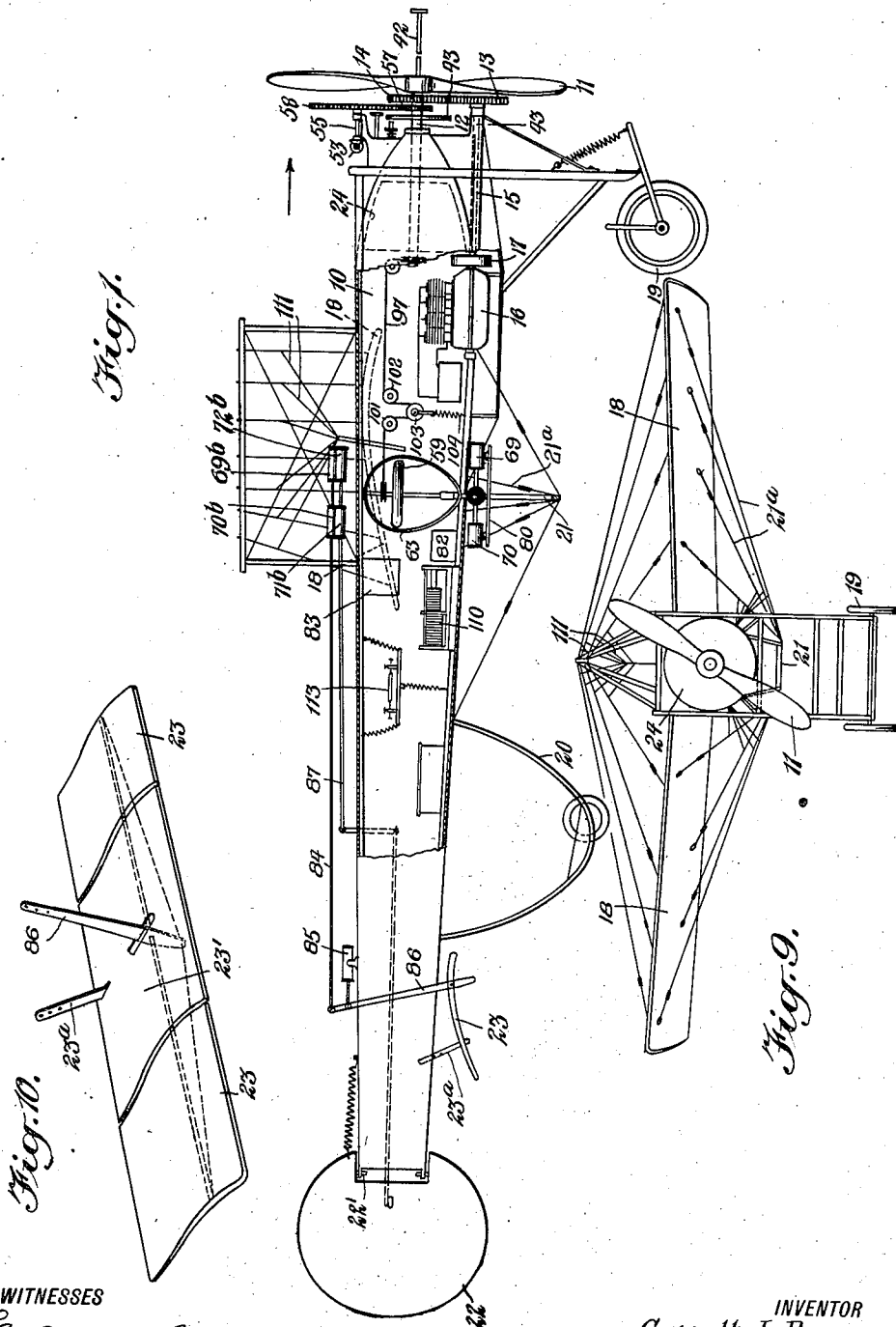


1,376,192.

G. J. DYE.
RADIO AERIAL TORPEDO.
APPLICATION FILED NOV. 8, 1918.

Patented Apr. 26, 1921.
6 SHEETS—SHEET 1.



WITNESSES
Geo. W. Taylor
Geo. H. Beeler

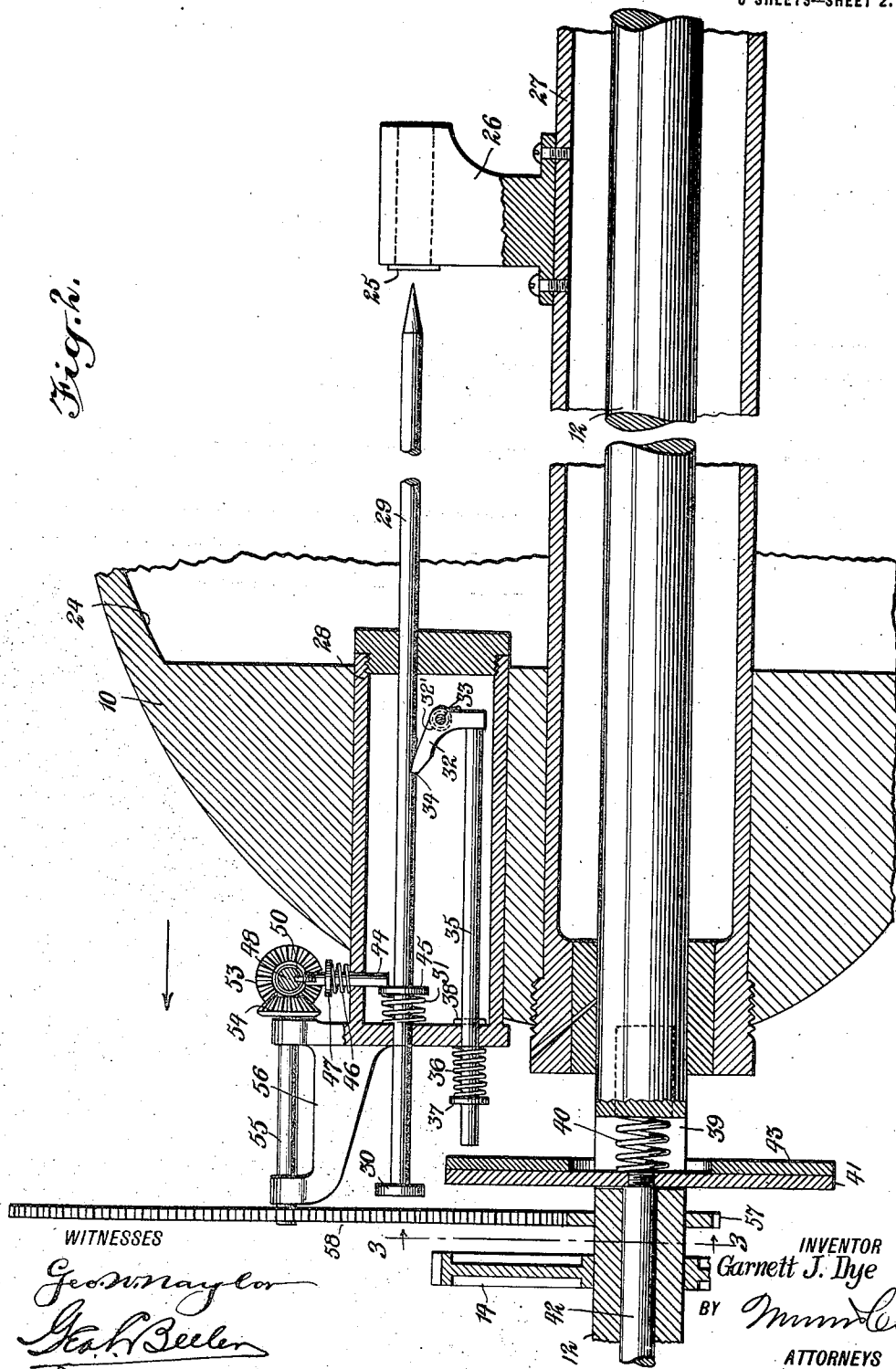
INVENTOR
Garnett J. Dye
BY *Mmm Co*
ATTORNEYS

1,376,192.

G. J. DYE.
RADIO AERIAL TORPEDO.
APPLICATION FILED NOV. 8, 1918.

Patented Apr. 26, 1921.
6 SHEETS—SHEET 2.

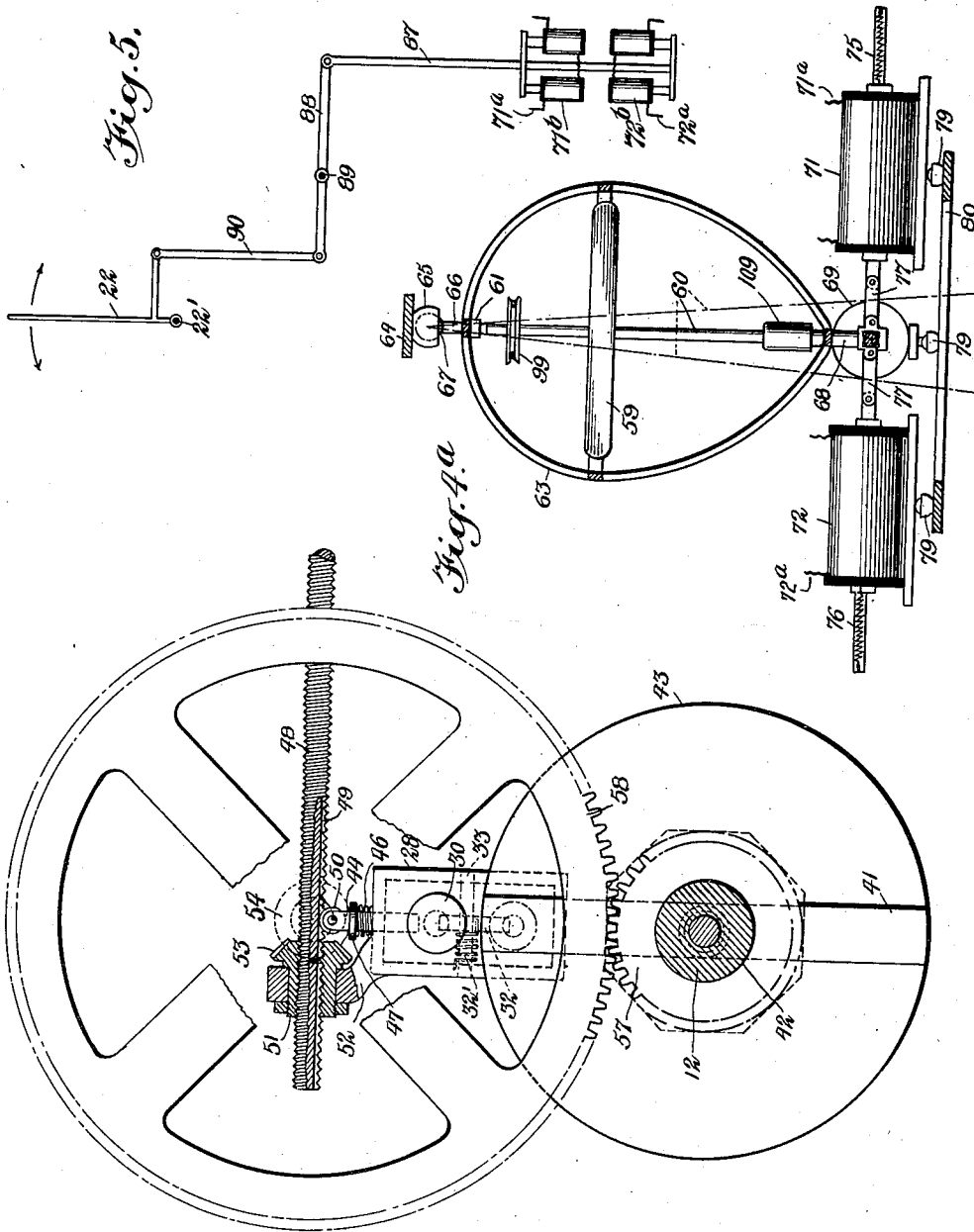
Fig. 2.



1,376,192.

G. J. DYE.
RADIO AERIAL TORPEDO.
APPLICATION FILED NOV. 8, 1918.

Patented Apr. 26, 1921.
6 SHEETS—SHEET 3.



WITNESSES
Geo. W. Taylor
Ed. L. Beale

Fig. 3.

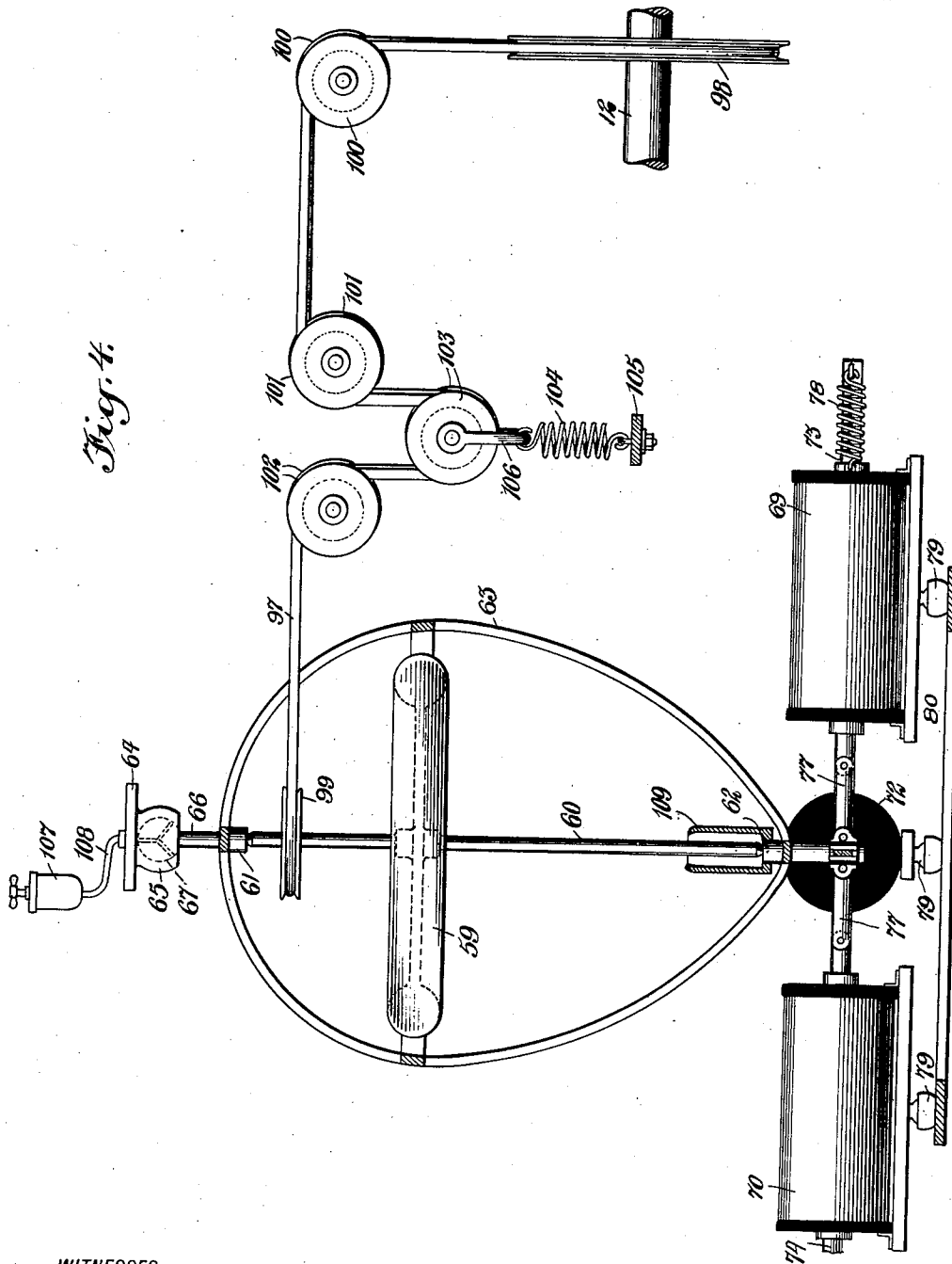
INVENTOR
Garnett J. Dye
BY *Wm. L. Co.*
ATTORNEYS

1,376,192.

G. J. DYE.
RADIO AERIAL TORPEDO.
APPLICATION FILED NOV. 8, 1918.

Patented Apr. 26, 1921.
6 SHEETS—SHEET 4.

Fig. 4.



WITNESSES
Geo. W. Maylor
Geo. H. Beiler

INVENTOR
Garnett J. Dye
BY *Mumford*
ATTORNEYS

G. J. DYE.
 RADIO AERIAL TORPEDO.
 APPLICATION FILED NOV. 8, 1918.

1,376,192.

Patented Apr. 26, 1921.

6 SHEETS—SHEET 6.

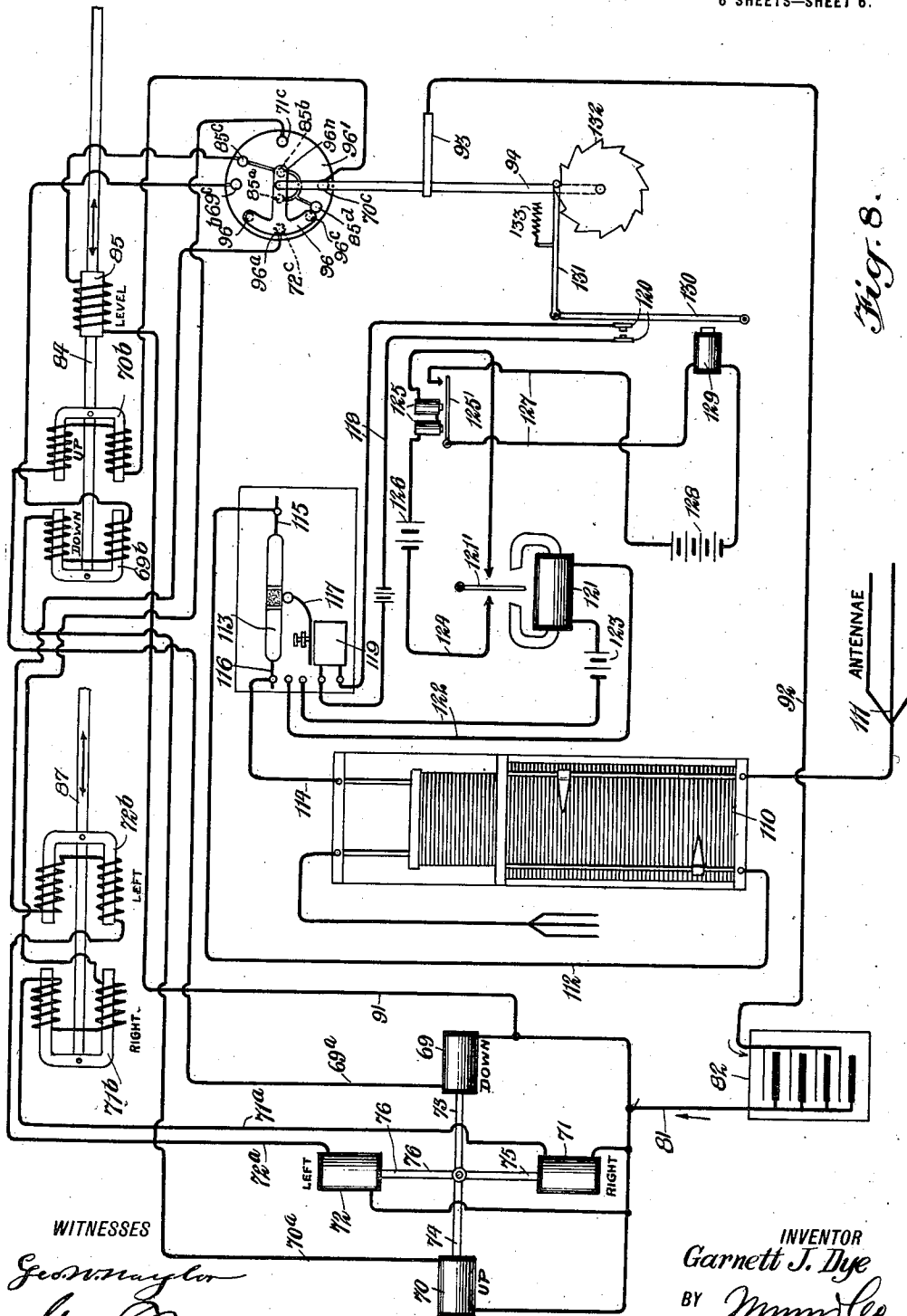


Fig. 8.

WITNESSES
 Geo. W. Taylor
 Geo. A. Steele

INVENTOR
 Garnett J. Dye
 BY Munn & Co.
 ATTORNEYS

UNITED STATES PATENT OFFICE.

GARNETT JOEL DYE, OF DOTHAN, ALABAMA.

RADIO AERIAL TORPEDO.

1,376,192.

Specification of Letters Patent.

Patented Apr. 26, 1921.

Application filed November 8, 1918. Serial No. 261,611.

To all whom it may concern:

Be it known that I, GARNETT JOEL DYE, a citizen of the United States, and a resident of Dothan, in the county of Houston and State of Alabama, have invented a new and Improved Radio Aerial Torpedo, of which the following is a full, clear, and exact description.

This invention relates to implements or apparatus designed especially for offensive operations in warfare, and has particular reference to an aerial device or machine adapted to be projected or directed through the air to any desired elevation or distance, carrying a charge of high explosive and driven by its own power, while the distance or direction of movement thereof is controlled by wireless apparatus from the sending station which may be either stationary or located on any suitable moving carrier or body such as a battleship or other air craft.

Among the objects of the invention, therefore, is to construct a mechanical torpedo of a self propelled nature, and having wireless means of communication for the accurate and positive control thereof from the time it leaves the sending station until it is to be exploded.

Another object of the invention is to provide a mechanical torpedo having means for self propulsion and special safety means to prevent the premature firing of the charge of explosive material, said safety means, however, being released after the propelling means will have operated through a certain predetermined distance or number of rotations so that the firing means will be operative any moment thereafter that the device strikes an obstacle.

A still further object of the invention is to provide a self propelled and mechanically controlled aerial vehicle with gyroscopic stabilizing means specially connected with the controlled apparatus.

With the foregoing and other objects in view the invention consists in the arrangement and combination of parts hereinafter described and claimed, and while the invention is not restricted to the exact details of construction disclosed or suggested herein, still for the purpose of illustrating a practical embodiment thereof reference is had to the accompanying drawings, in which

like reference characters designate the same parts in the several views, and in which—

Figure 1 is a side elevation of my improved aerial torpedo, parts being in section.

Fig. 2 is a vertical longitudinal sectional detail illustrating particularly the safety apparatus referred to.

Fig. 3 is a front elevation of the safety mechanism substantially on the line of the plane 3—3 of Fig. 2, but with parts broken away.

Fig. 4 is a detail view of the stabilizing gyroscope and parts associated therewith.

Fig. 4^a is a diagram of the gyroscope with indications of movements.

Fig. 5 is a plan view in diagram of the rudder controlling means.

Fig. 6 is a horizontal section of the casing showing some of the controlling devices.

Fig. 7 is a vertical sectional view of the same on the line 7—7.

Fig. 8 is a diagram of the principal wiring and parts associated therewith.

Fig. 9 is a front elevation of the improvement showing especially the wings and the guy wires associated therewith; and

Fig. 10 is a detail perspective view of the combined elevator and stabilizer.

Referring now more specifically to the drawings, I show an aerial torpedo comprising a body or fuselage 10 having a propeller 11 mounted on a propeller shaft 12 in the front end of the fuselage, said propeller shaft being driven through gears 13 and 14 from the shaft 15 of any suitable engine or motor 16 in the lower portion of the fuselage. Hence the fly wheel 17 connected to the motor shaft is driven in a direction reverse to that of the propeller for the purpose of reducing as much as possible the tendency of the device to wobble while it is flying. As this machine has been constructed and operated I have employed two wings 18, the position of which is indicated by dotted lines in Fig. 1, the same being arranged essentially similar to the wings in an airplane with any suitable bracing frames and guy wires. As to the specific construction of the wings or planes and other analogous features now well known in aeronautics I am not primarily concerned. I show, however, front supporting wheels 19, a rear skid 20, and an intermediate downwardly projecting brace 21 to

which certain of the guy wires 21^a are secured. These guy wires or riding wires 21^a are to act as the ground for the wireless impulses, and when properly placed in their respective positions are well insulated from the rest of the machine.

At the rear is a vertical rudder 22, and close in front of it is the elevator mechanism 23 to which reference will be made later. In the same line or plane with the elevator 23 is arranged a horizontal stabilizer 23' for adjusting the nose or tail dip of the machine. To this stabilizer is connected an arm 23^a by means of which the adjustment may be made when desired.

In Figs. 1 and 2 large arrows indicate the direction of flight and in the latter figure I show details of construction of the safety apparatus. 24 indicates a chamber filled with high explosive and within this chamber is a primer 25 for igniting the high explosive. This primer is supported by means of a bracket 26 connected to a sleeve 27 fitted in the solid nose portion of the fuselage or body and providing a bearing for the shaft. Above this sleeve there is fitted in the nose a casing 28 parallel to the shaft and in this casing and projecting through it longitudinally and parallel to the shaft is a firing pin or bolt 29 in alinement with, but spaced from the primer. The front end of the pin has a finger piece 30 for arming purposes, at which time the pin is drawn forward against the force of a strong spring 31 calculated to cause the firing pin to strike against the primer when released. A trigger 32 is pivoted on a transverse pivot 33 within the casing 28, and its point normally projects into a notch 34 formed in the firing pin. A plunger 35 projects forward through the front end of the casing and a spring 36 acts thereon against a collar 37 tending to hold the plunger pin 38 forward against the inner wall of the casing. The rear end of the plunger lies against the otherwise free end of the trigger below the pivot 33. Hence with the movement rearward of the plunger the trigger will be released from the notch 34. A spring 32' acts to set the trigger 32.

The shaft 12 ahead of the bearing in the front end of the sleeve 27 is provided with a transverse keyway 39 in which is fitted a spring 40 acting forward against a bar or key 41 projecting through the keyway, and to which is connected a forwardly projecting impact member 42 which extends well ahead of the propeller so as to engage with any obstacle for the purpose of discharge of the explosive. Surrounding the shaft at the keyway 39 is a disk 43 secured to the rear face of the key 41. The rear face of the disk during the rotation of the propeller shaft rotates continually over the

front end of the plunger 35 always in position, therefore, to strike the plunger when the impact member is stopped when striking an object. It will thus be seen that the operation of the propeller shaft is not interfered with in any manner by the firing devices, and neither are the firing devices affected during or because of the normal rotation of the propeller.

The specific safety mechanism that is calculated to prevent premature projection of the firing pin and discharge of the explosive includes a pin 44 projecting through the side or top wall of the casing 38 perpendicular to the axis of the firing pin and engaging normally behind a collar 45 against which the spring 31 bears. A spring 46 on the outside of the casing and surrounding the pin 44 and bearing against a collar 47 fixed to the pin 44, tends to eject the pin 44 from the casing, and hence away from the collar 45. Any suitable means may be provided to prevent the snapping out of this pin 44 prematurely. For this purpose I provide a keeper shown in the form of a screw 48 having a groove 49 along its bottom edge in which an anti-friction roller 50 mounted in the upper end of the pin 44 operates. This screw 48 lying with its axis directly in the vertical plane of the center of the pin prevents the premature movement of the pin, and the engagement of the pin roller 50 in the groove 49 prevents rotation of the screw. A nut 51 is journaled in a fixed bracket 52 and is provided with a bevel gear 53 meshing with a similar gear 54 connected to a jack shaft 55 journaled in a bracket 56. This nut 51 is internally threaded to correspond with the screw 48 fitted therein. A pinion 57 is fixed to the propeller shaft and meshes constantly with a large gear 58 secured to the front end of the shaft 55. The relative sizes of the gears 57 and 58 as well as the length of the screw 48 are so proportioned that the propeller may be operated a considerable number of times before the operation of the gearing just described will cause sufficient movement of the screw 48 toward the left in Fig. 3 to pass over the pin roller 50, but when it does so pass the pin roller the pin will be free to be tossed out of the casing 28 by virtue of the spring 46. Thus the safety means to prevent premature discharge will not be removed from the firing pin until after the device will have gone to a safe distance from the sending station. This release, however, of the safety device will have no immediate bearing upon the trigger 32 and the means for actuating it. When, however, the impact member 42 strikes an obstacle the firing pin will be released and explosion will follow.

In order to assist in the automatic stabilizing of the machine during its flight and to assist in the mechanical control of the

stabilizing devices I provide a gyroscope wheel 59 operating normally in a horizontal plane upon a vertical spindle 60 supported in suitable bearings 61 and 62 at its upper and lower ends, said bearings being supported in a frame 63 of any suitable design or construction. The gyroscope is located in the center of balance longitudinally and also in the center laterally of the fuselage.

The gyroscope and its supporting frame are suspended from a fixed rigid overhead support 64 including a socket 65, by means of a shank or neck 66 having a ball 67 fitted for universal movement in said socket.

The lower end of the frame 63 carries a shank 68 to which are connected a series of solenoids 69, 70, 71, and 72 all arranged with their axes in the same plane perpendicular normally to the vertical axis of the spindle 60. These solenoids are provided with slidable cores 73, 74, 75, and 76 respectively all connected through link members 77 to the lower end of the shank 68. A spring 78 connects the outer end of each solenoid to the outer end of the adjacent solenoid casing, the tendency of all of the springs being to keep the device in its normal position with the spindle 60 centered with respect to the system of solenoids. Each solenoid is connected through a ball and socket joint 79 to a ring 80 which like many of the frame parts is preferably made of aluminum for the sake of strength and lightness. The solenoids 69 to 72 represent means for manipulating the gyroscope for control of the machine in directions down, up, right, and left respectively. The ball and socket joints 79 permit sufficiently free tilting movement of the several solenoid casings to accommodate all of them to the pull of any of them that may be energized. As indicated in the diagram of Fig. 8 the solenoids just described are all connected through a conductor 81 with a suitable storage battery 82 which in my practice I have found should be of about fifteen volts. Conductors 69^a, 70^a, 71^a, and 72^a lead from the respective solenoids through another series of solenoids 69^b to 72^b respectively, all of which conductors lead from the last mentioned solenoids to a switch box 83, (see Figs. 6 and 7) in which is located a series of contact points 69^c to 72^c respectively.

The solenoids 69^b and 70^b are connected to the same bar 84, and to this bar a fifth solenoid 85 is connected, which through a lever 86 controls the down and up or normal lever movements or positions of the elevator 23. The two solenoids 71^b and 72^b are connected to the same bar 87 whose other end is secured to a lever 88 having a fixed pivot 89 and a link connection 90 with the rudder 22 whose vertical axis is indicated at 22'. See Fig. 5. The direction of movement of the core of the solenoid 71^b is oppo-

site to that of the solenoid 72^b and so whichever of these solenoids is energized the rudder will be moved in a corresponding direction laterally around the axis 22'. The same condition obtains with respect to the two solenoids 69^b and 70^b either of which tends to actuate the bar 84 in a direction opposite to the other, but if the solenoid 85 is energized it tends to draw the bar 84 back to its normal position. The solenoid 85 is energized through a circuit wire 91 from the main conductor 81, the circuit leading from the solenoid 85 to a chain of contact points 85^a, 85^b, 85^c and 85^d in the switch box. On the opposite side of the battery 82 from the main conductor 81 is a return wire 92 which leads from a bus bar 93 made preferably of copper and having constant contact with a shaft 94 journaled in the switch box upon a standard 95 and carrying at its opposite end a multiple brush arm 96 which sweeps over all of the contact points 69^c to 72^c and 85^a to 85^d. The multiple brush arm 96 comprises brushes 96^a, 96^b, 96^c, and 96^d all of which are in metallic connection with the brush as a whole and the member 94. As will be understood from Figs. 6, 7, and 8 the contact points 69^c, 70^c, 71^c, and 72^c are arranged in a circle concentric with the shaft 94 and spaced 90 degrees apart. The brush 96 includes an arc shaped wing in the center of which the brush 96^a is located while the brushes 96^b and 96^c are at the ends of the wing and spaced 90 degrees apart. The opposite end of the brush 96 carries the brush point 96^d, but is adapted to sweep over the contact plate in a smaller circle than that represented by the contacts 96^a to 96^c. The aforesaid contacts 85^a and 85^b are arranged so as to be engaged by the brush contact 96^d when the brush contact 96^a is in contact with the contact points 71^c and 72^c respectively. Therefore, when the controller is set to make a right turn only the neutral or level solenoid 85 will be energized through the contacts 96^d and 85^a to hold the machine on the level. Likewise when the brush 96^a is in contact with the left turn contact 72^c the brush contact 96^a will again maintain the machine on the level through the contact 85^b. The other neutral or level contacts 85^c and 85^d are arranged in the outer circle and spaced at a small angle from the contacts 69^c and 70^c respectively so that no one of the neutral contacts will be engaged by any part of the brush when any up or down movement of the machine is desired. To effect either the down or up movement simply, the brush 96^a will be brought into contact with the contacts 69^c and 70^c respectively. If a combined up or down movement is desired in connection with a right or left turn the brush contacts 96^b and 96^c will be employed to engage both of the desired contacts. For instance with

96^b on 69° and 96° on 72° the machine will be steered downward and to the left. To effect a downward movement and right turn the brush contact 96^b will be placed on 71° and 96° on 69° and so on for any desired combination, but it will be noted that from whatever position assumed in the positive steerage control of the machine a rotation of the ratchet wheel 132 through only a small angle will neutralize such control and put some part of the brush in contact with a neutral or level contact. It will now be seen that the completion of the current from the battery 82 through any one of the pairs of solenoids controlling the gyroscope and the mechanical controlling devices is dependent upon the position of the brush arm 96 with relation to the desired contact point in the switch box, and when so positioned the other pairs of solenoids are dead. The contact points 69° to 85° just referred to are all mounted on a disk of insulation 96', and the several wires leading thereto are connected through suitable binding posts in any well known manner. In the drawings I have indicated the circuit closed through the contact point 72° and the solenoids 72 and 72^b whereby the gyroscope control as well as the rudder will be actuated simultaneously. That is to say the gyroscope will be so tilted out of its horizontal plane as to tend to produce the same effect on the banking and steering of the machine as is produced by the lateral deflection of the rudder for a left turn. What has just been stated with respect to the left turn is true of each of the other pairs of solenoids, and with respect to the solenoid 85 which is for the purpose of returning the elevator connections to normal position, the springs 78 serve to work in unison to return the gyroscope to its normal position. Hence through the action of the springs 78 the machine will always be steered in a horizontal direction automatically except when otherwise intended.

The gyroscope is rotated at high speed by any suitable means. To this end I provide an endless belt or cable 97 driven from the propeller shaft 12 from a large pulley 98 and a small pulley 99, the latter being connected to the upper end of the spindle 60. These pulleys are formed preferably with deep grooves so as to insure reliable frictional contact for the belt and to prevent accidental loss of the belt therefrom. Any suitable intermediate direction pulleys may be provided such as at 100, 101, and 102. At 103 I show a pair of idler pulleys operating in loose bights of the cable, and a tension member 104 anchored to a fixed support 105 acts through a clevis 106 to maintain suitable tension on the belt irrespective of any of the several agencies that tend to vary its effective length, such as stretching of the

belt, variations in climatic conditions, and the tilting of the gyroscope spindle forward or rearward under the influence of the solenoids 69 and 70, and as indicated by dot and dash lines in Fig. 4^a. The bearings for the gyroscope, spindle, and shanks must be kept lubricated by some suitable means, and as indicative of such means I show a grease cup 107 having a duct 108 leading into the socket 65 from which the gyroscope is suspended. A cup 109 surrounds the lower step bearing 62 for lubrication purposes.

The wireless controlling devices include a tuning coil 110 which is tuned or adjusted in harmony with a similar instrument at the sending station prior to the discharge of the machine to the air. These instruments are susceptible of a practically infinite number of tunings or adjustments, and hence since it is the tuning coil that interprets the character of the wireless impulse it is practically impossible for an enemy or foreign instrument to disturb or affect its intended operation, even though the strength of the foreign impulse may be greater than that employed in the control of the machine. The impulses so sent through the air from the sending station are received by the aerial or antennae 111. A conductor 112 leads from the tuning coil to the coherer 113 and thence back along a conductor 114 through the coil, and thence to a suitable ground. The coherer is a sensitive instrument comprising two oppositely arranged silver tips 115 and 116 each suitably supported in a glass tube and between which is a slight space of from 1/16 to 3/100 of an inch, according to conditions or tuning of the instrument. In this space is arranged some suitable mobile medium such as clean soft iron filings, or its equivalent, which may bridge the space between the contacts and so make a temporary electric connection, but which may readily be disturbed or distributed after each impulse by the operation of a vibrator 117 or de-coherer. This de-coherer includes circuit wires 118 in which is located a small vibrator 119 and having two normally spaced contacts 120. 121 indicates a highly sensitive polarized relay in circuit through wires 122 with the coherer and in which circuit is located a small battery 123. When the relay 121 is energized the armature 121' thereof serves to complete the circuit 124 through a small or sub-relay 125 in which is located a small battery 126. The armature 125' of this sub-relay when attracted will close the circuit 127 having a heavier battery 128 and a large actuating relay 129 adjacent to which is located an actuating lever 130 having a pull arm 131 cooperating with the teeth of a ratchet wheel 132 fixed to the shaft 94. When the lever 130 is attracted and moved to the right in Fig. 7 the arm 131 having hooked engagement with one of the

teeth of the ratchet wheel 132 will rotate the same through an angle of one tooth and against the force of the spring 133, the tension of which is adjusted by means of a nut 5 134 tending to return the arm and lever to the left. At the same time that the lever 130 turns to the right it serves to connect the contacts 120 which complete the circuit through the de-coherer and thereby the temporary circuit through the coherer is broken, 10 to be renewed again, or as often as necessary according to the angle or amount of rotation of the ratchet wheel and shaft 94 to bring the brush arm 96 around to the desired contact point on the disk 96'. A spring 135 15 having an adjustable tension connection 136 acts to hold the arm 131 down upon the ratchet wheel. 137 indicates a spring in the nature of a brake acting upon a star wheel 20 138 fixed on the shaft 94 whereby accidental or untended rotation of the switch mechanism is prevented.

I claim:

1. In a self propelled torpedo, the combination of a body adapted to carry a high explosive, a motor within the body, a propeller shaft driven by the motor and projecting forward from the body, the projecting end of the propeller shaft having a central bore and a transverse keyway at the rear end of the bore, an impact member fitted slidably in the bore and projecting forward from the shaft, a contact member surrounding the portion of the shaft having the keyway and having rigid connection with the rear end of the impact member, and firing devices for the explosive including a trigger and a plunger between said contact member and the trigger whereby the trigger is released when the impact member strikes an obstacle.

2. In an automobile torpedo, the combination of a body carrying a high explosive, propelling and sustaining means for the body, steering mechanism for the body, power means for the steering mechanism carried by the body, gyroscopic stabilizing means located at the center of balance of the body, and means controllable from the sending station to selectively set into operation the power means for the steering mechanism and simultaneously vary the effective position of the stabilizer.

3. In an automobile torpedo, the combination with a body carrying a charge of high explosive, means to propel and sustain the body during its movement, and means to fire the explosive when an obstacle is reached, of mechanical steering means carried by the body, electrical power devices selectively controlling the action of the steering devices, a gyroscopic stabilizer, and means to vary

the effective position of the stabilizer aforesaid simultaneously and in accord with the selected action of the mechanical steering devices.

4. In an automobile torpedo, the combination of a body carrying a high explosive, means to fire the explosive when an obstacle is struck thereby, means to propel and sustain the body for movement along its supporting medium, an adjustable gyroscopic stabilizer located approximately in the center of balance of the body, mechanical steering means at the rear end of the body, electrical power means carried by the body to vary the position of the stabilizer simultaneously and in accord with the adjustment of any selected steering means, and wireless apparatus carried by the body and controllable from a distance to actuate said electrical power means.

5. In an automobile torpedo, the combination of a body, means to propel and sustain the body in its travel through a supporting medium, steering devices carried by the body, electrical power means to selectively operate the steering devices, a gyroscopic stabilizer comprising a frame suspended from a ball and socket support, a gyroscope wheel journaled for rotation around a vertical spindle within the frame, a plurality of solenoids connected to the lower end of the frame and adapted to act thereon to tilt the axis of the spindle forward, rearward, or laterally to either side, means controllable by wireless from a distance to actuate the gyroscope tilting means simultaneously with the actuation of the steering devices, and means to rotate the gyroscope wheel at high speed from the aforesaid propelling means.

6. In a device of the character set forth, the combination of a body, propelling and sustaining means therefor along a supporting medium, the propelling means including a rotating shaft, a gyroscopic stabilizer for the body including a frame suspended from a fixed support, a normally vertical spindle journaled in the frame, a gyroscope wheel fixed to the spindle within the frame, and selective means acting upon the lower end of the frame to tilt the spindle forward, rearward, or laterally to vary the stabilizing function of the wheel and whereby the distance between the spindle thereof and the propeller shaft is variable, an endless belt driving means between the propeller shaft and the gyroscope spindle, and automatic tension means acting upon the belt to maintain substantially uniform tension irrespective of the variations in effective length of the belt.

GARNETT JOEL DYE.