S. S. YARRINGTON.

AEROPLANE.

APPLICATION FILED JAN. 14, 1910.

983,192.

Patented Jan. 31, 1911.

3 SHEETS—SHEET 1.

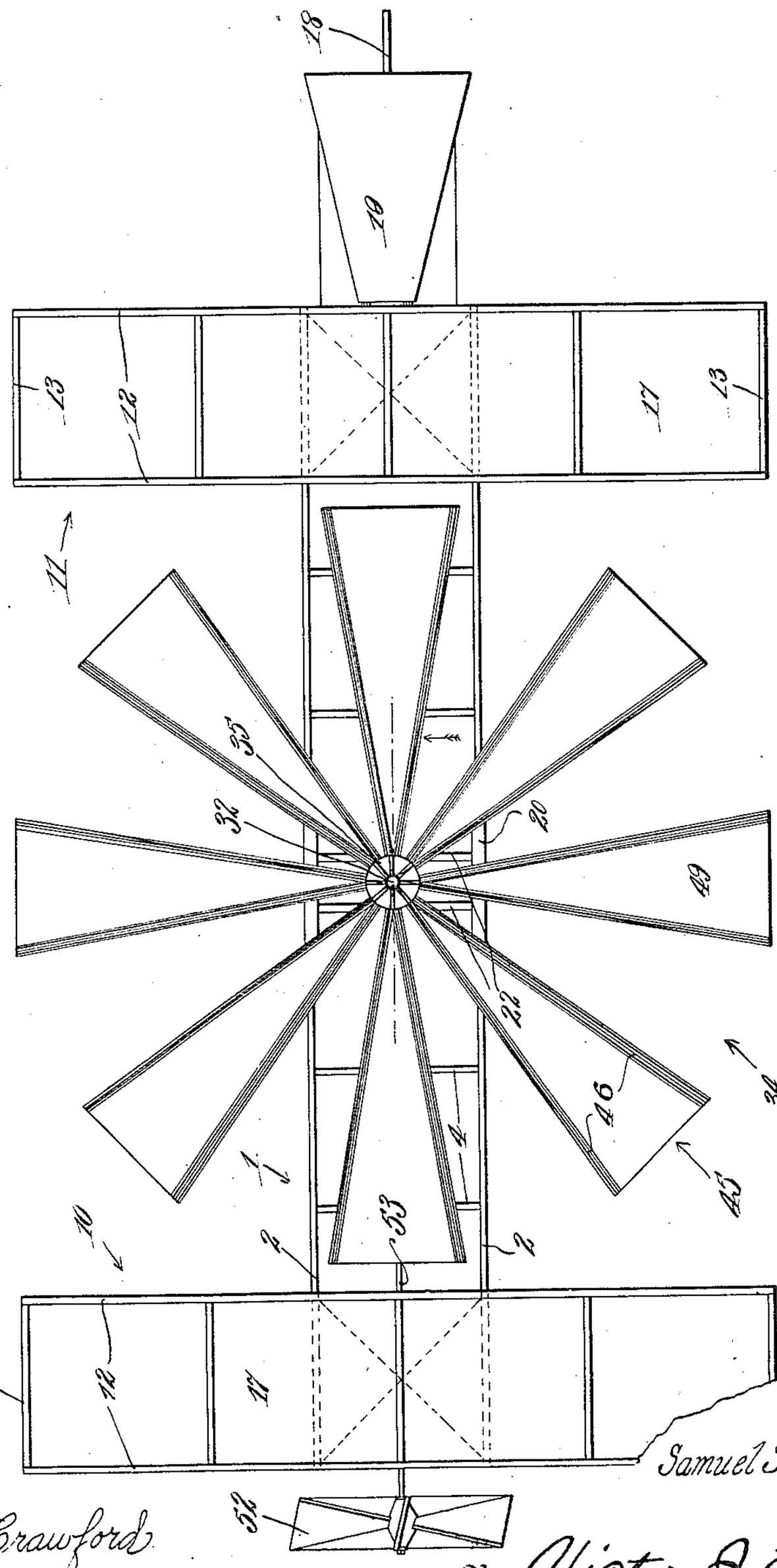

Fig. 1.

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3 SHEETS—SHEET 2.

Fig. 2.

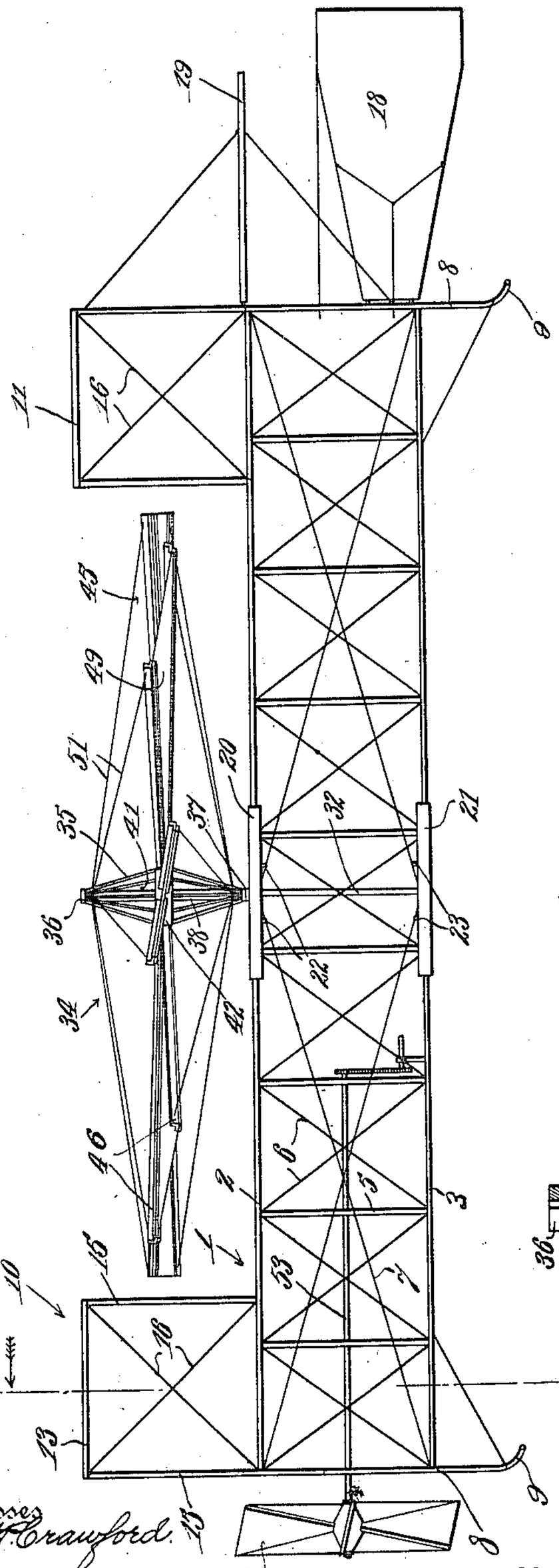


Fig. 7.

Fig. 6.

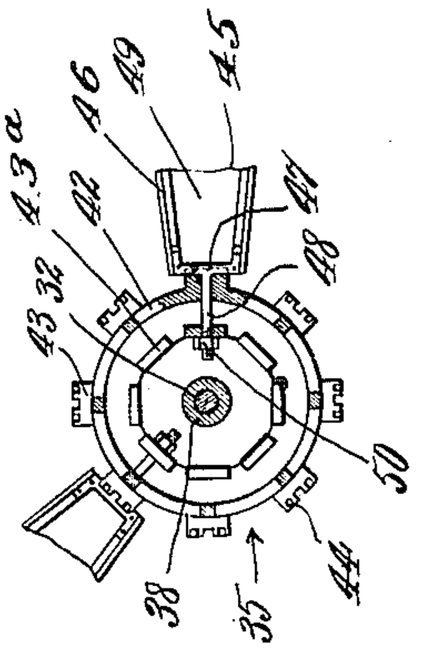
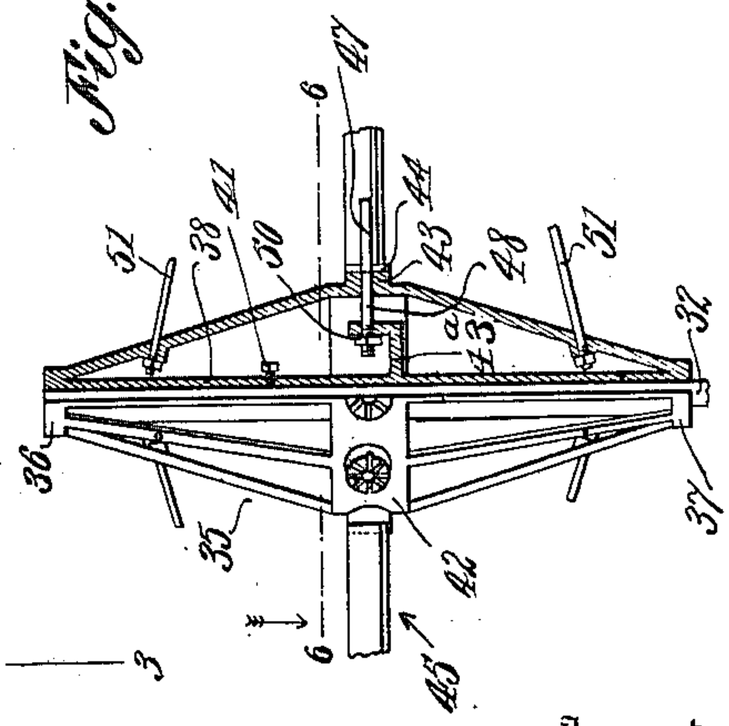


Fig. 5.



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3 SHEETS—SHEET 3.

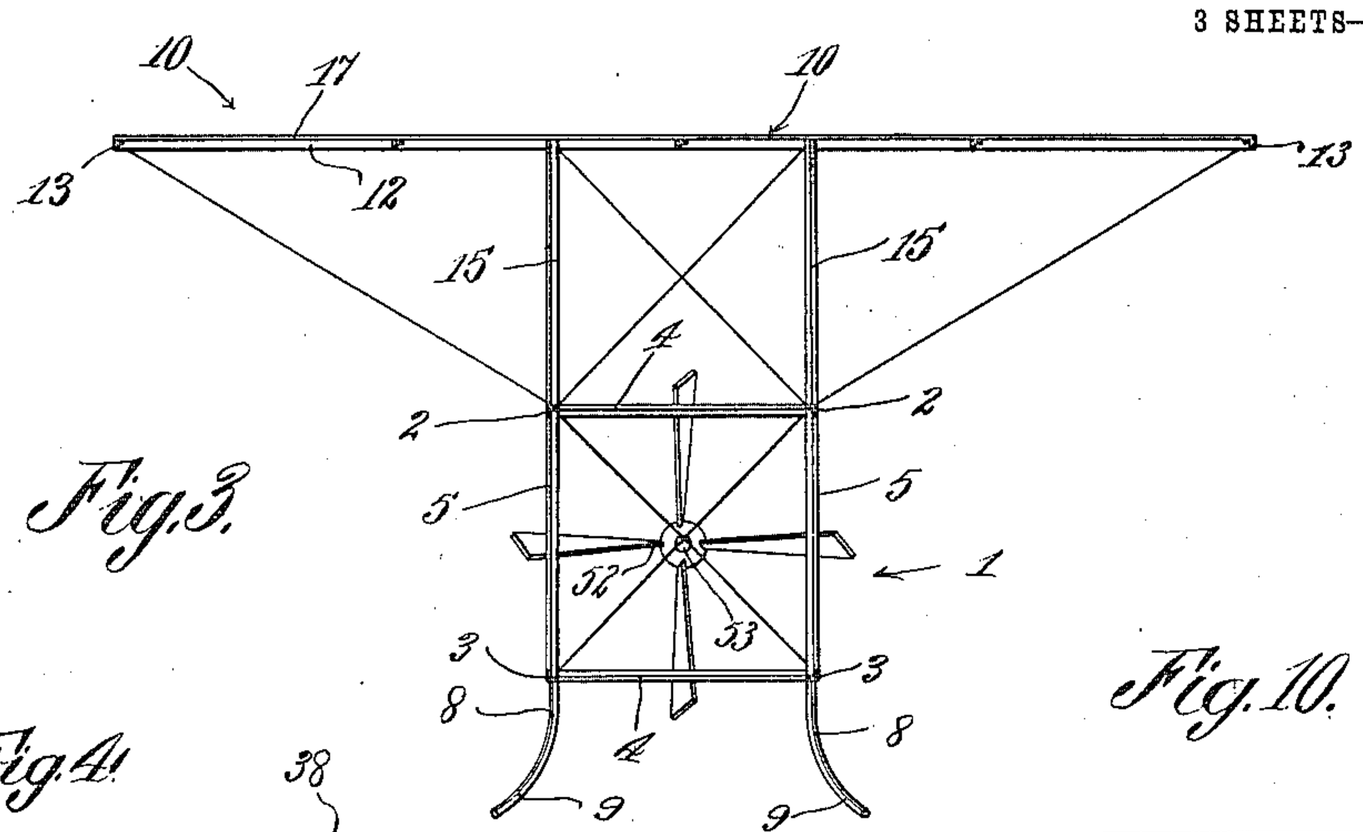


Fig. 3.

Fig. 4.

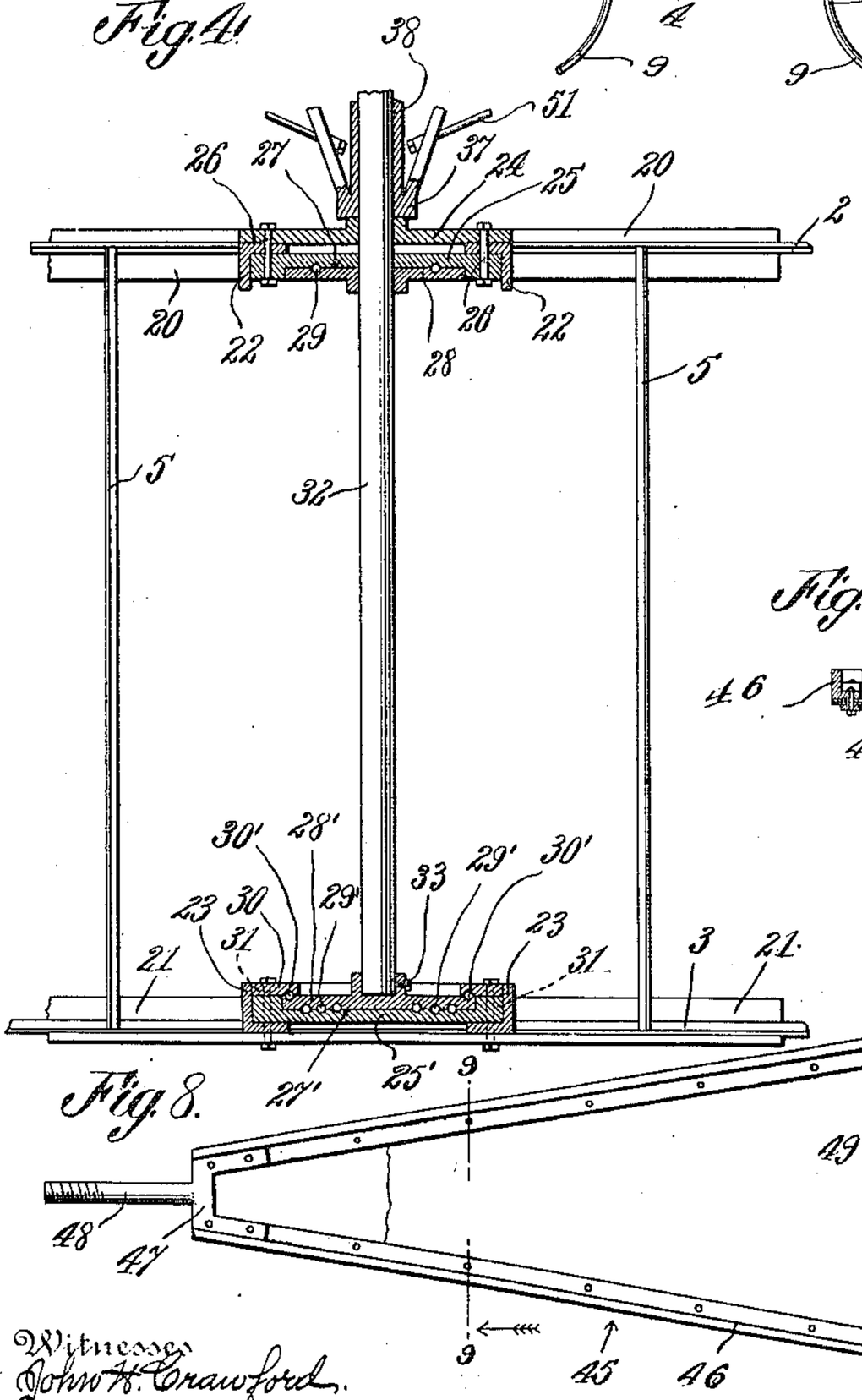


Fig. 10.

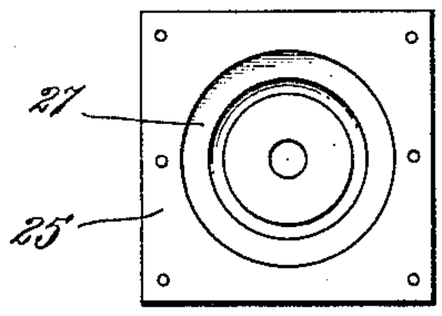
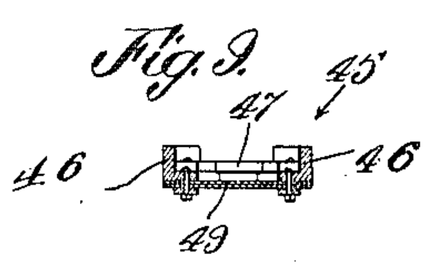


Fig. 11.

Fig. 9.



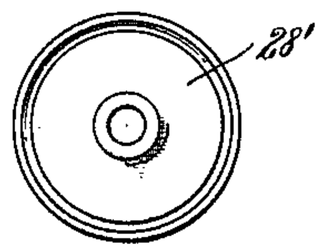


Fig. 12.

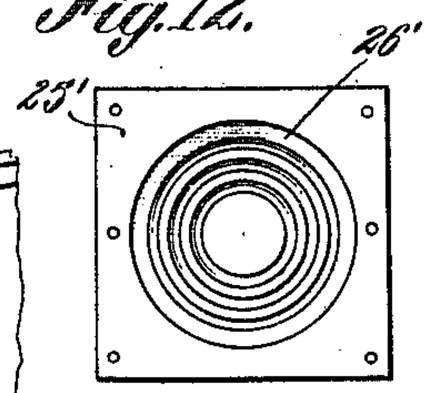


Fig. 8.

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UNITED STATES PATENT OFFICE.

SAMUEL S. YARRINGTON, OF WILMINGTON, DELAWARE.

AEROPLANE.

983,192. Specification of Letters Patent. Patented Jan. 31, 1911.

Application filed January 14, 1910. Serial No. 538,056.

To all whom it may concern:

Be it known that I, SAMUEL S. YARRINGTON, a citizen of the United States, residing at Wilmington, in the county of Newcastle and State of Delaware, have invented new and useful Improvements in Aeroplanes, of which the following is a specification.

This invention relates to heavier-than-air flying machines of the combined aeroplane and helicopter type, the object of the invention being to provide a machine including a novel construction and relative arrangement of supporting planes and forward driving and lifting propellers, whereby the machine may be positively lifted to any desired elevation and then driven ahead, and the speed of descent regulated at will.

A further object is to provide a strong and durable construction of machine which will have ample sustaining powers and in which the lifting propeller will be arranged so that in operation it will establish a balancing action to increase the stability of the machine.

With these and other objects in view, the invention consists of the features of construction, combination and arrangement of parts hereinafter fully described and claimed, reference being had to the accompanying drawing, in which:—

Figure 1 is a top plan view of a flying machine embodying my invention. Fig. 2 is a side elevation of the same. Fig. 3 is a vertical transverse section on the line 3—3 of Fig. 2. Fig. 4 is a vertical longitudinal section through the central portion of the frame and bearing for the shaft of the lifting propeller. Fig. 5 is a view partially in side elevation and partially in vertical section of the frame of the lifting propeller. Fig. 6 is a horizontal section on the line 6—6 of Fig. 5. Fig. 7 is a detail plan view of the upper end of the lifting propeller shaft and the crown portion of the propeller frame. Fig. 8 is a plan view of a portion of one of the blades of the lifting propeller. Fig. 9 is a cross section on the line 9—9 of Fig. 8. Figs. 10, 11 and 12 are views of the bearing elements for the lifting propeller shaft.

Referring to the drawings, 1 designates the main frame of the machine, which is in the form of an oblong rectangular cage extending in a fore and aft direction and comprising in its construction upper and lower pairs of angle metal bars 2 and 3, the bars of each pair being connected by cross pieces 4 and the bars of the opposite pairs by uprights or stanchions 5. The stanchions at each side are connected with each other and with the frame by crossed guys or bracing strands 6 of wire or other suitable material, and the central portion of the frame is similarly connected with the front and rear stanchions at each side by crossed guys or bracing stands 7, thus trussing the frame in each side to secure the requisite strength and rigidity.

The end stanchions of the main frame extend above and below the same, their lower portions forming supporting legs 8 terminating in outwardly and rearwardly bent or curved feet 9 which serve as skids or runners to support the machine upon the ground in alighting and attaining an initial speed for flight, and to serve as yielding bumpers to yield and absorb shocks in making a descent.

Arranged above the main frame at the front and rear thereof are supporting planes 10 and 11 extending longitudinally in a direction transversely of the frame and to the line of flight, each of which comprises parallel longitudinal frame bars 12 connected by cross pieces 13 and supported from the frame by stanchions 15, the front stanchions of the front plane and the rear stanchions of the rear plane being preferably formed by the upward extensions of the front and rear stanchions of the main frame, the frame structure of each plane being reinforced by crossed braces 16, as shown. Stretched across the frame structure of each plane is a body of fabric 17 composed of silk or other suitable material. Horizontal and vertical rudders 18 and 19 are pivoted or otherwise movably mounted at the rear of the main frame to enable the machine to be horizontally and vertically steered. These rudders may be controlled by suitable operating connection in the usual manner.

The central portion of the main frame, which is designed to support the motor, aviator's seat and operating devices for controlling the several parts, is reinforced by opposite longitudinal pairs of angle iron bars 20 and 21 and pairs of angle iron transverse bars 22 and 23 connecting the upper and lower pairs of bars 20 and 21, the upper horizontal flanges of the bars 22 forming a support for a bearing plate 24, as

shown in Fig. 4. Extending between the vertical webs of the bars 22 is a rectangular bearing plate 25 fastened to the vertical webs of said bars and to the plate 24 by bolts 26 and provided in its under side with a concavity or recess 27 receiving a rotary bearing plate 28, the meeting faces of the plates 25 and 28 being channeled to provide an annular raceway for a series of anti-friction bearing balls 29. The lower angle iron cross bars 23 support a stationary bearing plate 25′ having a recess 27′ in its upper face to receive a rotary bearing plate 28′, the meeting faces of said plates being annularly grooved to provide a plurality of raceways for the reception of anti-friction bearing balls 29′. Disposed between the bars 23 above the plate 25′ and overhanging the outer edge of the plate 28′ is a retaining ring 30 which holds the plate 28′ from upward movement and is fastened to the bars 23 and plate 25′ by bolts 31. The meeting faces of the rotary bearing plate and retaining ring are grooved to form a raceway for anti-friction bearing balls 30′, allowing said rotary bearing plates to have free movement with a minimum degree of friction.

Extending through the upper bearing plates is a vertical shaft 32 to which the plate 28 is fixed in any suitable manner, the lower end of said shaft being seated in a socket in the plate 28′ and secured thereto by a set screw 33. This shaft, which may be driven in any suitable manner from the motor, projects above the top of the frame between the planes 10 and 11 and carries at its upper end a lifting propeller 34. The propeller 34 embodies in its construction a skeleton frame 35 having its upper and lower ends tapering in substantially the form of hollow cones arranged in apposition and terminating in collars 36 and 37 between which extends a central core or tube 38. The upper collar 36 is provided with a key 39 entering a groove 40 in the upper end of the shaft and the sleeve 38 is provided with one or more set screws 41 to impinge against the shaft, whereby the frame is fixed to the shaft to rotate therewith and yet may be slidably removed therefrom when occasion requires. The lower collar 37 rests upon the bearing plate 24 to firmly support and stay the upper extended end of the shaft so that it will sustain the weight of the propeller and the strain falling thereon. The intermediate portion of the propeller frame is in the form of an annular body 42 provided with a series of radial bearing sleeves or collars 43 having toothed outer surfaces 44, and inclosed by said annular bearing portion is an annular series of angular lugs 43ª radiating from the sleeve 38 and arranged opposite the collars 43.

The propeller blades 45, any number of which may be employed, are of substantially triangular form each comprising a pair of outwardly diverging angle bars 46 connected at their inner ends by a U-shaped coupling 47 carrying a spindle 48 threaded at its free end, the body of the blade being formed of one or more thicknesses of fabric 49 stretched between and suitably secured to the bars 46. The spindles 48 of the respective blades extend through registering openings in the sets of collars 43 and lugs 45 and are retained from outward displacement by nuts 50 applied to their inner threaded ends and engaging the inner faces of the upturned portions of the lugs. The coupling members 47 of the respective blades are adapted to interlock with the teeth or notches 44 of the collars 43 and to be held in engagement therewith by the nuts 50, so that said blades may be disposed and held at any desired pitch or angle to the horizontal to obtain the desired lifting effect. The outer ends of the frame bars 45′ of the blades are connected with the upper and lower portions of the frame by guy rods 51, by which they are braced and sustained against deflection. Through suitable gearing and clutch mechanism, propeller 34 may be thrown into and out of connection with the motor shaft at any time, whereby it may be employed to raise the machine in starting it in flight or to lift it to any desired elevation while in flight, or utilized to regulate the speed of descent of the machine in alighting, in which last-named operation the propeller may be rotated at a low rate of speed. The rotation of the propeller 34 also establishes a gyroscopic action, tending to maintain the balance and increase the stability of the machine.

For forward propulsion a propeller 52 is provided at the front of the machine and mounted upon a horizontal shaft 53 journaled in the forward portion of the frame, which shaft may be driven in practice by any suitable type of gearing from the motor, the devices controlling the propellers, motor and vertical and horizontal rudders being arranged at or near the center of the machine within convenient reach of the aviator so that all of the operating elements may be readily controlled. In operation, after the machine has been elevated to the desired degree by the action of the propeller 34, said propeller is thrown out of gear and remains stationary, while the propeller 52 is coupled to the motor to drive the machine forwardly. The machine will then be sustained in flight by the reactions of the air upon the planes 10 and 11. When it is desired to descend, the propeller 52 is stopped and the propeller 34 driven at a reduced rate of speed to adapt a machine to come slowly to the ground. It will thus be seen that a type of machine is provided which not only ob-

viates the necessity of employing a launching apparatus, but may be elevated in a straight upward direction at will and allowed to descend easily and gradually, thus insuring complete control.

I claim:—

1. A flying machine comprising a frame, front and rear supporting surfaces carried by the frame, a shaft extending upwardly through the frame at a point between said supporting surfaces, a propeller frame carried by said shaft, locking devices upon said propeller frame, and a series of lifting propeller blades arranged around the propeller frame, the said blades being axially adjustable to lie at different angles and provided with interlocking devices to engage the locking devices upon the propeller frame.

2. A flying machine comprising a frame, front and rear supporting surfaces carried by the frame, a shaft extending vertically upward through the frame between said supporting surfaces, a skeleton frame mounted upon the upper end of said shaft, said frame being provided with an inner series of perforated lugs and an outer series of toothed collars, an annular series of propeller blades provided with stems journaled in said collars for the lugs and having locking members to engage and interlock with the teeth of the outer lugs, whereby they may be adjusted to lie at different angles, and nuts upon the inner ends of the stems to hold the same against endwise movement.

3. A flying machine comprising a frame including parallel pairs of upper and lower frame bars, superposed front and rear supporting surfaces carried by said frame, supports carried by the upper and lower frame bars, each consisting of longitudinal and transverse angle bars, stationary rectangular bearing plates fitted between the angle bars of the respective supports, a shaft extending vertically through said bearing plates, a propeller mounted upon the upper end of said shaft between the supporting surfaces, rotary bearing plates carried by the shaft for coöperation with the stationary bearing plates, and anti-friction bearings between each rotary bearing plate and the companion stationary bearing plate.

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

SAMUEL S. YARRINGTON.

Witnesses:
HARRY P. JOSLYN,
ELLIS W. YARRINGTON.