NATIONAL RADIO INSTITUTE
Washington D. C.

Radio-Trician Service Manual

Compiled solely for Students & Graduates

on the

Atwater Kent Early and Late Screen Grid Receivers,

Models 55, 55-C, 55-F, 55-F-C, 60, 60-C, 61, 61-C, 66, 67, 67-C.

General Description

The Model 55 receiver is a seven-tube A. C. outfit representing a distinct departure in design from previous models. It incorporates two stages of R. F. amplification, using screen grid A. C. tubes, detector, one stage of resistance coupled audio amplification, and a double-audio stage for the out-put. A heater type tube is used in the first audio stage and new power tubes, type 245, are used in the double audio stage. The usual 280 type rectifier is employed.

Among the distinct advantages of this type receiver may be mentioned the following:

The various units of the power pack are mounted in separate metal containers, simplifying replacement.

The volume control operates by regulating the voltage on the "screen grid" in the R. F. tubes, this voltage being continuously variable from zero to the maximum of about 75 volts. This gives quieter and smoother operation than previous designs which had the control in the antenna circuit.

The Model F-4 electro-dynamic speaker which can be used with Model 55 receiver uses for its field supply the entire B current supply, same as furnished to plates of all tubes. (See Fig. 2.)

Special Notes on Installation

Antenna: The Model 55 is very sensitive and does not require a large antenna. Two antenna posts are provided on the set, marked "Long Antenna" and "Short Antenna." The long-antenna post will give greater selectivity and should be used if the aerial is 30 feet or more in length. The short-antenna post should be used if a very short (inside) antenna is employed. If extreme selectivity is desired use a short antenna connected to the long-antenna post. Indoor aerials for Model 55 should be erected as far as possible away from grounded metal, such as pipes, electric wiring, etc.

Ground: Ground connections must be used with Model 55. This set will also not operate (as some A. C. sets do) with either antenna post connected to the ground.

Output Tubes: The two A. F. output tubes used in the audio stage should be matched on a tube tester, otherwise the set may hum.

Speaker: Do not use any other model of Atwater Kent speaker with Model 55, than the type F-4 or F-4C. Do not remove speaker plug from socket when set is in operation.

SERVICE NOTES

Replacing R. F. Transformers and Variable Condensers

As in the other Atwater Kent single dial receivers, if one R. F. transformer is defective, the entire group must be replaced. Likewise, if one variable condenser is defective, all three condensers must be replaced. It is necessary to remove the R. F. transformer shields when

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Printed in U.S.A.

TABLE 1
VOLTAGE READINGS ON ATWATER KENT MODELS 55 AND 55-C RECEIVER

Tests Made With Set In Operation, All Tubes and Speaker-Plug in Sockets

Use High Resistance D. C. Voltmeter (about 0-50-250) to Measure Plate and Grid Voltages. Use A. C. Voltmeter to Measure Filament Voltages.

MAKE TESTS IN ORDER LISTED

	MEASURE ACROSS	APPROX. VOLTAGE	NO READING INDICATES‡	REMEDY
FILAMENT VOLTAGES	—F to +F Contacts on the detector, 1st A. F. and each R. F. Socket.	2.4	Open filament winding or connection.	Make all voltage tests first to get a general idea of the trouble, then disconnect the set and test the suspected parts with a continuity testing circuit for opens, shorts & grounds.
	—F to +F on each 2nd A. F. Socket.	2.4		
	F1 to F2 on Rectifier Tube Socket.	4.9		
PLATE VOLTAGES	C1R to P1R.*	175	Open high voltage winding, open speaker magnet coil, open filter choke, open primary No. 2 R.F.T., or open R.F. bias resistor.	
	C2R to P2R.*	175	Open primary No. 3 R.F.T.	
	CD to PD.	105	Open detector filter resistor, coupling resistor, R.F. choke, or det. bias resistor.†	
	C1A to P1A.	70	Open 1st A.F. filter resistor, primary of A.F. input transformer, or 1st A.F. bias resistor.	
	—F2A to P2A.	235	Open primary of output transformer.	
	—F2Aa to P2Aa.	235		
GRID VOLTAGES	C1R to G1R.*	3	Open secondary No. 1 R.F.T.	
	C2R to G2R.*	3	Open secondary No. 2 R.F.T.	
	CD to GD.	12	Open secondary No. 3 R.F.T.	
	C1A to G1A.	2	Open 1st A.F. grid leak.	
	—F2A to G2A.	42	Open No. 2 2nd A.F. bias resistor or secondary of input A.F. transformer.**	
	—F2Aa to G2Aa.	42		
SCREEN VOLTAGES	C1R to S1R.*	85	Open connection to slider of volume control, open volume control resistor, or open bleeder resistor.	
	C2R to S2R.*	85		

* Volume control knob set at maximum.

** If No. 1 2nd A. F. bias resistor is open, the grid voltage will be approximately 85.

† The detector plate voltage will be low, and the detector grid voltage high, if the "phone" condenser is shorted.

‡ Low plate or grid voltages may indicate a partially shorted by-pass or filter condenser.

replacing the transformers. Care must be taken to avoid scratching or otherwise injuring the coils when replacing the shields. Also note that a lead from the secondary of each R. F. transformer to the bottom stator-terminal on each variable condenser should pass under a slot at the base of the shield, and must not be caught between the shield and the metal base plate.

Replacing Filter-Condenser Assembly: The filter condenser assembly in Model 55 is a completely air-sealed type which prevents entry of moisture, thus greatly prolonging the life of this unit. The condenser assembly is mounted in an outside case and cover, with a flat spring-plate inside to hold the assembly in place.

Replacing Tubular Resistors: In later Model 55 receivers, the tubular resistors are made with cast metal caps or contacts, which have a comparatively low melting temperature. Accordingly it is necessary in replacing these units to exercise considerable care when soldering in order not to melt the entire cap. The soldering iron should be held in place only long enough to insure a good electrical connection between the cap and the lug to which it is to be fastened. A few experiences in soldering these new tubular resistors will quickly show the correct method required for good results.

Whenever a tubular resistor of this type is replaced, the soldered connections should be tested for mechanical strength by endeavoring to push the resistor away from the contact lugs.

Testing: One of the quickest methods of testing Model 55 is by measuring the voltage at each tube socket as indicated in the accompanying table. These measurements must be made while the set is in operation, using either a commercial set-analyzer, with adapters which fit into the tube sockets, or using sepa-

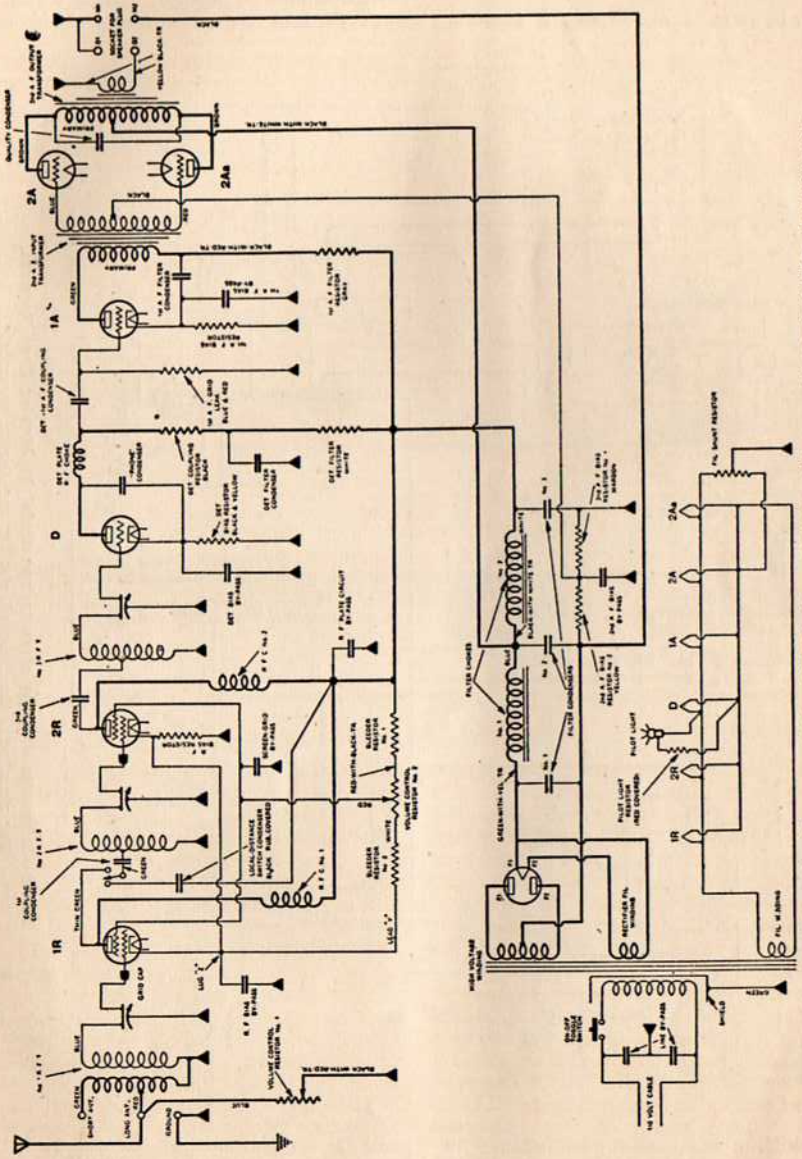

Fig. 1—Schematic diagram of later Model 55 and 55-C with capacity-coupled R.F. transformers. The changes shown above were made gradually, not all at one time.

rate A. C. and D. C. voltmeters, making connection to the tube socket contacts under the base-plate. All of the socket contacts may be exposed by inverting the set and removing the flat bottom plate.

Separate parts may be tested for continuity with a voltmeter and battery in the usual way. If there is any doubt as to whether a part is shorted, grounded, or open, it is advisable to remove all connecting leads to that part and test it separately.

Synchronizing Condensers

When synchronizing the condensers, connect a modulated oscillator pick-up lead to the short-antenna binding post, and place the local-distance switch in the "distance" position. Adjust the volume control to give about half scale reading on the output meter, and then leave the control in this position.

Owing to the design of the R. F. amplifying circuit in Model 55, it is necessary to use a top shielding plate when synchronizing the variable condenser, and in order to make the rotor of No. 1 condenser accessible for adjustment it is necessary to cut or file a hole in the top-shield over the rotor of No. 1 condenser. This hole should be about 1½ inches in diameter, with its center 2¼ inches from the left edge of the shield and about 1⅜ inches from the front edge. The rotor of No. 1 condenser may then be adjusted with one finger through this hole. No. 2 condenser rotor may be adjusted by turning the control knob, and No. 3 rotor may be reached from the right-hand side of the chassis.

The following pages give the wiring diagrams of Atwater Kent Screen-grid receivers, also Voltage Readings of the various models which should be very useful to radio-tricians when called upon to service these receivers.

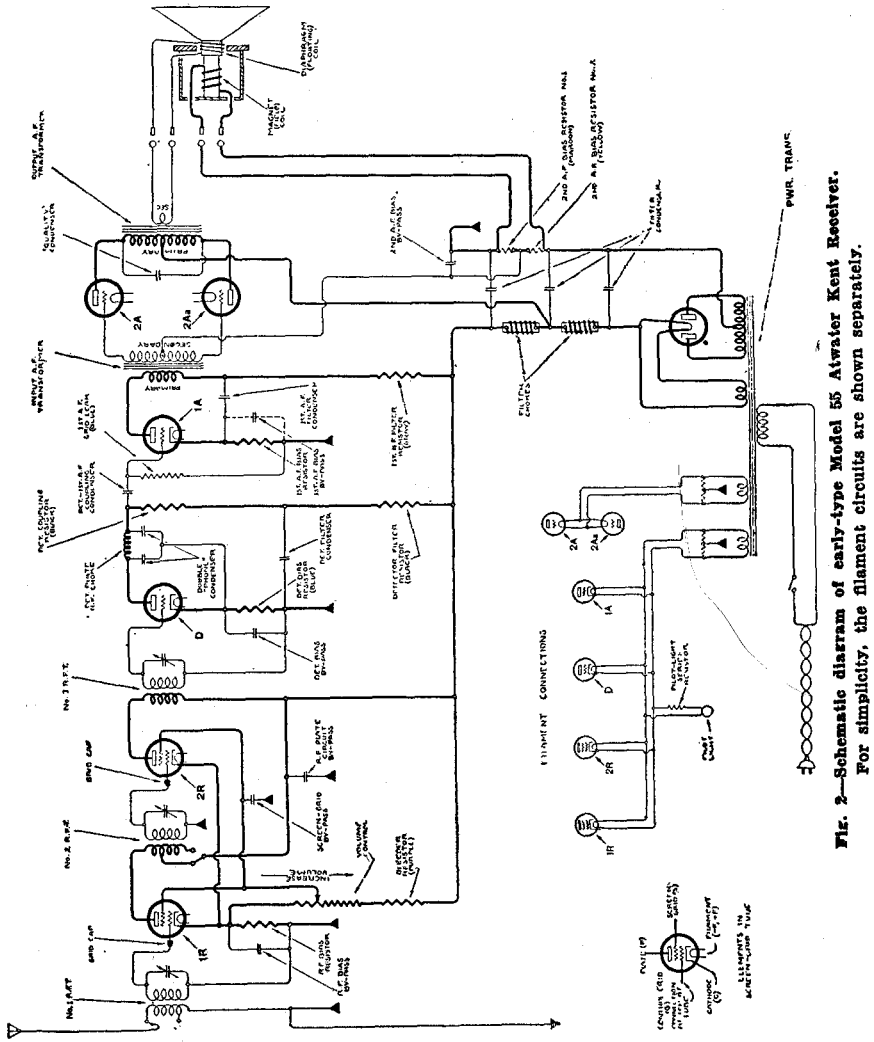

Fig. 2—Schematic diagram of early-type Model 55 Atwater Kent Receiver. For simplicity, the filament circuits are shown separately.

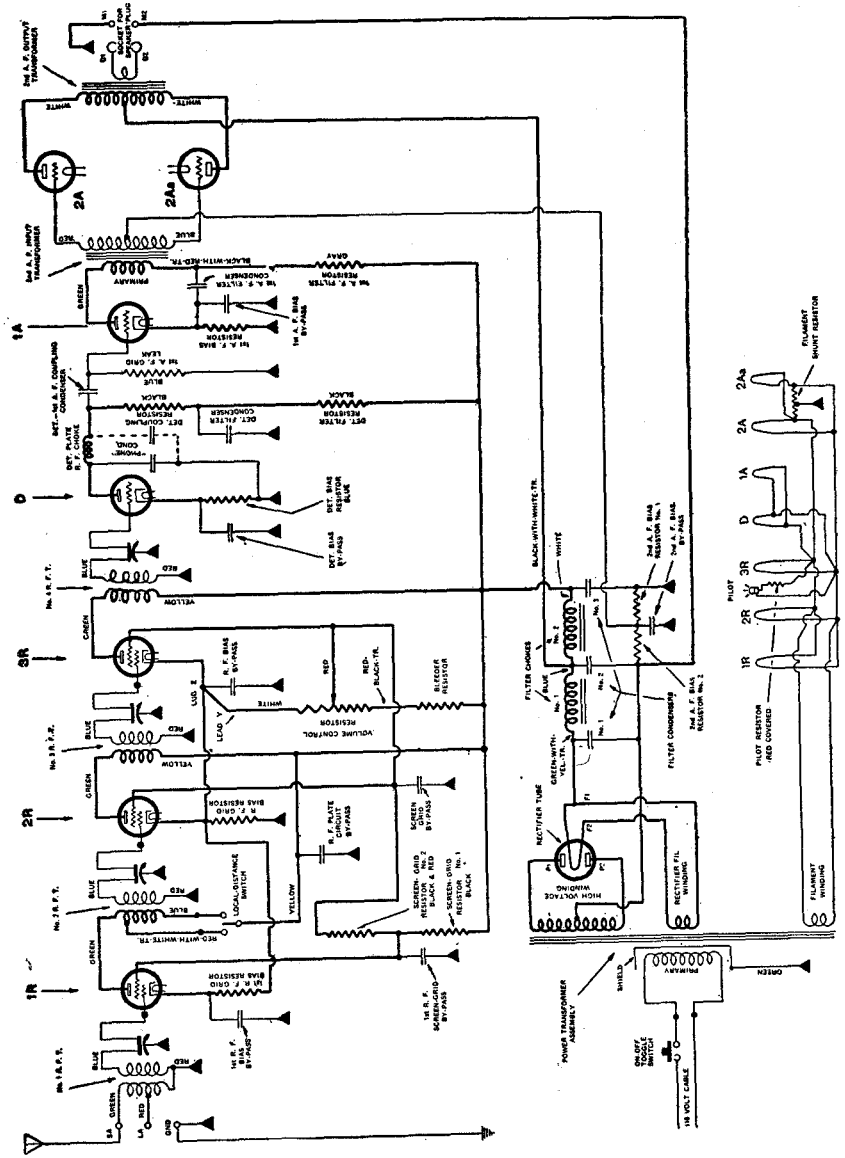

Fig. 3—Schematic diagram of early Model 60 and 60-C. In the above diagram, the 2nd A.F. bias resistor No. 1 is maroon, and No. 2 is yellow.

VOLTAGE READINGS ON ATWATER KENT MODEL 60, 60-C RECEIVER (60 CYCLE)

Use High Resistance D. C. Voltmeter (about 0-50-250) to Measure Plate and Grid Voltages. Use A.C. Voltmeter to Measure Filament Voltages.

Tests Made With Set In Operation, All Tubes and Speaker-Plug in Sockets. Adjust Volume Control to Maximum. Make Tests in Order Listed.

	MEASURE ACROSS	Approx. Voltage 110 V. Line	Approx. Voltage 120 V. Line	NO READING INDICATES‡
FILAMENT VOLTAGES	—F to +F Contacts on each Receiving Tube Socket.	2.2	2.4	Open filament winding or connection.
	F1 to F2 on Rectifier Tube Socket.	4.5	4.9	
PLATE VOLTAGES	C1R to P1R.	156	170	Open high voltage winding, open speaker magnet coil, open filter choke, open primary No. 2 R.F.T., †† open R.F. bias resistor, or open 1st R.F. bias resistor.
	C2R to P2R.	160	175	Open primary No. 3 R.F.T.††
	C3R to P3R.	160	175	Open primary No. 4 R.F.T.††
	CD to PD.	101	110	Open detector filter resistor, coupling resistor, R.F. choke, or det. bias resistor.†
	C1A to P1A.	69	75	Open 1st A.F. filter resistor, primary of A.F. input transformer, or 1st A.F. bias resistor.
	—F2A to P2A.	230	250	Open primary of output transformer.
	—F2Aa to P2Aa.	230	250	
GRID VOLTAGES	C1R to G1R.	7.3	8	Open secondary No. 1 R.F.T.
	C2R to G2R.	3.7	4	Open secondary No. 2 R.F.T.
	C3R to G3R.	3.7	4	Open secondary No. 3 R.F.T.
	CD to GD.	11	12	Open secondary No. 4 R.F.T.
	C1A to G1A.*	1.8	2	Open 1st A.F. grid leak.
	—F2A to G2A.	44	48	Open 2nd A.F. bias resistor No. 2 or secondary of input A.F. transformer.**
	—F2Aa to G2Aa.	44	48	
SCREEN VOLTAGES	C1R to S1R.	119	130	Open connection to slider of volume control, open volume control resistor, or open bleeder resistor.‡‡
	C2R to S2R.	83	96	
	C3R to S3R.	83	96	

*This is the measured voltage, not the actual operating voltage.

**If 2nd A.F. bias resistor No. 1 is open, the grid voltage will be approximately 85.

†The detector plate voltage will be low, and the detector grid voltage high, if the "phone" condenser is shorted.

††In later Model 60 and 60-C, the primaries of No. 2, 3 and 4 R.F.T. are replaced by R.F. choke coils mounted under the chassis.

‡Low plate, screen, or grid voltages may indicate a partially shorted by-pass or filter condenser.

‡‡In early Model 60 and 60-C, incorrect voltage on 1st R.F. screen may be caused by defective screen-grid resistor No. 1 or 2.

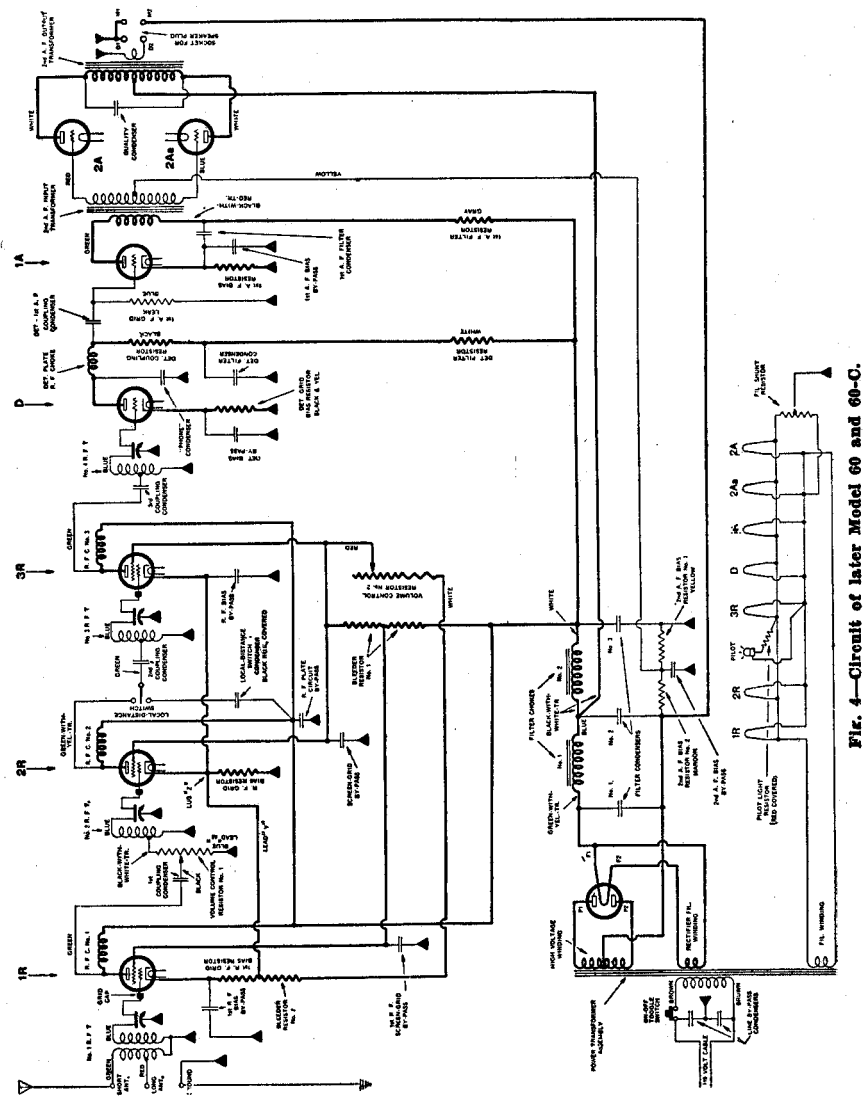

Fig. 4—Circuit of later Model 60 and 60-C. The changes shown above were made gradually, not all at one time.

VOLTAGE READINGS ON ATWATER KENT MODEL 66 RECEIVER (60 CYCLE)

Use High Resistance D.C. Voltmeter (About 0-50-250-500) to Measure Plate and Grid Voltages. Use A.C. Voltmeter to Measure Filament Voltages.

Tests Made With Set in Operation, All Tubes and Speaker-Plug in Sockets. Adjust Volume Control to Maximum. Make Tests in Order Listed.

	MEASURE ACROSS	Approx. Voltage 110 V. Line	Approx. Voltage 120 V. Line	NO READING INDICATES‡
FILAMENT VOLTAGES	—F to +F Contacts on the detector, 1st A.F. and each R.F. Socket.	2.2	2.4	Open filament winding or connection.
	—F to +F on each 2nd A.F. Socket.	6.9	7.5	
	F1 to F2 on Rectifier Tube Socket.	6.9	7.5	
PLATE VOLTAGES	C1R to P1R.	158	173	Open high voltage winding, open filter choke, open R.F. resistor, open R.F.C. No. 1, open R.F. bias resistor or 1st R.F. bias resistor or open speaker field coil
	C2R to P2R.	160	175	Open R.F.C. No. 2.
	C3R to P3R.	160	175	Open R.F.C. No. 3.
	CD to PD.	206	225	Open detector filter resistor, coupling resistor, R.F. choke, or det. bias resistor.
	C1A to P1A.	137	150	Open 1st A.F. filter resistor, primary of A.F. input transformer, or 1st A.F. bias resistor.
	—F2A to P2A.	412	450	Open primary of output transformer.
	—F2Aa to P2Aa.	412	450	
GRID VOLTAGES	C1R to G1R.	5.5	6	Open secondary No. 1 R.F.T.
	C2R to G2R.	2.8	3	Open secondary No. 2 R.F.T.
	C3R to G3R.	2.8	3	Open secondary No. 3 R.F.T.
	CD to GD.	23	25	Open secondary No. 4 R.F.T.
	C1A to G1A.*	2.8	3	Open 1st A.F. grid leak.
	—F2A to G2A.	78	85	Open secondary of input A.F. transformer, or open 2nd A. F. grid-filter resistor.
	—F2Aa to G2Aa.	78	85	
SCREEN VOLTAGES†	C1R to S1R.	110	120	Open No. 1 bleeder resistor.
	C2R to S2R.	78	85	Open No. 2 volume control.
	C3R to S3R.	78	85	

*This is the measured voltage, not the actual operating voltage.

‡Low plate, grid, or screen voltages may indicate a partially shorted by-pass condenser.

†High screen voltages may indicate an open No. 2 volume control or open No. 1 or 2 bleeder resistor.

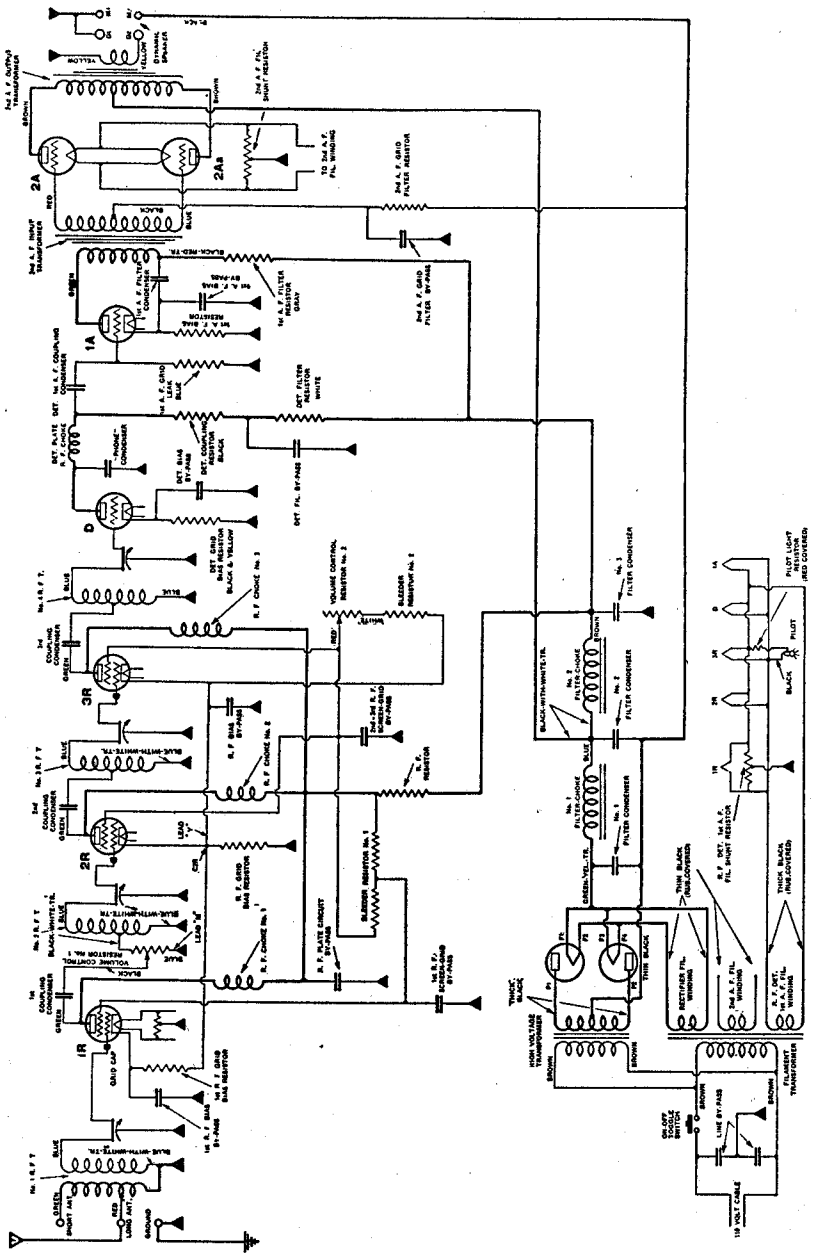

Fig. 5—Circuit of Model 66.

In some early Model 66, volume control resistor No. 1 is connected across the R.F. choke coil in the plate circuit of the 1st R.F. tube. The slider of this resistor is connected to a tap on No. 2 R.F.T. through a coupling condenser.

VOLTAGE READINGS ON ATWATER KENT MODEL 61, 61-C RECEIVER (DIRECT CURRENT)

Use High-Resistance D.C. Voltmeter (about 0-50-250).

Tests Made With Set in Operation, All Tubes and Speaker-Plug in Sockets. Adjust Volume Control to Maximum. Make Tests in Order Listed.

	MEASURE ACROSS	Approx. Voltage 110 V. Line	Approx. Voltage 120 V. Line	NO READING INDICATES‡
FILAMENT VOLTAGES	—F1R to +F1R.	2.9	3.2	Open R.F.C. No. 1 or No. 2 open filter choke, open filament series resistor No. 1, open 2nd R.F. grid bias resistor, open R.F.C. No. 3 or 4.
	—F2R to +F2R.	2.9	3.2	
	—F3R to +F3R.	2.9	3.2	Open filter choke, open 3rd R. F. or 1st A.F. bias resistor, or open filament series resistor No. 2.
	—FD to +FD.	4.6	5	
	—F1A to +F1A.	4.6	5	
	—F2A to +F2A.	4.6	5	
	—F2Aa to +F2Aa.	4.5	4.9	
PLATE VOLTAGES	—F1R to P1R.	78	85	Open primary No. 2 R.F.T.††
	—F2R to P2F.	78	85	Open primary No. 3 R.F.T.
	—F3R to P3R.	78	85	Open R.F.C. No. 5 or open primary No. 4 R.F.T.
	—FD to PD.	32	35	Open detector filter resistor, open primary No. 1 A.F.T., or open R.F.C. No. 6.
	—F1A to P1A.	50	55	Open 1st A.F. filter resistor, or open primary No. 2 A.F.T.
	—F2A to P2A.	80	87	Open "quality" choke or primary of output transformer.
	—F2Aa to P2Aa.	75	82	
GRID VOLTAGES	—F1R to G1R.	4.6	5	Open secondary No. 1 R.F.T.
	—F2R to G2R.	1.4	1.5	Open secondary No. 2 R.F.T.
	—F3R to G3R.	0.9	1.0	Open secondary No. 3 R.F.T.
	—F1A to G1A.	1.4	1.5	Open secondary No. 1 A.F.T.
	—F2A to G2A.	9	10	Open secondary No. 2 A.F.T.
	—F2Aa to G2Aa.	9	10	
SCREEN VOLTAGES	—F3R to S3R.	60	65	Open volume control circuit.
	—F2R to S2R.	46	50	
	—F1R to S1R.*	46	50	Open No. 1 screen-grid resistor.†

*Volume-control knob at minimum for this test.

†If 1st R.F. screen-grid voltage is about 100, with volume-control knob set at minimum, No. 2 R.F. screen-grid resistor may be open.

††In later Model 61 and 61-C, the primaries of No. 2, 3 and 4 R.F.T. are replaced by R.F. choke coils mounted under the chassis.

‡Low plate, grid, screen, or filament voltages may indicate a shorted by-pass for the respective circuits.

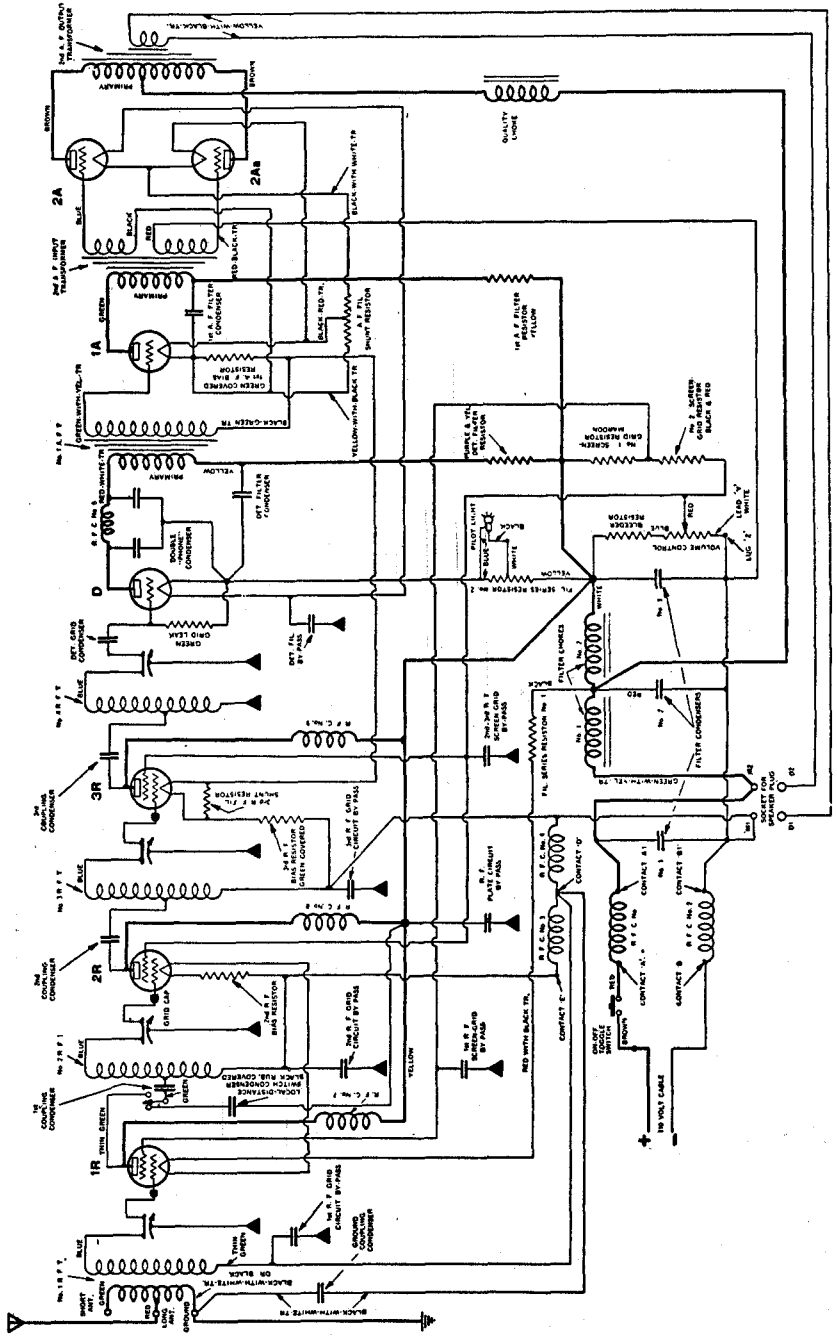

Fig. 6—Schematic diagram of later Model 61 and 61-C (Direct Current).
Note that R.F.C. No. 5 in diagram of early Model 61 and 61-C above, is omitted from the later model, and the number (R.F.C. No. 5) is skipped to avoid confusion.

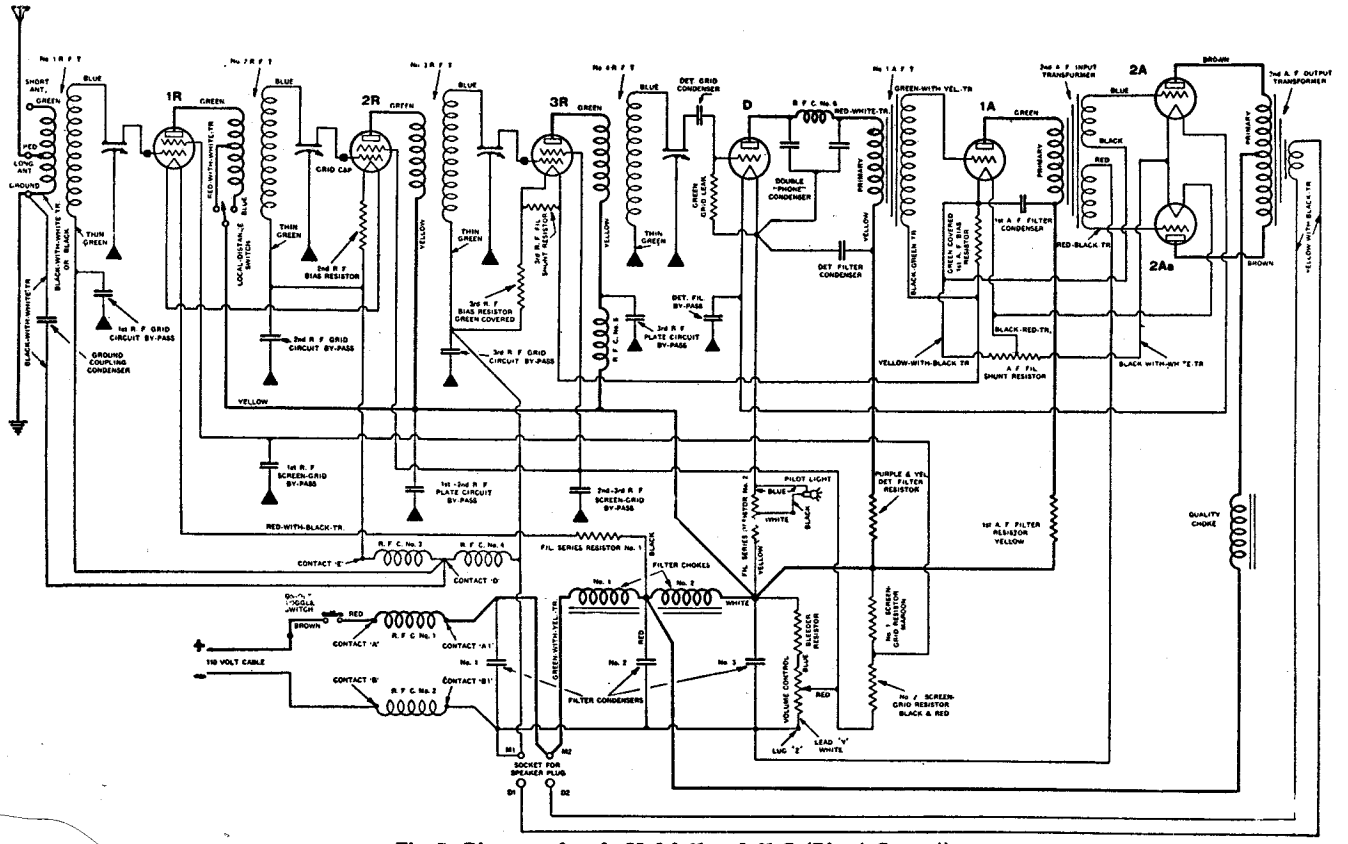

Fig. 7—Diagram of early Model 61 and 61-C (Direct Current).

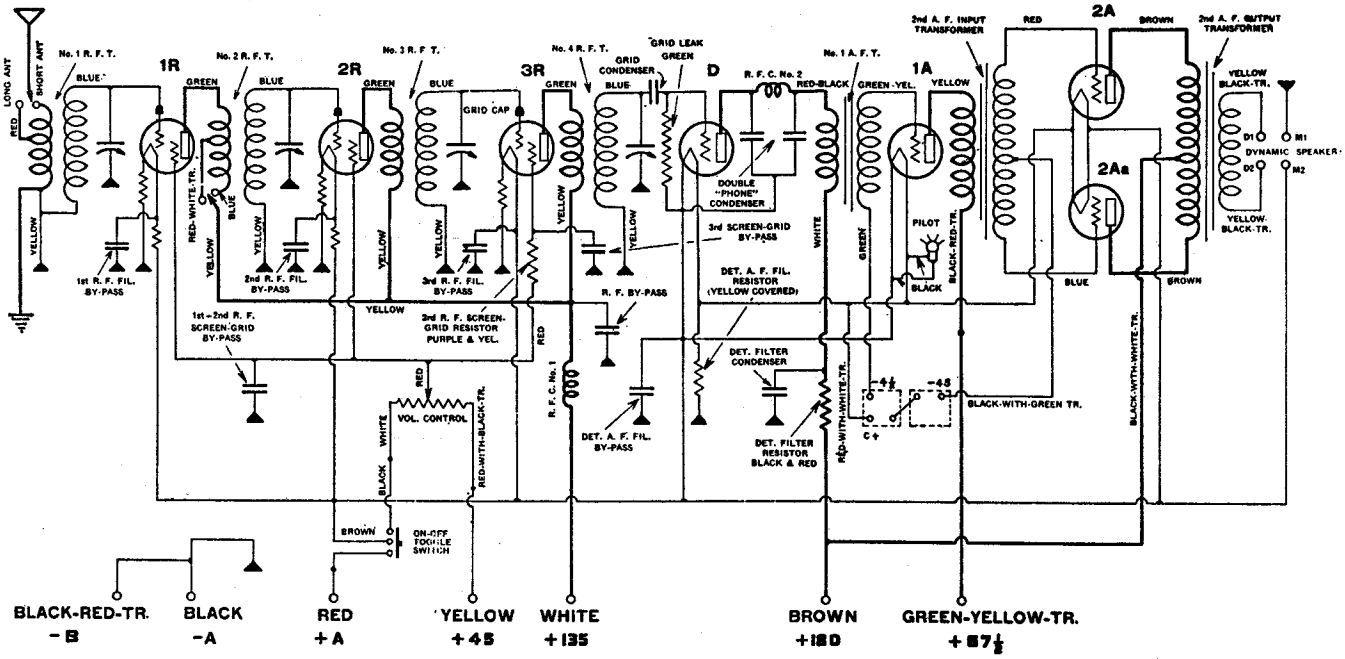

Fig. 8—Diagram of early Model 67 and 67-C (Battery Operated).

VOLTAGE READINGS ON ATWATER KENT MODEL 67, 67-C RECEIVER (BATTERY OPERATED)

Use High-Resistance D.C. Voltmeter (about 0-50-250).

Tests Made With Set in Operation, All Tubes and Speaker-Plug in Sockets. Adjust Volume Control to Maximum. Make Tests in Order Listed.

	MEASURE ACROSS	Approx. Voltage		NO READING INDICATES‡
		Total "B" 150 V.	Total "B" 180 V.	
FILAMENT VOLTAGES	—F1R to +F1R.	3.3	3.3	Open 1st R.F. filament resistor.
	—F2R to +F2R.	3.3	3.3	Open 2nd R.F. filament resistor.
	—F3R to +F3R.	3.3	3.3	Open 3rd R.F. filament resistor.
	—FD to +FD.	5.0	5.0	Open detector—A.F. filament resistor.
	—F1A to +F1A.	5.0	5.0	
	—F2A to +F2A.	5.0	5.0	
	—F2Aa to +F2Aa.	5.0	5.0	
PLATE VOLTAGES	—F1R to P1R.	110	135	Open primary No. 2 R.F.T., or open R.F.C. No. 1.*
	—F2R to P2R.	110	135	Open primary No. 3 R.F.T.*
	—F3R to P3R.	110	135	Open primary No. 4 R.F.T.*
	—FD to PD.	50	60	Open detector filter resistor, open primary No. 1 A.F.T., or open R.F.C. No. 2.
	—F1A to P1A.	55	65	Open primary of input transformer.
	—F2A to P2A.	150	180	Open primary of output transformer.
	—F2Aa to P2Aa.	150	180	
GRID VOLTAGES	—F1R to G1R.	1.5	1.5	Open secondary No. 1 R.F.T.
	—F2R to G2R.	1.5	1.5	Open secondary No. 2 R.F.T.
	—F3R to G3R.	2.5	2.5	Open secondary No. 3 R.F.T.
	—F1A to G1A.	4.5	4.5	Open secondary No. 1 A.F.T.
	—F2A to G2A.	45	45	Open secondary input A.F. transformer.
	—F2Aa to G2Aa.	45	45	
SCREEN VOLTAGES	—F1R to S1R.	30	45	Open connection in screen-grid or volume-control circuit.
	—F2R to S2R.	30	45	
	—F3R to S3R.	25	40	Open 3rd R.F. screen-grid resistor.

*In later Model 67 and 67-C, the primaries No. 2, 3 and 4 R.F.T., are replaced by R.F. choke coils mounted under the chassis.

‡Low filament voltages may indicate a shorted filament by-pass.

Low grid, screen-grid, or plate voltages may indicate a shorted by-pass for the respective circuits.

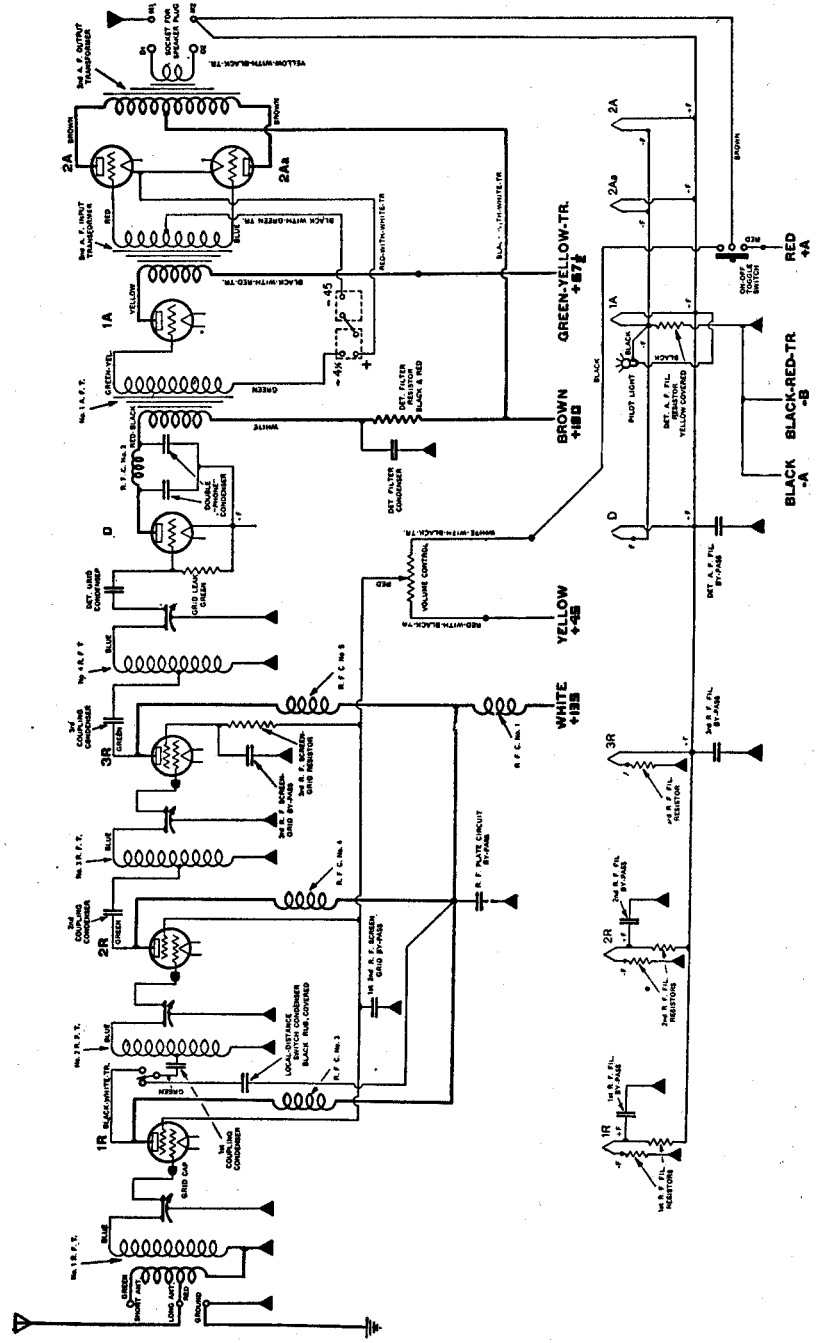

Fig. 9—Diagram of later Model 67 and 67-C (Battery Operated).

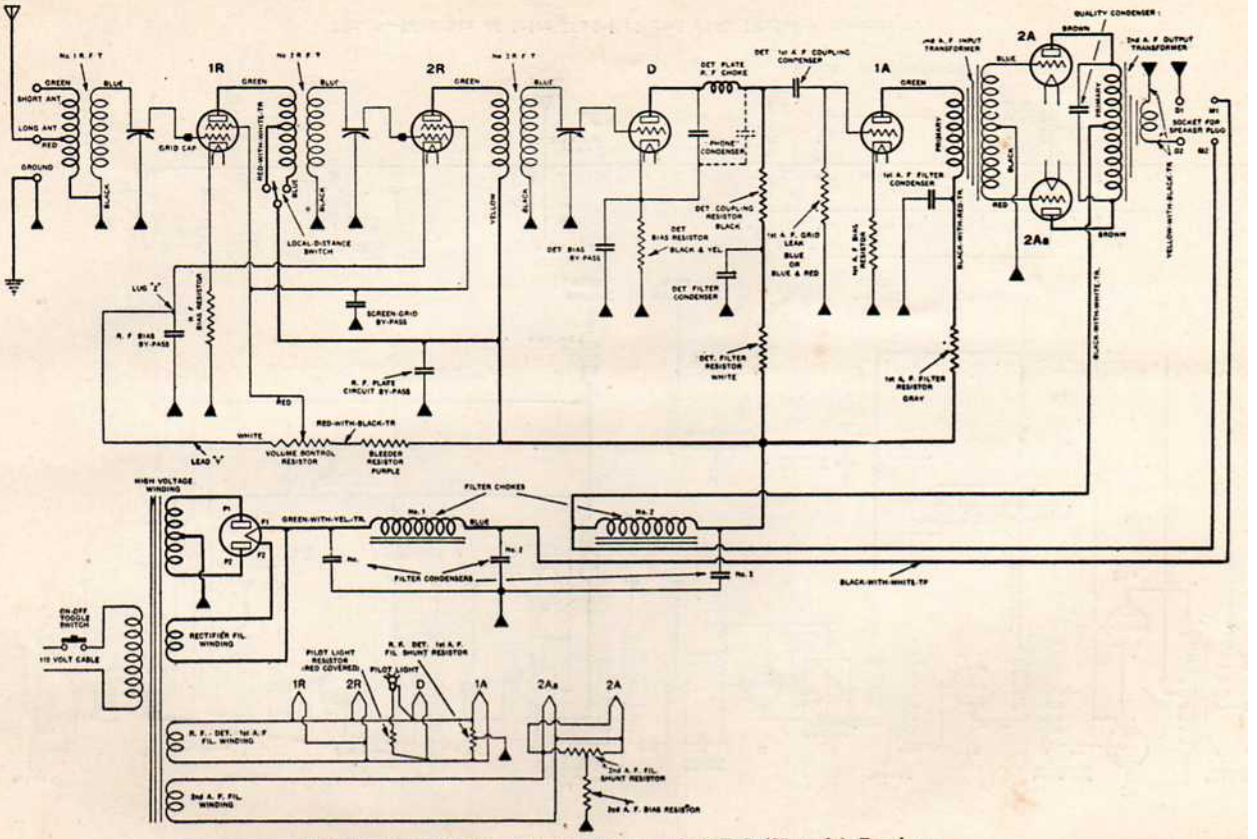

Fig. 10—Diagram of early Model 55-F and 55-F-C (25 cycle) Receiver.