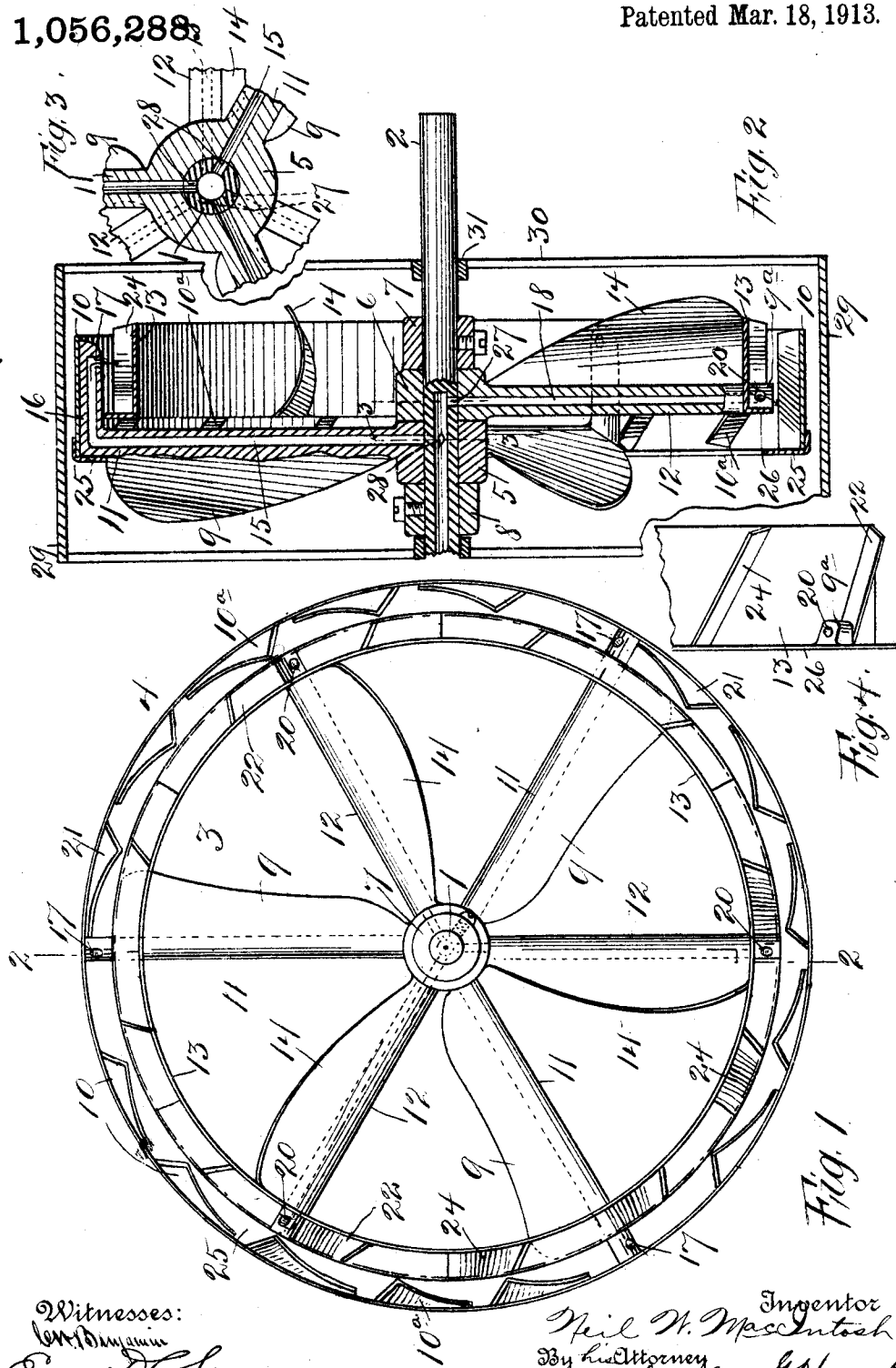


N. W. MacINTOSH.
 ROTARY BLOWER.
 APPLICATION FILED MAY 12, 1911.

Patented Mar. 18, 1913.

1,056,288



Witnesses:
 Edmund D. G. Sperry

Inventor
 Neil W. Macintosh
 By his Attorney
 Charles H. Mearns

UNITED STATES PATENT OFFICE.

NEIL W. MACINTOSH, OF NEW YORK, N. Y., ASSIGNOR TO EDWARD J. SALMORE, OF NEW YORK, N. Y.

ROTARY BLOWER.

1,056,288.

Specification of Letters Patent.

Patented Mar. 18, 1913.

Application filed May 12, 1911. Serial No. 626,759.

To all whom it may concern:

Be it known that I, NEIL W. MACINTOSH, a citizen of the United States, and a resident of the borough of Brooklyn, in the city of New York, county of Kings, and State of New York, have invented a new and useful Rotary Blower, of which the following is a specification.

My invention relates more particularly to a rotary blower though the same may be found advantageous for other uses.

More especially my invention relates to a blower such as may be used to create a forced draft for steam and other boiler furnaces wherever it is desired to forcibly inject increased quantities of air to provide the necessary oxygen to facilitate the rapid combustion of the fuel.

My invention is also adapted to inject a desirable quantity of steam into the boiler furnace and which will be rapidly and very completely mixed with the air as it is injected into the furnace, which also facilitates combustion.

My blower is adapted to be operated by a fluid as distinguished from mechanical means; and this fluid is preferably steam; and in the full embodiment of my invention the fluid which operates the blower commingles with the air injected by the blower and is forcibly injected into the furnace together with the air. Where steam is used as the fluid for operating the blower it may be furnished from the boiler in connection with which the blower is used or it may be furnished from an independent source.

Various blowers have been devised for the above purposes which have been more or less successful, certainly more so than mechanically operated blowers: but the object of my present invention is to increase the speed of the blower, increase its efficiency and use less fluid than heretofore, thereby decreasing the actual cost of operation of the blower. I have found that in a blower constructed in accordance with my invention, a speed can be obtained which is much greater than the speed of any blower heretofore used, and which speed I estimate at from 2500 to 4000 revolutions a minute; and in accomplishing this result I utilize about one third the quantity of fluid (steam) heretofore required for even the lesser speeds. I accomplish this by utilizing the fluid in such a way as to secure the maximum efficiency, where the fluid is of

an expansible nature such as steam. My device is in the nature of a compound blower, utilizing the expansive force of the fluid in a somewhat analogous manner to a compound engine, as well as using its impact force, caused by its velocity, when projected against the acting and reacting parts of the device.

The preferred form of my invention in all its details will be more fully set forth hereinafter.

In the drawing forming a part of this application, Figure 1, is an end elevation of a blower embodying my invention, in the preferred form, Fig. 2, is a horizontal section thereof, taken on the line 2—2 of Fig. 1, and Fig. 3, is a cross section taken on the line 3—3 of Fig. 2, Fig. 4, a plan view of a portion of the inner fan.

I have embodied the broad principles of my invention in a device consisting of two revolving members formed in the nature of fans, which I prefer to arrange to revolve partially concentric with each other; in reverse directions, and the steam is injected into the intermediate space between the fans, and it acts to revolve the fans not only by the force of impact of the injected steam against some part of the revolving bodies, but it also acts on them to propel them through the expansive force of the fluid. That is to say, such an arrangement embodies my invention in the preferred form.

I have shown a shaft 1, through which the steam or other fluid is conducted to the blower and on which I have mounted the revoluble fans and I preferably form the end 2, of this shaft solid or closed. The fluid, which I shall hereafter refer to as steam, is introduced into this shaft from any suitable source, but usually from the boiler in connection with which the blower is used.

Upon the shaft 1, I have arranged two revoluble fans 3, and 4, which I have shown carried upon the hubs 5, and 6, that revolve about the shaft 1, and these hubs are shown as held in place upon the shaft by the collars 7, and 8, on opposite side of the hubs are shown as setting against each other. The fans 3 and 4 are so constructed that their planes or blades, while revolving in reverse directions, project a current of air in the same direction, which is preferably at right angles to their rotation, or parallel with the shaft.

The fan 4, consists of its hub 5, and the radially disposed blades 9, there being three such blades shown, though the number may be varied and a rim 10, which is connected with the extreme ends of the blades, and which I dispose concentric with the shaft 1. The blades 9, of this fan are adapted to propel a current of air into the furnace and the blades are shown curved outwardly and spirally from their spokes 11, and these blades in Fig. 2, will project a current of air to the right, parallel with the shaft. The rim 10, of this fan projects laterally from the spokes 11, and preferably in the direction of propulsion of the air current, to the right Fig. 2, so that it will overlap a portion of the second fan, as will be apparent.

The fan 3, consists not only of the hub 6, and the radially disposed spokes 12, which are preferably of the same number as the spokes of the fan 4, but also of a rim 13, which connects the ends of the several spokes and which I have formed circular, and disposed concentric with the shaft 1. This fan also has blades 14, extending inwardly from the spokes 12, and these blades are curved reversely to those of the fan 4. This is so, because the fans revolve in reverse directions, but are intended to propel the air in the same direction; and the blades 9, and 14, are therefore reversely curved to each other. They are also shown extending in opposite directions from their hubs, the blades 9, extending to the left in Fig. 2, and the blades 14, to the right of their hubs, so that both hubs can travel close to each other. The structure so far described comprises the means for forcing the air into the furnace and the whole device is suitably located for such purpose.

The spokes of each fan are preferably spaced equidistant from each other and the spokes of each fan are preferably spaced the same. It is through these spokes that I preferably conduct the steam which propels the fans and for this purpose a port 15, extends through each spoke 11, from the bore of the hub, through the spoke, and terminating at a point where the steam will be projected against a portion of the opposite fan.

The inner fan 3, in the illustration given in the drawing is adapted to revolve to the left in Fig. 1, while the fan 4, is adapted to revolve to the right. The port 15, of the spokes 11, therefore is conducted by a tubular extension 16, from which the port 15, terminates at the point 17, directed somewhat to the left whereby the steam through these ports will be discharged into the space intermediate the flanges or rims 10, and 13. The ports 18, of the spokes 12 are carried outwardly, and they terminate at 20, slightly toward the right whereby the steam from these ports is also discharged into the space between the rims 10, and 13. Upon the inner

side of the outer rim 10, and upon the periphery of the inner rim 13, I have arranged members against which the steam from both sets of ports will strike, whereby the fans will be forced to revolve in opposite directions; and these members are preferably in the nature of small blades, which I have so positioned as to secure the maximum results from the steam; and so that the space between the rims will be cleared of the steam when the force of the latter has been spent.

On the inner side of the rim 10, I have arranged a blade 21, near each port opening 17, which is arranged diagonally across the rim, and which projects toward the rim 13. On the periphery of the rim 13, I have arranged a blade 22, near each port opening 20, which is also arranged diagonally across the rim, but reversely disposed as to the blades 21, and these blades 22, are directed toward the outer rim 10. The blades 21, and 22 are arranged to pass each other as the fans revolve, preferably close to each other. I prefer to arrange other blades 23, on the rim 10, intermediate the blades 21, and disposed similar thereto. On the rim 13, I also prefer to arrange intermediate blades 24, which are similar to the blades 22.

On the fan 4, is provided an annular plate 25, which connects with the rim 10; and on the fan 3, I provide a similar annular plate 26, which is secured to the rim 13; and these plates, together with the rims form a sort of chamber for the steam projected from the several ports, leaving one side open in the direction in which the air and steam are propelled by the fans.

In the shaft 1, through the bore of which the steam is supplied I provide a series of ports for the spokes of each fan, which open from the bore of the shaft and are intermittently in communication with the ports of the spokes. I have provided ports 27, in the shaft, which I prefer to make equal in number to the several spokes 12, of the inner fan and I prefer to space these about the shaft so that they will each register with a port 18 of the spokes 12, of the inner fan, simultaneously. I have also provided ports 28, in the shaft, and I also prefer to form as many such ports as there are spokes in the outer fan 4; and I prefer to space these equidistant from each other so that they will each register with a port 15, of the spokes 11, of the outer fan, simultaneously. I prefer not to arrange the ports 27, and the ports 28 in line with each other in the longitudinal direction of the shaft, nor to arrange them in equidistant staggered relation, but to arrange them with a slight "lead," preferably so that the following operations will result.

When the steam is admitted in the bore of the shaft it will pass through the ports in each hub and each spoke of each fan. The

steam emitted from the openings 17, which comes through the spokes 11, will pass into the space intermediate the rims 10 and 13, and the steam emitted from the openings 20, which comes through the ports 18, in the spokes 12, will also pass into the space intermediate the rims 10, and 13. These two sets of jets of steam being projected in reverse directions or substantially toward each other, will cause the fans to revolve rapidly in opposite directions; and the result of their revolutions will be to cause their blades 9 and 14, to force a current of air in the direction of the shaft, which will be projected into the furnace; and the steam utilized to revolve the fans will be taken up by the current of air and will also be projected into the furnace. This action is an improvement over that secured in the apparatus set forth in my U. S. Letters Patent No. 608377 wherein the steam of one fan is simply projected against air. This action alone, I consider an improvement over all known blowers and I will claim the same herein, aside from the other elements of my invention, as well as in combination therewith.

The jets of steam projected from the openings 29, will strike the blades 21, of the outer fan, while the jets projected by the openings 17, will also strike the blades 22 of the inner fan, which will tend to force the blades 21, and 22, apart; and thus to revolve the fans in reverse directions. The jets of steam, acting upon each other, and acting and reacting upon the blades 21, and 22, set up a very rapid motion in the fans. This utilizes to the highest extent, the impact force caused by the velocity of the steam injected into the apparatus. The steam injected into the space between the rims 10 and 13, is to a certain extent confined in a chamber, defined by the two rims, and the annular plates 25 and 26, which is subdivided by the blades 21 and 22, and the expansive force of the steam acts upon the blades 21, and 22, and has a tendency to force them apart and thus revolve the fans in the same direction as the motion caused by the first action. If steam is admitted to the space between the rims 10 and 13, at a time soon after the openings 17, and 20 pass each other, and is then cut off, as will be the case in the device shown, the size of the chamber in which the steam is received will be gradually increased as the fans revolve, by reason of the movement of the blades 21 and 22, away from each other and therefore the expansive force of the steam will be utilized in a somewhat similar manner to a compound engine and the maximum results will be obtained. I prefer to employ the intermediate blades 10 and 24 which are in fact similar in their effect to the blades 21 and 22. When the steam has

performed its work it will pass from the space between the rims and will be taken up by the current of air caused by the fan blades and will be mixed therewith and injected into the furnace.

In order to guard the fans and to direct the air current I preferably provide a hood or casing 29, cylindrical in shape and concentrically inclosing the fans, which casing can be mounted in any suitable or usual manner.

If the steam were passed continuously into the spokes the maximum results from a minimum of steam would not be obtained and for that reason I prefer to use the intermittently registering ports. The parts 27 and the parts 28, I prefer to place in such relative positions, that all the ports of the shaft will register with the ports of the spokes of the fans simultaneously, and at a time when the holes 17 and 20, have just passed each other, so that the jets of steam from said holes will be projected against each other and will then be cut off by the passing of the spokes beyond the ports of the shaft. After a partial revolution of the fans (a third revolution where there are three spokes in each fan) the ports of the shaft and of the fans will again register and so on. During the period when the ports are closed the force of the steam is being consumed and the latter is being cleared from the fan.

I have described in detail the preferred embodiment of my invention, but it is evident that changes may be made therein without departing from the broad spirit of my invention.

Having described my invention, what I claim is:—

1. In a device of the character described, a shaft, and a plurality of fans adapted to revolve in directions reverse to each other, and to propel a current of air in the same general direction when reversely revolving, means for directing a discharge of fluid from each of said fans, means on each fan against which the fluid from the other fan is adapted to act, whereby the fans will be revolved in reverse directions.

2. In a device of the character described, a shaft, and a plurality of fans, adapted to revolve in directions reverse to each other, and to propel a current of air in the same general direction when so revolving, means on said fans forming a fluid chamber, means for directing a discharge of fluid from each of said fans into said chamber, and means in said chamber, on each fan, and on which said fluids are adapted to act, to cause the revolution of the fans in reverse directions.

3. In a device of the character described, a shaft, and a plurality of fans adapted to revolve in directions reverse to each other, and to propel a current of air in the same

general direction, when so revolving, means on said fans forming a fluid chamber, means for discharging an expansible fluid into said chamber, and means on said fans adapted to be acted upon by the expansion of said fluid, whereby the fans will be revolved in reverse directions.

4. In a device of the character described, a shaft, and a plurality of fans, adapted to revolve in directions reverse to each other, and to propel a current of air in the same general direction, when so revolving, means on said fans forming a fluid chamber, means for discharging an expansible fluid into said chamber, and means on said fans adapted to be acted upon by the expansion of said fluid, and to be moved apart thereby, whereby the fans will be revolved in reverse directions.

5. In a device of the character described, a shaft, and a plurality of fans adapted to revolve in directions reverse to each other and to propel a current of air in the same general direction when so revolving, means on said fans forming a fluid chamber, means for discharging an expansible fluid from each of said fans, whereby the discharges will act against each other to revolve the fans in reverse directions, and means on said fans adapted to be acted upon by the expansion of said fluids to also cause the fans to revolve in reverse directions.

6. In a device of the character described, a shaft, and a plurality of fans adapted to revolve in directions reverse to each other, and adapted to propel a current of air in the same general direction when so revolved, means on said fans extending at right angles to the air current and forming a fluid chamber opening in the direction of motion of the

air current propelled by the fans, blades on said fans, and in said fluid chamber, arranged diagonally on the fans, and means for directing a discharge of fluid in said fluid chamber, whereby the fans will be revolved in reverse directions.

7. In a device of the character described, a shaft, and a plurality of fans arranged parallel to each other and adapted to revolve in directions reverse to each other, said fans comprising hubs revoluble on said shaft, and radial spokes, said spokes and hubs having ports therein, blades carried by said spokes, the blades of each fan being adapted to propel a current of air parallel to the fans and in the same general direction when the fans are reversely revolved, plates on the outer ends of the spokes of each fan, the plates of the fans being concentrically arranged and forming an annular chamber opening in the direction of the air current propelled by said fan, blades on the plates of each fan, and in said chamber, the last blades of one fan being directed toward those of the other, the ports of said spokes being adapted to discharge fluid into said chamber, the ports of one fan being directed toward those of the other fan, whereby the fluid will cause the fans to revolve in reverse directions, said shaft having ports with which the ports of the several spokes intermittently register.

Signed at the city, county and State of New York, this 10th day of May 1911.

NEIL W. MacINTOSH.

Witnesses:

EDWARD D. C. SPERRY,
ANNA L. BAUER.