

C. M. SPALDING.  
 ROTARY FAN.  
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930,701.

Patented Aug. 10, 1909.

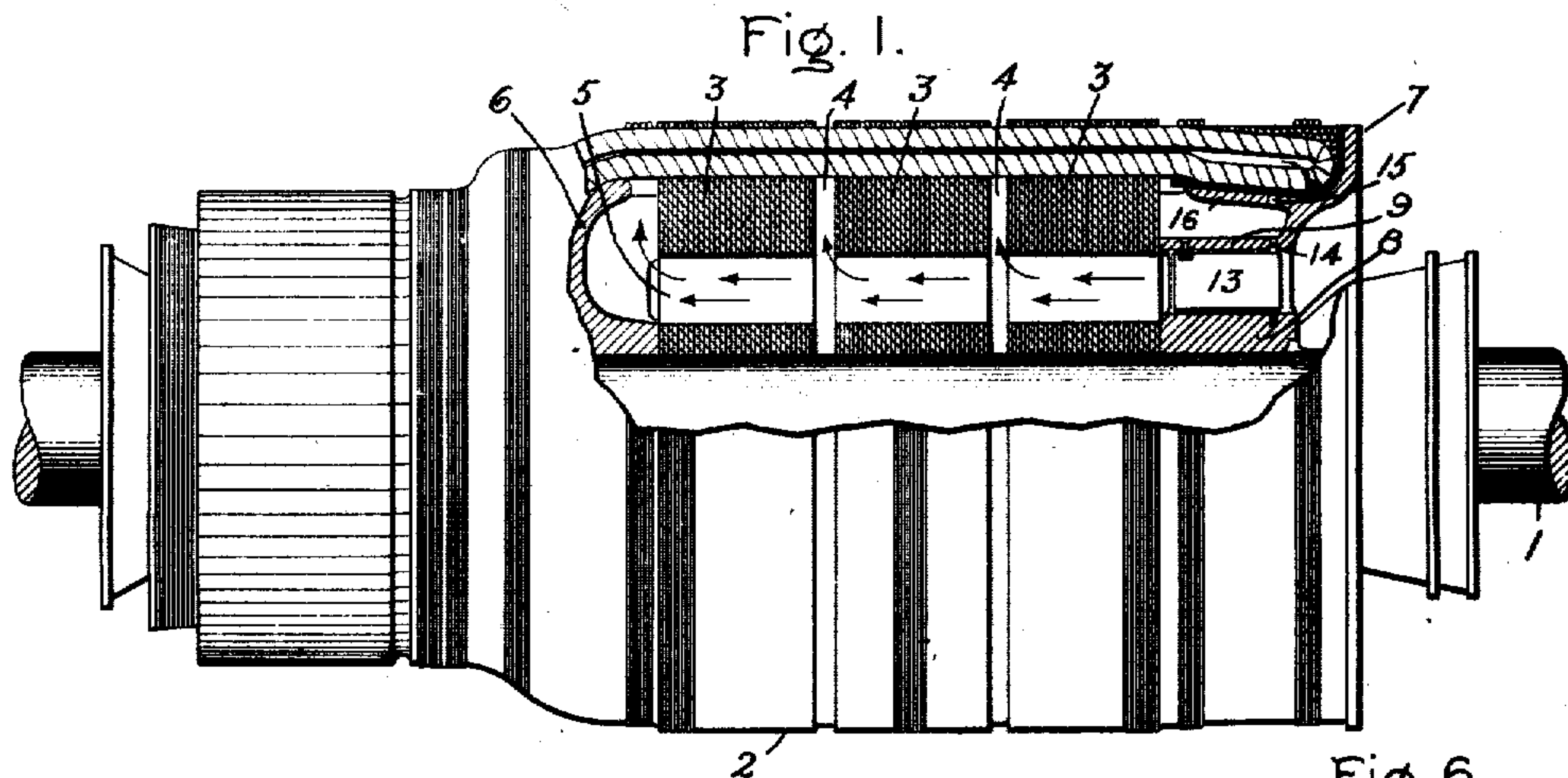


Fig. 2.

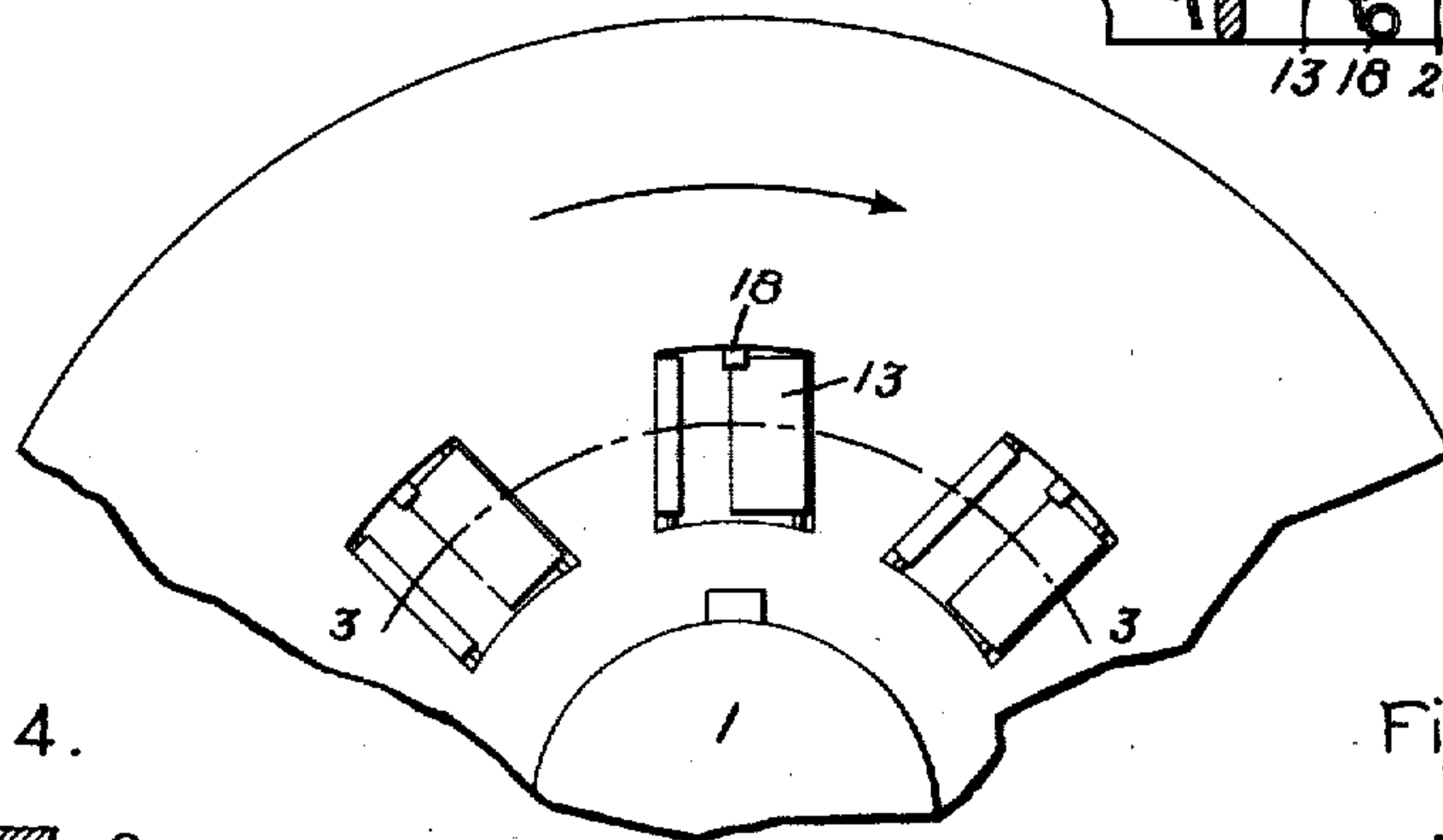
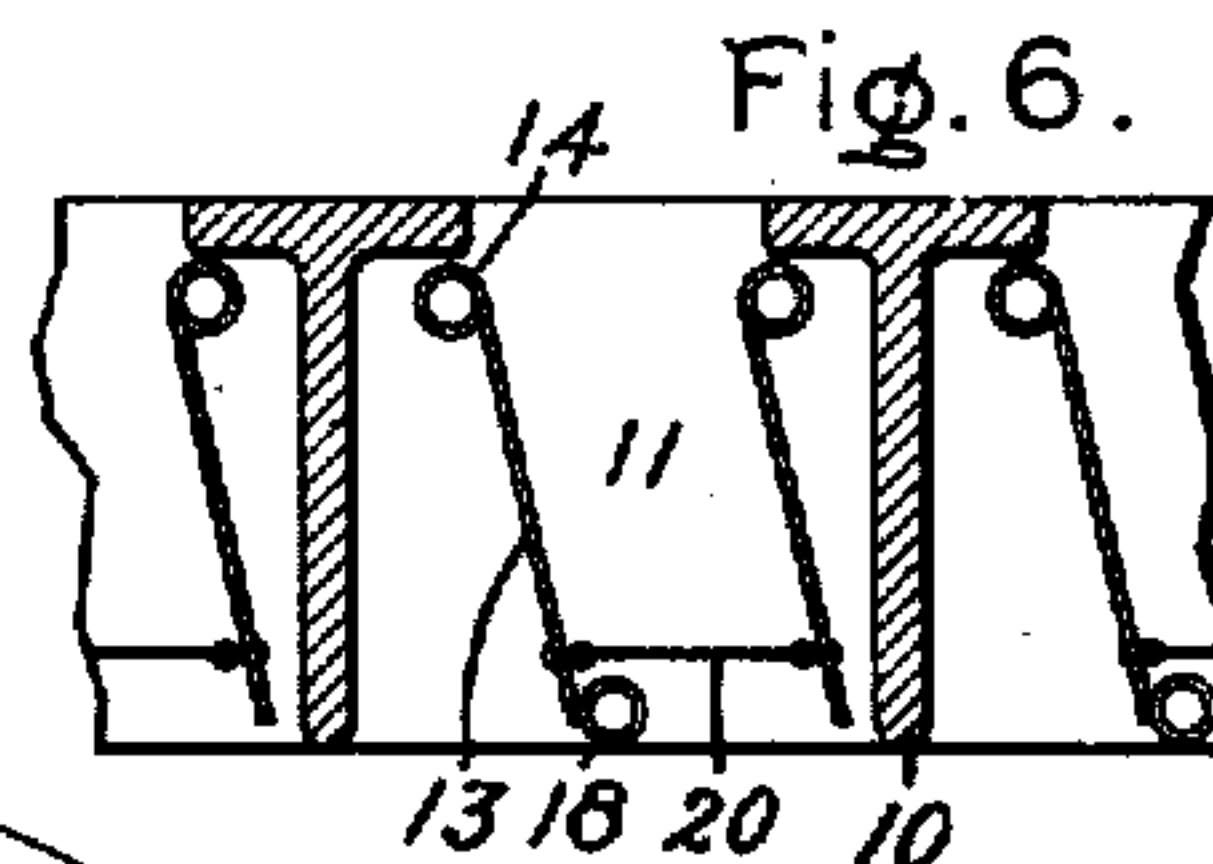


Fig. 4.



Fig. 5.

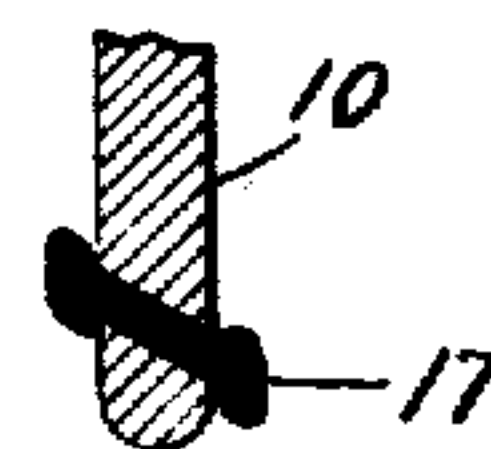
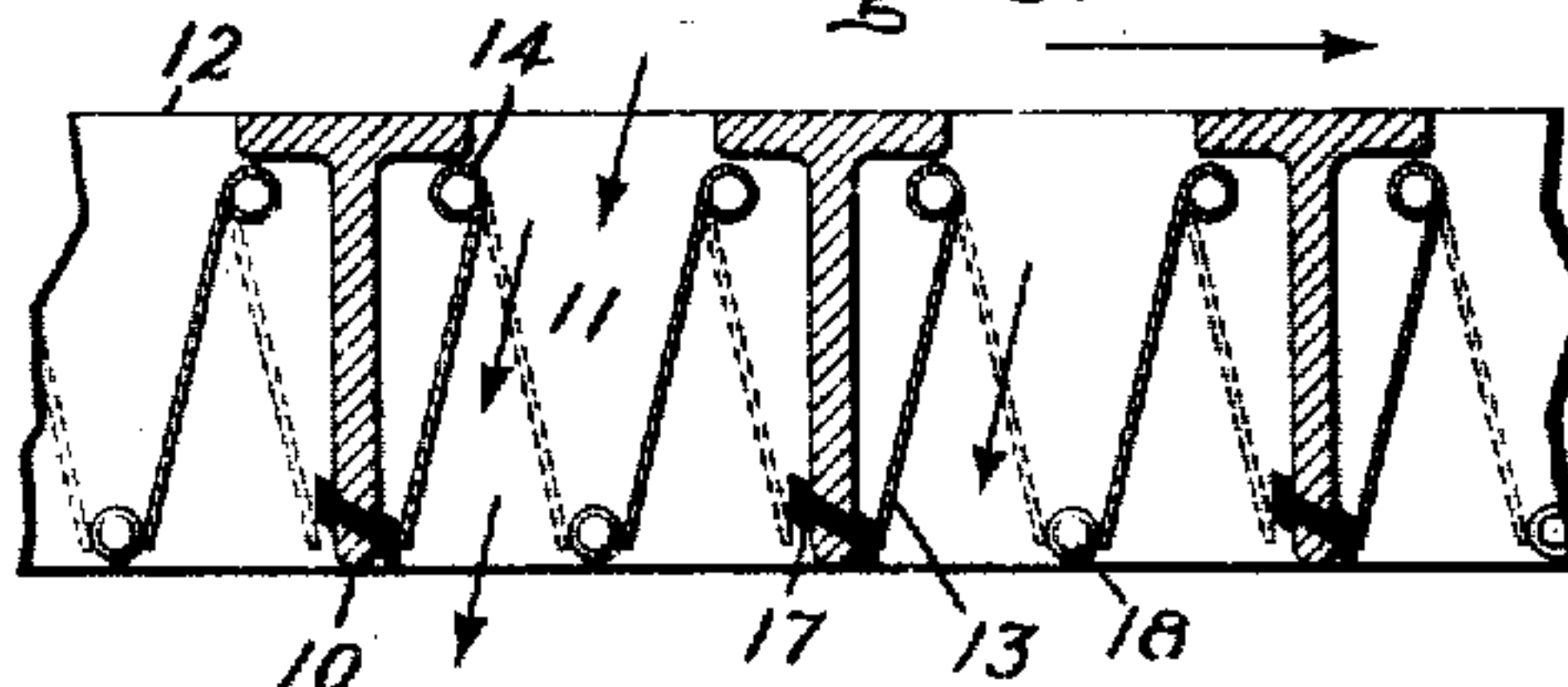


Fig. 3.



Witnesses.

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 Att'y.



# UNITED STATES PATENT OFFICE.

CHESTER M. SPALDING, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## ROTARY FAN.

No. 930,701.

Specification of Letters Patent.

Patented Aug. 10, 1909.

Application filed December 22, 1902. Serial No. 136,235.

*To all whom it may concern:*

Be it known that I, CHESTER M. SPALDING, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Rotary Fans, of which the following is a specification.

The fan which I have invented is especially useful when applied to a rotating machine element to produce currents of air or other fluid for cooling the machine when it is rotated and consists, in the preferred form, of a series of fan blades which are substantially in the same plane of revolution and are mounted about the axis of some rotating machine element, as for instance the armature of a dynamo-electric machine. These fan blades or vanes have two operative positions, one for each direction of rotation, and are moved automatically into the proper position upon the initial rotation of the machine element in either direction.

For a better understanding of my invention, reference may be had to the accompanying drawings, in which—

Figure 1 is an elevation partly in section showing the rotating armature of a dynamo-electric machine provided with my invention; Fig. 2 is an end elevation; Fig. 3 is a developed section taken on the line 3-3 of Fig. 2; Figs. 4 and 5 are details of the stops employed; and Fig. 6 is a view similar to Fig. 3 showing a modification.

In the drawing 1 represents the shaft upon which is mounted the armature 2 of a dynamo-electric machine. The armature which I have shown is of the ventilated type, the core laminæ being divided into groups 3, the groups being separated to leave ventilating spaces 4. Parallel to the shaft 1 are formed other ventilating spaces or passages 5 which are connected with the ventilating spaces 4.

The laminated core of the armature is located between armature heads 6 and 7. The armature head 6 is of the ordinary construction employed in machines of this type as is the armature head 7 save as it is modified by my invention.

The armature head 7 has a face portion which is shown as dish-shaped with the concave side out and a hub portion 8 extending inwardly from the face of the head. Concentric with the hub and separated there-

from by some distance is a circumferential rib or flange 9 which extends from the inner side of the head. Radial arms 10 connect the flange 9 with the hub 8 thus dividing the annular space between the hub and the flange into a series of axial channels 11. Openings 12 are formed in the face of the head 7 leading into these channels. These openings are approximately rectangular and are somewhat narrower than the channels 11 as indicated in Fig. 3. The sides of these openings are shown as parallel to each other and to the radius passing midway between them.

Within each channel 11 are placed a pair of fan blades or vanes 13. The fan blades, which are preferably made of sheet metal, are shown as substantially plane though other shapes may be employed if desired, and are pivotally mounted on pintles 14 placed closely adjacent to the side edges of the openings 12. In the construction which I have shown in Fig. 1 the pintles are shown secured in position by having their inner ends screwed into threaded sockets in the hub 8. Their outer ends rest in holes in the flange 9. Any suitable means may be employed for securing the pintles in position. Openings 15 are formed in the flange 16 to allow the pintles to be inserted in position.

In the construction shown in Fig. 3 the movement of each blade in the direction of the adjacent arm 10 is limited by means of a rubber plug 17 which is passed through openings in the arm 10 as is clearly shown in the drawing. These openings are formed at an angle for reasons of construction. The movement of the blades in the opposite direction is limited by stops 18 which are screw-connected or riveted to the flange 9 adjacent the inner end of the flange and centrally located with respect to the openings 12. These studs may be provided with a rubber bearing surface 19 if desired to reduce the noise and jar which otherwise would accompany the shifting of the blades.

In the operation of my invention the initial rotating movement of the shaft 1 in the direction indicated by the large arrows in Figs. 2 and 3 will throw the rearward blade of each pair of blades 13, having reference to the direction of rotation of the shaft, against the stop 17 while the other blade will be thrown back against the stop 18. The



blades will then be in the position shown in full lines in Fig. 3 and will operate as the blades of a screw fan to force air through the core in the directions indicated by the small arrows in Figs. 1 and 3. Upon a reversal of the rotation, the blades will be moved into the dotted position shown in Fig. 3 and will still operate to force air through the core.

In Fig. 6 I have shown the fan blades 13 as connected by a link 20. With this construction the stop 17 may be dispensed with, as a single stop midway between each pair of blades is sufficient to limit the movement of each blade. This construction has the further advantage that with it there is no tendency of the blades to separate at their free ends to the widest extent as might occur with the other construction, which is not conducive to the highest efficiency of the fan.

Other arrangements and constructions than those shown may be employed without departing from the spirit of my invention which I do not consider to be limited in its broader aspects to the particular construction herein shown or described. For instance, a single blade may be employed in each channel under some circumstances or the fan employed may be of the centrifugal type rather than of the screw-propeller type shown.

What I claim as new and desire to secure by Letters Patent of the United States, is,

1. In combination, a rotating element, a series of fan blades carried thereby and arranged substantially in the same plane of revolution, said fan blades being pivoted to said rotating element, stops carried by said rotating element for limiting the movement of said fan blades, said stops being arranged relative to the fan blades so that the blades are free to swing from a position in which a rotation of the element in one direction will cause a movement of air parallel to the axis of rotation of the element to a position in which a rotation of the element in the opposite direction will cause a similar air movement.

2. In combination, an element rotatable about an axis, fan blades carried thereby and arranged substantially in the same plane of revolution, said fan blades being loosely pivoted to said element, and stops for limiting the movement of said fan blades, said stops being arranged relative to the blades so that when the element rotates in either direction the fan blades will generate air currents moving parallel to the axis of rotation in the same direction.

3. In combination with the armature of a dynamo-electric machine provided with ventilating passages, an armature head, said armature head being provided with axial channels opening toward the ventilating passages of said armature, a pair of fan

blades placed in each of said channels, said fan blades being mounted on pivots and said head being provided with stops for limiting the movement of said fan blades about said pivots.

4. In combination, a rotating armature having ventilating passages formed in it, and a series of movable fan blades carried by said armature for forcing a ventilating fluid through said ventilating passages, said blades being arranged to be automatically shifted by a reversal of rotation of said armature so that the fluid currents produced by said fan blades will travel through the armature in the same direction, regardless of the direction of rotation of the armature.

5. In combination, an armature of a dynamo electric machine provided with ventilating passages, a pair of fan blades placed in each of several of said passages, said fan blades being mounted on pivots and free to have a limited turning movement about said pivots, and stops carried by said armature for limiting the movement of said fan blades about said pivots.

6. In a dynamo electric machine, a rotating armature, and one or more movable vanes carried thereby for generating currents for cooling said armature, said vanes being automatically shifted by a reversal in the direction of rotation of said armature whereby the air currents generated by said vane or vanes travel in the same direction with respect to the armature with either direction of rotation of the latter.

7. A fan consisting of a rotatable member having a transverse channel wider at one end than the other, and a pair of blades pivoted within the narrow end of said channel and arranged to be automatically oscillated into one of two positions, depending upon the direction of rotation of the member, so as to form a forwardly-inclined passage through the member for each direction of rotation.

8. A fan consisting of a rotatable member having a transverse channel wider at one end than at the other, a pair of blades loosely pivoted within said channel at the sides of the narrow end thereof, and stop devices for permitting the blades to swing into either of two operative positions in which they form oppositely-inclined passages through said member.

9. A fan consisting of a rotatable member having a plurality of transverse channels which are narrower at one end than at the other, a pair of blades loosely pivoted within each of said channels at the sides of the narrow end thereof, and stop devices between said member and said blades for permitting the blades to swing into either of two operative positions, depending upon the direction of rotation of the member, in each of which positions the blades form for-

wardly-inclined passages through said member.

10. A fan consisting of a rotatable member having transverse channels and fan-blades  
5 pivoted within said channels and arranged substantially in the same plane of revolution and to be automatically shifted upon reversal in the direction of rotation of said member so as to form forwardly-inclined

passages through said member for either di- 10  
rection of rotation.

In witness whereof, I have hereunto set my hand this 20th day of December, 1902.

CHESTER M. SPALDING.

Witnesses:

BENJAMIN B. HULL,  
HELEN ORFORD.