

No. 860,465.

PATENTED JULY 16, 1907.

R. HANCOCK & R. F. HALL.

CENTRIFUGAL FAN.

APPLICATION FILED DEC. 13, 1906.

4 SHEETS—SHEET 1.

Fig. 2.

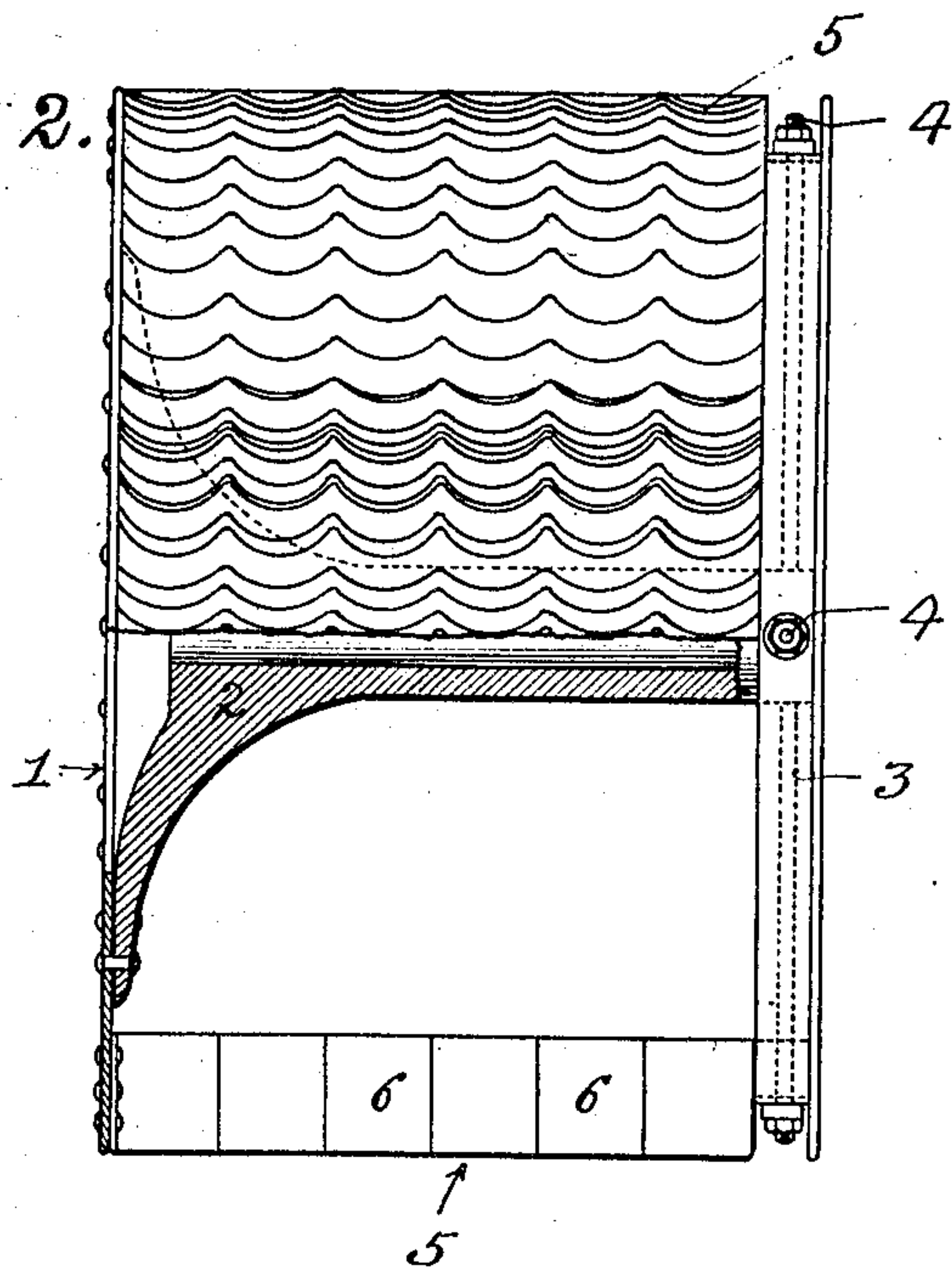
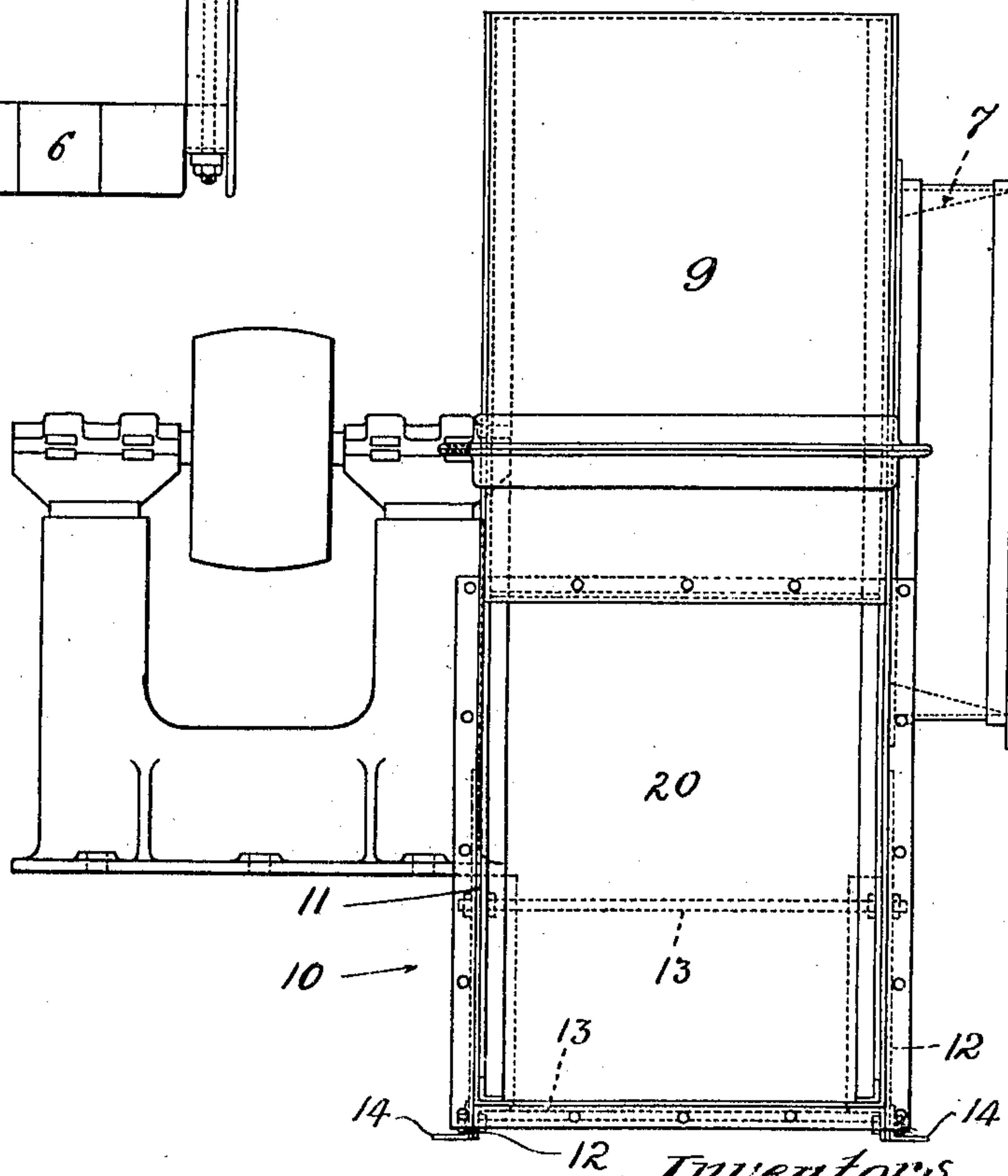


Fig. 1



WITNESSES

J. B. Keeler
C. H. Hester

Inventors
Ralph Hancock
Robert Frederick Hall
By
James L. Norris
Att'y.

No. 860,465.

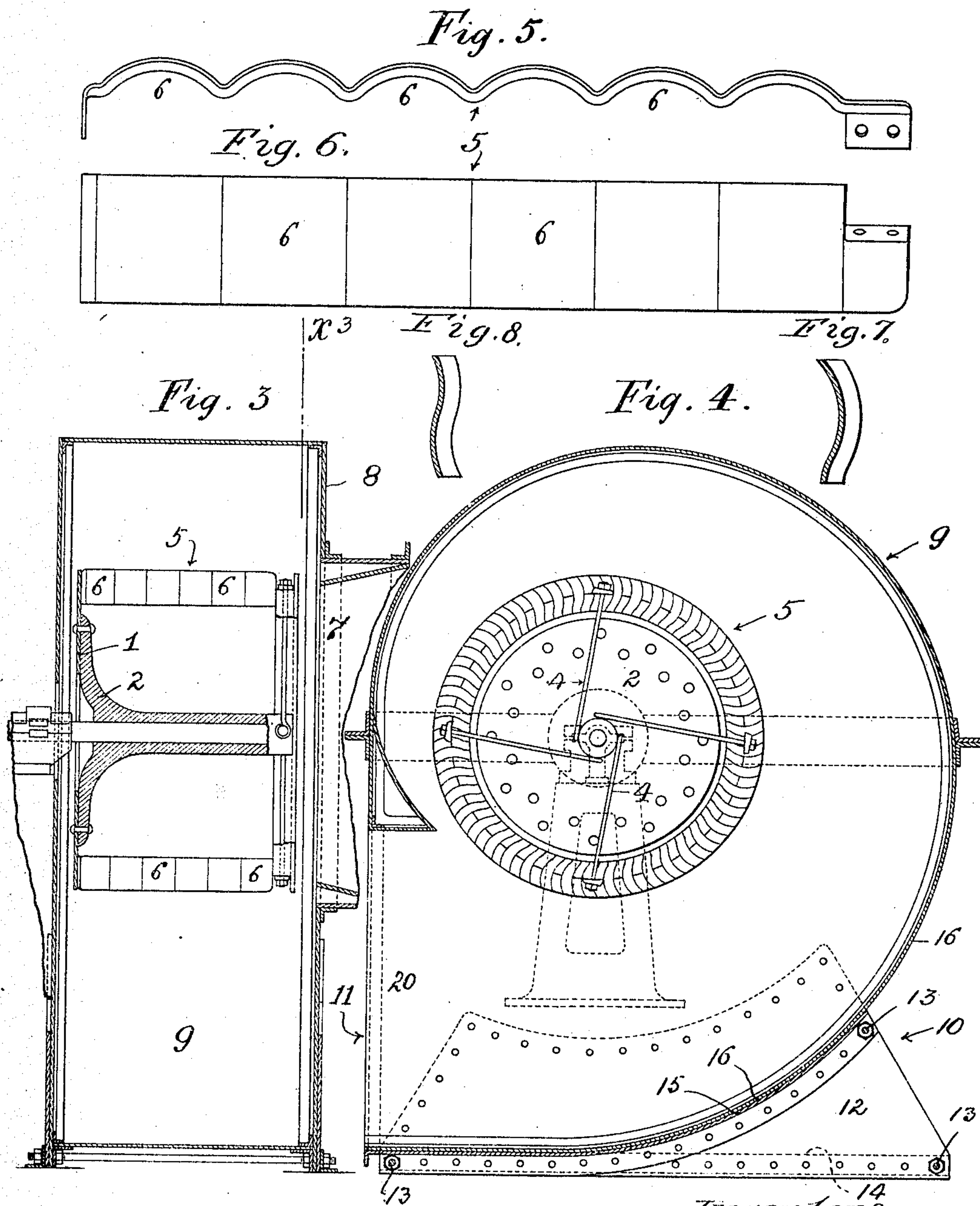
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4 SHEETS—SHEET 2.



WITNESSES

J. B. Keeler
W. H. Nesler

Inventors
Ralph Hancock
Robert Frederick Hall
By *James L. Norris*
Att'y

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4 SHEETS—SHEET 3.

Fig. 9.

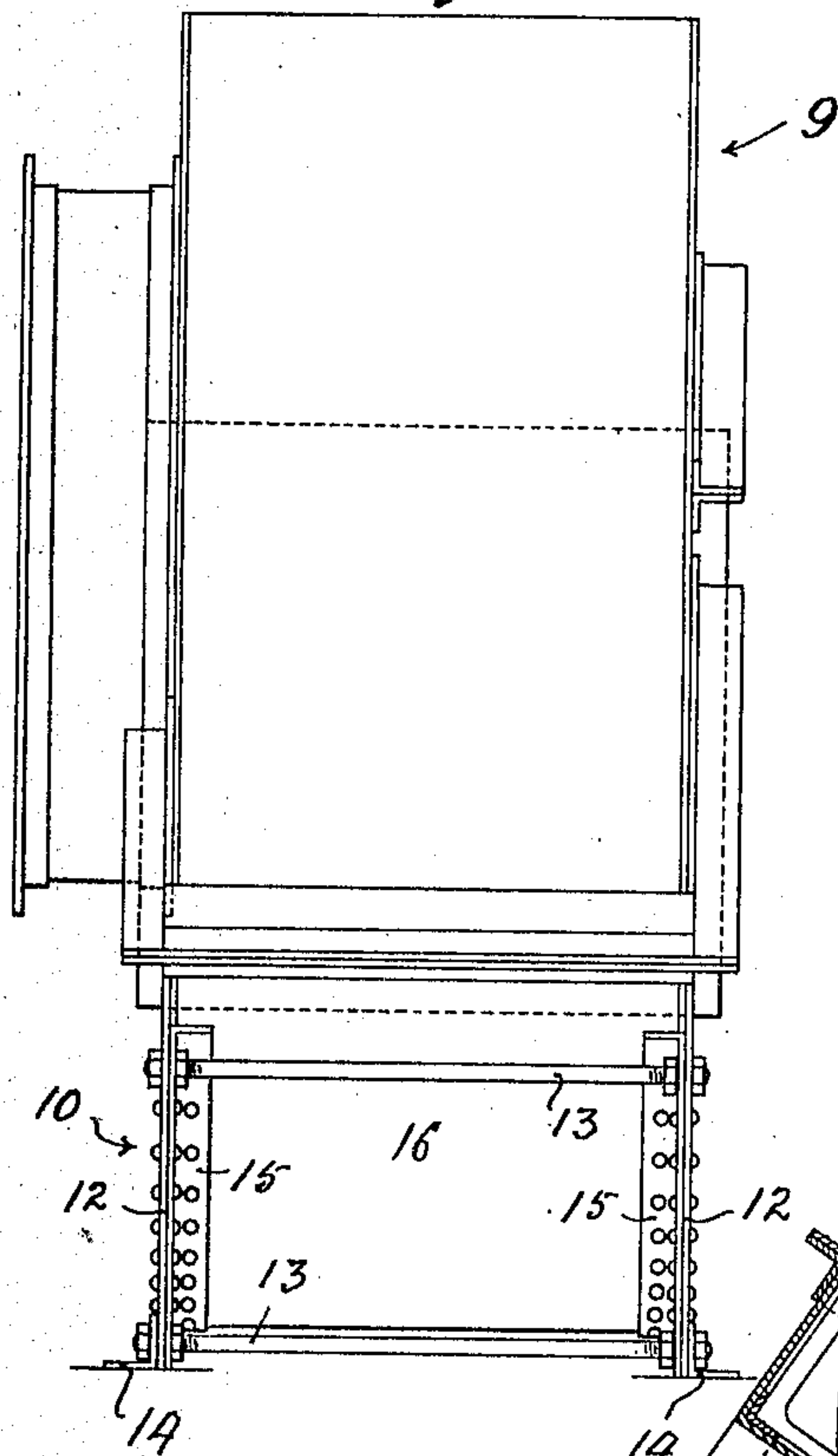
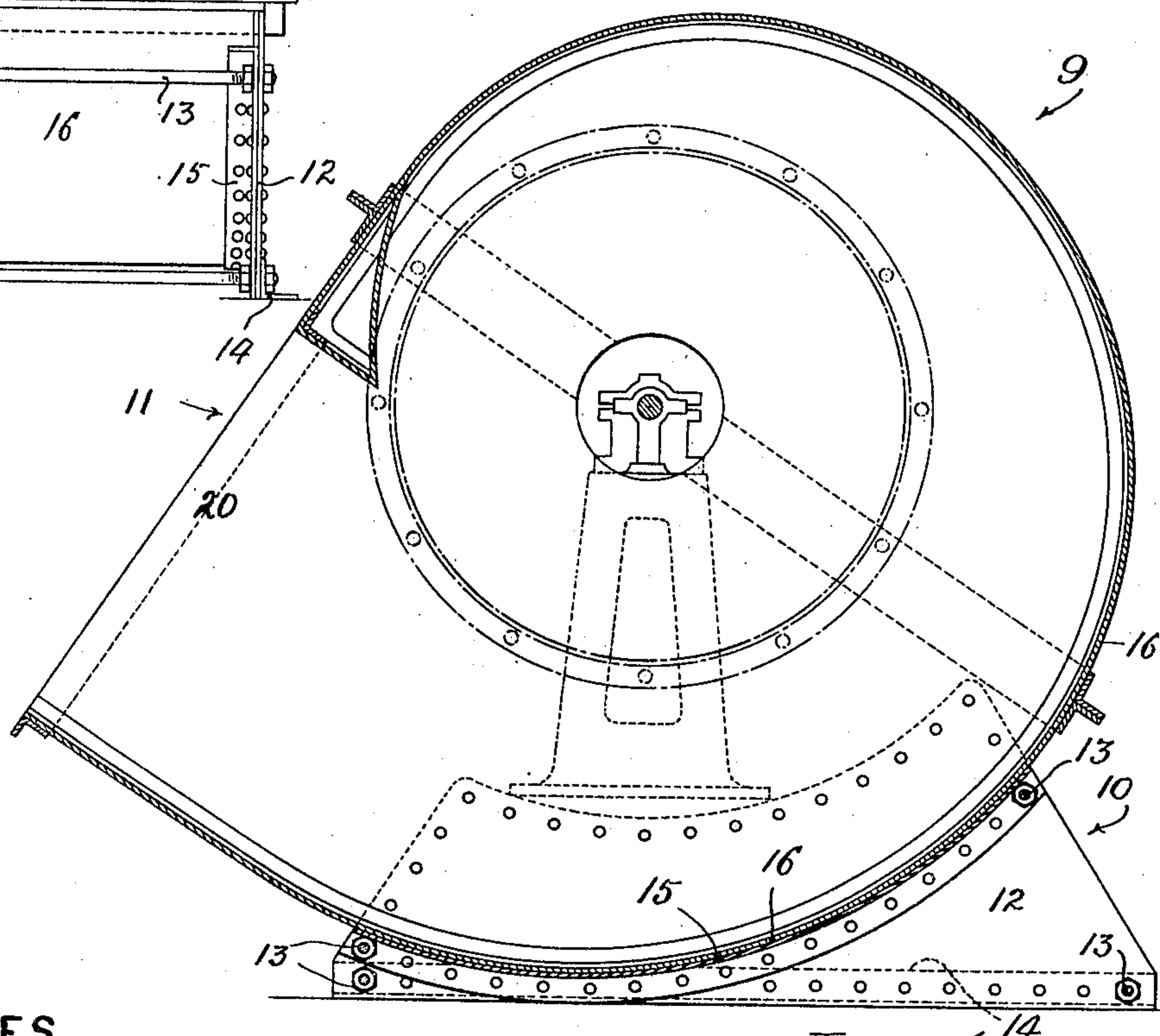


Fig. 10.



WITNESSES

J. B. Keeler
C. S. Kesler

Inventors
Ralph Hancock
Robert Frederick Hall
James L. Norris

No. 860,465.

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4 SHEETS—SHEET 4.

Fig. 11

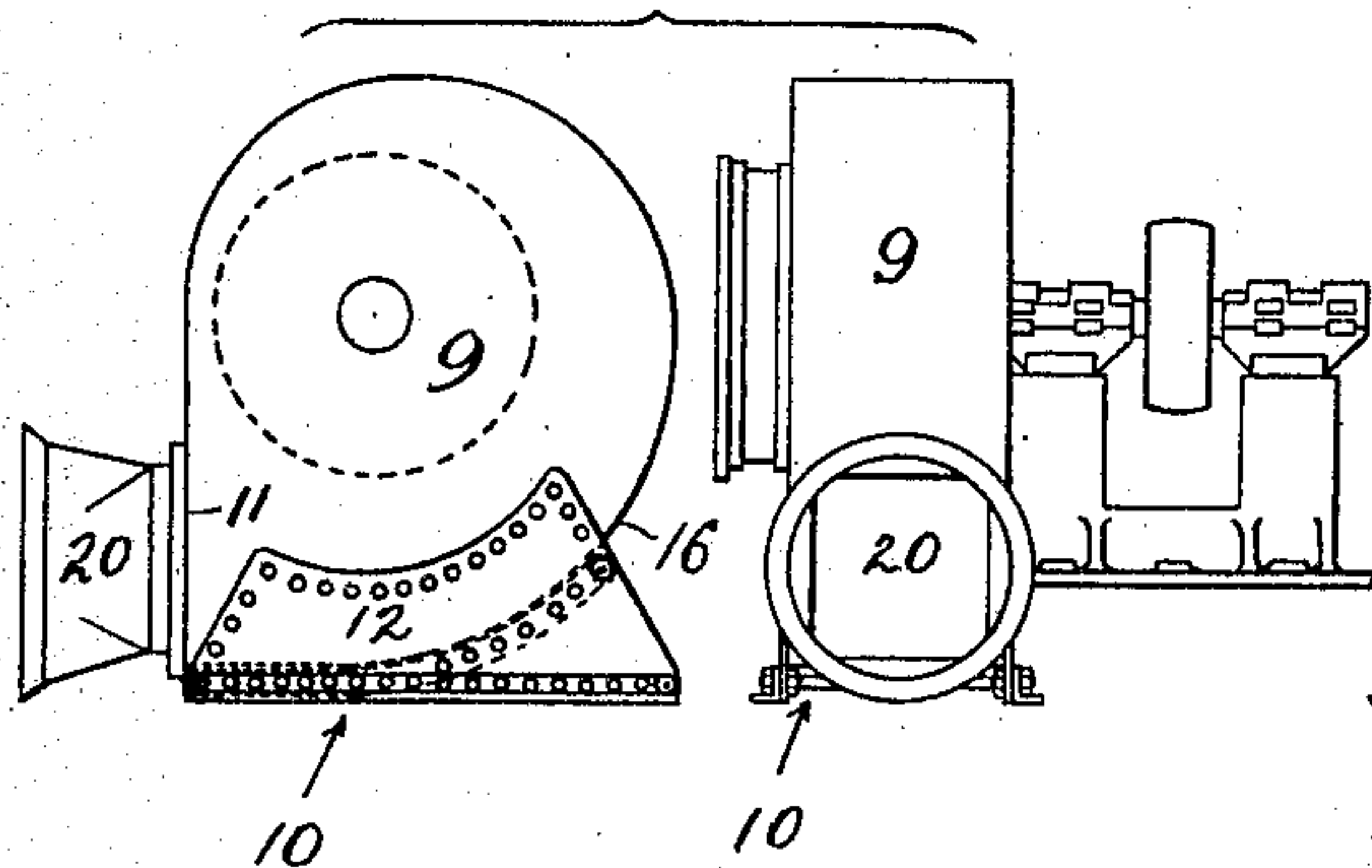


Fig. 12.

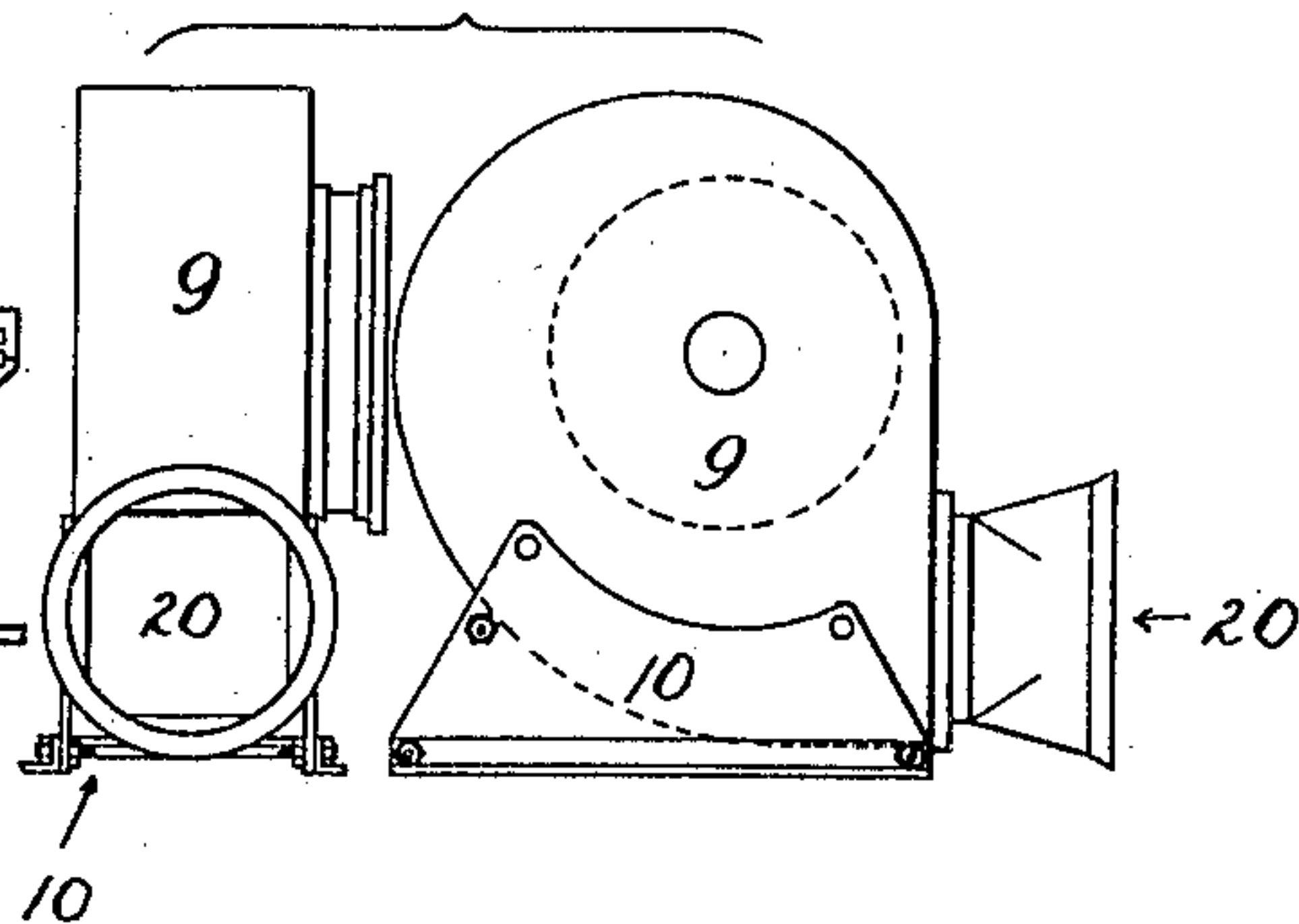


Fig. 13.

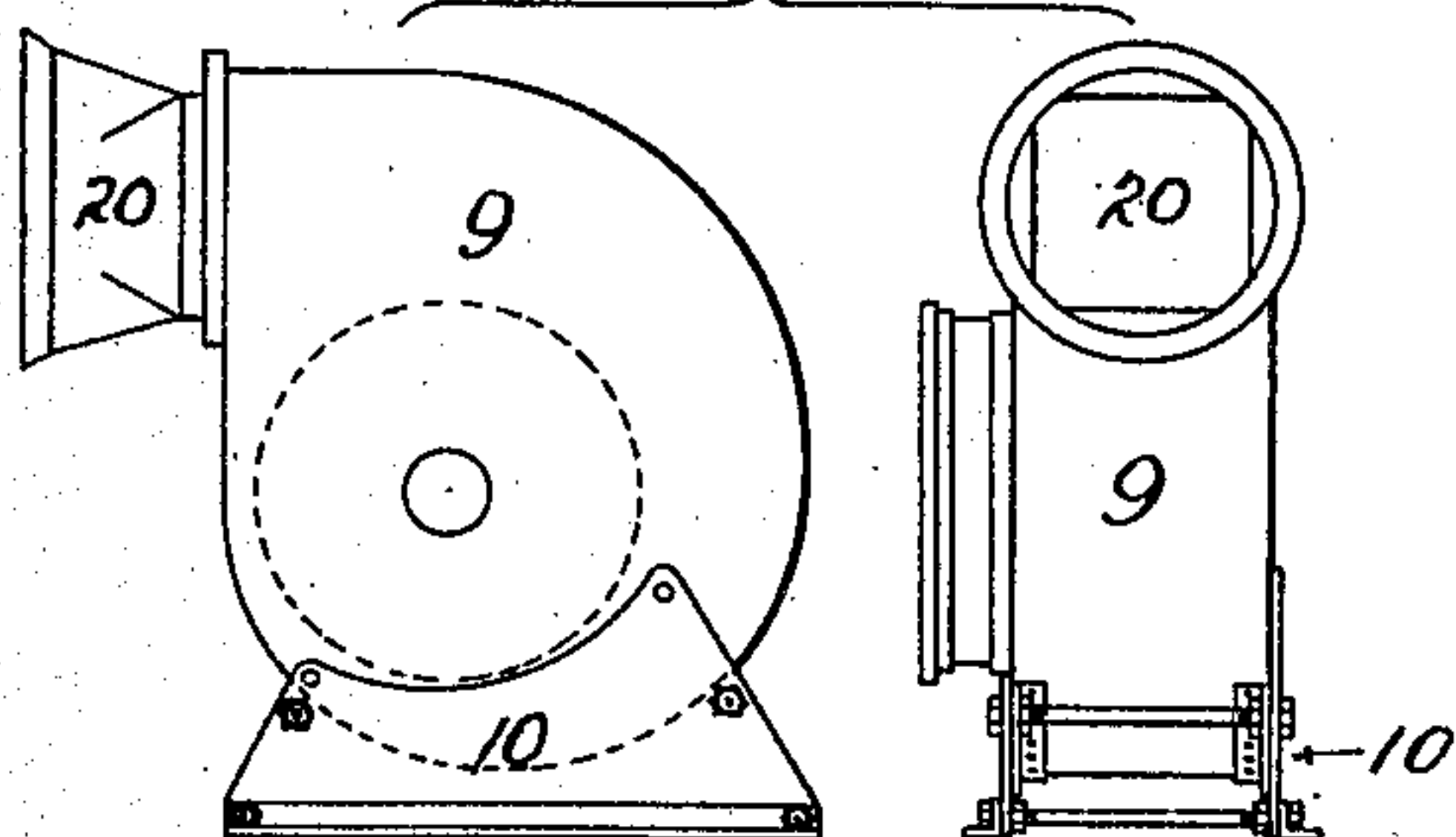


Fig. 14

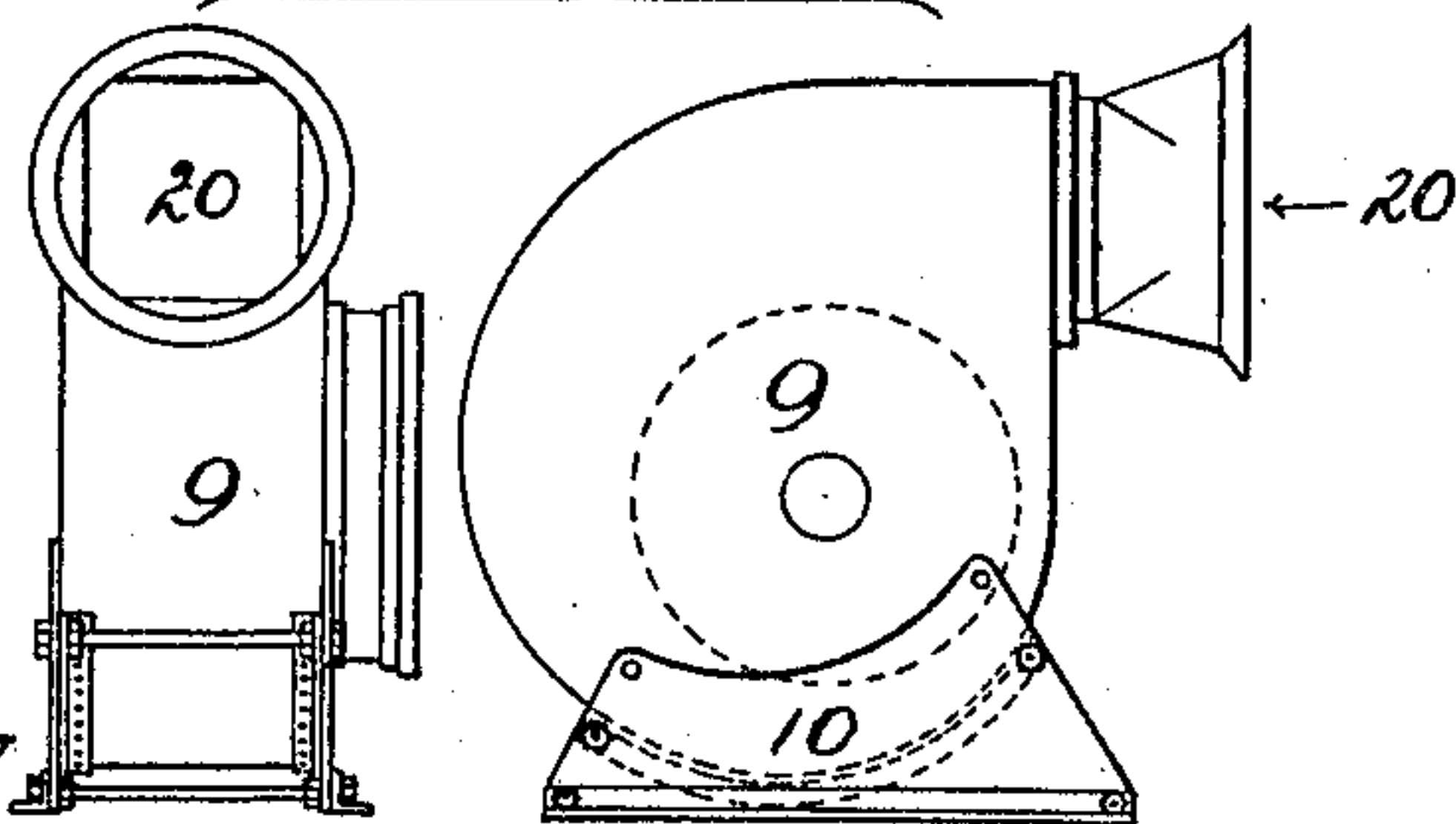


Fig. 15

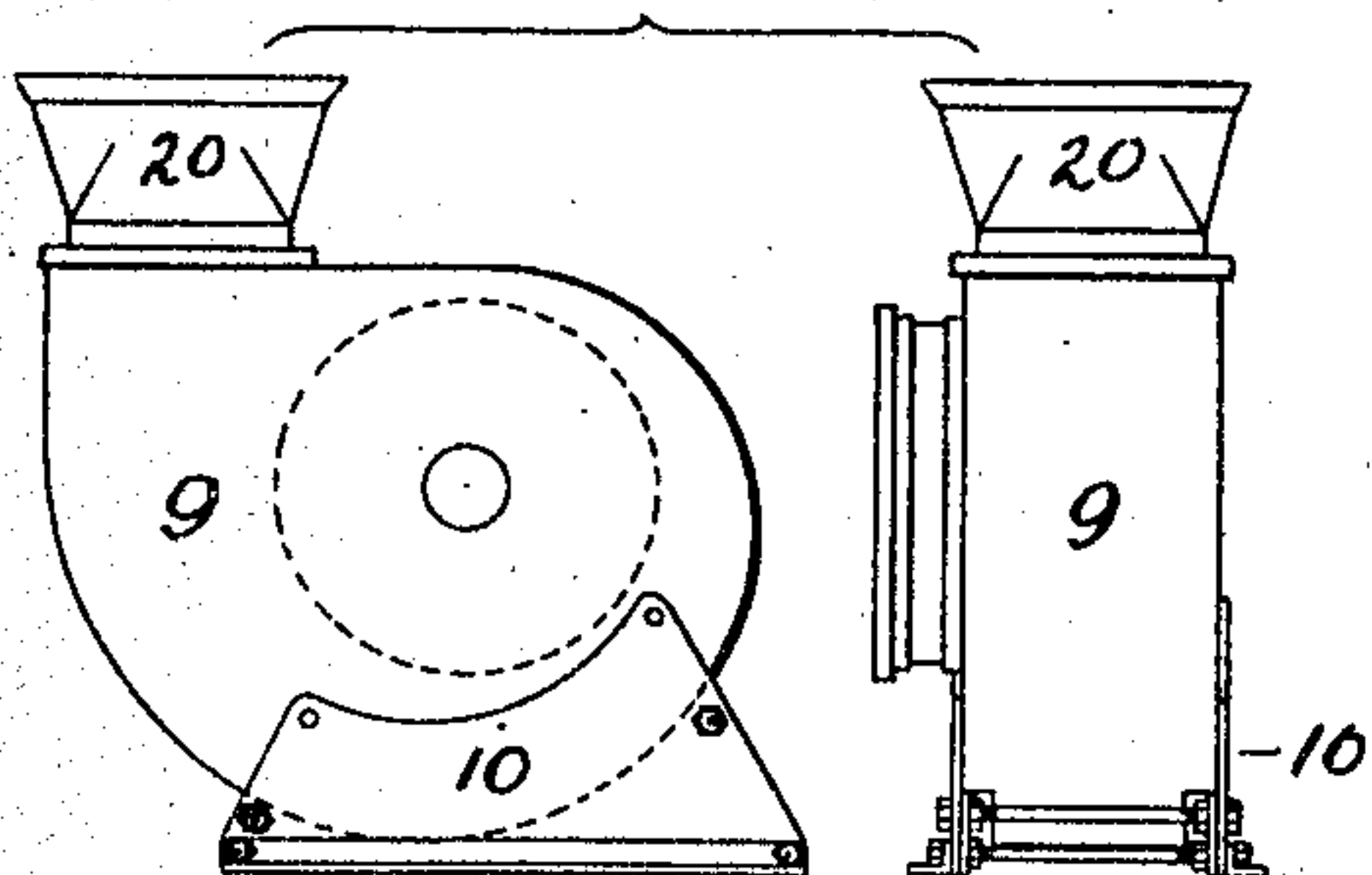
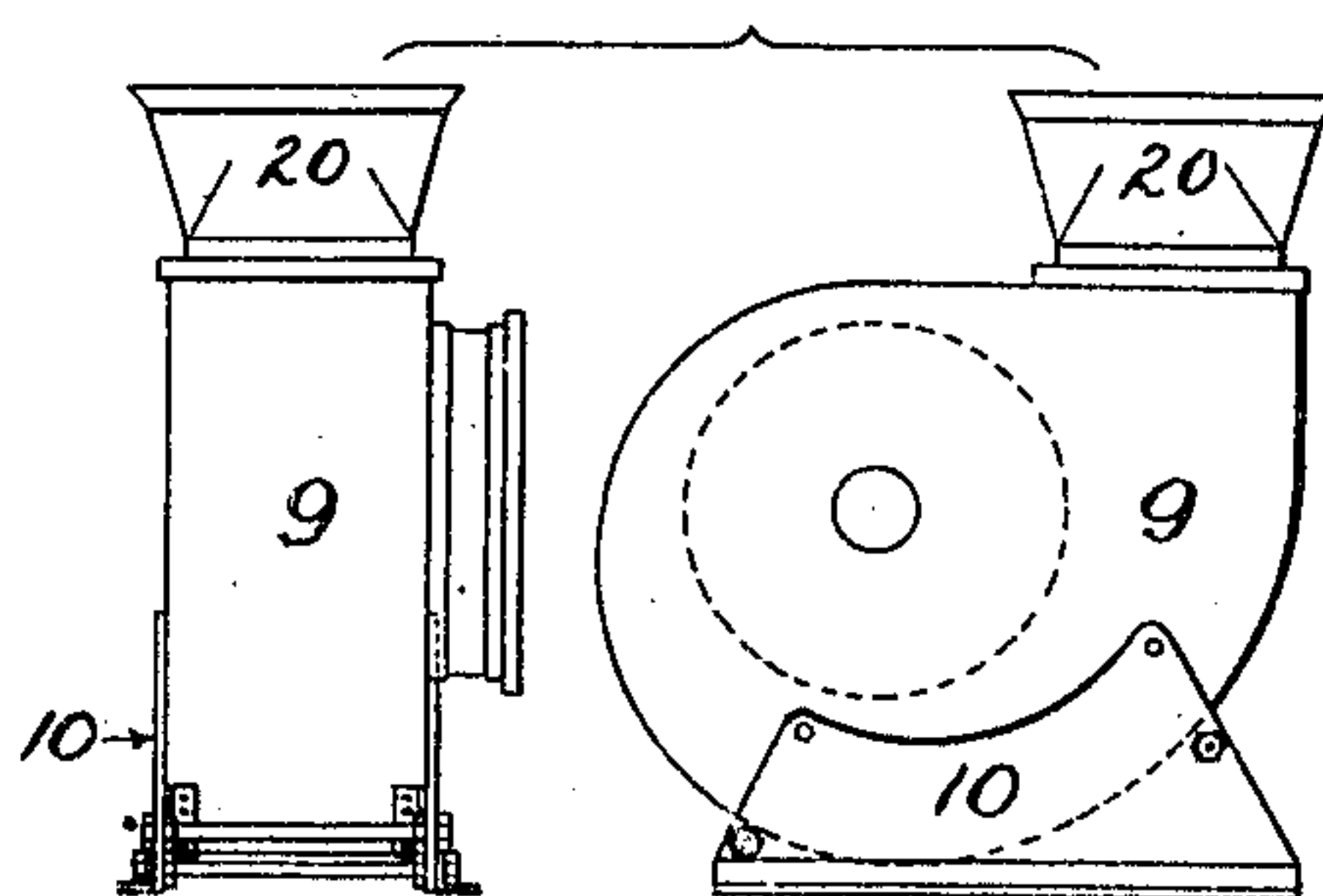


Fig. 16.



WITNESSES

J. B. Keeler
W. Kessler

Inventors
Ralph Hancock
Robert Frederick Hall

By
James L. Norris
att'y

UNITED STATES PATENT OFFICE.

RALPH HANCOCK, OF LONDON, AND ROBERT FREDERICK HALL, OF BIRMINGHAM, ENGLAND.

CENTRIFUGAL FAN.

No. 860,465.

Specification of Letters Patent.

Patented July 16, 1907.

Application filed December 13, 1906. Serial No. 347,698.

To all whom it may concern:

Be it known that I, RALPH HANCOCK, residing at Charing Cross House, Charing Cross Road, London, W. C., England, ventilating-engineer, and ROBERT FREDERICK HALL, residing at Ferndale, Church Road, Moseley, Birmingham, England, electrical and mechanical engineer, both subjects of the King of Great Britain, have invented certain new and useful Improvements in Centrifugal Fans, of which the following is a specification.

10 This invention has relation to centrifugal fans of that type in which air is drawn axially into the interior of the runner through a suction eye or opening in the casing which incloses the said runner and is discharged centrifugally through the ports or spaces between the
15 runner blades, and is applicable to both single suction fans of the type wherein the suction eye is arranged at one side of the casing, and also to double suction eye fans wherein a suction opening is formed in each side of the casing and two sets of centrifugal acting blades are
20 arranged to project from the opposite sides respectively of a single central disk and to be supported at their outer ends by rings whose diameters approximate to the diameters of the suction eyes in the casing sides to which they are respectively opposed.

25 The objects of the said invention are to increase the efficiency and utility or general adaptability of fans of this type by the employment of runner blades of special construction, and by the use of a fan casing which is capable of being arranged so that it will discharge
30 the air delivered by the runner in any desired direction, without necessitating any substantial modification or change in the structure of the casing itself, as is usually necessary.

Figure 1 of the accompanying drawings represents
35 an end elevation of a cased centrifugal fan of the single suction eye type constructed in accordance with our invention and with the adaptable casing arranged to give a left-handed undercast delivery. Fig. 2 represents partly in section and partly in elevation and
40 upon an enlarged scale, the runner of the improved fan separately. Fig. 3 is a cross section of the complete fan upon the same scale as Fig. 1. Fig. 4 is a longitudinal section, taken upon the dotted line $x-x$ Fig. 3. Fig. 5 shows an edge view of one of the special blades of the
45 runner; Fig. 6 is an elevation thereof; Fig. 7 is a sectional view of the same; Fig. 8 is a sectional view of a modification; Figs. 9 and 10 are views of the fan with the adaptable casing arranged to give an oblique upward discharge from the left-hand side; Figs. 11 to 16
50 are front and side views of the fan casing in its various relative positions.

The same letters of reference indicate corresponding parts in the several figures of the drawings.

55 The runner frame of the improved fan consists of an end ring or circular plate 1, riveted to a central boss or extended hub 2 which is keyed to the runner shaft

and a second angle-iron ring 3 arranged at the opposite end or side of the structure and supported from the extended hub by a series of stay arms 4 radiating at right angles from the said hub as shown in Figs. 1 and 3. 60 The series of air-collecting and discharge blades 5 are arranged transversely between the end supports and are formed from sheet or wrought metal plates, pressed, stamped or otherwise fashioned, and connected at their opposite extremities by rivets or other fastenings 65 to the said supports.

Each blade is of an undulatory figure in its longer direction so as to produce therein a plurality of concaved or curved grooves 6 running across the acting face of the said plate at right angles to the length and 70 this grooved or corrugated formation is compounded with the fashioning of each plate into a single curved configuration in cross section as shown in Fig. 5 or a double-curved configuration as shown in Fig. 6 whereby their acting faces are spooned and the power and efficiency 75 of the fan are increased as already described.

The open intake end of the runner is of approximately the same diameter as the suction eye 7 in the side 8 of the casing and it will be understood that the increased surface obtained by virtue of the undulatory 80 section enables the blades to be provided, as it were, with a series of pockets adapted to hold the air in such a way that it will meet a very high pressure before slipping out, so that the air is retained in the blades and a larger quantity is discharged when the centrif- 85 ugal action takes place. Further air is picked up practically over the entire length of each blade and a very equal discharge occurs over the whole surface, the action being entirely different to that which is obtained with ordinary straight blades of flat or con- 90 caved section inasmuch that when air between blades of the ordinary form meets with resistance it easily slips out, whereas in the case of a pocketed or spooned blade the air is retained laterally by the ridges between the pocket corrugations and its escape is rendered 95 more difficult.

Another advantage derived from the pocketing is that they tend to prevent the rushing of the air towards the blank disk at the closed end of the runner and so checks any churning action while the whole 100 of the additional working surface obtained by the special blade formations is effectively utilized in the work of retaining and projecting the air.

The fan runner is mounted, as shown in the drawings, within the casing 9, which is constructed as a 105 complete and self contained element, separate from its foundation bracket or pedestal 10 which is also a separate and self-contained element, said casing being so formed and arranged that it may be set with its discharge outlet in any desired position, (according to 110 the type of fan required) with respect to the said pedestal or foundation bracket prior to the two com-

ponent parts of the casing being riveted, bolted or otherwise rigidly secured together to complete the structure. The said casing body has its discharge outlet 20 at the side and is constructed in the form of a complete spiral or with its outline following a voluted curve commencing from a point which lies in the same plane as the center of the body portion wherein the runner is fitted and terminating at a point in the same plane as the commencement of the said volute curve. This formation produces on one side of the casing a flat surface 11 which is tangential to a circle struck from the center of the runner axis, and in this flat side or part the outlet or discharge orifice 20 of the casing is formed.

It will be obvious that by placing the casing with its discharge on either the right or left hand of the runner center and then turning the same bodily around said center to a greater or less degree the casing may be set or arranged so as to discharge in any direction, and on bolting or securing the same to the base or foundation bracket after such adjustment, a fan of either the undercast, overcast, downcast vertical delivery or oblique delivery type (such as shown in Figs. 6, 7 and 8) can be expeditiously produced or made up, and easily modified or altered subsequently to another type if necessary.

The separately formed bracket or foundation piece used in connection with the adaptable volute-shaped casing above described may be constructed in any convenient manner which will afford an effective support and strengthen reinforce or stiffen the casing. The bracket shown in the drawings takes the form of a shoe-like structure and consists of a pair of side plates 12 secured together and held in their proper relative positions and at the correct distance apart by stay bolts 13 and having lengths of angle iron 14 riveted along the bottom edges of their outer side to serve as feet or bearing flanges which afford a rigid and extended support for the complete structure, while the inner sides of the connected and laterally braced plates are provided with bearer flanges 15 which may also be formed from lengths of angle iron, riveted to the said plates, after having been first bent to conform to the curvature of the particular part of the voluted side 16 of the casing body, which is to come within the shoe and which, when applied in such desired relative position to the said shoe, fits closely against and takes its seating upon the said bearer flanges, prior to the two component elements of the structure being permanently riveted together. Or instead of the shoe or foundation bracket being constructed from sheet metal and angle iron components, it may be made from a shoe-like casting into which the bottom or underside portion of the casing is dropped and secured by riveting or otherwise.

It is obvious that the application of the herein described invention to fans of the double suction type differs in no essential respect from its application to a single suction type as herein described except that two sets of blades are employed and arranged respec-

tively upon the opposite sides of a single closed disk or plate and are supported at their outer ends by angle iron or similar rings; and that a suction eye or intake opening is formed in each side of the casing body in register with the respective open or intake ends of the double runner.

Having now fully described my invention what I desire to claim, and secure by Letters Patent is:—

1. In a cased centrifugal fan; the combination with a casing having a large intake or suction eye in one side, of a runner consisting of a plurality of long and narrow blades having an undulatory or zigzag formation longitudinally and a curved radial formation substantially as described.

2. In a cased centrifugal fan; the combination with a casing having a large intake or suction eye, of a runner which is arranged within the casing and consisting of long and narrow blades arranged upon a single disk or plate; said blades being of an undulatory or zig-zag formation longitudinally and of a curved formation radially substantially as described.

3. In a cased centrifugal fan; the combination with a casing having a large intake or suction eye in the one side, of a runner consisting of a plurality of long and narrow blades having a series of laterally separated air pockets or spoon like parts produced by making the blades of an undulatory or zig-zag formation longitudinally and a double curved cross section or radial formation laterally; said blades being attached at the ends furthest removed from the suction eye of the casing upon a disk or plate supported by the fan axis while their other ends are attached to a carrier ring, substantially as described.

4. In a cased centrifugal fan; the combination with a casing having a large intake or suction eye in the one side of a runner consisting of a plurality of long and narrow blades having an undulatory or zig-zag formation longitudinally and a curved formation radially, a disk or plate for supporting the inner ends of said blades; a ring for supporting said blades; a hub carried by the runner shaft, and a series of stay arms extending at right angles from said hub to the blade-supporting ring, substantially as described.

5. In a centrifugal fan, the combination of a casing a runner consisting of a plurality of long and narrow blades having an undulatory formation longitudinally and a curved formation radially, an end plate associated with the blades for supporting the same, a ring having connection with the blades and arranged at the intake end of the casing, and a foundation for adjustably supporting the casing.

6. In a centrifugal fan, the combination of a casing having a discharge outlet, and an intake at one side thereof, a runner rotatably mounted in the casing and consisting of a plurality of long and narrow blades having a zig-zag formation longitudinally and a curved formation radially, a disk for supporting the inner ends of said blades, a ring for supporting the opposite ends of the latter, a runner shaft, a hub having connection with the ring and disk and associated with the shaft, and a shoe supporting element forming a foundation for the casing.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

RALPH HANCOCK.

ROBERT FREDERICK HALL.

Witnesses to the signature of Ralph Hancock:

DANIEL PORTER,

EDMUND GRAHAM.

Witnesses to the signature of Robert Frederick Hall:

HENRY SKERRETT,

HENRY NORTON SKERRETT.