

Heating and Ventilating Apparatus, B. F. Sturtevant, Boston, c.1896.

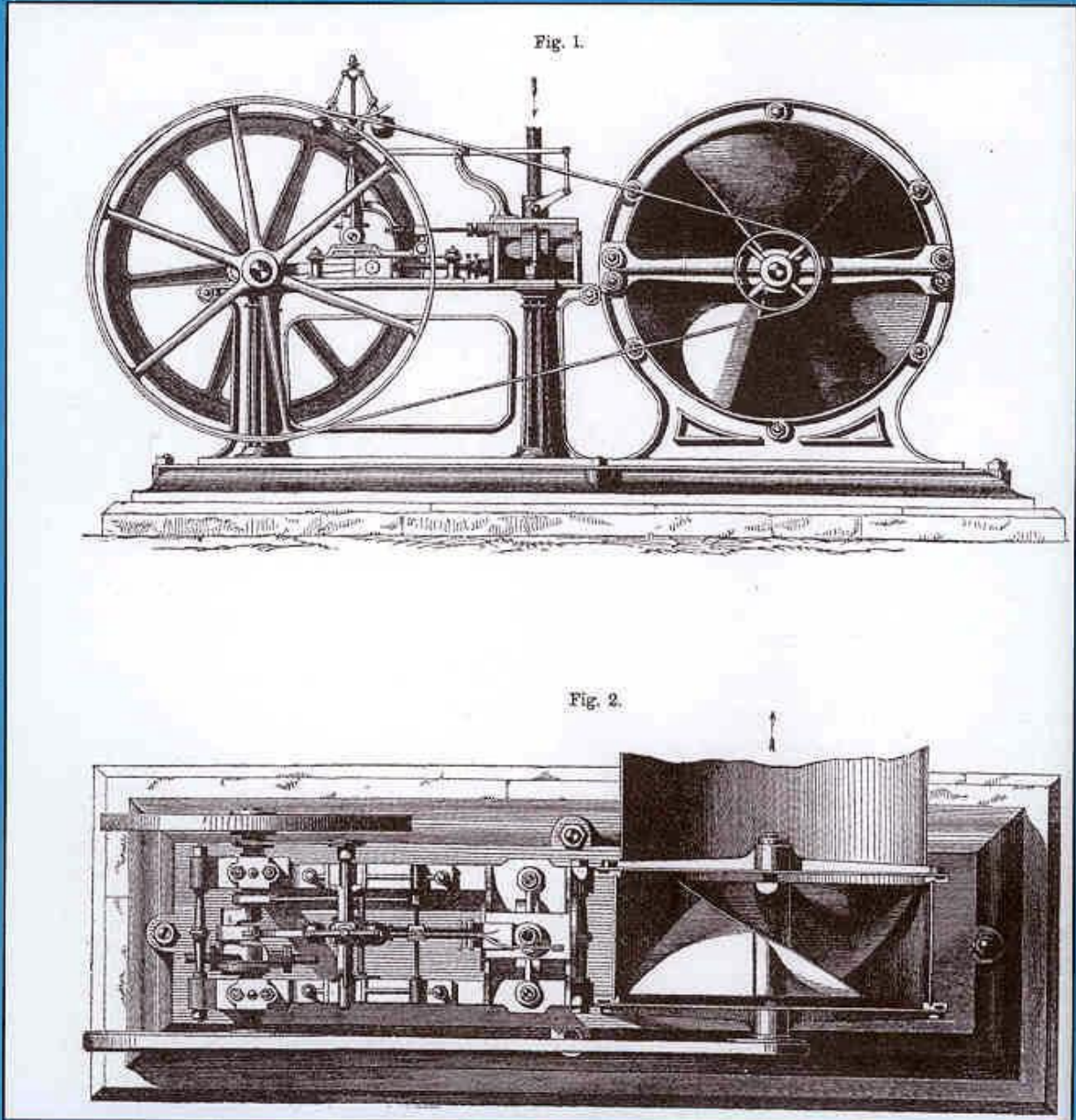
CENTRIFUGAL FANS

AND SOME EARLY VENTILATING MACHINES

BRIAN ROBERTS

WALKER

William Walker

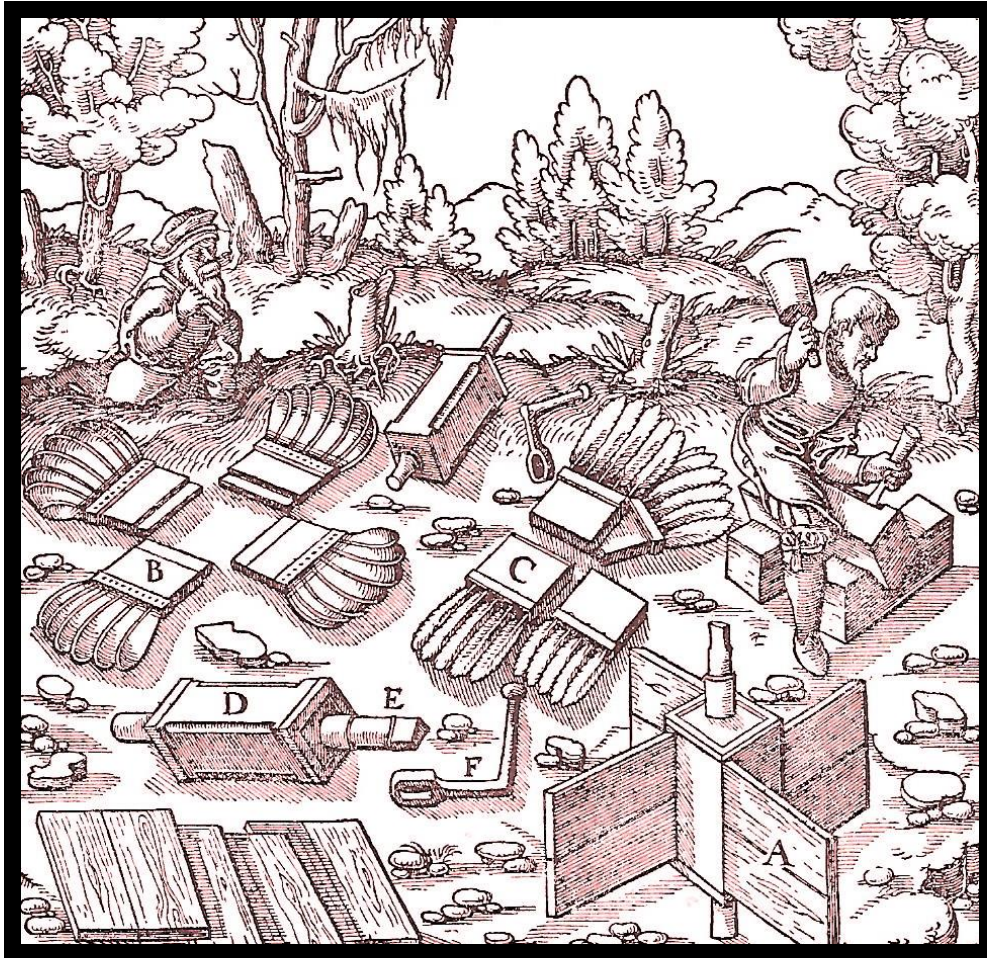


Early Screw Fan (steam driven).

"The quantity of air delivered in one minute by a screw 4 ft diameter, performing 500 revolutions per minute, was tested by the writer, by a delicate anemometer, and found to exceed 500 cubic feet."

[Useful Hints on Ventilation, W Walker, Manchester, 1850]

AGRICOLA



Making fan blades tipped with goose feathers, De Re Metallica, 1556.

CENTRIFUGAL FANS & EARLY VENTILATING MACHINES

From the CIBSE Heritage Group website and Archives.

BMR, Budleigh Salterton 2020

**Agricola 3, Alldays & Onions 6, American Blower 7,
Briggs 10, Buttner Werke 11, Buffalo Forge 12,**

**Capell 13, Combes 13, Davidson 14, Eck 18,
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Keith 24, Kley 25, Levelt 25,**

**Matthews & Yates 1,24, Mortier 28, Musgrave 29,
Peclet 30, Pelzer 31, Rateau 32,**

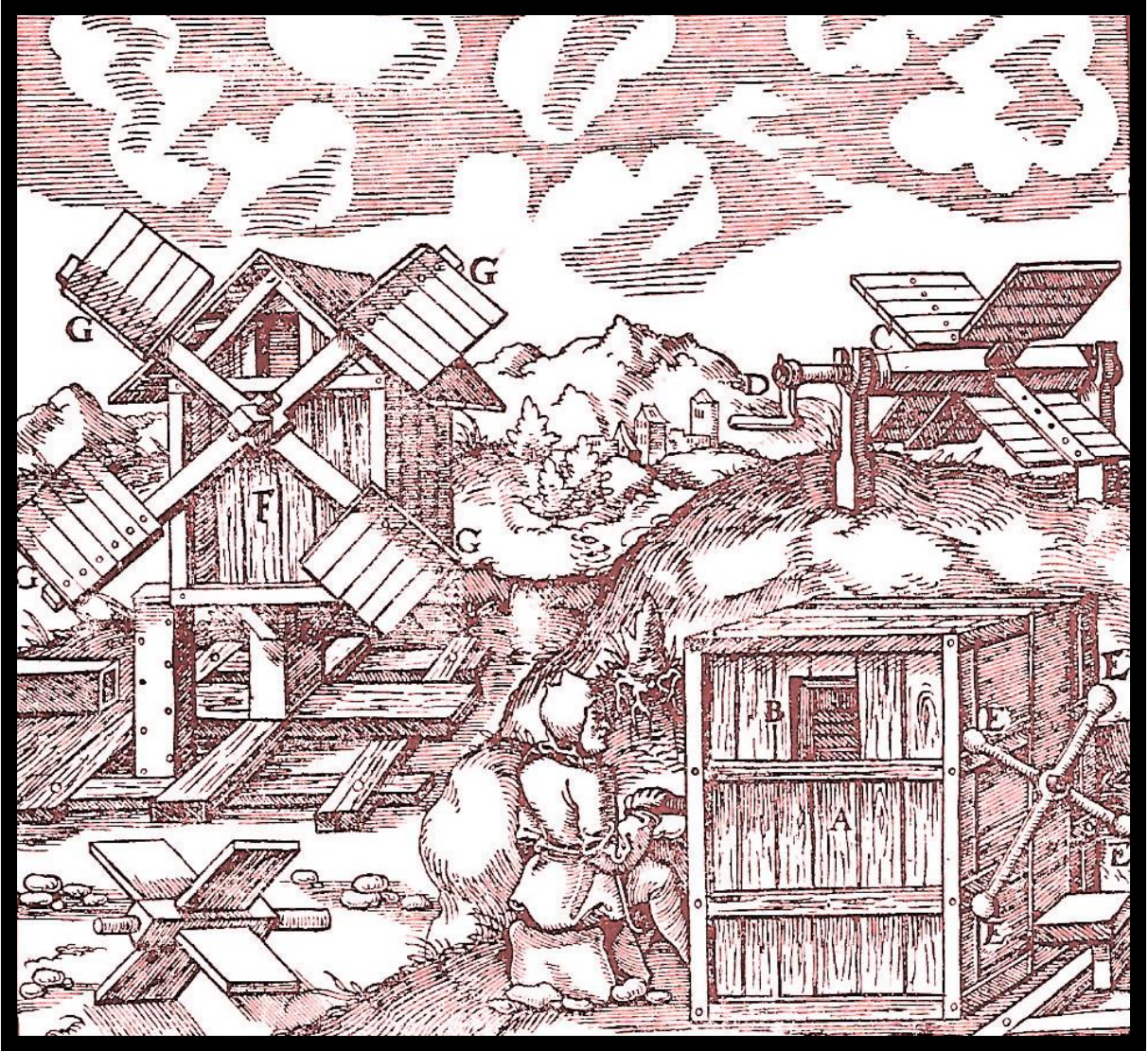
**Ser 33, Sirocco 34, Standard & Pochin 35,
Sturtevant 36, Sulzer 40, Sutcliffe 41,
Waddle 43, Walker 2,44,**

AGRICOLA



Hand-operated fans for mine ventilation, Germany, 1556.

AGRICOLA



Wind-assisted and hand-operated mine ventilation fans, Germany, 1556.

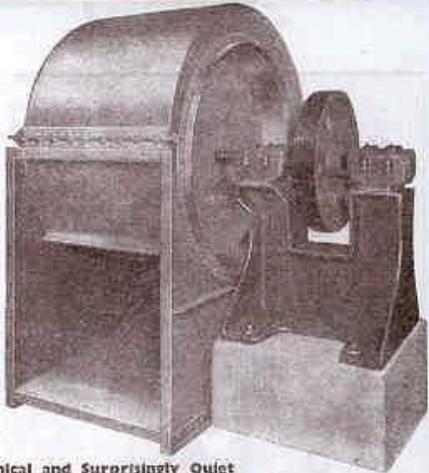
ALLDAYS & ONIONS

Alldays & Onions Ltd

CLIMAX

LOW VELOCITY

FANS



Dependable, Economical and Surprisingly Quiet

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Climax Low Velocity Fans.
[JIHVE, April-May, 1942]

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ULTRA QUIET

FANS

ARE REQUIRED

CONSULT



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GREAT WESTERN WORKS, BIRMINGHAM, 11 2 QUEEN ANNE'S GATE, LONDON, S.W.1

Phone: VICtoria 2251-4 Phone: WHL 1831
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Ultra Quiet Fans.
[JIHVE, Sept-Oct, 1944]

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Tough on the Coal Dealer,
but a boon to the man behind the pocket-book. With the price of fuel climbing higher and higher it is going to require "stratagem" to keep down expenses this winter.

The "A B C" Fan System of Heating
will not only heat but it will actually pay for itself in a season in its saving of fuel.

The most satisfactory system for the user—hence the most profitable for the contractor to advocate.
A complete line of Heaters, Fans and Blowers for all purposes.
Send for Catalogue.

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DETROIT, MICH.

NEW YORK, 141 Broadway. CHICAGO, Marquette Bldg. LONDON, 70 Gracechurch St.



AMERICAN BLOWER CO.

"A B C" DISC VENTILATING FANS



are constructed upon scientific principles. Strength, durability and efficiency certainly urge their adoption for Ventilating, Cooling and the many other applications for which they are adapted.

Descriptive catalog and specific information sent in response to all inquiries.

Specify CATALOG 111-P.

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DETROIT, MICH.

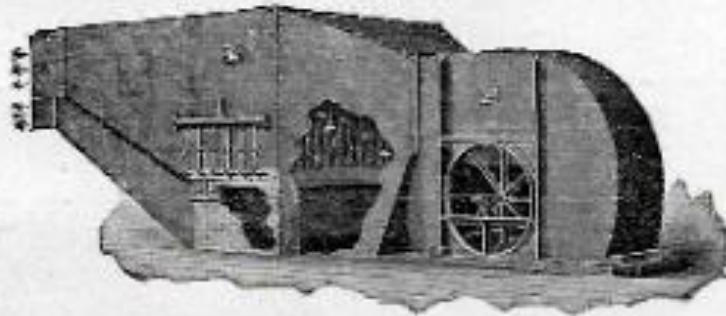
New York 141 Broadway Chicago Marquette Bldg. London 70 Gracechurch St.

NEW YORK DETROIT LONDON

HEATING, VENTILATING AND DRYING ENGINEERS
Manufacturers of Hot Blast Heaters, Steel Plate and Disc Fans, Blowers, Dry Kilns, etc.

AMERICAN BLOWER

“A B C” FAN SYSTEM OF Heating and Ventilation



PROVIDES A UNIFORM DEGREE OF HEAT.
FURNISHES AMPLE VENTILATION.
FIRST COST AND OPERATING EXPENSES LOW.

SUITABLE FOR

FACTORIES,
CHURCHES,
SCHOOLS,
HOSPITALS,
THEATRES,

IN FACT, LARGE BUILDINGS OF ALL TYPES.

THE MOST COMPLETE LINE OF HEATERS AND FANS
ON THE MARKET. CATALOGUES ON REQUEST.



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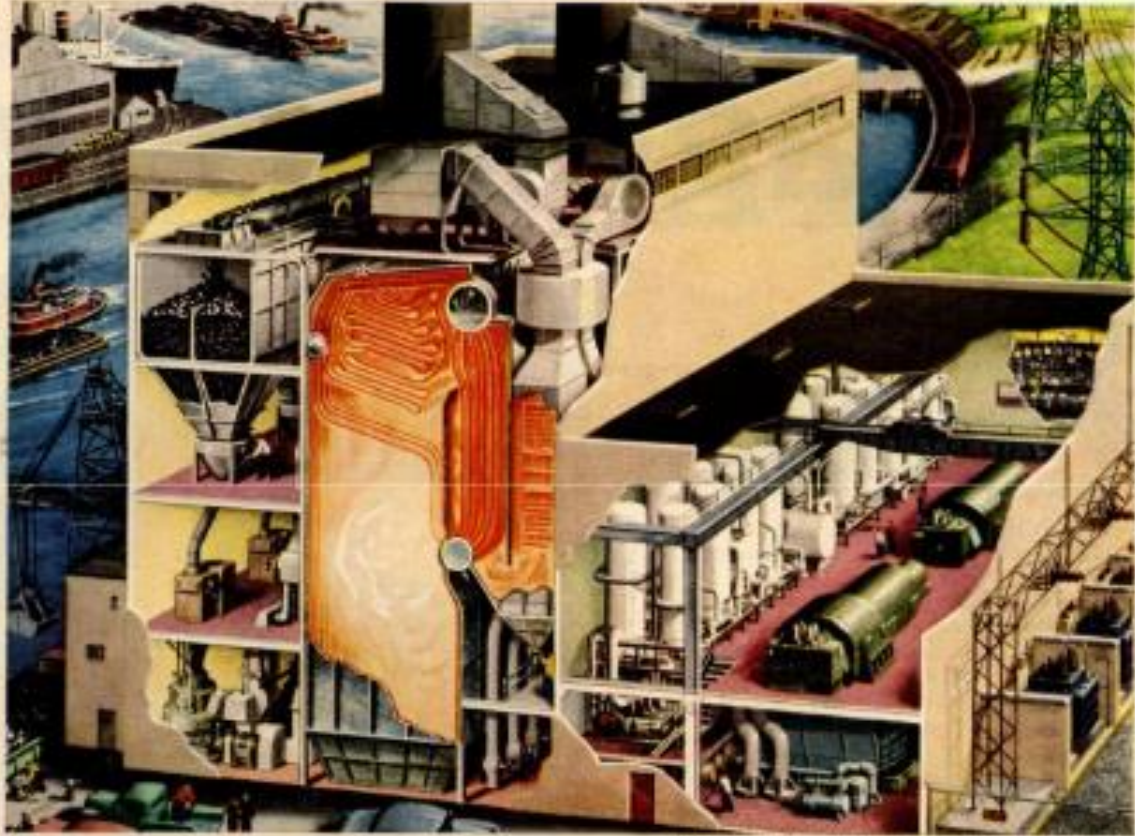


Illustration courtesy of Armstrong Ltd. Canada, makers of industrial facilities

Feeding air to a 3000' inferno

1 3000° F.—that's really hot! And it has to be to create enough steam to drive generators that supply an entire city with electricity. How's it done? Huge American Blower Mechanical Draft Fans supply the necessary air to boilers for proper combustion. American Blower Gyral Fluid Drives provide adjustable speed control for the mechanical draft fans and boiler feed pumps.



2 The world's largest power plant uses an efficient American Blower Fly Ash Precipitator to remove fly ash from the smoke. In industry, American Blower Dust Collectors recover valuable materials from air.

3 American Blower supplies air-handling equipment to many manufacturers and installers of air conditioning equipment. The newly-renovated Capitol building is now equipped with efficient American Blower Fans.

4 Whatever your business—if your needs include air conditioning, or air handling equipment, consult your nearest American Blower branch office. They are conveniently located in all principal cities to serve your needs.



American Blower Mechanical Draft Fans are used to power plants of the heating units of homes and industrial manufacturers.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN • CANADIAN BROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

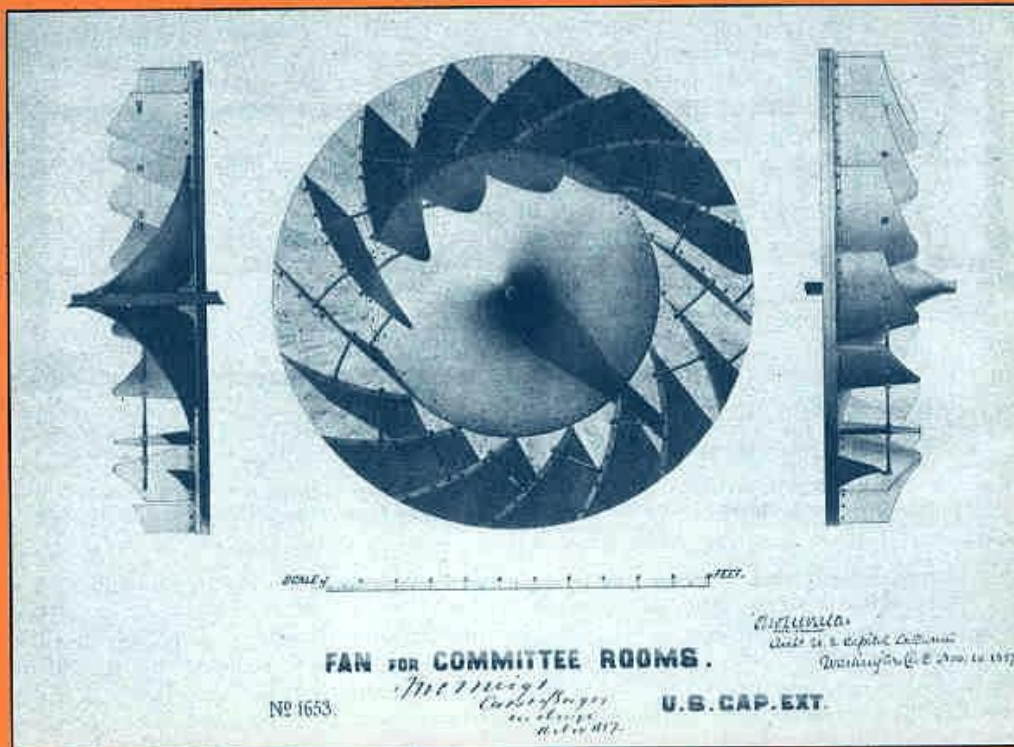
OCT 1963

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS and WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

<10>

ROBERTS BRIGGS

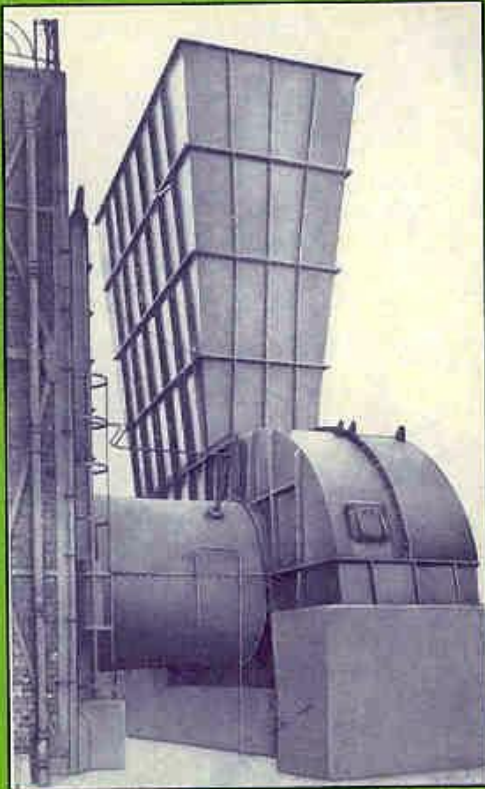
Robert Briggs, 1822-82



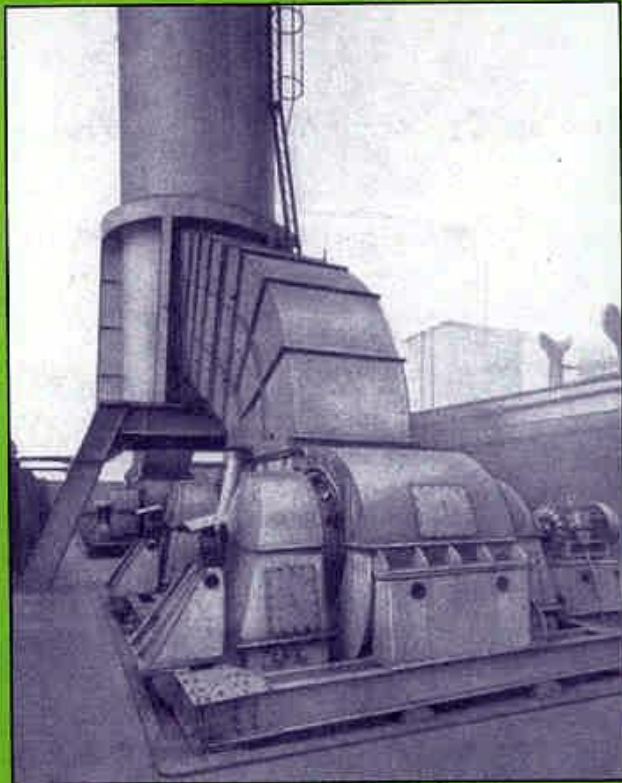
**Fan rotor used at the US Capitol, Washington DC, 1857.
Designed by Robert Briggs, 14 feet diameter, cast-iron central cone,
wooden vanes, operated without a casing.
[Building Early America, chap 10 by Eugene S Ferguson, 1976]**

BÜTTNER-WERKE

Büttner-Werke AG



Mine Fan designed by Eck.



Large Induced-Draught Fan.

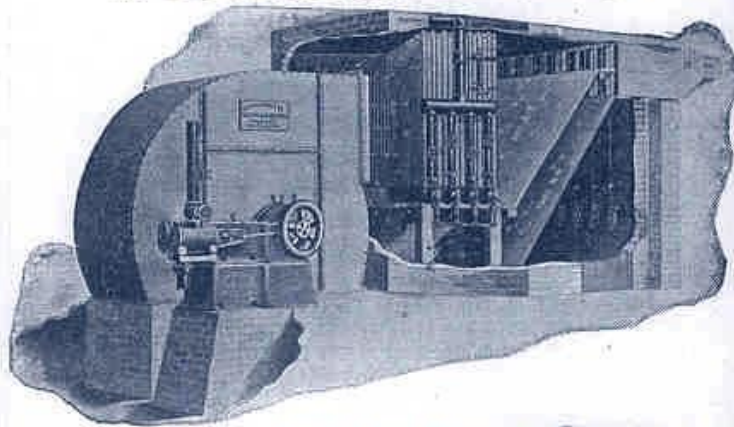
[Fans, Bruno Eck, 1976]

BUFFALO FORGE

Buffalo Forge Company

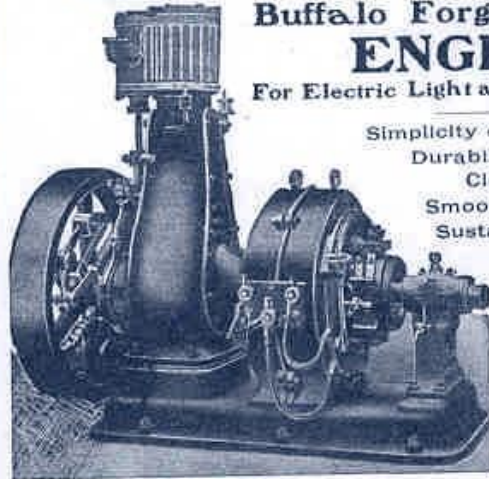
Buffalo Fan System OF Heating and Ventilating.

*For Schools, Churches, Theatres, and
all Public and Industrial Buildings.*



Buffalo Forge Company **ENGINES**

For Electric Light and Power Service.



Simplicity of Design.
Durability of Construction.
Close Regulation.
Smooth Cool Running at
Sustained High Speed.

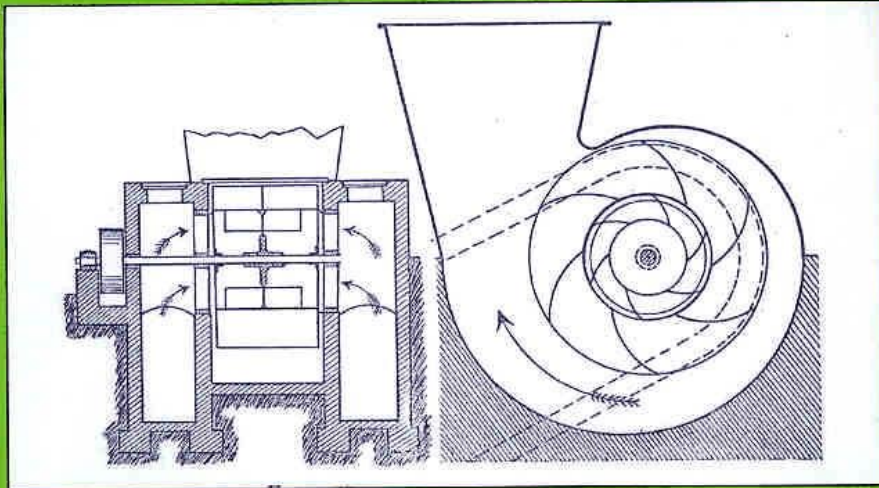
Horizontal.
Vertical.
Simple.
Compound.
Belted.
Direct-
Connected.

Buffalo Forge Company,
BUFFALO, N. Y., U. S. A.

Buffalo Fan System, Buffalo Forge, Buffalo, NY.
[Heating and Ventilating Buildings, Prof Rollo C Carpenter, 1910]

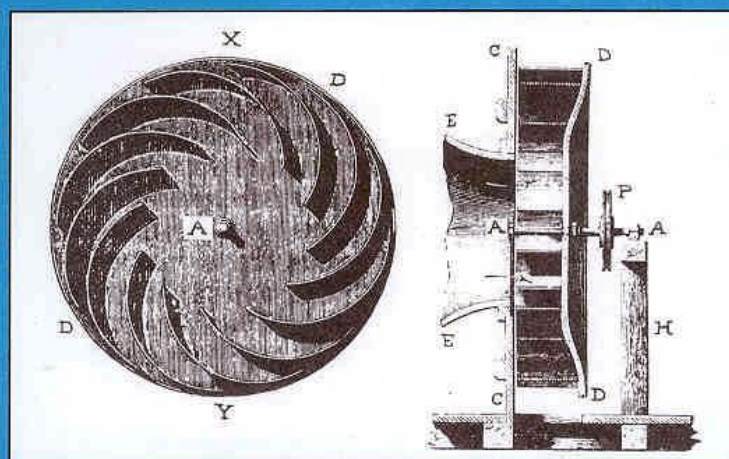
CAPELL: COMBES

Capell



Large Continental Capell Centrifugal Fan,
Formed of two fans, one outside the other, c.1900.
[The Fan, Chas H Innes, 1916]

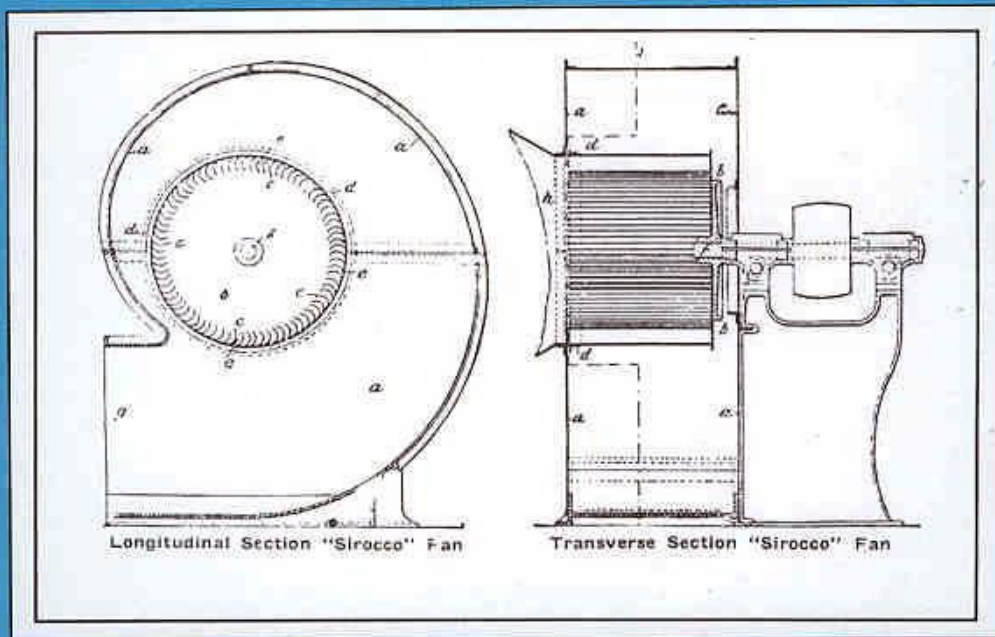
Combes



Combes' Fan with Backward-Curved Blades fitted to
one side of a Rotating Disc, 1854.
[Building Services Engineering, Billington & Roberts, 1982]

DAVIDSON

Samuel Cleland Davidson



Davidson of Belfast patented his Sirocco multiblade centrifugal fan in 1898, which proved to be one of the most successful of all times and extremely quiet in operation. [Engineering Review, 1908]

DAVIDSON

54. DESIGN OF THE MULTIVANE IMPELLER (SIROCCO RUNNER)

In many applications a choice of fan is governed by the space available for its installation and the permissible noise level. One requires a design giving a minimal value for the coefficient δ . This problem was solved by the design of the multivane impeller. It is some 60 years old and is widely known. Its main features are its large diameter ratio, large relative width, and number of blades which are of the forward-curve design, thus forming a "drum". The original design of the Sirocco fan had the following dimensions:

$$d_1/d_2 = 0.875; \quad b = \frac{3}{4} d_2; \quad \beta_1 = 64^\circ; \quad \beta_2 = 22^\circ; \quad z = 54.$$

The blades were formed precisely as circular arcs.

This design received no attention in the field of research. Although the circular arc was blamed for the poor efficiency ($\eta = 50\%$), it has enjoyed a success unrivalled by any other design and has been manufactured in greater numbers than any other form of flow machine. Apart from its compactness it is remarkably silent in operation. There is no other fan which operates as silently at comparable pressures. One will find quiet operation a criterion in many applications even if it is at the expense of efficiency. In this aspect the multivane impeller fulfils uncontested an important operational problem that is no less important today than it was in previous years.

This impeller differs quite considerably from others, and there is a lack of fundamental knowledge of the design and calculations.

This is the Introductory Note on the design of the Sirocco Impeller from the textbook "*Fans*, Bruno Eck, Pergamon Press, Oxford, 1973."

The Davidson Ventilating Fan Co

THE DAVIDSON VENTILATING FAN CO.,

MANUFACTURERS OF

FANS, BLOWERS, MOTORS AND ENGINES.

ENGINEERS and CONTRACTORS.



MAIN OFFICE:
COR. OLIVER & MILK STREETS,
BOSTON, MASS.

Estimates and Specifications Cheerfully Furnished.

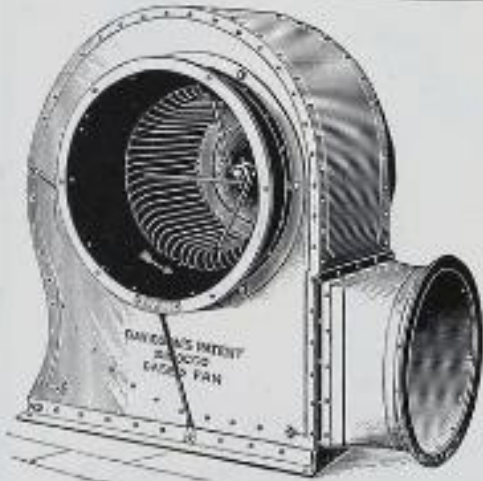


NEW YORK CITY OFFICE:
112 LIBERTY STREET.

Davidson, Boston and New York.
[Ventilation and Heating, J S Billings, 1896]

DAVIDSON

An entirely new departure in Fan Construction.



DAVIDSON'S PATENT

“SIROCCO”

CENTRIFUGAL

.. FAN ..

DISCHARGES THREE TIMES MORE AIR
PER REVOLUTION THAN ANY OTHER
CENTRIFUGAL FAN OF EQUAL DIAMETER.

Further information on application to

DAVIDSON & Co., Ltd.,

SIROCCO ENGINEERING WORKS. BELFAST.

1901

You will find exactly the right type and size of Fan you need in the extensive range of "Sirocco" Fans we build. We will assist you in the selection and furnish you with a Fan that will do your work efficiently and well.
Sirocco Service is at your Service.

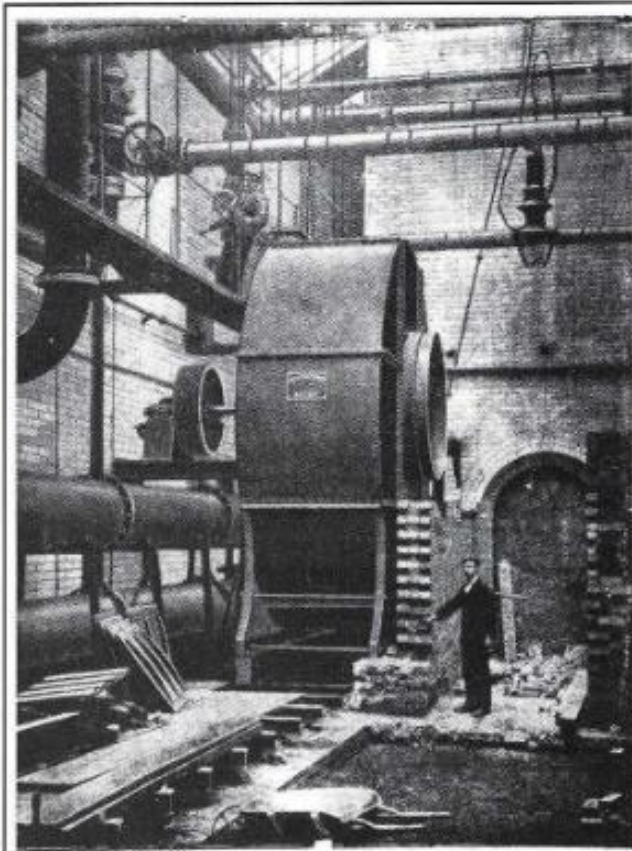
DAVIDSON & CO., LIMITED.
Sirocco Engineering Works - Belfast, Ireland.
LONDON - GLASGOW - CARDIFF - BRISTOL - MANCHESTER - BIRMINGHAM - NEWCASTLE.

1931

DAVIDSON

Sirocco Engineering Company of New York

The Company obtained the U.S. rights to market Samuel Davidson's centrifugal fan. During the first decade of the 20th century, the Sirocco fan went through numerous modifications, including changes to the blade design and the production of single-inlet and double-inlet configurations. In 1908, the Sirocco rights were sold to the American Blower Company.



Heating—Cooling

Mechanical Draft
for Boilers

Davidson's Patent

SIROCCO
Centrifugal Fans

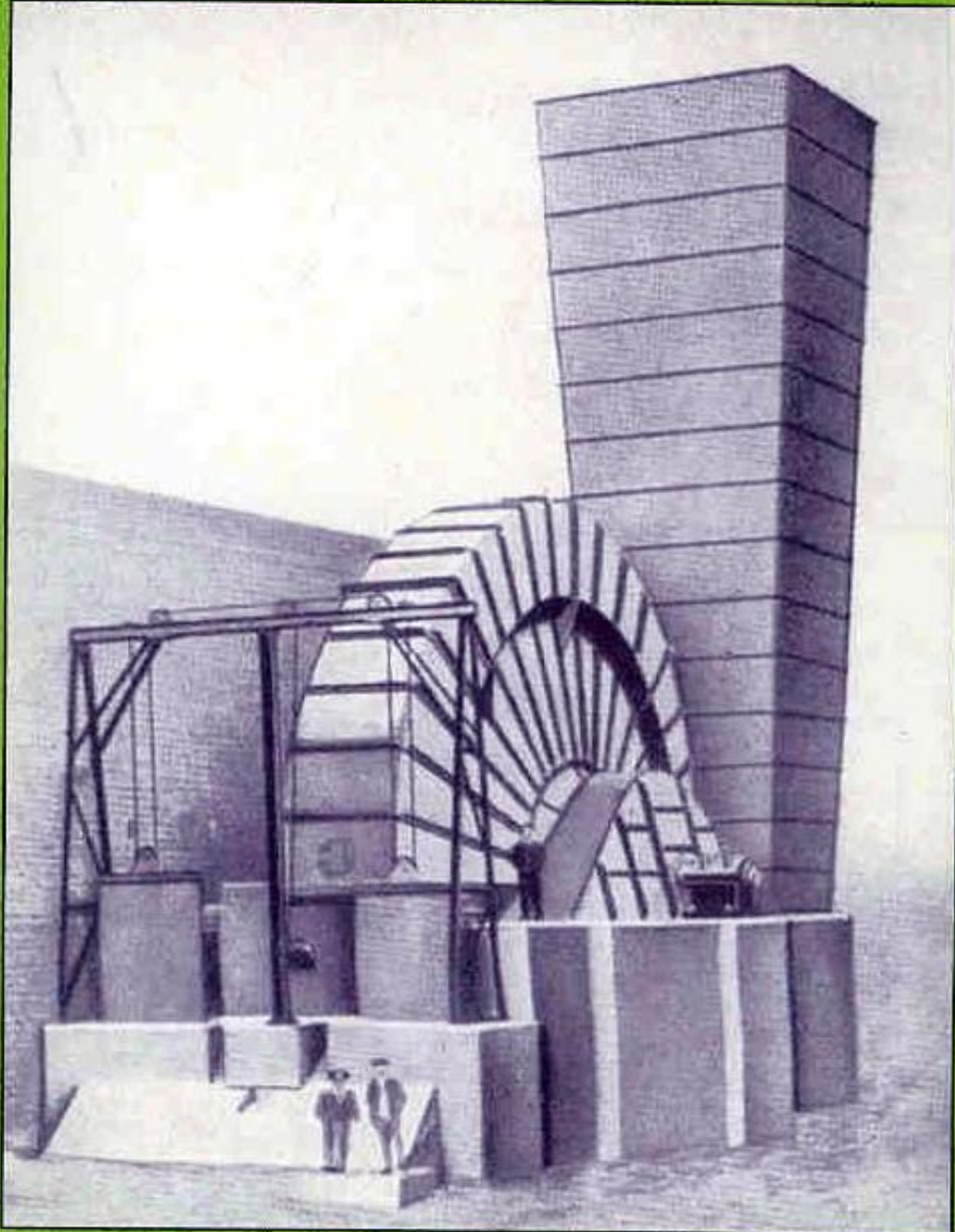


Sirocco Engineering Co.
22 Thames Street, New York

*Sirocco Engineering promoted Davidson's Patent Sirocco Centrifugal Fans
(Engineering Review, September 1906)*

BRUNO ECK

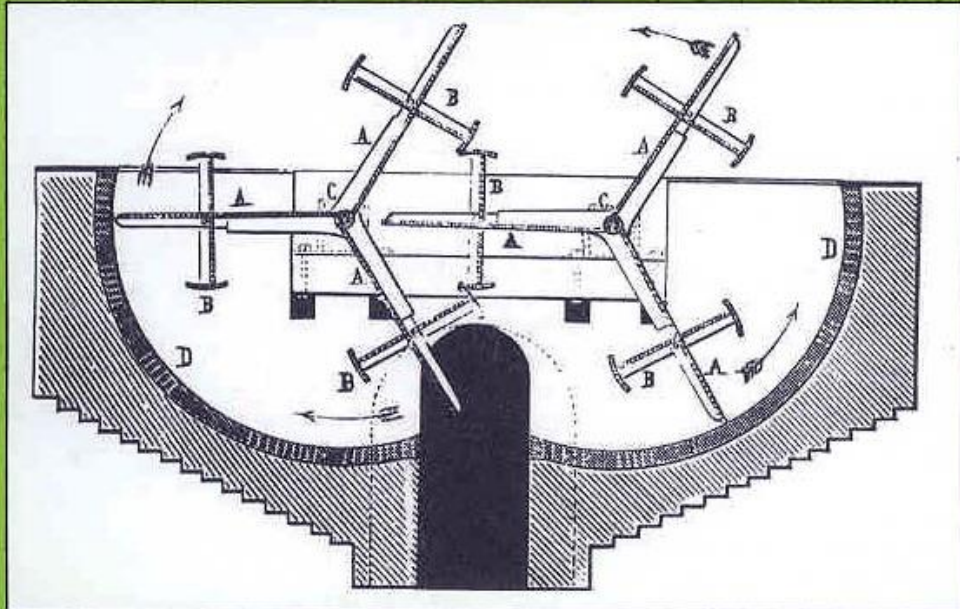
Bruno Eck



**Early Mine Fan with Radial Impeller, date unknown.
Westfalia-Dinnendahl-Gröppel, Bochum.
[Fans, Bruno Eck, 1973]**

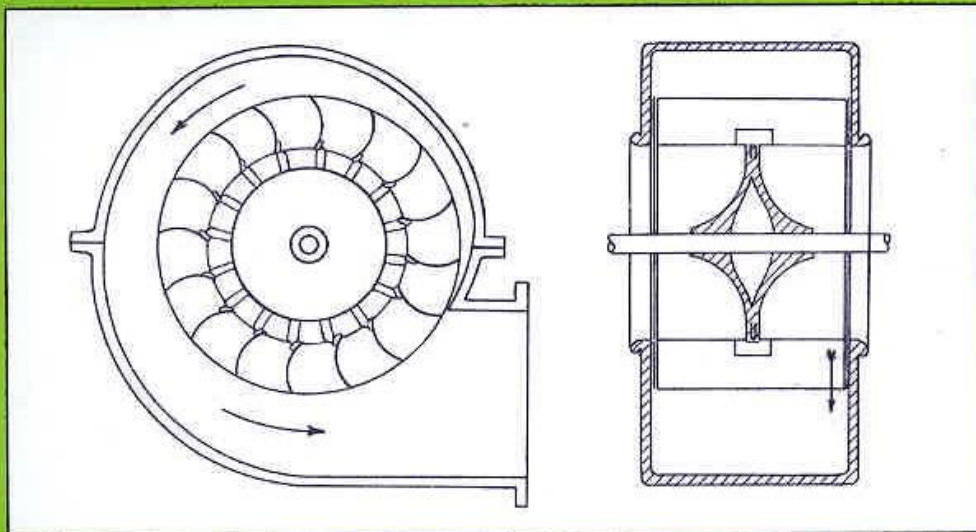
FABRY: FOURNIER & CORNU

Fabry



**Contra-Rotating Blower, early 19C, of Fabry
who was the ventilation engineer at the Charleroi mines.
[Building Services Engineering, Billington & Roberts, 1982]**

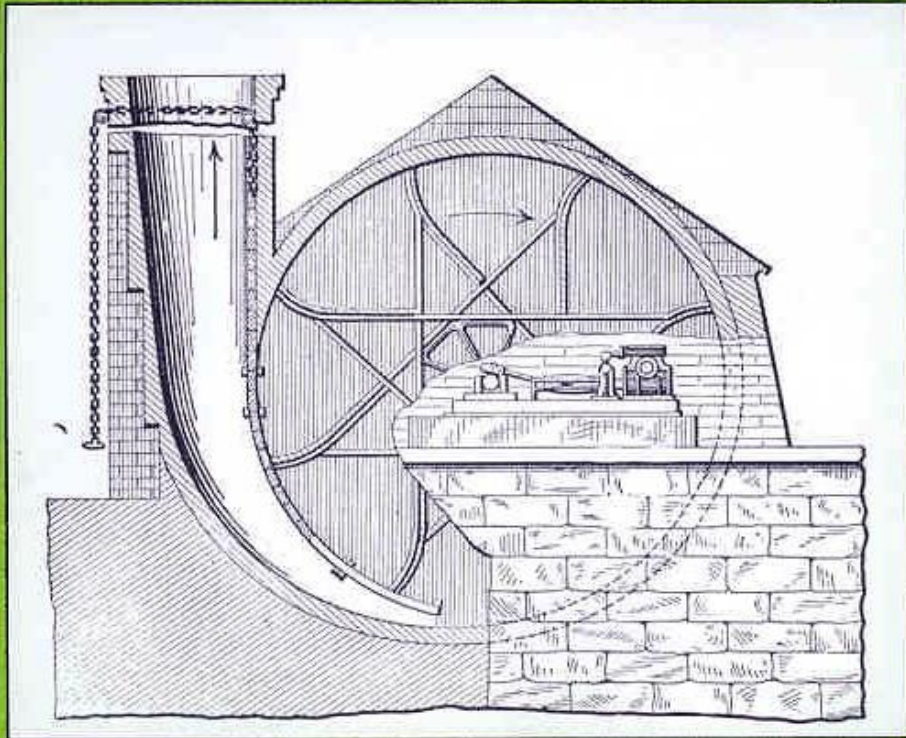
Fournier & Cornu



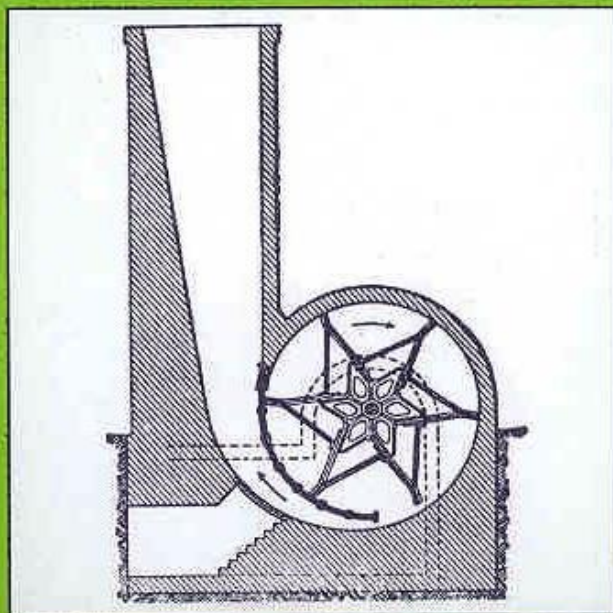
**Centrifugal Fan, French Patent of 18 February 1896.
Forerunner of the modern narrow-blade multivane fan
with curved blades on a central revolving disc and an unobstructed inlet.
[Building Services Engineering, Billington & Roberts, 1982]**

GUIBAL

Guibal



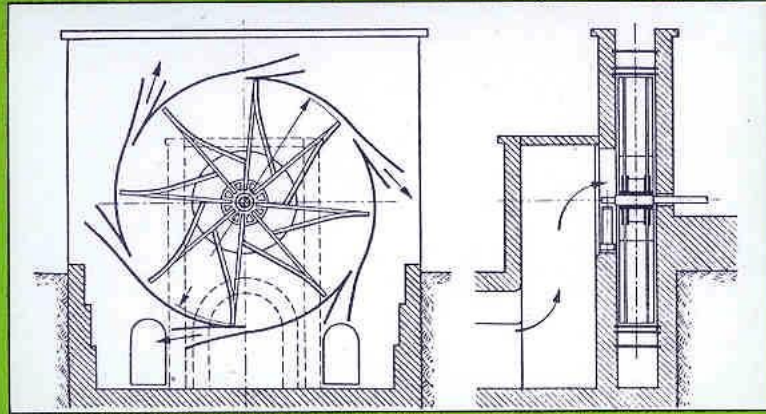
**Fan, c.1878, invented by the Frenchman Guibal in 1860.
[Heat & Cold, Donaldson & Nagengast, ASHRAE, 1994]**



**Guibal Fan and Chimney or Venturi Discharge Expander.
[Building Services Engineering, Billington & Roberts, 1982]**

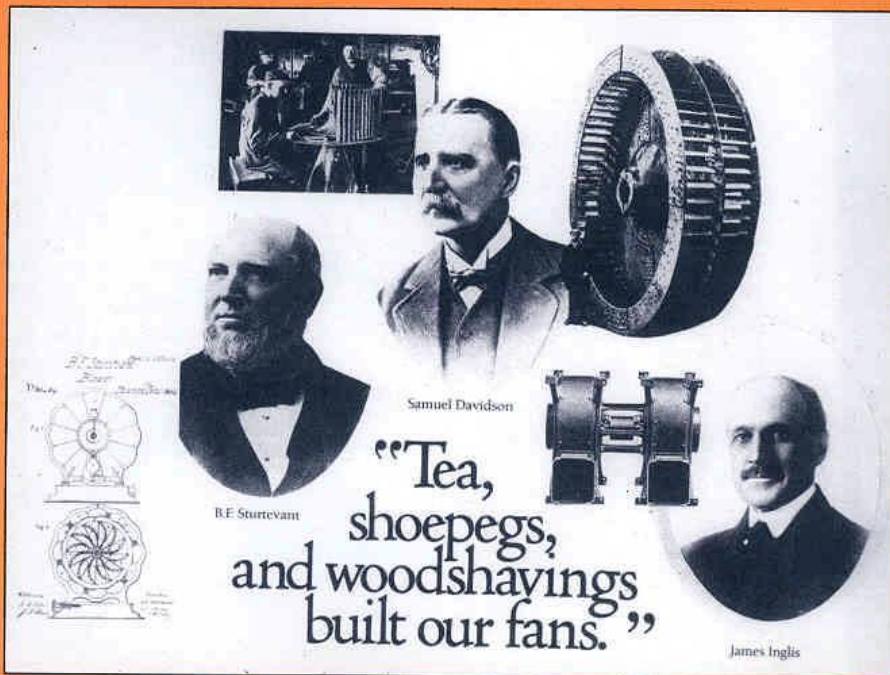
HARZE: HOWDEN

Harzé



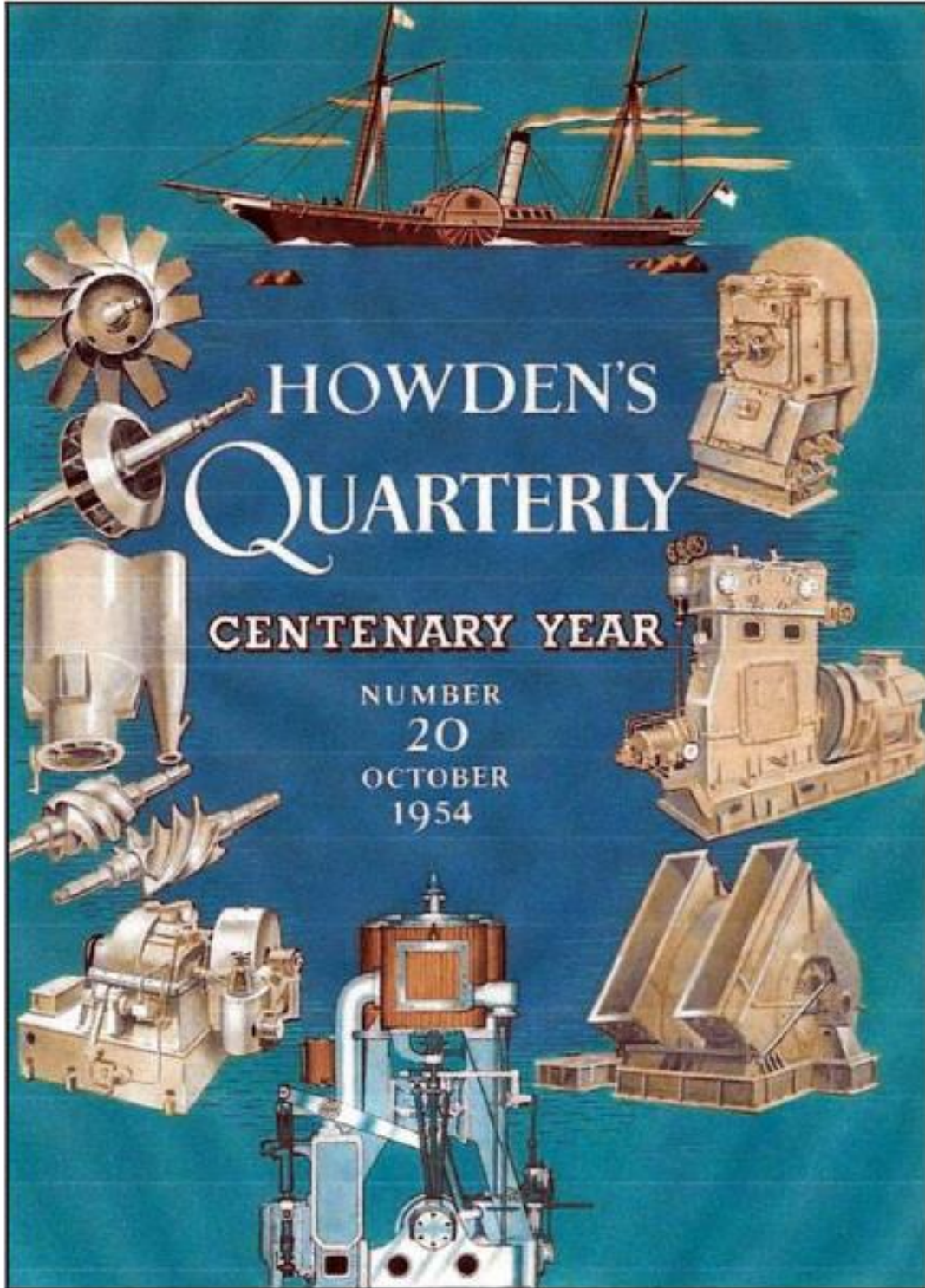
Mine Fan of Harzé with Free-Discharging Partial Diffusers.
[Building Services Engineering, Billington & Roberts, 1982]

Howden Sirocco Inc



Advertisement from Howden Sirocco, date unknown.
Featured pioneers are B F Sturtevant, S C Davidson and James Inglis.
Their companies Sturtevant, Davidson (USA) & American Blower all
became part of Howden Sirocco Inc.
[Heat & Cold, Donaldson & Nagengast, ASHRAE, 1994]

HOWDEN



While manufacturing their own range of fans, Howden acquired both Davidson and Sturtevant

HUYETT & SMITH

The Huyett & Smith Mfg Co

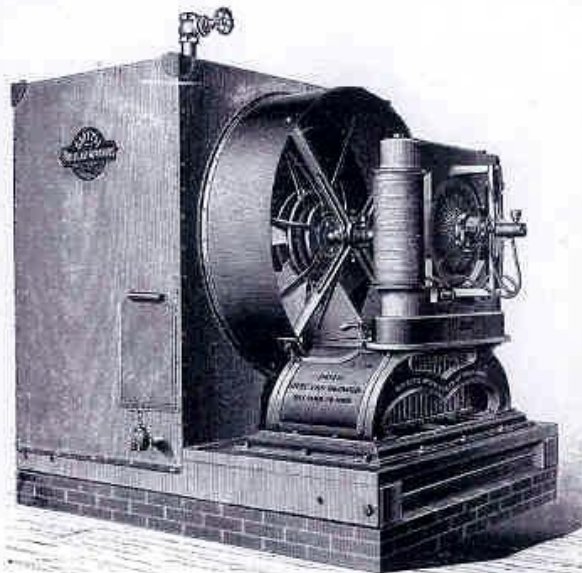


THE SMITH
HOT BLAST
APPARATUS

For Heating
and Ventilating
Buildings
of All Kinds.

MANUFACTURED BY
THE HUYETT & SMITH MFG. CO.,
HEATING AND VENTILATING ENGINEERS.
CHICAGO, NEW YORK, BOSTON. Main Office and Works:
DETROIT, MICHIGAN.

Hot Blast Apparatus.
[Ventilation and Heating, J S Billings, 1896]

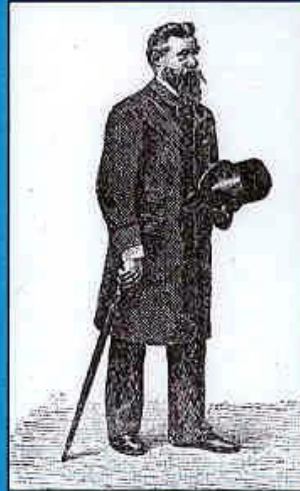


SMITH COMBINED MOTOR AND VENTILATING FAN.

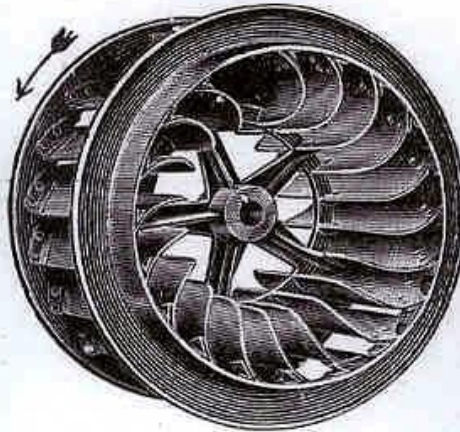
Smith Combined Motor and Ventilating Fan, Patented 1888.
[Heat & Cold, Donaldson & Nagengast, ASHRAE, 1994]

JAMES KEITH

James Keith



1906.
"Keith" Fan Wheel.



Loose blade, showing blade
form and proportions.

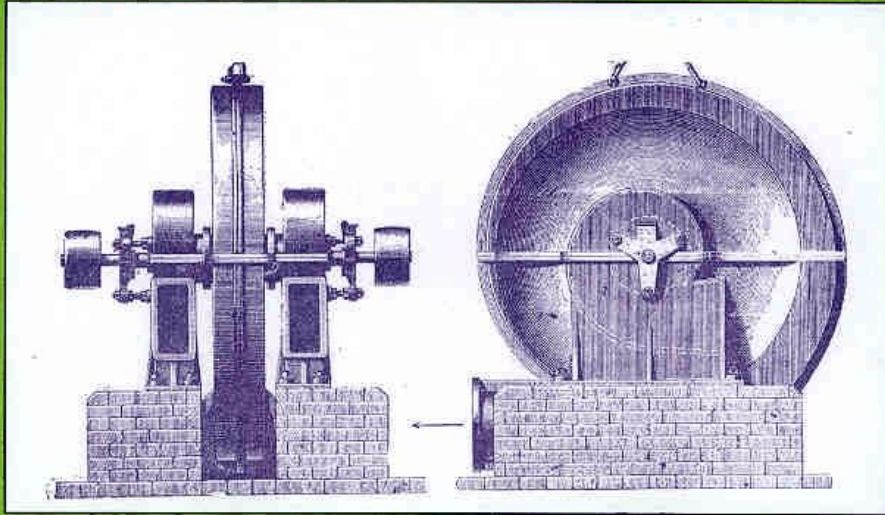


British Patent
No. 10048, A.D. 1906.

Keith Patent Fan Wheel of 1906.

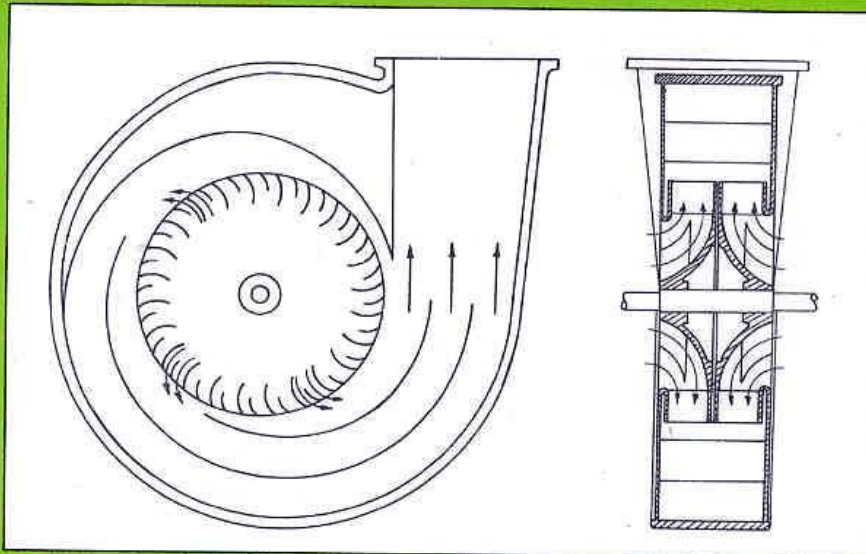
KLEY: LEVET

Kley



**Kley Ventilator with Radial, Plane Vanes and Two Spiral Inflow Passages.
[The Fan, Chas H Innes 1916]**

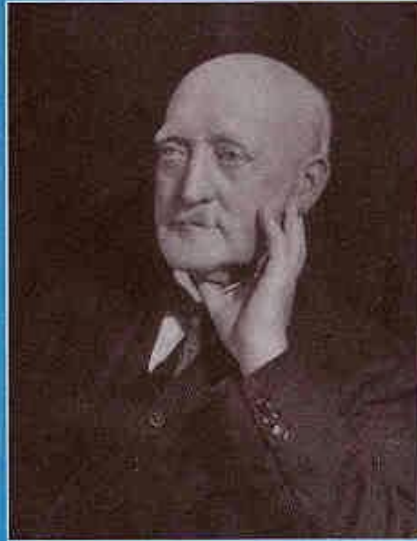
Levet



**Levet Centrifugal Fan, French Patent of 25 April 1890.
[Building Services Engineering, Billington & Roberts, 1982]**

MATTHEWS & YATES

Walter Yates, President IHVE 1909



**Delivery of M&Y Fans from Swinton, Manchester
to Stuart Street Electricity Station, 1890s.
[BSE, 1, 45, April 1977]**

MATTHEWS & YATES

**CYCLONE
FANS**
AND ALLIED EQUIPMENT
FOR ALL PURPOSES



CYCLONE SPECIALITIES—
 Machine Fans—Forward and
 Reverse Drive
 Patent Laminated Fan Coings
 for Super-Hot
 Paddle Blade Fans
 Air Propellers (Hot and Electric)
 Copper Gilled Pipe Heaters
 Heat Exch. (G.S.S. Copper
 Tubes)
 Air Filters
 Air Washers (Water Spray)
 Humidifiers
 Cyclone Separators

E. E. Machine Fan

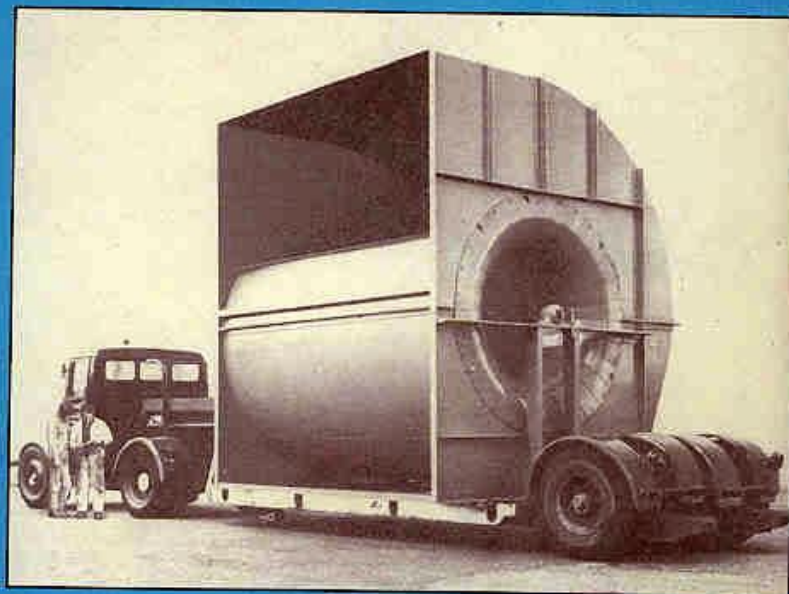
APPLICATION OF EQUIPMENT—
 Drying for all materials
 Air-Conditioning
 Deodorizing
 Dust Collecting
 Warming and Ventilating for
 Mills and Works
 Increased Draught for Boilers



Electric Propeller Fan

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YATES LIMITED**
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SWINTON (MANCHESTER) AND LONDON
 Telephones: Swinton 2273 (4 Lines) London: CHAnsey 7823 (3 Lines)
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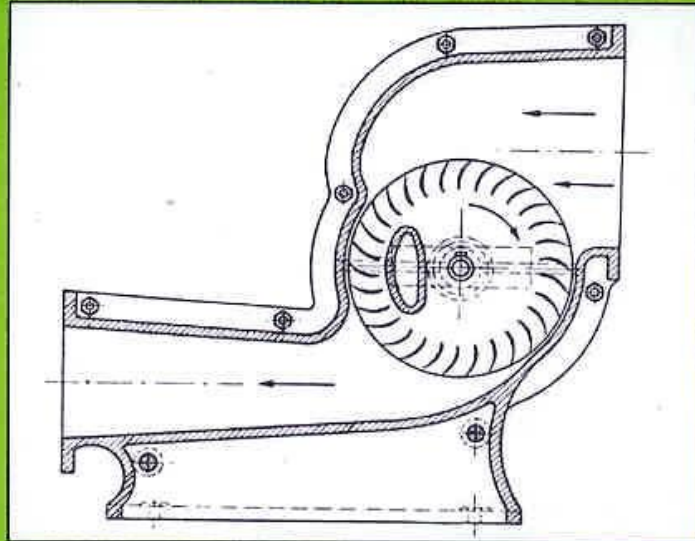
Cyclone Fans, M&Y, Swinton, Manchester.
[Year Book of the Heating & Ventilating, 1948]



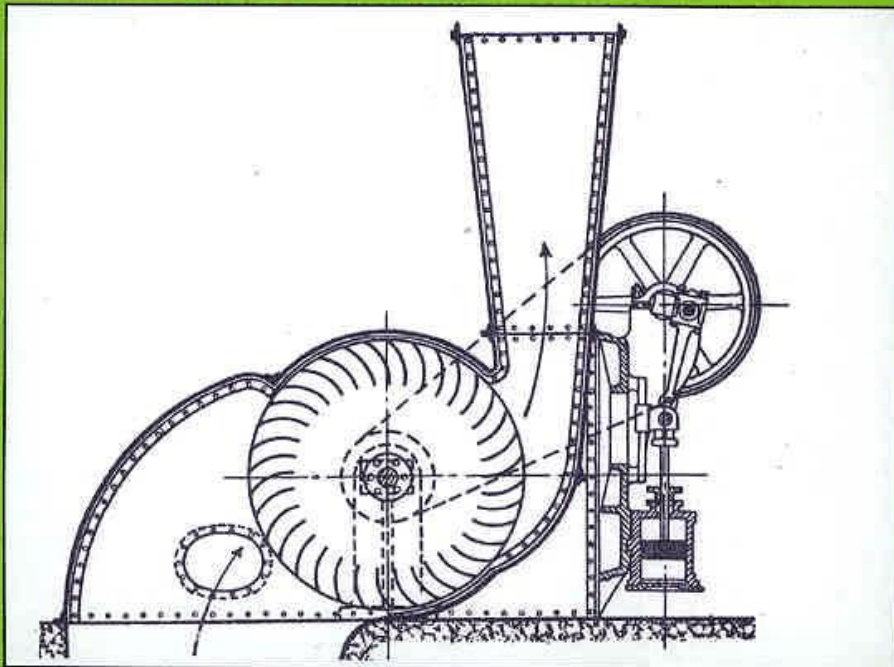
Large M&Y Centrifugal Fan ready for delivery, probably 1960s.
[BSE, 1, 45, April 1977]

MORTIER

Mortier



**Mortier Cross-Flow Fan, French Patent of 1891.
[Building Services Engineering, Billington & Roberts, 1982]**



**Mortier Diametral Fan manufactured by Louis Galland of
Chalon-sur-Saône, c.1900.
[The Fan, Chas H Innes, 1916]**

MUSGRAVE

Henry Musgrave 1827-1922



MUSGRAVE
FANS *and ancillary equipment*

AIR CONDITIONING
DUST REMOVAL
AND COLLECTION
DRYING
FUME AND VAPOUR REMOVAL
HEATING AND VENTILATING
MECHANICAL DRAFT
FINE VENTILATION
PNEUMATIC CONVEYANCE
MUSGRAVE & CO. LTD.

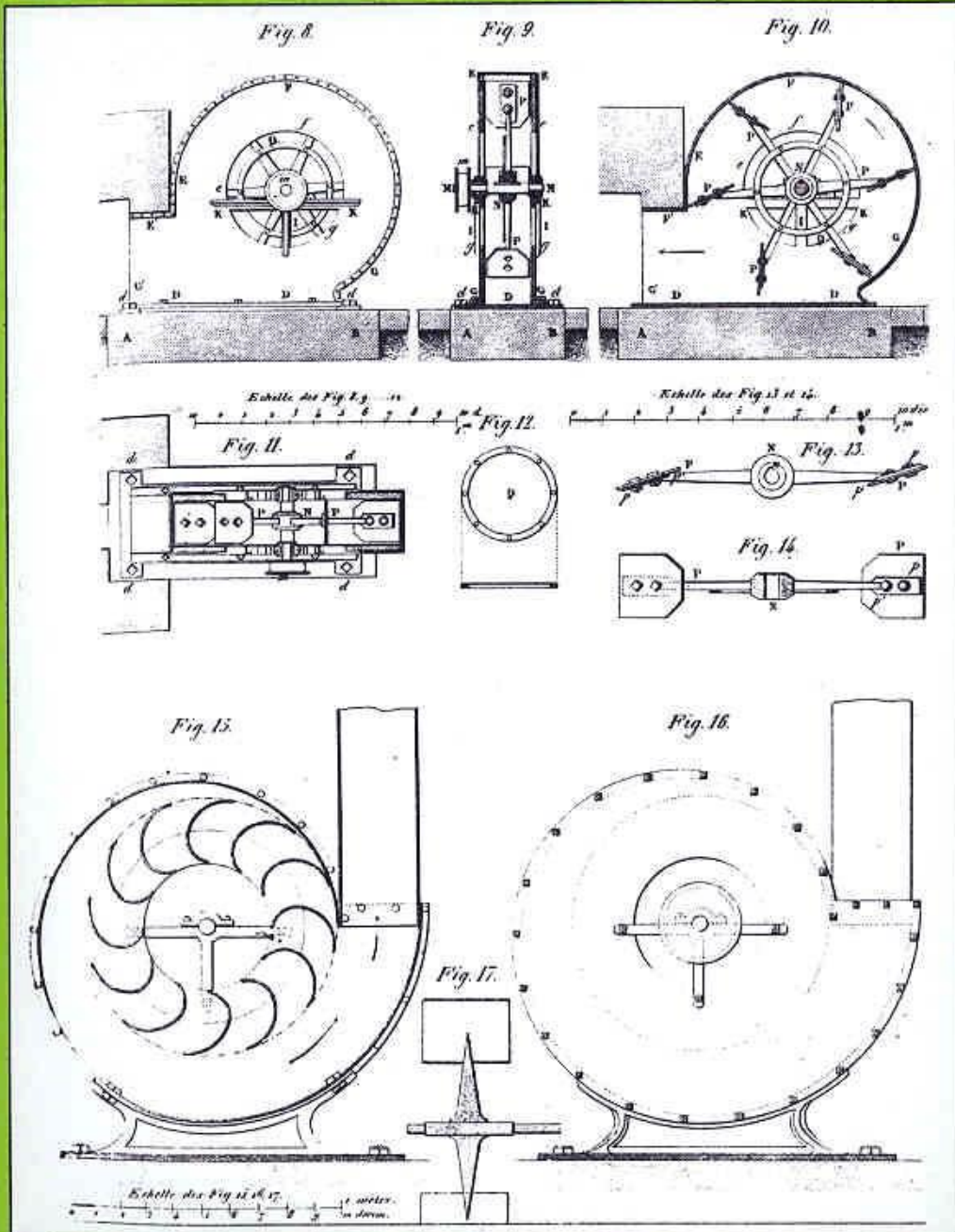
ST ANN'S WORKS
BELFAST

LONDON · MANCHESTER · GLASGOW · BRISTOL · BIRMINGHAM

Musgrave Fans, St Ann's Works, Belfast.
[Year Book of the Heating and Ventilating Industry, 1948]

PECLET

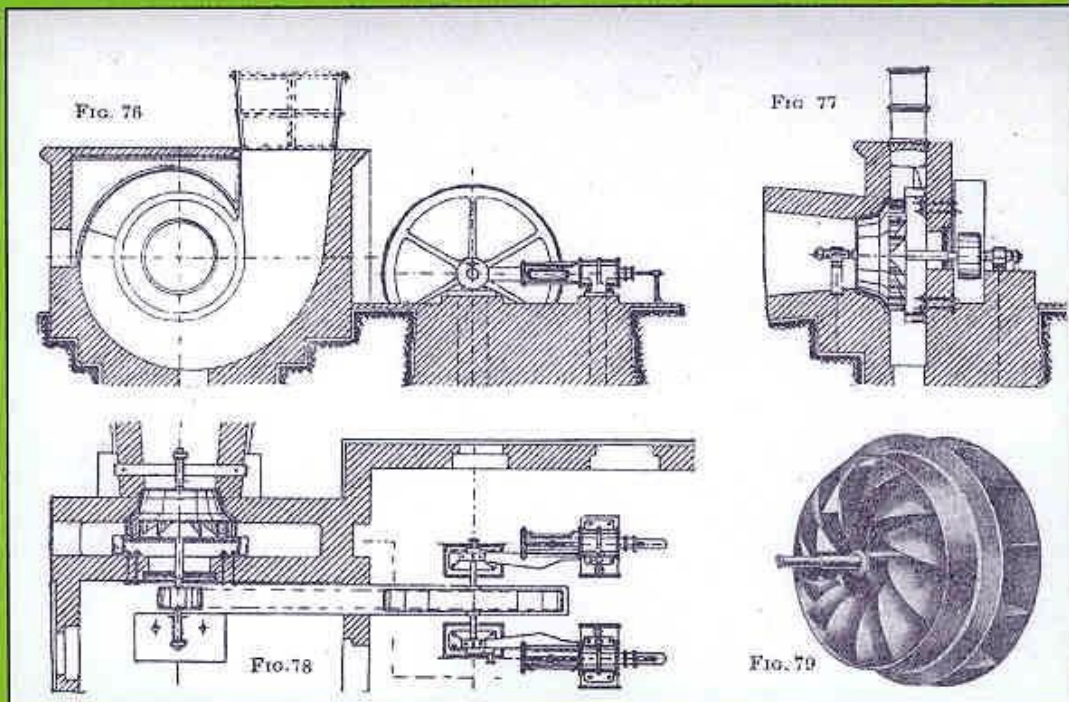
J Claude Eugène Peclét, 1793-1857



Combes Forward/Backward-Bladed Blower.
[Traité de la Chaleur, E Peclét, Paris, 1844]

PELZER DORTMUND

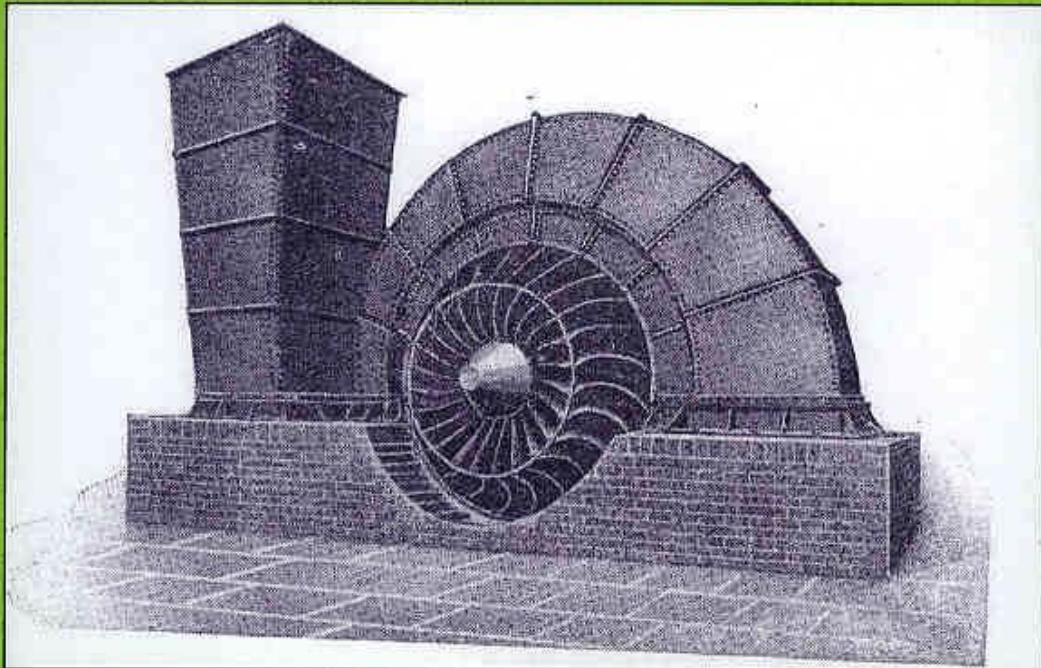
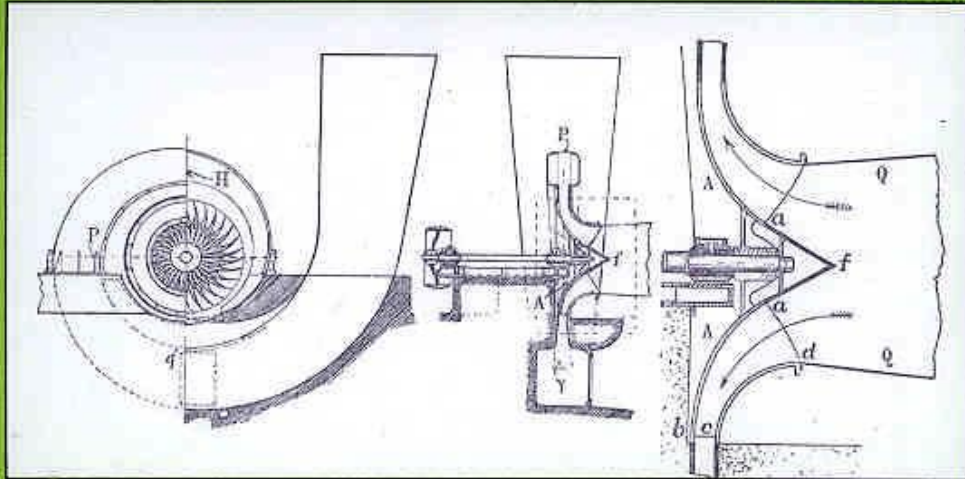
Pelzer Dortmund



Continental Centrifugal Fan, c.1900
[The Fan, Thom H Innes, 1916]

RATEAU

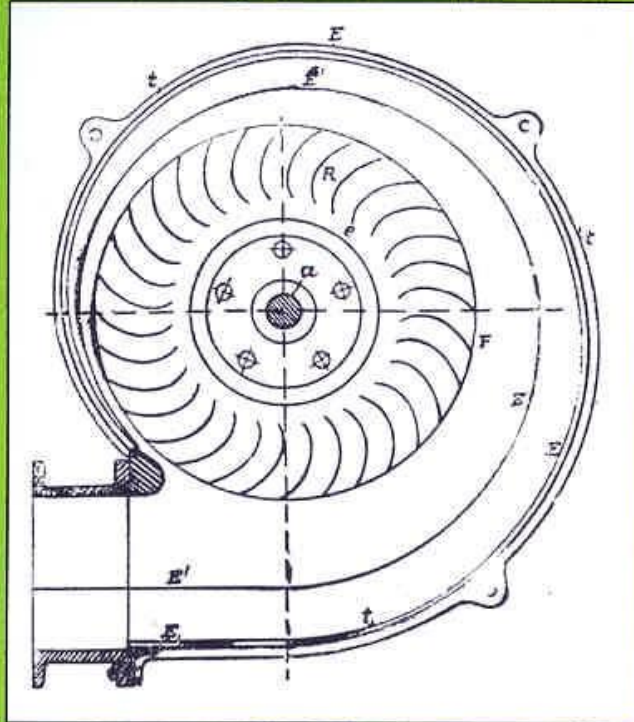
Rateau



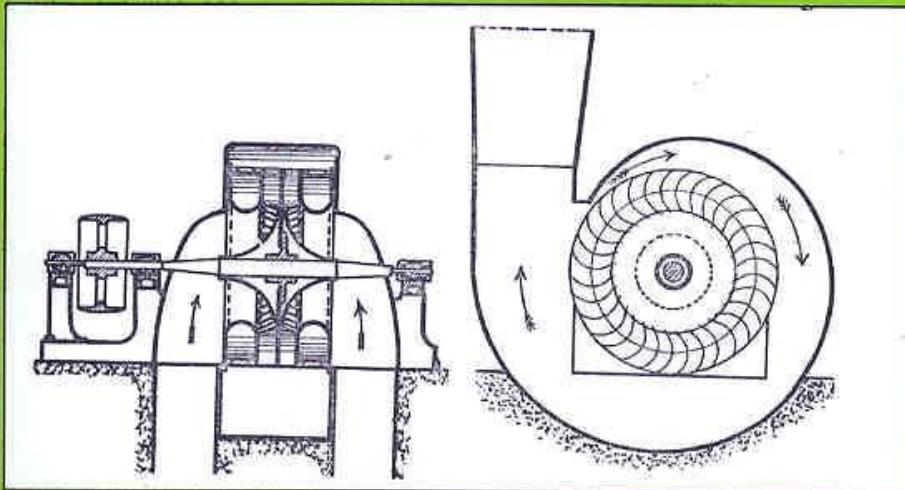
**Rateau Mixed-Flow Fan as used in Belgium, c.1900.
[The Fan, Chas H Innes, 1916]**

SER

Prof Marie Antoine Ser



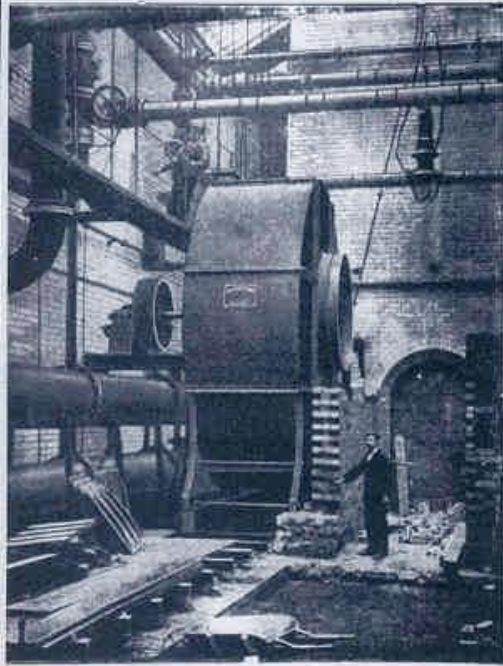
Ser Centrifugal Fan of 1878, French Patent of 1884.
[Heat & Cold, Donaldson & Nagengast, ASHRAE, 1994]



Ser Centrifugal Fan of 1878.
[The Fan, Chas H Innes, 1916]

SIROCCO

Sirocco Engineering Co



Heating—Cooling

Mechanical Draft
for Boilers

Davidson's Patent

SIROCCO

Centrifugal Fans

”

Sirocco Engineering Co.

22 Thames Street, New York

Davidson of Belfast, Patent Sirocco Centrifugal Fan.
[Engineering Review, Sept 1906]

STANDARD & POCHIN

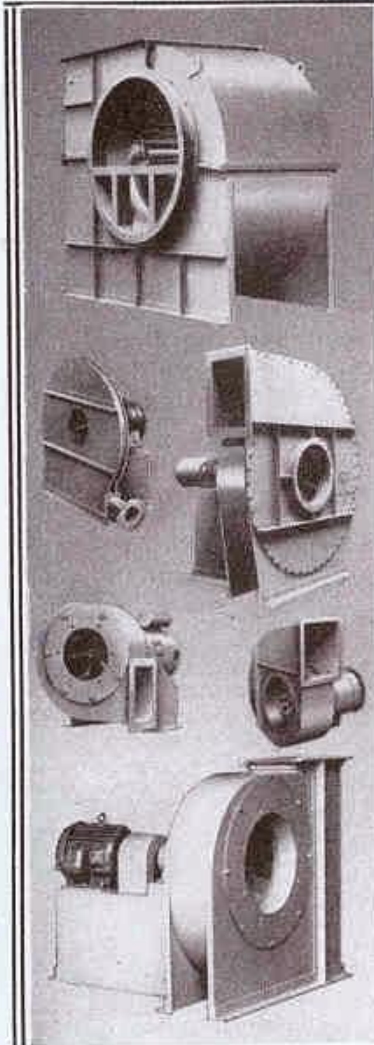
The Standard & Pochin Bros Ltd

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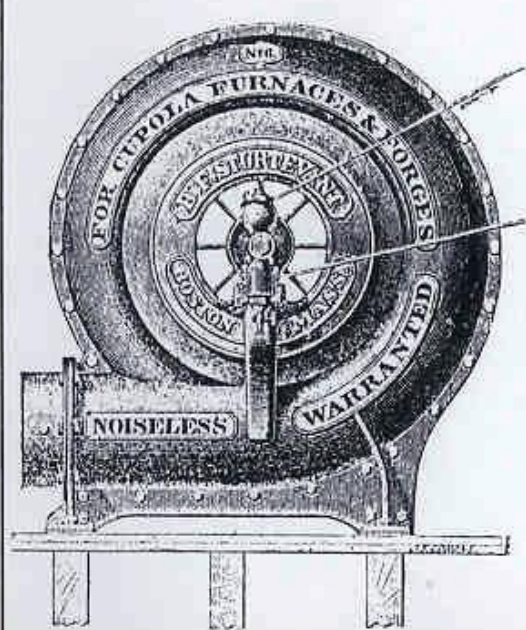
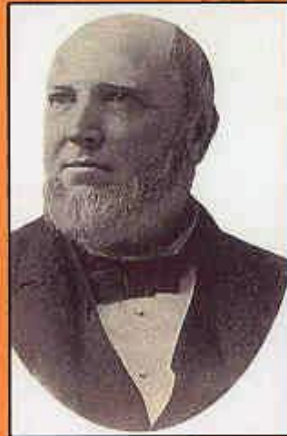
- No. 150B — "CALORAD" RADIATORS
- " 154A — P.X. PRESSURE FANS
- " 164B — P.R. "VARIFORM" FANS
- " 165A — "LEXTRA" ROOF VENTILATORS
- " 169 — MULTIVANE FANS
- " 171 — "CALORIER" UNIT HEATERS
- " 175 — SMALL FANS
- " 177 — P.R. "UNIFORM" PULLEY MOUNTED FANS
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- " 185 — "FLATFIN" AIR HEATERS

OTHER PRODUCTS INCLUDE—
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LECTING UNITS

S&P Fans, Evington Valley Road, Leicester.
[A Guide to Current Practice, IHVE, 1959]

STURTEVANT

Benjamin Franklin Sturtevant



STURTEVANT STEEL PRESSURE BLOWER,
For Cupola Furnaces and Forges.
The Blower which excels all others, producing maximum results with minimum power. Used in the largest establishments in the country, where the strongest blast is required.

STURTEVANT PATENT IMPROVED FAN BLOWER,
For Steam Boilers, Puddling and Heating Furnaces.

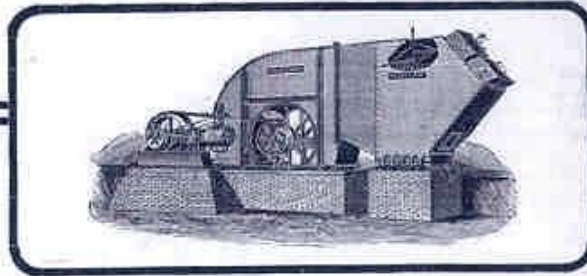
STURTEVANT PATENT EXHAUST FAN,
For removing Shavings and Dust from Wood-working Machines, Dust from Sand and Emory Wheels, and for Ventilation.
Send for Illustrated Catalogue.

B. F. STURTEVANT, Patentee and Sole Manufacturer,
70 & 72 Sudbury St., Boston, Mass.

**Sturtevant Blower of 1862, B F Sturtevant. Boston, Mass.
The Sturtevant Company was operating by 1872.
[Heat & Cold: Mastering the Great Indoors, Barry Donaldson
& Bernard Nagengast, ASHRAE, 1994]**

STURTEVANT

B F Sturtevant Company



STURTEVANT Blowers of all Descriptions.

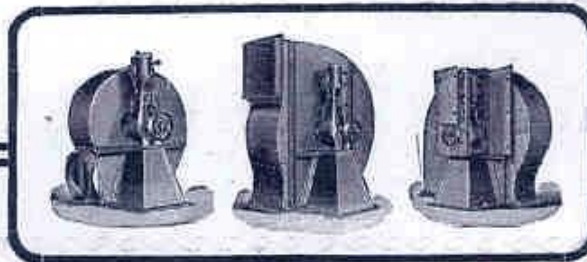
Steam Hot Blast Apparatus for Positive
Ventilation and Heating.

Generating Sets for General Lighting and
Power Requirements.

Steam Traps and other Sundries required for
the Complete Equipment of Heating
and Ventilating Installations.

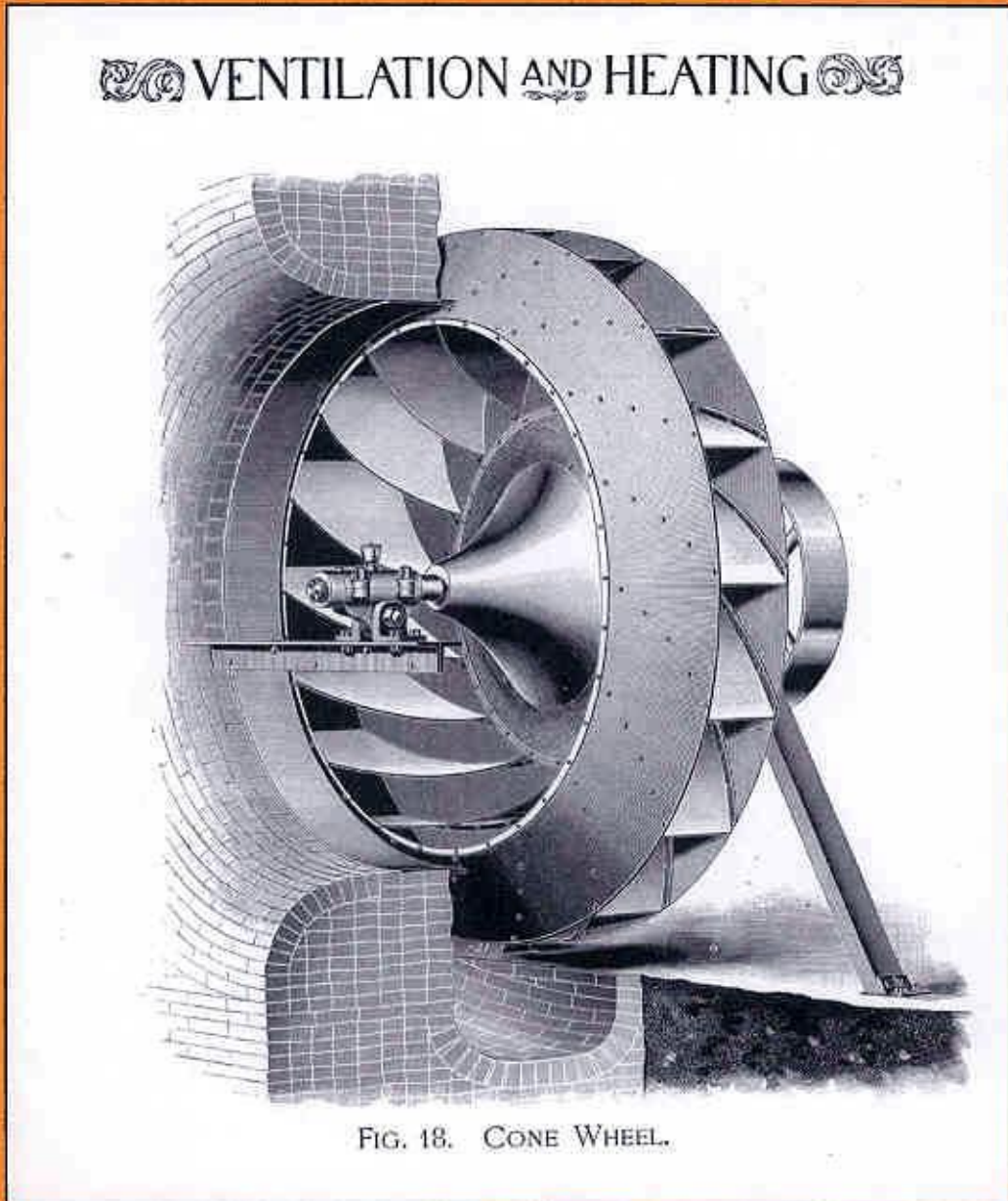
B. F. STURTEVANT CO.
BOSTON, MASS.

New York, Philadelphia, Chicago, London.



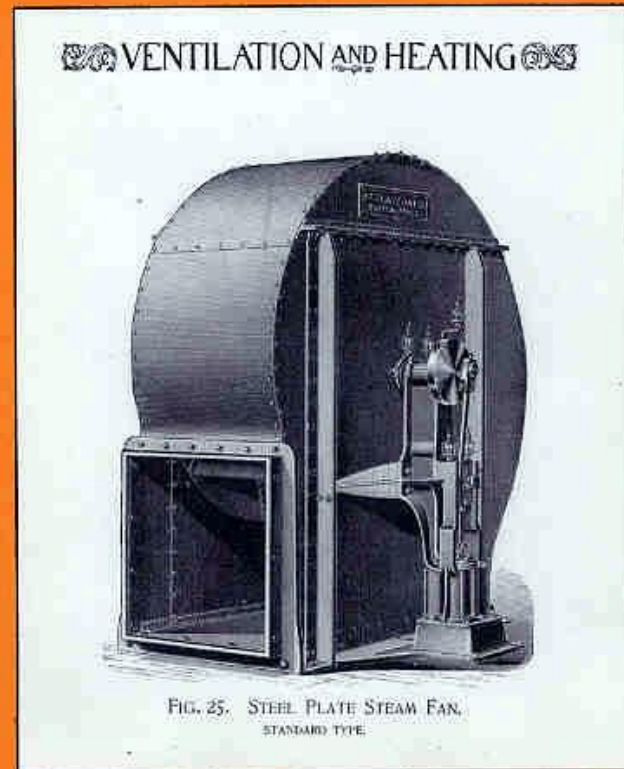
Blowers of all Descriptions, Sturtevant, Boston, Mass.
[Heating and Ventilating Buildings, Prof Rolla C Carpenter, 1910]

STURTEVANT



Cone Wheel Fan.
[Ventilation and Heating, B F Sturtevant, Boston, Mass, 1906]

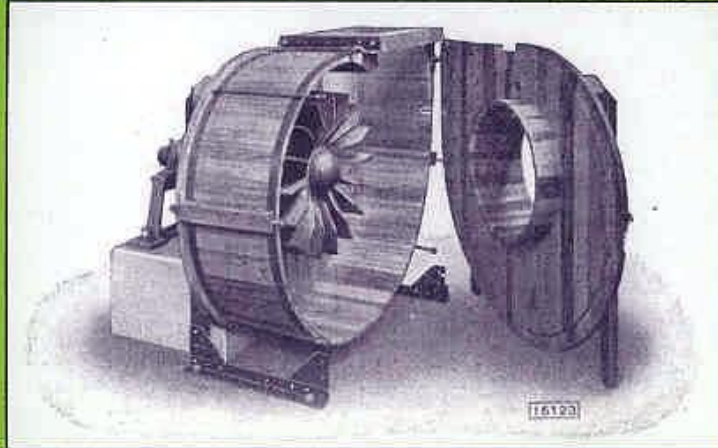
STURTEVANT



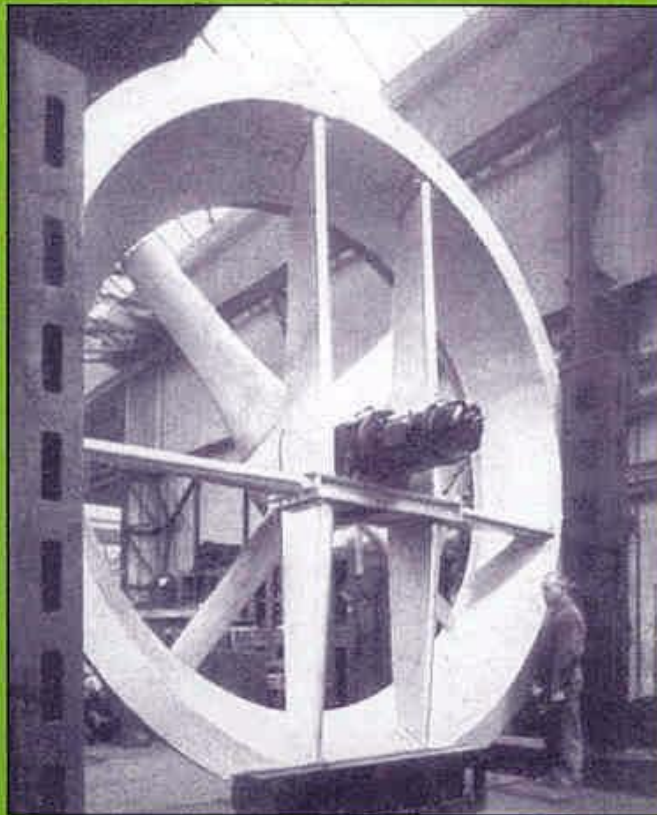
Steel Plate Fans: Electric (top) and Steam.
[Ventilation and Heating, B F Sturtevant, Boston, Mass, 1906]

SULZER BROTHERS

Sulzer Brothers



Fan made completely of wood by Sulzer Bros for handling corrosive fume-laden air, date unknown.
[Fans, Bruno Eck, 1973]



Large Axial-Flow Fan made by Sulzer Bros.
Duty 60 m³/s at 9 mm wg.
[Fans, Bruno Eck, 1973]

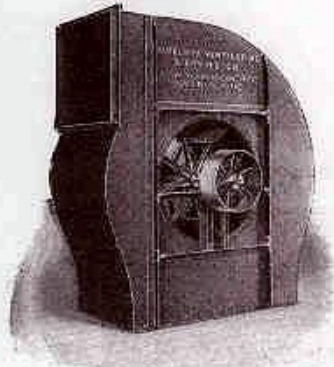
SUTCLIFFE

Oswald Stott, President IHVE 1926-27



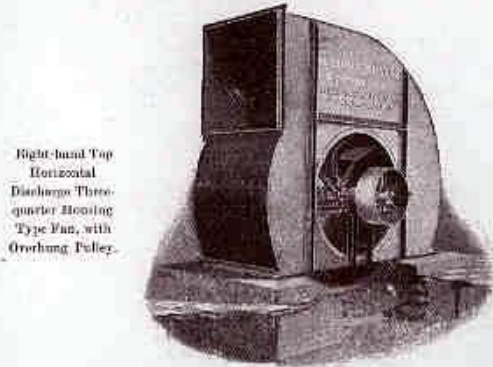
42

SUTCLIFFE STEEL PLATE VENTILATING FANS. BELT-DRIVEN FANS.



Right Hand Top
Horizontal
Discharge Full
Housing Type Fan,
with
Overhung Pulley.

Our Three-quarter Hooped Fans are constructed on the same lines and principles as our Full Hooped Fans. They are mostly used in positions where the height is insufficient for a Full Hooped Fan and are necessary with under-ground shafts where the discharge is directly into the shaft.



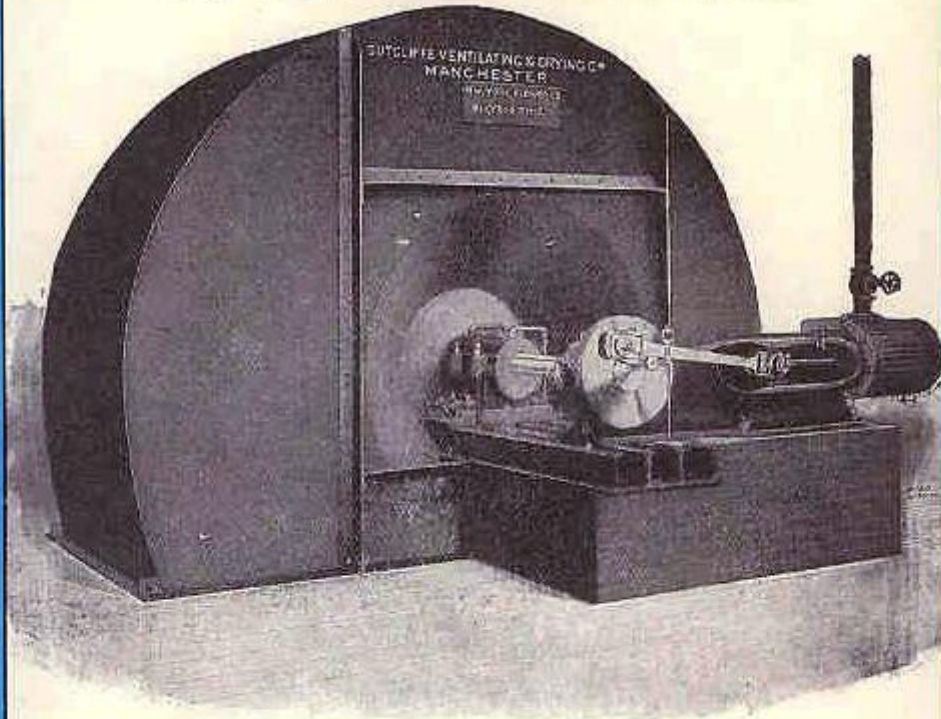
Right-hand Top
Horizontal
Discharge Three-
quarter Hooping
Type Fan, with
Overhung Pulley.

Sutcliffe Steel Plate Belt-Driven Fans.
[The Practice of Ventilation, J D Sutcliffe, 1906]

SUTCLIFFE

48

SUTCLIFFE INDUCED DRAUGHT FAN. FANS DIRECT COUPLED TO STEAM ENGINES.



Three-quarter Housing Type, with Water-cooling Bearing and Special Grillage for Over-hung Fan Wheel and Direct-coupled Engine.
All our Fans are fitted with Ring-girling Ball and Socket Bearings.

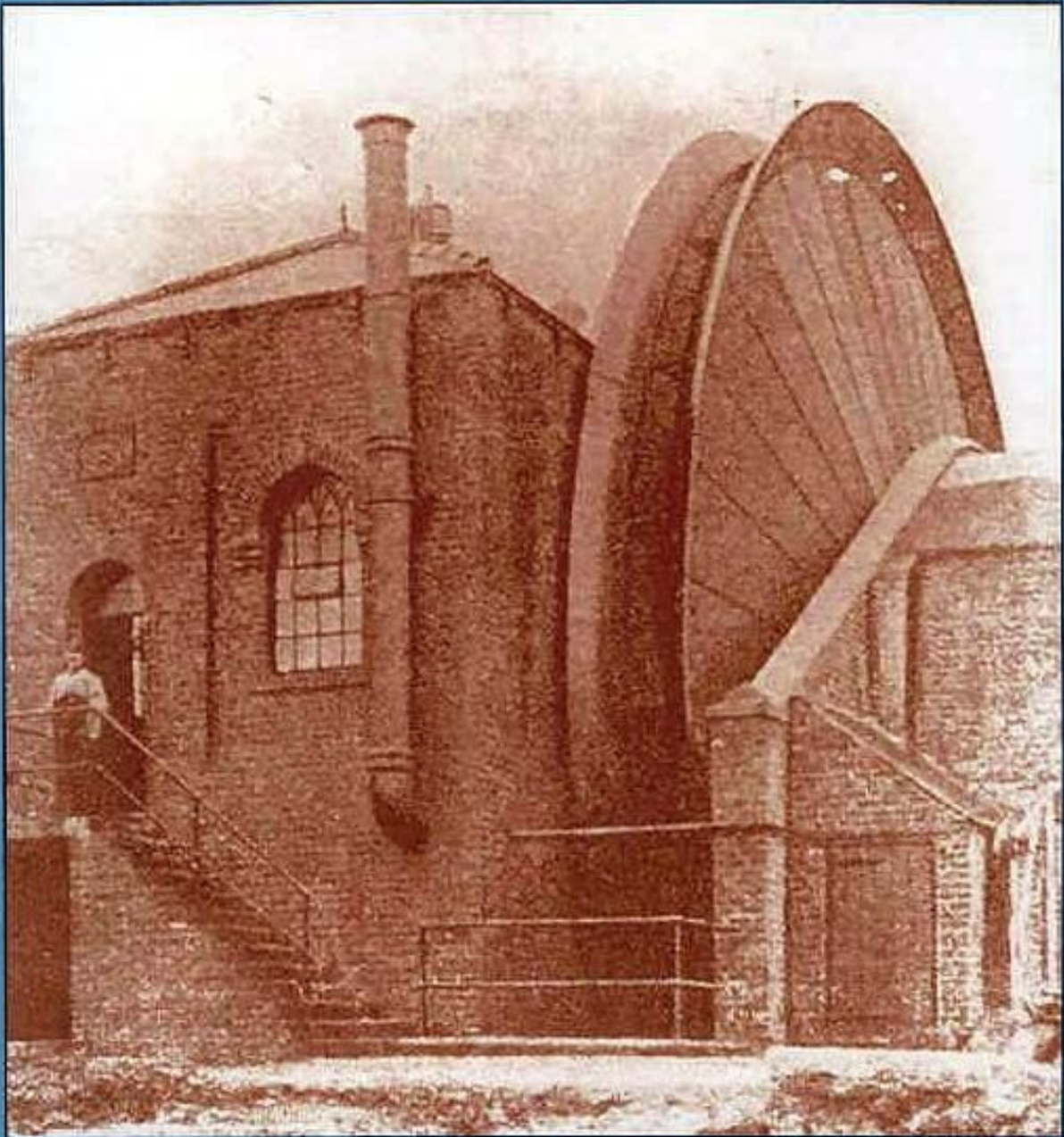


In application and usage our Steam-driven Fans are identical with our Pulley Fans. The direct-connected Engine makes them independent, and variation in speed is easily attainable. Fans can be run with Horizontal or Vertical Engines, or with Electric Motors as preferred.

Sutcliffe Steam Engine Driven Induced Draught Fans.
[The Practice of Ventilation, J D Sutcliffe, 1906]

J. R. WADDLE

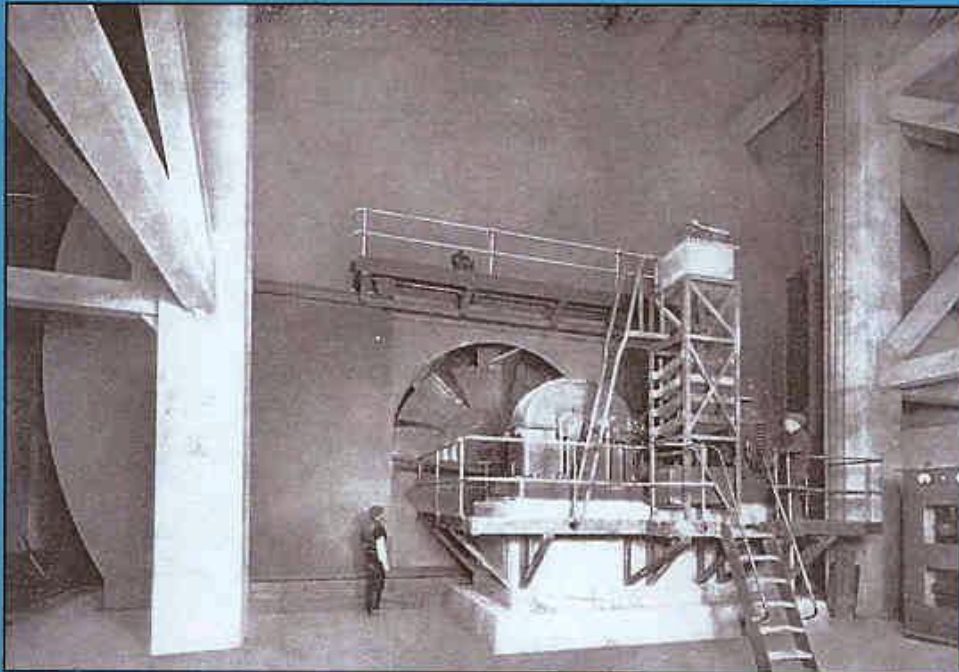
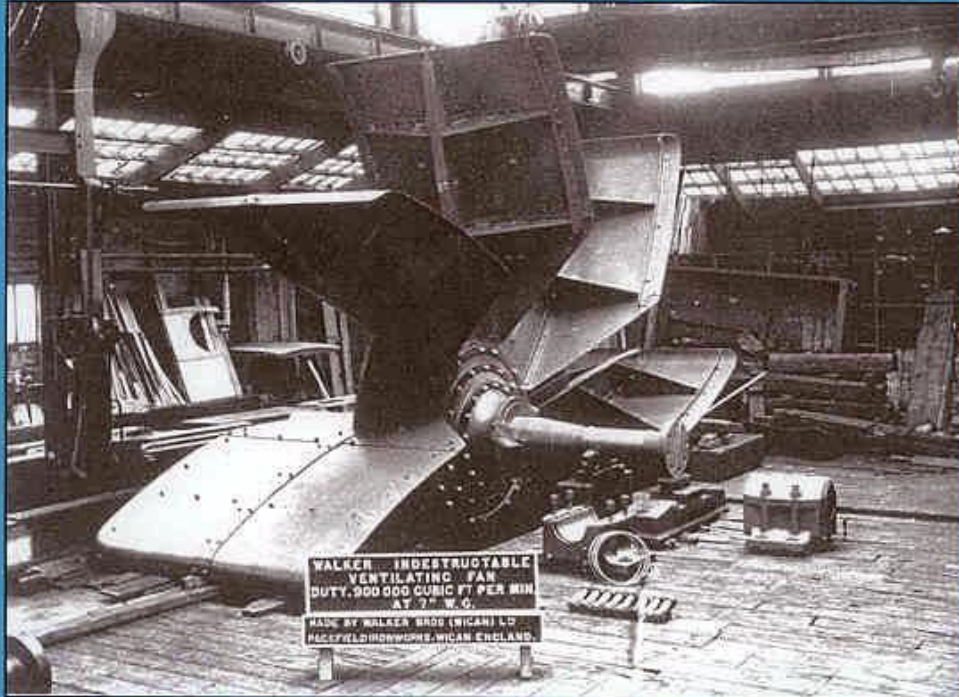
J R Waddle



**Waddle Colliery Fan, Llanelli 1864.
with a so-called expanding rim.
[The Fan, Chas H Innes, 1916]**

WALKER BROTHERS

Walker Brothers



Fan Impeller (above) and Fan Installed by Walker Bros, Wigan, c.1934.
Mersey Tunnel Ventilation, Liverpool.
[Heating & Ventilating Engineer, April 1934 (above)
And Heritage Group Collection]