P. A. SPARRE.

MEANS FOR STARTING AEROPLANES.

APPLICATION FILED DEC. 2, 1914.

1,161,744.

Patented Nov. 23, 1915.

2 SHEETS—SHEET 1.

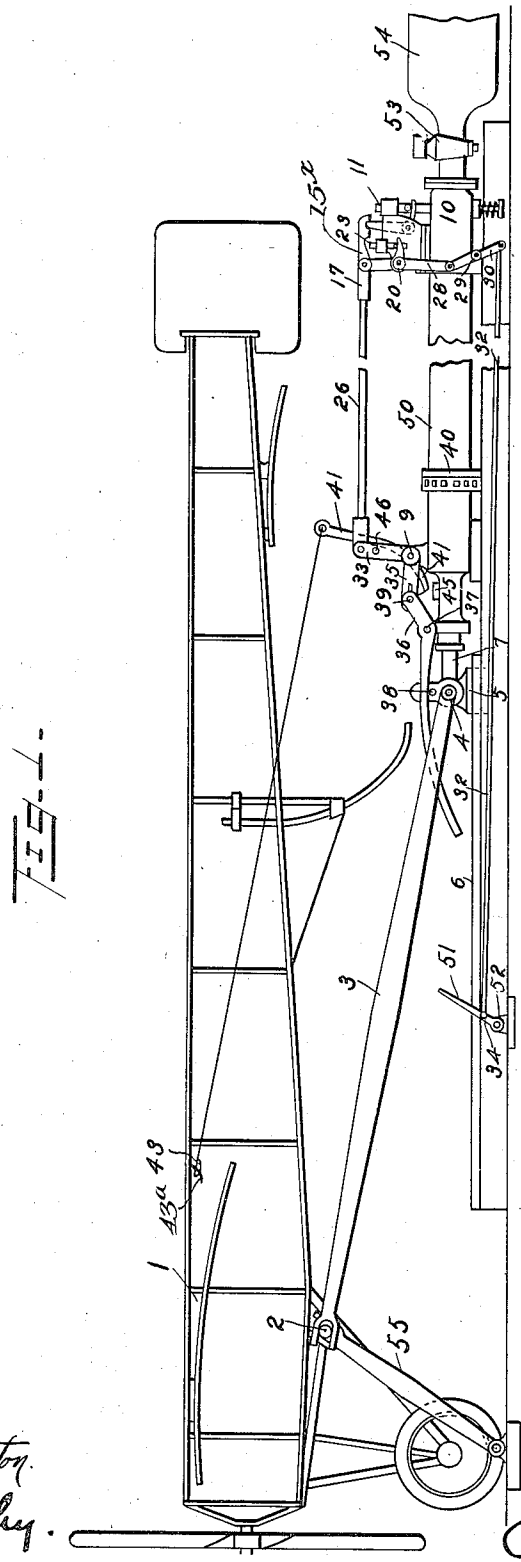


Fig. 1.

Witnesses

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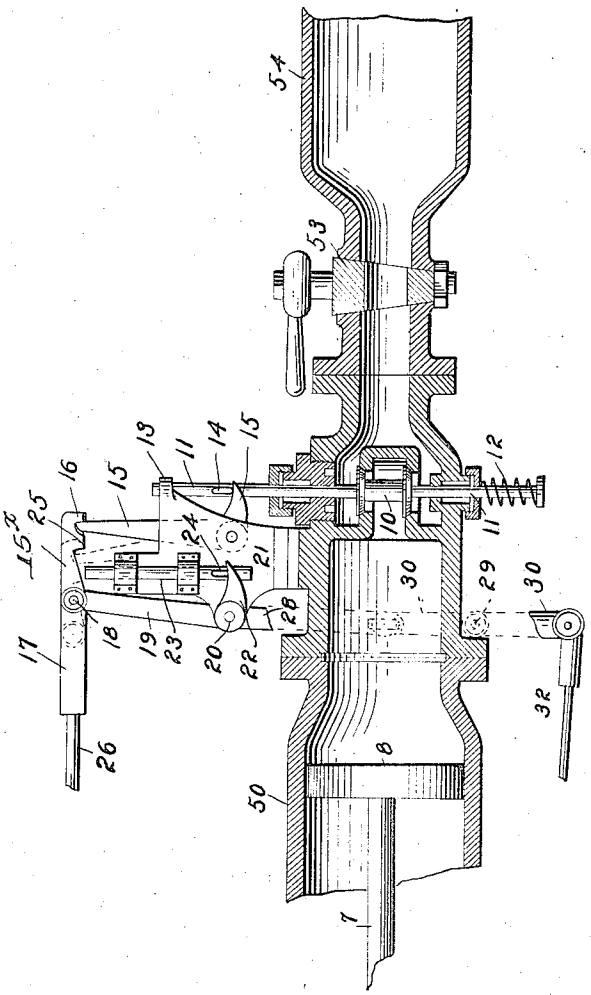
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2 SHEETS—SHEET 2.

FIG. 2.



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UNITED STATES PATENT OFFICE.

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MEANS FOR STARTING AEROPLANES.

1,161,744. Specification of Letters Patent. Patented Nov. 23, 1915.

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To all whom it may concern:

Be it known that I, PIERRE A. SPARRE, citizen of Sweden, residing at London, England, have invented new and useful Improvements in Means for Starting Aeroplanes, of which the following is a specification.

My present invention pertains to flying machine starters, and it seeks to provide means which will enable an aeroplane or other flying machine to start flight directly from the spot on which it is standing, thereby obviating the necessity of the machine being rolled a certain distance along the ground as a condition precedent to flight.

In the drawings, accompanying and forming part of this specification: Figure 1 shows in side elevation a flying machine with the mechanism for launching it secured to the deck of a ship. Fig. 2 is an enlarged detail section of valve mechanism hereinafter specifically referred to.

It has been proposed to employ elastic mechanism such as bent springs, compressed air and steam for the launching of flying machines, but these methods have not given satisfaction because the force produced by the expansion of a bent spring or a compressed fluid begins always with a heavy blow on the machine but diminishes rapidly toward the end of the stroke, this distribution of the force being contrary to what is necessary for the launching of a flying machine. To attain the best results the pushing effort must be very moderate at the commencement and then increased gradually in speed during the progress up to the end of the movement when the pushing pressure should be at its maximum, this at the moment the flying machine takes flight.

Similar numerals designate corresponding parts in both views of the drawings.

54 is a cylinder for compressed air or other fluid, communicating through valve 53 with the cylinder 50 in which is a piston 8. The piston rod 7 is flexibly connected with the rear ends of a pair of rods 3, one on each side of the rod 7, the other and upper end of the said rods 3 being forked to engage with short transverse rods 2 fixed on the flying machine 1, one rod 2 and one rod 3 being shown in Fig. 1. A pair of light rods 55, preferably of bamboo, are also employed, their lower ends being hinged to the deck of the ship while their upper ends are forked to receive the said rods 2 on the flying machine. One of the said rods 55 is shown in Fig. 1. The transverse rods 2 are acted upon by the forks at the upper ends of the rods 3. The lower ends of the rods 3 are jointed to the piston rod 7 and the slide 5 by the transverse pin 4 fixed on the slide 5 which is guided on rails 6, one of which is shown in Fig. 1.

Arranged in and controlling the conduit intermediate the reservoir 54 and the piston cylinder 50 is a reciprocatory valve 10, Fig. 2, having a stem 11 on which is a compression spring 12 for returning the valve 10 to and yieldingly holding it in its closed position. On the stem 11 is a lateral projection 14 for a purpose hereinafter set forth. The stem 11 is guided in an apertured lug 13 on a fixed standard 21, and pivoted on the said standard is a lever 15 having lower and upper arms, the lower arm being disposed under the projection 14 of the valve stem 11, whereby when the upper arm is moved toward the left the valve 10 will be opened against the action of spring 12, and when said upper arm is released the spring 12 will expand and thereby close the valve 10.

The piston cylinder 40 is provided in its forward portion with exhaust ports, and on the forward end of said cylinder a vertically-swinging bell-crank lever 33 is mounted; said lever having a lateral pin or projection 46 on its upper arm. Pivoted to and extending rearwardly from the upper arm of the lever 33 is a rod 26. At its rear end the said rod is provided with an enlargement 17 to which is pivoted a vertically-movable latch $15^{\times}$, having a toe 16, designed to rest in rear of and engage the upper arm of the lever 15, and also having a lower-surface portion 25, separated by an intervening space from the toe 16, as shown.

Movable vertically in guides on the standard 21 is a rod 23. The upper end of said rod 23 is designed to be opposed to the lower-surface portion 25 of the latch $15^{\times}$ when said latch $15^{\times}$ is in the position shown by dotted lines in Fig. 2, for a purpose presently described. Adjacent to its lower end the rod 23 is provided with a lateral projection 24. This projection 24 is designed to rest above and be engaged by an arm 22, fixed on a rock-shaft 20, journaled in the standard 21. Also fixed to the rock-shaft 20 is a depending arm 28, and loosely mounted

on said rock-shaft 20 and pivotally connected to the enlargement 17 and the latch 15× is a link 19. When the arm 22 is swung upwardly the rod 23 will be moved endwise upwardly to lift the latch 15× and release the lever 15 from the toe 16 of said latch. The link 19 serves to retain the enlargement 17 and latch 15× of rod 26 in proper relation to the lever 15 and the rod 23.

41 is a lever movable toward and from a stop 45 and having its upper arm disposed in rear of the projection 46 on the lever 33. Connected through a cable 42 with the upper arm of the lever 41 is a handle 43, designed to be detachably connected with a hook 43ª on the flying machine 1. Manifestly when the machine operator disengages handle 43 from hook 43ª and pulls forwardly on the cable 42, the upper arm of lever 33 wil be moved forwardly through the medium of the lever 41, and the valve 10 will be raised and opened through the medium of the rod 26, the latch 15× and the lever 15. After having drawn the cable 42 as stated, the operator of the flying machine can and is supposed to drop the handle 43.

Loosely connected at 39 to the lower arm 35 of lever 33 is the rear arm of a lever 36, the forward and curved arm of which rests over and is engaged with a transverse pin 38 on the carriage 5 so that incidental to forward movement of said carriage 5, the pin 38 acting against lever 36 will operate to further open the valve.

Arranged in the path of the pin 4 on carriage 5 is a lever 51. This lever 51 is pivoted at 52, and is connected at 34 to the forward end of a rod 32. At its rear end said rod 32 is connected to the lower arm of a lever 30, fulcrumed at 29, and having its upper arm loosely connected with the arm 28 on rock-shaft 20. Thus when lever 51 is swung forwardly during the completion of the forward movement of the slide 5, the rod 23 which will then be in engagement with the lower-surface portion 25 of the latch 15× on rod 26 will raise said latch to release lever 15 from toe 16, whereupon the spring 12 will promptly return the valve 10 to its closed position.

The operation of the apparatus is as follows: The pilot first opens the valve 53 which establishes communication between the starting valve 10 in the cylinder 50 and the reservoir 54. After having put the propeller at full speed the pilot takes his seat on the flying machine and when ready to start, pulls the handle 43 which by means of the cable 42 turns the lever 41 which acting on the pin 46 moves the bell-crank lever 33, and when the lower arm of the said lever 41 comes in contact with stop 45 the pilot drops the handle 43. The movement of lever 33 being transmitted by the rod 26 and the latch 15× to lever 15 lifts the stem 11 fixed on valve 10 just enough to allow the compressed air to slowly start the piston in cylinder 50 and with it the slide 5. The flying machine will then begin to move forwardly or oscillate on the rods 55 in the same proportion as the slide advances. The roller 38 on slide 5 will lift when advancing the lever 36 which movement is transmitted by the rod 26 to the latch 15× and lever 15 which will lift the valve 10 in the same proportion as the speed increases in order to allow a continual increasing supply of compressed air from the reservoir 54 to cylinder 50. When the valve is fully open the flying machine will have attained its greatest speed. At this moment the pin 4 on slide 5 will contact with lever 51 which being pushed forward will produce a traction by rod 32 on the lever 30 which through the arm 28 will rock the shaft 20 and with it the arm 22. This arm will act upon bar 23 which at this moment is below the lower surface portion 25 of latch 15×; the upward push of bar 23 will disengage latch 15× from the lever 15 and allow the valve 10 to be closed by the compression spring 12, and the piston 8 will continue advancing until it has reached the exhaust ports 40 of cylinder 50. After it has passed these ports it will be stopped gradually by the compression of air in the forward end portion of the cylinder, the compressed air behind, being allowed to escape freely through said exhaust ports. At this moment the flying machine will leave the forks of the rods 3 and take its flight.

Having described my invention, what I claim and desire to secure by Letters-Patent, is:

1. The combination of a flying machine, and a launching apparatus, comprising a source of fluid pressure supply, a valve for controlling the passage of fluid under pressure, means for moving a flying machine forwardly and means actuable and controlled by said flying-machine moving means for opening said valve gradually as the movement of the machine proceeds whereby a gradually increasing accelerating force is applied to the flying machine, substantially as specified.

2. An apparatus for the purpose set forth, comprising a source of fluid pressure supply, a valve for controlling the passage of fluid under pressure, means for moving a flying machine forwardly, and means for opening said valve gradually in concert with the movement of said machine-moving means and applying a gradually increasing accelerating force to the machine moving means; said valve-opening means being actuable and controlled by movement of the machine-moving means.

3. The combination of a flying machine having a transversely disposed rod, and a launching apparatus comprising a vertically-swinging lifting device detachably engaged

with said rod, a source of fluid pressure supply, a valve for controlling the passage of fluid under pressure, means for moving the said machine forwardly, said means being detachably engaged with said rod, and means, actuable and controlled by the machine moving means for opening said valve gradually as the movement of the machine proceeds, whereby a gradually increasing accelerating force is applied to the flying machine.

4. The combination of means for moving a flying machine, a piston cylinder, a source of fluid-pressure supply connected with said cylinder, a piston in said cylinder connected with the machine-moving means, a valve for controlling the passage of fluid under pressure to the cylinder, means for enabling an aviator on a machine to initially open the valve, and means actuable by the machine-moving means for further opening the valve incidental to forward movement of the machine-moving means.

5. The combination of means for moving a flying machine, a piston cylinder, a source of fluid-pressure supply connected with said cylinder, a piston in said cylinder connected with the machine-moving means, a valve for controlling the passage of fluid under pressure to the cylinder, and means actuable by the machine-moving means for opening the valve incidental to forward movement of the machine-moving means.

6. The combination of means for moving a flying machine, a piston cylinder, a source of fluid-pressure supply connected with said cylinder, a piston in said cylinder connected with the machine-moving means, a valve for controlling the passage of fluid under pressure to the cylinder, means actuable by the machine-moving means for opening the valve incidental to forward movement of the machine-moving means, and means for bringing about the closing of the valve; the latter means being actuable by the machine-moving means during the completion of the forward traverse thereof.

7. The combination of means for moving a flying-machine, a piston cylinder, a source of fluid-pressure supply connected with said cylinder, a piston in said cylinder connected with the machine-moving means, a valve for controlling the passage of fluid under pressure to the cylinder, means actuable by the machine-moving means for opening the valve incidental to forward movement of the machine-moving means, means for enabling an aviator on a flying machine to initially open the valve and thereby start the forward movement of the machine-moving means, and means for bringing about the closing of the valve; the latter means being actuable by the machine-moving means during the completion of the forward traverse thereof.

8. In apparatus for the purpose described, the combination of a source of fluid-pressure supply, a piston cylinder connected therewith, a valve for controlling communication between the said source and the cylinder, said valve having a stem and a projection thereon, a spring for closing the valve, a piston in the cylinder, machine-moving means connected with and movable with the piston, means for enabling an aviator on a machine to initially open said valve, means actuable by movement of the machine-moving means for further opening the valve, and means actuable by the completion of the forward traverse of the machine-moving means for releasing the valve so as to enable the spring to close the same.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

PIERRE A. SPARRE.

Witnesses:
A. C. BROWN,
F. W. ANDREWS.