H. C. MOUGEY & J. M. H. JACOBS.

FUEL TANK.

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1,298,080.

Patented Mar. 25, 1919.

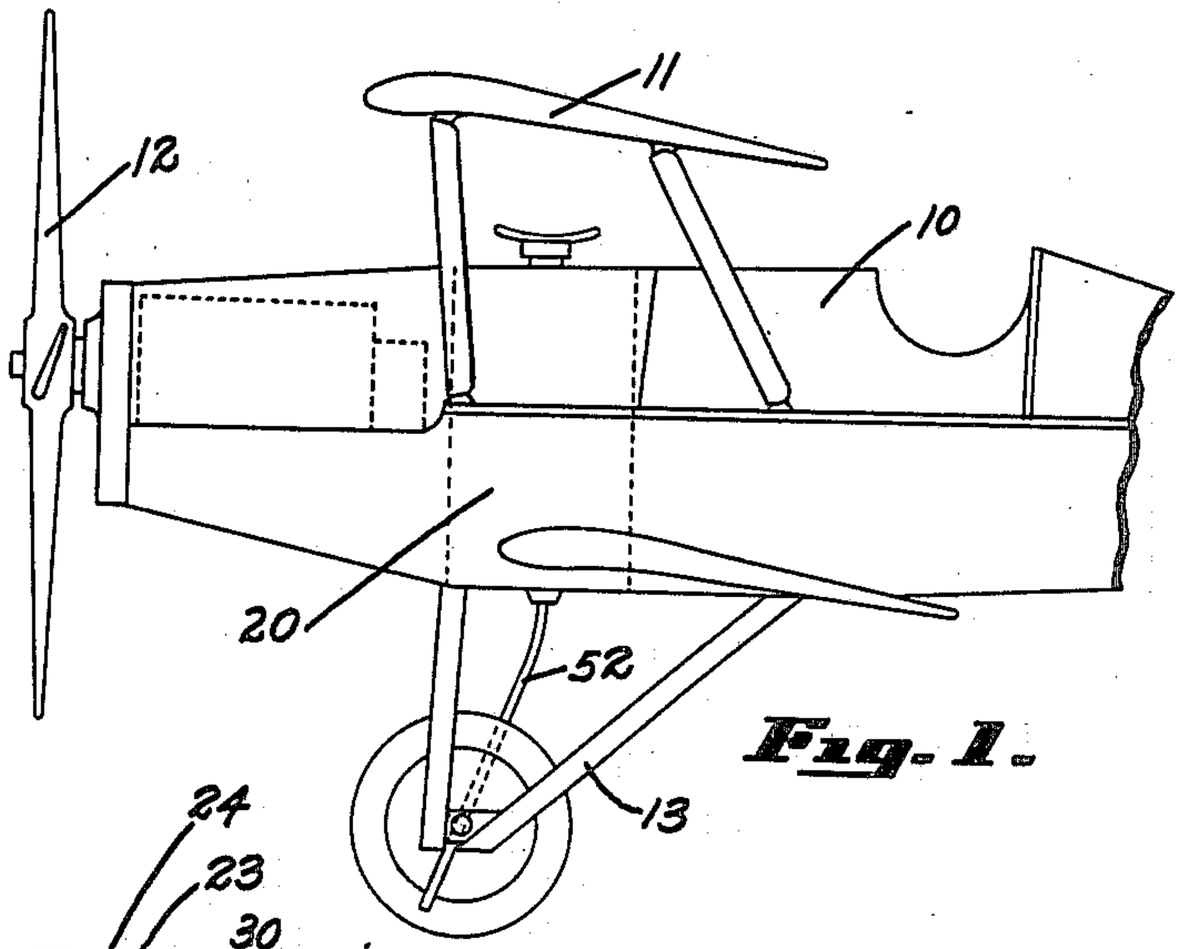

Fig. 1.

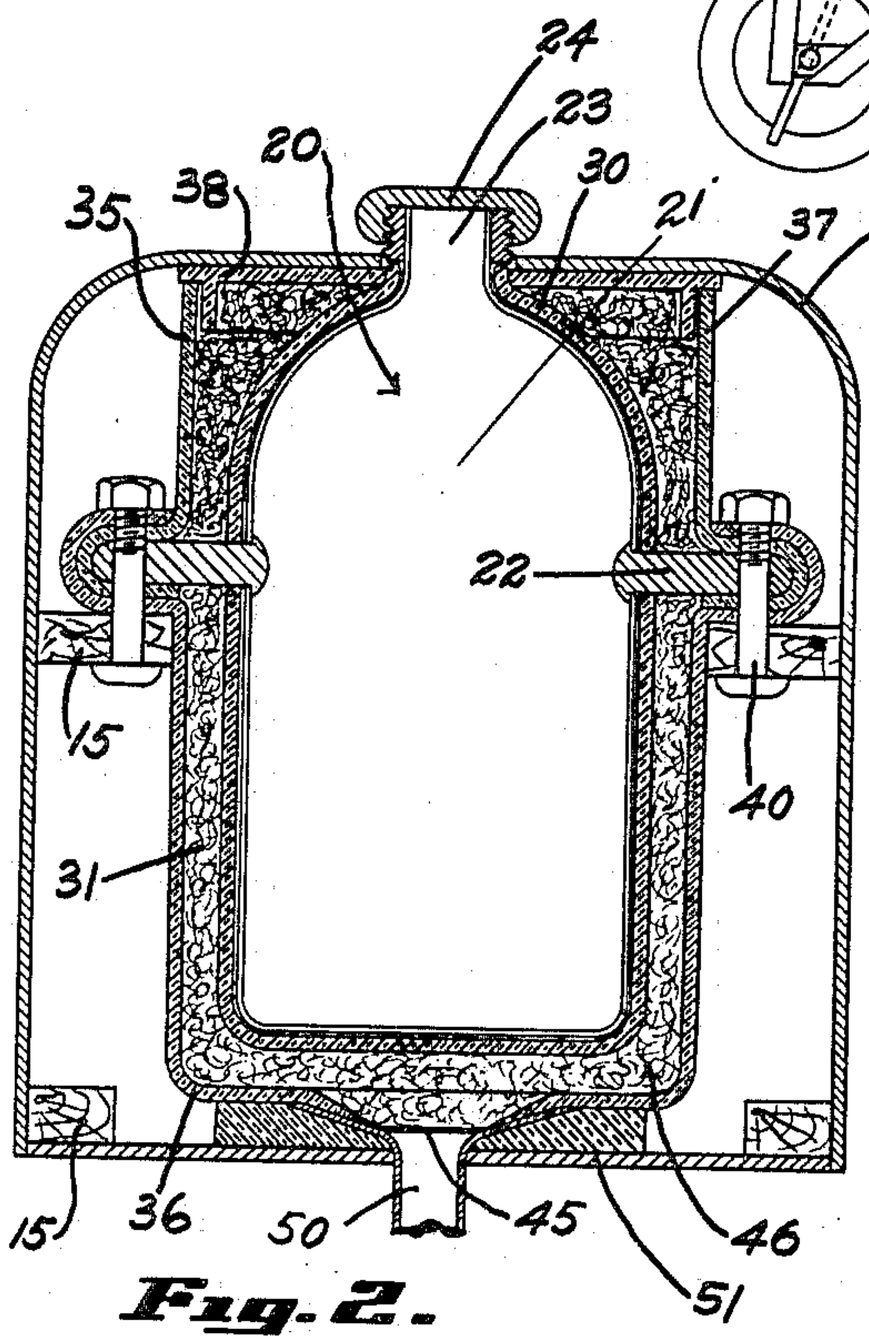

Fig. 2.

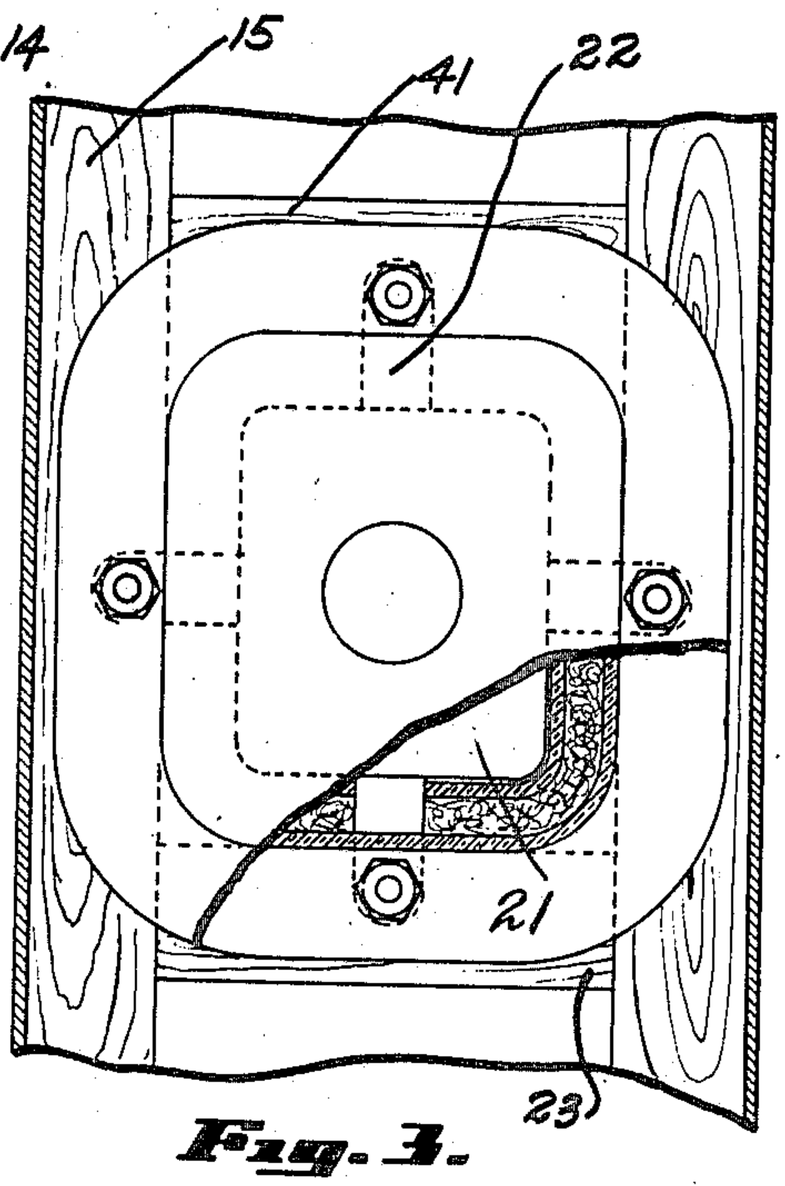

Fig. 3.

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UNITED STATES PATENT OFFICE.

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FUEL-TANK.

1,298,080. Specification of Letters Patent. Patented Mar. 25, 1919.

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To all whom it may concern:

Be it known that we, HARRY C. MOUGEY and JAMES M. H. JACOBS, citizens of the United States of America, residing at Dayton, county of Montgomery, State of Ohio, have invented certain new and useful Improvements in Fuel-Tanks, of which the following is a full, clear, and exact description.

This invention relates to fuel tanks and more particularly to an improved fuel tank especially adapted for use in airplanes.

The principal object of the invention is to provide an improved fuel tank constructed to prevent, under all circumstances, the leakage of fuel onto the airplane, to thus minimize, or entirely eliminate, the danger of having the airplane set on fire by incendiary bullets, or otherwise, during flight.

Other objects and advantages of the invention will be apparent from the description thereof set out below, reference being had to the accompanying drawing in which—

Figure 1 is a fragmentary diagrammatic view, in elevation, of a typical form of airplane containing my improved fuel tank;

Fig. 2 is a transverse sectional view through the tank and airplane body, illustrated in Fig. 1; and

Fig. 3 is a longitudinal sectional view of the device, with parts broken away to more clearly illustrate the construction.

In the drawing, in which like characters of reference designate like parts throughout the several views thereof, 10 is the body, or fuselage, of a conventional airplane having the usual wings 11, propeller 12 and landing gear 13. The shell of the body, or fuselage, 10 consists of a thin sheet of veneering 14 which is attached, in the conventional way, to the longerons 15. Any other type of covering for the body of the fuselage may be used if desired, the precise type of covering being a matter of indifference so far as this invention is concerned. All the structure thus far described is purely conventional.

Our improved tank is designated generally by the numeral 20. This tank consists of a metal tank 21 preferably composed of a soft or ductile metal, such as copper, adapted to contain the fuel. In order to secure the most desirable type of tank this metal should be of some material which offers comparatively little resistance to the passage of the bullet therethrough. Where a metal such as the steel of which fuel tanks are ordinarily made is used it is found that when a bullet passes through the tank the hole in the side of the tank made by the bullet on entering will be clean cut and just large enough to permit the passage of the bullet, whereas the hole in the opposite side of the tank will at times be of considerable size, and even where it does not reach large proportions the metal surrounding the hole will often be carried along by the bullet to form outstanding, jagged projections. Where a soft or ductile metal such as copper is used we have found that the hole made by the bullet on leaving the tank is not substantially larger than the hole made on entering the tank. And we have further found that there is practically no tendency for the bullet to form outstanding projections around the exit hole made in passing through the metal. We wish it expressly understood that the metal composing this tank need not necessarily be copper as it may be any desired soft or ductile metal, brass and soft steel giving very good results. Rigidly attached to the shell of the tank are several outstanding lugs or projections 22. As shown there are four of these lugs or projections 22 which serve as supports for the tank when it is mounted in the body of the airplane. Any other supporting means desired may be used in place of these lugs. Opening into the tank through the upper end thereof is a passage 23 closed by the cap 24 which is adapted to be threaded upon the wall of this passage for closing the tank. This passage 23 is the conventional filling opening.

Surrounding the metallic tank 21 is a covering or bag of rubber 30. The purpose of using rubber is to secure a covering material adapted to quickly close up any holes that may be formed therein. In actual practice it has been found that if a bullet is shot through a rubber covering of substantial thickness, a quarter of an inch thick for example, the hole formed by such bullet will tend to close up, especially in the presence of a fuel such as gasolene, and will prevent the flow therethrough of any substantial amount of the fuel within the tank. It is preferable that the rubber covering fi

the tank loosely. We have found that where the rubber covering fits the tank closely, as a coating, there is a tendency for the bullet passing through the tank to tear a large hole in the coating on its way out, but that where a loose rubber covering is used this tendency is practically eliminated.

Surrounding the metallic tank 21 and its loose rubber covering 30 is a second rubber covering 35 which is spaced from the first rubber covering, leaving a substantial space 31 between them. This covering, as shown in the drawing, consists of three parts, a lower section 36 which covers the lower part of the tank, an upper section 37 which covers the upper part of the tank, and a top section 38 adapted to fit within the upper section, to tightly close that section, the three sections when in place thus forming what is in effect a one piece tank. As shown in the drawing the projections 22 pass entirely through the inner rubber covering 30. The outer rubber covering, however, is so arranged that the upper end of the lower section and the lower end of the upper section surround these projections and overlap. Passing through the projections 22 are bolts 40 which also pass through the over-lapping ends of the upper and lower rubber sections 36 and 37 and through the longerons 15 and the cross beams 41, which extend between the longerons and serve as supports for the tank. It is obvious that tightening the bolts 40, to hold the tank securely in position within the airplane, tends to press the over-lapping parts of the sections 36 and 37 closely together to thus make a tight joint and prevent any fuel that may leak into the space 31 from escaping therethrough onto the parts of the airplane. To further insure the prevention of leakage through this joint onto the airplane the over-lapping ends of the rubber sections are so positioned that any fluid flowing down the inner wall will tend to drain back into the space 31 and to not escape to the outside of the tank. The sole reason for making the outer covering 35 in sections is to permit of easier assemblage. Obviously this covering may be made in one piece, or in any number of pieces, if desired so long as, when assembled, the covering as a whole is adapted to prevent leakage of fuel therethrough. The lower rubber section 36 has through the bottom thereof an outlet opening 45 adapted to permit the escape therethrough of any fuel that may leak into the space 31. Filling the space 31 is fibrous, or some analogous material 32 adapted to cause any fuel that may leak into the space to drain through such material to the bottom of the space where it may escape through the opening 45. In actual practice we have used excelsior to fill the space 31. This material need not necessarily be absorbent but should be of such character that it will cause any fuel leaking into the space to drain toward the opening in the bottom of the outer covering 35.

The purpose of this construction is thought obvious from the above description. The use of a ductile metal tank prevents the bullet from tearing big holes in such tank and further prevents it from forming jagged outstanding projections around the exit hole. In the absence of these objectionable features the bullet as it passes through the loose fitting rubber covering 30 normally makes a hole therein no larger than is necessary for permitting passage of the bullet. A hole of this size is generally quickly closed up by the rubber itself. As a result therefore the passage of a bullet completely through the inner tank and its inclosing rubber covering 30 will generally result in no appreciable leakage of fuel through the bullet holes, and even when such leakage occurs only a small quantity of fuel will escape. The ductile metal tank and its loose fitting rubber covering therefore are designed to prevent any leakage of fuel from the tank when it is punctured by a bullet. If, however, such leakage does occur the fuel is caught by the material within the space 31, which tends to break up any streams of fuel flowing through holes in the tank to prevent the fuel from escaping through the corresponding holes in the outer covering, and is drained to the bottom of this space where it can escape through the opening 45. The excelsior or fibrous material also tends to prevent the formation of air currents through the space 31 which of itself minimizes the danger of any fuel within such space being ignited, as by an incendiary bullet.

Coöperating with the opening 45 is a funnel shaped member 50 which is held in place against the bottom of the section 36, and surrounding the opening 45 thereof, by means of a rubber pad 51. This pad 51 is located between the bottom of the section 36, and the funnel shaped member 50, and the bottom of the fuselage and is adapted to hold the funnel shaped member 50 tightly against the bottom of the lower rubber section 36 to thus prevent leakage at this point. Obviously any other desired type of material may be used for constituting this pad, but if desired it may be entirely dispensed with and some other desired means of connecting the funnel shaped member tightly to the rubber section 36 may be provided. Connected to the funnel shaped member 50 is a drain pipe 52 the lower end of which terminates adjacent the lowest point of the landing gear 13. This pipe is also preferably of rubber, to minimize leakage in case it too is punctured. It has been found in actual practice that where a drain pipe has its lower, or outlet, end thus positioned any fuel passing therethrough while the machine

is in flight will not be sprayed upon the parts of the machine, but will be dissipated into the atmosphere. And obviously while the machine is at rest none of the fuel will escape thereonto. It is not necessary that the drain pipe terminate adjacent the lowest part of the landing gear, although we have found this location the most desirable one. It is only necessary that the outlet end of the drain pipe be so positioned that any fuel escaping therethrough shall not get upon the body or other parts of the airplane. The common practice in aerial warfare is to use incendiary bullets. If one of these bullets passes through a part of an airplane saturated with gasolene the machine will be immediately set on fire and it is estimated that a large percentage of the fatalities in aerial warfare, probably above 75%, result from airplanes being thus set on fire. It is obvious that the location of the drain pipe terminal need only be such that it will prevent the escape of the fuel onto the parts of the airplane in case of leakage of fuel into the space 31.

From the above description the method of functioning of this apparatus is thought quite clear. The ductile metal tank and its loose covering, as stated above, are adapted to prevent any leakage of fuel. In case any such leakage should occur, however, the outer rubber covering with the material intermediate the two coverings is adapted to prevent the escape of any of this leaking fuel to the outside except through the drain pipe. And the drain pipe is so arranged that any fuel that may pass therethrough will be fed into the atmosphere at such a point that none of it will get upon the airplane or its parts. If desired the inner covering 30 may be dispensed with. Under such circumstances there will be nothing to prevent the escape into the space 31 of fuel in case the tank is punctured, but the outer covering and fibrous material will be affective in catching such fuel and draining it away, without damage, through the pipe 52. Obviously such construction is not so desirable as that described above. Also if desired the coverings 30 and 35 may be of some material other than rubber, though we believe rubber better than any other material now known to us and prefer to use it. It is thus seen that we have invented a tank which is of itself non-inflammable and which is adapted to minimize and practically eliminate all danger of the airplane, in which it is mounted, being set on fire from incendiary bullets, or other causes, during flight.

While the form of mechanism herein shown and described constitutes a preferred form of embodiment of the invention, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What we claim is:—

1. A fuel tank for airplanes comprising a thin metal tank adapted to contain the fuel; a loose covering of rubber inclosing said tank; and a second covering of rubber, inclosing the first mentioned covering and spaced therefrom.

2. A fuel tank for airplanes comprising a tank of ductile metal adapted to contain the fuel; a loose cover of rubber inclosing said tank; and a second covering of rubber, inclosing the first mentioned covering and spaced therefrom.

3. A fuel tank for airplanes comprising a thin ductile metal tank adapted to contain the fuel; a loose covering of rubber inclosing said tank; and a second covering of rubber, inclosing the first mentioned covering and spaced therefrom.

4. A fuel tank for airplanes comprising a thin metal tank adapted to contain the fuel; a loose covering of rubber inclosing said tank; a second covering of rubber inclosing the first mentioned covering and spaced therefrom; and a drain, opening through the outer covering, connecting the space between the two coverings, at its lowest points, with the atmosphere.

5. A fuel tank for airplanes comprising a ductile metal tank adapted to contain the fuel; a loose covering of rubber inclosing said tank; a second covering of rubber inclosing the first mentioned covering and spaced therefrom; and a drain opening through the outer covering and connecting the space between the two coverings with the atmosphere, said drain having its outer end positioned to prevent the escape onto the airplane of any fuel escaping therethrough.

6. A fuel tank for airplanes comprising a ductile metal tank adapted to contain the fuel; a loose covering of rubber inclosing said tank; a second covering of rubber inclosing the first mentioned covering and spaced therefrom; and a drain opening through the outer covering and connecting the space between the two coverings at its lowest point, with the atmosphere, said drain terminating adjacent the lowest point of the landing gear of the airplane.

7. A fuel tank for airplanes comprising a ductile metal tank adapted to contain the fuel; a loose covering of rubber inclosing said tank; a second covering of rubber inclosing the first mentioned covering and spaced therefrom; material within said space adapted to drain any fuel that may escape thereon to the bottom of said space; and a drain opening through the outer covering and connecting said space, at its lowest point, with the atmosphere.

8. In an airplane, a fuel tank, constructed to prevent leakage of fuel onto the airplane, comprising a metal tank adapted to contain

the fuel; a loose covering of rubber inclosing said tank; a second covering of rubber inclosing the first mentioned covering and spaced therefrom; and a drain connecting said space with the atmosphere.

9. In an airplane, a fuel tank, constructed to prevent leakage of fuel onto the airplane, comprising a thin metal tank adapted to contain the fuel; a loose covering of rubber inclosing said tank; a second covering of rubber inclosing the tank and spaced therefrom; and a drain connecting the space to the atmosphere, the outer end of said drain being positioned to prevent the escape onto the airplane of any fuel passing therethrough.

10. A fuel tank for airplanes comprising a metal tank adapted to contain the fuel; a covering inclosing said tank and spaced therefrom, fibrous material within the space between the tank and covering; and a drain through said covering connecting the space with the atmosphere.

11. A fuel tank for airplanes comprising a metal tank adapted to contain the fuel; a rubber covering inclosing said tank and spaced therefrom, fibrous material, such as excelsior, within the space between the tank and covering; and a drain through said covering connecting the space, at its lowest point, with the atmosphere.

12. In an airplane, a fuel tank, constructed to prevent leakage of fuel onto the airplane, comprising a tank adapted to contain the fuel; a rubber covering inclosing said tank and spaced therefrom, fibrous material, such as excelsior, within the space between the tank and covering; and a drain through the covering connecting the space to the atmosphere, the outer end of said drain being positioned to prevent the escape onto the airplane of any fuel passing therethrough.

In testimony whereof we affix our signatures.

HARRY C. MOUGEY.
JAMES M. H. JACOBS.

Witnesses:
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Thomas Midgley, Jr.