

Sept. 26, 1933.

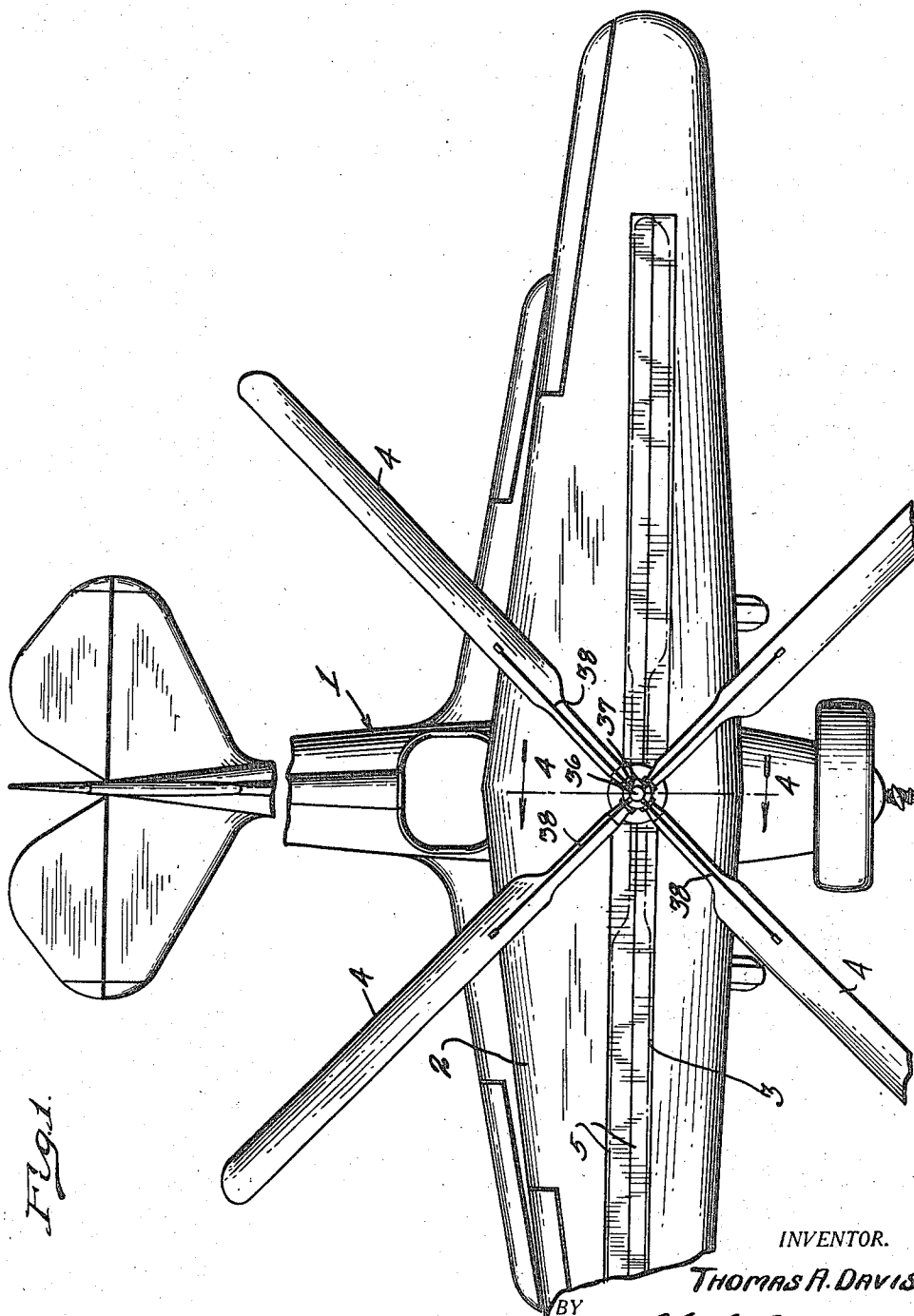
T. A. DAVIS

1,928,560

SAFETY DEVICE FOR HEAVIER-THAN-AIR MACHINES

Filed Sept. 26, 1931

5 Sheets-Sheet 1



INVENTOR.

THOMAS A. DAVIS.

Charles E. Wisner

ATTORNEY.

Sept. 26, 1933.

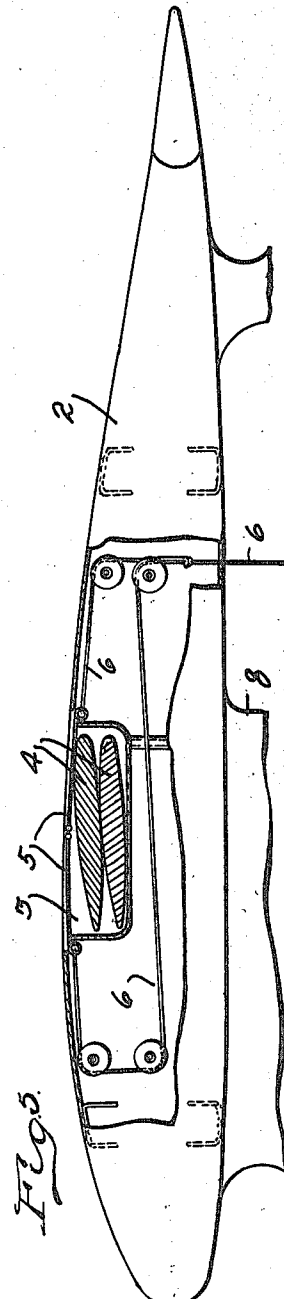
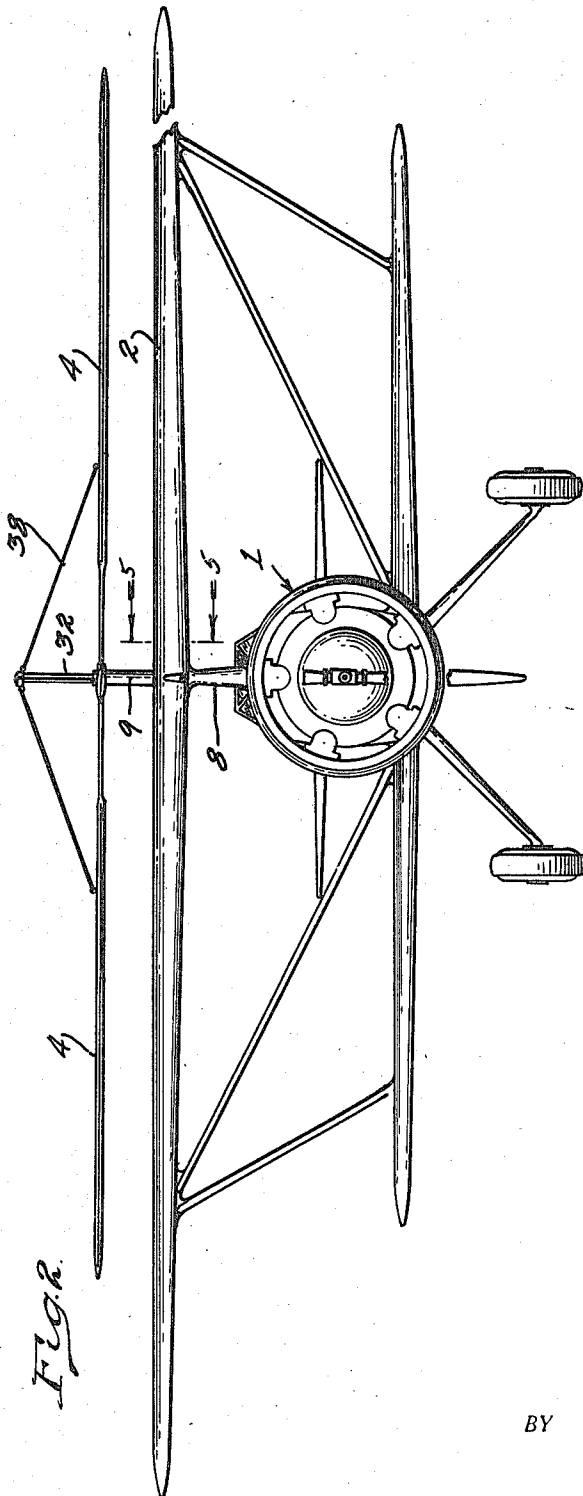
T. A. DAVIS

1,928,560

SAFETY DEVICE FOR HEAVIER-THAN-AIR MACHINES

Filed Sept. 26, 1931

5 Sheets-Sheet 2



INVENTOR.
THOMAS A. DAVIS.

BY

Charles E. Wiener
ATTORNEY.

Sept. 26, 1933.

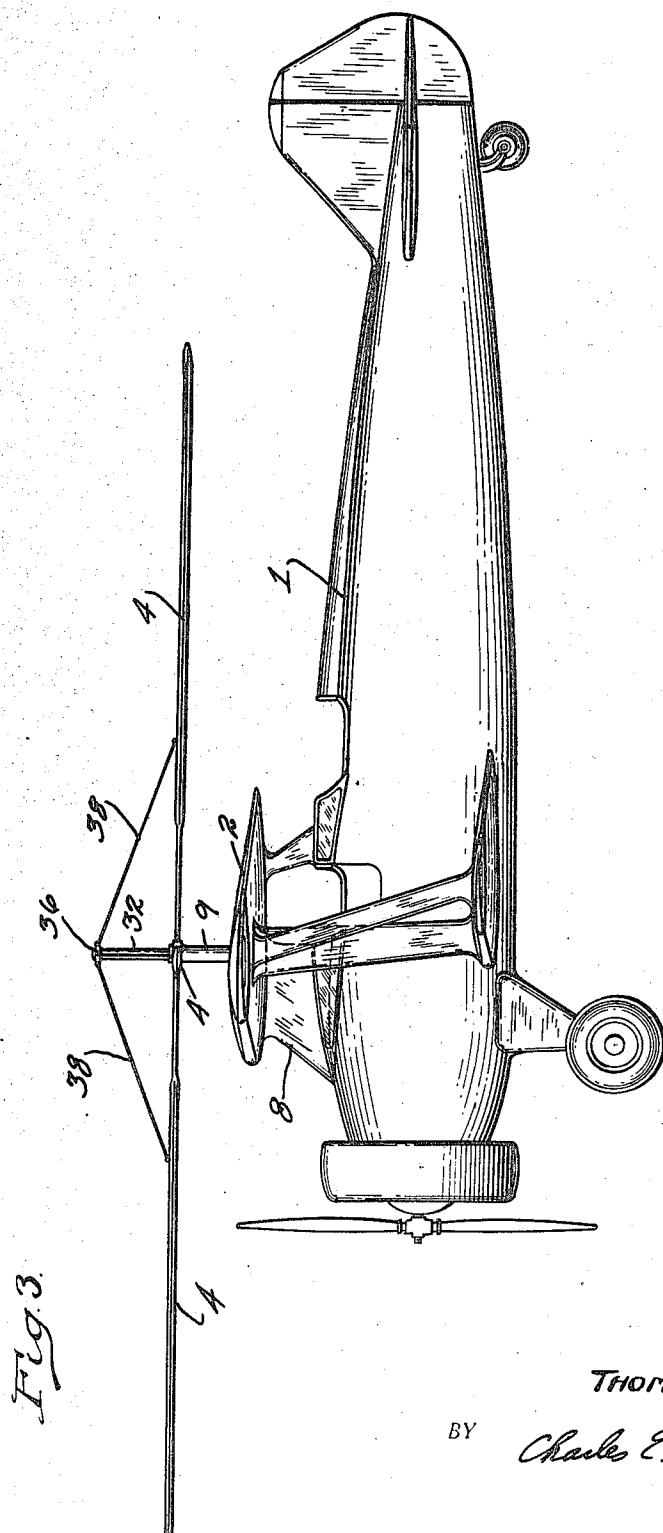
T. A. DAVIS

1,928,560

SAFETY DEVICE FOR HEAVIER-THAN-AIR MACHINES

Filed Sept. 26, 1931

5 Sheets-Sheet 3



INVENTOR.
THOMAS A. DAVIS.

BY

Charles E. Wisner

ATTORNEY.

Sept. 26, 1933.

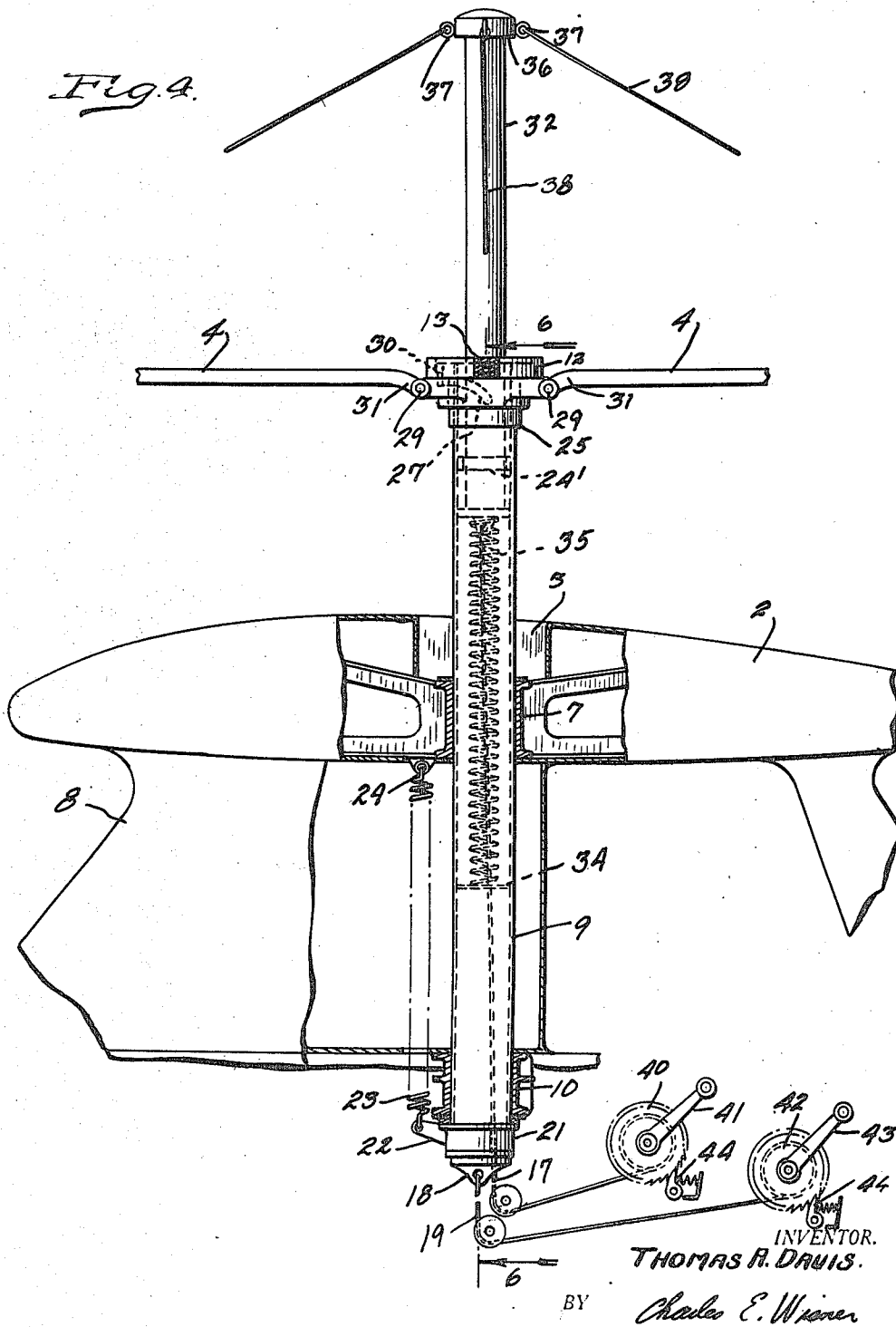
T. A. DAVIS

1,928,560

SAFETY DEVICE FOR HEAVIER-THAN-AIR MACHINES

Filed Sept. 26, 1931

5 Sheets-Sheet 4



ATTORNEY.

Sept. 26, 1933.

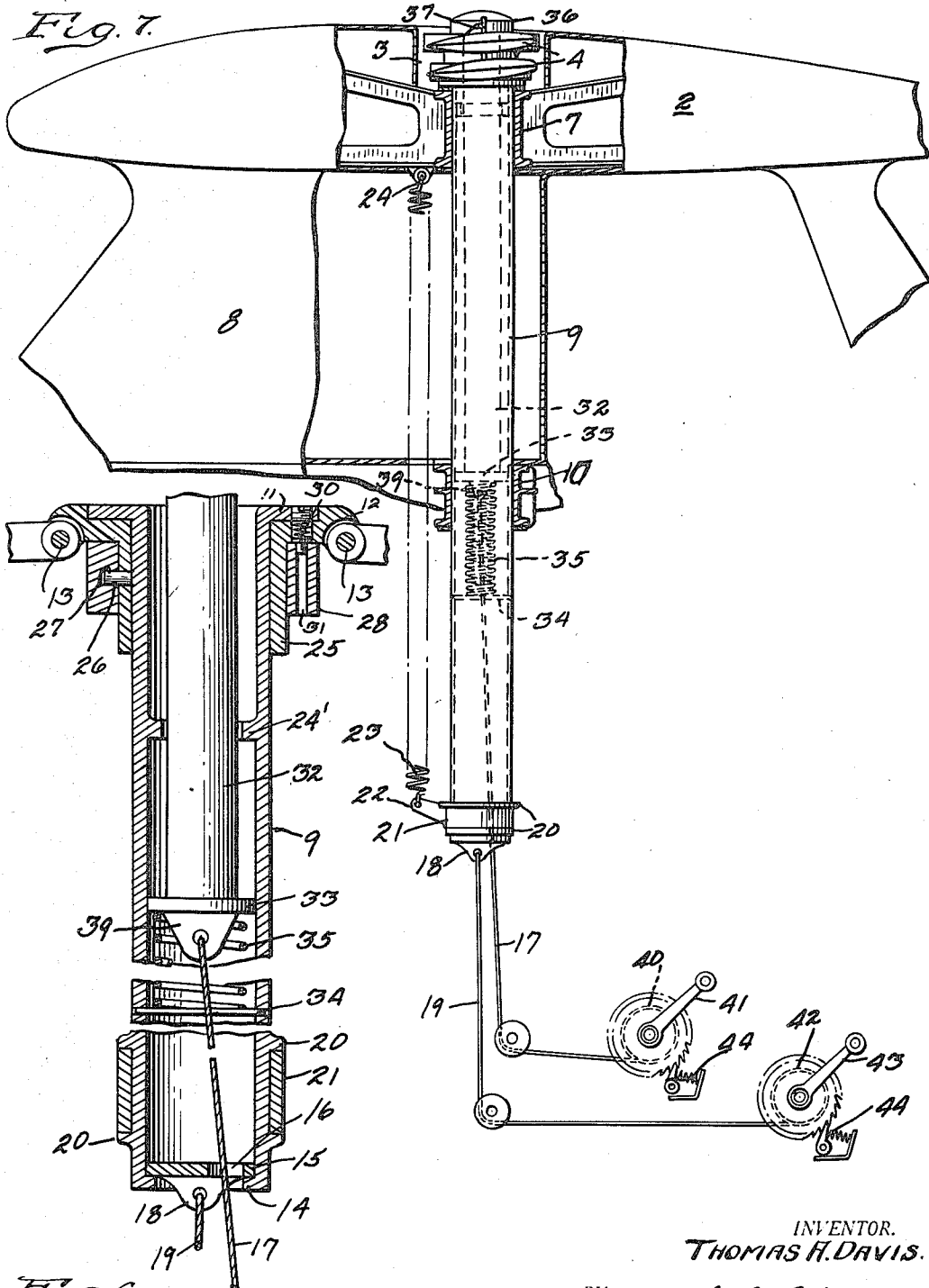
T. A. DAVIS

1,928,560

SAFETY DEVICE FOR HEAVIER-THAN-AIR MACHINES

Filed Sept. 26, 1931

5 Sheets-Sheet 5



INVENTOR.
THOMAS H. DAVIS.

BY
Charles E. Weiner

ATTORNEY.

UNITED STATES PATENT OFFICE

1,928,560

SAFETY DEVICE FOR HEAVIER-THAN-AIR
MACHINES

Thomas A. Davis, Windsor, Ontario, Canada

Application September 26, 1931
Serial No. 565,211

3 Claims. (Cl. 244—15)

This invention relates to safety devices for heavier than air machines.

In the type of heavier than air machine in which revolving blades are used above a stationary plane hereinafter called a rotor, difficulty has been encountered in maintaining the maximum forward speed of the machine due to the retarding thereof by the rotor forming a wind obstruction. While the device functions very properly in permitting a take-off or a slow landing, nevertheless, the retardation of the forward speed has been a serious drawback to the commercial success of the device particularly in the case where a relatively fast flying speed is desirable.

It is therefore an object of my invention to provide a device of this character which may be either installed in a second-hand plane by merely substituting a new upper wing, that is adapted for use with this device or it may be incorporated in a specially designed aeroplane.

Another object of the invention is in the provision of a rotor provided with a plurality of vanes rotatable about a vertical axis that is so designed as to permit the same to be moved to operative position above the machine or to be retracted to a position out of the wind path.

Another object of the invention is in the provision of a rotor provided with a plurality of radially extending vanes rotatable about a vertical axis that may be automatically moved to operative position to help sustain the weight of the aeroplane when the same becomes inoperative due to stalling of the motor or failure of some of the operating elements to perform their function.

A still further object of the invention is in the provision of a rotor provided with a plurality of axially aligned vanes rotatable about a vertical axis, the upper wing of the aeroplane provided with a recess and the vanes being so arranged as to nest in the recess in the wing when the device is not in use thereby permitting the maximum speed to be attained by the aeroplane.

Another object and feature of the invention is in the provision of a rotor provided with a plurality of axially aligned vanes rotatable about a vertical axis, the device being so constructed as to normally lie out of the wind path when not in operation and which may be quickly and easily brought into operation by automatic means when occasion for utilizing the device has arisen.

A still further object of the invention is in the provision of a rotor provided with a plurality

of radially extending vanes rotatable about a vertical axis, the device being so arranged as to permit one pair of vanes to be superimposed upon the other pair when the device is in its normal inoperative position and which will automatically lock the vanes in their supporting position when the device is brought into operation.

A still further object of the invention is in the provision of a device of this character which may be manufactured at a relatively low cost and which may be easily installed either in a specially built aeroplane or in a plane that has already been built by making a few minor changes therein and which will permit the aeroplane to be landed at a relatively low landing speed.

These objects and the several novel features of the invention are hereinafter more fully described and claimed, and the preferred form of construction by which these objects are attained is shown in the accompanying drawings in which—

Fig. 1 is a top plan view of an aeroplane equipped with my improved rotor in operative position.

Fig. 2 is a front elevational view of the same.

Fig. 3 is a side elevational view thereof.

Fig. 4 is an enlarged sectional view taken substantially upon line 4—4 of Fig. 1.

Fig. 5 is a detailed sectional view through the wing structure showing the vanes of the rotor nested therein.

Fig. 6 is an enlarged sectional view taken on line 6—6 of Fig. 4.

Fig. 7 is a view similar to Fig. 4 showing the device in its retracted position.

Referring to the drawings, the aeroplane 1 is of the heavier than air type and may be of any well known construction and is here shown as being of the biplane type. The upper wing 2 thereof is provided with the recess 3 in its upper surface for receiving the vanes 4 therein as will be more fully described.

The recess 3 is normally closed by means of the shutters 5 which conform in shape to the upper contour of the wing and which may be retracted by means of the cable arrangement 6, operable by the pilot from the cockpit, to permit the vanes 4 to be moved out of the aperture 3 and into operative position. The wing 2 is provided with the hollow cylindrical guide member 7 opening at its upper end to the recess 3 and at its lower end to the hollow strut 8 which connects the top of the fuselage to the lower surface of the wing 2. It will be understood that this guide member 7 is preferably positioned on the longitudinal axis of the aeroplane 1. A hollow sleeve

9 is slidably positioned in the hollow cylindrical guide 10 secured to the top of the fuselage and in the guide 7. The upper end of the sleeve 9 is provided with the outturned flange 11, the same being welded or otherwise secured to the bracket 12 that in turn being provided with a pair of bearings 13 for supporting two of the vanes 4. The lower end of the sleeve 9 is provided with the inturned flange 14 forming a support for the plate 15. The plate 15 is provided with an aperture 16 through which the retracting cable 17 extends and is further provided with a depending ear 18 to which one end of the retracting cable 19 is attached. It will be seen that, since the plate 15 merely rests upon the flange 14, the sleeve 9 is free to rotate while the plate 15 may remain stationary thereby preventing twisting of the cables 17 and 19.

The outer periphery of the sleeve 9 near its lower end thereof is provided with a pair of outturned flanges 20 each engaging one end of the collar 21 to maintain the same in place on the sleeve 9. The collar 21 is provided with an ear 22 and one end of the spring 23 is attached thereto while the opposite end of the spring is attached at 24 to the lower surface of the wing 2. It will be seen that the tendency of the spring 23 is to move the sleeve 9 upward until the upper flange 20 on the collar 21 strikes the lower end of the guide member 10. It will be understood that the collar 21 is of sufficient looseness upon the sleeve 9 to permit the sleeve 9 to freely rotate without turning the said collar. The sleeve 9 is provided adjacent its upper end with the inturned flange 24' for a purpose to be later described. The bracket 12 is provided with a downwardly extending sleeve portion 25 which encircles the upper portion of the sleeve 9 and is provided with an outwardly extending pin 26 engaging in a spiral groove 27 provided in a collar 28. The collar 28 is provided with a pair of pivots 29 and each one of the same carries one of the vanes 4. It will be seen that the vanes 4 connected to the bracket 12 are each provided with a slightly upturned portion 31 while the vanes 4 extending at right angles thereto are connected to the collar 28 and are each provided with a slightly down turned portion 31 so that the horizontal center line of all of the vanes traverse the same path when rotating.

It will be understood that the vanes 4 may be of any desired construction to help support the weight of the plane when descending but are here shown as being of the airfoil type and the entering edge thereof is shown as being slightly higher than the trailing edge. It will further be noted that when the device is in its retracted position that the pair of vanes connected to the collar 28 will be aligned with the pair connected to the bracket 12 and positioned therebeneath while in the operative position one pair will extend at right angles to the opposite pair. A suitable spring-pressed lock pin 30 may be provided in the bracket 12 to lock the vanes in their operative position and the same may be released by inserting a suitable tool into the aperture 31 provided in the collar 28 to retract the pin 30. It will be understood that the pin 30 will be so designed as to automatically lock the parts in their operative position when the vanes are brought into operation. A shaft 32 is slidably positioned in the sleeve 9 and is provided at its lower end with the flange 33 that abuts the inturned flange 24' to limit the upward movement of the outer ends of the vanes 4. A pin 34 ex-

tends through the sleeve 9 and forms an abutment for the lower end of the compressing spring 35, the upper end of the same abutting the flange 33 provided on the lower end of the post 32, and it will be seen that the tendency of the spring 35 is to move the post 32 to its extreme uppermost position.

The upper end of the post 32 is provided with the cap 36 to which suitable eye bolts 37 are secured and each of the eye bolts has secured thereto one end of a cable 38 while the opposite end of each of the cables is secured to one of the vanes 4 thereby limiting the drop of the outer end of the vanes 4 when the device is in the extended position and the plane resting on the ground. The lower end of the post 32 is provided with a depending ear 39 to which the cable 17 is attached.

Referring to Fig. 4, it will be seen that a retracting drum 40 is secured to a stationary portion of the cockpit and is provided with the operating handle 41 for rotating the drum to pull the cable 17 thereby drawing the post 32 down into the hollow sleeve 9. The retracting drum 42 is similar in construction to the drum 40 and is provided with the handle 43 for rotating the drum thereby pulling the cable 19 and retracting the sleeve 9 so that the upper end thereof lies below the top surface of the wing 2.

It will be understood that suitable locking mechanism such as the pawls 44 may be used to hold the device in its retracted position and which may be disengaged from each of the drums 40 and 42 to permit the springs 23 and 35 to bring the device into operative position. It will be further understood that the retracting means and the locking means therefor is merely diagrammatic and different types or forms of retracting mechanism may be used as desired.

The operation of the device is as follows:

Under normal flying conditions, the parts will be in the position shown in Fig. 7 and all of the mechanism will be out of the air path thereby permitting the aeroplane to be flown at the maximum speed attainable thereby. In case the motor of the aeroplane stalls or visibility becomes so poor that a forced landing is necessitated, it is only necessary for the pilot to pull the cable arrangement 6 which will retract the shutters 5 and then by releasing the locking mechanism 44 the spring 23 will move the sleeve 9 upward until the flange 20 strikes the lower end of the bearing 10 and the spring 35 at the same time will force the post 32 upward and bring the parts to the position shown in Fig. 4. The vanes 4 connected to the collar 28 will be moved around until they lie at right angles to the vanes connected at 13 to the bracket 12 and will be locked by the pin 30. It will be understood that the air current will cause the vanes 4 connected to the collar 28 to move around to the operative position as the pin 26 will be engaged with the spiral groove 27. When the plane is being landed the pilot will preferably head into the wind and the centrifugal force will throw the outer end of the vanes 4 downward so that the vanes will rotate in approximately a horizontal plane and will help sustain the weight of the plane and permit the machine to be landed at a relatively slow landing speed.

When it is desired to bring the device to its normal inoperative position the lock 30 is retracted and the vanes brought into alignment with the recess 3, the drums 40 and 42 are then operated to retract respectively the post 32 and

the sleeve 9 and the shutters 5 are moved back to cover the aperture 3 and the device is again ready for use. It will be seen that since the spring 35 is used to maintain the post at its extreme height it is not necessary to interpose any spring in the cables 38 thereby permitting the same to be coiled down upon the top of the vanes 4 without danger of entanglement of the cable.

From the foregoing description it becomes evident that I have provided a safety device for heavier than air machines which will permit the machine to be landed at a relatively slow landing speed and which is so constructed as to form no obstruction while the machine is traveling through the air and further, that the device is simple in operation and so constructed as to not easily get out of order and will perform the objects theretofore set up.

Having thus fully described my invention, its utility and mode of operation, what I claim and desire to secure by Letters Patent of the United States is—

1. A device for use in combination with a heavier than air machine having a wing provided with a recess, a rotor consisting of two pairs of oppositely disposed vanes, a post extending upwardly through the wing on the longitudinal center line of the body, a sleeve in which the post is slidable longitudinally, the said sleeve being also movable upwardly from a retracted position, a rotatable collar on the sleeve to which the inner ends of two of the vanes are oppositely hingedly secured and the inner ends of the other two blades being hinged to the sleeve, a means connected with each of the vanes and to the upper end of the post limiting the drop of the vanes by gravity, said collar being rotatable relative to the sleeve, a lock means limiting the extent of rotation of the collar to dispose the two pairs of vanes on diametrically opposite lines, a compression spring tending to project the post, a second spring tending to project the sleeve, and a manually operable means for withdrawing the sleeve and post to retract the vanes to the inoperative position within the wing recess.

2. A device for use in combination with a

heavier than air machine having a wing provided with a recess in its upper surface, of two pairs of vanes free to rotate upon a common axis by movement of the machine through the air, means for projecting the blades to within the wind path comprising a rotatable sleeve arranged for vertical movement relative to the machine on approximately a longitudinal center line thereof, one of the said pairs of vanes being turnable with the longitudinal line from one blade to the other at a right angle to that occupied by the other pair of blades, a locking means for locking the blades in the said last named position, a spring tending to project the sleeve to thereby position the vanes in the wind path, manual means for retracting the sleeve longitudinally to withdraw the vanes to within the recess, each of said vanes being hinged at the inner ends relative to the sleeve, a projectible and rotatable post riding longitudinally in the sleeve, a cable attached to each blade and to the post limiting the drop of the vanes by gravity, manual means for retracting the sleeve and the post, means limiting the extent of projection of the sleeve, and means limiting the extent of projection of the post.

3. A device for use in combination with a heavier than air machine having a wing provided with a recess in its upper surface comprising a rotor consisting of two pairs of oppositely disposed vanes, a support for the vanes comprising a sleeve reciprocally and rotatably mounted on a center line thereof, one pair of vanes being fixed to the sleeve and the other pair of vanes being mounted to turn thereon to bring the second pair of vanes to a position at a right angle to the other pair, spring means for projecting the sleeve to raise the vanes from the recess, a post reciprocable in the sleeve, a cable extending to each of the vanes from the upper end of the post for sustaining the vanes and determining the drop thereof by gravity, a spring for projecting the post, and means whereby both the post and the sleeve may be retracted from their extended position permitting the vanes to be positioned within the recess of the wing.

THOMAS A. DAVIS.

50 125

55 130

60 135

65 140

70 145

75 150