Jan. 7, 1947. L. J. MAXSON ET AL 2,413,724

AIRPLANE CATAPULT

Filed Aug. 1, 1932 3 Sheets-Sheet 1

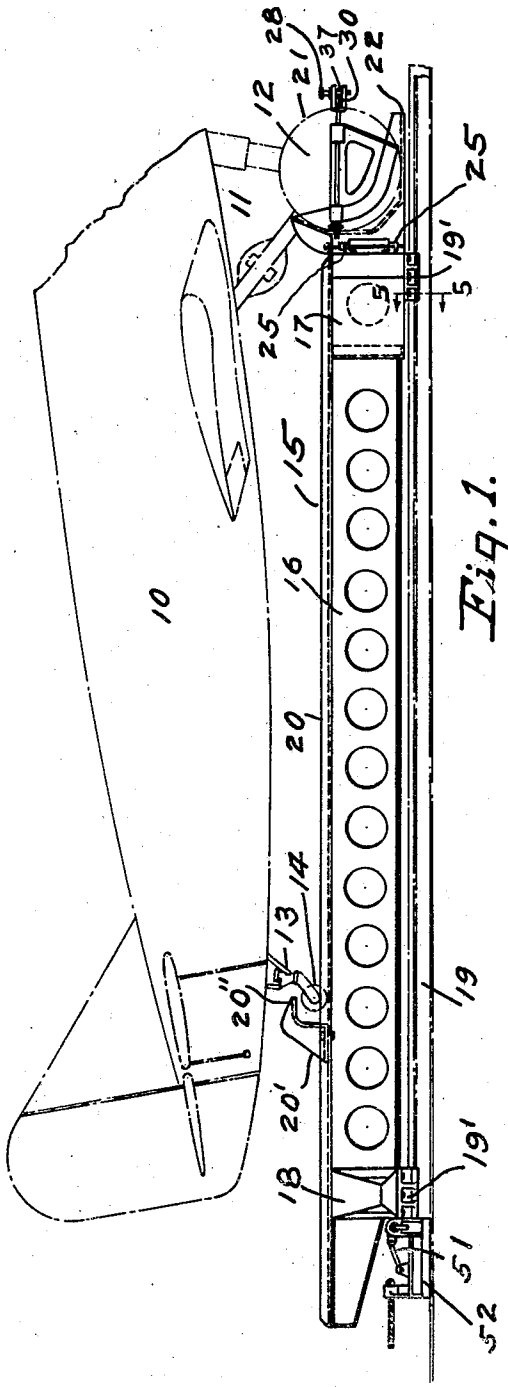


Fig. 1.

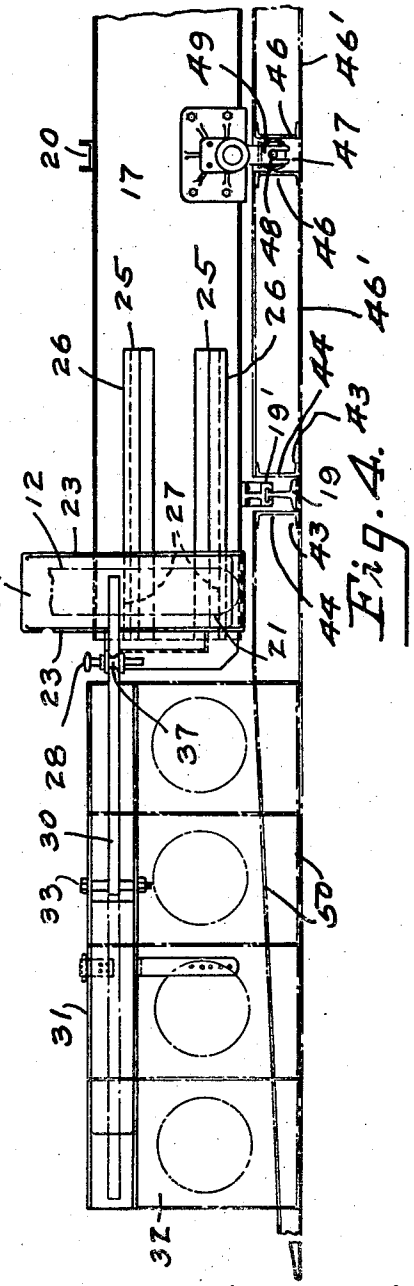


Fig. 4.

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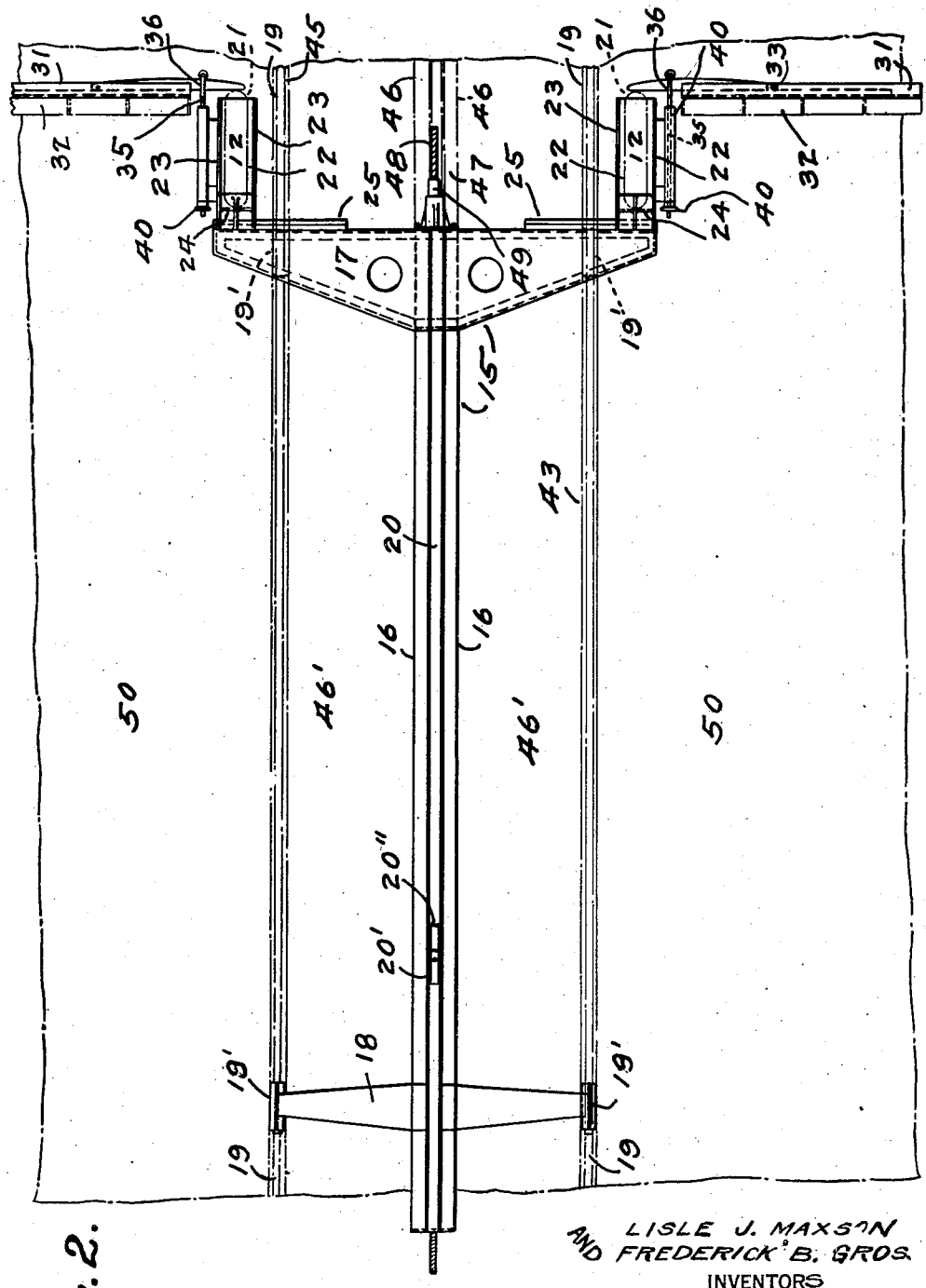


Fig. 2.

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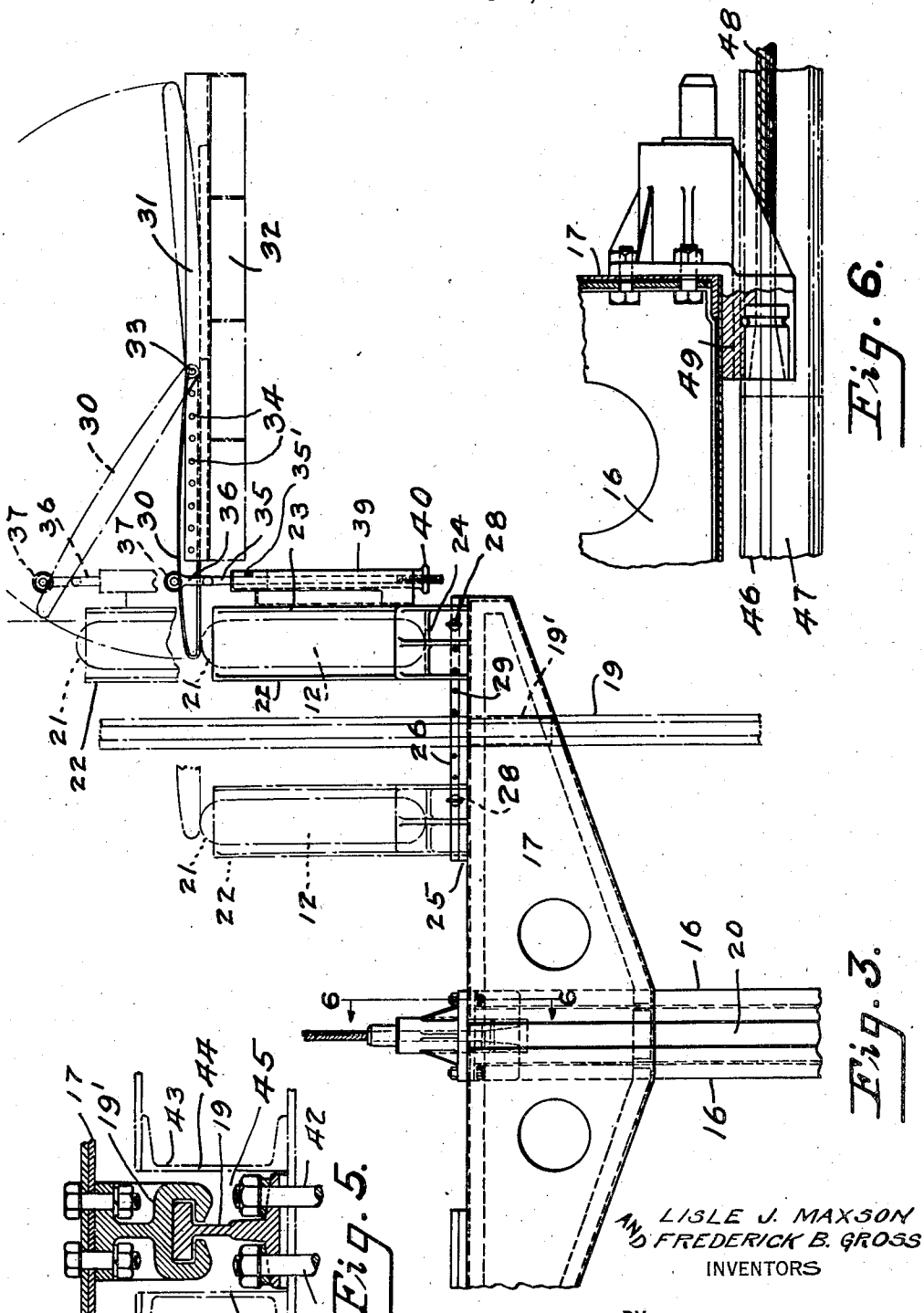


Fig. 6.

Fig. 3.

Fig. 5.

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AIRPLANE CATAPULT

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Application August 1, 1932, Serial No. 627,213

16 Claims. (Cl. 244—63)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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Our invention relates broadly to catapults for launching airplanes, and more particularly to a safety coupling for the securing and positive release of an airplane from the launching car of a catapult.

The principal object of our invention is to provide an improved and efficient mechanism for the coupling of airplanes having wheel equipped landing gear to the launching cars.

A further object of our invention is to provide a coupling for securing the under carriage of an airplane to a launching car having positive means for automatically separating the same immediately after acceleration has begun.

Another object is to provide a safety coupling and release mechanism having means for the transverse setting of the device associated with the wheels to accommodate landing gear having different distances between the wheel treads.

Another purpose of our invention is to provide a mechanism of the character described that is rugged, light in weight, one that has a minimum of working parts, and is positive in action.

A further object of our invention is to provide a novel means of handling airplanes on the decks of ships by utilizing the wheels of the landing gear for the trucking about and positioning the same upon the launching car, this feature being accomplished by mounting the guide rails of the catapult structure of the launching way in grooves formed by channel members and the placing of ramps at sides and building up of the space between the channel members.

It is also a feature of our invention to arrange a launching mechanism upon the deck of a vessel in such a manner as to enable the airplanes to be trucked about or taxied under their own power back and forth across the area occupied by the launching catapult without interference, and thus utilize the space otherwise prohibited where the catapult structure is mounted several feet above deck.

Reference is to be had to the accompanying drawings forming a part of this specification in which like reference characters indicate corresponding parts throughout the several views and in which:

Fig. 1 is a fragmentary side elevation of a launching car secured in battery or starting position upon the guide rails of a launching apparatus, incorporating the improved features of our invention;

Fig. 2 is a plan view of a launching car showing our improved safety coupling mechanism for securing airplanes equipped with landing gear having ground engaging wheels;

Fig. 3 is an enlarged detail plan view of our safety coupling and its association with the landing wheels;

Fig. 4 is a fragmentary vertical section taken

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through the guide rails of the launching way forward of the launching car;

Fig. 5 is a detail enlarged vertical section through one of the guide rails and sliding shoes;

Fig. 6 is a central longitudinal section on line 6—6 of Fig. 4 showing the towing fitting of the car and a portion of the launching fitting and its location in a groove in the deck structure.

Referring more particularly to the drawings, 10 indicates a portion of an airplane shown diagrammatically, having a shock absorbing landing gear 11 equipped with wheels 12, and the tail skid 13 provided with castored wheel 14.

The launching car 15 is fabricated of two centrally located channel beams 16 spaced apart and covered at the top and bottom with metal sheeting and is also provided with forward and rear cross members 17 and 18 of box-like construction which are designed to provide supports for the sliding shoes 19' adapted to travel along the guide rails 19 of a launching way.

A light weight channel member 20 is secured to the top and approximately the entire length of the car to form a trough for guiding the castored tail skid wheel 14, and also keep the tail centered upon the car.

A fitting 20' having a horizontal lip 20'' is secured to the channel 20 which will extend over the top of the wheel 14 to prevent the airplane from nosing over while in position upon the launching car.

The main landing wheels 12 are equipped with the customary pneumatic tires 21 which form the abutment or contact members between the airplane and the launching car. The wheels are supported in scoop-shaped carriages 22 which have flanged side plates 23 and backs 24, the backs 24, being placed in contact with the tires, acting as the propulsion member for the launching force. The carriages 22 are adjustably supported by the forward cross member 17, the adjustment being accomplished transversely to accommodate the various types of landing gears having different treads. The carriages 22 are supported by the racks 25 secured to the cross member 17 having offset flanges 26 which slidably engage the grooves 27 formed in the back plates 24. Locking pins 28 are inserted through registering apertures 29 in the back plates 24 and racks 26 to secure the carriages in the various positions along the racks.

The airplane is secured against forward movement while mounted upon the launching car in battery or starting position on the catapult by a safety coupling and automatically releasable hold-back bars 30 which have one end extending in front of and directly in contact with the tires, and the other end connected to a channel member 31 supported upon a foundation 32 and adapted to be swung in an arc about a pin 33 inserted in

the selected apertures 34 and through the aperture in the bar 30 (see Fig. 3).

Links 35 having a forked end 36 and a pin 37 form a loose slip connection for the tire contact end of the bar 30, while the rear end of the link 35 extends through the bore of the brackets 39 supported by the wheel carriages 22. The link 35 is insured against rotation within the bore of the brackets 39 by being provided with an elongated key-way extending the length of the active movement of the link, and a tap screw 35' located in the bracket 39. A hand wheel 40 is provided at the rear end of each of the links 35 which is threaded to be turned on the threads of the links so as to allow for adjustment of the varying tire sizes.

The guide rails 19 upon which the shoes 19' are slidably connected are secured to the landing surface or the like by bolts 42, and channel members 43 are placed so that the webs 44 form the walls of the grooves 45. A similar set of channel members 46 are located at the center line to form a groove 47 to protect the launching cable 48 and its connecting lug 49 supported by the launching car 15.

The area between the channels 43 and 46 is covered over with a superstructure 46' flush with the tops of the channels, and the area adjoining the outside of the guide rails 19 is provided with a ramp construction 50 which is tapered so as to become flush with the main deck structure and is extended approximately to full length of the catapult mechanism.

This feature of the construction of a launching mechanism in which the guide rail or trackage are substantially flush with the landing surface, combined with the use of a launching car equipped with the wheel carriages about flush, will enable the transportation and handling of an airplane equipped with wheel type landing gear upon the deck of a vessel without the use of cumbersome hoisting cranes and stowage or trucking cradles. It will also improve the appearance of the landing and launching decks of ships by the elimination of such unnecessary incumbrances.

The launching car 15 is propelled along the guide rails 19 by means of power applied to the launching cable that is run forward to a catapult engine (not shown).

A release mechanism of the breaking bar or other similar type 51 is to be provided between the car 15 and the stationary structure of the launching trackage as at 52 that will free the car and its supported airplane only after a sufficient and predetermined amount of power has been developed to accomplish a perfect launching, but since this feature does not constitute novelty in the present invention, further description has been omitted.

It will be understood that the above description and accompanying drawings comprehend only the general and preferred embodiment of our invention, and that various changes in construction, proportion and arrangement of parts may be made within the scope of the appended claims, without sacrificing any of the advantages of this invention.

The herein described invention may be manufactured and used by or for the government of the United States of America for governmental purposes without the payment of any royalty thereon.

What we claim is:

1. In a connection for launching apparatus, in combination, an airplane having a plurality of forward landing wheels and a tail wheel, a launching car having a plurality of carriages for supporting said forward wheels and a guide and a hold-down fitting for said tail wheel, pivoted bars adjustably mounted upon a stationary foundation, said bars having one end in engagement with the foremost point of said wheels, forked links forming guides for said bar having bearings supported by said launching car, and hand wheels threaded upon said links for adjusting the said bar against said wheels.

2. In an airplane launching apparatus, in combination, a plurality of guide rails upon a landing surface, structural members at either side of and substantially flush with said rails forming a groove, ramps extending outwardly from said rails flush with said structural members and tapering to said surface, a centrally located groove bounded by structural members between said rails, superstructure between said central groove and said structural members flush with said ramp, a launching car having guide shoes for restricting the movement to along said rails, a propelling fitting secured to said car projecting within said centrally located groove, a towing cable connected to said propelling fitting free to travel in said centrally located groove, an airplane having wheel type landing gear, means in juxtaposition to the landing wheels for holding said airplane to said launching car, said means automatically releasable upon forward translation of a launching.

3. In a launching car safety securing mechanism, in combination, a launching car, having forwardly located wheel carriages adjustably connected thereto and a rearwardly located tail wheel hold-down fitting thereon, a guide rail on said car for centering said airplane during a launching run, guides on said car for transverse adjustment of said carriages, securing fins for setting said carriages on said car, brackets on said car having bores for sliding engagement of an airplane release mechanism, links having a forked forward end supporting a friction roller and a rear portion extending through the bore of said brackets, hand wheels threaded upon said links for fore-and-aft adjustment of the links, which contact members are adjustably pivoted at one end and secured by said link and in engagement with the wheels at the other end, said contact members adapted to move clear of said wheels upon the forward movement of the car at the beginning of a launching run.

4. In a launching apparatus for an airplane having wheel type landing gear, a wheel engaging unit comprising a bottom portion conforming to the contour of the lower rear quarter of a landing wheel, an inclined portion extending forward of the wheel and a back portion having a part thereof inclined forward thus permitting the wheels to be rolled onto the unit and, after same are in position, preventing upward or sidewise displacements, and means for supporting the remaining portion of the aircraft.

5. In a launching apparatus for an aircraft having wheel type landing gear, a base frame, a tail wheel hold-down fitting attached to said frame and having an offset lip for holding said wheel against upward displacement, and a plurality of carriages secured to said beam and adapted to receive the forward wheels of the aircraft, said carriages having a rear element with a forwardly inclined portion for preventing upward displacement of the wheels and side

flanged plates for preventing sidewise displacement of the wheels.

6. In a launching apparatus for an airplane having wheel type landing gear, a base frame, means adapted to retain the tail wheel of an airplane, carriages secured to said beam for receiving the forward wheels of the landing gear, and means for firmly holding the wheels in the carriages while the launching apparatus is in battery position, said holding means being automatically released on the start of the launching run.

7. In a launching apparatus for an airplane having wheel type landing gear, a runway, a launching car adapted to reciprocate on said runway, said launching car consisting of a frame member, adjustable wheel carriages for the forward wheels of the airplane and means for holding the tail wheel, and stationary supports secured to the runway, bar members pivotally mounted to said supports and means secured to the carriages for holding the bar members in engagement with the aircraft wheels while the launching car is in battery position.

8. In a launching apparatus for an airplane having wheel type landing gear, a launching car having wheel carriages secured to the forward end thereof, means for preventing upward and sidewise displacements of the aircraft wheels when positioned in the carriage and means for engaging the wheels to firmly hold them in place while the launching car is in battery position, said holding means being automatically released from the wheels on forward movement of the car.

9. In a mechanism for holding and propelling an airplane equipped with wheel type landing gear while upon a launching car, in combination, wheel supporting carriages attached to a launching car for receiving the wheels of the landing gear, pivoted bars mounted upon stationary supports and adapted to engage with the wheels to prevent movement of the airplane upon the launching car prior to launching, and a link attached to the carriage for engaging the pivoted bars to firmly hold the wheels in place.

10. In a mechanism for holding and propelling an airplane equipped with wheel type landing gear while upon a launching car, in combination, wheel supporting carriages attached upon a launching car, and wheel engaging retaining members pivotally mounted upon stationary supports, said wheel carriages consisting of inclined portions extending forwardly of the landing wheels and extending around the back and terminating in forwardly inclined portions near the top of the wheels, said retaining members adapted to be automatically released from the wheel retaining members by forward accelerated movement of the launching car.

11. In a carriage for receiving a wheel type landing gear of an airplane while positioned upon a launching apparatus, and for transmitting forward acceleration to the airplane during launching, in combination, scoop-shaped wheel carriage conforming to the general contour of the wheels, bottoms extending forward of the wheel and slightly inclined upwardly to facilitate the transportation of the plane in position, backs snugly conforming to the contour of the rear portion of the wheel and extending above and forward of the rearmost point of the wheels, pivoted levers extending into the path of the wheels for preventing premature removal of the wheels from said carriages, links engaging said levers pivotally

secured to the launching car, said wheels being automatically released from the levers upon forward motion of the launching car.

12. In an apparatus for preventing forward translation of an airplane having forward landing wheels and a tail wheel, while in battery position upon a launching car, in combination, a plurality of scoop-shaped wheel supports adjustably mounted upon the launching car, a fitting mounted to the car and extending above the tail wheel for holding down the tail of the airplane, a plurality of bars pivotally mounted upon stationary supports outboard of the launching car for contact with the forward portion of the landing wheels, said bars adapted to be automatically released after the launching run has begun, and adjustable means attached to the launching car for causing engagement of the bars to the landing wheels.

13. In a launching apparatus for airplanes, in combination, an airplane equipped with landing wheels and a tail wheel, a launching car, wheel carriages connected to said car for receiving the wheels and adapted to impart propelling force during a launching by direct contact at the rearmost point of the wheels, pivotally mounted bars in engagement with the foremost point of the landing wheels, and link connections between the launching car and the bars for preventing play of the wheels, said links adapted to automatically release the bars upon forward motion of the launching car.

14. In a launching apparatus, in combination an aircraft, landing means on said aircraft, a launching car, a launching way, shoes carried by said launching car and slidable in said launching way, vertical members forming stops for said landing means and said shoes, flanged plates for preventing transverse movement of the landing means, and aircraft locking members on said shoes and launching way for securing the landing means while in battery position upon the launching car.

15. In a launching apparatus, in combination an aircraft, landing means on said aircraft, a launching car, a launching way, shoes carried by said launching car and slidable in said launching way, vertical members forming stops for said landing means and said shoes, flanged plates for preventing transverse movement of the landing means and aircraft, locking members on said shoes and launching way adapted for engagement with said landing means while in battery position on said launching car, and means for automatically releasing said locking member as soon as the car starts to move forward during launching from the launching apparatus.

16. In a launching apparatus for an airplane having wheel type landing gear, a runway, a launching car adapted to reciprocate on said runway and having wheel carriages for the forward wheels of the airplane, said carriages having members adapted to prevent vertical and horizontal movement of the wheels when positioned on the carriage, securing means on said carriages and runway and engageable with said wheels to securely hold the wheels in place when the launching car is in battery position, the said securing means being automatically released from said wheels when the launching car moves forward.

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