

A. R. NORDSTROM.
 PROPELLING MECHANISM FOR FLYING MACHINES.
 APPLICATION FILED JUNE 4, 1912.

1,064,162.

Patented June 10, 1913.

3 SHEETS—SHEET 1.

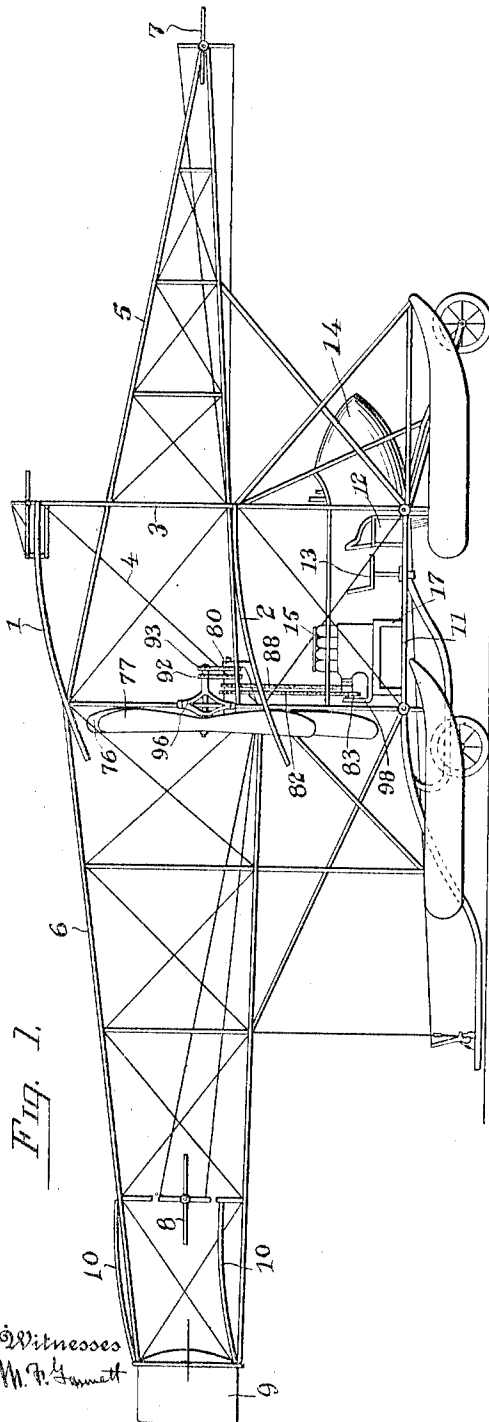


Fig. 1.

Witnesses
 M. F. Emmett

C. C. Hines.

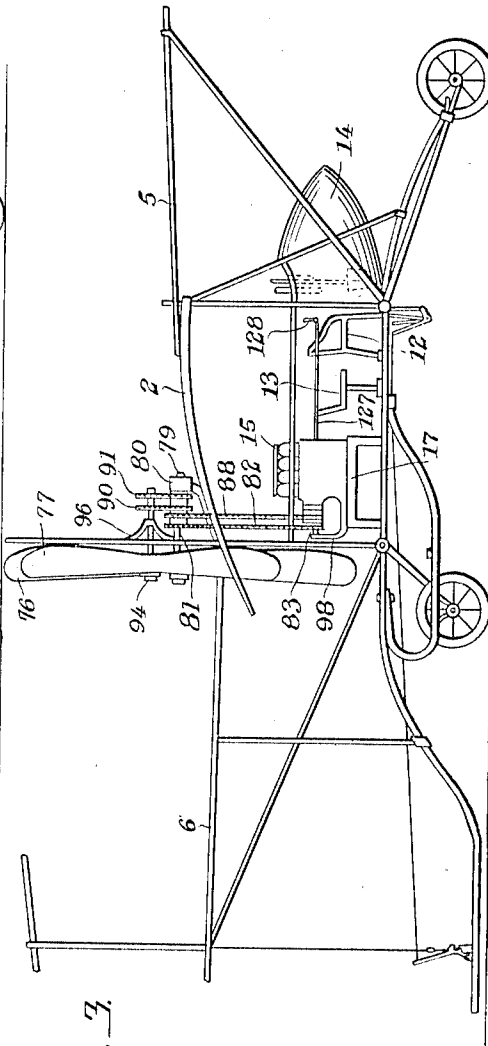


Fig. 3.

Inventor
 A. R. Nordstrom

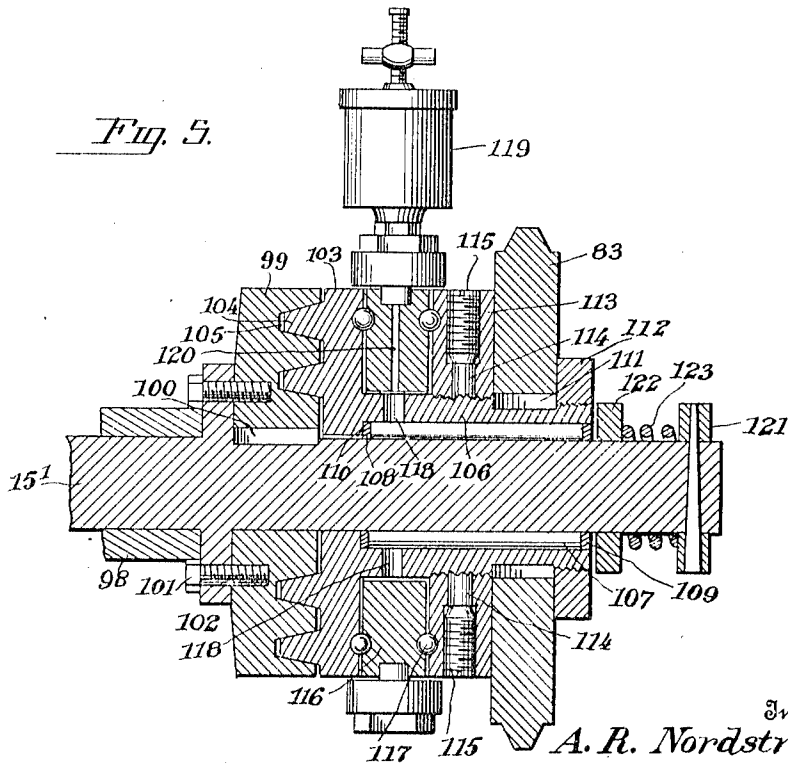
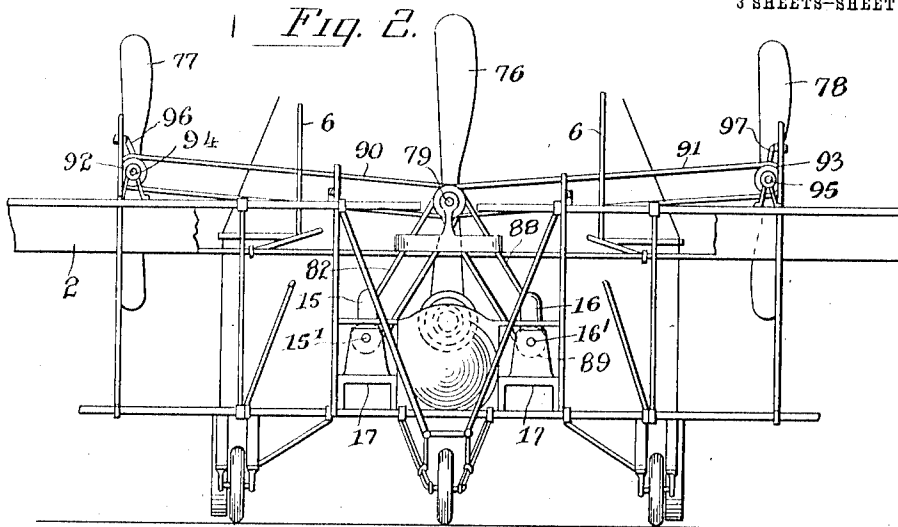
By Victor J. Evans
 Attorney

A. R. NORDSTROM.
PROPELLING MECHANISM FOR FLYING MACHINES.
APPLICATION FILED JUNE 4, 1912.

1,064,162.

Patented June 10, 1913.

3 SHEETS-SHEET 2.



Witnesses
M. F. Gannett
C. C. Kline.

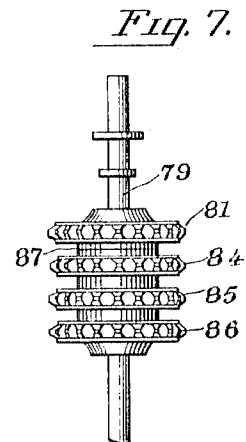
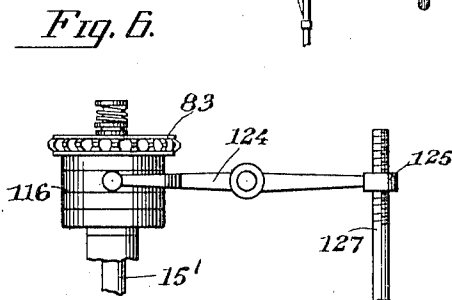
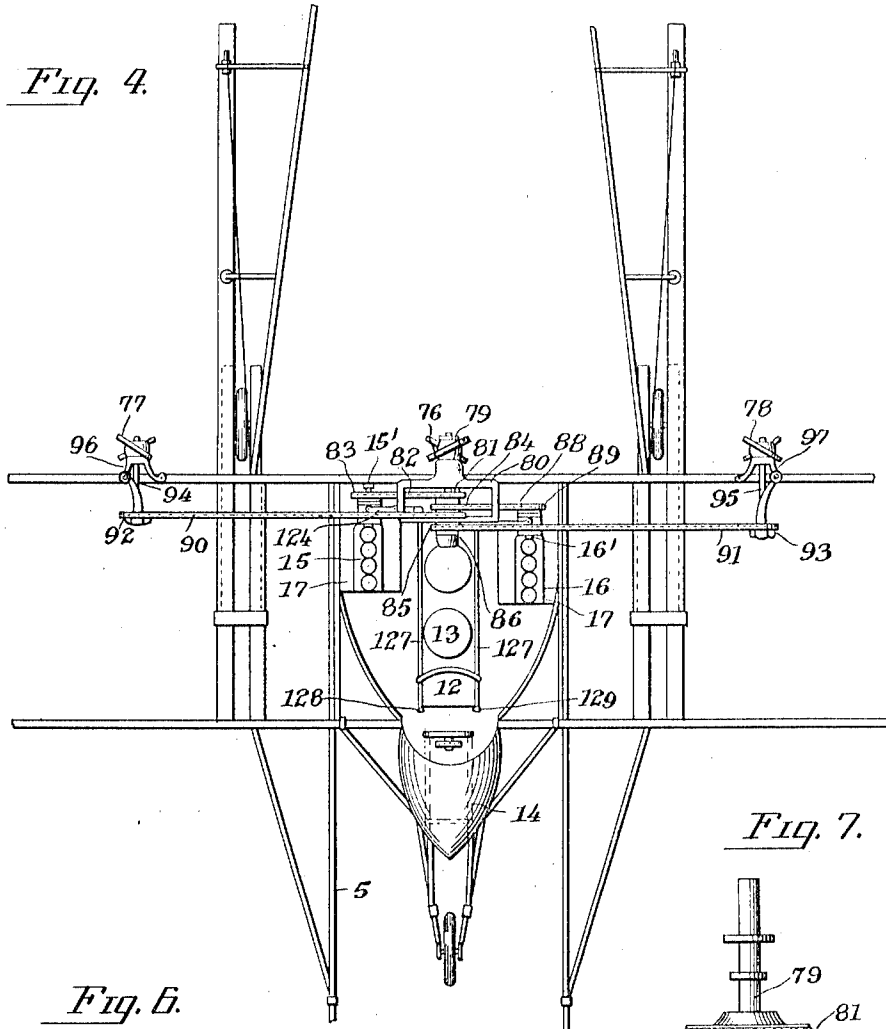
Inventor
A. R. Nordstrom
By Victor J. Evans
Attorney

A. R. NORDSTROM.
PROPELLING MECHANISM FOR FLYING MACHINES.
APPLICATION FILED JUNE 4, 1912.

1,064,162.

Patented June 10, 1913.

3 SHEETS—SHEET 3.



Inventor
A. R. Nordstrom

Witnesses
M. F. Gannett
C. C. Hines.

By Victor J. Evans
Attorney

UNITED STATES PATENT OFFICE.

AXEL R. NORDSTROM, OF WEST LYNN, MASSACHUSETTS, ASSIGNOR OF ONE-FOURTH TO GUSTAF F. HELLSTROM, SR., AND GUSTAF F. HELLSTROM, JR., OF WEST LYNN, MASSACHUSETTS, THREE-SIXTEENTHS TO MARTIN BOWMAN, OF ROCKPORT, MASSACHUSETTS, AND ONE-SIXTH TO CARIN E. NORWALL, OF WEST LYNN, MASSACHUSETTS.

PROPELLING MECHANISM FOR FLYING-MACHINES.

1,064,162.

Specification of Letters Patent.

Patented June 10, 1913.

Original application filed December 27, 1911, Serial No. 668,046. Divided and this application filed June 4, 1912. Serial No. 701,577.

To all whom it may concern:

Be it known that I, AXEL R. NORDSTROM, a subject of the King of Sweden, residing at West Lynn, in the county of Essex and State of Massachusetts, have invented new and useful Improvements in Propelling Mechanism for Flying-Machines, of which the following is a specification.

This invention relates to propelling mechanism for aeroplanes or so-called heavier-than-air flying machines, and the present application is a division of my prior application No. 668,946, filed December 27, 1911.

The object of the present invention is to provide a propelling mechanism embodying a double power system including separate and independent motors and propellers operated thereby, together with means for throwing the motors and propellers into and out of action, the construction being such that in the event of the failure of one of said power systems the other will operate to maintain continuity of flight of the machine.

The invention consists of the features of construction, combination and arrangement of parts hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 is a side elevation of a flying machine embodying my invention. Fig. 2 is a sectional front elevation through the carriage and lower supporting surface. Fig. 3 is a vertical longitudinal section of the same. Fig. 4 is a sectional plan view of the parts shown in Fig. 3, omitting the lower supporting surface. Fig. 5 is a vertical section on an enlarged scale through one of the transmission shafts and bearing thereon. Fig. 6 is a plan view of the same. Fig. 7 is a plan view of the countershaft and transmission sprockets thereon.

In the present instance, I have shown the application of my invention to a flying machine of the biplane type, in which the superposed supporting planes or surfaces 1 and 2 are connected in the usual manner by struts 3 and stay wires 4, said machine being provided with head and tail frames 5 and 6 carrying the elevators or horizontal rudders 7 and 8. The tail frame also carries a vertical or direction rudder 9 and stabilizing plane or surfaces 10, which

operate also to sustain the weight of the tail frame when the machine is in flight.

The machine is mounted upon a carriage or chassis including a car or platform 11 which supports the aviator's seat 12, one or more passenger's seats 13, and a substantially cigar-shaped or torpedo-shaped body or shield 14, in rear of which said seats are disposed, said body or shield serving to protect the aviator and passenger from the force of the wind. The seats 12 and 13 are preferably arranged in tandem relation in the central longitudinal line of the machine, in order that the weight of the occupants thereof may be properly distributed to trim or balance the machine. The car or platform 11 also supports a pair of motors 15 and 16, which rest upon suitable beds 17 arranged on opposite sides of the longitudinal center of the machine so as to properly position the motors for balancing effect and to dispose the same in the path of the air for an effective cooling action.

The propelling mechanism comprises a central propeller 76, disposed in the central longitudinal line of the machine, and side propellers 77 and 78, arranged equidistantly on opposite sides of said central propeller. The propeller 76 is fixed to a counter-shaft 79 journaled in a suitable bearing bracket 80. This shaft carries a fixed sprocket wheel 81 connected by a chain 82 with a sprocket wheel 83 on the shaft of the engine 15, whereby said propeller 76 is driven. Said shaft 79 also carries a series of sprocket wheels 84, 85 and 86 fixed to a sleeve 87 revolvably mounted on said shaft 79, antifriction roller or ball bearings being preferably disposed between said sleeve and shaft to reduce friction. The sprocket wheel 84 is connected by a chain 88 with a sprocket wheel 89 on the shaft of the engine 16, and chains 90 and 91 connect the sprocket wheels 85 and 86 with sprocket wheels 92 and 93 on the shafts 94 and 95 of the propellers 77 and 78, which shafts are journaled in suitable counterpart bearing brackets 96 and 97, whereby the said propellers 77 and 78 are driven from the engine 16. While the propellers 77 and 78 are shown in the present instance as arranged to rotate in the same direction, it will, of course, be understood

that one of the chains 90 and 91 may be crossed to drive the two side propellers in opposite directions. In practice, when the side propellers are geared to rotate in the same direction, the central propeller 76 will be geared to rotate in the opposite direction, so that the side thrust of the side propellers will be counteracted by the thrust of the central propeller to prevent divergence of the machine from a straight course of travel.

Clutch devices are provided upon the shafts 15' and 16' of the respective engines 15 and 16, whereby the propellers may be thrown into and out of action at will, without stopping the engines, and whereby in the event of the failure of either propelling system the other may be set into or maintained in operation to adapt the machine to secure a continuance of driving motion of the machine. As these clutch devices are similar in construction, a description of one will suffice for both. As shown, the shaft 15' of the motor 15 is journaled in a suitable bearing 98 and has fixed thereto the friction clutch disk or member 99, which is shown as keyed to the shaft, as indicated at 100 and also fixed to the shaft by screws 101 passing through an annular flange 102 on said shaft. Loosely mounted on the shaft is a complementary adjustable friction disk or member 103, the side of which adjacent the disk 99 is provided with annular tapered rings or projections 104 to frictionally engage the walls of similarly shaped grooves 105 formed in the disk 99, so that by adjusting said disk 103 longitudinally on the shaft it may be connected with the shaft to revolve therewith or disconnected so as to remain stationary while the shaft is in motion. The opposite side of the disk 103 is provided with a sleeve 106 formed to receive anti-friction roller bearings 107 interposed between the same and the shaft, which roller bearings are held from endwise movement by bearing washers 108 and 109, the inner bearing washer 108 engaging a shoulder 110 at the inner end of the bore of the sleeve. Keyed to the outer end of the sleeve, as at 111, is the sprocket wheel 83 or 89, as the case may be, which is retained against outward movement by a threaded ring or collar 112. Said sprocket wheel is disposed between the ring 112 and a collar or retaining member 113 threaded on the shaft and provided with gibs or keys 114 to engage the threads, which gibs or keys are secured in position by adjustable screw plugs 115. The member 113 forms with the adjacent side of the disk 103 an annular groove receiving a shifting ring 116, between which and the faces of the disk and collar 113 are interposed the anti-friction bearings 117. The sleeve 106 is provided with annular series of oil ducts or channels 118, and the shifting ring 116 carries a lubricator 119 com-

municating with an oil feed duct or channel 120 therein, which is adapted to supply lubricant to the ducts 118, by which it is distributed to the various bearing surfaces. At the outer or free end of the shaft is arranged a suitable stop 121 between which and a sliding disk or head 122 fitted on the shaft is arranged a coiled pressure spring 123. The head 122 under pressure of the spring normally serves to slide the friction disk 103 inward and to connect the two disks 103 and 99 to couple the sprocket wheel to the shaft and allows sufficient outward longitudinal sliding movement of the parts to throw the friction faces of the disks out of engagement with each other, to permit them to turn independently of the sprocket wheel. The ring 116 is engaged by the forked end of a shipper lever 124, the opposite end of which is provided with an eye 125 internally threaded to receive the rear threaded end 126 of an adjusting rod 127, the rods of the two clutch devices being journaled at their forward ends in bearings on the aviator's seat 12 and respectively provided with handles 128 and 129 whereby said rods may be turned to shift the respective shipper levers 124 by their threaded engagement therewith, so as to adjust the shifting rings 116 on the respective engine shafts 15' and 16'. One of the rods 127 preferably has a right hand threaded engagement with the eye 125 of the coacting shipper lever 124, while the other rod 127 preferably has a left hand threaded engagement with its coacting shipper lever, whereby the two clutches are adapted to be controlled by outward and inward lateral swinging movements of the handles 128 and 129, as will be readily understood. It will thus be seen that both motors may be maintained in operation and either the central or side propellers employed for a driving action, or all three propellers employed to secure maximum power in launching the machine and driving the same to the desired altitude before beginning a straight flight. It will also be seen that this construction permits the motors to be set into action by the aviator without driving the propellers, so that the aviator may start the propellers at his convenience in beginning a flight. If, during flight, either motor or any part of the propelling system actuated thereby should become inoperative, the other propelling system may be set in action to maintain flight, the advantages of which will be apparent.

I claim:—

1. In a flying machine, a pair of separate and independent motors, a central propeller, a pair of side propellers, means for directly driving the central propeller from one of said motors, a gear element on the shaft of the central propeller, means for driving the

same from the other motor, and means for driving the side propellers from said gear element.

2. In a flying machine, a pair of separate
5 and independent motors, a central propeller, a pair of side propellers, a multiple sprocket gear on the shaft of the central propeller, means for directly driving said central propeller from one of said motors, means for
10 driving said multiple sprocket gear from the other motor, and means for driving the side propellers from said multiple sprocket gear.

3. In a flying machine, a central propeller,
15 a pair of side propellers, a pair of separate and independent motors, gearing for di-

rectly driving the central propeller from one of said motors, a gear element loosely mounted on the shaft of the central propeller, gearing for driving said gear element from the other motor, gears for driving the said propellers from said gear element, and means for throwing the sets of gearing for driving the propellers from the respective motors into and out of action
25 without stopping said motors.

In testimony whereof I affix my signature in presence of two witnesses.

AXEL R. NORDSTROM.

Witnesses:

GUSTAF F. HELLSTROM, Sr.,
JOHN H. MATTSO.