H. H. BALES.

PYROTECHNICAL AUXILIARY PROPELLING MECHANISM FOR AEROSTRUCTURES.

APPLICATION FILED MAY 4, 1910.

1,003,411. Patented Sept. 19, 1911.

3 SHEETS—SHEET 1.

Fig. 1.

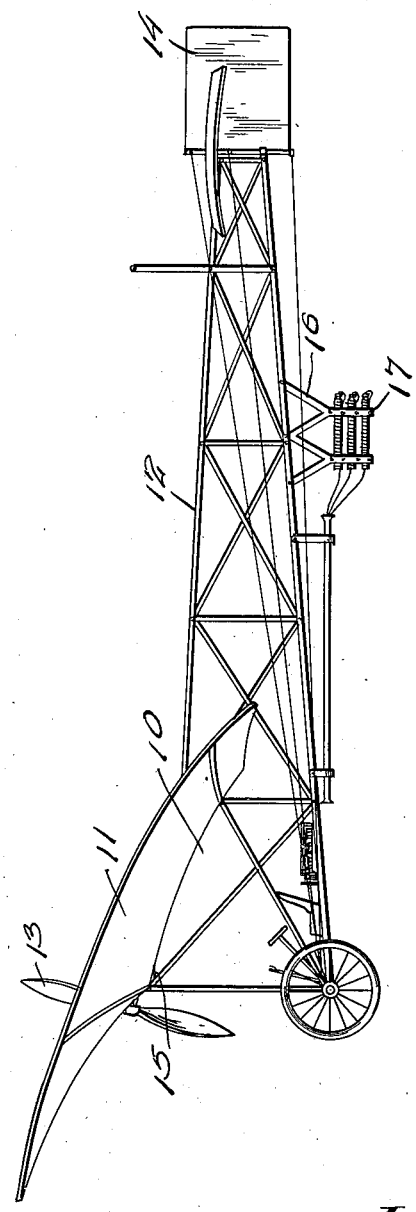
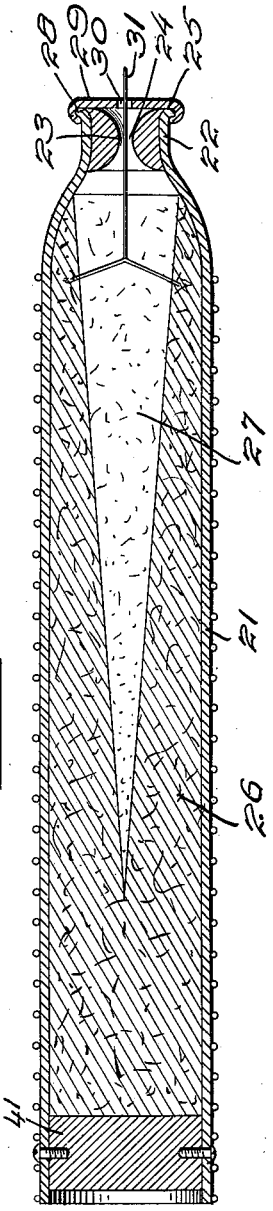


Fig. 4.



Witnesses

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3 SHEETS—SHEET 2.

FIG. 4.

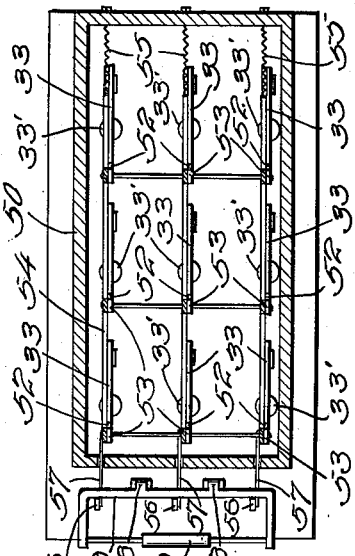


FIG. 6.

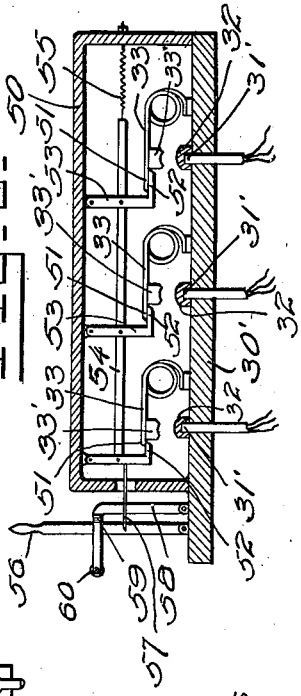


FIG. 2.

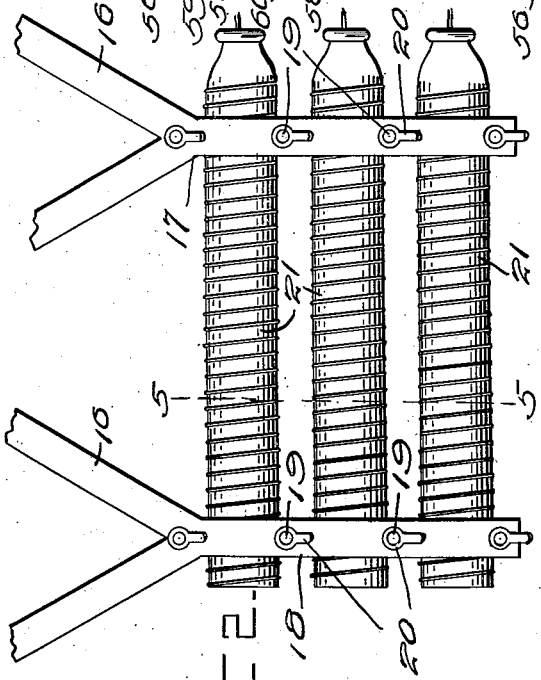
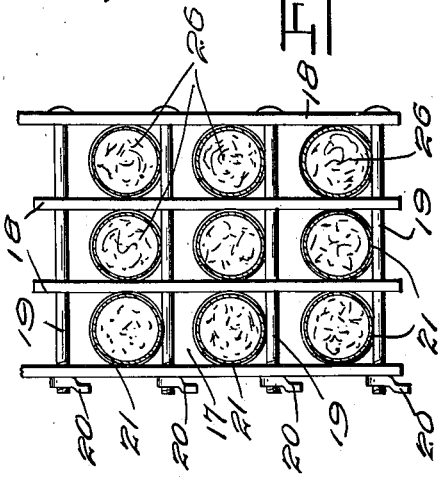


FIG. 5.



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3 SHEETS—SHEET 3.

Fig. 7.

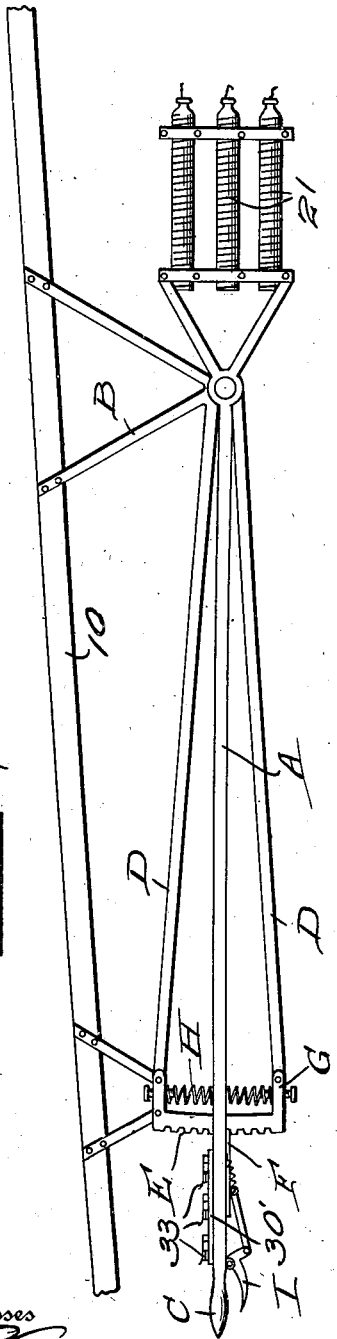
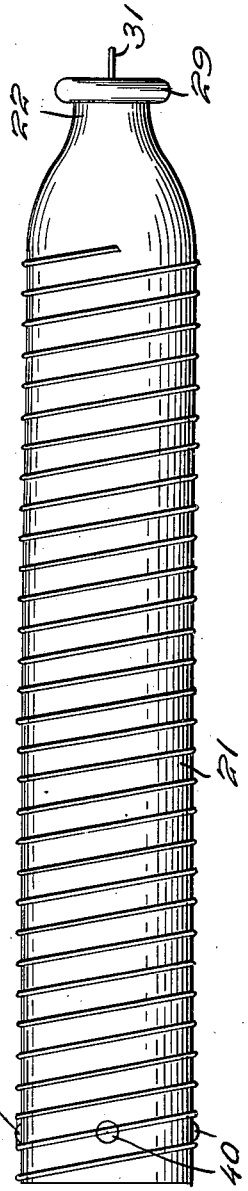


Fig. 8.



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PYROTECHNICAL AUXILIARY PROPELLING MECHANISM FOR AEROSTRUCTURES.

1,003,411. Specification of Letters Patent. Patented Sept. 19, 1911.

Application filed May 4, 1910. Serial No. 559,272.

To all whom it may concern:

Be it known that I, HADEN H. BALES, residing at Ashcroft, in the Province of British Columbia, Dominion of Canada, have invented certain new and useful Improvements in Pyrotechnical Auxiliary Propelling Mechanism for Aerostructures, of which the following is a specification.

This invention relates to aero-structures, and more particularly to aero-structures of the aeroplane type, and has especial relation to an auxiliary propelling mechanism for such aero-structures, which may be actuated by the operator of the machine at any time that the main power plant may become incapacitated for any reason.

Another object is to provide a structure of this type which will be so arranged that its power may be varied within certain limits, and which, while being efficient will yet be simple and cheap.

Other objects and advantages will be apparent from the following description, and it will be understood that changes in the specific structure shown and described may be made within the scope of the claims without departing from the spirit of the invention.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts of the several views, Figure 1 is an elevational view of a monoplane provided with the present invention. Fig. 2 is an enlarged view showing the tube bank. Fig. 3 is a longitudinal section through the tube. Fig. 4 is a top plan of the tube. Fig. 5 is a transverse section on line 5—5 of Fig. 2. Fig. 6 is a longitudinal section through the mechanism for igniting the fuses. Fig. 7 is an elevational view of the modified form of the mechanism connected with the aeroplane for movement to control the direction of movement of the aeroplane. Fig. 8 is a top plan, partly in section, of the structure shown in Fig. 6.

Referring now to the drawings, there is shown an aeroplane at 10 having the forwardly disposed main planes 11, and rearwardly extending tail frame 12. A forwardly located propeller 13 is provided, and at the rearward end of the tail frame there are located the vertical and horizontal rudders 14. A suitable power plant 15 is provided and is connected with the propeller 13 for actuation thereof. Depending from the tail frame 12 there are supports 16 to which there is attached a tube frame 17. This frame includes longitudinally spaced pairs of transversely spaced parallel vertical plates 18, connected by transverse bolts 19, these bolts being spaced from each other, and being provided with threads of high pitch, as shown, to receive lever nuts 20, which may be operated to clamp the plate against a plurality of longitudinal tubes 21 engaged therebetween. These tubes are disposed parallel to each other, in a vertical series, one above the other, and have reduced necks 22 at their rearward ends, through which there are formed passages 23 communicating with the interiors of the tubes.

The passages 23 are centrally reduced as shown at 24, and are flared at their ends 25, and within each of the tubes there is located a body of highly inflammable quick burning material 26, each of these fillings of material having in its end adjacent to the passage 24, a conical cavity 27.

A circumscribing outwardly projecting rib 28 is formed at the outer end of each of the necks 22 and engaged over the outer ends of these necks, there are closure caps 29 of a character to be quickly destroyed by heat, but which will nevertheless be waterproof. Each of these caps has a central opening 30, through which there is passed a fuse 31, this fuse at its inner end being embedded in the inflammable core 26 at the large or rearward end of the conical cavity 27.

Outwardly of the closures 29 the fuses are carried forwardly between the plate 17 and resting upon the bolts 19 and terminate at a plate 30′ located within reach of the operator's seat of the aeroplane, and provided with upwardly extending nipples 31′ arranged to receive explosive caps 32 which may be fired to ignite the fuses. Triggers are provided and are arranged to forcefully strike these caps when released, and as will be seen, the mechanism is provided for individual operation of these triggers so that any one or any set of the tubes 21 may be ignited as desired.

As will be understood, when the fuses are ignited, they will quickly burn to the closures 29, which will be destroyed, and the fuses will then burn into the tubes and ignite the inflammable cores 26. The conical cavities 27 will provide a large burning sur-

face, so that high pressure will be at once generated within the tubes by the gases incident to the combustion of the material, and these gases will pass out through the passages 24, and will strike the air, the impact incident thereto forcing the aeroplane forwardly, the mechanism thus providing a quickly operable auxiliary power plant for use in the event of an accident to the main power plant, or the exhaustion of a fuel supply.

As shown, the tubes 21 are exteriorly wound with wire to increase their strength and, as will be understood, any one or any number of the tubes may be removed from the frame for the replacement thereof by loaded tubes.

In the modified form of the invention shown in Fig. 7, the tube receiving frame is carried by the rearward end of a bar A which is mounted pivotally in a hanger B secured to the tail frame of the aeroplane, the pivot point being located between the ends of the bar. A handle C is provided at the forward end of the bar, within reach of the operator of the aeroplane, and by means of this handle the tube frame may be shifted vertically in an arc to vary the direction of discharge of gases from the tube.

A pair of divergent arms extend forwardly from the hanger B, one below and one above the bar A, and these arms are indicated at D. At their forward ends they are secured to a vertically extending rack E, and a dog F is mounted upon the bar A and is arranged for interchangeable engagement with the teeth of the rack to hold the bar at different points of its pivotal movement. Adjustable balance springs are engaged in rearwardly turned end portions G of the rack E, these balance springs being indicated at H, and, as shown, the springs bear upon the arm A, to retard its movement upon its pivot.

The plate 30′ referred to above is mounted upon the bar A, and the triggers 33 are also provided as shown. The manner of exploding the cap and thus igniting the fuses is the same as that described in connection with the previously illustrated form.

A grip I is pivoted to the bar and extends in operative relation to the handle C, and is connected with the dog F, so that the dog will be retracted when the grip is moved toward the handle. The direction of movement of the aeroplane may thus be controlled to a considerable extent by shifting the bar upon its pivot point. At the forward end of each tube, there is a removable plug 41 firmly fixed in position by detachable fasteners 40 and, as will be seen, this plug may be removed when the tubes are to be reloaded. In order to form the cavity 27 a conical expansible mandrel can be introduced through the neck of the tube by removing the choked bushing 23 the combustible filling can then be tightly packed around the mandrel, the mandrel can then be reduced in diameter and withdrawn from the tube, the bushing being replaced in the neck of the tube and cemented in position.

The fuse or quick-match 31 is covered with a protecting and damp resisting covering and only exposed at its extremities. The structure for igniting the fuses is clearly shown in Fig. 6.

The triggers 33 and the nipples 31′ are located within a water-tight box, indicated at 50, and the triggers are equipped with fingers 51 which receive therebeneath the noses 52 of dogs 53 which are pivoted to the top of the box 50, and which are arranged to hold the triggers with their hammers 33′ elevated above the cap 32.

The triggers are arranged in series longitudinally of the box 50, as will be seen, and from the rearward to the forward end of the box the fingers 51 of the triggers are of gradually increased length. The noses 52 of the dogs are correspondingly decreased in length so that from the front to the rearward end of the box a greater movement of each successive dog is necessary in order to spring the trigger engaged thereby.

The several dogs are connected by means of a horizontal rod 54 pivoted thereto, it being understood that the dogs of each series are so connected, and this rod is connected with the rearward end of the box by means of a spring 55, which normally holds the dogs in finger engaging position.

An actuating lever for each series of triggers is provided, as indicated at 56, and a rod 57 connects the lever with its series of dogs. It will thus be seen that when any one of the levers 56 is moved forwardly to a slight extent, the foremost trigger 33 of that series will be released, and continued forward movement of the lever will successfully release the other triggers of the series.

Upright members 58 are pivoted rearwardly of the levers 56, which are arranged in a transverse series, as shown, and these members have a horizontal bar 59 which lies rearwardly of the levers. A forwardly extending handle 60 is connected with this bar, and thus, by drawing the handle forwardly, the several levers 56 may all be moved at one time, to release all of the triggers 33, and fire the complete battery of tubes.

What is claimed is:

1. An auxiliary propelling mechanism for airships comprising a frame, a plurality of parallel tubes mounted in the frame, each of said tubes having a reduced opening at one end, an inflammable filling within each of the tubes, a closure for the opening of each tube, said closures being of a character to be destroyed through the action of heat, fuses passed through the closures and com-

municating with the inflammable fillings of the tubes, and selective mechanism for firing the fuses either singly or simultaneously.

2. In an airship, the combination with the main frame, of a battery of rocket cylinders depending therefrom, means for adjusting the position of the battery to regulate the direction of discharge of the rocket cylinders, and selective mechanism for firing any or all of the cylinders as desired.

3. A propelling mechanism for an airship comprising a tube, a plug engaged within one end of the tube, removable means for holding the plug in position, said tube having a reduced neck at its opposite end provided with a passage therethrough communicating with the interior of the tube, a sleeve engaged within the passage, and having a central passage in itself reduced at its center and flared at its end, an inflammable filling within the tube and means for igniting the filling.

4. The combination with an aeroplane, of a main propelling mechanism for the aeroplane, and an auxiliary propelling mechanism comprising a plurality of tubes, each of said tubes having a rearwardly directed opening, a filling of inflammable material within the tubes, and manually controlled selective mechanism for igniting the filling of the tubes either singly or simultaneously.

5. A combination with an airship, of a frame pivotally supported thereby, a battery of rocket tubes secured in said frame and having their discharge openings at the rear, means for regulating the pivotal movement of the frame to control the direction of discharge of the tubes, and manually controlled selective mechanism for firing the tubes of the battery either singly or in a volley.

6. The combination with an aeroplane having main propelling mechanism, of an auxiliary propelling means therefor, said means comprising a tube closed at one end and having a rearwardly directed opening formed at the other end, an inflammable filling for said tube, a removable moisture proof closure for the opening at the rear end of the tube, the inflammable filling for the tube being packed to provide a longitudinally extending recess centrally thereof at the rear end, and an igniting fuse having one end fitting into said space through the opening.

7. The combination with an air-ship, of plates depending therefrom, bolts connecting said plates, supplemental plates slidably mounted on the bolts, tubes resting on the bolts between the various plates, means mounted on the ends of the bolts for clamping the plates against the tubes to retain the latter in position, and selective mechanism for firing the various tubes as desired.

8. The combination with an air-ship, of rocket tubes supported therebelow, selective mechanism for firing said tubes, and means for adjusting the tubes to regulate the direction of discharge of the gases of said tubes.

9. The combination with an air-ship, of a frame depending therefrom, a second frame pivotally secured to the first, rocket tubes mounted in the latter frame, selective mechanism for firing said tubes, and means for securing the tube bearing frame in pivotally adjusted position to regulate the direction of discharge of the tube.

10. The combination with an air-ship, of a supplemental frame depending therefrom, a rack formed on said frame, a lever pivotally secured to the frame, rocket tubes carried by one end of the lever, an operating handle on the other end of the lever, a dog adjacent said handle for engagement with the rack to secure the handle in pivotally adjusted position, and selective mechanism mounted on the lever adjacent the handle for firing the tubes.

11. The combination with an air-ship, of a frame depending therefrom, rocket tubes mounted in the frame, inflammable fillings in said tubes, fuses connected to said fillings, and selective mechanism for firing said fuses, said mechanism comprising percussion caps mounted on the other ends of the fuses, spring actuated hammers for striking said caps, means for normally holding said hammers out of engagement with the caps against the tension of the springs, and a handle for moving said means out of engagement with the hammers to permit the hammers to strike the caps and thus ignite the fuses.

12. The combination with an air-ship, of rocket tubes containing inflammable material mounted therebelow, fuses for lighting said material, and selective mechanism for firing said fuses, said mechanism comprising a casing having passages formed therein through which the free ends of the fuses extend, percussion caps mounted in the casing and resting on the ends of the fuses, spring actuated hammers adapted to strike said caps, dogs pivoted to the casing and having noses of different lengths engaging the different hammers to hold them out of engagement with the caps against the force of the springs, a rod pivotally connecting the dog, and a handle for moving said rod, different degrees of movement of the handle moving the several dogs to release their handles according to the length of the nose of the said dog.

13. The combination with an air-ship, of rocket tubes containing inflammable material supported in rows below the air-ship, fuses for firing said tubes, and selective mechanisms for igniting said fuses, said mechanism comprising a casing having a row of apertures formed therein for the fuses of each row of tubes, percussion caps secured

in the casing to the ends of the fuses, spring actuated hammers having noses of different lengths increasing toward the rear, dogs pivoted to the casing and having noses similarly increasing in length engaging the corresponding noses of the hammers, a rod pivoted to the dogs of each row, a handle for shifting said rod, the movement of the handle releasing the hammers sequentially according to the lengths of the interengaging noses of the dogs and hammers, said hammers when released striking the caps and thus igniting the fuses, a bar pivotally supported by the casing and adapted to engage the operating handles for the dogs of the several rows, and means for shifting the bar to operate the handles of the various rows simultaneously.

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

HADEN HERBERT BALES.

Witnesses:

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RODERICK JOHN MCKAY.