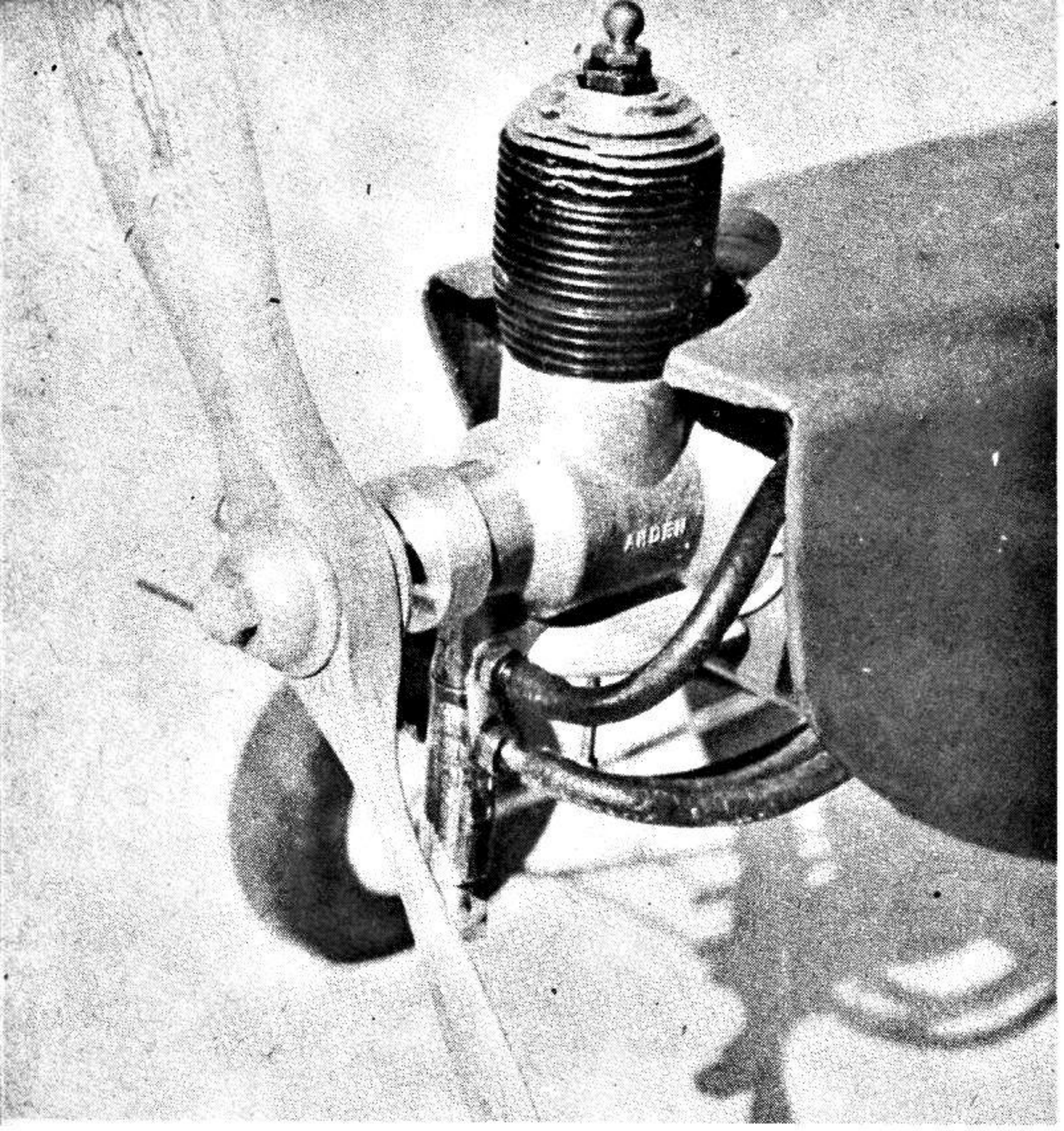
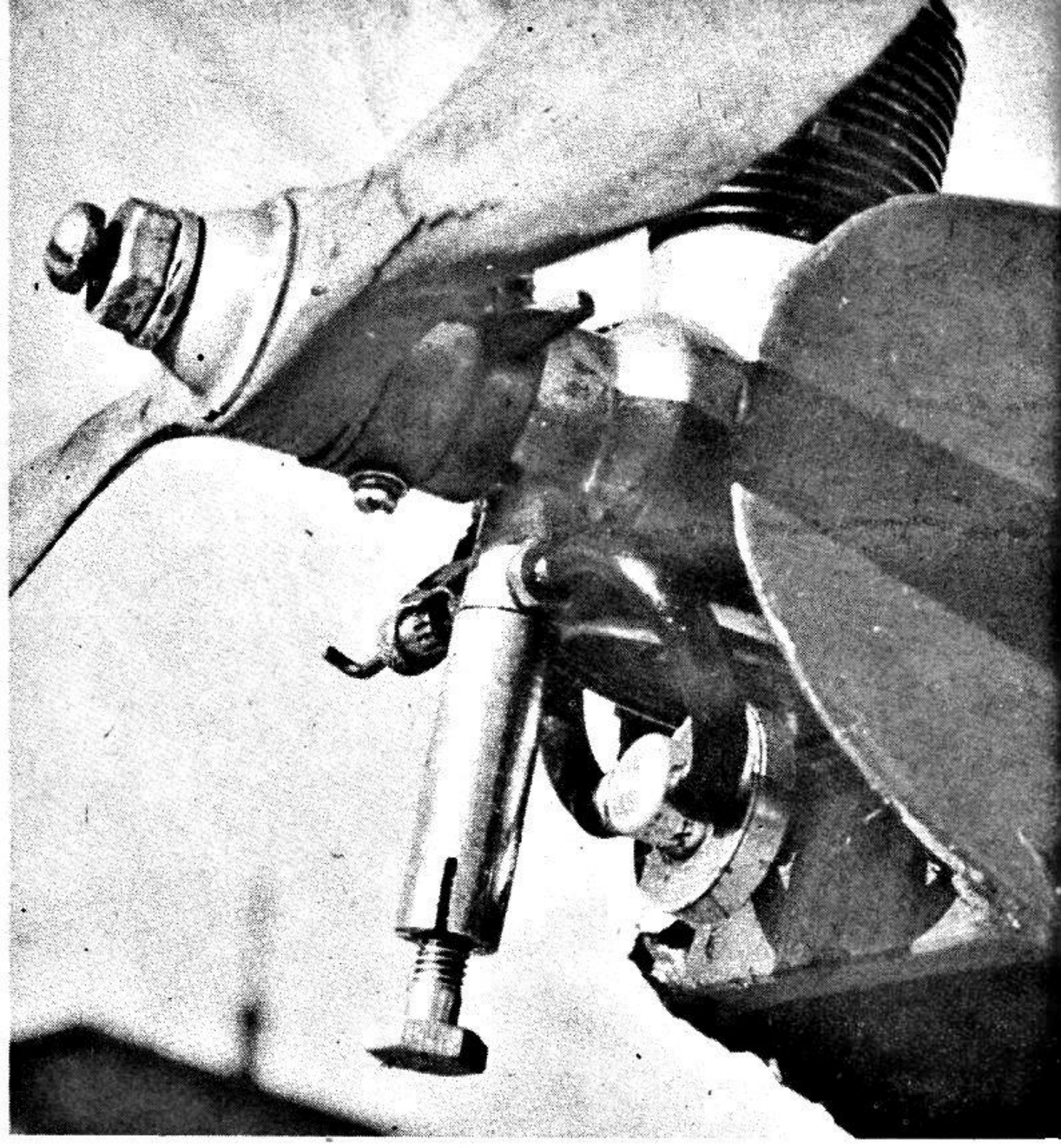



Arden engine on author's CQ equipped with two-speed. Note the extension to the venturi, as described in the text. This is for a glow plug.



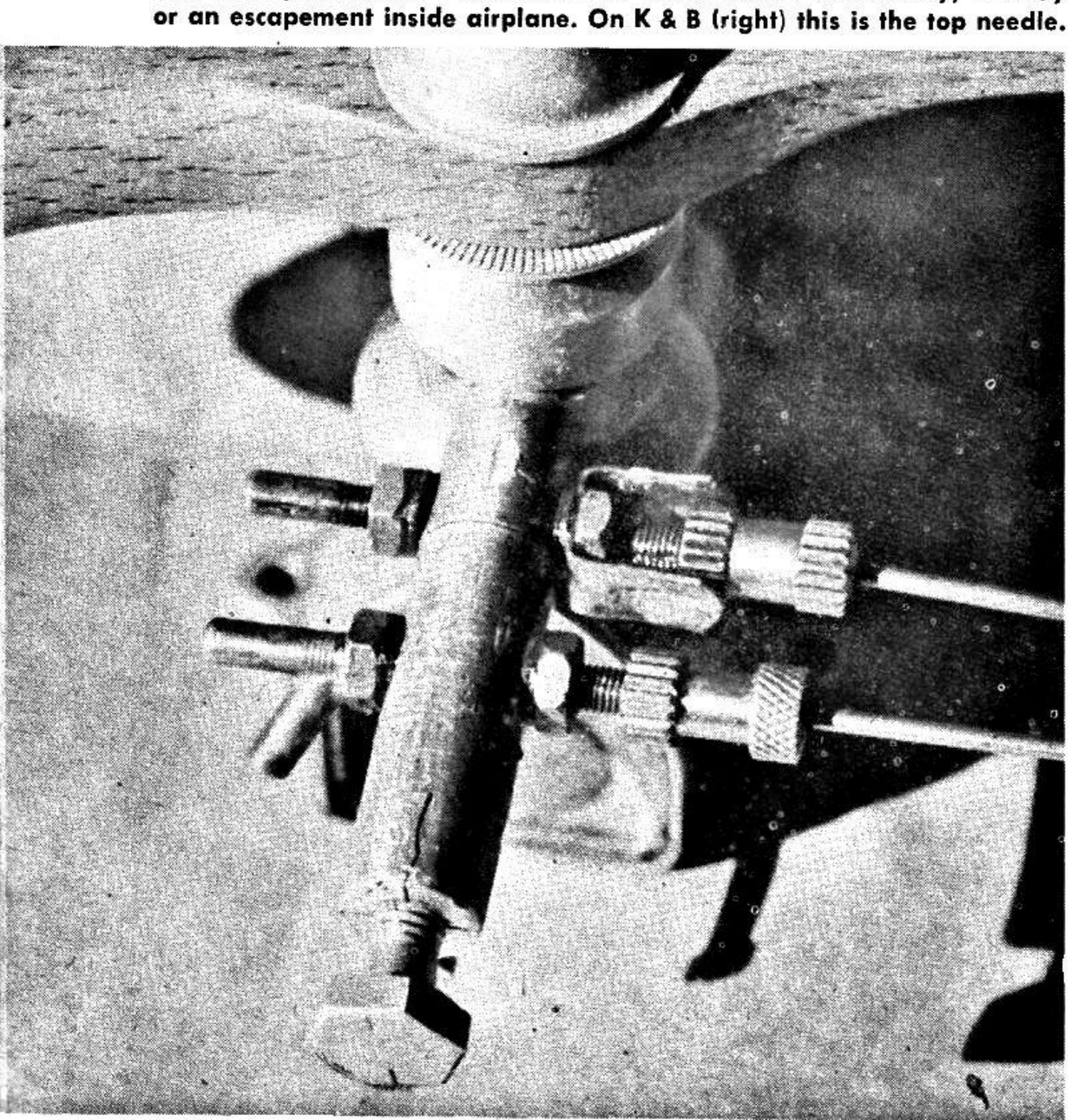
The screw head on the venturi is for adjustment of high-speed operation. Movement of bolt covers or uncovers the air intake slots, changes mixture.

# For the R.C. Fan

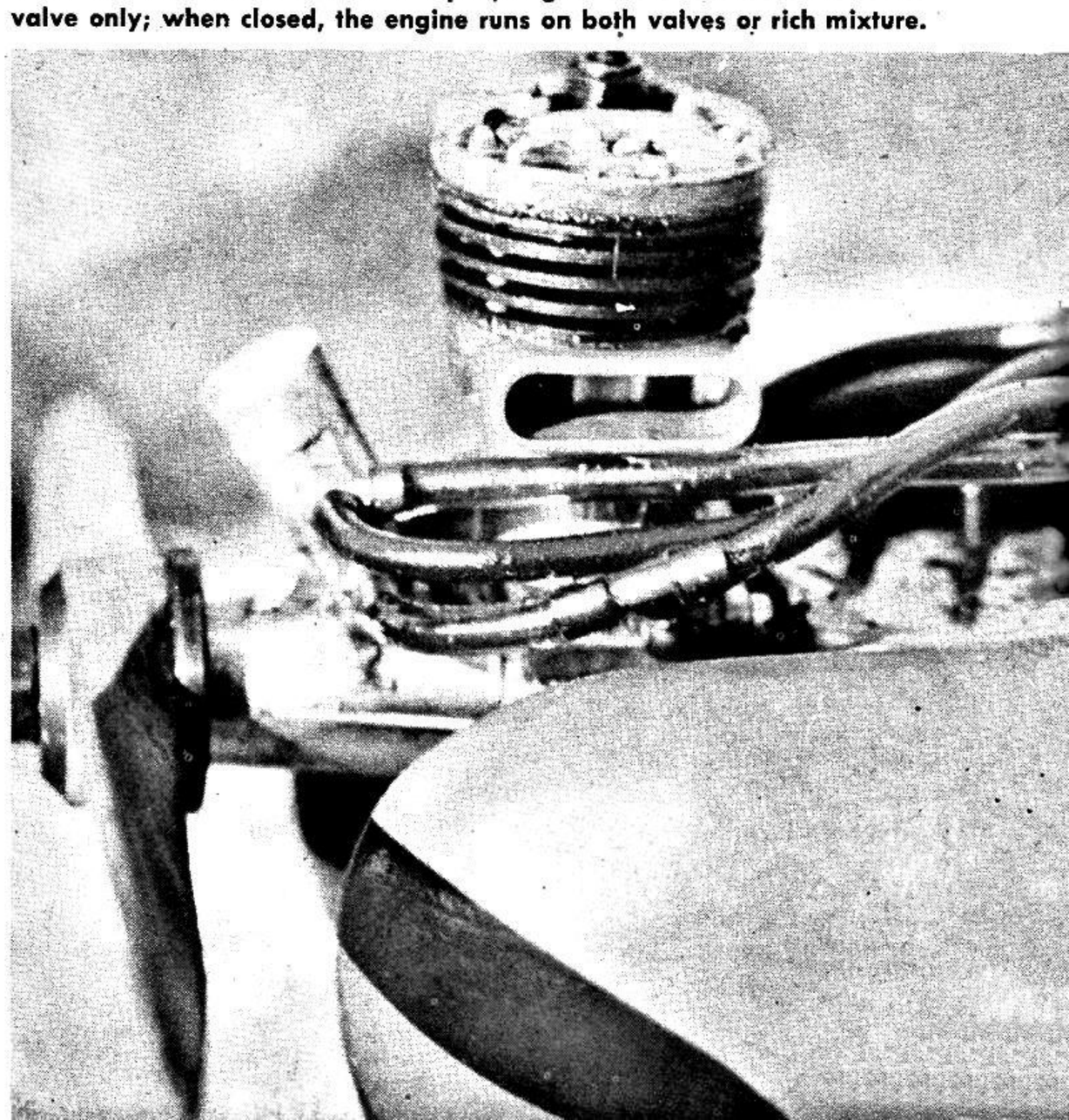
## TWO SPEED MOTORS

***After rudder control, two-speed engine is the most important addition. Not elevator! Here's the run down on how to rig the deal in your ship.***

Fuel tubing runs from T-section on the lower needle valve body, to relay or an escapement inside airplane. On K & B (right) this is the top needle.



Third line is an air bleed. When open, engine sucks fuel from the lower valve only; when closed, the engine runs on both valves or rich mixture.



# TWO SPEED CONTROL

by E. J. BROWN

Two speed power control for radio controlled models is second in importance only to direction or rudder control. Many recent developments have been made which allow this most desired set-up to be added to the control system without the addition of a second receiver or transmitter involved. Most of the units in use today for the control of model airplanes, boats and cars are of the single-tube, super-regenerative receiver type. The description of units in this article are for receivers of the Control Research, Aerotrol, Good Brothers or other single tube units using a RK61, XFG-1 or 3A5 tube. It is recognized that other multi-channel or tone operated equipment, such as Rockwood's reed set-up and the Bell unit, provide excellent engine speed controls, but higher weight rules out their use in smaller planes. Experiments and workable two-speed controls have been developed by the Good Brothers and also by Owbridge and Schumacher of "Ruddervator" fame.

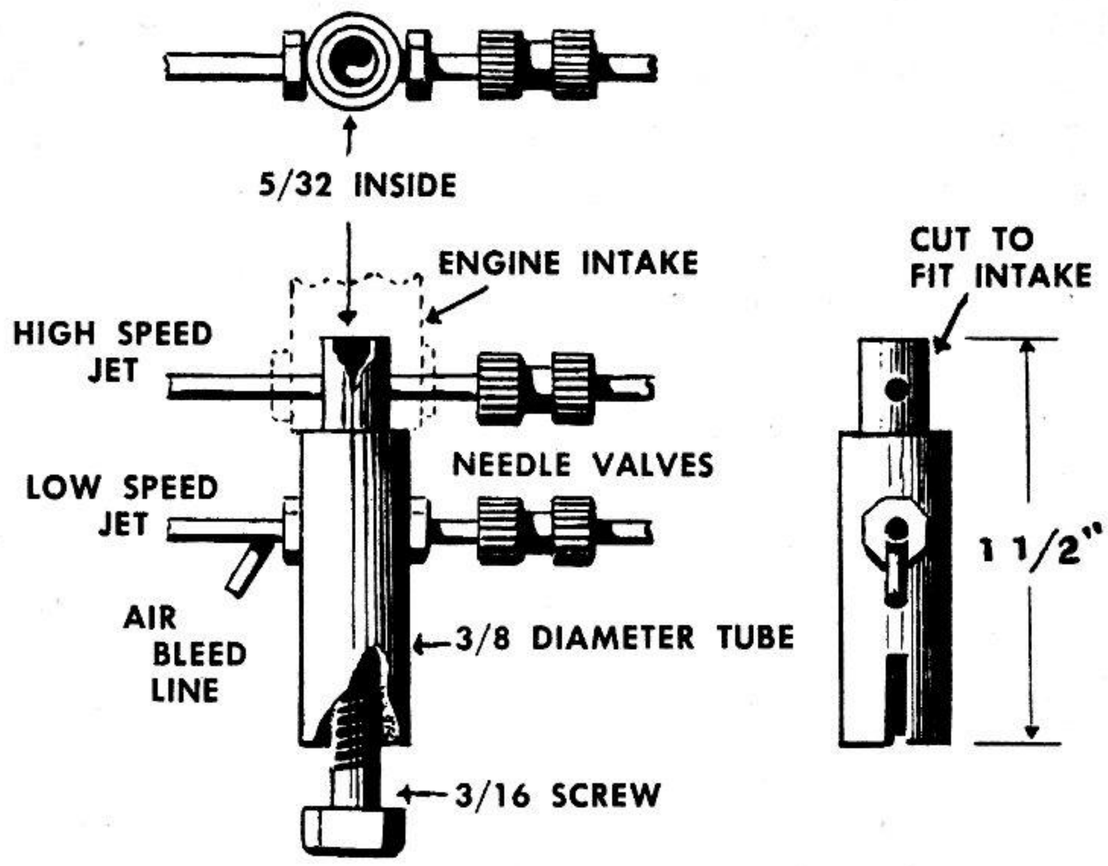
More recent developments have been made by Howard Bonner, E. J. Brown, and others in the Southern California area. These units operate on the principle of admitting additional fuel through a second needle valve and regulating the flow by opening and closing an air-bleed by radio to achieve two-speed control. Bonner has also added an air-bleed valve to the main fuel jet which controls the high speed, and by opening this bleed line, is able to stop the engine at any given time by radio control.

Photographs show the carburetor jet set up. Gas for the high-speed jet is drawn from the tank in the conventional manner and the engine is adjusted to the desired speed for full throttle operation. The second fuel jet is an addition and this jet is fed from a second tank if a pressure-type tank is used for the high speed jet as in Brown's plane. Otherwise the gas can be drawn from the same tank through a second pick-up tube. The second jet has an additional air-bleed line soldered on the jet at the intake or fuel line end of the jet. The hole is drilled through the original jet tube after the brass tube is soldered in place.

A rubber or plastic tube is fed from this point back into the cabin at a level above the carburetor to a relay which opens and closes this line with a rubber stopper hooked to the relay armature. When the line is open at the relay end, air is drawn into the tube and gas is drawn into the engine only through the high speed jet. Upon closing the line at the relay end by radio signal, gas is drawn from the tank through the second jet in addition to the high speed jet. This produces a very rich mixture which causes the engine to lose speed even enough for two cycle operation which will permit the plane to lose altitude. Full speed is regained at any time by opening the air-bleed line, thus cutting off the flow of fuel to the second jet, since air will be drawn through the line easier than the fuel from the tank. Mixture adjustments can be made at the carburetor end which, if rich enough, will cut off power completely by over choking of the engine. A second air bleed line on the main or high speed jet is a more effective engine cut off. This method is used by Bonner with excellent results.

Operation of the two speed fuel line relay is achieved by installing a single lobe cam on the escapement shaft. This cam, made from a piece of brass tubing 1/8" outside diameter, is soldered to the shaft so the lobe will operate or close a set of contact points when the escapement is in one of the neutral positions. When these points close, they in turn close the circuit to the control relay, thus changing engine speed. If continual high speed operation is desired, this position is passed through when selecting turns and the engine remains in high speed. It is necessary to use a coil with from eight to 20 ohms of resistance to hold battery drain to a desirable figure. Four pen cells are used in the author's ship wired to furnish three volts. As many as 12 flights can be made on one set of batteries if a 10 ohm coil is used on the fuel line relay.

A second set up is possible by using a four lobe cam on the escapement shaft with the circuit *(Continued on page 52)*



# For the R. C. Fan

*(Continued from page 27)*

through a second high resistance type relay of the Sigma 4F 8000 ohm type. A delay condenser is wired across the relay and by rapid pulses of the transmitter switch, four to eight pulses, the relay can be made to close, thereby operating an escapement type of fuel line control relay. This system has the advantage of being able to select high or low speed for all control positions but is much heavier than the single cam set up.

The use of the air control shown in the photos greatly adds to the selectivity of speeds by being able to pre-set the high speed to the desired point by screwing the adjustable bolt up or down, thus opening or closing the air intake slots. This device could also be used for engine speed control for glow plug engined free flight planes.

The intake tube is made from a piece of 1/2" aluminum tubing or copper gas line. Tubing is selected that has a 5/32" hole or solid stock is drilled to this size. The external section is cut to fit the inside of the regular intake tube of the motor used. Make this section long enough to project past the hole for the conventional jet. Drill a hole through the new tube at the former jet location. This jet, when installed, will retain the tube in place. A second hole is drilled about 1/2" away from the first hole to fit the new two speed jet. Any type of replacement jet may be used. A second piece of tubing is soldered to the jet body at a slight angle to the tube just outside of the intake tube as shown in the photographs. A hole is drilled through the inside of this additional tube into the passageway of the original jet. All chips are removed and the tube is installed in the former intake of the engine. If the use of the two-speed jet is not desired, screw the needle valve closed and the additional jet will not interfere with conventional operation. It is pointed out that the reduced air intake area will affect engine speed only slightly as will be demonstrated by the amount the speed control screw will have to be screwed in to control engine speed. The inside of the tube is threaded with a 10-32 tap about one inch down before cutting air slots. Slots are cut in the end of the tube from 1/4" to 1/2" deep. All slots can be made different depths by holding the saw at an angle when making the cuts. After slots are cut, squeeze the ends together slightly to put a bind on the threads of the adjustment screw which is a 3/16 or 10/32 screw long enough to completely close the slots when screwed all the way in. The slots and use of the screw may be omitted if intermediate settings of high and low speeds are not desired.

The Control Research or Bonner Specialty escapement relay may be used for the control relay. It is not necessary to use the escapement portion and these parts may be removed. A

small tab or extension is soldered onto the armature or the pawl and a piece of wide rubber band or rubber sheet is cemented to this piece to seal off the end of the air bleed tube when the relay is activated. If rubber tubing is used for an air bleed line, this piece of rubber is not necessary as the metal to tube fit can be close enough to cut off the air intake. A gap of 1/8" should be maintained between the end of the tube and the armature when the relay is not energized to permit a free flow of air for high speed operation. The coil may be used as is but rewinding with No. 32 to No. 34 wire will reduce battery drain. The Bonner Specialty relay will operate on 1-1/2 volts but three volts will give more reliable operation.

The cam on the original escapement shaft is a piece of 1/8" outside diameter brass tubing 1/2" long slipped over the shaft and soldered in place to position the lobe of the cam to close the actuating points at one of the neutral positions. The actuatory points can be made from two strips of hard brass 1/4" wide and one inch long. Insulate the strips from each other by installing in slots in a fiber or micarta or wood block and solder a lead to each strip. Install in position for cam to close the points in the desired neutral position. Three-volt battery is in series with the points and the control relay.

There is enough delay in speed change action to pass through the low speed if change is not desired. Check batteries occasionally to insure proper action.

This system will give very excellent two-speed control at very little additional weight and for no extra radio equipment. It is very possible to do "touch and go" landings and to also maintain any desired altiude by selection of low or high speed. A diagram is illustrated of the second system using an additional Sigma relay and four lobe cam as described above for a more complete control but the extra weight restricts its use to airplanes of six foot spread or more and operation is not as positive.