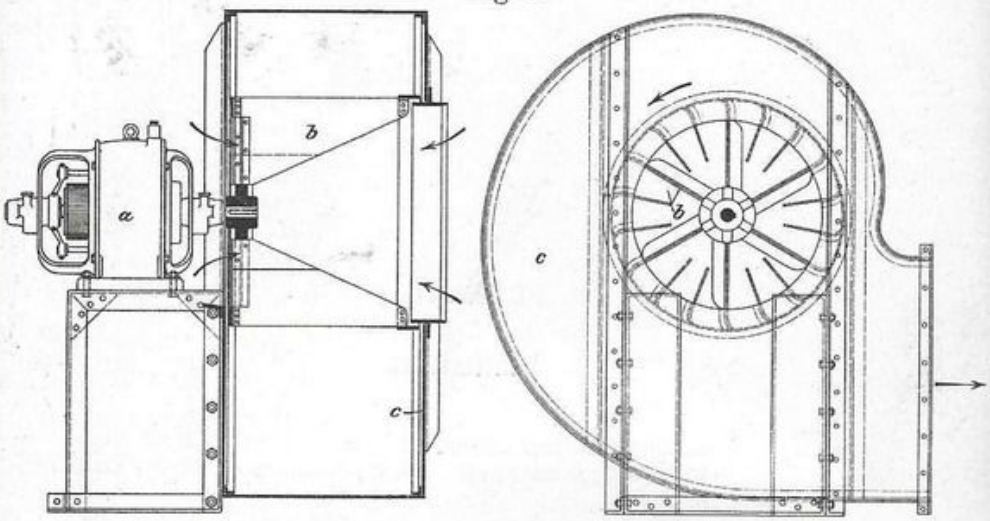
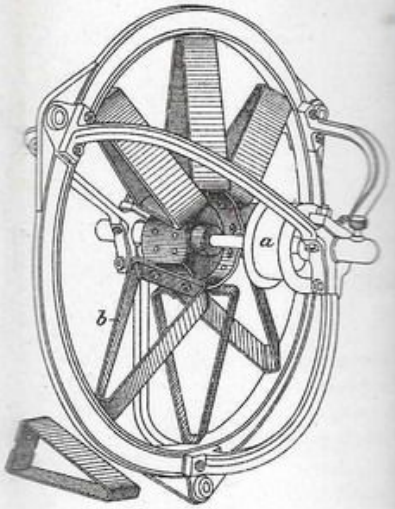


Fig. 3.



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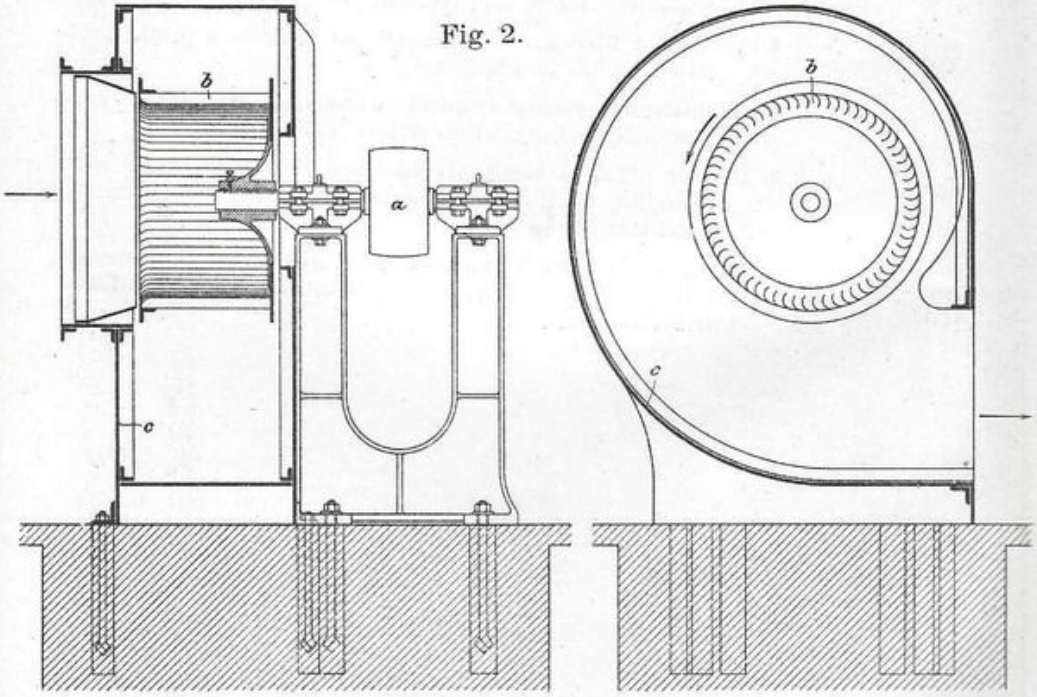

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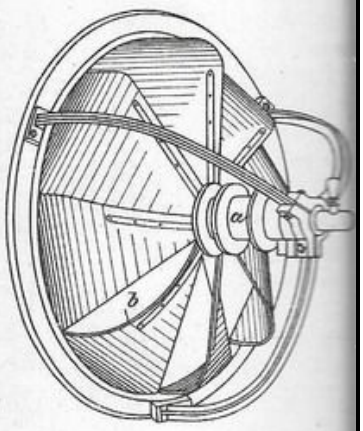

Ch. Béranger, édit.

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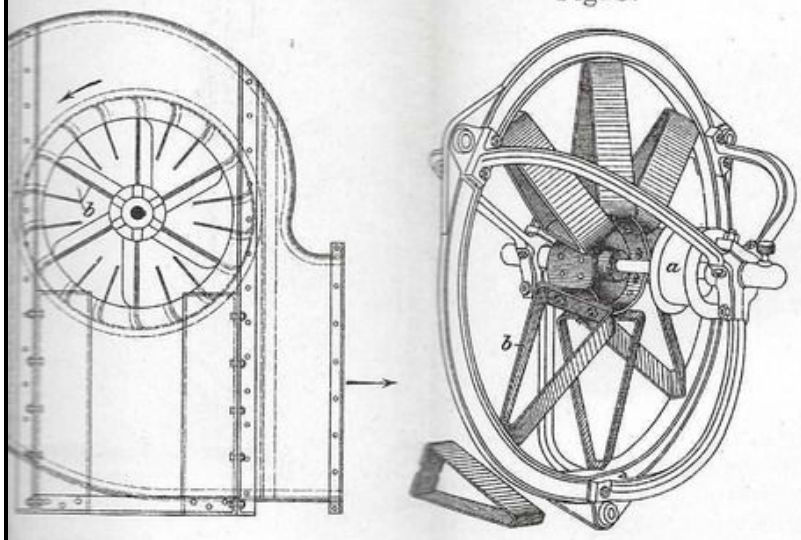

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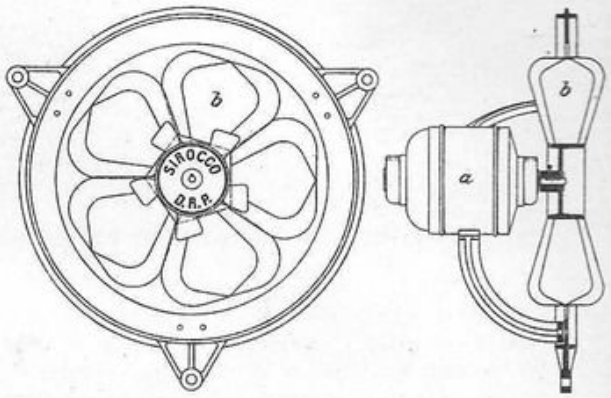

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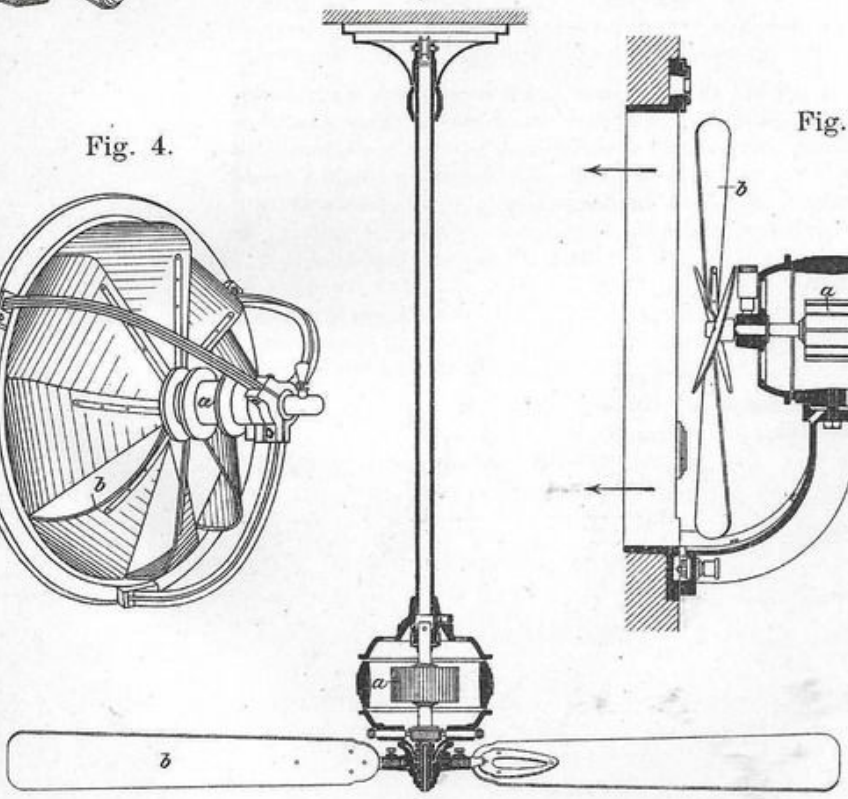

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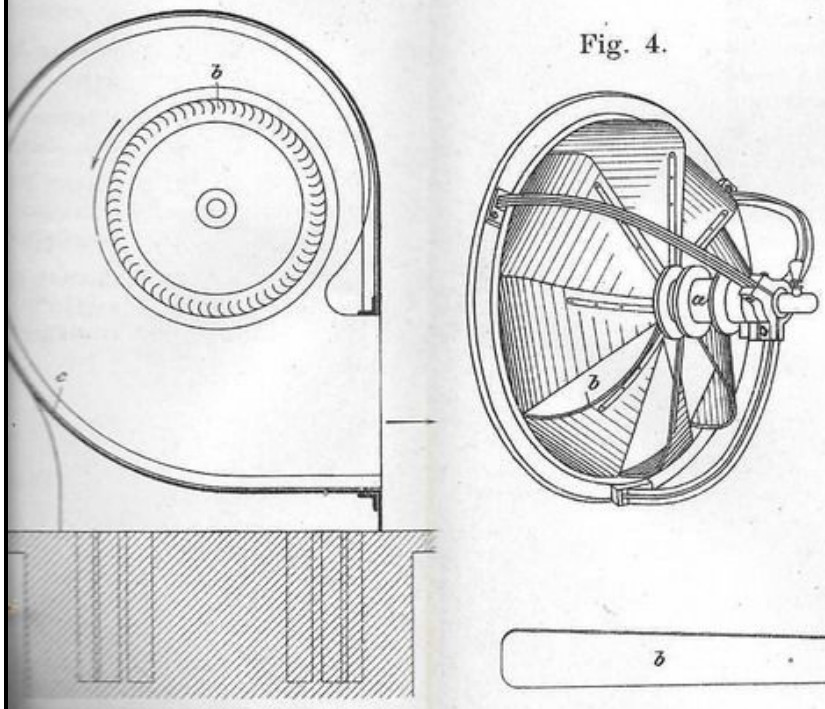

Fig. 7.

Imp. Léon Monrocq, Paris