

INSTRUCTIONS FOR USE AND INSTALLATION OF
MODEL CR
CITIZEN-SHIP RECEIVER

INDEX
FOR RECEIVER INSTRUCTIONS

- 1.0 Unpacking
- 2.0 Mounting
 - 2.1 Mounting receiver and batteries Fig. 2, 3 and 4.
 - 2.2 Isolating antenna
- 3.0 Recommended batteries
 - 3.1 A batteries
 - 3.2 B batteries
 - 3.3 Choice of batteries and weight of receiver
 - 3.4 Battery complements
 - a. Minimum
 - b. Recommended
 - c. Alternate recommendation
 - 3.5 Life of complement (a)
 - 3.6 Use of complement (b)
 - 3.7 Reasons for complement (c)
- 4.0 Sources of batteries
 - 4.1 Pen cells and Flashlight
 - 4.2 Hearing aid batteries
- 5.0 Wiring of Receiver
 - 5.1 Wiring A batteries, Figure 4.
 - 5.2 Battery box for hearing aid batteries, Figure 5.
 - 5.3 Connecting to receiver, Figure 6 and Figure 7.
 - 5.4 Switch for "A" and jack for "B"
 - 5.5 Necessity for meter
 - 5.6 Turning on receiver
 - 5.7 Testing for operation with transmitter, Figure 8.
 - 5.8 Distance checks
- 6.0 Adjustments
 - 6.1 Fixed tuning of receiver
 - 6.2 Relay setting
 - 6.3 Relay adjusting
- 7.0 Ignition interference
 - 7.1 Spark plug suppressor
 - 7.2 Checking for ignition interference
 - 7.3 Results of tests
 - 7.4 Additional ignition remedies if necessary
 - 7.5 No ignition interference from glow plug
- 8.0 End use of batteries
 - 8.1 Result of battery failure
 - 8.2 End life of "A" batteries
 - 8.3 End life of "B" batteries
- 9.0 Testing and Flying
 - 9.1 Type of control
 - 9.2 Reliability
 - 9.3 Skipping of escapement
 - 9.4 Skipping with motor running
 - 9.5 Final baloney

RECEIVER INSTRUCTIONS

1.0 UNPACKING:-

Unpack your Citizen-Ship receiver carefully. Handle it ONLY by the edges of the bakelite base. DO NOT pick it up by the antenna which is the aluminum square below the base, or by any of the parts above the base. Deforming the antenna or tuned circuit (see side view drawing, Figure 1), will reduce its sensitivity. It may be set down carefully on the antenna.

2.0 MOUNTING:-

2.1 Recommended mounting is by means of #16 rubber bands through the loops of the Fahnstock clips on both ends of the base. (Figure 2.) Holes HH (Figure 1) are provided if the modeler wishes to put an extension (preferably bakelite) onto the chassis to allow mounting with sponge rubber blocks. Also additional rubber bands may be threaded through holes HH for additional support in the event of a crash. Suggest cementing a piece of sponge rubber to bulkhead or any structure in FRONT of receiver. In case of crash landing, receiver will be cushioned by this rubber.

Since the receiver does not require any tuning, but is accurately adjusted at the factory, it is recommended that it be mounted near the top of the cabin under the wing in a high wing cabin model. In a low wing model, reverse this arrangement and put the receiver in the bottom and the batteries on top accessible through a hatch on top.

All batteries should be mounted as far as possible from the antenna, and it is recommended the filament or "A" batteries be mounted at the bottom of the cabin and made accessible through a hatch for ready replacement and voltage check (Figure 3.). Since the plate or "B" batteries will last as long as their shelf life, or several months of normal flying, they may be mounted anywhere to help balance the model. However, keep them at least two inches away from the antenna or tuned circuit. Make sure such objects as batteries which may come loose in a crash cannot hit receiver.

2.2 Keep everything, including lead wires and EVEN balsa wood supports, at least two inches from HOT end of the antenna. This HOT end is the end with the gap and adjusting screw. (Refer to Figure 1). The sides of the fuselage will be closer to the sides of the antenna, and this should be 1/2" MINIMUM. Before mounting batteries permanently, see Section 7.0 on ignition interference.

Don't expect receiver to work if antenna is sitting on a bench. Must be suspended in air, and must be clear of everything.

If receiver does not work mounted in airplane, pull it out and hang it on leads to the Fahnstock clips. If it works then, you know something is too close to antenna in airplane. (What happens is that antenna gets detuned by capacity to adjacent objects.)

3.0 RECOMMENDED BATTERIES: -

Voltage required are 6 volts on the filament or "A" batteries and 60 or 67-1/2 volts on the plate or "B" batteries.

- 3.1 Filament or "A" batteries recommended in the order of their preference.
- | | Total Weight |
|--|--------------|
| 1. 4 Type 1-1/2 V. #1 Burgess Flashlight batteries | 6 oz. |
| 2. 5 Pen light 1-1/2 V. cells (or | 3-1/4 oz. |
| 3. 4 Pen light 1-1/2 V. cells equivalent) | 2-3/4 oz. |

- 3.2 Plate or "B" batteries recommended may be either
- | | |
|---|-----------|
| 1. 2 - Burgess hearing aid batteries Type U20E
30 volts each (or | 3 oz. |
| 2. 1 - Eveready #457 "B" battery
67-1/2 volts equivalent) | 7-1/2 oz. |

- 3.3 The choice of batteries depends on the size of the plane and its weight carrying ability and how often the operator is willing to change batteries. The receiver weighs only 5-1/4 oz.

- 3.4 (a) Minimum battery weight possible
- | | Weight |
|--|-----------|
| 4 pen light cells | 2-3/4 oz. |
| 2 Burgess Type U20 hearing aid batteries | 3 oz. |
| Receiver weight | 5-1/4 oz. |
| Total ----- | 11 oz. |

The above is recommended for ships of 4 foot wing span or less.

- (b) Recommended battery complements (b or c)
- | | |
|---|------------|
| 4 #1 Burgess flashlight cells or equivalent | 6 oz. |
| 2 Burgess U20 hearing aid batteries | 3 oz. |
| Receiver weight | 5-1/4 oz. |
| Total ----- | 14-1/4 oz. |

- (c) 5 Pen cells may be substituted in the above complement for the 4 intermediate size "A" batteries, and weigh less. See Section 3.7.

The above (b) and (c) recommendations are for ships of 5 to 6 foot wing span.

- 3.5 The theoretical life of the pen light cells in Group (a) is 45 minutes but it is difficult to get absolutely fresh batteries and after a 15 minute flight they must be rested for a like period. (Useful life on the "A" batteries for the Citizen-Ship receiver is when their voltage has fallen to 4.5 volts WITH THE RECEIVER TURNED ON. This will be discussed later). See Paragraph 8.2.

- 3.6 The battery complement in (b) is most desired. The four #1 Burgess flashlight cells will give a theoretical life of 2 hours, giving plenty of life for ground checks, etc. The hearing aid batteries, despite

their small size, are good for 500 hours of use or about 4 months shelf life, if not accidentally shorted. This is because the receiver draws so little plate or "B" current as will be discussed below. Their only disadvantage is making connection to them. No battery holder is available. The end life of the "B" batteries will vary and depends on the receiver action as described below. See Paragraph 8.3.

3.7 The reasons 5 pen cells may be used is as follows.

Because of the higher internal drop of pen cells the initial tube filament voltage will be about 6.5 volts, which will not harm tube. Five pen cells give over twice the useful life of four and about the same life as four intermediate #1 cells before the tube voltage drops to 4.5 volts.

4.0 SOURCES OF BATTERIES:-

4.1 Pen cells and flashlight batteries may be obtained from your Hobby Dealer or any drug or hardware store.

4.2 The Burgess Hearing Aid batteries may be obtained from Radio Parts Jobbers or Hearing Aid Distributors. There are generally jobbers of these types in towns of 40,000 or more.

5.0 WIRING THE RECEIVER:-

5.1 After the battery complement has been decided upon for the size of plane, the receiver should be hung in place and the battery locations laid out to give the ship the correct balance. (The assumption is made that the flyer has some knowledge of free flight planes. Plane should balance at 50% of cord for ship with lifting tail, 33-1/3 to 40% from leading edge with non-lifting tail.) It is recommended that the filament or "A" batteries be mounted in battery boxes as shown in Figure 4, and in the location in the ship approximately as shown in Figure 3. Figure 4 shows the arrangement of batteries in the battery boxes and the wiring to obtain 6 volts. Plus and minus 6 volts is also indicated. If 5 pen cells are used, simply add one more battery in series.

5.2 Figure 5 shows a simple way of making a battery box to hold the U20E hearing aid batteries and how they should be inserted to get 60 volts. The box and batteries may then be glued in place or held with rubber bands to obtain balance of plane. Since these batteries should last several months, leads may be soldered direct. If the 67-1/2 volt type 457 "B" battery is used, the terminals are marked.

5.3 The wires from both the "A" batteries and "B" batteries should go to the similarly designated connections on the receiver. Top view (Figures 1 and 6.) It will be noticed that one terminal (Fahnstock clip) of the receiver is marked "Common". Since it is difficult to put more

than one wire in a Fahnstock clip, these wires should be connected at another point as shown in the overall wiring diagram Figure 6. This diagram shows the escapement wiring also and it is convenient to complete this and wire up the escapement (or whatever control mechanism is to be used) so that it may be used as an indicator of the relay in the receiver opening and closing. When the relay in the receiver closes, it will actuate the escapement or control mechanism. Figure 7 shows an alternate wiring using two of the filament batteries to operate the escapement. Since this arrangement will run these two cells down more rapidly, their voltage must be checked frequently.

- 5.4 The wiring diagram also shows a single pole single throw switch for turning the filament on and off and a closed circuit jack in the plus B lead. This jack is essential in checking the operation of the receiver and is put in for the purpose of inserting a 1.5 milliamperemeter in series with the "B" batteries to check the plate current change.
- 5.5 It is almost a necessity to have a D.C. milliammeter or separate D.C. meters that will read the following currents and voltages accurately; 0-1.5 milliamperes, 0-6.0 volts and for use with the transmitter, (see transmitter instructions) 0-150 volts. A special meter has been designed for this application and is advertised on the enclosed flyer.
- 5.6 It is suggested that the "A" leads be connected to the receiver first and the filament switch turned on. A faint glow can be seen in the tube. Check the filament voltage at the receiver with a meter that will read 6 volts D.C. It should read between 4.5 and 6 volts depending on the freshness of the batteries. Now connect the plus B lead and plug in the 1.5 milliammeter. It should read between 0.1 and 0.2 milliamperes. (Figure 8.)

When receiver is first turned on, plate current may rise and fall once or twice before settling down. This may operate relay. This action may differ from one receiver to the next, but is normal. Will not occur after tube is fully heated up. Same action may occur when receiver is shut off. If the plate current rises to a value higher than 0.2 milliamperes, it may be due to a local source of interference nearby. Sometimes the harmonic of the oscillator in a television set will be strong enough and of the correct frequency to operate the receiver. Some airline blind landing equipment has been effected by television sets and legislation by F.C.C. is being prepared to eliminate this radiation in television set design.

- 5.7 Next turn on the transmitter and REMOVE THE ANTENNA. (See paragraph regarding installing batteries in transmitter.) Allow a minute for the filament of the transmitter tube to warm up. Hold the transmitter close to the fuselage near the receiver and press the operating button. The plate current of the receiver should jump from 0.1 or 0.2 m.a. to 0.9 to 1.3 m.a., (Figure 8.), and the relay should close.

The reason for removing the antenna is the fact that the receiver is so sensitive the strong signal would paralyze it at such close range.

When antenna is removed from transmitter, effective range is reduced to about one foot. It should be possible to check out a receiver on the ground with the transmitter sitting beside the plane with the antenna removed without interfering with another plane which is being flown.

- 5.8 Now insert the antenna and walk about 20 feet away and point the antenna **AWAY** from the ship. Approximately the same jump in plate current should occur. At greater distances and when the plane is flying, the antenna should be pointed at the ship. Actual flying tests have proved that the receiver will be operated at $3/4$ of a mile in the air. How much farther is not known. With the ship sitting on the ground, it will work about 1000 feet away.

6.0 ADJUSTMENTS:-

- 6.1 No adjustments should be needed and attempting to adjust the tuning of the receiver voids the Warranty. If the range of the receiver is limited, failing to operate at a distance of a few hundred feet, both receiver and transmitter should be returned. See Warranty.
- 6.2 The only adjustment allowed is on the relay, but this should not be attempted by anyone not skilled in either the electrical or radio arts. The relay is set at the factory for best operation and closes at approximately 0.4 m. a. and opens at approximately 0.3 m. a. (Figure 8.)
- 6.3 To check the relay operation, or to further adjust it, proceed as follows. Obtain a volume control such as used in a radio set with a value of 500,000 ohms. Wire it in series with the plus B lead. (Figure 9.) With all the resistance out, turn on the receiver and transmitter and cause the plate current to rise to its maximum of 1.0 m. a. or more. With both receiver and transmitter still turned on, turn the volume control to introduce resistance and the plate current will decrease. The exact value at which the relay drops out can be observed by the action of the escapement or any other indicator across the contacts. Reversing the direction of rotation of the volume control will again increase the current and the exact value at which the relay pulls in can be observed. These values should be between 0.23 and 0.34 for the drop out and 0.35 and 0.45 for the pull in. To any person qualified to make this test, the adjustment of the relay should be obvious.

7.0 IGNITION INTERFERENCE:-

- 7.1 The high sensitivity of this receiver makes it subject to ignition interference. Even auto sets which are shielded require the use of one ignition suppressor in the main distributor lead. Packed with this receiver is a 10,000 ohm carbon resistor. This should be soldered into the high tension lead of the spark plug adjacent to spark plug. (Figure 10.) This should completely eliminate ignition interference. If it does not, it may be necessary to rearrange the batteries and ignition coil. See Paragraph 7.4.

- 7.2 The following describes how you can tell if you have ignition interference. Turn on the receiver and transmitter and move the transmitter around so that when the operating button is pushed, you get a rise in plate current to around 0.9 m. a. or more. (This may be done with the transmitter close and the antenna out or farther away with the antenna in. Paragraph 5.7). Note the exact reading of the milliammeter. Next start the motor. (No change will occur in the transmitter off or low value reading, whether you have ignition interference or not.) Now operate the transmitter WITHOUT changing its previous location or position. The high plate current, or "transmitter on" reading, should be the same as with the motor not running. It may even be slightly less by an amount of 0.1 m. a. but if it drops to 0.5 m. a. or below, which would be close to the operating value of the relay, DO NOT FLY.
- 7.3 All the ships that have been built to date have had no ignition interference after installing the 10,000 ohm resistor in the ignition lead and one large ship with more spacing between parts did not even need the suppressor.
- 7.4 If ignition interference is found with the suppressor in the spark plug lead, the cause of the interference must be isolated by trial and error experiment, as each ship may require a different arrangement of batteries.

Following are some suggestions as to how to proceed, the simpler procedure first.

1. Move wires around keeping ignition leads (both battery and ignition coil leads) away from the radio set, batteries and radio leads.
2. Remove the coil and ignition batteries from the model and set these on the table near the fuselage.
3. Try external "A" and "B" batteries on the receiver or move the batteries away from the motor and ignition system. Longer leads of course must be used.
4. Remove the whole radio and its batteries out of the fuselage.

Some of these operations will eliminate ignition interference. When you have done something to eliminate it, start putting the parts back one at a time until you find exactly what part is causing the trouble. Relocate this part in the fuselage until the interference is gone.

- 7.5 It should be obvious that a glow plug or diesel engine does not generate ignition interference and offers no problem in this regard.

An ignition type motor is somewhat desirable in radio control because motor speeds can be adjusted and a motor cut off may be used to stop the motor at any time.

8.0 END USE OF BATTERIES:-

- 8.1 It is obvious that when batteries run down, the receiver (and transmitter) will stop working, but if this happened during a flight, it might result in a lost or damaged plane. It is therefore essential that batteries be checked BEFORE EVERY FLIGHT with an accurate meter.

- 8.2 The "A" batteries should be discarded when the voltage across all four cells drops to 4.5 volts with the RECEIVER TURNED ON. In fact, when lower than 4.6, a long flight should not be attempted as they may pass out during the flight.
- 8.3 The life of the "B" batteries is difficult to evaluate in terms of voltage. It will be noticed that as the voltage drops both the no signal current and the "transmitter on" current, as read on the 1.5 m. a. meter, will gradually decline. When the "transmitter on" current cannot be made to go above 0.60 or 0.70 m. a. (move about with the transmitter to get maximum reading), the "B" batteries should be changed. The voltage of the "B" batteries when this occurs will be approximately 40 to 45 volts.

9.0 TESTING AND FLYING:-

- 9.1 The above instructions have described only how to make the radio operate satisfactorily. Since the modeler may use one of the many types of escapements or the Rudevator as a means of operating the control surfaces, instructions on the use of these devices are packed with those units.
- 9.2 If the above instructions and those pertaining to the transmitter have been carefully followed, the relay should close whenever the transmitter "Operate Switch" is pushed. (Do not forget that the receiver may fail to operate if the transmitter is too close with the antenna plugged in.)
- 9.3 If the escapement is correctly wired as shown in Figure 6 or Figure 7, everytime the transmitter "Operate Switch" is pushed, it should operate ONCE. If it jumps or skips, do not fly. If inserting the 1.5 m. a. shows that the plate current is rising to its proper value, the escapement needs adjustment. (See instructions for that unit.)
- 9.4 Everything may operate correctly when the motor is not running, but the escapement may skip when the motor is running. This may be the result of several factors. The escapement may skip because of direct vibration, or the relay may be vibrating because the receiver is not mounted in sufficiently flexible mounting. If holding the relay closed with the fingers still allows skipping with the motor running, it has to be the escapement itself vibrating. Also, make sure all wiring connections are solid and vibration proof.
- 9.5 If everything works properly with the motor running, go ahead and fly. Our personal experience indicates the Citizen-Ship radio is probably the most reliable part of all the components, which constitute a radio controlled model airplane.

WARRANTY

Your CITIZEN-SHIP receiver is warranted by the manufacturer to be free from defects in material and workmanship. Any receiver failing to operate within thirty days after date of purchase will be repaired or replaced free of charge upon being returned to the factory. This warranty does not apply to failure of operation due to exhausted or improper batteries.

If your receiver is damaged in shipment, you should file a claim with the carrier immediately upon noting the damage.

This warranty does not apply, if, in our judgment, the receiver has been tampered with or received abusive treatment beyond that encountered in normal usage.

VERNON C. MACNABB COMPANY,

Indianapolis, Indiana.

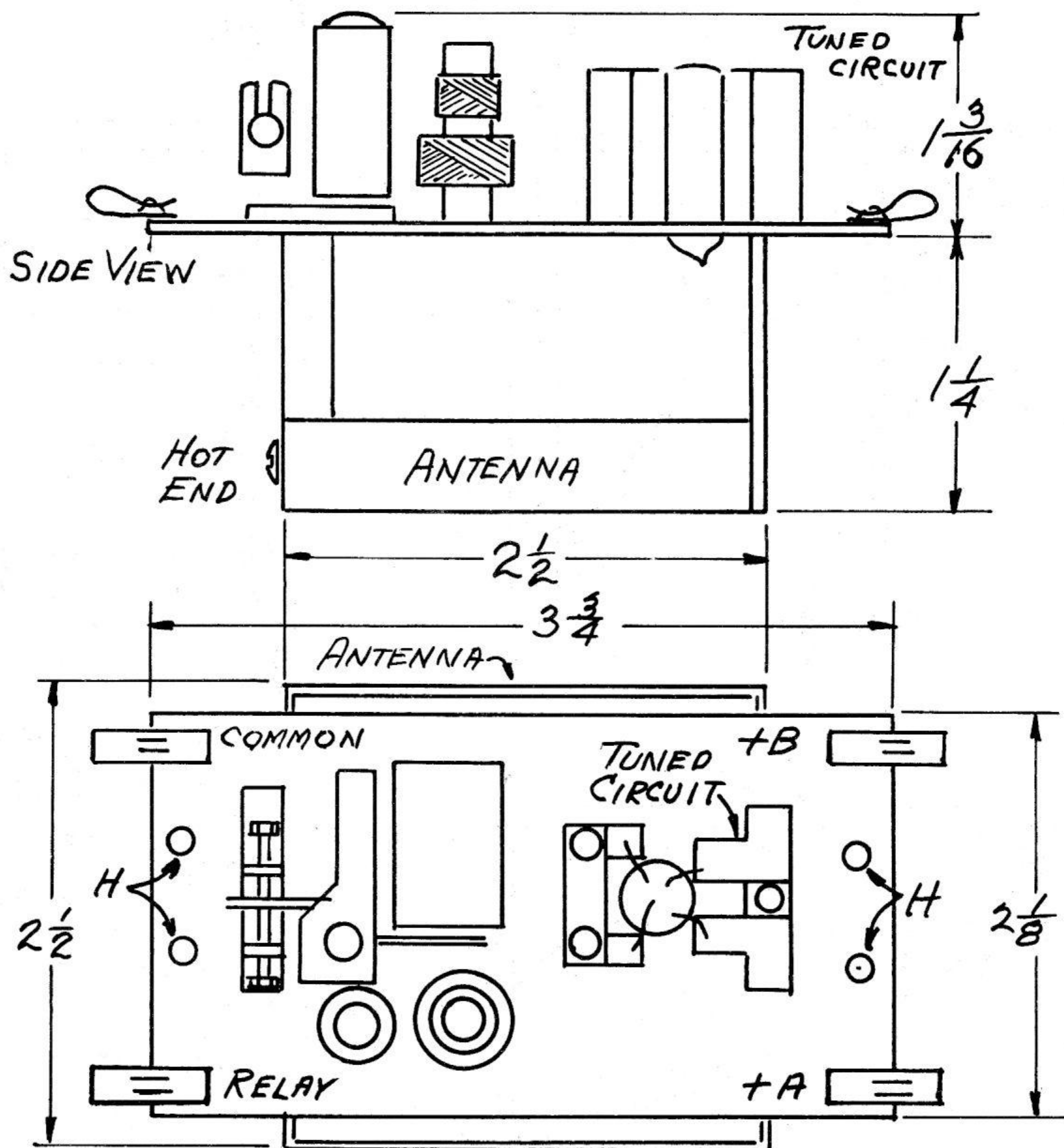


FIG 1

CITIZEN-SHIP
RADIO CONTROL

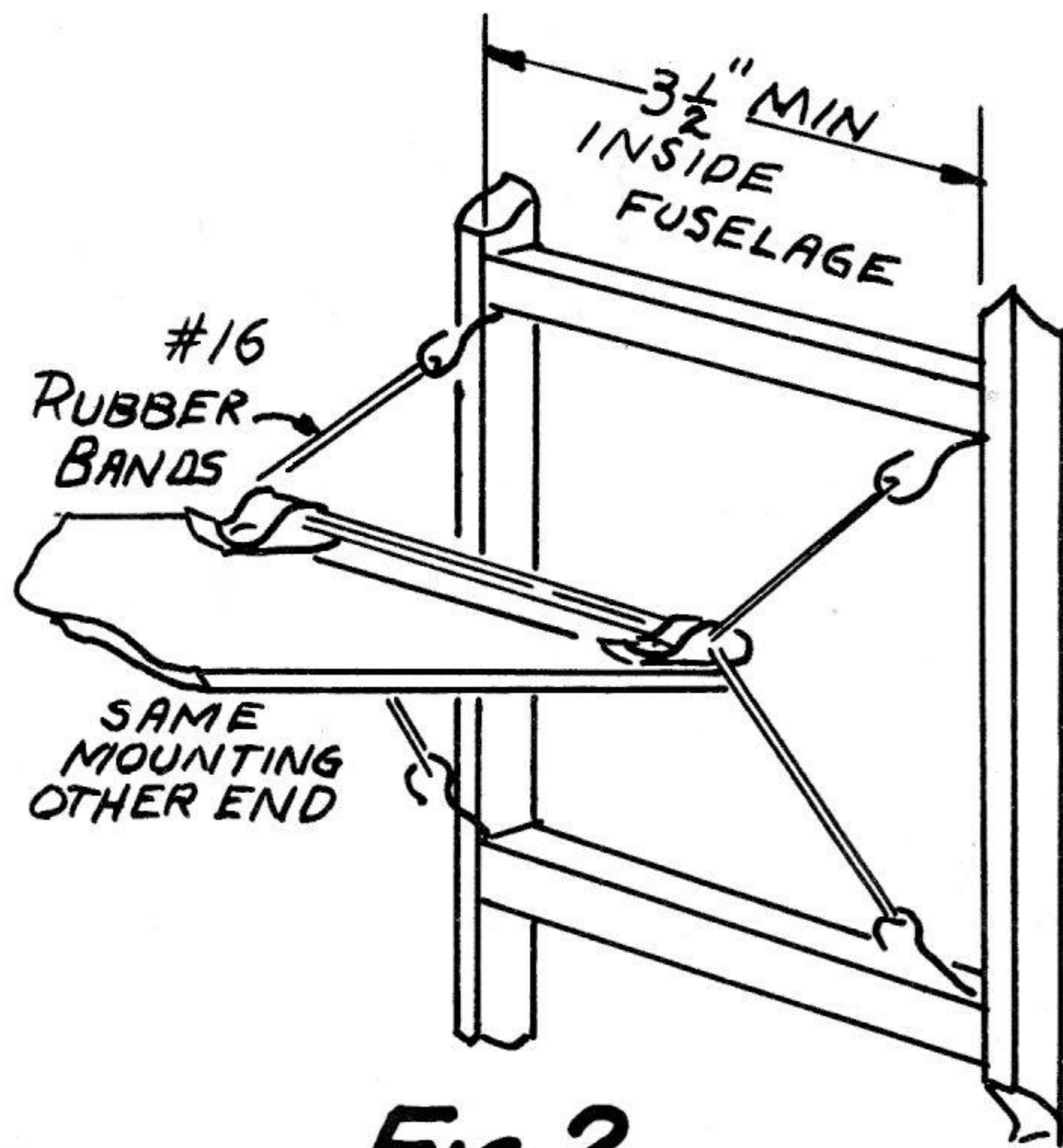
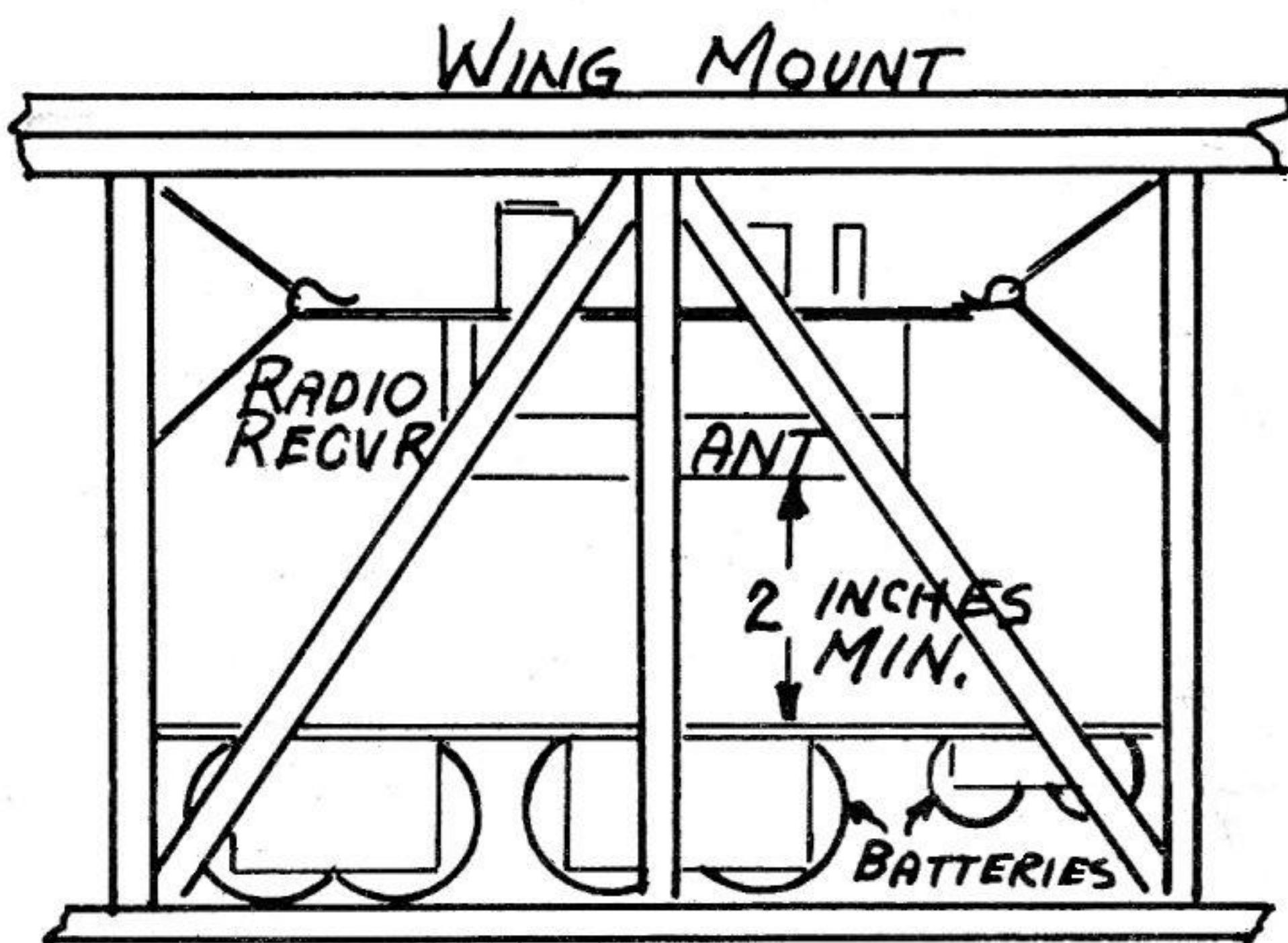


Fig 2



HATCH FOR ACCESS TO BATTERIES

Fig 3

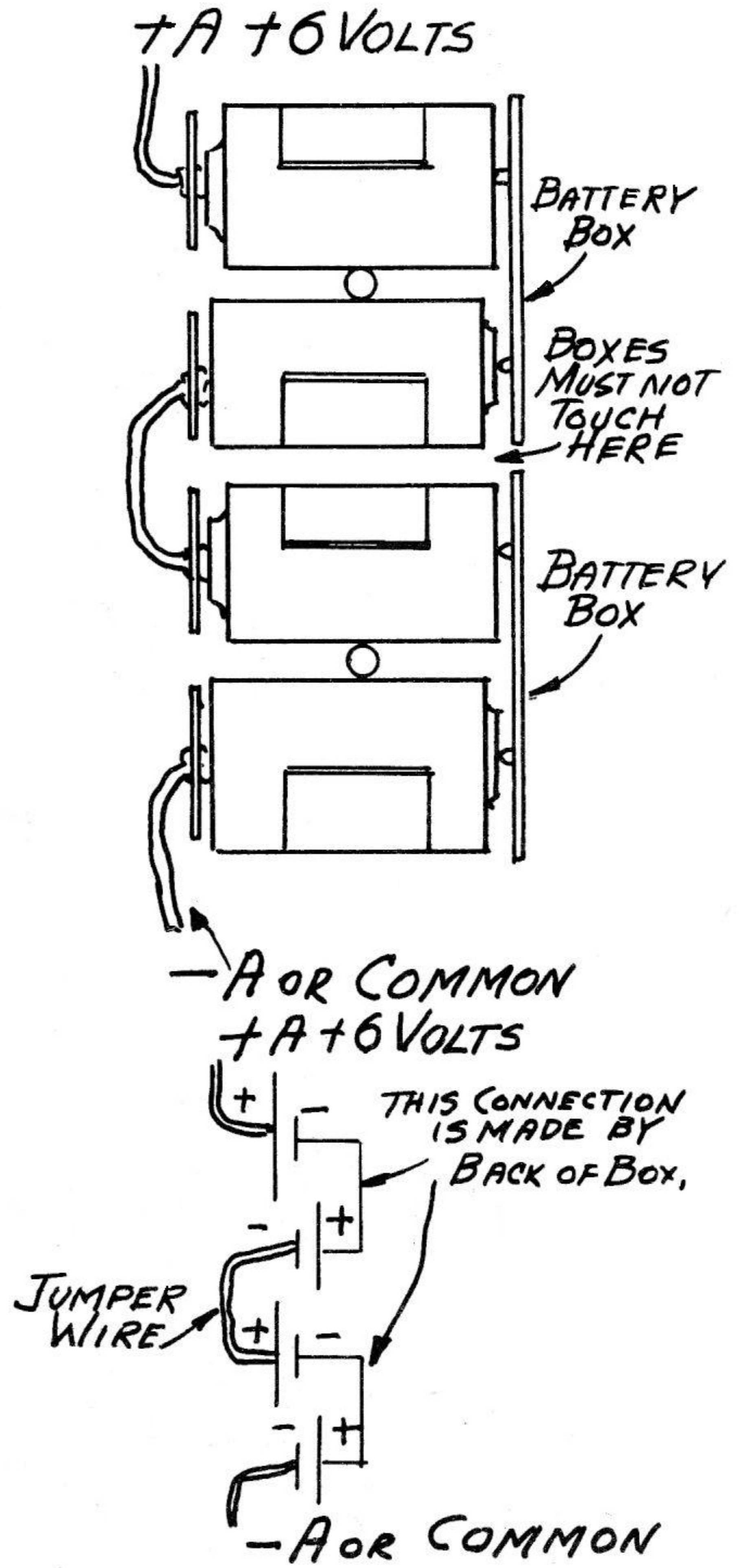


Fig 4

**CITIZEN-SHIP
RADIO CONTROL**

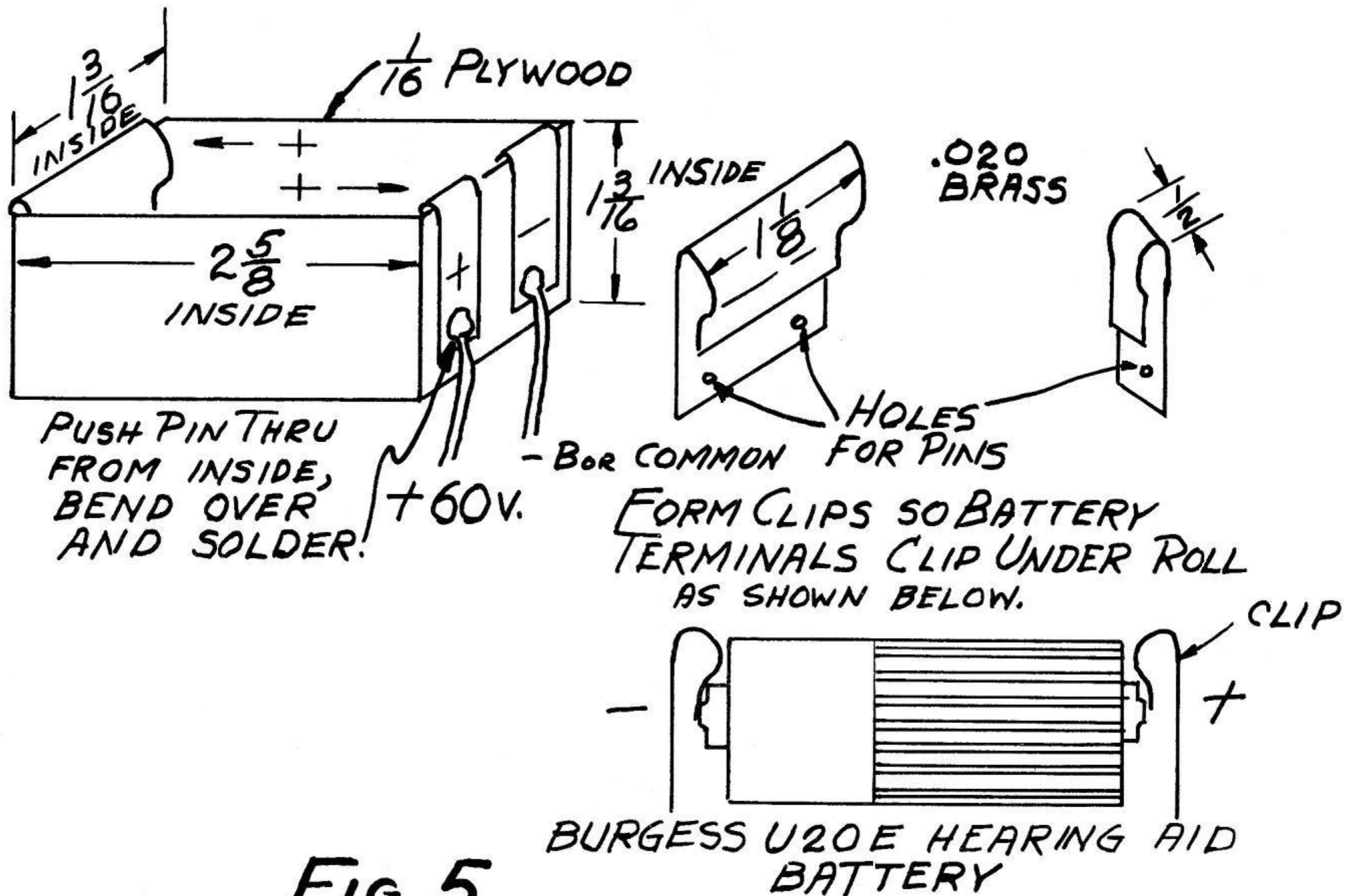


Fig 5

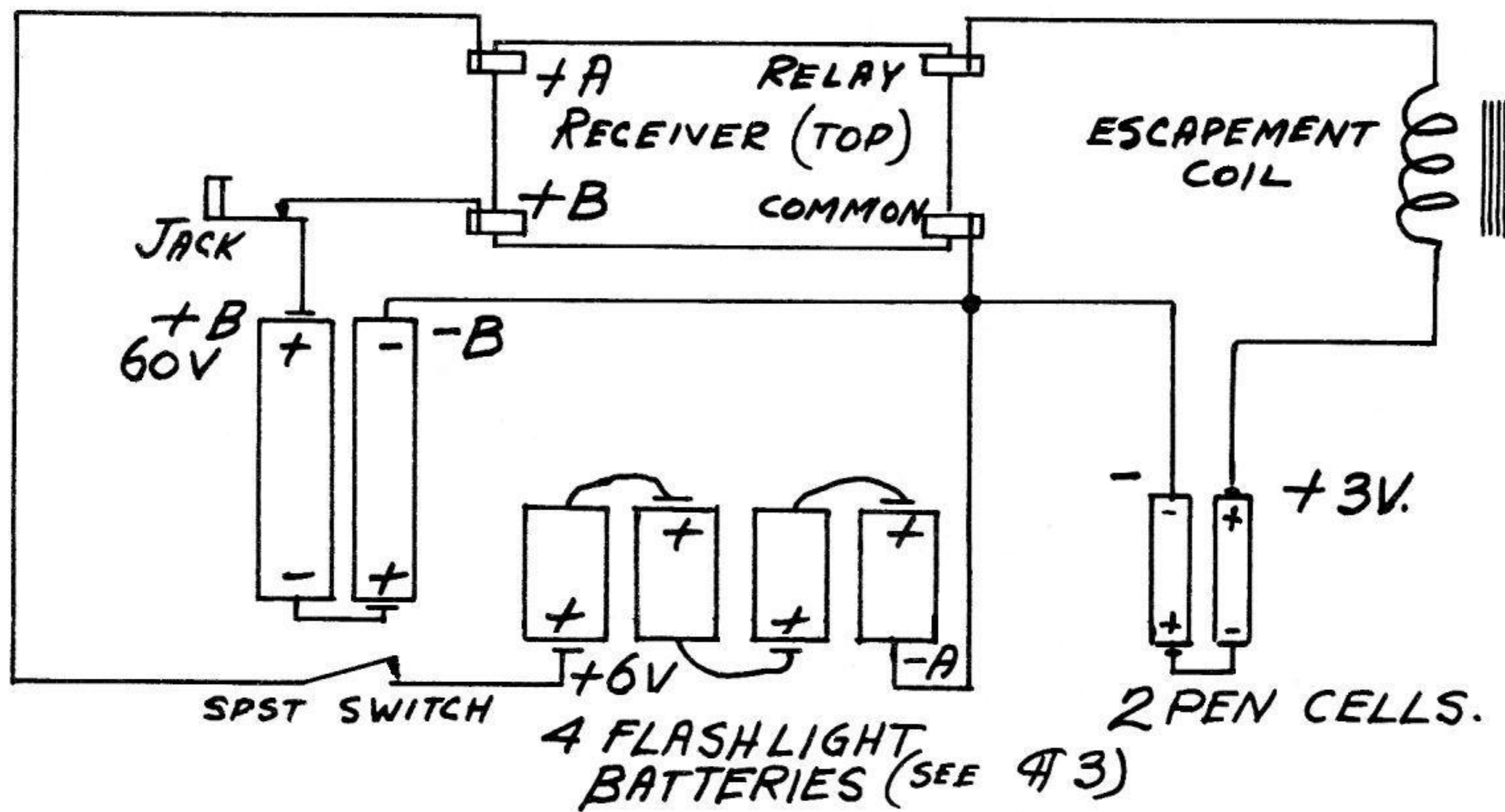


Fig 6

CITIZEN-SHIP
RADIO CONTROL

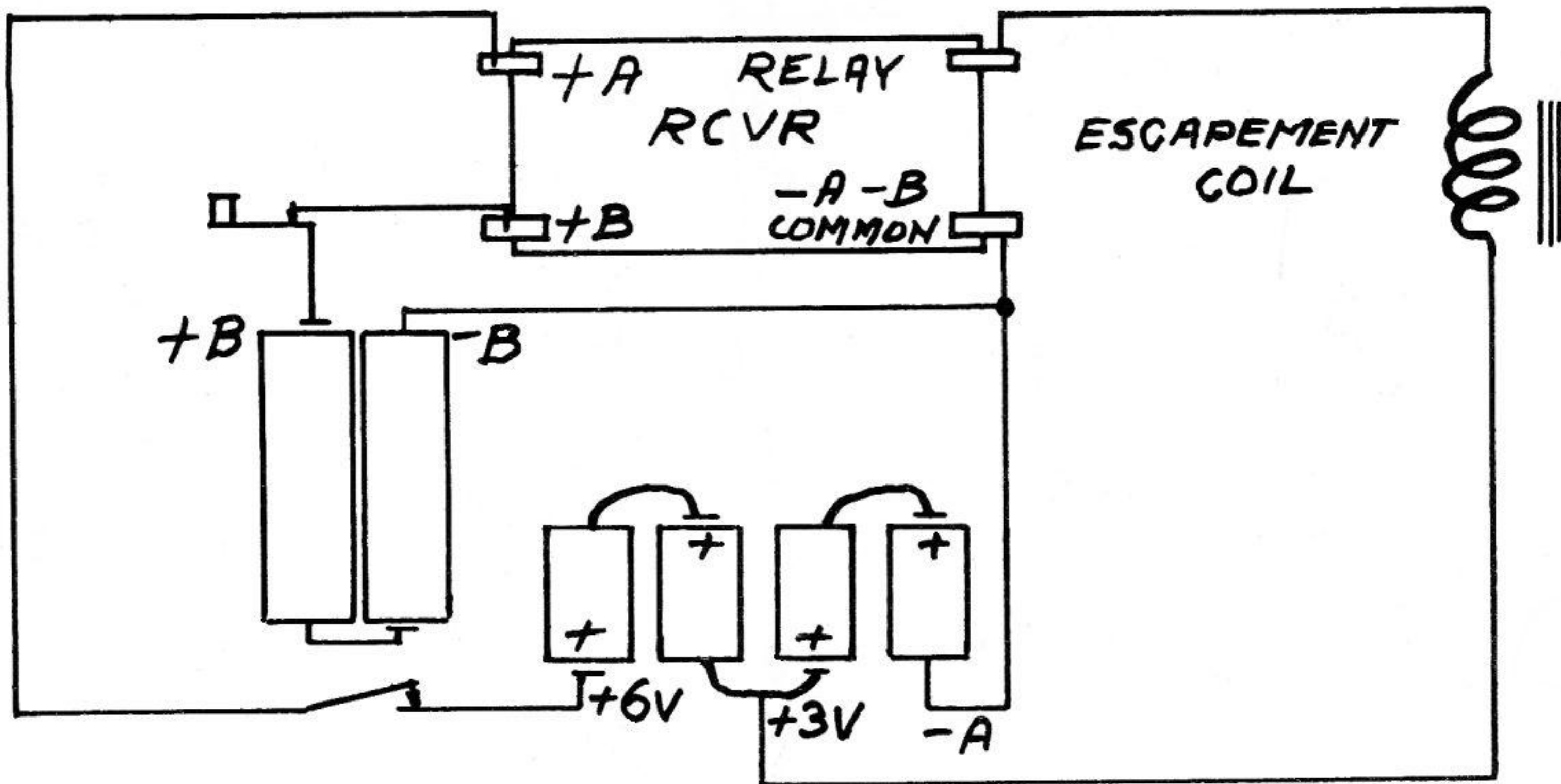


FIG 7

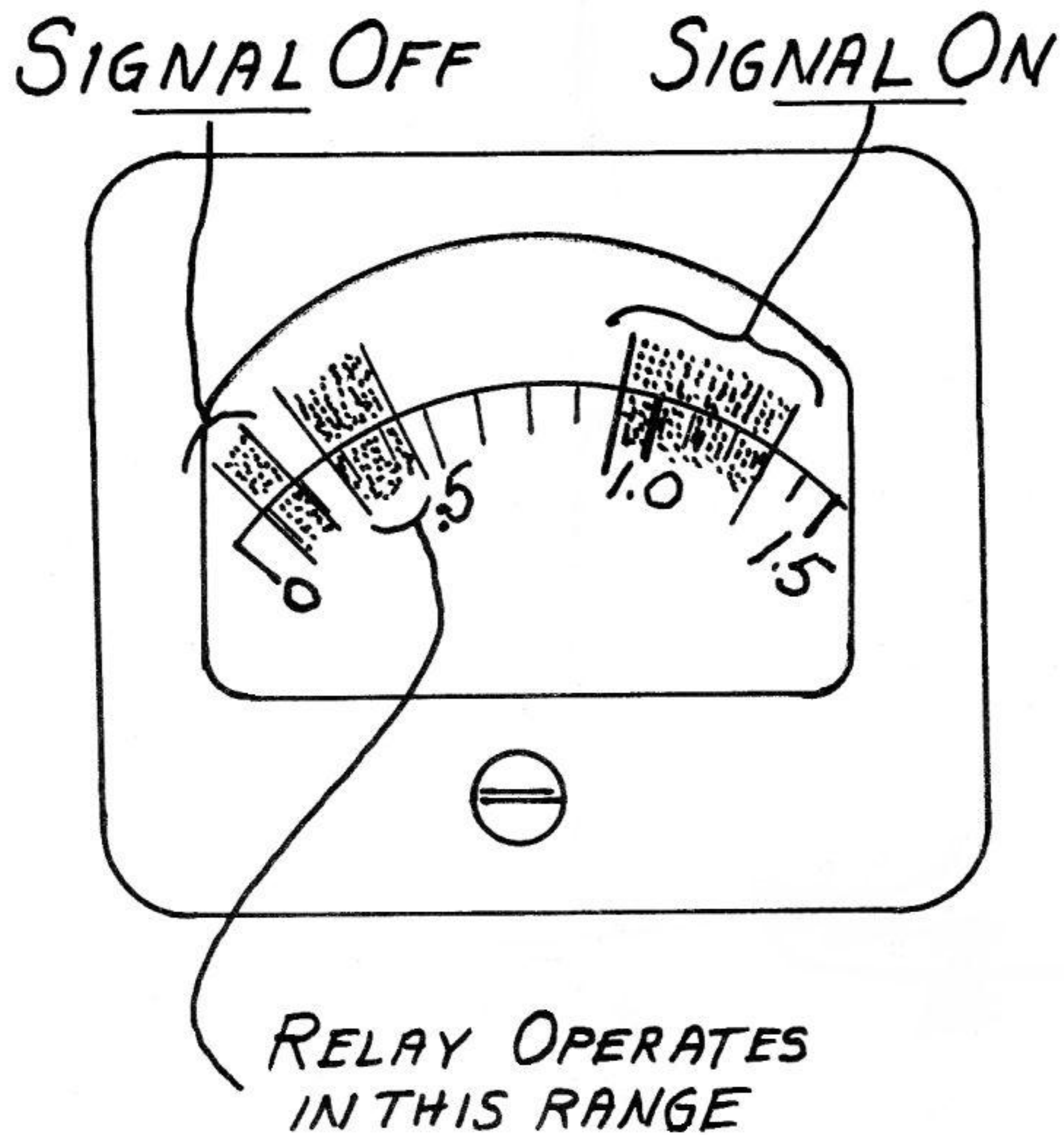


FIG 8

CITIZEN-SHIP
RADIO CONTROL

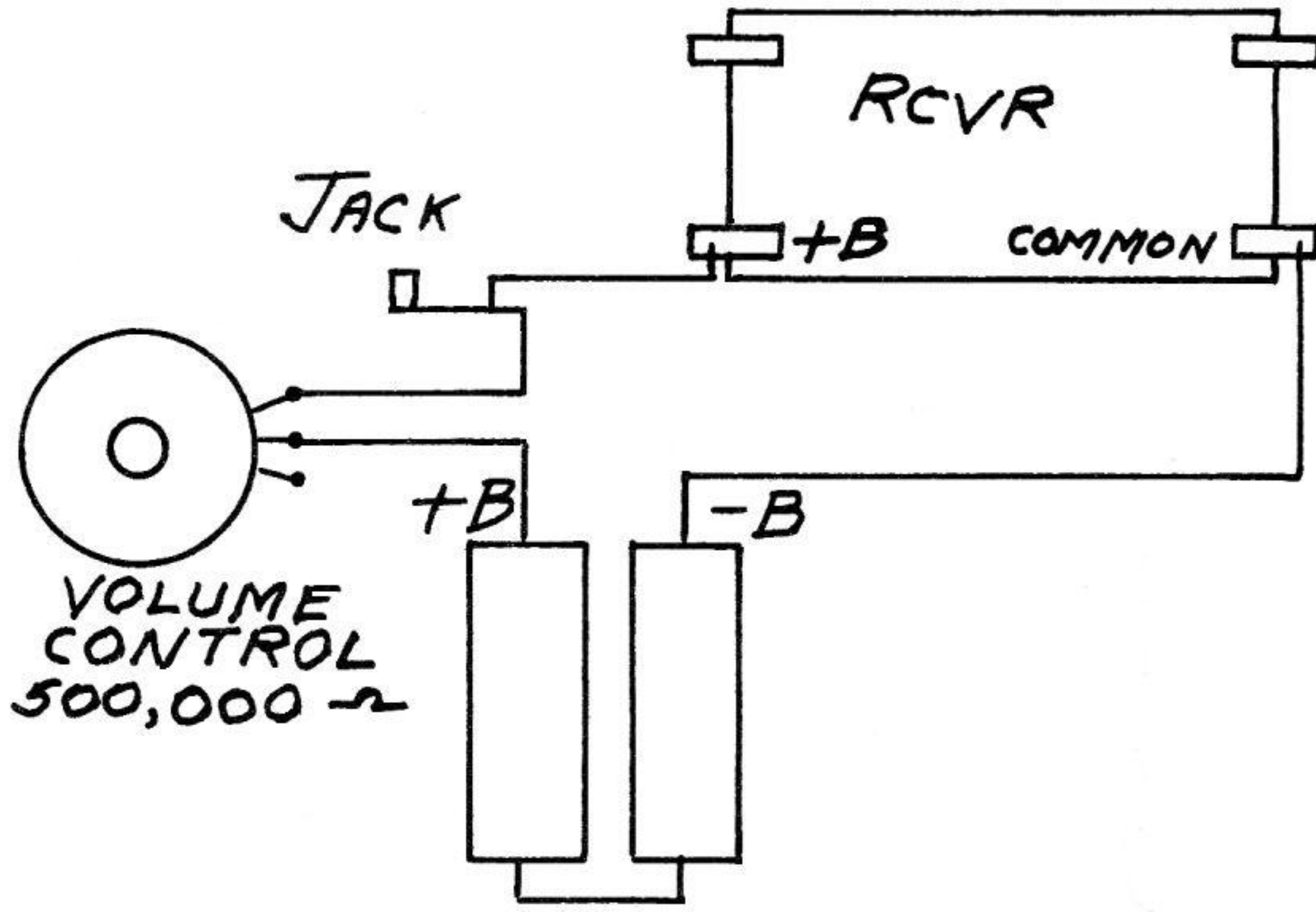


FIG 9

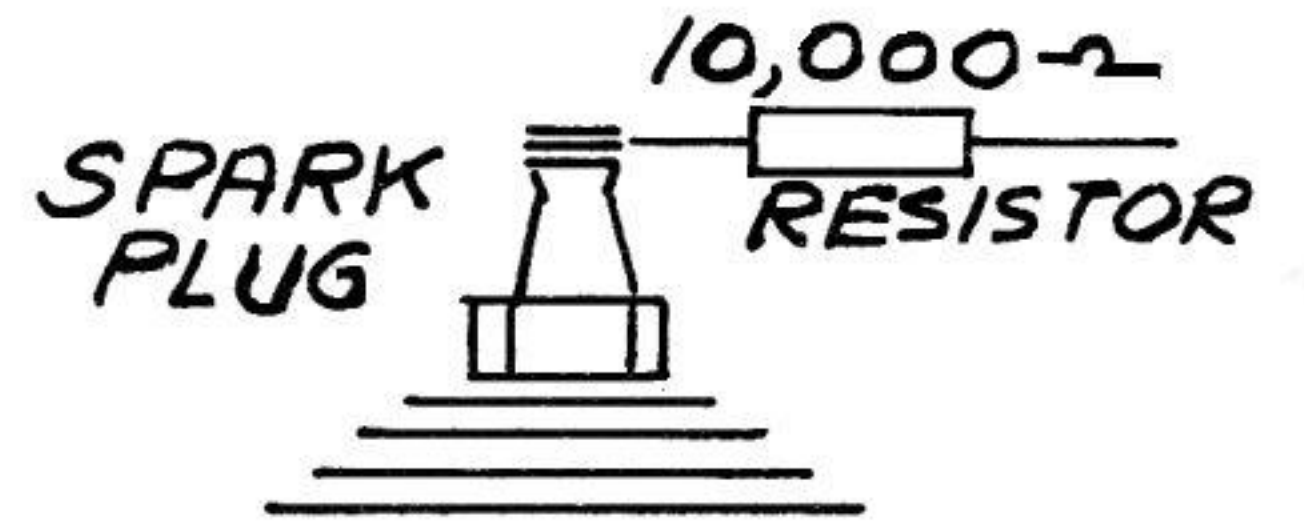


FIG 10