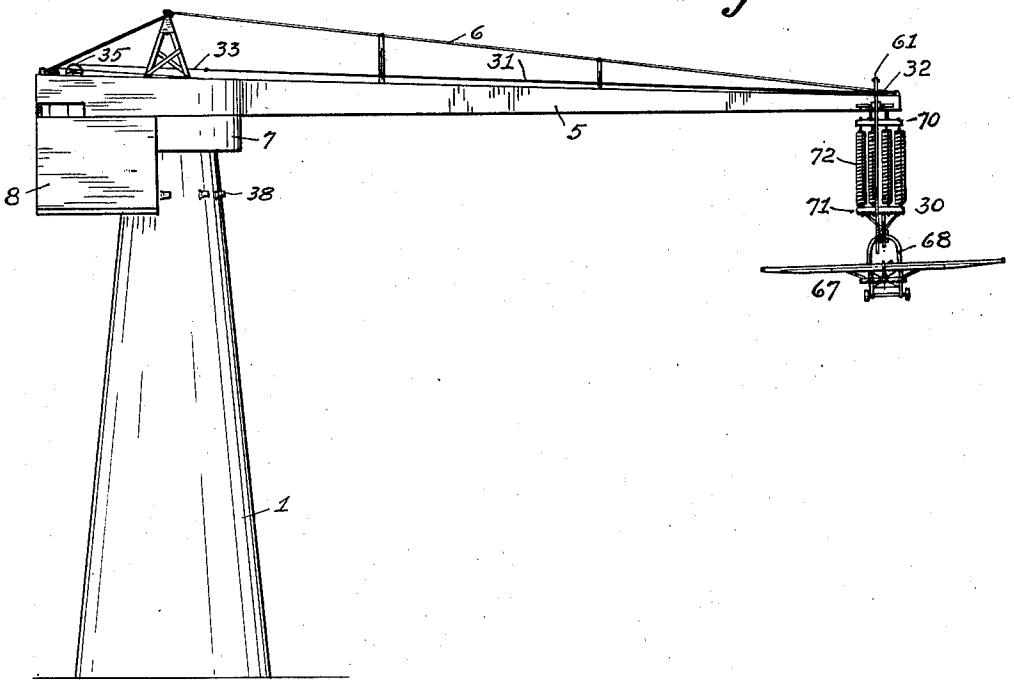
Jan. 26, 1932. S. A. STANTON 1,842,432

LANDING AND TAKE-OFF APPARATUS FOR AIRPLANES

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Fig. 1.



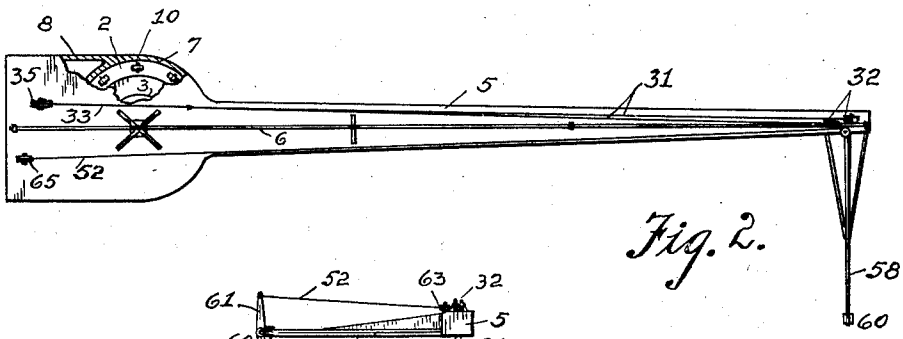


Fig. 2.

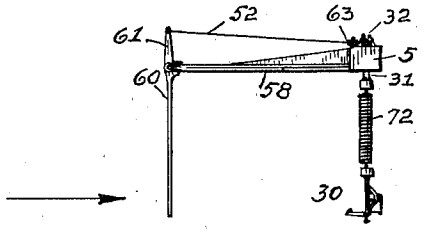


Fig. 3.

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LANDING AND TAKE-OFF APPARATUS FOR AIRPLANES

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Fig. 5.

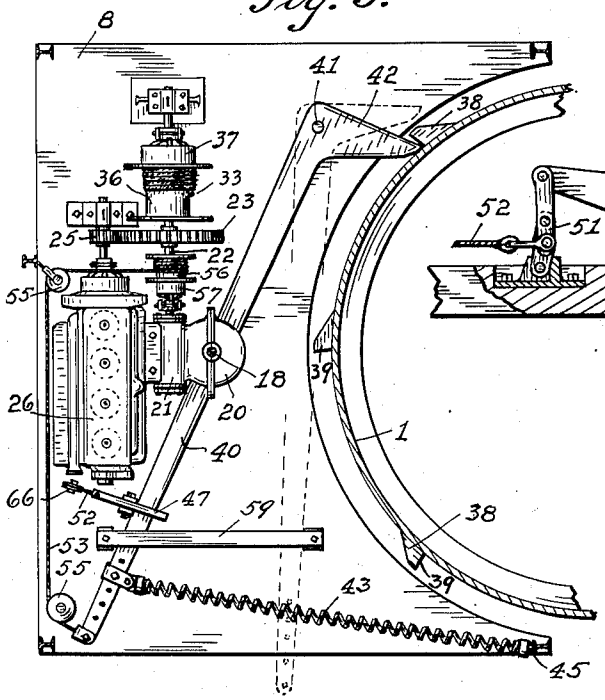
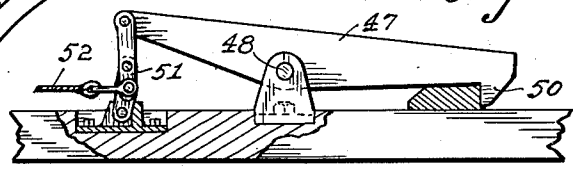


Fig. 6.



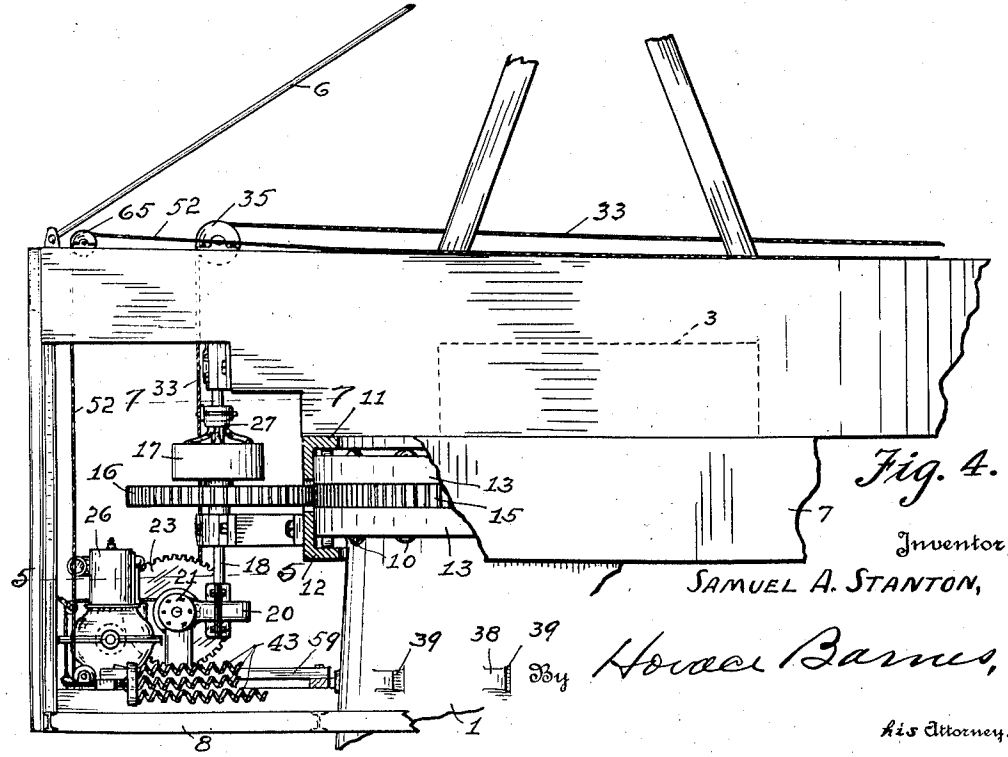


Fig. 4.

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LANDING AND TAKE-OFF APPARATUS FOR AIRPLANES

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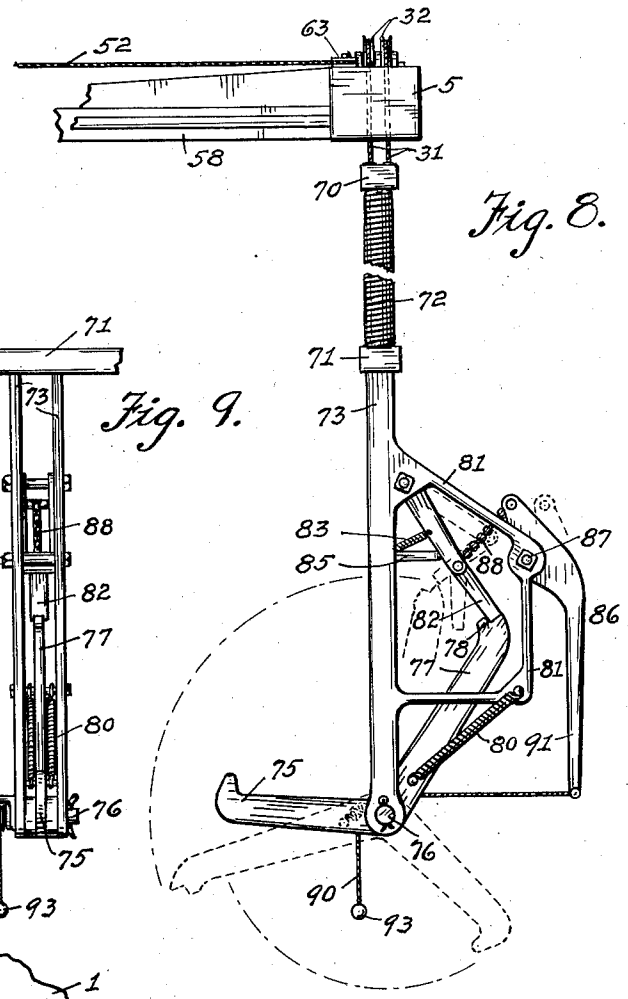


Fig. 8.

Fig. 9.

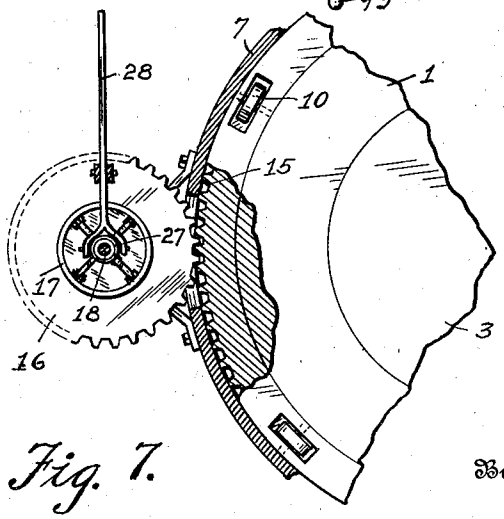


Fig. 7.

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Patented Jan. 26, 1932 1,842,432

UNITED STATES PATENT OFFICE

SAMUEL A. STANTON, OF PORTLAND, OREGON

LANDING AND TAKE-OFF APPARATUS FOR AIRPLANES

Application filed August 2, 1930. Serial No. 472,617.

This invention relates to improvements in apparatus to facilitate the landing and launching of airplanes.

One of the principal objects of my invention is to provide apparatus of simple and practicable construction engageable by an airplane intending to make a landing and which will check the flight of the plane in the air with less shock and with greater safety than hitherto and through which apparatus the plane may be expeditiously and safely lowered and landed upon the ground.

A further object of the invention is the provision of apparatus to aid the plane in taking off in flight without the necessity of the usual preliminary run along a field or airport; said take-off apparatus including devices for speeding the plane in the air to the desired velocity and manually releasable means for freeing the plane to assume independent flight.

Other objects and advantages residing in my invention, and objects relating to details of construction and arrangements of parts thereof, will be fully ascertained in the course of the detailed description to follow.

The accompanying drawings illustrate by way of example a representative form of my invention, in which:

Figure 1 is a view in side elevation of apparatus embodying my invention.

Fig. 2 is a plan view of the same.

Fig. 3 is a view in end elevation of the swinging-arm element of the invention.

Fig. 4 is a fragmentary view in side elevation of the inner end of the arm and upper end of the supporting tower with the outer casing and other portions broken away to disclose the actuating mechanism.

Fig. 5 is a view in horizontal section of the apparatus shown in Fig. 4 taken on line 5—5 of Fig. 4.

Fig. 6 is a detail view in side elevation of the tripping-dog element of the invention.

Fig. 7 is a fragmentary view in horizontal cross-section taken on line 7—7 of Fig. 4.

Fig. 8 is a detail view in side elevation upon an enlarged scale of the outer end of the swinging-arm and plane-engaging hook.

Fig. 9 is a partial view in endwise elevation of the same.

Referring to said views, the reference numeral 1 indicates a tower of rigid construction and of, preferably, considerable elevation surmounted by a circular overhanging table 2. A circular trunnion 3 of relatively large diameter extends above the table in concentric relation. A swinging-arm 5 extends in substantially horizontal relation from the top of said tower and is pivotally mounted adjacent one end thereon to rotate in full revolutions thereabout if desired. Said arm is preferably of relatively light and strong structural steel fabric tapering towards its outer end and is reinforced by one or more tension-rods 6 upon its upper side. The inner end of said arm is increased in size to overlie said table and to provide a circular dependent housing 7 extending exteriorly of and including the table 2. A cab 8 is positioned to the rear of said housing and opposite to the relatively long reach of the swinging-arm and in counterbalance thereof.

The trunnion 3 extends upwardly into a well or bearing formed in the underside of the arm and about which the arm may be rotated. The housing 7 is of circular channel formation into whose channel the perimeter of the table 2 extends. Anti-friction rollers 10 are rotatably mounted in the upper and lower overhanging surfaces of the table in circular order and are engaged by the top and bottom flanges 11 and 12, respectively, of the housing to provide for the rotation of the arm upon the tower with as little loss of power in friction as practicable.

The exterior vertical face 13 of the table is provided with an annular toothed rack 15 with which a similarly toothed pinion 16 is in mesh, the housing 7 being cut away slightly to admit of the connection. The pinion 16 and clutch element 17 connected therewith are loosely mounted upon a vertical shaft 18 whereby the arm may be free to swing in either rotary direction with relatively slight exercise of power, particularly if applied upon the outer extremity of the arm 5.

The shaft 18 is keyed at its lower end to a

worm-wheel, not shown, enclosed within the casing 20 which in turn is in operative engagement with a worm included within the casing 21 and mounted on a shaft 22 upon which a gear-wheel 23 is keyed with which a pinion 25 is in mesh that is keyed to the crank-shaft of a motor 26. Thus upon the energizing of the motor the shaft 18 may be rotated and the pinion 16 may be operatively connected therewith by the actuation of a clutch-element 27 to engage the element 17 through a handle 28, as seen in Fig. 7. It will thus be seen that the arm 5 may be swung about with ease through a complete revolution or repeatedly as when launching a plane or may be moved from time to time for a lesser distance to adjust the direction of the arm to the direction of the wind or for any other reason.

The outer extremity of the arm is provided with a dependent hook, indicated generally by the numeral 30, adapted to be engaged by a plane on landing in a manner to be explained. Said hook is connected to a pair of cables 31 which extend over sheave-wheels 32 and thence over the top of the arm to unite in a single cable 33 which extends to and over a sheave-wheel 35 from whence it passes into the cab and about a winding-drum 36, mounted upon the shaft 22 and arranged to be operatively connected to said shaft by a clutch 37 whereby the cable 33 may be wound in or out. Thus upon a plane being engaged and stayed in flight by the hook 30 it may be lowered to the ground by the indicated actuation of the drum 36. Conversely, the plane may be lifted to the end of the arm for launching in flight by a reversal of the said winding operations.

It may be desirable to overcome the inertia normally residing in the arm previously to the engagement of a plane therewith to avoid severe shocks to the plane and as a safeguard both to the ship and to the landing apparatus. Provision is therefor made to impart an impulse of motion to the arm in the direction from which the plane seeking a landing is approaching and slightly before the impact of the plane with the hook 30. Such apparatus consists in a series of evenly spaced lugs 38 projecting in a horizontal line about the exterior of the tower and each having faces 39 directed in substantially radial direction with respect to the tower. In the cab 8 a lever 40 is pivoted at 41 adjacent one end from which an arm 42 extends at approximately right angles and into close engagement with the tower and the faces 39 of the respective lugs.

At the opposite end of the lever 40 a plurality of coil-springs 43 are adjustably connected and at their opposite ends the springs are connected at 45 to the wall of the cab. The lever may be swung to extend the springs 43 and to present the extremity of its arm 42 into close proximity with one of the lugs 38, see Fig. 5, and is detachably secured in such position through a retaining-dog 47, see Fig. 6. Said dog is pivoted at 48 intermediate its ends and has a bill 50 at one end behind which the lever 40 is retained. The opposite end of the dog is held up to depress the bill into retaining position by means of toggle-links 51 which may be tripped to release the connection of the dog-bill with the lever 40 by means of a cable 52. Power means for extending said springs and engaging the lever 40 with the retaining-dog is provided in a cable 53 secured at one end to the end of the lever 40 and extending about sheaves 55 to a winding-drum 56 mounted on the shaft 22 and adapted to be operatively connected therewith by means of a clutch 57. 59 indicates a guide-bar in which the movements of the lever 40 may be limited.

The lever 40 is set with the extremity of the arm 42 positioned immediately behind one of the lugs 38, as seen in full lines in Fig. 5. When the retaining-dog is tripped to release the lever 40 the power of the springs 43 will be instantly released to impel the lever forwardly and impart a sharp impulse or kick from the arm 42 to the respective lug 38 which will react through the cab to the arm to start the swinging arm in motion in the same direction as the approaching plane and thus serves to reduce the shock of impact therebetween.

Devices are provided whereby the lever retaining-dog 47 may be tripped by the landing plane in advance of its engagement with the hook 30. Said devices consist in a braced rod 58 extending from the extremity of the swinging-arm at right angles and in the direction in which the hook 30 is pointed. A lever 60 is pivotally mounted in the outer end of said rod having its longer end extending downwardly to about the level of said hook. From its shorter, upper end 61 the cable 52 extends from the lever through a directing sheave 63 at the end of the arm and thence along the arm to a sheave 65 whence it passes into the cab and under a sheave 66 to its engagement with the toggle-links 51. Thus the landing plane 67 will first strike the lever 60 sufficiently in advance of its engagement with the hook 30 to start the arm in motion in the interval between its impact upon the lever 60 and its engagement with the hook 30.

The plane is provided with suitable apparatus for engagement with the hook 30, such as a looped, bail-like member 68 extending rigidly above the plane and above the sweep of the propeller or which may be hinged to lie closely to the upper wing when not in use and is movable to operative position, as shown in Fig. 1, by manually operated devices, not shown.

The hook 30 in detail may desirably comprise apparatus for releasably securing the hook member proper in position for holding a plane and upon occasion for tripping the

same to launch a plane in flight. Such hook devices include a horizontally disposed upper bar 70 to whose opposite ends the cables 31 are attached so that the hook will be reliably held in right angled relation to the arm 5; a lower horizontal bar 71 between which a plurality of extensible coil-springs 72 are connected in parallel and which collectively serve as an efficient shock absorbing device in an obvious manner.

A pair of frame-bars 73 are rigidly connected in rectangular relation to the lower bar 71 and spaced apart in parallel. The hook-member proper, indicated at 75, is pivoted upon a pin 76 at the lower end of the frame and includes a rearwardly disposed extension 77 terminating in a notch 78. A pair of springs 80 are connected at one end to said extension adjacent its pivot and at their other ends to a skeleton-frame 81 extending rearwardly from the frame-members 73 and tend to resiliently maintain the hook and extension in operative position where they are releasably held by a toggle-dog 82 engageable in the notch 78. A spring 83 connected to the frame-members 73 and to said dog tends to yieldably hold the upper joint of said dog against a stop 85 where the lower joint of the dog will be engaged by the notch 78 when the springs 80 return it to set position after each time it is tripped. The toggle-dog is tripped to release the hook-member, as when a plane is to be launched therefrom, by means of a lever 86 pivoted at 87 and having a short upper arm connected by a chain 88 or other flexible connection to the hinge-joint in said toggle-dog. A pull-cord 90 is connected to the other dependent arm 91 of the lever 86 and extends over a pulley 92 on the pin 76 and terminates in a ball 93 which may be engaged by the operator of the plane taking off from the apparatus to pull the toggle-dog from its latched engagement with the hook-extension to release the plane when the arm and plane have reached a suitable speed for taking off.

It will be seen that the apparatus is in substantially constant readiness to receive a landing plane. After the plane is caught by the hook 30 the motor and appropriate devices are set in motion to lower the plane to the ground whereupon the hook may be raised again and is ready for the reception of another plane. When a plane is to be launched it is hauled to or near the extremity of the arm 5 and the pinion 16 is actuated to rotate the swinging-arm at a rate of speed that will lend sufficient momentum to the plane to take off. As soon as the plane operator considers that such take off speed has been reached and with his own motor working at speed he pulls the cord 90 to unlatch the hook thus freeing him from the arm and admitting of independent flight.

The landing and launching apparatus just described is particularly advantageous as it will in large part do away with the necessity for large landing fields. Landings and take offs may be made from tall building in cities or in any small field in congested areas where standard landing fields are not desirable for any reason. The invention may be readily adapted for naval use to facilitate the employment of airplanes with warships or may be utilized on the larger commercial vessels in expediting the mails or for other uses.

Having described my invention, what I claim, is:—

1. In apparatus of the class described, a tower, an arm rotatably mounted on said tower, a cab on one end of said arm, means upon the other end of said arm and upon the opposite side of said tower to engage an airplane in flight, a rod extending laterally from said last named end of the arm, a trip-lever mounted on said rod, apparatus positioned in said cab and engageable with said tower to start said arm in motion, and connective means between said trip-lever and said starting apparatus.

2. In apparatus of the class described, a tower, an arm rotatably mounted on said tower, a hook on the outer end of said arm to engage and check an airplane in flight, means to impart an impulse of motion to said arm, and tripping-means adapted to be contacted by an airplane in advance of engagement with said hook to actuate said means and impart motion to the arm in advance of the said engagement.

3. In apparatus of the class described, in combination with a revoluble arm extending in substantially horizontal directions, and a cable extending along said arm and depending from the outer extremity thereof, of a hook suspended from said cable adapted to engage with and support an airplane, the bill-member of said hook being pivotally mounted and releasably secured by a detent-dog, a plurality of spring-members interposed between said cable and said hook, and means operable from an airplane supported from said hook to trip said dog and release said bill-member.

4. In apparatus of the class described, a tower, an arm revolubly mounted on said tower to swing upon a vertical axis, starting devices upon the inner end of said arm to impart an impulse of movement to said arm, grappling means upon the outer end of said arm, a trip-lever spaced laterally from said outer end of the arm, and connective means between said trip-lever and said starting devices to actuate the arm in its initial movements.

5. In apparatus of the class described, a tower, an arm revolubly mounted upon said tower to swing upon a vertical axis, means to rotate said arm upon said tower, spring-actuated starting devices upon the inner end of

said arm to impart an initial impulse of movement to said arm, grappling means upon the outer end of said arm engageable by an airplane in flight, trip-devices spaced laterally from said outer end of the arm and engageable by an airplane in advance of its engagement with said grappling means, and connective means between said trip-devices and said starting devices to actuate the arm in its initial movements.

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