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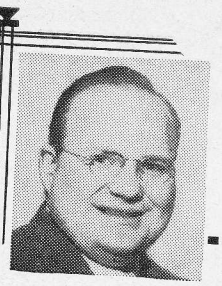


Transistor Topics

By LOU GARNER

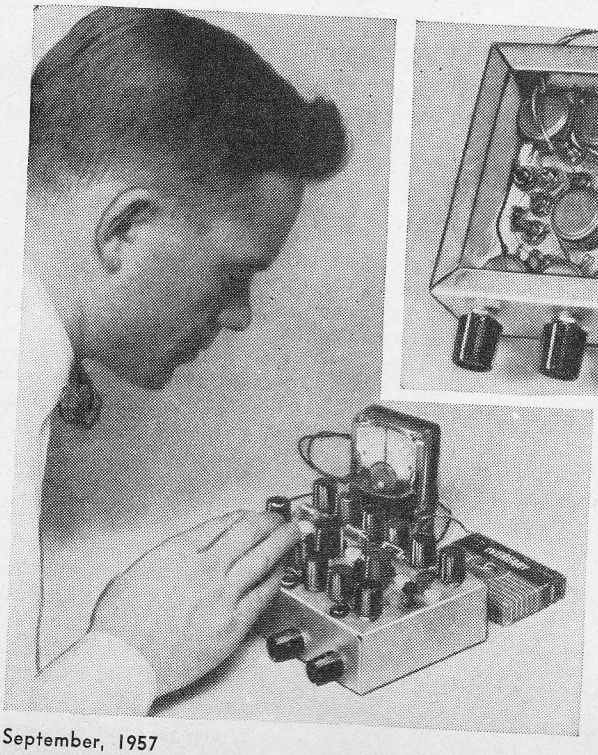
WITH the hottest part of summer past and autumn just around the corner, chances are many POP'tronics readers have found that their fingers are starting to itch . . . that the old urge is returning . . . and that they get chills up and down their spines whenever they look in a radio parts catalog.

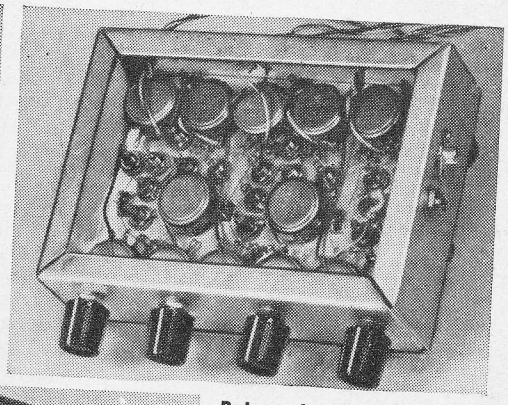
All of these sensations are symptoms of that old and rather pleasant ailment—"electronic builditis." A sure remedy is to choose a good project from your favorite magazine, gather together the necessary parts, heat up the old soldering iron—and start assembling. So why not start with a transistorized project?

Transistor Circuit Designer. Few thrills match that of creating and developing a completely new circuit. Unfortunately, transistor circuit design is not easy. There are so many variables to consider that even a highly trained design engineer may have difficulty designing a circuit "on paper" that will work without changes when it is assembled.

But Dick Keller, of the Semiconductor Products Department of *General Electric*, has developed an instrument that should prove valuable in every electronics workshop. Dubbed a *Transistor Circuit Designer*, it will enable a fledgling to devise new transistor circuits with an ease approaching that of an "old hand." And you don't have to know . . . or to use . . . mathematics to operate the device! !

Basically, the circuit designer consists of a partially wired three-stage transistor circuit assembled on a 5" x 7" aluminum chassis (see Fig. 1 and the photos). Sockets are provided for each transistor, with small potentiometers used for all resistive elements. Six potentiometers are available





Below-chassis view of Dick Keller's transistor circuit designer. See Fig. 1, on following page, for the schematic diagram of the gadget.

Using the circuit designer, even a beginner can create new transistor circuits.

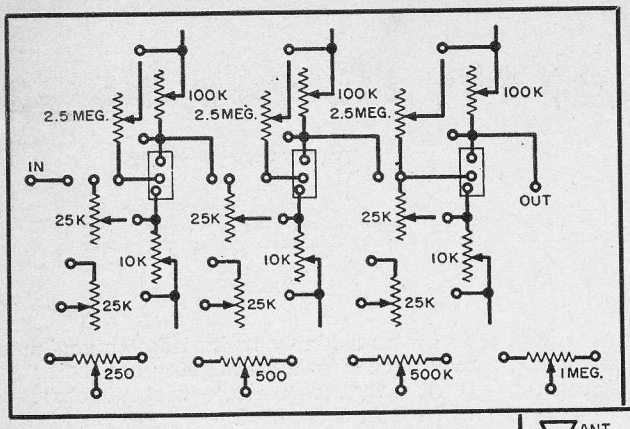


Fig. 1. Schematic diagram of the circuit designer. Small potentiometers are used for all resistive elements.

Fig. 2. Two-transistor receiver circuit, submitted by reader Roy Frank. It utilizes complementary properties of n-p-n and p-n-p transistors.

for each stage. Instead of trying individual resistors one at a time, the best value can be determined simply by adjusting the appropriate pot.

The transistor electrodes may be returned to either polarity of the external battery power supply and even reversed from one stage to the next for *n-p-n/p-n-p* configurations. Pin jacks are used for each terminal connection, making it a simple matter to insert capacitors, transformers, coils, diodes, or other special components into the circuit being designed.

In operation, a tentative circuit is assembled by interconnecting appropriate pin jacks with short wire leads. Afterwards, the emitter, base, and collector resistor values may be adjusted experimentally simply by rotating the proper potentiometer. Once the desired circuit operation is achieved, the resistance values may be measured and fixed resistors specified in the final design.

If there is any question concerning circuit stability or transistor interchangeability, the necessary tests may be made while the circuit is still in the experimental stage. Parts changes, if required, can be made before the circuit design is "frozen."

Reader's Circuit. An interesting two-transistor receiver circuit utilizing the complementary properties of *n-p-n* and *p-n-p* transistors is given in Fig. 2. The basic circuit design was submitted by reader Roy Frank, of 4783 Fair Ave., Oakland 19, Calif., and the transistor types specified are manufactured by *General Transistor*.

L1 is a ferrite transistor antenna coil (*Lafayette* No. MS-299). *C1* is a standard 365-$\mu\mu$fd. variable capacitor and *C2* a 0.05-μfd. paper or ceramic capacitor. *R1* is a 470,000-ohm, ½-watt carbon resistor, *S1* a s.p.s.t. toggle or slide switch and *B1* two penlite cells connected in series to supply three volts. Standard moderate-to-high-impedance (2000 to 4000 ohm) magnetic headphones are used with the receiver. A medium-length external antenna is needed in most localities, but a ground is not necessary for the reception of nearby stations.

You can assemble this simple receiver on a small metal chassis or in a wooden or plastic box. Parts layout and lead dress are not critical. For optimum operation, you may want to experiment with the values of *C2* and *R1*. Try values from 100 $\mu\mu$fd. to 0.05 μfd. for *C2*, values from 250,000 ohms to 1 megohm for *R1*. Choose the final values which give the best results with your individual transistors.

In operation, r.f. signals picked up by the antenna (*Ant.*) are selected by tuned circuit *L1-C1*. *C1* may be adjusted to tune the desired station. A tap on *L1* permits a match to the comparatively low input impedance of the first stage and prevents excessive loading of the tuned circuit. *C2* serves as a d.c. blocking capacitor for the base bias current supplied through *R1*. Amplification and detection occur in the two-stage direct-coupled transistor amplifier.

In Other Lands. We've received a note from Mr. R. V. Parrett of Ellison Queale Radio Supply, Ltd. (1205 Quadra St., Victoria, B. C., Canada), who would like us to "pass on the word" that Canadian readers can obtain transistor components and sup-

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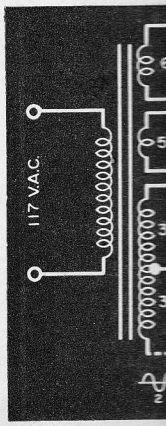
Fig. 1.



leads had flaked off and we weren't too sure of connections. However, once this component was mounted, we found that the leads almost "fell in place."

In use, the sweep generator is connected to the "input" of the r.f. or i.f. amplifier to be tested or aligned. A standard oscilloscope is connected to observe the signal across the amplifier's second detector. If an individual stage is to be studied or checked, a separate broadband detector probe is employed with the 'scope. Finally, a connection is made between the *Scope Hor.* terminals of the sweep generator and the *Horizontal Input* terminals of the oscilloscope—the internal linear sweep of the 'scope is not used. With the 'scope and sweep generator controls adjusted, the frequency response curve of the amplifier under test is displayed on the screen of the cathode-ray tube.

All factors considered, the Model 368 represents a good buy for the experimenter who works with FM tuners, TV receivers, or similar types of equipment. And the assembly of the instrument is an especially good project for the advanced student. —30—

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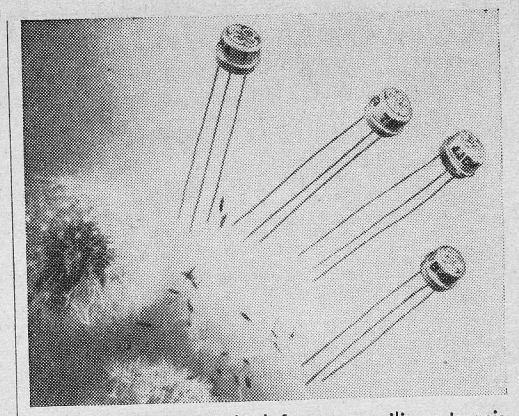
plies from his firm. And he has a pamphlet of transistor projects available to anyone *free* for the asking. Be sure to drop him a card requesting a copy.

There are a couple of interesting developments in Germany. Elektromedizinische GmbH. is offering a battery-operated transistorized electronic stethoscope to the medical profession. And Audio-Master of New York is marketing a German-made transistorized three-speed portable phonograph which lists at $89.50, plus tax.

Although Britain is probably about two years behind advanced U. S. firms in the transistor field, she is rapidly "catching up." Some eight major British firms are rushing transistor production. The estimated 1956 production of British transistors is about 500,000 units. Somewhere between one and ten million units is expected in 1957.

We've heard that General Electric Co., Ltd. expects 1957 sales of about 500,000 units, with a fair percentage exported. Several other Anglo-American firms are being formed, including Sylvania-Thorne and Semiconductors Limited—the latter being a joint effort of Philco (American) and Plessey Co., Ltd. (British).

Product News. The J. W. Miller Company (5917 S. Main St., Los Angeles 3,



General Electric's high-frequency silicon transistors compared in size with "seeding" dandelions.

Calif.) has introduced a new transistorized receiver kit. Catalog No. 555, the receiver is named the "Transistall." It uses a unique reflexed arrangement to achieve four-transistor performance with a three-transistor circuit.

Production of a new line of high-frequency, high-temperature silicon transistors has been stepped up by General Electric (Syracuse, N. Y.) to meet increasing industrial demands. Manufactured by the diffused-meltback process developed in G.E.'s Advanced Semiconductor Laboratory, these new units are rated at 25 mc. but can provide useful gain up to as high as 50 mc. Gain ratings vary from 12 to 30, depending on type, with a 150-mw. collector dissipation rating at room temperatures.

From the Argonne Manufacturing Company (27 Thompson St., New York 15, N. Y.), famous for its line of miniature audio transformers, comes news of three new subminiature i.f. transformers. Designed for 455-kc. i.f. stages, these units measure *only 3/8" in diameter by 5/8" high*, yet feature slug-tuning and a molded-in fixed capacitor. Anticipated selling price is slightly over one dollar at all Argonne distributors. Type Nos. are AR-220 (Input), AR-221 (Interstage), and AR-222 (Output).

The General Transistor Corporation (91-27 138th Place, Jamaica 35, N. Y.) is offering especially matched pairs of *p-n-p* and *n-p-n* transistors for complementary-symmetry applications.

Clevite Transistor Products (241 Crescent St., Waltham 54, Mass.) now manufactures a semiconductor diode which uses a silicon-germanium alloy. These units combine the better high-temperature performance of silicon with the higher forward conductance characteristics of germanium.

Well, fellows, that about does it for now . . . see you next month.

Lou