

Feb. 6, 1940.

A. MATHISEN

2,189,147

FIRE PREVENTING AND EXTINGUISHING APPARATUS

Filed Aug. 8, 1939

6 Sheets-Sheet 1

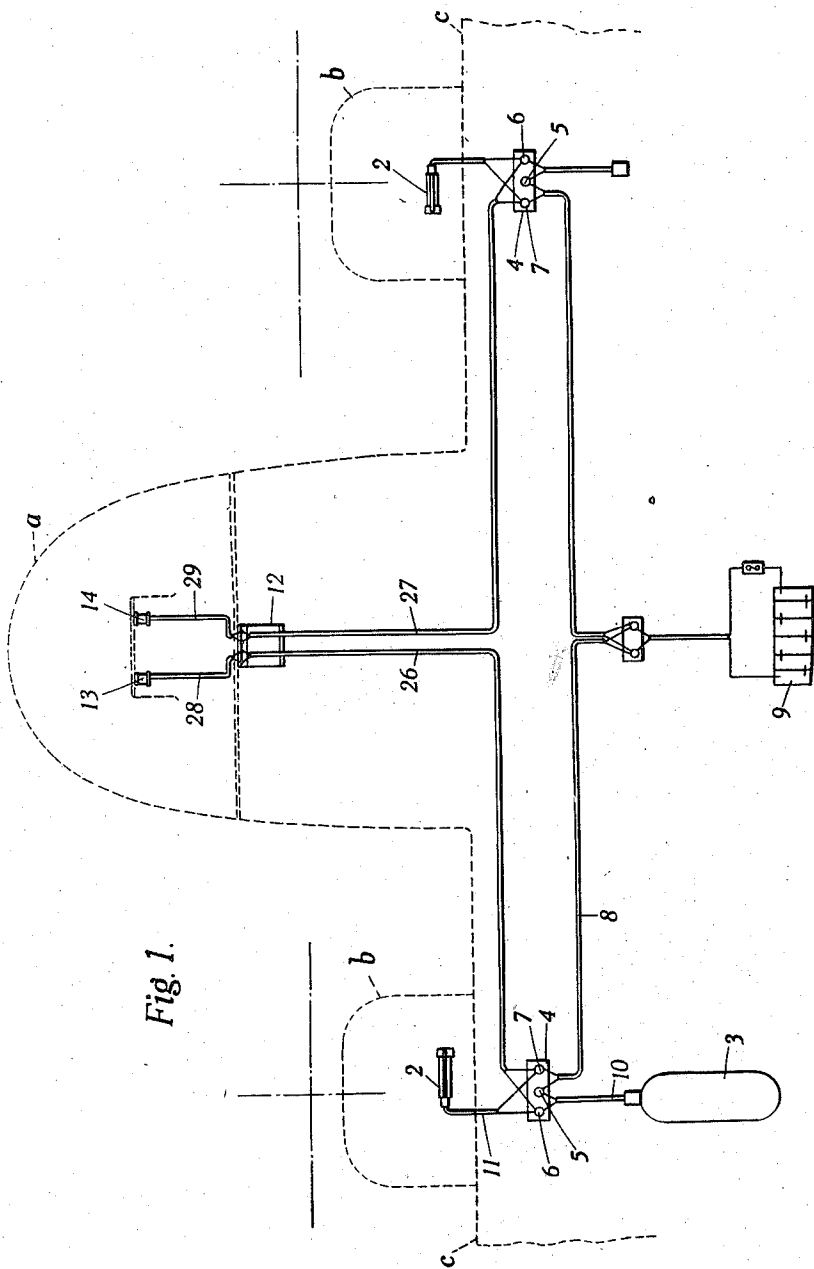


Fig. 1.

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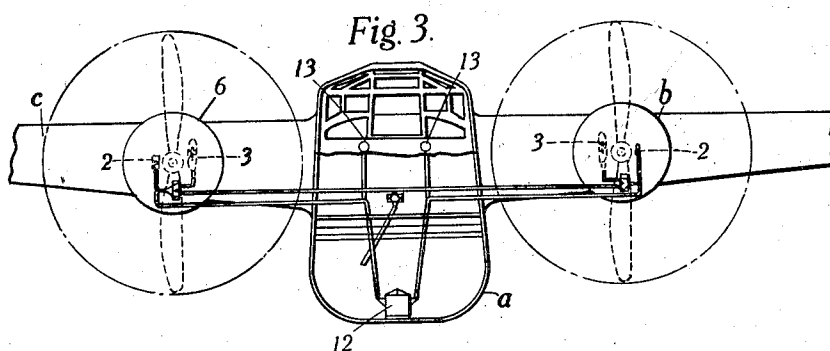
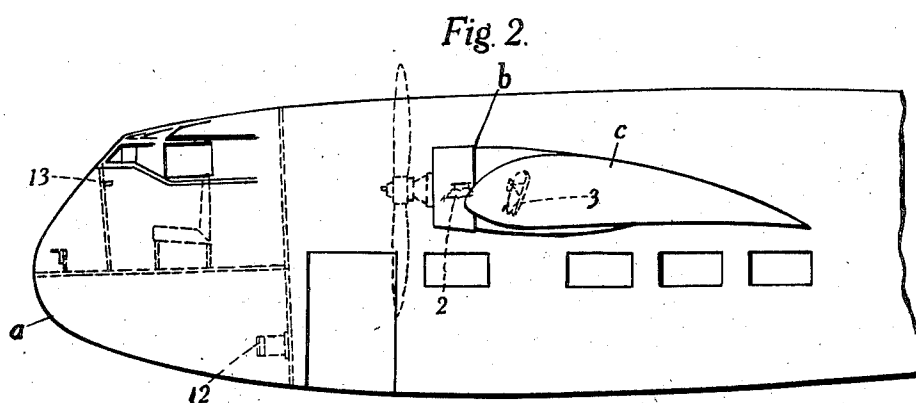
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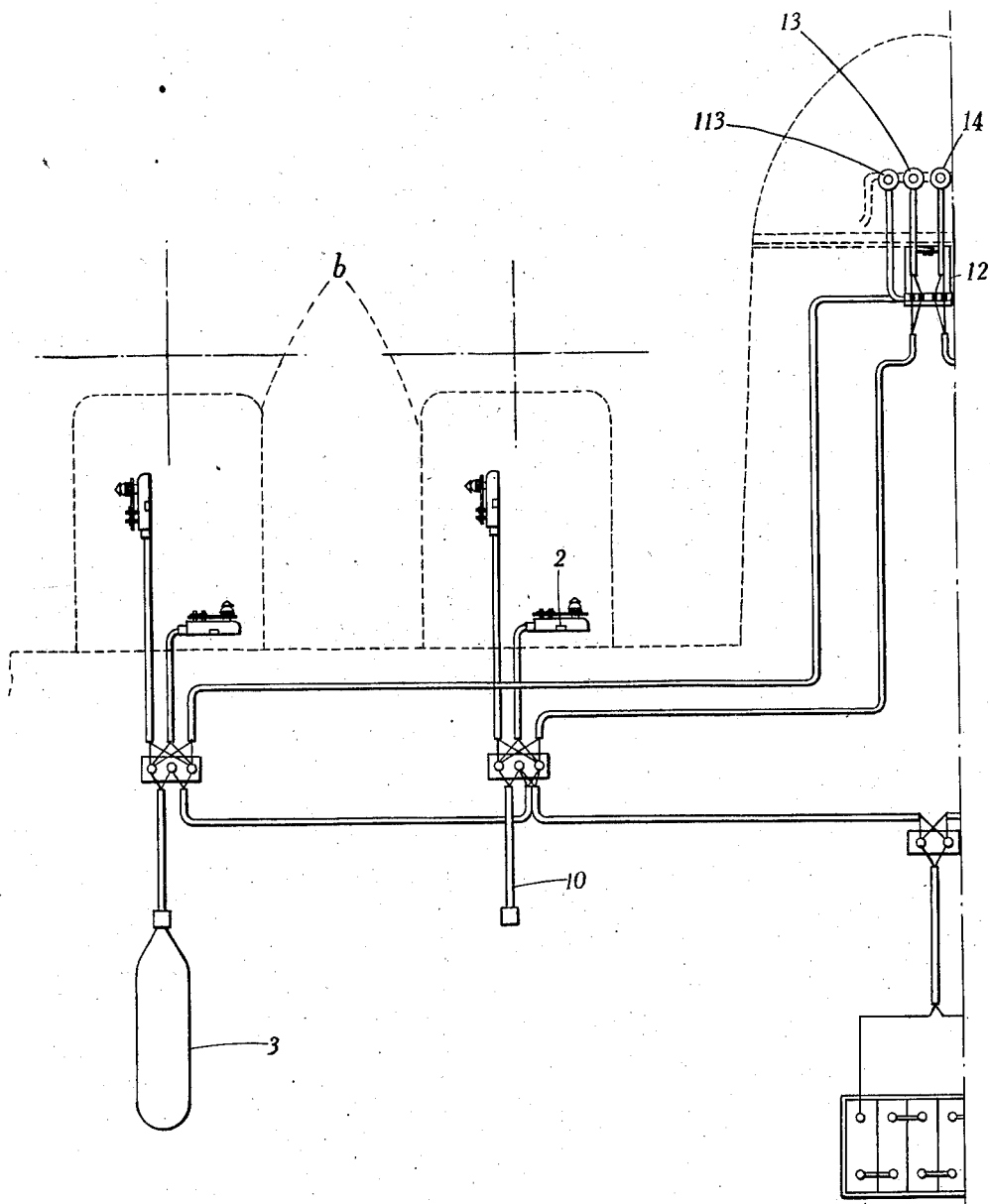
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Fig. 4.



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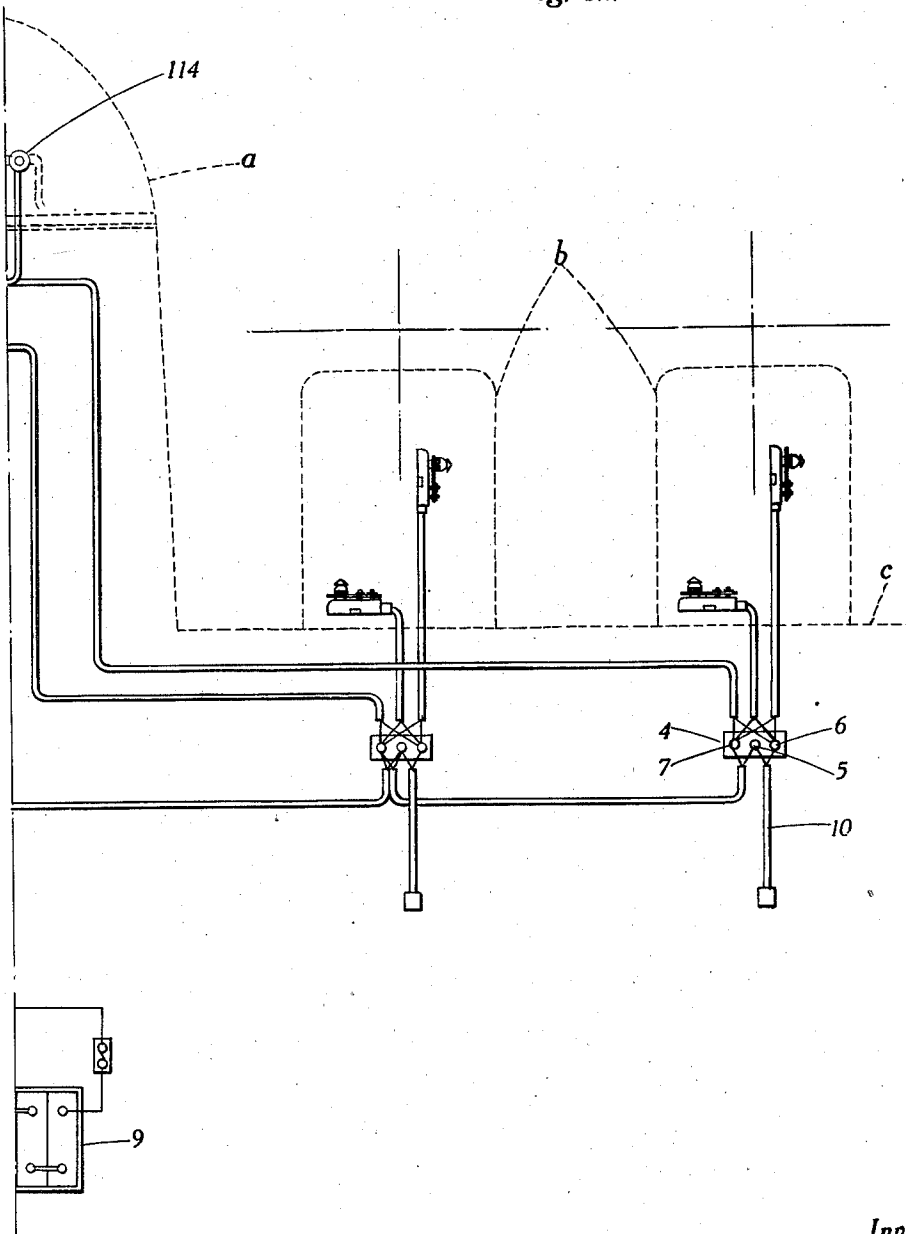
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Fig. 4A.



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FIRE PREVENTING AND EXTINGUISHING APPARATUS

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Fig. 5.

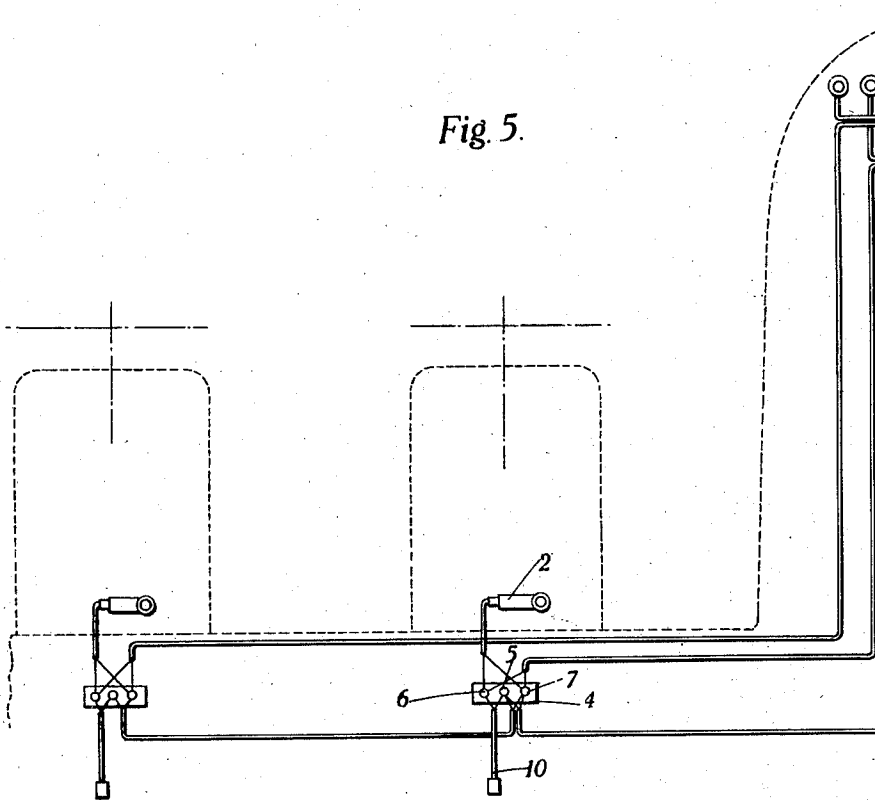
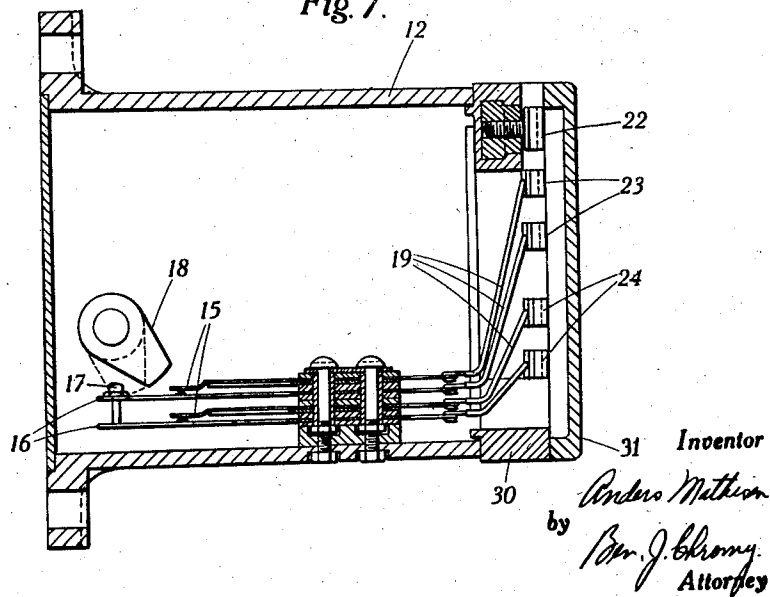


Fig. 7.



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Fig. 5A.

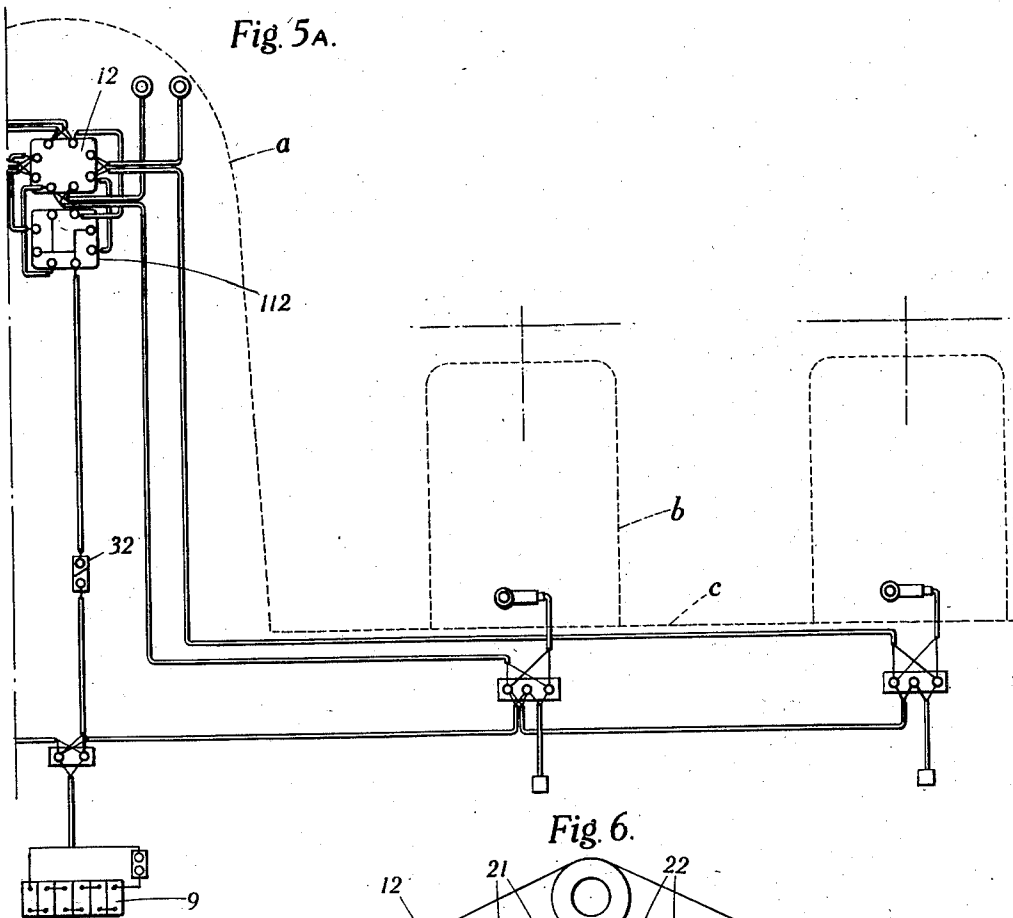
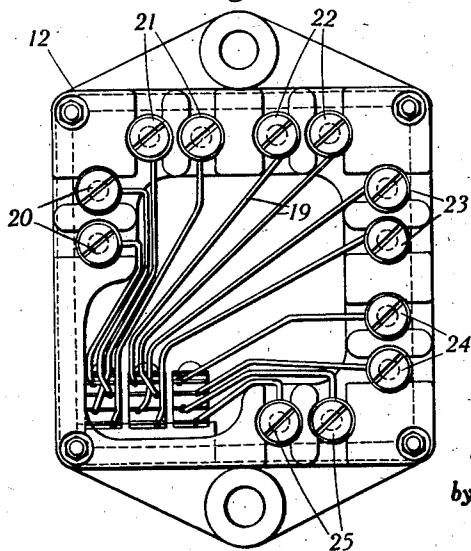


Fig. 6.



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UNITED STATES PATENT OFFICE

2,189,147

FIRE PREVENTING AND EXTINGUISHING
APPARATUS

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Application August 8, 1939, Serial No. 289,062

4 Claims. (Cl. 169—2)

This invention relates to fire fighting equipment for use in aircraft, and particularly to systems for multi-engined aircraft, employing electrically actuated fire preventing and extinguishing systems.

One object of the invention is to provide fire fighting equipment of the kind comprising an electrically actuated fire extinguishing fluid container associated with the aircraft engine, or in the case of multi-engined aircraft, associated with each of the engines, said container or containers being capable of discharge by electric current controlled by any one of a plurality of automatic or manually operated circuit controlling switches.

Another object of the invention is to reduce the amount and weight of fire fighting equipment in a multi-engined aircraft by providing only a single impact operated switch to effect discharge of all the said containers when the aircraft is subjected to abnormal deceleration.

A further object of the invention is to provide in multi-engined aircraft a single gravity operated switch which will effect discharge of fluid from all the said containers if the aircraft accidentally overturns when alighting, without creating crash conditions.

A still further object of the invention is to provide in the engine nacelle or in each engine nacelle, one or more flame or temperature increase responsive devices associated with the fire extinguishing fluid container or containers for that particular nacelle so that on the occurrence of abnormal temperature in a nacelle, the appropriate device will operate to effect discharge of fluid from the appropriate container or containers.

Yet another object of the invention is to provide means in such fire fighting systems whereby the pilot or other operator may selectively operate any one fluid container from the control compartment to effect discharge of fluid from the container.

The foregoing and other objects of the invention will be apparent from a consideration of the following description of certain embodiments of the invention shown by way of example in the accompanying drawings, for the purpose of illustrating the manner in which the invention may be carried into effect.

Figure 1 is a wiring diagram of the fire fighting equipment upon a twin engined aircraft.

Figure 2 is a side elevation of a twin engined aircraft,

Figure 3 is a front elevation in partial section of Figure 2,

Figures 4 and 4A which are respectively the left and right halves of one continuous drawing, together show a wiring diagram of the fire fighting equipment upon a four engined aircraft,

Figures 5 and 5A which are respectively the left and right halves of one continuous drawing, together show a modification of the wiring diagram of Figure 4,

Figure 6 is a front elevation with cover removed of a multi-contact switch arranged to effect operation of up to six fire extinguishing liquid containers and

Figure 7 is a sectional elevation of Figure 6. Referring to the drawings and more especially to Figures 1, 2 and 3, letter *a* denotes the fuselage or hull of an aircraft and *b* the engine nacelles built out on the wings *c* of the aircraft. The fire fighting equipment comprises a fire extinguishing liquid container 3 associated with each individual engine. Associated with each engine is one or more flame or temperature rise responsive devices denoted 2 in the drawings. The equipment in individual engine nacelles comprises a three-way terminal block 4 provided with a centre terminal 5 and outer terminals 6 and 7. A twin lead cable 8 extending from any suitable electric current supply source such as the aircraft battery 9 has the leads connected to terminals 5 and 7 whereas a twin lead cable 10 from container 3 has the leads connected to terminals 5 and 6, switch 2 having the leads from its twin lead cable 11 connected to terminals 6 and 7 so that closure of the contacts in switch 2 energises the fuse in the fire extinguishing liquid container.

In aircraft crashes it is important that discharge of the containers 3 is effected as soon as possible and in any case before a fire breaks out. Inertia element operated switch 12 is therefore mounted forward in the lower part of fuselage of hull *a* as shown in Figures 2 and 3 so that in an accidental crash the switch will operate at the first moment of impact to effect discharge of all containers 3 before or during the severance of the engines from the aircraft and by this means outbreak of fire may be prevented.

In addition to switches 2 and 12 manually operated push button switches 13 and 14 are provided in the pilot's compartment so that if either one of the engines catches fire during flight or during starting the pilot can effect discharge of the appropriate container 3 by pressing the push button switch.

Referring now to Figures 6 and 7 which show

in front elevation and section respectively part of the mechanism of switch 12, it will be seen that the switch comprises a plurality of pairs of contacts 15 and 16, contacts 16 being provided with insulation members 17 which are adapted to be actuated by a cam 18 controlled by inertia element operated mechanism.

Contacts 15 and 16 are provided with soldering tags or the like to which connecting wires 19 are soldered, the wires from individual pairs of contacts 15 and 16 being connected to pairs of contact terminals 20, 21, 22, 23, 24 and 25.

Twin lead cables 26 and 27 extend from selected pairs of terminals 20 to 25 to terminals 6 and 7 upon block 4 and twin lead cables 28 and 29 extend from push button switches 13 and 14 to the terminals to which cables 26 and 27 are connected as shown in Figure 1 whereby operation of containers 3 can be effected by switches 13 and 14 without extending separate leads from these switches to terminal block 4. Terminals 20 to 25 are secured in an insulation block 30 secured to the casing of switch 12 by screws or the like as indicated in Figures 6 and 7 and an insulation material cover 31 is adapted to be secured over terminals 20 to 25 as shown in Figure 7 to protect and insulate said terminals.

Contacts 15 and 16 are arranged in pairs spaced by insulation material as shown in Figure 7, two pairs being arranged in a block and secured to the casing of switch 12 by screws or the like and as shown in Figure 6 three blocks of two pairs of contacts are arranged in switch 12 so as to permit operation of up to six extinguishers.

As shown in Figures 4 and 4A of the drawings a four engined aircraft is equipped with fire fighting equipment according to the invention and in this case four pairs of contacts 15 and 16 are utilised in switch 12 and four push button switches 13 and 14 and 113 and 114 are provided in the pilot's cockpit as shown in the wiring diagram. As will be seen by referring to Figure 4 two flame switches 2 are provided in each engine nacelle.

Referring to Figures 5 and 5A of the drawings the wiring diagram shows an arrangement in the engine nacelle similar to the arrangement shown in Figures 4 and 4A. However, in addition to inertia element operated switch 12 a gravity element operated switch 112 is provided.

The function of switch 112 is to effect discharge of all extinguishers 3 if the aircraft turns over inadvertently upon its back, for example, during landing without being subjected to sufficient impact to cause switch 12 to operate. As it is not desired that switch 112 should be liable to operate during inverted flight or aerobatics the electric current supply from the aircraft battery is connected to switch 112 over a switch 32 which may be operated to disconnect the battery current to switch 112 whenever the aircraft leaves the ground and reconnected when the aircraft is about to land. A gravity switch for this purpose, and an automatic switch for automatically disconnecting the gravity switch except when the

aircraft is about to alight, are shown in the corresponding application of H. M. Salmond and A. Mathisen Serial No. 300,833 filed October 23, 1939. The electrical connections from switch 32 to switch 112 are connected together or common end to the terminals of insulation block 30 which are connected to contacts 15, for example, whereas the contact terminals connected to the corresponding contacts 16 are connected to the terminals upon switch 12 in such a manner that when all the contacts in switch 112 are closed current can flow from the battery over contact 32 through the fuses of fire extinguishing liquid containers 3 back to the battery to effect discharge of the containers. In actual practise this is conveniently effected owing to the fact that twin lead cables have the separate leads marked for example by blue and red coloured marking threads so that individual leads can be distinguished at both ends of a long length of twin lead cable.

Having thus fully described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a fire-extinguishing system for a multiple engine air craft having a plurality of nacelles respectively for its engines, a plurality of individual containers containing fire extinguishing fluid and positioned respectively one in each engine nacelle, individual electrically actuatable release means on each of said containers for releasing fluid therefrom, a central control multiple contact switch having individual pairs of contacts for each of said containers, impact responsive means mounted for actuating said switch, individual manually operable switch means connected across each of said pairs of contacts respectively, and individual connections between each of said release means and each of said pairs of contacts, whereby excessive deceleration of said aircraft causes discharge from all of said containers, and each of said containers may be selectively manually discharged.

2. A system according to claim 1, said central control switch being mounted forward in the lower part of the fuselage of said aircraft.

3. A system according to claim 1, and an auxiliary multiple contact gravity operable switch mounted on said aircraft adjacent said central control switch and having individual pairs of contacts for each of said containers connected respectively to the pairs of contacts of said central control switch.

4. A system according to claim 1, an auxiliary multiple contact gravity operable switch mounted on said aircraft adjacent said central control switch and having individual pairs of contacts for each of said containers connected respectively to the pairs of contacts of said central control switch, and control means for selectively placing said auxiliary gravity switch into operating condition only when said aircraft is about to land and for removing it from operating condition at other times.

ANDERS MATHISEN.