Dec. 1, 1925. 1,563,450

L. L. SNOW

AIRPLANE RADIATOR SHUTTER

Filed May 11, 1923 3 Sheets-Sheet 1

FIG. 1.

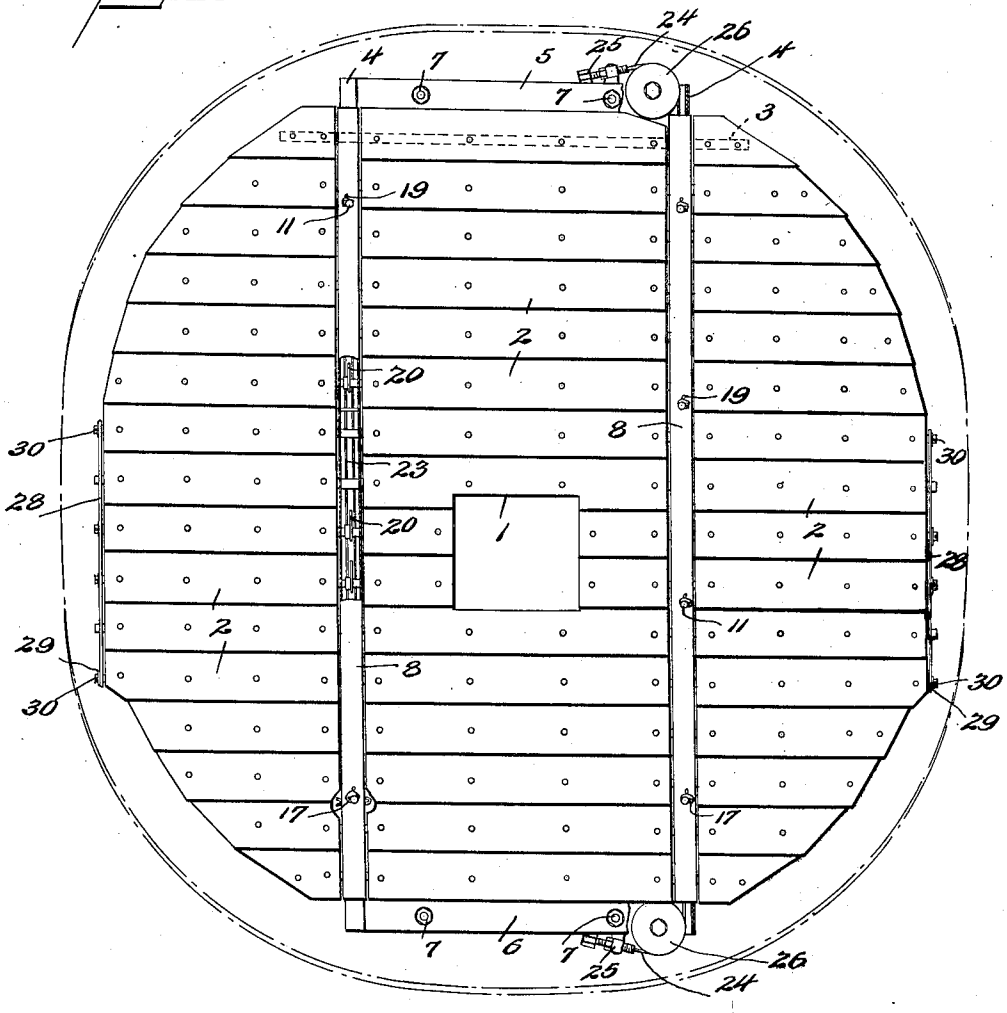
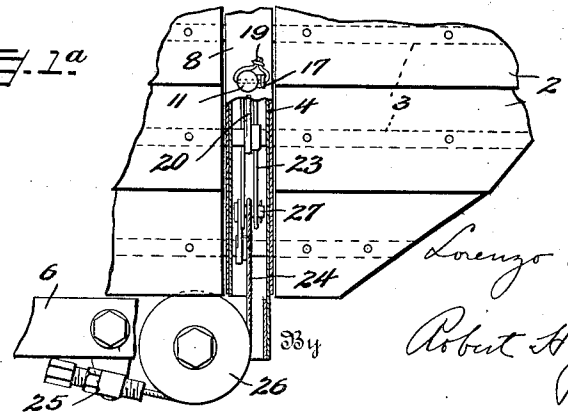


FIG. 1a.



Inventor
Lorenzo L. Snow,
By Robert H. Young
Attorney

Dec. 1, 1925. 1,563,450

L. L. SNOW

AIRPLANE RADIATOR SHUTTER

Filed May 11, 1923 3 Sheets-Sheet 2

FIG. 2.

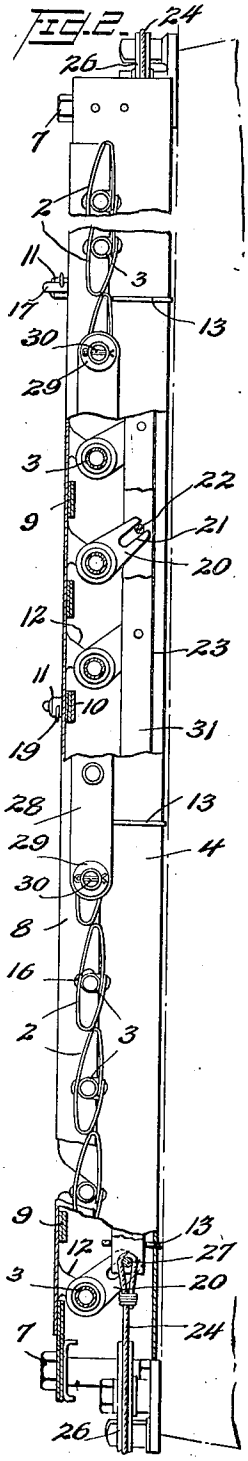


FIG. 4.

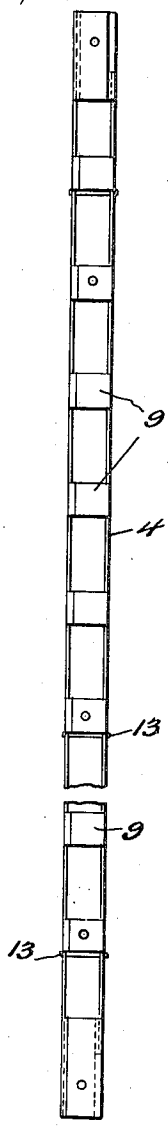


FIG. 3.

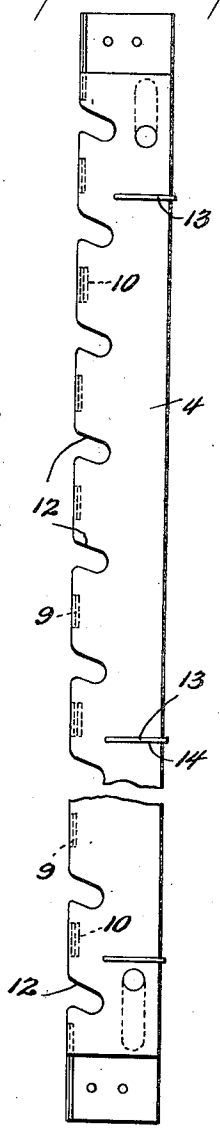


FIG. 7.



FIG. 6.

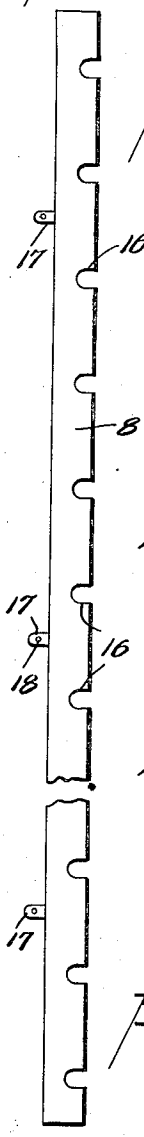


FIG. 10.

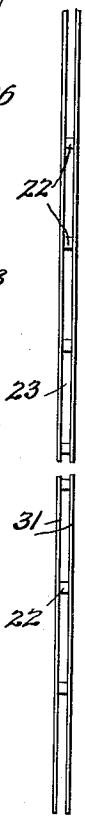


FIG. 11.



FIG. 5.

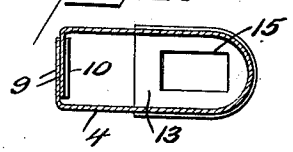
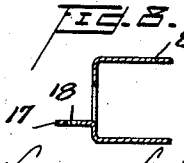


FIG. 8.



Inventor

Lorenzo L. Snow,

By Robert H. Young

Attorney

Dec. 1, 1925. 1,563,450

L. L. SNOW

AIRPLANE RADIATOR SHUTTER

Filed May 11, 1923 3 Sheets-Sheet 3

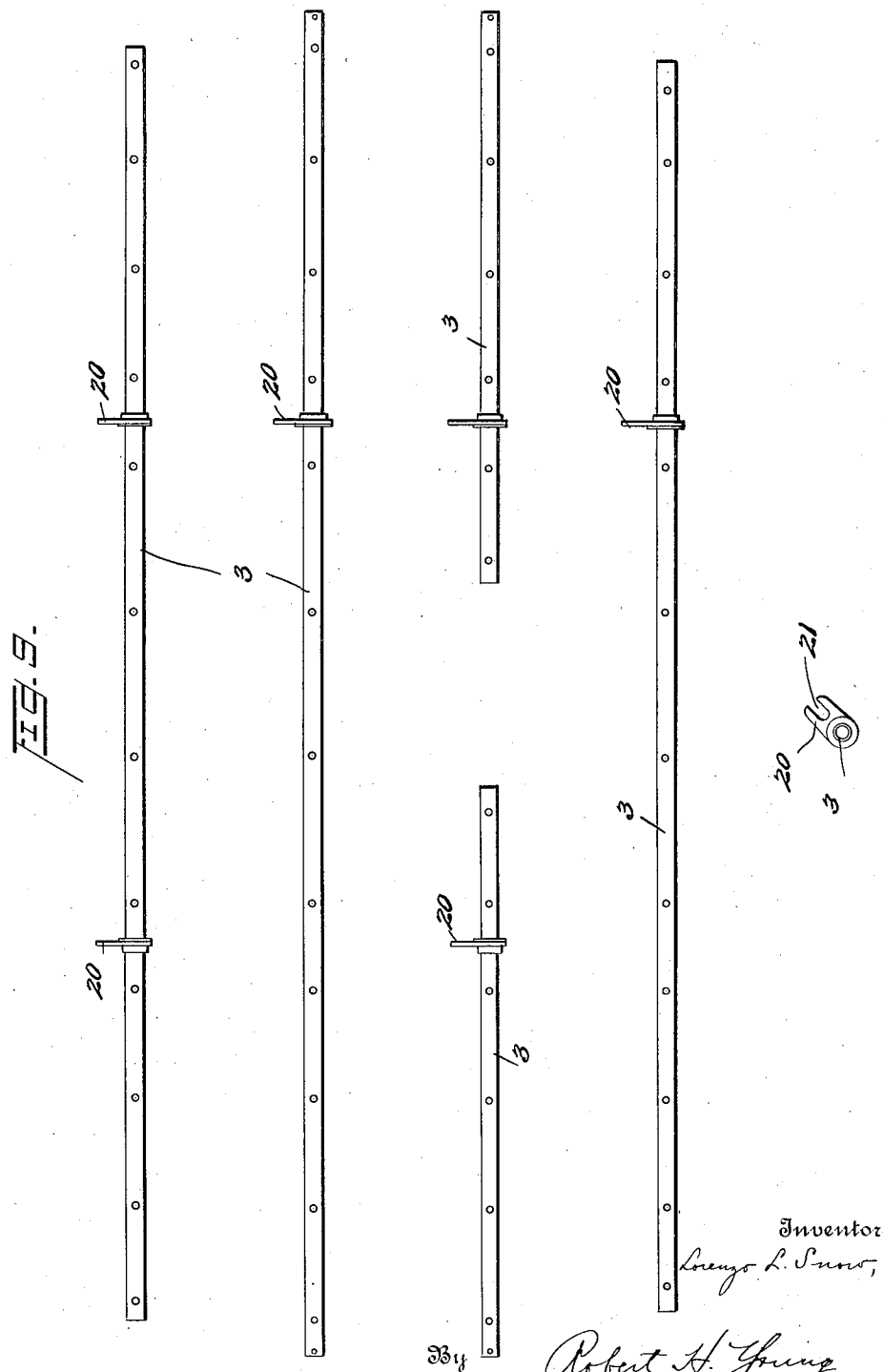


FIG. 9.

Inventor
Lorenzo L. Snow,
By Robert H. Young
Attorney

Patented Dec. 1, 1925. 1,563,450

UNITED STATES PATENT OFFICE.

LORENZO L. SNOW, OF WASHINGTON, DISTRICT OF COLUMBIA.

AIRPLANE-RADIATOR SHUTTER.

Application filed May 11, 1923. Serial No. 638,284.

To all whom it may concern:

Be it known that I, LORENZO L. SNOW, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Airplane-Radiator Shutters, of which the following is a specification.

This invention relates to airplane radiator shutters, the object in view being to improve upon the ordinary construction of radiator shutter with a view to making the parts thereof more accessible for assembly and demounting in order that repairs may be effected with a minimum expenditure of time, physical effort and expense.

In many airplanes, especially those of the tractor type, it is found necessary to mount the radiator in the nose of the fuselage or body of the machine. In order to so mount the radiator and the shutter, where one is used in conjunction with the radiator, it becomes necessary to extend the propeller shaft or engine shaft through the radiator and the shutter, the radiator and shutter being mounted in front of the engine and between the engine and the propeller and its hub.

By means of the construction herein fully disclosed, the shutter slats of the radiator are so mounted that the slats above and below the opening for the propeller shaft and at opposite sides of said opening are all capable of being concurrently operated or moved toward other open positions.

By means of the construction herein disclosed, it is also practicable to quickly and easily remove any one or more or all of the shutter slats, one or more being detachable without disturbing the remainder. At the same time the invention embodies a sturdy and serviceable construction of radiator shutter which will stand the rough usage and unusual strains to which a radiator shutter when used on an airplane of great speed is subjected.

With the above and other objects in view, the invention consists in the novel construction, combination and arrangement herein fully described, shown and claimed.

In the accompanying drawings—

Figure 1 is a front elevation of the improved radiator shutter, certain parts being broken away to better illustrate the construction and relative arrangement of the parts thereof;

Figure 1ª is a detail in elevation with portions broken away, showing the interior of the channel members and the operating means;

Figure 2 is a view partly in side edge elevation and partly in section of the same;

Figure 3 is a side elevation of one of the frame members the same forming a housing for a portion of the shutter operating mechanism;

Figure 4 is a front edge view or elevation thereof;

Figure 5 is a horizontal cross section through the same;

Figure 6 is a side elevation of one of the cap sections used in conjunction with the frame member of Figures 3 and 4;

Figure 7 is a front elevation of the same;

Figure 8 is a cross section thereof;

Figure 9 is a front elevation diagram of the shaft system of the radiator shutter;

Figure 10 is an edge view of one of the shutter operating slides;

Figure 11 is a cross section through the same.

The shape of the radiator is designed with reference to the special size and shape or outline of the nose portion of the fuselage in conjunction with which the same is used, and the radiator shutter is made of corresponding shape and size and is illustrated in the drawings as mounted directly in front of the radiator and behind the propeller where it is subjected to the propeller throws.

In order to mount the radiator and shutter in the nose portion of the fuselage, it becomes necessary to extend the shaft of the engine or the propellor shaft through an opening in the radiator and the shutter. The opening in the shutter is indicated at 1 in Figure 1 of the drawings, said opening being shown as of rectangular shape. The shutter, as a whole, is composed of any suitable number of horizontally extending shutter slats 2 arranged in a vertical series, each slat being preferably of tubular and streamline formation, as shown in Figure 2, and the sizes thereof adapting the slats when in a closed position, to abut against each other edge to edge, as illustrated, thereby preventing the air to pass to and through the core of the radiator.

Each of the slats 2 is mounted fixedly upon a rock shaft 3, preferably of tubular

formation, as shown, and the rock shafts of all the shutter slats are journaled in a pair of upright frame members 4 parallel to each other and arranged at opposite sides of the opening 1, as shown in Figure 1 of the drawings. The upright frame members are connected at top and bottom by top and bottom cross frame members 5 and 6, respectively, and said frame as a whole is fastened to the frame of the radiator by bolts 7. This enables the entire radiator shutter to be removed from the radiator when it becomes necessary.

Referring now more particularly to Figures 3, 4 and 5, it will be observed that each of the frame members 4 is of channeled formation, this being best shown in Figure 5, which is a cross section through one of the members 4. When all the parts are in place the open front side of the channeled member 4 is closed by means of a housing cap 8, which is also of channel formation and which fits over and closes said open front end of the channeled member 4. The channel member 4, which is preferably formed of sheet metal, is proveded adjacent its open side with inwardly extending overlapping tabs 9 which are brazed together so as to brace the open side of the member 4. At intervals in the length of each channel member 4, a stud-carrying plate 10 is pressed or otherwise united to the overlapping tabs 9 at the inner side thereof, and a stud 11 extending therefrom passes through the tabs 9 and forms a part of the means for fastening the cap 8 in place, as will hereinafter appear.

The side walls of the channel member 4 are formed with open-ended bearing notches 12 into which the rock shafts 3 are fitted and from which they may be forwardly removed for the purpose of detaching one or more of the shutter slats 2. The member 4 is further provided with internally arranged guides 13 for the shutter operating slide, hereinafter described, each of said guides 13 being in form of a plate inserted in a kerf 14 cut into the rear side and extending transversely part way through the member 4. Each guide 13 is brazed or otherwise fastened in place and is formed with a guide opening 15, shown best in Figure 5 to direct the up and down movements of the slide hereinafter referred to.

Referring now to Figures 6, 7 and 8, the cap 8 above referred to is substantially U-shaped in cross section, as shown in Figure 8, and is formed in its inner side with bearing notches 16, which, when the cap is placed in position, partially embraces the rock shafts 3, which therefore have a firm bearing in both sections 4 and 8 of the upright frame member. The cap 8 is further provided with an outstanding lug 17 having a hole 18 therethrough to receive a retaining wire or cotter pin 19 which is inserted through the projecting end of the stud 11 and through the hole 18 and twisted upon itself, as indicated in Figure 1. By removing the several wires 19 the caps 8 may be readily detached from the frame member 4 and the slats and their journals or rock shafts may then be lifted out of place.

The several rock shafts 3 are provided in line with the frame members 4 with crank arms 20 extending rearwardly from the rock shafts, as shown in Figure 2, and said crank arms are formed with open-ended notches 21 in which work pins or projections 22 on one pair of shutter-operating slides 23. Each of the slides is movable longitudinally within the respective frame member 4 and through the guide openings 15 in the guide members 13, above described. Due to the feature of construction just described, it will now be seen that when the caps 8 are removed from the members 4, the slats and rock shafts may be forwardly displaced from the bearing notches 12 and the crank arms 20 may be simultaneously displaced from the pins 22 on the shutter operating slides 23; this makes it a very easy matter to remove one or more of the shutter slats or rock shafts without disturbing the remainder of them.

Referring again to Figure 1, it will be seen that at opposite sides of the opening 1, short slats 2 are employed and as they cannot be connected across the opening 1 some means must be provided for connecting the slats at one side of said opening with the remainder of the slats for joint and simultaneous operation. This is done by connecting all the slats at one side of the opening 1 to a single operating slide as shown in Figure 2, and employing at the opposite side of the opening 1 a relatively shorter shutter-operating slide 23 connected in the same way as above described to crank arms 20 on the rock shafts above and below the opening 1 and to other similar crank arms on the shutter slats, as shown in Figure 1. By means just described all of the slats are operated by the movement of the under shutter-operating slide 23, shown in Figure 2 and to the right of the center of Figure 1.

Any suitable means may be employed for imparting longitudinal movement to the shutter-operating slide 23. The means illustrated in the drawings comprises upper and lower cables 24 which passes around an operating form or handle, not shown, although one cable will answer for both. The end portions of the cable or cables pass through casings 25 around pulleys 26 and are connected at 27 to the upper and lower extremities of the slide 23, as best illustrated in Figures 1 and 2. The operator may thus move the slide 23 upwardly and

downwardly and thereby open or close the shutter slats, as may be necessary in accordance with the temperature of the engine.

I employ at the outer extremities of the shafts of the shorter shutter slats at opposite sides of the opening 1 a tie bar 28 having openings for adjacent end portions of the rock shafts 3, said tie bar at 28 also extending to and engaging in a similar way longer rock shafts extending above and beneath the opening 1, as clearly shown in Figure 1. This brazes the rock shafts relatively to each other and greatly strengthens the construction. The tie bars 28 are shown fastened in place by means of washers 29 and cotter pins 30, although any suitable means for the purpose may be substituted.

As shown in Figures 10 and 11, each of the slides 23 is composed of parallel bar-like members 31 and interposed connecting pins 22, which pins engage the open notches 21 of the crank arms 20, as above described. As shown in Figure 9, the length of the several rock shafts 3 is approximately the same as the respective shutter slats, while the crank arms 20 are arranged in two vertical series and operate within the channeled frame members 4.

In view of the foregoing description, taken in connection with the accompanying drawings, it will now be understood that the shutter slats are capable of being simply and easily removed and replaced without removing the entire shutter from its mounting. Furthermore, the shutter is, even as a whole or in part, easily removable over the propeller hub. The design of the shutter is adaptable to many sizes and shapes. All operating mechanism is inclosed or housed. The construction is locked and parts tied together in such a manner as to protect the shutter when removed from the radiator. Furthermore, the design reduces strains on the radiator to a minimum. The actuating mechanism is enclosed, protecting it from the weather and damage from the outside. This also facilitates keeping lubricants and corrosion preventatives on the actuating mechanism.

What I claim is—

1. An airplane radiator shutter, embodying a frame having upright channeled housings formed with bearing notches, shutter slats journaled for pivotal movement in said notches, and shutter slat operating members slidable in said housings, said slats being detachable from said housings and operating members.

2. An airplane radiator shutter embodying channeled housings having bearing notches and guiding means, shutter slats having journals removably set in said bearing notches, and shutter operating slides movable longitudinally within said housings and directed by said guiding means.

3. An airplane radiator shutter embodying channeled housings having bearing notches and guiding means, shutter slats having journals removably set in said bearing notches, and shutter-operating slides directed by said guiding means within the channeled housings and having a detachable pin and open notch engagement with the shutter slats.

4. An airplane radiator shutter embodying channeled housings having bearing notches and guiding means, shutter slats having journals removably set in said bearing notches, removable housing caps covering the open sides of the channeled housings, and shutter-operating slides movable longitudinally within said housings and directed by said guiding means.

5. An airplane radiator shutter embodying channeled housings having bearing notches and guiding means, shutter slats having journals removably set in said bearing notches, removable housing caps covering the open sides of the channeled housings and having bearing notches for the journals of the slats, and shutter-operating slides movable longitudinally within said housings and directed by said guiding means.

6. An airplane radiator shutter embodying channeled housings having open ended bearing notches, shutter slats having journals fitting in but forwardly displaceable from said notches, crank arms extending from the shutter slats and having open ended notches therein, and a shutter-operating slide movable within one of said housings and having pins which work in the notches of the crank arms.

7. An airplane radiator shutter embodying parallel rock shafts, shutter slats fixedly mounted thereon, a channeled housing having open ended bearing notches in which said rock shafts work but from which they may be forwardly displaced, and a shutter-operating slide movable within said housing, and separable motion transmitting means operatively connecting said rock shafts and shutter-operating slide.

8. An airplane radiator shutter embodying parallel rock shafts, shutter slats fixedly mounted thereon, a channeled housing having open ended bearing notches in which said rock shafts work but from which they may be forwardly displaced, and a shutter-operating slide movable within said housing and separable motion transmitting means operatively connecting said rock shafts and shutter-operating slide, and a shutter-operating cable connected with said slide.

9. An airplane radiator shutter embodying parallel rock shafts having shutter slats fixed thereon, a frame member comprising a channeled section and a cap section one of which sections has open ended bearing notches in which said rock shafts are jour-

naled and from which they are forwardly displaceable upon separation of said sections, and shutter-operating means comprising a slide housed within said frame member and from engagement with which said shutter slat and rock shafts may be withdrawn.

10. An airplane radiator shutter embodying rock shafts having shutter slats fixed thereon, a frame member, said rock shafts mounted in said frame member, and shutter operating means so constructed to permit the withdrawal of the rock shafts from engagement with said operating means concurrently with the withdrawal of the rock shafts from the frame member.

In testimony whereof I affix my signature.

LORENZO L. SNOW.