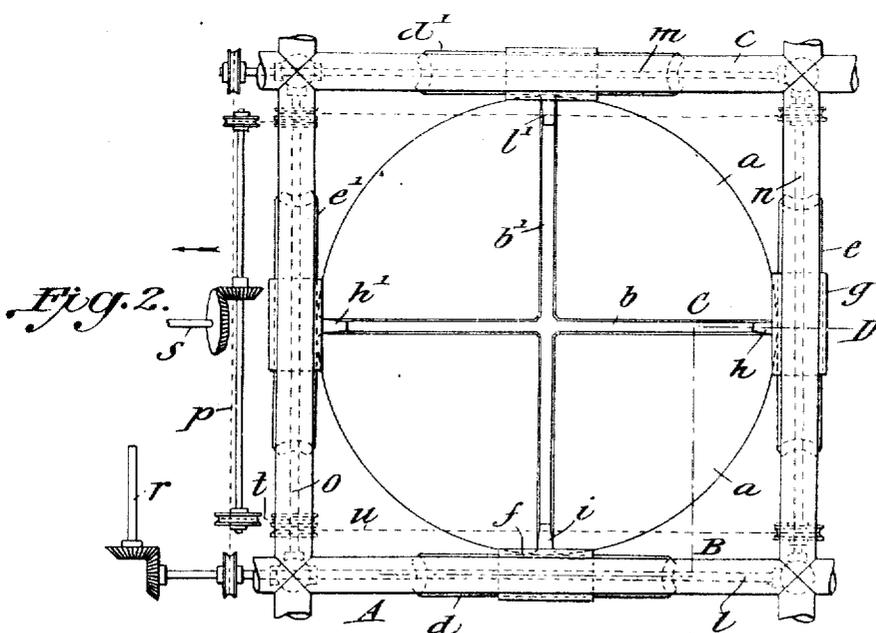
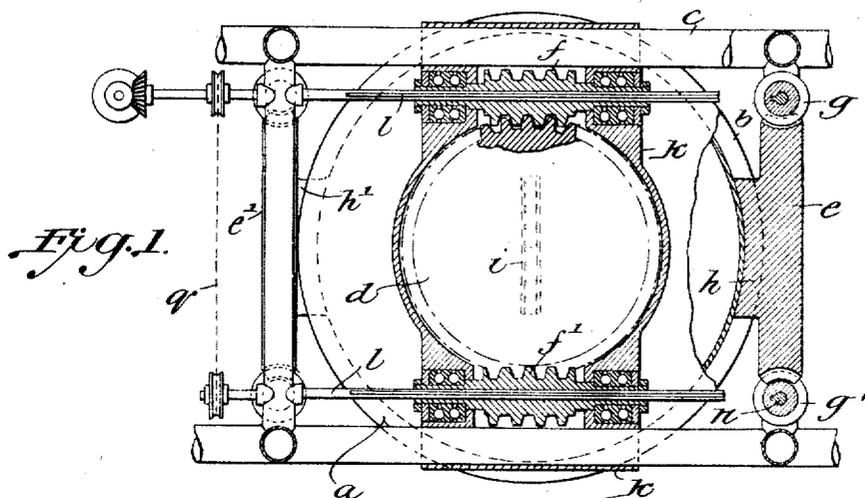


G. KOLB.
 FLYING MACHINE WITH GYROSCOPIC STEADYING DEVICE,
 APPLICATION FILED APR. 28, 1913.

1,175,959.

Patented Mar. 21, 1916.

2 SHEETS—SHEET 1.



Witnesses:
 Bertha F. Feuser
 William C. Gagon

Inventor:
 Guido Kolb.
 by Howard Smith Stewart
 Atty

G. KOLB,
 FLYING MACHINE WITH GYROSCOPIC STEADYING DEVICE,
 APPLICATION FILED APR. 28, 1913.

1,175,959.

Patented Mar. 21, 1916.
 2 SHEETS—SHEET 2.

Fig. 3

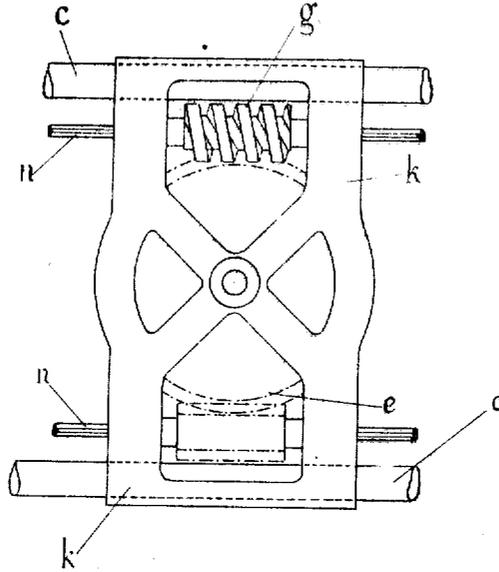
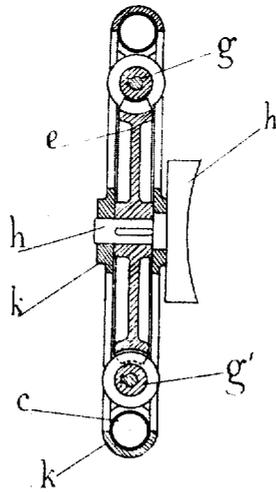


Fig. 4



Witnesses.
Bertha F. Feuser
William C. Sagar

Inventor.
 Guido Kolb,
 by *Herard Smith & Tennant*
 Attys.

UNITED STATES PATENT OFFICE.

GUIDO KOLB, OF BERLIN, GERMANY.

FLYING-MACHINE WITH GYROSCOPIC STEADYING DEVICE.

1,175,959.

Specification of Letters Patent.

Patented Mar. 21, 1916.

Application filed April 28, 1913. Serial No. 763,969.

To all whom it may concern:

Be it known that I, GUIDO KOLB, a subject of the Emperor of Germany, residing at Berlin, Germany, have invented new and useful Improvements in Flying-Machines with Gyroscopic Steadying Devices, of which the following is a specification.

This invention has reference to improvements in flying machines with gyroscopic steadying devices and it consists essentially in improvements in the mounting and driving of a gyroscopic steadying device on the frame of the flying apparatus together with improvements in the steering devices of the flying machine which are necessitated by this method of mounting the steadying device.

Many kites are known in which a gyrost at or top mounted either in the fixed or in the movably arranged frame is employed as a steadying device, but my invention is distinguished from such arrangements by the following characteristic features: The gyrost at is mounted in a perfectly spherical housing or shell, which is to be regarded as the carrier of the flying machine frame; the tilting of the supporting planes in the direction of flight or the actuation of the elevators, the adjusting of the supporting planes to the wind or the actuation of auxiliary planes or the like is effected by the pilot inclining the frame of the flying machine correspondingly to the gyrost at axis of the spherical housing and through this movement actuating the steering devices. The gyrost at is driven from the shaft of the flying machine motor. It may be driven direct by means of gear wheels, or it may be driven by an electric current which is produced by a small generator driven by the motor and is conducted to the spherical casing which in this case is constructed as a stator with the gyrost at as rotor.

The invention is illustrated, in part diagrammatically, in the accompanying drawing, in which:

Figure 1 is an elevation, partly in section on the dot-and-dash line A, B, C, D of Fig. 2, and Fig. 2 is a plan view, Figs. 3 and 4 show details of construction.

Referring to the drawings, *a* is the spherical shell in which the gyrost at is mounted. This spherical shell has two peripheral guide grooves *b* and *b'* at right angles to each other. The frame of the flying machine is constructed of tubes: *c* represents a portion of the said frame. The edges of the frame

form a skeleton rectangular prism of such dimensions that the spherical gyrost at-shell is housed within same. In each of the four vertical sides of the frame a worm wheel *d, d', e, e'* is mounted as hereinafter described and in each of these worm wheels a lower and an upper worm engages, the worm wheel *d* engaging the worms *f* and *f'* and the worm wheel *e* engaging the worms *g* and *g'*. Each two oppositely arranged worm gears work in the same direction. Assuming that the arrow in Fig. 2 indicates the direction of flight, the gears *d* and *d'* with their worms serve for regulating the elevation, whereas the gears *e* and *e'* actuate the lateral steering devices. The worm wheels are provided with guide shoes *h, h', i, i'* which are engaged in the guide grooves *b, b'*, so that the said worm wheels can be displaced in the said grooves but cannot rotate around their axis. The worms are each mounted in a frame *k* which is carried by the rods *l* of the frame and they are actuated from the shafts *m* for regulating the elevation and from the shafts *n* and *o* for lateral steering. The worms are slidable longitudinally upon these shafts but are not rotatable thereon.

The shafts of the worm gears which belong to a set are connected with each other by means of chains or the like in such a manner that they can be actuated by the pilot from a single steering shaft, the shafts *l* and *m* being shown in the drawing connected by the chain *p*, while the coupling of the upper and lower shafts is effected by chains *q*. The worms of the worm wheels *d* and *d'* are consequently set in motion when the steering shaft *r* is rotated but, as the worm wheels cannot rotate around an axis which is vertical to the plane of the wheel on account of the guide shoes, the worms and consequently their carriers *k* and the frame *c* must rotate around this axis while the guide shoes *h* and *h'* of the other two worm wheels are displaced in the guide groove *b*. By actuating the steering shaft *r* the inclination to the horizontal of the supporting planes is consequently changed. In an exactly corresponding manner the actuation of the lateral steering devices is brought about through the worm wheels *e* and *e'*. The relative shafts *n* and *o* are connected with each other by means of chains *t* and *u* so that they can all be actuated simultaneously from the steering shaft

e. The rotation of the frame *c* around the axis vertical to the plane of the wheels *e* and *e'* results in a displacement of the guide shoes *i* and *i'* in the groove *b'*.

5 The actuation of the two steering devices at the same time necessitates the carriers *k* of the worms being displaceable upon the frame tubes *c* in the direction of the axis of the tube. In correspondence with this displacement the worms will be displaced longitudinally upon their shafts *l, m, n, o*. The worm gears have such a small pitch that they are automatically locked and any movement of same depends entirely upon
15 the will of the pilot.

The transmission of the driving power from the motor of the flying machine to the gyrostat may be by means of gear wheels and an intermediate flexible shaft, a chain drive or the like. The arrangement of the gear wheels may however be such that the gyrostat may be driven without employing special intermediate members. Further, the driving of the gyrostat may be effected by means of an electric current without employing mechanical intermediate gearing, the current being delivered from any suitable source, for example a small generator for producing any desired kind of current
20 driven from the shaft of the flying machine motor. The gyrostat with its shell or casing *a* is in this case constructed as an electro-motor, the gyrostat itself constituting the rotor and the casing the stator of the motor.
35 What I claim as my invention and desire to secure by Letters Patent is:—

1. In a flying machine the combination with a gyrostat of a spherical housing within which the said gyrostat is mounted and

which housing is itself rotatably mounted 40 in a frame in the form of a skeleton rectangular prism that forms part of the rigid frame of the machine, peripheral grooves formed at right angles to each other in the said spherical housing, a worm wheel 45 mounted in each of the four vertical sides of the said rectangular frame on a carriage which is slidable on the said frame, a lateral guide rib formed centrally on each of the said worm wheels and fitting slidably in the 50 relative peripheral grooves in the said housing, worms mounted on the frame and engaged with the said worm wheels, and means for actuating the said worms substantially as set forth. 55

2. In a flying machine, the combination with a gyrostat, of a housing within which the said gyrostat is mounted and which housing is itself rotatably mounted in a frame forming part of the rigid frame of 60 the machine, guiding means arranged opposite each other in the said housing, a worm wheel mounted in each of the vertical walls of the said frame on a carrier which is slidable on the said frame, guiding means 65 formed on each of the said worm wheels and adapted to slide in the respective guiding means in the said housing, worms mounted on the frame and engaging with the said worm wheels, and means for actuating the 70 said worms substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GUIDO KOLB.

Witnesses:

CLEMENS KOLB,
JACOB W. SCHMIDT.

a. The rotation of the frame *c* around the axis vertical to the plane of the wheels *e* and *e'* results in a displacement of the guide shoes *i* and *i'* in the groove *b'*.

5 The actuation of the two steering devices at the same time necessitates the carriers *k* of the worms being displaceable upon the frame tubes *c* in the direction of the axis of the tube. In correspondence with this displacement the worms will be displaced longitudinally upon their shafts *l, m, n, o*. The worm gears have such a small pitch that they are automatically locked and any movement of same depends entirely upon
15 the will of the pilot.

The transmission of the driving power from the motor of the flying machine to the gyrostat may be by means of gear wheels and an intermediate flexible shaft, a chain drive or the like. The arrangement of the gear wheels may however be such that the gyrostat may be driven without employing special intermediate members. Further, the driving of the gyrostat may be effected by
25 means of an electric current without employing mechanical intermediate gearing, the current being delivered from any suitable source, for example a small generator for producing any desired kind of current driven from the shaft of the flying machine motor. The gyrostat with its shell or casing
30 *a* is in this case constructed as an electromotor, the gyrostat itself constituting the rotor and the casing the stator of the motor.

35 What I claim as my invention and desire to secure by Letters Patent is:—

1. In a flying machine the combination with a gyrostat of a spherical housing within which the said gyrostat is mounted and

40 which housing is itself rotatably mounted in a frame in the form of a skeleton rectangular prism that forms part of the rigid frame of the machine, peripheral grooves formed at right angles to each other in the said spherical housing, a worm wheel
45 mounted in each of the four vertical sides of the said rectangular frame on a carriage which is slidable on the said frame, a lateral guide rib formed centrally on each of the said worm wheels and fitting slidably in the relative peripheral grooves in the said housing, worms mounted on the frame and engaged with the said worm wheels, and means for actuating the said worms substantially
55 as set forth.

2. In a flying machine, the combination with a gyrostat, of a housing within which the said gyrostat is mounted and which housing is itself rotatably mounted in a frame forming part of the rigid frame of
60 the machine, guiding means arranged opposite each other in the said housing, a worm wheel mounted in each of the vertical walls of the said frame on a carrier which is slidable on the said frame, guiding means
65 formed on each of the said worm wheels and adapted to slide in the respective guiding means in the said housing, worms mounted on the frame and engaging with the said worm wheels, and means for actuating the
70 said worms substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GUIDO KOLB.

Witnesses:

CLEMENS KOLB,
JACOB W. SCHMIDT.

Correction in Letters Patent No. 1,175,959.

It is hereby certified that in Letters Patent No. 1,175,959, granted March 21, 1916, upon the application of Guido Kolb, of Berlin, Germany, for an improvement in "Flying-Machines with Gyroscopic Steadying Devices," an error appears in the printed specification requiring correction as follows: Page 2, line 47, claim 1, for the word "carriage" read *carrier*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office

Signed and sealed this 18th day of April, A. D., 1916.

[SEAL.]

R. F. WHITEHEAD,

Acting Commissioner of Patents.

Correction in Letters Patent No. 1,175,959.

It is hereby certified that in Letters Patent No. 1,175,959, granted March 21, 1916, upon the application of Guido Kolb, of Berlin, Germany, for an improvement in "Flying-Machines with Gyroscopic Steadying Devices," an error appears in the printed specification requiring correction as follows: Page 2, line 47, claim 1, for the word "carriage" read *carrier*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office

Signed and sealed this 18th day of April, A. D., 1916.

[SEAL.]

R. F. WHITEHEAD,

Acting Commissioner of Patents.

Cl. 244—29.