The Huyett & Smith Connection

Mr Huyett, owner of a successful lumber business in Detroit, employed a young shop foreman Wright D Smith who developed an exhaust fan for the removal of wood shavings. “It had a double cut-off and double discharge and (was) believed by Mr Smith to have a high efficiency and wonderful possibilities.” Patents were obtained and in 1881 a co-partnership was formed by Huyett and Smith to manufacture and sell the fan.

The W D Smith later U.S. Patent of 1886
The W D Smith U.S. Patent of 1886
It was Huyett who funded the venture while “Smith was the inventive genius.” Over the next ten years, the Company manufactured a number of heating and ventilating systems, including the 1888 patented disc fan blower and hot blast apparatus.

Huyett & Smith hot blast apparatus, patented in 1888
Huyett & Smith also manufactured low pressure steam engines, but in 1895 the Huyett & Smith Manufacturing Company became the American Blower Company.
Davidson & Company Ltd & the Sirocco Fan
In Belfast, at what he later named his Sirocco Works, Samuel Cleland Davidson (1846-1921) devised a low-pressure multivane curved blade fan which he patented in 1900. His fan became one of the most successful fans of this period and notable for its quiet operation.

The Sirocco Fan with “multiblade vane wheels and wide configuration”
(Engineering Review, May 1908)
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 $\delta$. 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:

$$\frac{d_1}{d_2} = 0.875; \quad b = \frac{3}{7} d_2; \quad \beta_1 = 64^\circ; \quad \beta_2 = 22^\circ; \quad z = 54.$$

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.”
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

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TRADE

MARK

FANS

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.


1931
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.
American Blower Company

The Company continued to develop heating and ventilating systems. The “ABC System of Heating and Ventilating” featured strongly in its advertising and used slogans such as “ABC Disc Ventilating Fans” and “The ABC Fan System of Heating.” American Blower also offered a complete line of steam heating systems and a variety of low-speed and high-speed electric and steam fan-motor drives.

American Blower had offices in Detroit’s David Whitney Building and in 1898 was operating from premises at 70 Gracechurch Street in London.
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 "strenuousness" 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.

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There are to-day more feed-water heaters in use that are giving their owners a temperature of less than 180° than there are giving over 180°, and the majority of all the heaters in service give no purification whatsoever. Therein are 'The Cochrane’s' different, for they give 208°-210° under normal conditions—with real purification—and are made with every regard for convenience in operating and cleaning. Being built of metals that do not quickly deteriorate they last—indefinitely—and without repairs. The water and exhaust steam coming into direct contact, their efficiency is unaffected by years of service.

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OF MECHANICAL HEATING AND VENTILATION.

ABC Drying Rooms and Drying Machines
FOR ALL MATERIALS.

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BRUSSELS, HAMBURG, STOCKHOLM,
AMSTERDAM, DRAMMEN, WARSAW, MOSCOW, ETC.

17,000 IN USE.
Great Saving in Steam Consumption.

1898
REFERENCES

1973 *Fans*, Bruno Eck, (from the German) Pergamon Press, Oxford


------ *Engineering Review*, magazine USA

------ U.S. Patent Office


------ *Davison & Company*, Graces Guide

Footnote
There is a book (not viewed): *Air conditioning and Engineering: a Treatise of the Technique of Conditioning and Mechanical Movement of Air and the Transmission of Power*....... Published by American Blower Corporation, 1956
The derelict Detroit Factory of American Blower in 2015
APPENDIX I

A listing by the American Blower Company (Trade Mark Sirocco) of early Patent dates.

1901: 27\textsuperscript{th} November
1901: 30\textsuperscript{th} April; 4\textsuperscript{th} June; 30\textsuperscript{th} July; 27\textsuperscript{th} August; 31\textsuperscript{st} December
1902: 21\textsuperscript{st} January
1903: 10\textsuperscript{th} November
1904: 14\textsuperscript{th} June
1905: 19\textsuperscript{th} October
1906: 15\textsuperscript{th} March
1908: 26\textsuperscript{th} May

APPENDIX II

To illustrate the development of the centrifugal fan by the American Blower the full text of a Patent is shown on the pages which follow.

This is U.S. Patent 2,155,631 of April 25, 1939 granted to Edward L Anderson for a BLOWER (Filed June 20, 1936) assigned to the American Blower Corporation.
My invention relates generally to blowers, and more particularly to the construction of the discharge outlet of blowers.

It is the principal object of my invention to increase the efficiency of an enclosed, wheel type blower. Another object of my invention is to increase the discharge capacity of an enclosed blower in a manner such that substantially no air will be drawn by the blower, into the blower housing through the discharge outlet.

The invention consists in the improved construction and combination of parts, to be more fully described hereinafter and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawings, to be taken as a part of this specification, I have clearly illustrated my invention, in which drawings—

Figure 1 is a view shown in side elevation of a blower embodying my invention;

Fig. 2 is a front view of the blower shown in Fig. 1;

Fig. 3 is a diagrammatic view of a blower having a particular type of fan blade and showing the effect of the blade on the air, and

Fig. 4 is a view shown in cross section and taken along the line 4—4 of Fig. 2.

Referring to the drawings by characters of reference the numeral 1 designates in general a fan, or blower housing of the conventional scroll-shaped type formed by a pair of spaced, vertically extending, parallel side walls 2, and a wall formed by a sheet of metal 3 that wraps around and conforms in shape to the scroll-shaped peripheral edges of the side walls 2. The housing 1 may be supported on upright standards 4 that may be secured to the opposite side walls of the housing by bolts 5, or other suitable means. In each of the opposite side walls 2 of the present housing there is provided an aperture or opening 7, and these openings 7 constitute the inlets for the entrance of air into the housing. The openings 7 are preferably circular in shape and in alignment with the inlet openings 11 in the side walls 2 of the housing. A wheel or drum type fan or blower 10 is disposed within the housing 1 and is mounted on the shaft 13 for rotation therewith. The shaft 13 may have one end coupled to the drive shaft of a suitable motor (not shown) for driving the blower 10. The present blower wheel comprises, in general, three spaced, circular ring-like members 16 secured to a hub 17 by spokes or tie-rods 18 and a plurality of 10 spaced blades 19 that extend between, and are connected to, the circular ring-like members 16. The construction of this wheel type blower or fan is well known in the art to which this invention appertains.

The opposite ends of the curved wall 2 terminate in substantially the same vertical plane at one end, or front of the housing 1, and cooperate with the side walls 2 to provide an air outlet or discharge opening 20 adjacent the top of the housing 1. The outlet 20 has its minimum flow area in a plane substantially tangent to and extending from the scroll end of minimum radius, see Fig. 1. The height or dimension of the opening 20 in the plane of minimum flow area is substantially equal to the diameter of the wheel 18 and when the wheel is viewed through opening 20 normal to the plane of minimum flow area, the opening 20 overlies substantially one quarter of the periphery of the wheel, see Fig. 2. In the present instance the curved wall 2 has top and bottom horizontally extending, cutturned flange portions 21 and 22 respectively, that are joined at their end edges to the end edges of vertically and outwardly extending flange portions 23 of the side walls 2. The flange portions 21, 22 and flange portions 23 the there is a U-shaped flanged member 24 suitable for coupling the housing 1 to an air conveying duct (not shown). Placed over the bottom flange 22 and the side flange 23 there is a resilient member 25 that provides a resilient seal for preventing the discharge of air from the housing 1 into the blower housing through the lower region of the discharge outlet. Referring now to the diagrammatic view, Fig. 3, I have shown in this view a blower or fan of the...
wheel type having blades of a particular shape, and have indicated by lines how air is affected by these blades. The blades shown are of the curved type that curve from their longitudinal inner edges outwardly to their lead edges and in the direction of rotation of the blower. These blades are preferable for use on high speed blowers but because of their curvature a blower having blades of this type had, in the past, required a relatively small discharge opening compared to blowers using other types of blades, in order to prevent drawing air into the housing through the lower region of the discharge opening. That is to say, the blower cut-off portion had to extend well above the axis of rotation of the blower to obtain best results from the blower. Instead of pushing the air toward and through the outlet of a housing as other types of blades do, air is flipped off the curved blades and at the outlet of the curved blades bend, more than other types of blades, to draw air back into the housing and create a low pressure area in the lower region of the housing between the ends of the blower wheel and the side walls of the housing. The tendency to draw air into the housing through the outlet is at the sides of the blower wheel, or adjacent to the inlet openings. However, in the past, cut-offs for blowers have extended entirely across a lower portion of the discharge opening with the result that the capacity of the discharge opening was materially reduced with respect to full, or desired capacity.

In order to obtain a relatively larger blower discharge opening, and in a manner so as to increase the efficiency of the blower, I provide a discharge opening defined by wall means including wall portions or baffles that extend from the sides of the housing and converge toward an apex below the axis, and substantially midway between the ends of the blower. To obtain this opening I prefer to employ angle shaped, plate-like corner pieces 27 positioned in the lower corners of the opening 28 to serve as cut-off members for the blower. The corner pieces 27 may be formed of sheet metal and their shape is preferably that of a 45° right angle triangle. Each of the triangular-shaped corner pieces 27 is formed having outturned flanges 18 and 28 extending along its base and vertical side edge, respectively. The horizontal flanges 18 of the corner pieces 27 seat on the horizontal flange 22 of the housing 1, and the vertical flanges 28 abut the inner side of the vertical flange 24 of the housing. The flanges 22, 24, 26 and the U-shaped connecting member 18 may be provided with aligning apertures 29 to receive screws 31 for securing the parts together. The third side of each of the triangular-shaped pieces 27, or hypotenuse, extends from a side wall of the housing 1, as a point slightly above the inlet opening 7 to the horizontal flange 22. The angularly extending sides, or hypotenuse of the cut-off members 27 cooperate to define a V-shaped opening having a downwardly directed apex. The edges of the angularly disposed sides of the corner pieces 27 are preferably curved outwardly, as at 22, Fig. 4, to induce crowding of air over these surfaces and through the discharge opening. The triangular-shaped corner pieces 27 substantially overlying the end portion of the blower wheel, adjacent the inlet openings 7, prevent the blower from drawing air back into the housing between the ends of the blower wheel and the side walls of the housing. By constructing the discharge outlet of a blower housing as herein described, I have found that the efficiency of the blower is increased from approximately 67% to approximately 82%.

While I have herein shown and described a wheel type blower, or fan, having two inlets for the entrance of air, it is to be understood that my invention is equally applicable to the type of blower that has only one air inlet. It will be apparent that in a blower having a single air inlet that only one corner piece need be employed to close the space between the side wall in which the inlet is located and the adjacent end of the blower, for I have found, as previously pointed out, that the discharge opening of the blower need only be provided with a so-called cut-off overlying the above mentioned space. It will also be apparent in fans having a single air inlet that the size or capacity of the discharge outlet may be larger than in blowers having two inlets, since the desired capacity of the outlet will only be reduced by the use of one corner piece.

What I claim and desire to secure by Letters Patent of the United States is:

1. In a blower, a housing of scroll form having an inlet, a blower wheel in said housing, said blower wheel being arranged with one end thereof disposed toward said inlet and spaced from the housing wall having said inlet, an outlet opening in the scroll shaped wall of said housing, said outlet opening having a dimension transverse to the axis of rotation of the wheel substantially equal to the diameter of said wheel and overlying substantially one quarter of the periphery of said wheel, and wall means overlying the space between said one end of said blower wheel and said housing wall and overlying the periphery of one end portion of said blower wheel, said wall means cooperating with said outlet opening to provide an opening of greatest effective discharge capacity without appreciable inwarding of air by said blower wheel through said outlet opening.

2. In a blower, a housing of scroll form having a side wall provided with an inlet, a blower wheel in said housing, said blower wheel being arranged with one end thereof disposed toward said inlet and spaced from said side wall, an opening in the wall of said housing spaced from and substantially parallel with a plane tangent to the periphery of said blower wheel, said opening having a dimension transverse to the axis of rotation of said blower wheel substantially equal to the diameter of said wheel, said opening overlying substantially one quarter of the periphery of said blower wheel, and wall means extending in the plane of said opening and overlying the space between said side wall and said one end of said blower wheel and overlying the periphery of an end portion only of said blower wheel to prevent inwarding of air through said opening by said blower wheel, said wall means cooperating with said opening to provide an air outlet of greatest effective discharge capacity.

3. In a blower, a housing of scroll form having side walls provided with inlets, a blower wheel in said housing, said blower wheel being arranged with its ends disposed one toward each of said inlets in spaced relation to the housing side walls, a rectangular shaped opening in the scroll shaped wall of said housing, said opening being spaced from and in a plane substantially parallel with a plane tangent to the periphery of said blower wheel, said opening overlying substantially one quarter of the periphery of said blower wheel and having a height substantially equal to the diameter of said blower wheel, and spaced triangular
shaped corner pieces positioned in said opening, said corner pieces overlying the spaces between the ends of said blower wheel and the adjacent side walls of said housing and overlying end portions of the blower wheel to minimize indrawing of air into said housing through said opening by said blower wheel, said corner pieces cooperating to form in part a discharge outlet of greatest effective discharge capacity.

4 In a blower, a housing of scroll form having side walls provided with inlets, a blower wheel in said housing, said blower wheel being arranged with its ends disposed one toward each of said inlets in spaced relation to the housing side walls, a rectangular shaped opening in the scroll shaped wall of said housing, said opening being spaced from and in a plane substantially parallel with a plane tangent to the periphery of said blower wheel, said opening overlying substantially one quarter of the periphery of said blower wheel and overlying the space between said one end of said blower wheel and said side wall and overlying an end portion of the periphery of said blower wheel, said corner piece cooperating with the wall defining said outlet opening to provide the largest effective discharge outlet without appreciable indrawing of air through said outlet opening by said blower wheel.

5 In a blower, a housing of scroll form having side walls provided with inlets, a blower wheel in said housing, said blower wheel being arranged with its ends disposed one toward each of said inlets in spaced relation to the housing side walls, a rectangular shaped outlet opening in the scroll shaped wall of said housing, said opening being spaced from and in a plane substantially parallel with a plane tangent to the periphery of said blower wheel, said opening overlying substantially one quarter of the periphery of said blower wheel and overlying the space between said one end of said blower wheel and said side wall and overlying an end portion of the periphery of said blower wheel, said corner piece cooperating with the wall defining said outlet opening to provide the largest effective discharge outlet without appreciable indrawing of air through said outlet opening by said blower wheel.

6 In a blower, a housing of scroll form having side walls provided with inlets, a blower wheel in said housing, said blower wheel being arranged with its ends disposed one toward each of said inlets in spaced relation to the housing side walls, a rectangular shaped outlet opening in the scroll shaped wall of said housing, said opening being spaced from and in a plane substantially parallel with a plane tangent to the periphery of said blower wheel, said opening overlying substantially one quarter of the periphery of said blower wheel and having a height substantially equal to the diameter of said blower wheel, and corner members positioned in the corners of said opening adjacent the wheel axis and having diverging air flow edges curved in the direction of air flow, said corner members overlying the spaces between said ends of said wheel and the adjacent housing side walls and also overlying end portions of the wheel to substantially eliminate indrawing of air into said housing through said opening.

EDWARD L. ANDERSON.