L. BRIANNE.

APPARATUS FOR ACTUATING FLYING MACHINES.

APPLICATION FILED NOV. 18, 1910.

**1,039,889.**

Patented Oct. 1, 1912.

3 SHEETS—SHEET 1.

FIG. 1.

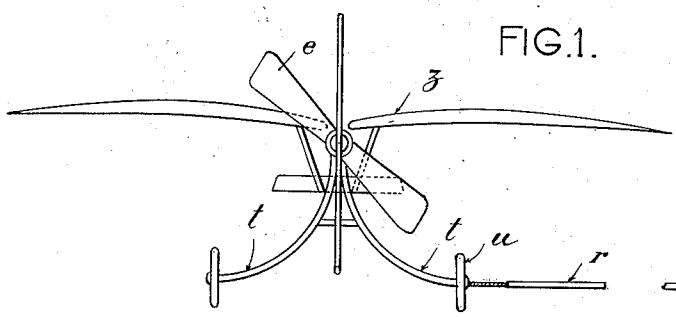
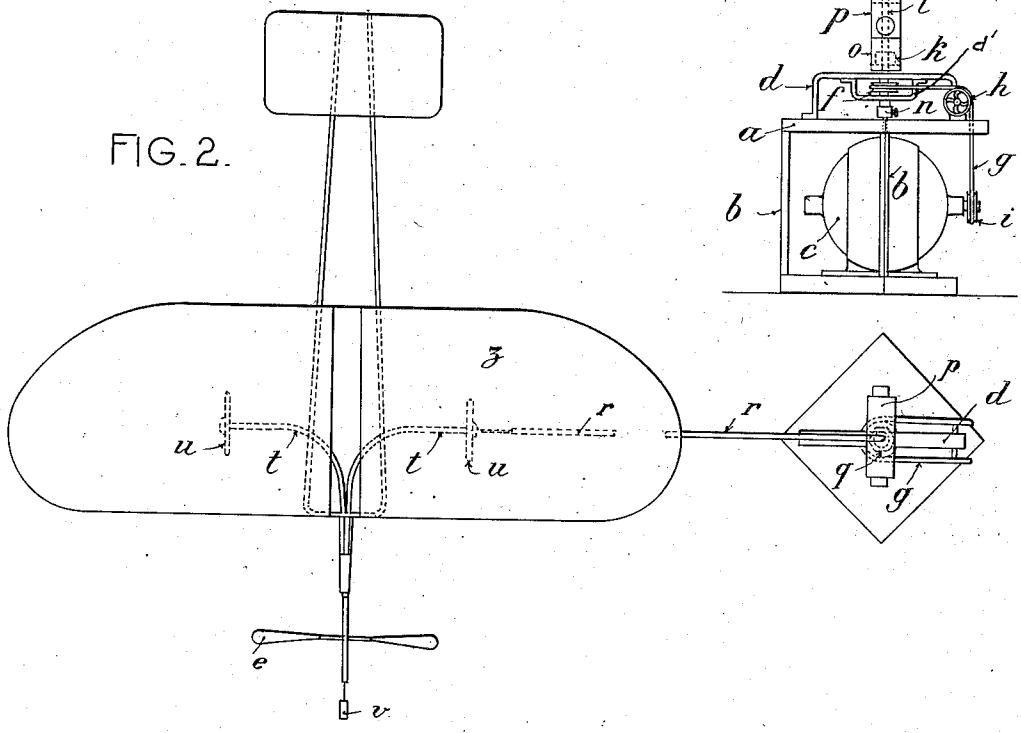



FIG. 2.

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3 SHEETS—SHEET 2.

FIG. 3.

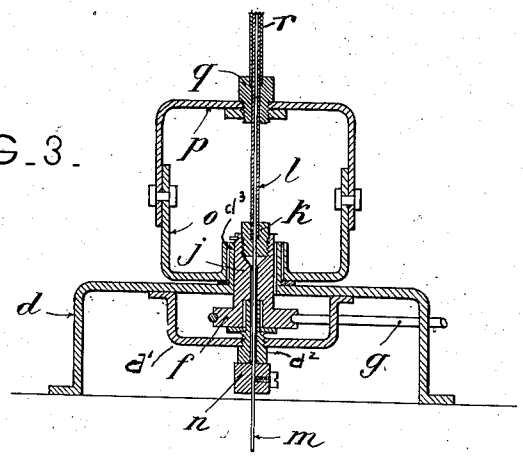



FIG. 4.

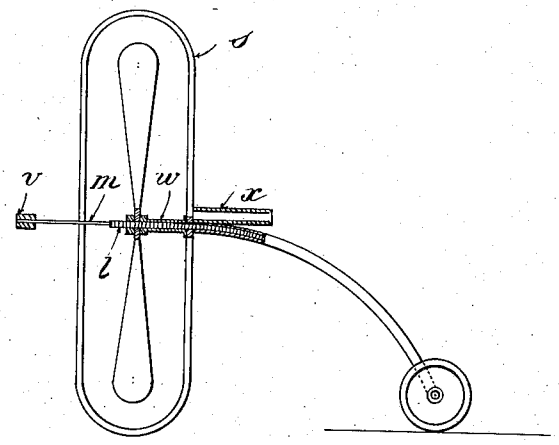
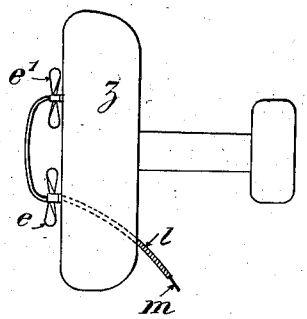



FIG. 5.

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3 SHEETS—SHEET 3.

FIG_6_

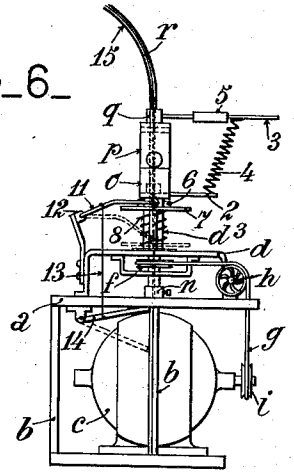



FIG_8_

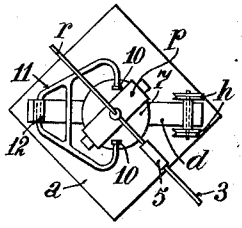
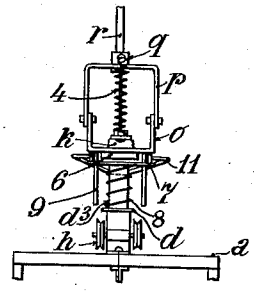



FIG_7_

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# UNITED STATES PATENT OFFICE.

LUCIEN BRIANNE, OF PARIS, FRANCE.

## APPARATUS FOR ACTUATING FLYING-MACHINES.

1,039,889. Specification of Letters Patent. Patented Oct. 1, 1912.

Application filed November 18, 1910. Serial No. 593,015.

*To all whom it may concern:*

Be it known that I, LUCIEN BRIANNE, citizen of France, residing at 10 Rue Alibert, Paris, in the Republic of France, have invented new and useful Improvements in Apparatus for Actuating Flying-Machines, of which the following is a specification.

My invention relates to an improved apparatus for operating the propelling members of flying machines and is particularly applicable to the propulsion of small testing apparatus used in experiments.

It is well known that the inventors and manufacturers of flying machines have a deep interest in testing their machines in the forms of models designed on a reduced scale which are much less expensive than the commercial machines. Up to the present, the use of small models was in fact very restricted in view of the lack of a small, light and inexpensive motor capable of imparting to the propelling means of a flier a regular and controllable motion. The engine of the rubber spring type gives only an objectionable solution of the problem because of the short duration and the rapidly decreasing value of its torque.

My invention removes all the above disadvantages in a simple and efficient manner and consists broadly in transmitting to the flier by means of a flexible shaft the necessary motive power, however considerable it may be, from an engine located on the ground, the power of which may be controlled at will. By this means, the flying machine may retain any desirable liberty of movement while being relieved of the dead weight formed by the propelling motor and the power transmitted to the same may be easily controlled according to requirements.

In the annexed drawings which show by way of example an embodiment of my invention more particularly designed for use with a flier for experimenting purposes: Figure 1 is a side elevation of my invention, the flier being shown in operation, Fig. 2 is a plan view, Fig. 3 is a detail in vertical section of the driving device, Fig. 4 is a detail side view of the rolling carriage, Fig. 5 shows the application of my invention to a flier having two propellers. Fig. 6 is a side elevation of an apparatus provided with means for balancing the weight of the flying machine and imparting movements to a member of said machine while flying. Fig. 7 is a front elevation seen from the right to the left in Fig. 6. Fig. 8 is a plan view, the stirrup being shown in an angular position different from that of Fig. 6.

My invention consists broadly in transmitting to a flying machine the controllable motive power necessary for the propulsion thereof by means of a flexible drive of any known construction from an engine of any suitable type located on the ground. In the case of testing apparatus for demonstrating purposes, the engine may be a small electromotor and in the case of larger apparatus, an explosion or like engine. The engine may be stationary on the ground or mounted on a vehicle if desired. A hand or foot driving device may also be used.

In the example shown, relating to an experimental flier, I use a driving box *a* of suitable dimensions formed of two superposed platforms connected together by angle iron bars *b*. On the lower platform is located an electromotor *c* and on the upper platform is mounted a bridge piece *d* supporting a stirrup piece $d^1$ into which a bolt $d^2$ is screwed. On the upper end of said bolt rests a pulley *f* driven by an endless belt *g* which is carried on two guide rollers *h* and passes around the pulley *i* of the motor. The pulley *f* is made in one piece with a cylindrical guiding part *j* extending through the bridge piece *d*. A pin *k* is screwed into the end of said part *j*. To the pin *k* is soldered a thin wire *l* wound around a straight steel wire *m* into coils in close relation one to the other, both members *l* and *m* forming the flexible shaft. One end of the wire *m* extends through the part *j* and the pulley *f* and carries at its lower part a sleeve *n* secured to it by a screw. Said sleeve *n* prevents the wire *m* from being drawn away through the device as hereinafter explained. The cylindrical part *j* is surrounded by the central hub of a stirrup piece *o* which may rotate in a horizontal plane. The hub of the piece *o* is spaced from the part *j* by a sleeve like part $d^3$ of the bridge piece *d* so that the rapid movement of rotation of the part *j* is not transmitted to the stirrup *o*. To the stirrup *o* is pivotally connected another stirrup piece *p* which may swing on the former in a vertical plane. In the stirrup *p* is screwed a bolt *q* to which is soldered one end of a metallic pipe *r* containing the flexible driving means *i* and *m*. It may be seen that

with the above arrangement, the flexible drive may oscillate in a vertical plane and also turn bodily around the driving box as a center.

The motive power is transmitted to the flier, in the example shown, through the medium of a rolling carriage upon which the propeller *e* is placed. The carriage is formed of a frame *s* fixed to two diverging arms *t* carrying at the ends the wheels *u*. One of the arms *t* is hollow and contains both wires *l m* of the flexible drive. The outer tube *r* inclosing said transmission terminates at a short distance from the end of the arm *t* whereby the rolling carriage and the whole flier is supported from the driving apparatus by the flexible shaft only so that it may freely oscillate in all directions. The end of the central wire *m* is carried by the frame *s* and is provided with a stop *v*. The coiled wire *l* is supported at its end in a sleeve *w* secured to the frame and is connected to the hub of the propeller. The frame *s* is provided also with a sleeve *x* into which a pin provided on the fore end of the flier proper *z* may be engaged. The flier is provided at the back with a supporting wheel as usual. By this means the flying structure *z* may be replaced by others at will very easily. When the electromotor is started, the pulley *f* rotates together with the coiled wire *l* whereby the propeller *e* is actuated. By the impulsion produced by the same, the rolling carriage and the whole flier begin to roll on the ground and rise soon in the air while turning around the driving box. When the flier rises or descends the stirrup *p* swings on the stirrup *o* and at the same time, both stirrups rotate bodily under the action of the flier around the hub of the bridge piece *d*.

The arrangement above described has the following advantages: The flexible drive being contained in a light tube cannot be bent or distorted if occasion arose from any accidental cause. Moreover, if the tube is rigid, means can be easily provided for balancing the weight of the flying machine and imparting at will to some parts of the same any desired movements while flying. An arrangement of this kind is shown in Figs. 6 to 8. A rigid plate or tube 2 is then made integral with or fixed to the lower stirrup *o* and a rod 3 is similarly fixed to the upper stirrup *p*. The rod 3 can be smooth, notched, threaded and a coiled spring 4 is connected by one end to the plate or rod 2 while its other end is connected to a block 5 sliding upon the rod 3 and adapted to be retained on this rod by the notches in the same or any other suitable means. It will be readily understood that the weight of the block 5 together with the tension of the spring 4 has for its effect to oppose any pivotal movement of the upper stirrup *p* on the lower stirrup *o* under the action of the weight of the flying machine, so that by moving the block 5 on the rod 3 so as to increase the tension of the spring, the action of the latter which tends to raise the flying machine will be also increased and inversely. It will thus be possible to remove from the flying machine any desired portion of its weight or even to give the same some ascensional force, according to the experiments being made. The spring could obviously in some cases be omitted, if the weight of the sliding block is sufficient for effecting the action desired. In the beginning of the experiments, I may also connect the outer end of the tube *r* to any desired points of the flying machine so that the same may be given predetermined positions whereby the experiments may be made step by step. Moreover by the described construction, I am enabled to impart very easily to some operative parts of the flier while running, any desired movements. In the arrangement shown in Figs. 6 to 8, the sleeve $d^3$ of the fixed bridge piece *d* is extended upwardly and carries at its upper part a washer 6 upon which the lower stirrup *o* rotates. Between the washer 6 and the bridge piece *d* is interposed a disk 7, suitably guided upon the sleeve $d^3$ and forced upwardly by a coiled spring 8. The lower stirrup *o* is provided with two depending arms 9 which slide through holes in the disk, whereby said disk is caused to rotate with the stirrup and the flying machine around the propelling apparatus. On two diametrically opposite points of the disk, bear two rollers 10 mounted on the ends of a yoke 11 which is pivoted at 12 upon the frame and may be lowered by means of a steel wire 13 and a pivoting lever 14. A steel wire 15 is attached by one end to the disk 7 and extends through both stirrups *o p* near the center thereof; said wire is then guided through suitable eyes or sockets along the tube *r* and is connected by its opposite end to levers, rods, cables, or other means conveniently arranged for operating the rudder, deformable planes or any other member of the flier. By lowering the lever 14 through the medium of any suitable transmission, the yoke 11 and the disk 7 will be lowered as shown in dotted lines in Fig. 6 and a pull will be exerted by the steel wire 13 on the member of the flier, which may be recalled to its original position by a spring so that the wire 13 is always taut. The steel wire 13 may enter the carriage through a ring concentric with the axle of one of the wheels, so as to give a strong bearing to said wire. A number of devices similar to that just described may be superposed so that a similar number of different parts may be operated on the flier. By this means I can effect very precise and useful

experiments, the actuation of some members of the flier being effected while flying.

My invention is not of course restricted to the apparatus shown and described which has been indicated by way of example only. I may use also for the power transmission springs, cables, shafts pivotally connected one to the other and supported from a central point by arms connected also together by pivot joints. The rigid wire *m* of the transmission shown may be replaced by a very flexible spring so that more flexibility may be obtained in the movements of the flying machine. The transmission may also be used for actuating on the flier any operating members, such as propellers, planes, pulleys, gearings according to the type of flier used. I may take advantage, as in the example shown, of the rolling carriage for guiding through the medium of some parts of the same the transmission up to the point where the power is to be applied. If the aeroplane or other flying machine is provided rotating in opposite directions with two propellers *e* $e^1$ Fig. 5) or like propelling means, in which the flexible drive *l m* extends forwardly through one propeller *e* and has its end bent rearwardly and connected to the other propeller $e^1$, I may use for operating them the arrangement shown in Fig. 5.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. An apparatus for actuating flying machines comprising in combination a motor on the ground and a power transmission from said motor to the propelling means of the flying machine, said transmission being rotatable bodily around the motor, and capable of swinging in a vertical plane, substantially as described and for the purpose set forth.

2. An apparatus for actuating flying machines comprising in combination a motor on the ground and a flexible transmission from said motor to the propelling means of the flying machine, the guiding member of said transmission being rotatable bodily around the motor, substantially as described and for the purpose set forth.

3. An apparatus for actuating flying machines comprising in combination a motor on the ground, a flexible transmission from said motor to the propelling means of the flying machine, the guiding member of said transmission being rotatable bodily around the motor, a rigid tube containing said transmission, said rigid tube being rotatable bodily around the motor and capable also of swinging in a vertical plane, substantially as described and for the purpose set forth.

4. In an apparatus for actuating flying machines, the combination with a rolling carriage carrying the propelling means of the flier of a motor on the ground and a power transmission from said motor to the propelling means, said transmission being rotatable bodily around the motor and capable of swinging in a vertical plane and being also guided on the rolling carriage, substantially as described and for the purpose set forth.

5. An apparatus for actuating flying machines comprising in combination a motor on the ground, a power transmission from said motor to the propelling means of the flying machines, said transmission being rotatable bodily around the motor and capable of swinging in a vertical plane, and means capable of imparting movements to some parts of the flying machine while flying, substantially as described and for the purpose set forth.

6. An apparatus for actuating flying machines comprising in combination a motor on the ground, a power transmission from said motor to the propelling means of the flying machines said transmission being rotatable bodily around the motor and capable of swinging in a vertical plane, and means for balancing the weight of the flying machine, substantially as described and for the purpose set forth.

7. An apparatus for actuating flying machines with two propellers rotating in opposite directions, comprising in combination a motor on the ground, a flexible drive from said motor to the propellers of the flying machine, said flexible drive extending forwardly through one propeller and having its end bent rearwardly and connected to the other propeller, the guiding member of said flexible drive being rotatable bodily around the motor, substantially as described and for the purpose set forth.

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

LUCIEN BRIANNE.

Witnesses:
LOUIS MOSES,
H. C. COXE.