

Nov. 24, 1931.

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1,833,210

SKI FOR AEROPLANES

Filed Dec. 20, 1928 2 Sheets-Sheet 1

Fig. 1.

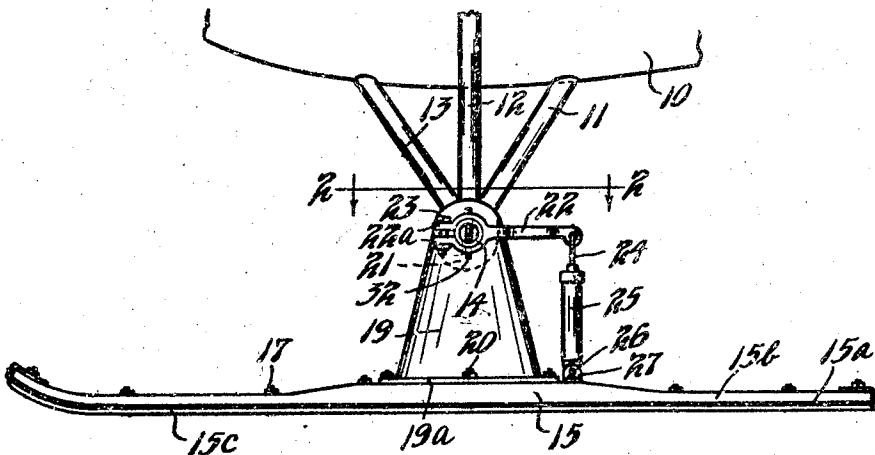


Fig. 2.

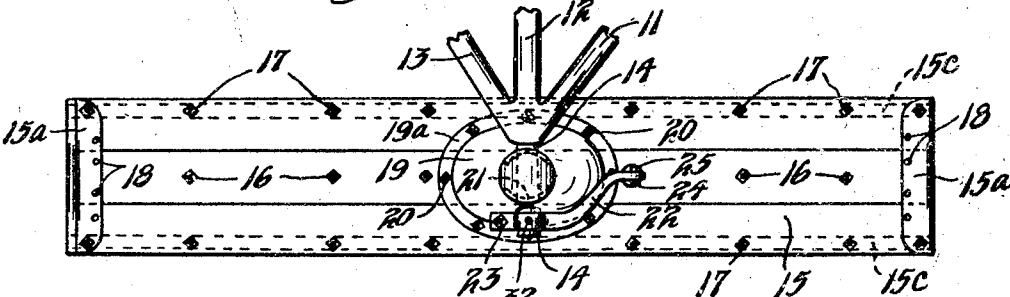
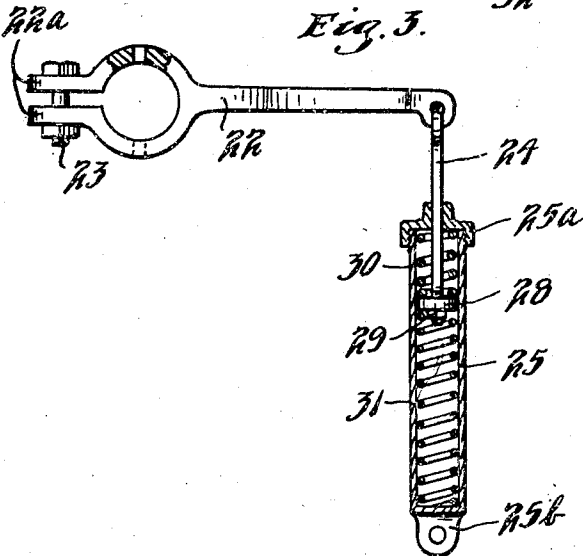


Fig. 3.



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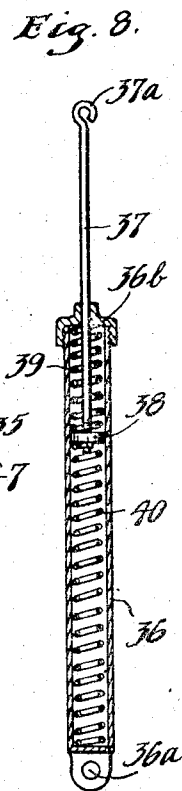
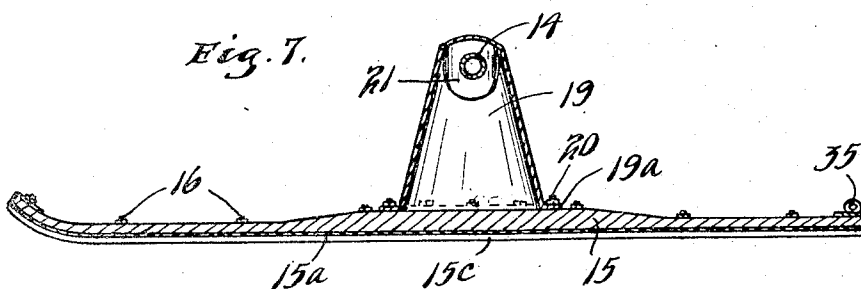
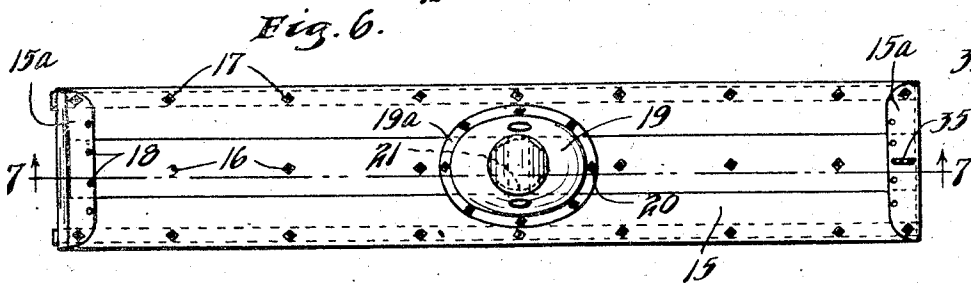
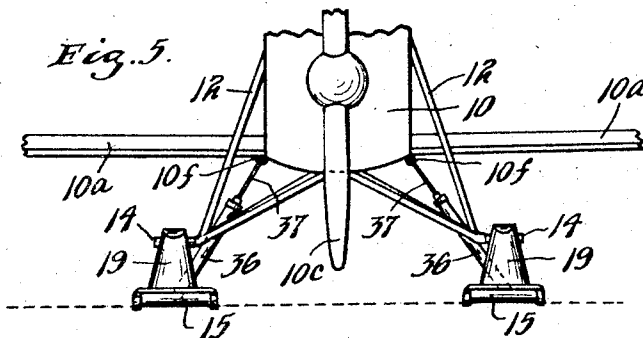
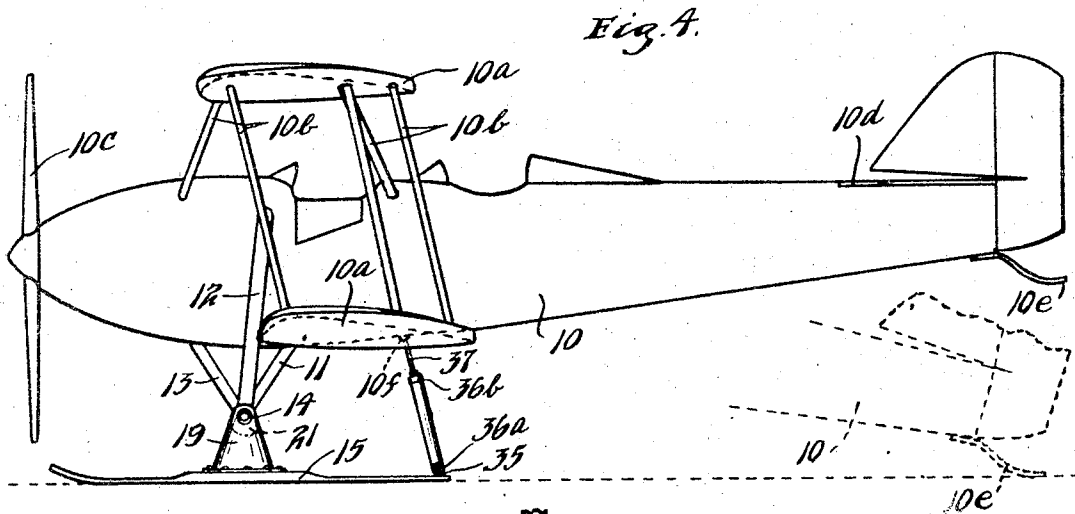
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2 Sheets-Sheet 2



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SKI FOR AEROPLANES

Application filed December 20, 1928. Serial No. 327,442.

This invention relates to a ski or runner and particularly to such a device adapted for use with an aeroplane.

It is desirable to have skis for supporting an aeroplane when the same is operating where landings are made on snow, ice or other surface where there is small friction, such as on grass or sod. It is desirable in such a ski to have lightness and still have the requisite strength and to provide means accommodating the necessary swinging movement of the aeroplane about its supporting spindles.

It is an object of this invention, therefore, to provide an aeroplane ski having light, simple and yet strong and durable construction.

It is a further object of the invention to provide an aeroplane ski comprising a runner having a hollow column secured to the top surface of said runner and tapering upwardly from said runner, said column having a bearing opening extending transversely therein adjacent its top adapted to receive an aeroplane supporting spindle.

It is still another object of the invention to provide a ski for an aeroplane comprising a runner having a lower layer of sheet metal, an upper layer of wood which comprises a plurality of longitudinally extending strips, said runner also preferably having spaced metallic strips adjacent the edges of said metal layer and at the under surface thereof.

It is still another object of the invention to provide a ski for an aeroplane comprising a runner having an upstanding member thereon adapted to receive the supporting spindle of an aeroplane, and comprising resilient means resisting rotation of said spindle in said member.

It is more specifically an object of the invention to provide a ski for an aeroplane comprising a runner having secured to the top surface thereof an upwardly tapering hollow column having a bearing for an aeroplane supporting spindle adjacent the top thereof, a casing having a pair of compression springs therein, a plunger between said springs and articulated means connecting

said plunger to said spindle for preventing rotation of said spindle.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings, in which like reference characters refer to similar parts throughout the several views, and in which:—

Fig. 1 is a view in side elevation showing the ski with a portion of the aeroplane which is supported thereby;

Fig. 2 is a horizontal section taken on line 2—2 of Fig. 1;

Fig. 3 is a view in side elevation of a portion of the structure shown in Figs. 1 and 2, a part thereof being broken away and other parts being shown in vertical section;

Fig. 4 is a view in side elevation showing a slightly modified construction and also showing the aeroplane, a portion of the aeroplane being shown in different position in dotted lines;

Fig. 5 is a view in front elevation as seen from the left of Fig. 4;

Fig. 6 is a top plan view of the ski shown in Fig. 4;

Fig. 7 is a vertical section taken on line 7—7 of Fig. 6, and

Fig. 8 is a central longitudinal section through the spring casing used.

Referring to the drawings, particularly Figs. 1 to 3, a portion of an aeroplane fuselage is indicated as 10, having the supporting frame members 11, 12 and 13 which converge into a common portion from which projects a spindle 14. This spindle in the most common construction of aeroplanes has mounted thereon the wheels on which the aeroplane runs in taxiing.

In accordance with the present invention a ski is provided comprising a runner 15. The runner 15 comprises a sheet metal layer 15a having a plane flat surface for the greater part of its length, and being slightly curved upwardly at its forward end. The runner has a layer of wood or similar material 15b superposed on and in contact with layer 15a which layer is also straight for the greater part of its length but curves upward-

ly at its forward end with layer 15a. The layer 15b is made of a plurality of longitudinally divided and extending strips which are in engagement with each other at their adjacent sides. While the number of strips may be varied, in the embodiment of the invention as illustrated, three of such strips are shown. The layer 15a is shown as bent around the front and rear ends of layer 15b and extending some distance over the top of said layer at said front and rear ends. A plurality of spaced headed and nutted bolts 16 extend through and secure together the central strip of layer 15b and layer 15a and the heads of said bolts being countersunk in the layer 15a. Ground-engaging runners 15c formed of strips of metal are disposed in contact with the surface of layer 15a adjacent the edges thereof and headed and nutted bolts 17 extend through layers 15a, 15b and the runners 15c, the heads of these bolts being countersunk, in the ground-engaging runners 15c. A plurality of small bolts or rivets 18 also extend through the overlapping end portion of layer 15a and into layer 15b. It will be noted that layer 15b has an intermediate or central portion made of greater thickness than the portions adjacent its ends, said central portion sloping into the end portions. A member 19 comprising an upwardly tapering hollow metal column or shell is provided and has a flange 19a extending thereabout at its bottom, which column is disposed centrally of runner 15 transversely thereof and is bolted to said runner by a plurality of headed and nutted bolts 20 extending through flange 19a and layers 15a and 15b, the heads of said bolts being countersunk in layer 15a. It will be noted that member 19 is of oblong or elliptical shape in horizontal cross section, the long axis thereof extending longitudinally and centrally of runner 15. The column 19 preferably is closed at its top as shown in Fig. 2 and the same preferably has secured at its inner side reinforcing and bearing members 21 each in the form of a curved plate substantially fitting the curve of the inner side of member 19. Members 19 and 21 have a transverse aperture extending therethrough adjacent the top of member 19 in which is received and journaled the spindle 14. As shown in Figs. 1 and 2, the spindle 14 projects from column 19 at its terminal end and an arm 22 has a split hub embracing spindle 14 and clamped thereto by the headed and nutted bolt 23 passing through projecting ears 22a of arm 22. The arm 22 extends rearwardly normally in substantially horizontal position and has an apertured lug at its rear end in which is swingingly connected an eyelet at one end of a plunger rod 24. The rod 24 extends through the end 25a in the form of a cap threaded onto a cylinder 25 shown as of cylindrical form, cap 25a having a cen-

tral boss forming a guiding means for rod 24. Casing 25 has an apertured lug 25b at its other end pivotally connected by a suitable pivot 26 to an angle bracket 27 bolted to runner 15 in the rear of column 19. Rod 24 is threaded at its end which is disposed in casing 25 and a plunger 28 in the form of a cylindrical block or disk is threaded on said rod. A nut 29 is also threaded on rod 24 and engaging plunger 28. A compression coiled spring 30 is disposed in casing 25 above plunger 28, rod 24 passing thru said spring. Another compression coiled spring 31 is disposed in casing 25 below plunger 28. Springs 30 and 31 respectively engage plunger 28 at one end and one end of casing 25 at the other end. Arm 22 is additionally secured to spindle 14 by a pin 32 passing through said arm and spindle.

In operation the parts will be carried by the aeroplane in flight as they are shown in Fig. 1. When the aeroplane makes a landing the ski will engage the ground at its bottom portion and slide along on the ground, with the parts shown in the same position as shown in Figs. 1 and 4, the ski being substantially horizontal with the central axis of the fuselage, which is in substantially horizontal position. When the plane has landed the rear end of the fuselage swings downward and has a runner or ski secured thereto adapted to engage the ground. There will be some oscillation of the fuselage with spindle 14 and this will be resisted by the springs 30 and 31. When the plane is resting on the ground, however, one of said springs will be compressed owing to the lowered position of the rear end of the fuselage. When the aeroplane is taking off the runners will move along the supporting surface and the movement of the arm 22 controlled by the springs will accommodate oscillating movements of the fuselage which are caused by unevenness of the ground or any movement of the fuselage just before the plane leaves the ground.

In Figs. 4 to 7 a modified construction is shown comprising the runner 15 and members 19 and 21 which carry the spindle 14 carried, as already described, by members 11, 12 and 13. A large part of an aeroplane is shown, comprising the wings 10a, struts 10b, propeller 10c the rudders 10d and the rear resilient runner or ski 10e. The runner 15 is provided at its rear end with eye bolt 35 extending through layers 15a and 15b and one end of a casing 36 is pivoted to eyebolt 35 by a suitable bolt or pivot, said casing having an apertured lug 36a at one end through which said bolt extends. The casing 36 is exteriorly threaded at its opposite end to receive the cap member 36b having a central hub through which a rod 37 slidably passes, said rod being threaded at its end and having adjustably mounted thereon a threaded plunger 38. Compression coiled springs 39 and 40

are disposed in casing 36 at either side of plunger 38 said springs engaging said plunger and respectively engaging the ends of casing 36 at their other ends. The rod 37 has an eyelet 37a at its end adapted to pivotally engage lugs 10f on the fuselage 10.

In flight the aeroplane and ski will normally have the position shown in Fig. 4. In landing the ski will engage the ground at its bottom, and the rear end of the aeroplane will gradually lower until the ski 10e engages the ground. There will be more or less oscillating movement of the aeroplane about the axes of spindles 14 and this will be resisted and the shocks absorbed by the springs 39 and 40. When the plane comes to rest with the tail runner on the ground the spring 40 will be compressed.

From the above description it is seen that applicant has provided a very simple and efficient structure of aeroplane ski. The ski has been constructed after a great deal of experimentation and is constructed and arranged to withstand the shocks and strains encountered in landing a plane. The column 19 of applicant gives ample strength and at the same time can be made of comparatively thin metal so that the ski is light in weight. The column also having a solid peripheral surface prevents snow and ice from collecting therein. An open-work structure for the ski is objectionable as tending to collect snow and ice. The column 19 as shown can also be made with a longer diameter lengthwise of the ski than transversely thereof so that there is no great resistance to the air. The movements of the plane are cushioned by the resilient mechanism provided and a good landing is easily made. The device has been amply demonstrated in practice and found to be very successful and efficient.

It will, of course, be understood that various changes may be made in the form, details, proportions and arrangement of the parts, without departing from the scope of applicant's invention, which, generally stated, consists in a device capable of carrying out the objects above set forth, in the novel parts and combinations of parts disclosed and defined in the appended claims.

What is claimed is:—

1. A ski for an aeroplane comprising, a runner, a hollow upwardly tapering shell forming a column with closed upper portion secured to the upper side of said ski intermediate the ends thereof, said column having a transversely extending opening adjacent its top receiving the wheel supporting spindle for an aeroplane from which the wheel has been removed.

2. A ski for an aeroplane comprising, a runner, an upwardly tapering shell with closed upper portion secured to the top of said runner substantially midway between the ends thereof, a bearing and reinforcing

member secured to the inner side of said shell below said closed upper portion, said shell and member having transversely extending openings adjacent the top of said shell for receiving a supporting spindle of an aeroplane.

3. A ski for an aeroplane comprising, a runner having a lower layer of sheet metal, an upper layer of wood secured to said first mentioned layer, said wooden layer having a central portion of greater thickness than its end portions and an upwardly tapering shell extending upwardly from and secured to said central portion having means for receiving an aeroplane supporting member.

4. A ski for an aeroplane comprising, a runner having a lower layer of sheet metal, an upper layer of wood secured to said first mentioned layer, said layer of wood comprising a plurality of longitudinally extending strips, spaced means securing said layers together, and a member secured to said wooden layer for supporting said aeroplane.

5. A ski for an aeroplane comprising, a runner having a lower layer of sheet metal and an upper layer of wood, the ends of said sheet metal layer being bent over the top of and secured to said wooden layer, a pair of metal runners secured to the bottom surface of said sheet metal layers adjacent the edges thereof, and spaced fastening means securing said metal runners and layers together.

6. A ski for an aeroplane comprising, a runner having a sheet metal layer, a superposed layer of wood comprising a plurality of longitudinally extending strips, said sheet metal layer being bent around and on top of the ends of said strips, spaced fastening means securing said layers together and an upstanding member secured to said wooden layer intermediate the ends of said ski adapted to support an aeroplane.

7. A ski for an aeroplane comprising, a runner, a hollow upstanding tapered column-forming shell with closed upper portion secured to said runner having a transverse opening therethrough below said closed upper portion forming a bearing for the supporting spindle of said aeroplane, which is rotatable in said bearing, and resilient means resisting rotation of the spindle in said bearing in either direction.

8. A ski for an aeroplane comprising, a runner having an upwardly curved forward end, a hollow column with closed upper portion secured to the top of said runner and tapered upwardly therefrom, said column having a transverse bearing below said closed upper portion adapted to receive and have journaled therein the spindle of an aeroplane, an arm secured to said spindle, and resilient means connecting said arm and runner to resist rotation of said spindle in either direction.

9. A ski for an aeroplane comprising, a runner having an upwardly curved forward end, a hollow column secured to the top of said runner and tapered upwardly therefrom, said column having a transverse bearing adjacent its top adapted to receive and have journaled therein the spindle of an aeroplane, said spindle being adapted to project at one side of said column, an arm secured to said projecting arm of said spindle, a casing pivotally secured to said runner, a pair of coiled compressible resilient means in said casing, a plunger disposed between said means and a link connecting the said plunger and the end of said arm whereby said means will resist rotative movement of said spindle.
10. A ski for an aeroplane comprising, a runner, a column secured to the upper side of said runner intermediate the ends thereof and tapering upwardly therefrom, said column having a transverse bearing opening there-through adapted to receive the supporting spindle of an aeroplane, a casing pivotally secured to said runner, a pair of compressible resilient means disposed in said casing, a plunger disposed between said springs, a rod extending into one end of said casing through one of said means to which said plunger is adjustably secured, and means connecting said rod to said spindle whereby said means resist rotation of said spindle.
11. A ski for an aeroplane having a runner with an imperforate under surface, a column-forming upwardly tapering shell with closed upper portion disposed on said ski centrally transversely thereof and substantially midway between the ends thereof, means projecting laterally from the base of said shell, securing means for said shell extending through said means and ski, said shell having a longer diameter longitudinally of said ski than transversely thereof, and having a transversely extending opening below its closed upper portion in which the wheel spindle of an aeroplane is received and is oscillatable.
12. A ski for an aeroplane comprising a substantially solid runner having a central portion of greater thickness than its end portions, an upwardly tapering shell with closed upper portion having a solid peripheral surface secured to said central portion and up-standing therefrom, said shell having a transversely extending bearing opening below its closed upper portion receiving the wheel spindle of an aeroplane.
13. A ski for an aeroplane comprising a runner having an upwardly curved forward end, a hollow column disposed on said ski and secured thereto, said column tapering upwardly therefrom and having a closed upper portion and a transversely extending bearing adjacent the top of the column below said closed upper portion receiving the wheel-carrying spindle of an aeroplane from which the wheel has been removed, said spindle being oscillatable in said bearing and resilient means secured to said ski for resisting rotation of said spindle in either direction.
14. The structure set forth in claim 13, said resilient means comprising a casing secured adjacent the rear end of the ski, a plunger movable in said casing and springs at either side of said plunger.
15. A ski for an aeroplane, comprising a runner, a hollow upwardly tapering shell forming a column with closed upper portion secured to the upper side of said runner intermediate the ends thereof, said runner providing a closure for the bottom of said column, and said column having a transversely extending bearing opening adjacent its top below said closed upper portion for receiving the wheel supporting spindle of an aeroplane from which the wheel has been removed.
16. A ski for an aeroplane, comprising a runner and a hollow, upwardly tapering, continuous shell forming a column secured against the upper face of said runner intermediate the ends thereof, said column having a transversely extending bearing opening adjacent its top and in spaced wall portions of said shell for receiving the wheel supporting spindle of an aeroplane from which the wheel has been removed.
17. A ski for an aeroplane, comprising a runner, a hollow, upwardly extending shell forming a column secured to the upper side of said runner intermediate the ends thereof, said column having a transversely extending bearing opening adjacent its top for receiving the wheel supporting spindle of an aeroplane from which the wheel has been removed, and said bearing opening being included in a plurality of oppositely disposed wall portions of said shell, and resilient means attached to said runner in spaced relation to said wheel supporting spindle and adapted to be attached to an element of said aeroplane to limit swinging movement of said runner upon its axis.
- In testimony whereof I affix my signature.
FRANCIS J. DITTER.