Feb 20, 1923. 1,446,110.

S. T. WILLIAMS.

MODEL OR TOY AIRPLANE.

FILED MAR. 10, 1921. 2 SHEETS—SHEET 1.

FIG. VI.

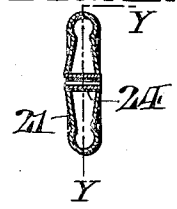


FIG. VII.

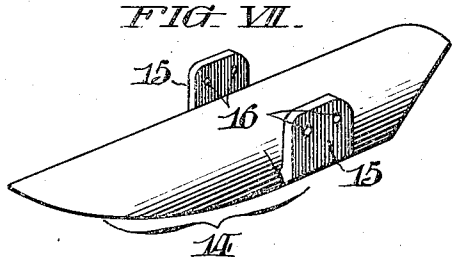


FIG. VIII.

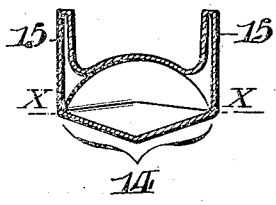


FIG. I.

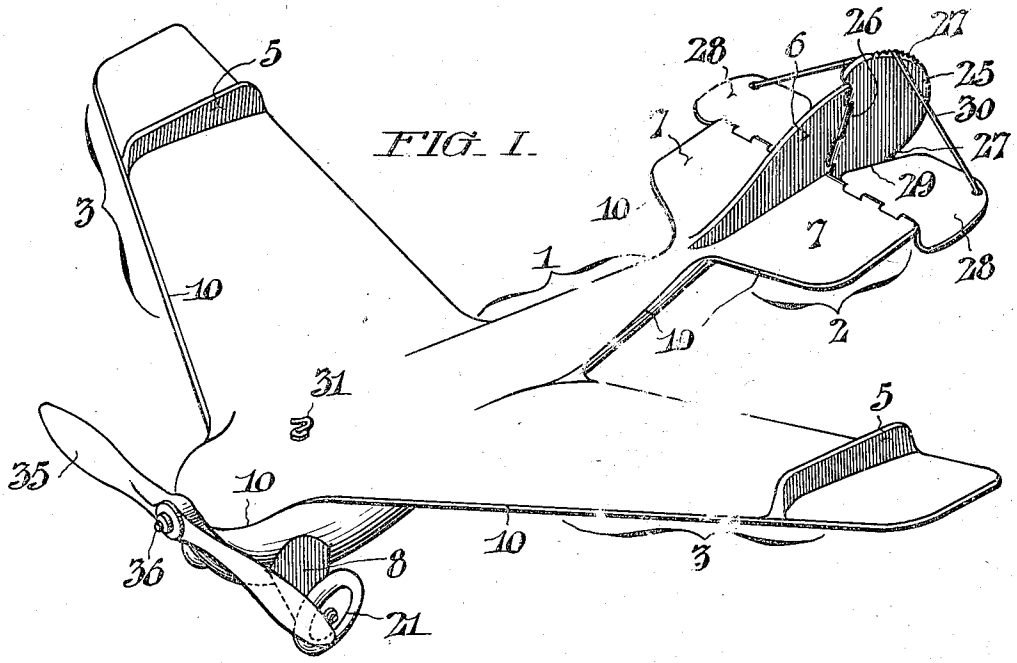


FIG. IX.

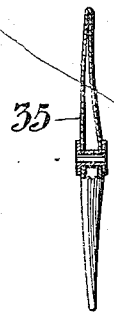
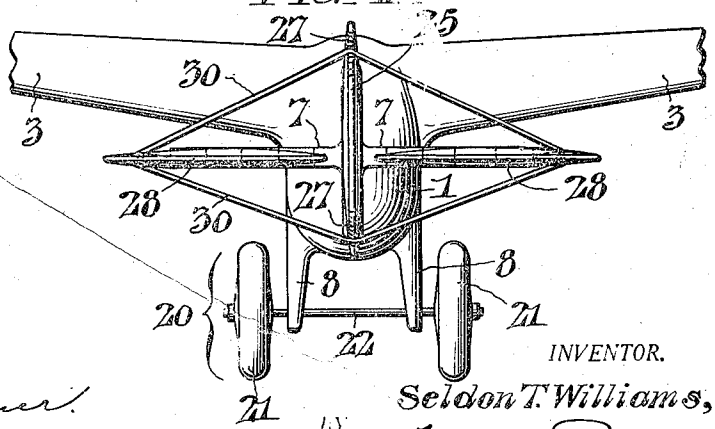


FIG. II.



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S. T. WILLIAMS.

MODEL OR TOY AIRPLANE.

FILED MAR. 10, 1921. 2 SHEETS—SHEET 2.

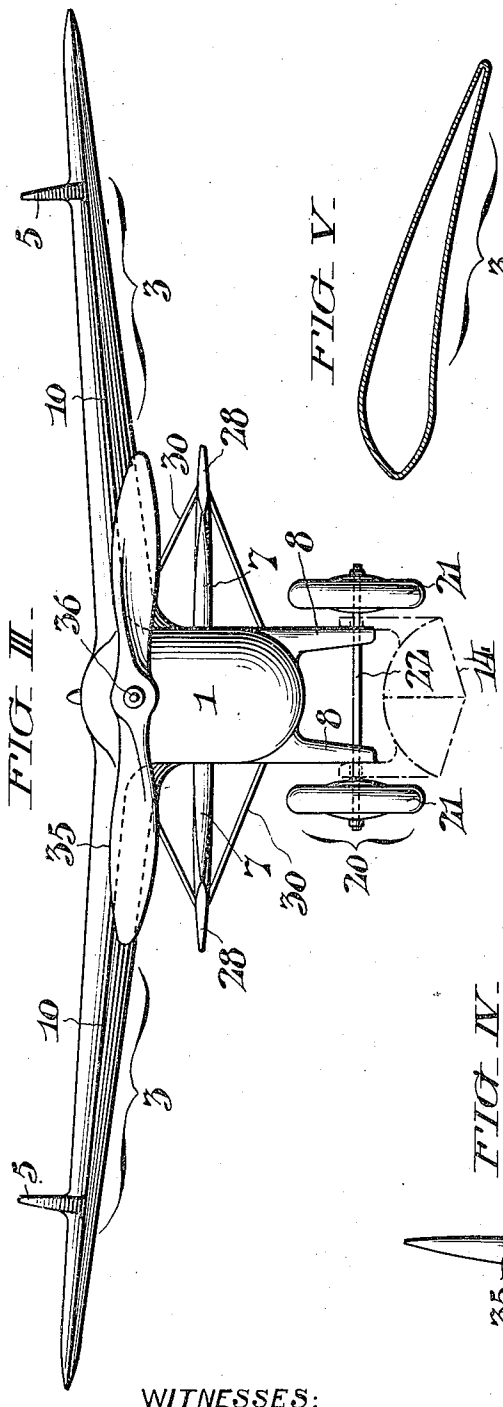

FIG. III.

FIG. V.

FIG. IV.

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UNITED STATES PATENT OFFICE.

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MODEL OR TOY AIRPLANE.

Application filed March 10, 1921. Serial No. 451,335.

To all whom it may concern:

Be it known that I, SELDON T. WILLIAMS, a citizen of the United States, residing in Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Model or Toy Airplanes, whereof the following is a specification, reference being had to the accompanying drawings.

My invention relates to model or toy airplanes, such as may be used for amusement, experimentation, display or aerodynamic tests.

The primary object of my invention is to construct such airplanes not only along lines which are accurate from a scientific standpoint in simulating airplanes of standard design, but to render them extremely light so as to be capable of being sustained in flight for considerably longer periods than heretofore possible in airplane structures intended for similar purposes. These desiderata I attain by constructing the airplanes of a material which in itself is very light, and of such character as to allow of being molded or pressed to the desired shape to form a structure which is hollow throughout. For this purpose, I preferably employ celluloid, although other materials such, for example, as vulcanized rubber, bakelite or any vitreous, colloidal or similar substances having like properties, may be used. A hollow airplane structure or shell of such stiff, vitreous material as celluloid, etc., can be made substantially rigid and stable in form or configuration by virtue of the structural strength and stiffness of the shell itself, without internal or external reinforcement, even when the walls of the shell are extremely thin and light.

As hereinafter set forth, the general scheme of hollow construction characteristic of my invention is embodied not only in the main body portion of the airplane structure, but also in various appurtenances by which directional flight may be determined, and in the elements of appropriate landing gear serviceable either for water or land use.

Other objects and advantages of my invention will become apparent from the detailed description which follows:

Referring to the drawings, Fig. I is a perspective view of a model or toy airplane conveniently embodying my invention, showing the same as it appears when in flight.

Fig. II is a rear elevation of the same, with the ends of the main wings broken away.

Fig. III is a front elevation of the airplane.

Fig. IV is a longitudinal sectional view of the structure.

Fig. V is a cross section through one of the main wings.

Fig. VI is a detail sectional view of one of the wheels of the landing gear.

Fig. VII is a perspective view of a float capable of being detachably secured to the body portion of the airplane.

Fig. VIII is a cross sectional view of the float; and

Fig. IX is a detail view showing the construction of the driving propeller.

The airplane structure herein chosen for illustration, is in the form of a monoplane having a body portion 1 which tapers gracefully toward the rear end and terminates in a tail, comprehensively indicated at 2. Integrally formed with the body portion 1 are laterally extending main wings 3, 3, which are complementarily pitched at a slight inclination to the horizontal, as clearly shown in Fig. III. Near their ends, the main wings are provided with upstanding "non-skid" fore and aft fins 5, 5 likewise hollow, which aid in stabilizing the airplane when in flight.

The tail 2 consists of a hollow vertical fin element 6 which is flanked at the sides by horizontal fin elements 7, 7, likewise made hollow. Depending from the body portion 1 near its forward end are struts 8, 8, to which appropriate landing gear may be attached. The hollow airplane structure as a whole, may be made in any approved manner provided that the walls are sufficiently strong and rigid to withstand the usage for which the structure is intended, yet so light

that it may be readily sustained against gravity without necessitating the application of undue force in maintaining flight. In practice, the structure is preferably molded or pressed of extremely thin celluloid and made in two complementary sections which meet preferably along a plane coincident with that which may conveniently be termed the median plane of the main wings 3, and which is continued longitudinally through the body portion 1 as suggested by the lines 10, 10 in Fig. I. The two sections of the structure will thus comprise complementary parts of the body portion 1 and corresponding parts of the main wings 3. The upper section, it will be seen, carries the hollow non-skid fins 5, 5, a portion of the vertical tail fin 6, and the upper surfaces of the horizontal tail fins 7, 7, while the lower section carries the struts 8, 8 and the complementary parts of the fins 6 and 7. The component sections may be integrally united in any approved manner for example by employment of a suitable cementing substance or by fusion along the edges of abutment.

When the airplane is to be used for flight above water, the float 14 shown in perspective in Fig. VII, may be attached to the struts 8, 8. To this end, said float is provided with upstanding extensions 15, 15 which are pierced by apertures 16 adapted to register with corresponding apertures 17 in the struts 8, 8 (Fig. IV) for the reception of any suitable attachment means, preferably pins (not shown). The float 14, together with its extensions 15, 15, is, like the main body portion of the airplane, made hollow, of like material, and preferably in two parts which are united along the plane indicated by the arrows X—X in Fig. VIII.

When the airplane is to be used on land, the float 14 is removed, and a wheeled landing gear such as designated comprehensively at 20 in Figs. II and III, substituted in place thereof. This wheel gear comprises the wheels 21, 21, which are detachably mounted upon a suitable shaft 22 capable of being inserted through appropriate centrally disposed apertures 23 in the lower ends of the struts 8. As shown in Fig. VI, each wheel 21 is also made hollow and preferably of two counterpart sections which are joined along its median plane represented by a dot and dash line Y—Y and united by a transversely extending sleeve member 24.

Attached to the inclined rear edge of the vertical fin 6 of the tail 2, is a rudder 25 which is preferably hinged as at 26 so as to be capable of being swung laterally to any desired angular position in steering. Said rudder, while extremely shallow in cross section, is also made hollow, and preferably in two parts whose edges are united along its median plane in a manner already explained. Near the top and bottom, the rear edge of the rudder 25 is notched as suggested at 27, 27 in Figs. I and II for a purpose which will be presently explained.

To the ends of the horizontal fins 7, 7 of the tail 2 are attached, preferably by hinging, elevators 28, 28 which are constructed hollow in a manner similar to that described in connection with the rudder 25. Said elevators are cut away as a 29, so as to allow for the swinging of said rudder, and have their ends connected, both above and below, by strings or cords 30, 30 which are adapted to cooperate with the notches 27, 27 of the rudder, and, when drawn taut by proper selection of the notches, serve as common means for holding said rudder and the elevators 28, 28 in adjusted positions.

The airplane may be used either with or without propelling means. In the first instance, it may be projected by a swing of the arm or by releasing it from any suitable elevation, or again, it may be suspended by a hook shown at 31 in Figs. I and IV and confined to trace a circular course under the restriction of a supporting string. If definite propulsion should be desired, this may be effected by a propeller 35 (here shown hollow like the rudder 25, and other parts) fixed to a shaft 36 which is journalled in a suitable bushing 37 at the front end of the body portion of the structure, as clearly shown in Fig. IV. The inner end of the shaft 36 is bent into the form of a loop 38 for the attachment of a number of rubber bands 39 which are concealed within the body portion 1 and secured at their opposite ends to a fixed internal anchorage 40 attached directly to the reduced portion of the tail 2, which forms the opposite extremity of the body from the propeller 35 (see Fig. IV). Power may be stored in the bands 39 by twisting induced by rotation of the propeller. A suitable counterweight 41 is attached at the forward end of the body portion for the purpose of counterbalancing the weight of the tail 2 and its appendages.

While I have herein shown my invention as in the form of a monoplane, it is to be understood that I do not wish to be limited to this type alone since the characteristic hollow construction may be embodied in simulating airplanes of any of the standard types.

Having thus described my invention, I claim:

1. A model or toy airplane comprising a body portion and main wings in the form of a hollow structure or shell of vitreous material which is plastic when heated so as to be capable of being molded to desired formation with extremely thin, light walls; substantially rigid and stable in configuration by virtue of the structural strength and its inherent resistance to flexure and fracture

possessed by its shell formation, providing a maximum supporting area with a minimum amount of weight.

2. A model or toy airplane comprising a body portion and main wings in the form of shells hollow throughout with extremely thin, light walls of celluloid, substantially rigid and stable in configuration at every point by virtue of the stiffness of the material and the inherent resistance to flexure incidental to the shell formation.

3. A model or toy airplane comprising a body portion and main wings integral therewith in the form of a hollow structure or shell with extremely thin, light walls; substantially rigid and stable in configuration, without reinforcement, by virtue of the structural strength of said shell itself.

4. A model or toy airplane comprising a body portion and main wings integral therewith in the form of a hollow structure or shell with extremely thin, light walls of celluloid, substantially rigid and stable in configuration.

5. A model or toy airplane in the form of a hollow structure comprising two sections of extremely light and thin material comprehending, respectively complementary parts of the body portion; together with integral extensions adapted to form corresponding parts of the main wings of the structure.

6. A model or toy airplane in the form of a hollow structure comprising two sections of extremely light and thin material comprehending, respectively complementary parts of the body portion; together with integral extensions adapted to form corresponding parts of the main wings of the structure; said sections meeting along a longitudinal line in the median plane of the main wings.

7. A model or toy airplane in the form of a hollow structure of extremely light material comprising a body portion; integral, hollow, main wings; and struts depending from said body portion; in combination with landing gear including a hollow float for water use, and hollow wheels for land use; said float and wheels being interchangeably attachable to the aforesaid struts.

8. A model or toy airplane comprising a body portion and main wings in the form of a hollow structure or shell with extremely thin, light walls of vitreous material which is plastic under certain conditions so as to be capable of being molded to form, substantially rigid and stable in configuration by virtue of the stiffness of the material and the structural strength and resistance to flexure of a shell formation; and a driving propeller of similar material, substantially stable in configuration and rotatably supported by said body.

9. A model or toy airplane comprising a body portion and main wings in the form of a hollow structure or shell with extremely thin, light walls of vitreous material, substantially rigid and stable in configuration by virtue of the stiffness of the material and the structural strength of said shell itself; a driving propeller of thin, light vitreous material, substantially stable in configuration, rotatably supported by said body; and rubber bands for driving said propeller spanned between an attachment on the propeller shaft and an internal anchorage fixed directly to the other extremity of the body.

10. A model or toy airplane comprising a hollow structure or shell of vitreous materail which is plastic when heated so as to be capable of being moulded to form with extremely thin, light walls including a hollow body portion and hollow main wings with hollow fore and aft non-skid fins integrally formed thereon; substantially rigid in configuration by virtue of the stiffness of the material and the inherent resistance to flexure and fracture possessed by its shell formation.

11. A model or toy airplane in the form of a hollow structure comprising a winged body portion, said body portion terminating in a tail having integral, hollow, vertical and horizontal fins; a hollow rudder attached to the vertical fin with capacity for being deflected laterally to various angular positions with respect to that fin; elevators attached to the horizontal fin of the tail at opposite sides of the rudder and capable of being deflected angularly with respect to said horizontal fins; and common means whereby said rudder and elevators may be secured in adjusted positions.

12. A model or toy airplane in the form of a hollow structure comprising a winged body portion, said body portion terminating in a tail having integral, hollow, vertical and horizontal fins; a hollow rudder attached to the vertical fin and capable of being deflected laterally to various angular positions with respect to said fin; elevators attached to the horizontal fin of the tail at opposite sides of the rudder with capacity for being deflected angularly with respect to said horizontal fin; and a pair of strings connecting the outer ends of said elevators, said strings being adapted to engage with notches in the free edge of the rudder at points above and below the level of the elevators, to hold said rudder and elevators in adjusted position.

13. A model or toy airplane comprising a body portion and main wings in the form of a hollow structure or shell with extremely thin, light walls of vitreous material which is normally rigid but adapted to be rendered plastic so as to be capable of being molded to desired formation, substantially rigid and stable in configuration by virtue of the stiffness of the material and the inherent resist-

ance to flexure and fracture of its shell formation; said body terminating in an integral hollow tail, directive means attached to said tail; and a counterbalance weight concealed in the body at the end opposite said tail.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pennsylvania, this 7th day of March, 1921.

SELDON T. WILLIAMS.

Witnesses:
JAMES H. BELL,
E. L. FULLERTON.