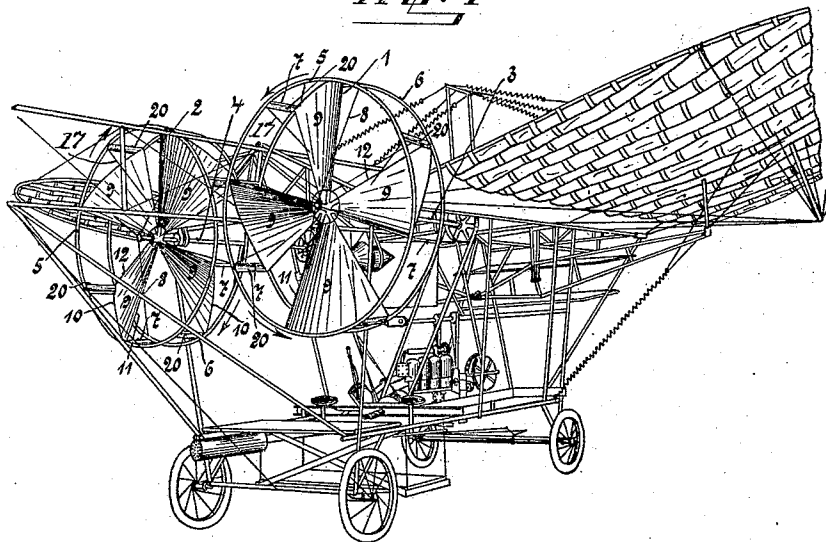


H. RUTHENBERG.  
ROTARY FAN OR PROPELLER.  
APPLICATION FILED JULY 2, 1909.

959,392.

Patented May 24, 1910.  
3 SHEETS—SHEET 1.

Fig. 1



WITNESSES

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*J. P. Davis*

INVENTOR

*Hermann Ruthenberg*

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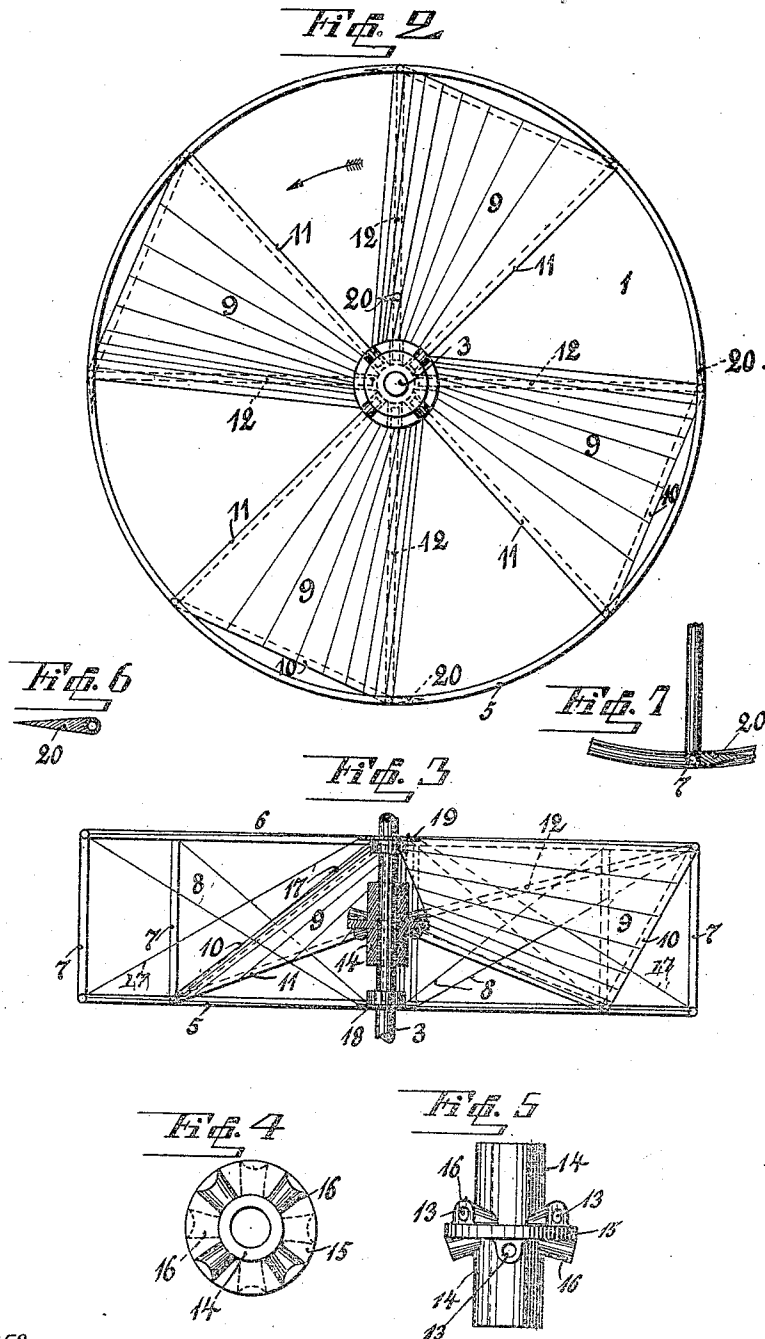
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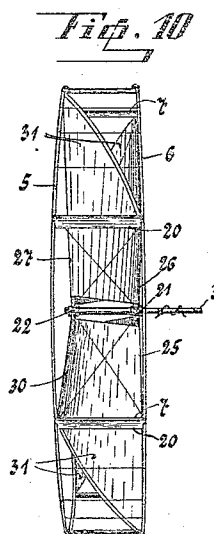
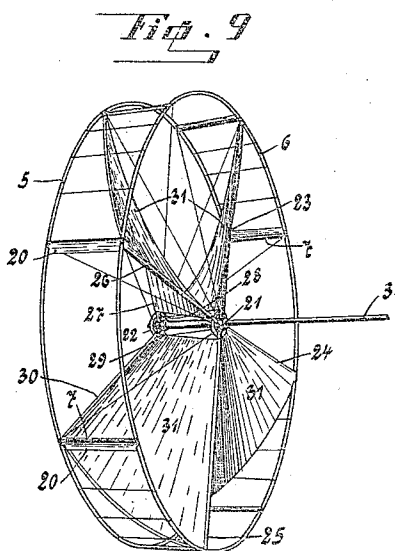
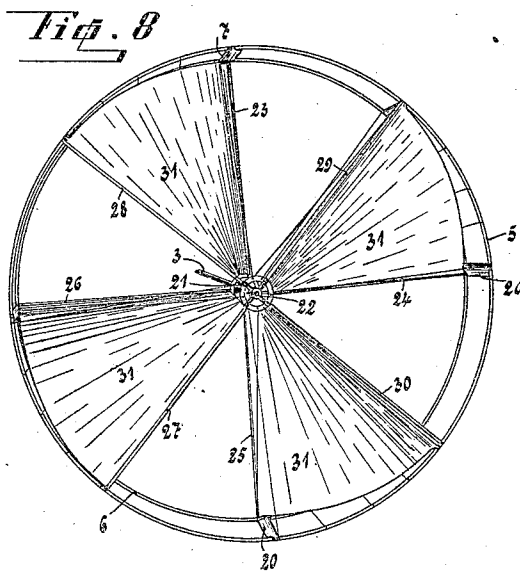
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3 SHEETS—SHEET 3.



WITNESSES  
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# UNITED STATES PATENT OFFICE.

HERMANN RUTHENBERG, OF VILLEN COLONIE GRUNEWALD, NEAR BERLIN,  
GERMANY.

## ROTARY FAN OR PROPELLER.

959,392.

Specification of Letters Patent.

Patented May 24, 1910.

Application filed July 2, 1909. Serial No. 505,574.

### *To all whom it may concern:*

Be it known that I, HERMANN RUTHENBERG, a subject of the King of Prussia, residing at No. 52 Königs Allee, Villen Col-  
onie Grunewald, near Berlin, German Em-  
pire, have invented certain new and useful  
Improvements in Rotary Fans or Propellers,  
of which the following is a specification.

My invention relates to improvements in  
rotary fans or propellers adapted to act upon  
the air, and particularly to such air pro-  
pellers as are used for propelling air ships  
or flying machines and which are actuated  
either by hand or by mechanical means.

In describing the invention I shall make  
reference only to air propellers, in which the  
improvements have proved particularly use-  
ful. But I wish to be understood, that I do  
not limit my invention to the particular use  
described, and that the same may advan-  
tageously be applied to fans or other ap-  
paratus of this character.

In the construction of fans or propellers  
it is of importance, that the propeller be as  
light as possible, and yet sufficiently strong  
to resist the strains exerted thereon by the  
pressure of the air. Furthermore, the blades  
and the bearings must be so constructed that  
the friction of the air on the blades and the  
friction of the shafts within the bearings are  
reduced to a minimum.

The object of the present improvements is  
to provide a fan or propeller which is in ac-  
cordance with these requirements. And  
with this object in view, my invention con-  
sists of the matters to be hereinafter de-  
scribed and particularly pointed out in the  
appended claims.

For the purpose of explaining the inven-  
tion two examples of a propeller designed  
for use in a flying machine have been shown  
in the accompanying drawings, in which the  
same numerals of reference have been used  
in all the views to indicate corresponding  
parts.

In said drawings—Figure 1, is a perspec-  
tive view of a flying machine provided with  
two propellers of my improved construction,  
Fig. 2, is a front elevation of one of the pro-  
pellers, Fig. 3, is a top view of Fig. 2, Fig.  
4, is a side view of the hub of the propeller,  
Fig. 5, is a top view of the same, Fig. 6, is  
a cross-section of a knife like blade used in  
constructing certain parts of the propeller  
for the purpose of decreasing the resistance

of the air, and Fig. 7, is a part of the frame  
work showing the blade secured thereto.  
Figs. 4 to 7 are shown on an enlarged scale.  
Figs. 8, 9 and 10 are views of another pro-  
peller constructed according to my inven-  
tion. Fig. 8, shows this propeller seen from  
the front, Fig. 9 is a perspective view, and  
Fig. 10 is an edge view.

Referring to the drawings, Fig. 1 illus-  
trates one example of using my improved  
propeller, the latter being shown as mount-  
ed on a flying machine. However, it should  
be understood, that I do not limit myself to  
the particular use described hereinafter and  
illustrated in the drawings. It should also  
be understood, that the construction of the  
flying machine, the method of mounting  
the propeller on the same, and the number  
of the propellers used in a machine are im-  
material as far as my invention is con-  
cerned.

In the example shown in Figs. 1 to 7,  
the propellers 1, 1 are disposed in the rear  
part of the flying machine, and they are  
secured with their hubs to shafts 3, 3 adapt-  
ed to be rotated in opposite directions, as  
indicated by the arrows in Fig. 1. Thereby  
the flying machine is propelled. The means  
for raising or lowering the flying machine  
are immaterial as far as my invention is con-  
cerned, and they will therefore not be de-  
scribed, my invention relating merely to the  
construction of the fan or propeller, and its  
combination with a flying machine of any  
construction. The propeller is constructed  
of a pair of tubular rings 5 and 6 which in  
the preferred form are constructed as con-  
tinuous Mannesmann tubes or in a similar  
way insuring great strength of tension and  
flexure. The pair of rings are connected  
with each other by several straight tubular  
rods 7 which are likewise made of strong  
material. To provide for a rigid connec-  
tion of the parts any preferred means may  
be employed, which means are known in  
the art and need no detailed description.  
For further increasing the rigidity of the  
frame and securing it against axial dis-  
placement I prefer to provide wires 8 and  
17 which have one of their ends attached  
to the rings 5 and 6, and their other ends to  
the shaft 3 or parts connected therewith,  
such for instance as subsidiary hubs and the  
like. Preferably, the said wires are pro-  
vided with tension locks such as are used in

connection with the spokes of bicycle wheels, though such locks are not necessary in all cases.

A frame work constructed as described possesses considerable rigidity, so that it provides a reliable support for the blades of the propeller. The number of such blades required under varying conditions will be determined by calculation in the usual way. In the example shown, the propeller is provided with four blades; but there may be provided two, three, five or more. Each of the blades consists of a frame work and the filling for the same. The frame work consists of a straight tubular rod 10 connecting the rings 5 and 6, and a pair of tubular rods 11 and 12 secured within suitable bores 13 of the hub 14. The latter carries a disk 15 and lugs 16 offset from one another and formed with the bores 13. This construction, and particularly the novel form of the hub 14, has proved particularly effective in providing a rigid frame work for the blades. Evidently a hub of different construction, or a plurality of such hubs can be used. Furthermore instead of a straight tubular rod 10 a curved rod may be provided. In this case, the blades provided by the frame work are not entirely plane but curved, which is preferable for certain purposes.

The faces of the blades or the filling of the frame work can be made of sheet metal, such for example as aluminum, or a strong alloy of aluminum. In the preferred form, however, I use a filling which is constructed as follows: Between the tubular rods 10 and 11 there is provided a netting of wire or some textile fabric such for example as jute, yarn, wool, hemp, or the like, or some suitable woven, knitted, or twisted textile fabric or wire netting, which is loosely or tightly stretched over the frame work, and which provides a support for some hardening material, such for example as paper pulp, or papier mâché. This layer of paper pulp or the like after being hardened is covered with a layer of varnish, gum, or some other suitable material adapted to make the blades water proof and as smooth as possible, so that the resistance of the air is reduced to a minimum. To further decrease the resistance of the air, the said blades may be ground or polished. A further suitable means for constructing the filling of the blades consists of thin pieces of wood, which are preferably also covered with some water proof material.

A further object of the improvements is to provide means whereby the resistance of the air is reduced, which means have proved particularly effective. For this purpose I provide knife like or edged blades 20 on the tubular rods 7 or at a suitable part of the circumference of the tubular rings 5, 6

which are disposed parallel to the tubes 7 or at an angle thereto, and which are made for example of wood. To enable a blade of the construction described to be neatly fitted to the tubes, it is formed with grooved or semi-circular cross-section fitting on the tubes. Furthermore suitable means are provided for holding the said blades in place on their tubes. Blades of a similar character are preferably provided on the tubes 10, 11 and 12, which blades in the preferred form are equal in length to their tubes.

In the other example shown in Figs. 8 to 10 on the shaft 3 are keyed two hubs 21, 22, which may, if desired, be replaced by a single long hub. These hubs 21 and 22, which are secured to the shaft or projections thereof in any suitable manner each carry four spokes 23, 24, 25, 26 or 27, 28, 29, 30, of which each two adjacent spokes, for example 23 and 24 or 27 and 28 are at an angle of 90°. The manner of connecting these spokes with the hubs is not shown in the drawing, because it has nothing to do with the invention and can be carried out in any suitable way. The spokes 23, 24, 25, 26 are at an angle of 45° to the respective spokes 27, 28, 29, 30. All the spokes are secured at their outer ends to two parallel hoops 5, 6 of equal diameter, which are connected together by transverse stays 7, so as to form a rigid structure. Both the hoops 5 and 6 and the transverse stays 7 are preferably made of thin steel pipes, for example of Mannesmann pipes. Instead of the parallel hoops 5, 6 the number of which can be increased, if desired, polygonal frames for example with 8 or 16 sides, can be used. Further, the transverse stays 7 may be arranged at an angle to the planes of the hoops 5 and 6 or be replaced by other equivalent means. In the rigid structure thus formed are provided four similar vanes 31, which, as particularly evident from Fig. 9, have a twisted surface. The advantage of this part of my invention consists in the use of such vanes having the twisted surface shown or a similarly twisted form in connection with a rigid structure consisting of hoops 5, 6 and transverse stays 7 or their equivalents. The number of the vanes is different according to the circumstances. For example in the case of wind wheels or fans it may be advisable to use two or three of such vanes, while in the case of a propeller designed for an air ship or the like it may be desirable to adopt four vanes or to increase the number to 5, 6 or even more. The twisted surfaces, which these vanes possess already exist in the case of ship-propellers. They have however never been employed for wind wheels, fans and propellers in combination with the described rigid structure. In regard to the construction of these vanes it may be mentioned that they can be made of any suitable sheet metal for

example of aluminum-bronze or other suitable metal. They can however also be made of wood papier mâché, canvas or any other suitable material. Of course, care must be

5 taken that the vanes are protected as much as possible against the action of the weather, and, for this purpose, a waterproof coating of varnish, enamel etc. may be used. In the case of wood the vanes consist preferably of a series of parallel laths, a second series of such laths being arranged at an angle of 90°. The adjacent laths should be preferably connected together by a tongue and groove. The lattice work thus formed is then covered  
10 with some suitable cloth. In order to avoid injurious friction the spokes and transverse stays are provided with sharp knifelike edges 20 formed in integral relation with said parts or attached thereto.

20 Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A rotary fan or propeller comprising a  
25 hub, spaced tubular rings, tubular rods connecting the rings, tubular spokes secured to the hub and to the rings, the spokes being arranged in pairs and the spokes of the pairs being at an angle one to the other, and vanes  
30 secured to the spokes.

2. A rotary fan or propeller, comprising a hub, spaced tubular rings, tubular rods connecting the rings, tapering blades projecting from the rods between the rings, tubular  
35 spokes secured to the hub and rings, the spokes being arranged in pairs and the spokes of the pairs being at an angle one to the other, and vanes secured to the spokes.

3. A rotary fan or propeller, comprising a  
40 hub having a plurality of sockets, spaced tubular rings, tubular rods connecting the rings, tubular spokes fitting in the sockets of the hub and secured to the rings, tubular rods secured to the rings between each pair

of spokes, and vanes secured to the spokes 45 and to the last named tubular rods.

4. A rotary fan or propeller, comprising a central hub having a plurality of sockets, spaced rings, rods connecting the rings, spokes fitting in the sockets and secured to  
50 the rings, rods, connecting the rings, one between each pair of spokes, vanes secured to the spokes and to the last named rods, auxiliary hubs, and wires extending from the rings to the auxiliary hubs. 55

5. A rotary fan or propeller, comprising a central hub, spaced rings, rods connecting the rings, spokes secured to the hub and rings, rods connecting the rings, one between each pair of spokes, vanes secured to the  
60 spokes and to the last named rods, auxiliary hubs, wires secured to the rings and to the auxiliary hubs, and tension wires also secured to the rings and auxiliary hubs, sundry of the tension wires passing through the  
65 vanes.

6. A rotary fan or propeller, comprising a central hub having an annular flange and sockets arranged alternately on opposite sides of the flange, spaced rings, rods connecting the rings, tapering blades projecting from the rods between the rings, spokes fitting in the sockets and secured to the rings, rods connecting the rings, one between each pair of spokes, vanes secured to the spokes  
75 and to the last named connecting rods, auxiliary hubs one on each side of the central hub, wires extending from the rings to the auxiliary hubs, and tension wires also secured to the rings and auxiliary hubs, sundry of the tension wires passing through the  
80 vanes.

In witness whereof I have hereunto set my hand in presence of two witnesses.

HERMANN RUTHENBERG.

Witnesses:

FRANZ SCHWENTERLEY,  
HENRY HASPER.