Dec. 27, 1932. R. I. MARKEY 1,892,064

AEROPLANE LANDING SKI

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Fig. 1.

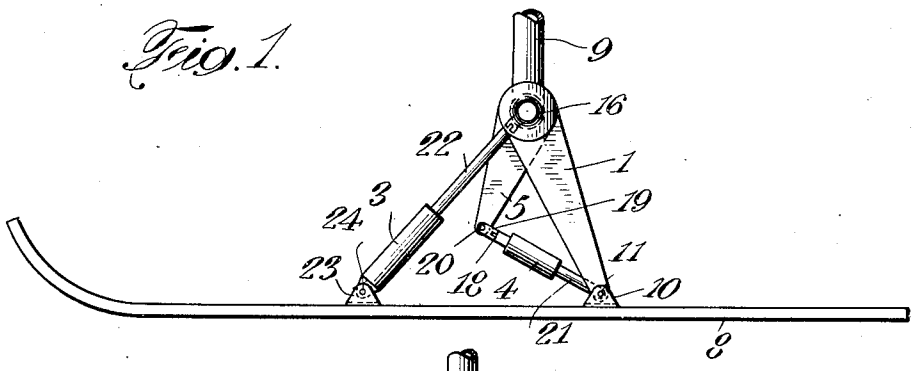


Fig. 2.

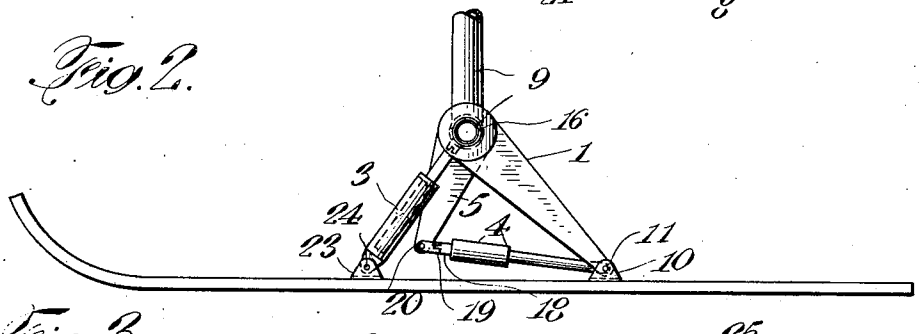
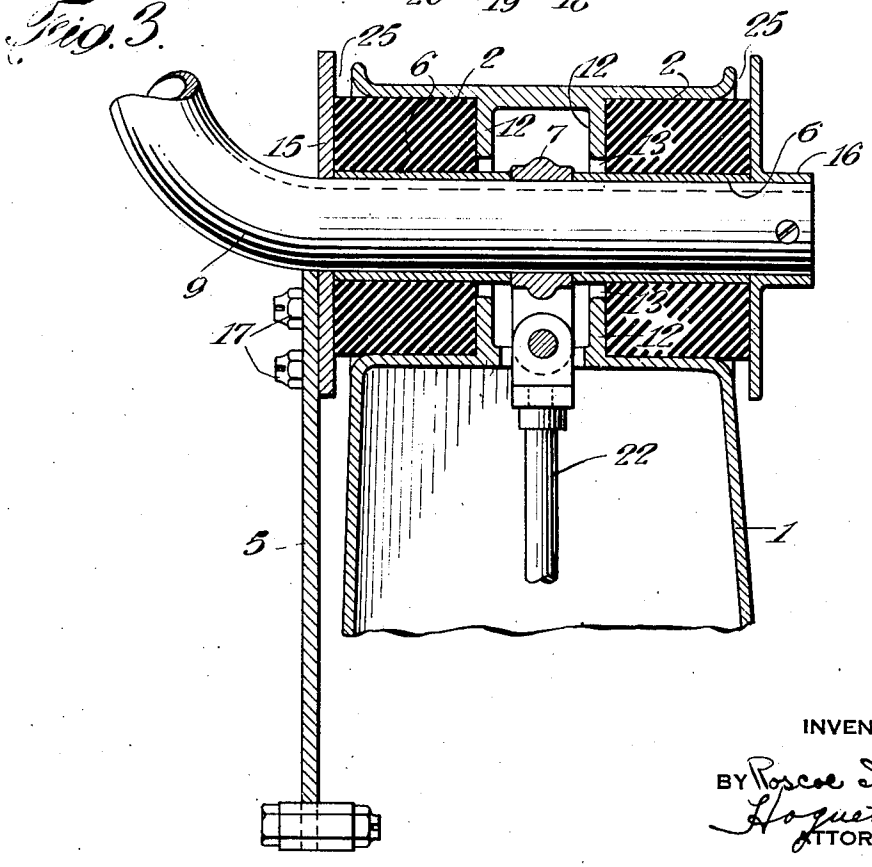


Fig. 3.



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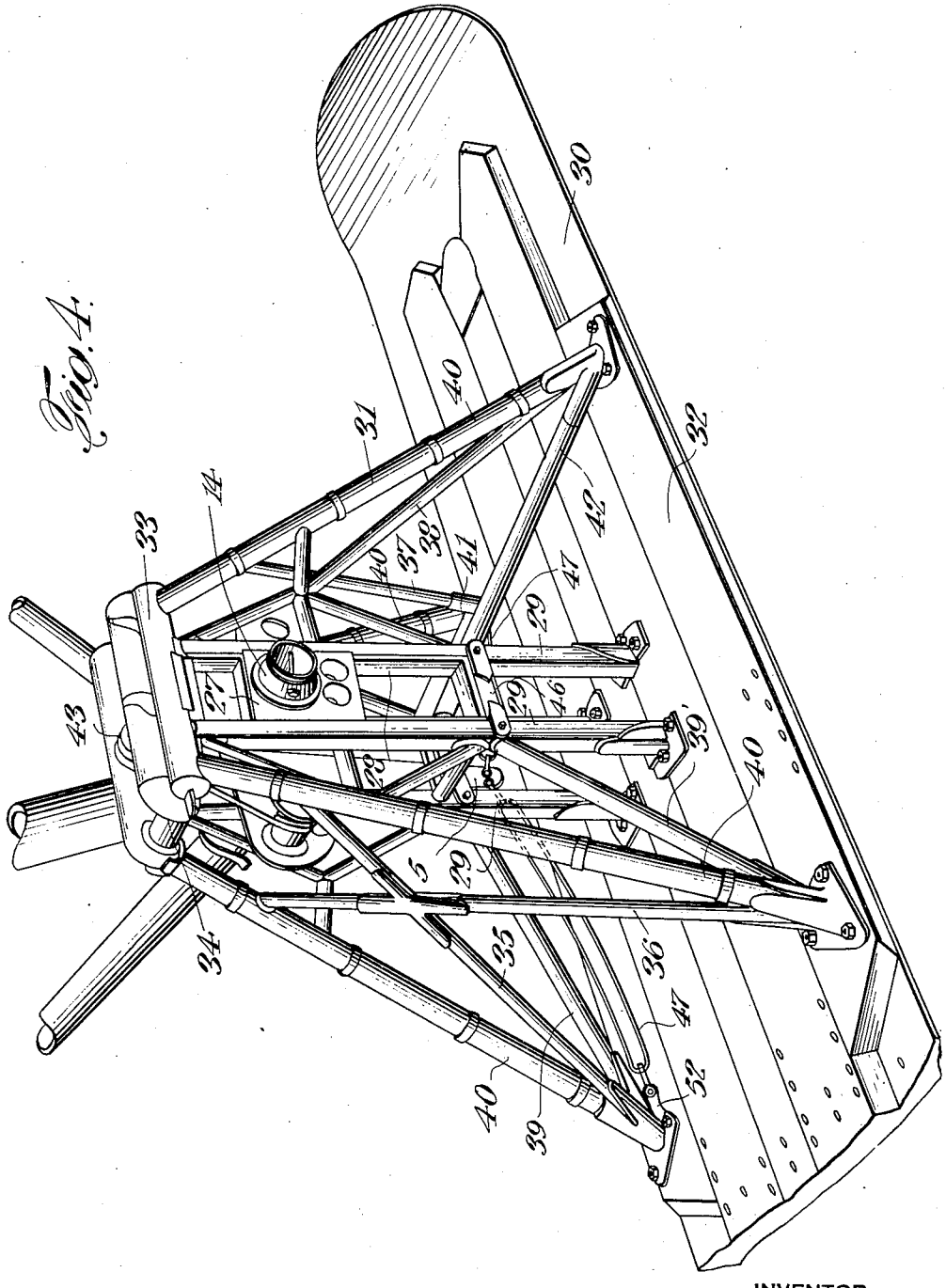
ATTORNEYS

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Fig. 4.



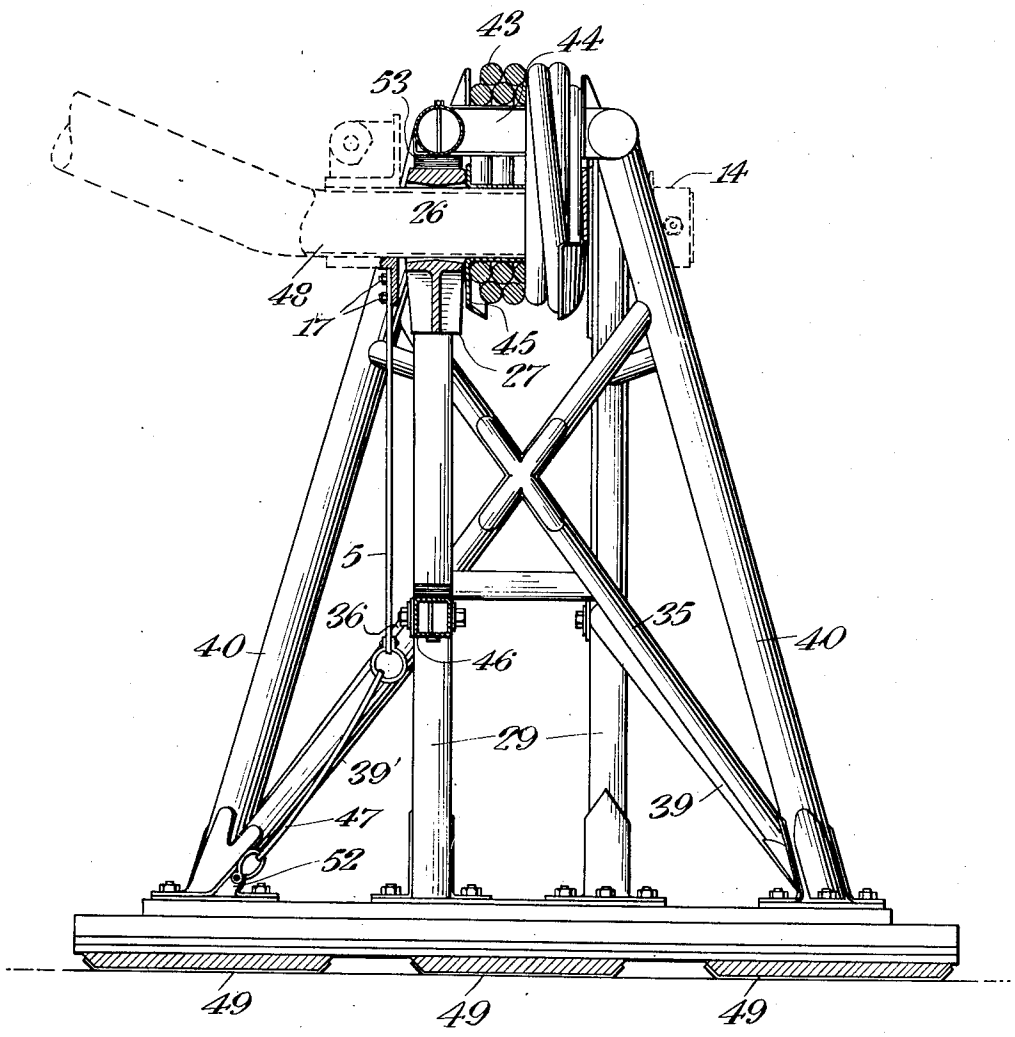
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Fig. 5.



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UNITED STATES PATENT OFFICE

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AEROPLANE LANDING SKI

Application filed May 3, 1930. Serial No. 449,401.

This invention relates in general to improvements in aeroplane landing gear and more particularly to pedestals for carrying skis and for attachment to aeroplane axles.

The object of this invention is to provide a unitary ski landing gear construction comprising a pedestal with a landing ski attached thereto and provided with its own shock-absorbing units and with suitable connections for ready attachment to and detachment from the axles of aeroplanes.

It is a further object of the invention to provide a unitary structure of this type which will not only be readily attached and detached but which will allow for relative movement between the ski and the aeroplane against the action of resilient shock-absorbing means.

A further object of the invention is to provide such a construction wherein the shock-absorbing means will allow for relative movement of the ski with the aeroplane longitudinally and transversely but which will in themselves provide not only for an effective landing device but will also retain the ski in the proper position free from movement while the aeroplane is in flight.

With the foregoing and other objects in view, the invention consists in the combination of parts and in the details of construction hereinafter set forth in the following description and in the appended claims, certain embodiments thereof being illustrated in the accompanying drawings, in which:

Figure 1 is a diagrammatical view in exterior side elevation showing the landing gear in flying position.

Figure 2 is a similar view of the landing gear showing the relation of the parts of the pedestal upon receiving an impact upon the landing of the aeroplane.

Figure 3 is a vertical transverse section taken through the aeroplane axle and a portion of the pedestal.

Figure 4 is an elevation in perspective of a modified form of ski and pedestal attached to the axle of an aeroplane.

Figure 5 is a front view in partial vertical section of a ski and pedestal of the type shown in Figure 4.

Referring more particularly to the drawings a ski 8 is provided with upstanding lugs 10 on either side of the ski to provide a pivot connection 11 for the hinged support 1 which at its upper end encircles the axle 9. Surrounding the axle 9 are tubular spacers 6 for positioning a centrally disposed lug 7. The upper tubular portion of the support 1 is provided with inwardly disposed flanges 12, which allow for a clearance 13 between them and the spacers 6. Cylindrical elements 2 of elastic quality, such as rubber, are centrally apertured and arranged about the spacers 6 so as to fit snugly between the tubular portion of the support 1, the flanges 12, and the spacers 6. Axle flanges 15 and 16 are then arranged so as to abut against the spacer members 6.

To the axle flange 15 there is rigidly attached an arm 5, by means of bolts 17, or the like. A shock-absorbing element of the spring or dashpot type 4 has an arm 18 connected to the lower end of the arm 5 by means of a universal joint as a longitudinal pivot 19 and a transverse pivot 20. The arm 21 of the element 4 is connected to the ski by means of a universal connection.

The shock-absorbing unit 3 which may be of the spring or dashpot type has an arm 22 connected to the lug 7 by means of a universal joint, the opposite end of the shock-absorbing unit 3 being pivotally connected to the lug 23 at the pivot 24, through a universal joint.

A clearance 25 is arranged for at the inner and outer end of the tubular portion of the support 1 surrounding the axle and the flange 15 and 16 to provide for transverse movement of the support 1 against the action of the rubber elements 2. This allows for a slight transverse movement of the ski and pedestal assembly with relation to the axle and the aeroplane. The tubular support 1 being essentially a floating member as far as the axle is concerned is thus rigidly connected to the ski as far as transverse movement is concerned. The support comprising the arm 5 and the shock-absorbing unit 4 being attached to the lug 10 which is rigid in its relation to the ski 8 is necessarily provided

with universal joints at its pivotal connections to allow for the transverse movement of the support 1 with relation to the axle. This is also true of the shock-absorbing unit 3, in that it is connected by means of the arm 22 through a universal joint to the lug 7 which is rigid in its relation to the axle.

By means of the above-described construction the entire pedestal assembly including the ski attached thereto may be readily slipped on to the axle and held in place by means of the ordinary well-known expedients. The proper angle of disposition of the ski 8 having been determined and shown in Figure 1, the same relation of the ski to the aeroplane will be effectively maintained under ordinary conditions. However, upon the landing of an aeroplane the assembly will be subjected to impacts which are taken care of in a longitudinal plane, as shown in Figure 2, in which the shock-absorbing unit 4 is elongated and unit 3 is compressed, each of these movements being resisted by the units themselves.

The support 1 by means of the rubber shock-absorbing elements 2 is adapted to absorb a considerable portion of the vertical thrust imparted by the impact on landing and any tendency of the ski pedestal to rotate about the axle 9 is effectively resisted by the absorbing units 3 and 4 due to the impact upon landing. The shock-absorbing units 3 and 4 also resist any tendency of rotation of the ski pedestal about the axle 9 caused by the wind while the aeroplane is in flight.

The construction involving the use of the rubber rings 2 is sufficiently rigid to avoid any vibration or oscillation of the ski while the aeroplane is in flight but will allow for a limited relative transverse movement of the ski pedestal with relation to the axle in case a side skid landing is made. This is not only a means of prevention of breakage of parts of the landing gear but also allows for enough flexibility of the construction to eliminate a tendency of the aeroplane to turn over sidewise and damage the wings.

Another form of the invention is shown in Figure 4, in which the axle of the aeroplane has releasably attached thereto a sliding block 27 of rectangular form adapted for sliding movement within a frame 28 formed by four uprights 29 with bracing members 46 which limit the downward movement of the block in the frame.

There are also provided four converging braces 40 attached to a reinforced portion 32 of the ski, which braces are joined together at the top by the longitudinal tubes 33 and the transverse tubes 34 therebetween. The central cross tube 44 is adapted to receive a plurality of resilient cords 43 which are wrapped around the bearing and retainer members 45 surrounding the axle 48, thus restraining the downward movement of the axle and the consequent downward sliding of the block 27 in the frame 28. In order to properly brace the pedestal, there are provided diagonal braces 35 and 36 and 37 and 38 between the two main rear supports and front supports of the pedestals, respectively. There are also provided diagonal braces 39 and 39′ from the lower portion of the rear supports and the uprights 29 and braces 41 and 42 from the bottom of the front supports to the uprights 29.

In attaching the ski to the axle, the ski is locked by means of the collar 14 against movement longitudinally of the axle and the relative movements possible are vertical, rotational and lateral, which movements are resisted by the shock absorbing elastics. The shock of the return of the axle 48 to no-load position after the ski 30 leaves the ground, is cushioned by a pair of resilient blocks 53, of rubber or similar material, which are compressed between the blocks 27 and the longitudinal members 33. These cushion blocks reduce the noise of operation of the shock absorbing unit and increase the life of the structure by eliminating sudden impact loads which would be produced by the energy stored in the rubber cords 43 when elongated and suddenly released.

The position of the shock-absorber in the ski pedestal unit itself makes for a quick attachment and detachment. The block 27 fitting in the guideway 28 allows for a rotational movement of the ski about the axle, but this movement is resisted and controlled by means of the shock-absorbing cords 47, which may be wrapped under tension around two rigid lugs 52 arranged fore and aft with relation to the axle. The ski presents a surface of considerable size and without this precautionary means would be caused by the wind to oscillate and render landing a dangerous proceeding. The tension and strength of the elastic cords are arranged accordingly. For directional purposes while the ski is on the ground, a ski is provided with runners 49 on its bottom surface. These runners may be stripped with a non-corrosive metal as brass or stainless steel which makes it easier to break the ski loose after it has been resting on the snow and moreover increases the life of the ski.

Having thus described my invention, I claim:

1. In combination with an aeroplane landing ski, a pedestal comprising an energy absorbing unit which provides in itself a flexible mounting for said ski on the supporting axle of said aeroplane, said unit comprising a support from said axle and pivotally connected to said ski to resistingly permit the rotation of said ski about said axle and the vertical and transverse movement of said ski with relation to said axle, a second shock absorbing member having a pivotal connection to said ski at a point in advance of said axle,

said member being rigidly connected to the axle assembly.

2. In combination with an aeroplane landing ski, a pedestal comprising an energy absorbing unit which provides in itself a flexible mounting for said ski on the supporting axle of said aeroplane, said unit comprising a support from said axle and pivotally connected to said ski to resistingly permit the rotation of said ski about said axle and the vertical and transverse movement of said ski with relation to said axle, a second shock absorbing member having a pivotal connection to said ski at a point in advance of said axle, said member being rigidly connected to the axle assembly, a third shock-absorbing member including a support extending from a rigid connection to said axle assembly and a resilient element pivotally connected thereto and to said ski.

3. In combination with an aeroplane landing ski, a pedestal comprising an energy absorbing unit which provides in itself a flexible mounting for said ski on the supporting axle of said aeroplane, said unit comprising a support from said axle and pivotally connected to said ski to resistingly permit the rotation of said ski about said axle and the vertical and transverse movement of said ski with relation to said axle, a second shock-absorbing member having a pivotal connection to said ski at a point in advance of said axle, said member being rigidly connected to the axle assembly, a third shock-absorbing member including a support extending from a rigid connection to said axle assembly and a resilient element pivotally connected thereto and to said ski, said second and third means having tension and compression elements which are adapted to work in opposite phase to resist the corresponding opposite action to each other.

4. In combination with an aeroplane landing ski, a pedestal comprising a support pivoted to said ski and terminating in a tubular portion surrounding the axle of said aeroplane, resilient elements disposed around said axle between the same and said tubular portion to allow for relative vertical and transverse movement between the ski and said axle, a strut rigidly connected to the inner flange of said axle, said strut comprising a tension and compression shock-absorbing unit which is pivotally attached to said ski.

5. In combination with an aeroplane landing ski, a pedestal comprising a support pivoted to said ski and terminating in a tubular portion surrounding the axle of said aeroplane, resilient elements disposed around said axle between the same and said tubular portion to allow for relative vertical and transverse movement between the ski and said axle, a strut rigidly connected to the inner flange of said axle, said strut comprising a tension and compression shock-absorbing unit which is pivotally attached to said ski, another strut universally mounted on a lug arranged on said axle centrally with respect to the tubular portion of said first-named support, said last named strut having a tension and compression shock-absorbing unit pivotally connected thereto and angularly disposed with relation therewith and also pivotally connected to said ski.

6. In an aeroplane, a landing gear having an axle, an aeroplane landing ski mounted thereon and comprising a runner and a pedestal, said pedestal having an energy absorbing unit, said unit comprising resilient elements adapted to permit universal movement of said ski on the supporting axle of said aeroplane and to resiliently stabilize said ski in its tendency toward movement in any direction relative to said axle by dampening said movements.

In testimony whereof, I have signed my name to this specification this 18th day of April, 1930.

ROSCOE I. MARKEY.