T. A. TANNER.

FLYING MACHINE.

APPLICATION FILED DEC. 21, 1910.

1,037,804.

Patented Sept. 3, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

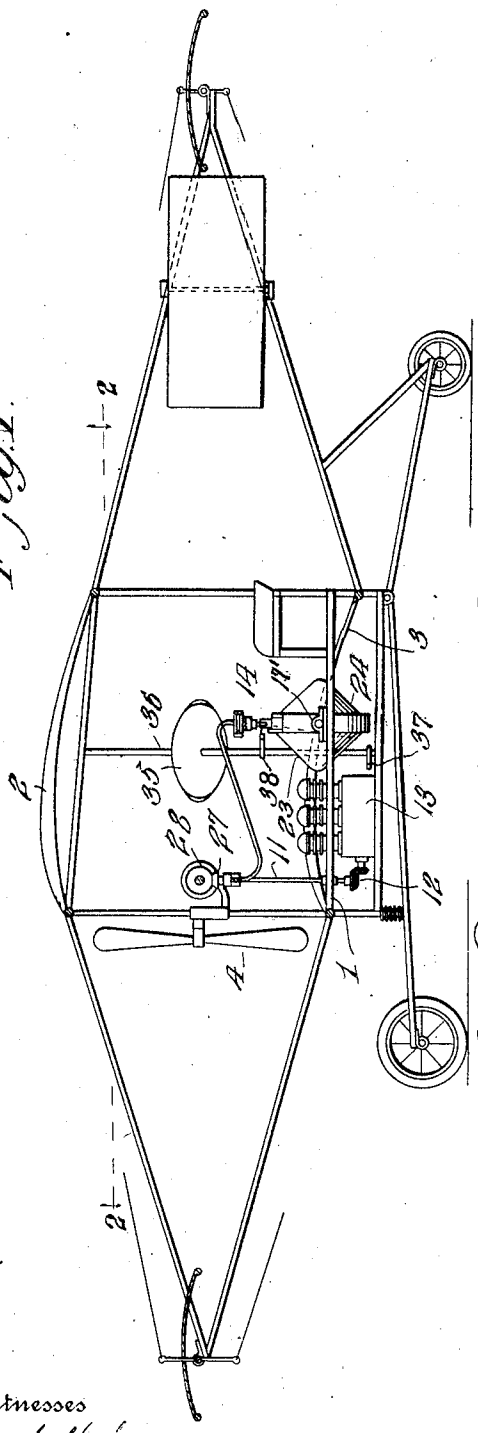
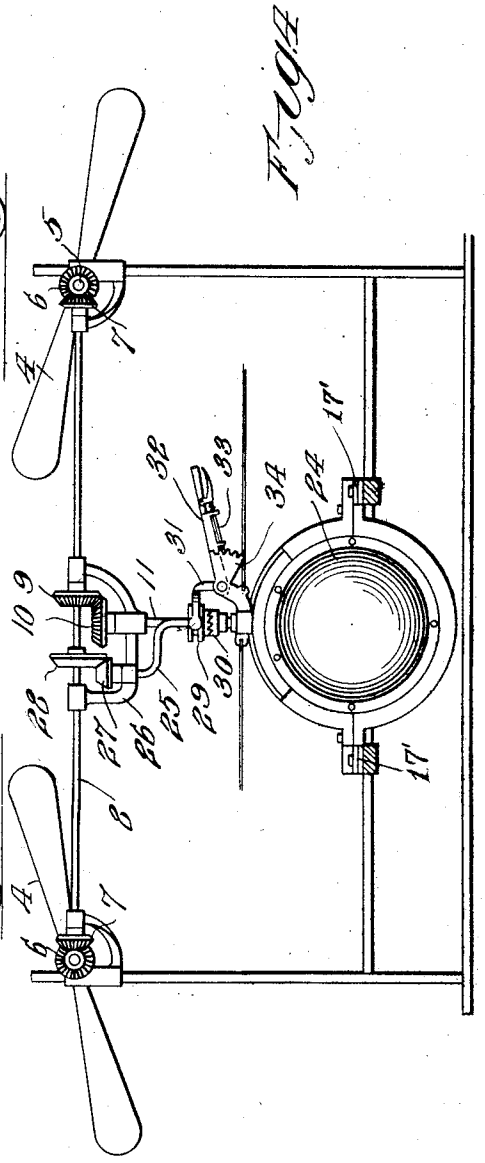


Fig. 2.



Witnesses

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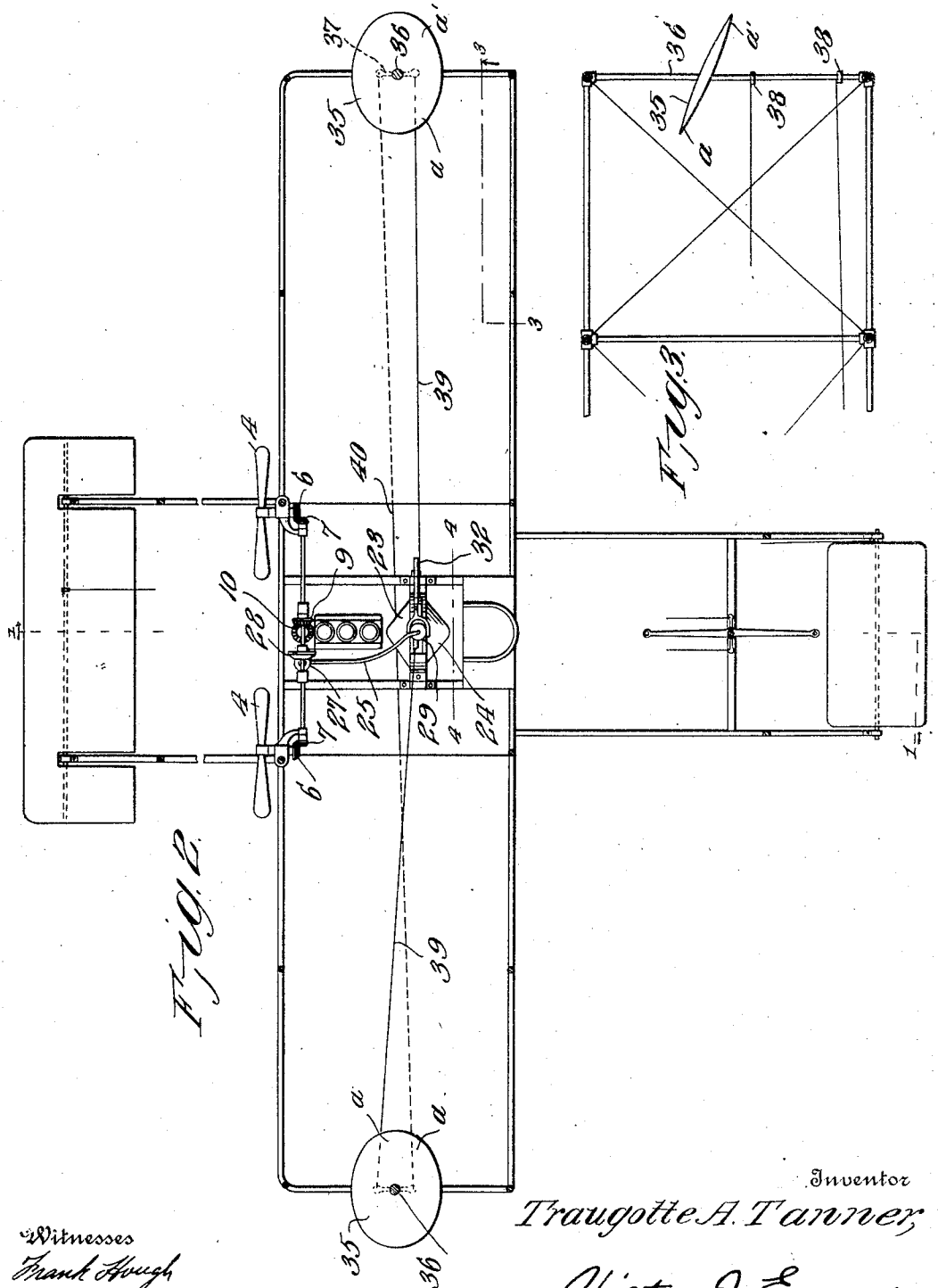

Fig. 2.

Fig. 3.

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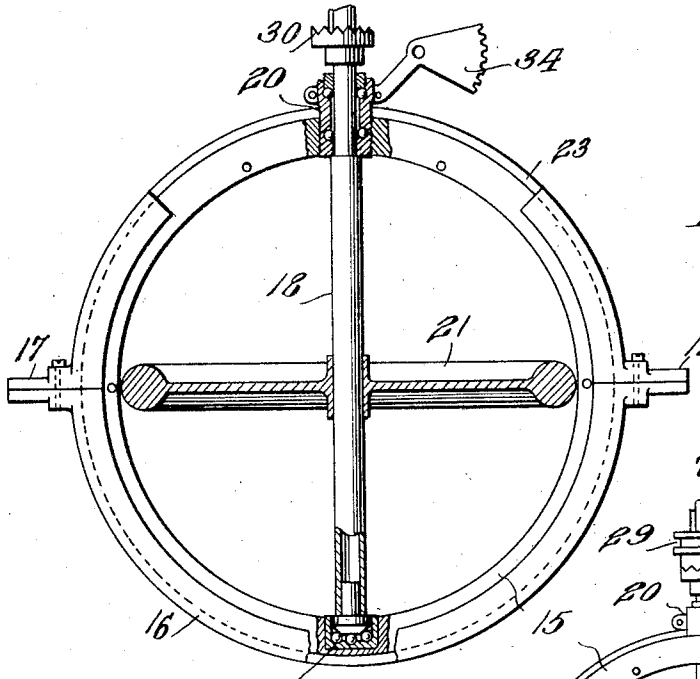

Fig. 6.

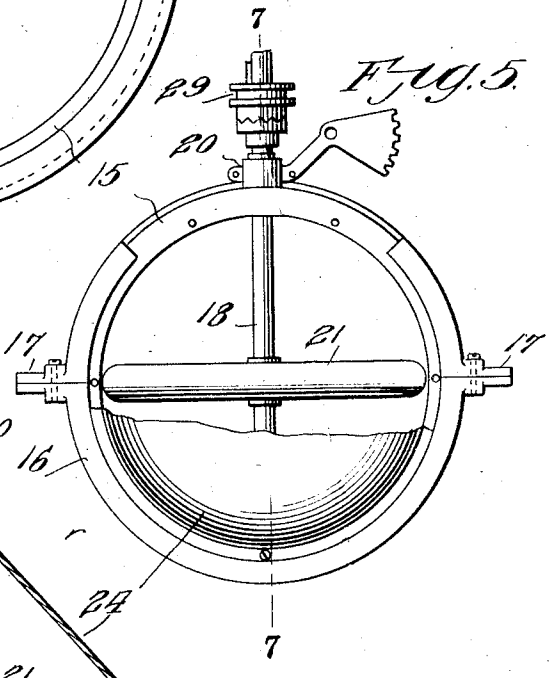

Fig. 5.

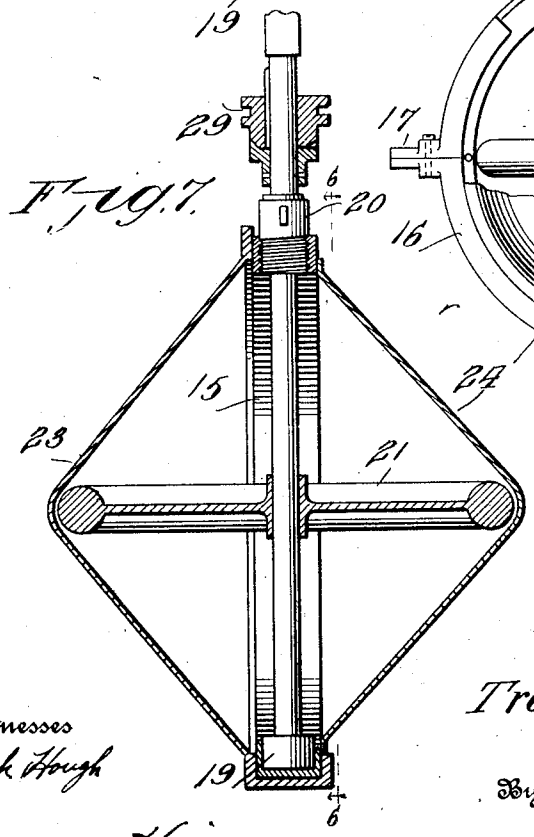

Fig. 7.

Witnesses

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UNITED STATES PATENT OFFICE.

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FLYING-MACHINE.

1,037,804. Specification of Letters Patent. Patented Sept. 3, 1912.

Application filed December 21, 1910. Serial No. 598,511.

To all whom it may concern:

Be it known that I, TRAUGOTTE A. TANNER, a citizen of the United States, residing at Flint, in the county of Genesee and State of Michigan, have invented new and useful Improvements in Flying-Machines, of which the following is a specification.

This invention relates to flying machines, and particularly to means for controlling and maintaining the lateral balance of such machines, the main object of the invention being to provide novel gyroscopically-operated means for actuating balancing devices, whereby an automatic balancing action will be secured.

A further object of the invention is to provide a novel construction of gyroscope and drive gearing therefor, and means for throwing said gearing into and out of action at will.

With these and other objects in view, the nature of which will more fully appear as the description proceeds, the invention consists of the features of construction, combination and arrangement of devices, hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 is a vertical longitudinal section of the machine on the line 1—1 of Fig. 2. Fig. 2 is a sectional plan view on the line 2—2 of Fig. 1. Fig. 3 is a vertical transverse section on the line 3—3 of Fig. 2. Fig. 4 is an enlarged vertical transverse section on the line 4—4 of Fig. 2. Fig. 5 is a front elevation, with the front part of the casing broken away, of the gyroscope. Fig. 6 is an enlarged vertical transverse section of the same on the line 6—6 of Fig. 7. Fig. 7 is an enlarged fore and aft section of the same on the line 7—7 of Fig. 5.

In the accompanying drawings, I have illustrated my invention as applied to a conventional type of biplane machine, although it is to be understood that it may be applied in suitable form to monoplanes and multiplanes generally.

1 in the drawings designates the frame of the machine and 2 and 3 the upper and lower supporting surfaces. Arranged at the front of the frame on opposite sides of the longitudinal center thereof are propellers 4 mounted on shafts 5 provided with beveled gears 6 which mesh with gears 7 on a transversely extending drive shaft 8, which shaft is connected by bevel gears 9 and 10 with a vertical transmission shaft 11, which shaft is driven by intermeshing bevel gears 12 from the shaft of the motor 13.

The controlling mechanism comprises a gyroscope 14 mounted upon the frame and embodying a frame ring 15 fitting within an outer channeled supporting member 16, composed of upper and lower sections suitably united to permit of the application and removal of the ring. The member 16 is arranged vertically upon the frame and extends transversely thereof or at right angles to the line of flight and is provided at its sides with trunnions 17 journaled in bearings 17′, which pivotally connect the gyroscope as a whole with the machine, by which the latter is permitted to tilt in a fore and aft direction without affecting the gyroscope.

The ring 15 corresponds in arrangement, relative to the frame, with the member 16, and the latter is adapted, as the machine tilts laterally in one direction or the other to turn or pivot on said member 16, which latter is held from motion in the operation of the machine by the action of the rotary member of the gyroscope. This rotary member comprises a vertical shaft 18 journaled at its lower end in an antifriction bearing 19 at the base of the ring and at its upper end in an antifriction bearing sleeve 20 disposed at the top of the ring, which shaft carries a horizontally arranged gyroscope wheel or disk 21 arranged to rotate between the sides of the ring and within a suitable inclosing casing composed of sections 23 and 24 respectively carried by the ring and channeled supporting member. This casing protects the gyroscope wheel from the entrance of dust and other foreign particles and from any other disturbing influence, such as the action of the wind when the machine is in flight.

The shaft 18 is driven from the propeller drive shaft 8 by a flexible shaft 25, which is journaled at one end in a bearing yoke 26 and provided with a beveled friction gear 27 driven from a bevel gear 28 on said shaft 8, the opposite or lower end of the flexible shaft being provided with a clutch member 29 adapted to engage a clutch member 30 on the shaft 18 by which said shafts may be

coupled for the transmission of motion from one to the other, the friction gearing being proportioned to rotate the gyroscope wheel at a desired high rate of speed. The clutch member 29 is provided with an annularly grooved collar engaged by pins on the arms of a fork 31 forming part of a bell crank shipper lever 32, by which said clutch member may be adjusted into and out of engagement with the clutch member 30, said lever being provided with a spring-actuated pawl or dog 33 adapted to interlock with a rack 34 forming part of the collar 20 or ring 15, by which said clutch member 29 may be held fixed in adjusted position.

The gyroscope is adapted on the lateral tilting of the vessel in one direction or the other to control balancing devices, whereby the balance of the machine will be automatically restored. These balancing devices are shown in the present instance in the form of ailerons or balancing planes 35 arranged between the lateral extremities of the supporting surfaces 2 and 3, but may be of any other desired form, construction and arrangement suitable for the purpose, the invention contemplating in this particular the use of balancing mediums of any of the types commonly used, including balancing planes or ailerons, warping tips or any other of the elements commonly employed for the purpose.

In the present instance I have disclosed the use of ailerons of elliptical form and having their major axes arranged normally at right angles to the line of flight, said ailerons being rigidly mounted upon vertical shafts 36 at a normal angle of about 15° to the horizontal, the normally inner end *a* of each aileron being at a higher level than the outer end *a'* thereof, each aileron thus extending at an outward and downward inclination and at a negative angle of incidence. The shafts 36 are respectively provided with forwardly and rearwardly projecting crank arms 37 and 38, the crank arm 37 of one shaft and the crank arm 38 of the other shaft being connected by wires or cables 39 to some suitable portion of the gyroscope member 15, as the sleeve 20, while the other two crank arms 37 and 38 of said shafts are coupled to each other by a wire or cable 40, the construction being such as to simultaneously effect a movement of the ailerons in reverse directions upon the tilting of the machine in either direction.

It will thus be understood that when the machine is in flight the rapid motion of the gyroscope wheel will maintain the fixed member 15 of the gyroscope in a perpendicular position irrespective of the tilting motion of the machine in either general direction, and that the machine may tilt in a fore and aft direction without influencing the gyroscope or the connections leading to the ailerons. If, however, the machine should tilt laterally in one direction, the maintenance of the gyroscope member 15 and shaft 18 in normal position will result in a relative tilting motion between the machine and said gyroscope member, by which the connection 39 leading to the aileron shaft at the elevated side of the machine will be drawn upon and the other connection 39 slackened to swing the end *a* of the aileron at the high side rearwardly and correspondingly swing the end *a* of aileron at the depressed side forwardly, thus respectively decreasing and increasing the angle of incidence of said ailerons to restore the balance of the machine in the well-known way. When the machine tilts laterally in the opposite direction, a reverse adjustment of the ailerons occurs, as will be readily understood, whereby the machine will similarly be restored to normal position. Hence, at all times when the machine is in flight the lateral balance will be automatically preserved, obviating the necessity of manual control for the purpose. When in the operation of landing the machine, or in the act of gliding, the propelling power is cut off, the clutch mechanism may be disconnected to free the gyroscope shaft from the flexible shaft, allowing the gyroscope wheel to revolve by momentum to automatically maintain control over the lateral balance until a landing is made.

Having thus described the invention, I claim:—

1. In a flying machine, the combination of a gliding structure, a channeled ring mounted to tilt in a fore and aft direction upon the frame of the gliding structure, a second ring mounted to turn in a transverse direction in said channeled ring, a shaft journaled in said second ring, a gyroscope wheel carried by said shaft, a propeller shaft, a driving motor in gear therewith, a flexible shaft in gear at one end with said propeller shaft, a clutch device for connecting the opposite end of said flexible shaft with the gyroscope shaft, means mounted upon the said second ring for throwing said clutch device into and out of action, and balancing devices controlled by the turning movement of the second ring.

2. In a flying machine, the combination of a gliding structure, a channeled ring mounted to tilt in a fore and aft direction upon the gliding structure, a second ring mounted to turn in a transverse direction in said channeled ring, a gyroscope wheel mounted upon said shaft to rotate within the second ring, a two-part casing secured to the channeled ring and inclosing the gyroscope wheel and the major portion of the shaft, a bracket supported by the second ring and carrying a toothed rack, a propeller shaft, a driving motor in gear therewith, a flexible shaft in

gear at one end with said propeller shaft, a clutch device for connecting the opposite end of said propeller shaft with the gyroscope shaft, a lever mounted upon the bracket for throwing said clutch device into and out of operation, said lever being provided with a dog to engage said rack, and balancing devices coupled to and controlled by the turning movements of the said second ring.

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

TRAUGOTTE A. TANNER.

Witnesses:

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B. F. MILLER, Jr.