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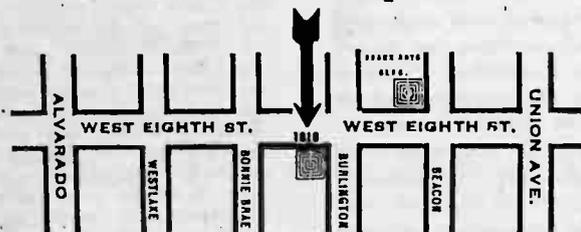
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PLENTY OF PARKING SPACE

The "TECHNICIAN"

Bulletin and House Organ of

The Certified Radio Technicians' Association

An Organization of Competent, Qualified and Trustworthy Radio Technicians for the Purpose of Advancing the Radio Art and for the Protection of the Public.

A. PAUL, Jr.
President

JOHN L. VINCENT
Vice-President

JOHN A. ORME
Sec.-Treas.—Adv. Manager

\$1.50 Per Year



Editor

NORMAN B. NEELY
1569 Munson Avenue
Los Angeles, California

15 Cents Per Copy

VOL I

JANUARY, 1934

NO. 5

EDITORIAL

By The Editor

Opportunity and Education

In this day of rapid progress and extensive scientific development we find many of the old proverbs to be disprovable. The adage—"Opportunity knocks but once"—certainly does not obtain today when man has so much power to shape his individual destinies. New opportunities appear every day and every hour. However, it is imperative that we prepare ourselves to take full advantage of these opportunities when they beckon.

"Hard work spells success" is another old proverb with which we may rightfully disagree. Hard work, mechanical skill and long experience do not necessarily mean greater qualification for a given field of endeavor than a thorough education in the fundamentals of the work concerned. On the contrary it will be admitted that a man who has spent ten years of "fixing" radio sets probably is not nearly so good a radio technician as a man with a comparatively brief experience combined with a thorough understanding of the fundamentals of electrical and radio theory and practice.

A given plow hand may, by super human effort, be able to plow one more acre of raw land in a given number of hours

than his fellows, but one can hardly say that this accomplishment due to "hard work" constitutes lasting success. An exceptionally fast radio operator with no technical education has nothing to look forward to except a life of pounding a typewriter at top speed which is undoubtedly hard work, until automatic equipment eventually replaces him.

Machinery is continually replacing thousands of skilled mechanics. One thing a machine has never had in any profession, however, is the ability to think.

Educated brains are the prime requisite if we are to assure ourselves of success in any line. We should avail ourselves of every opportunity to increase and extend our education. Members of the Certified Radio Technicians Association are indeed fortunate in being given the opportunity of learning more about the fundamentals of radio engineering and the electronic arts. No technician should fail to avail himself of these opportunities when and as often as they knock. The opportunity of advancing our education is open to all of us and if education spells success let us be successful.

To facilitate ready contact with any member of the officers and directors of the Association, the following directory is published for your convenience:

Name	Office	Phone	In Charge of:
A. Paul, Jr.	President	OX. 8877	Public Relations
John L. Vincent	Vice-President	KE. 1640	Arbitration
John A. Orme	Secretary-Treasurer	AT. 9501—1348 West 20th Street	
Norman B. Neely	Director	AL. 1628	Meetings, Papers, Publications
E. H. Darrow	Director	AN. 4509	Finance and Budget
Geo. W. Ekelberry	Director	HL. 2788	Employment and Membership
Art Oodrys	Director	CA. 5542	Publicity
Charles E. Miller	Director	HE. 2697	Technical and Examining Boards
George Kis	Director		Statistics
Richard G. Leitner	Director		Consultant

NEW RECORDING LABORATORY

The Technical Service Laboratories, operated by A. Paul, Jr., have installed a recording laboratory which is attracting widespread attention. The laboratory is cooperating with several institutions devoted to the training of vocal and instrumental talent for motion picture, radio, and theatrical entertainment. Air check, that is, recording of portions of radio broadcasts are made for radio entertainers. Those using this service claim that it is invaluable both for the student and the professional in that it gives the performer the audience point of view, something hitherto not possible.

The equipment is all original in design and was designed and built by Mr. A. Paul, Jr., and the engineers of the Technical Service Laboratories. Many of the difficulties of aluminum recording have been overcome in this system, and unusual fidelity is being obtained. In fact, the quality achieved is closely comparable to professional wax recording. In addition to the studio installation, Mr. Paul has a complete portable recording and play-back unit which may be taken to public functions or other necessary locations for the purpose of making records under almost any conditions. Universal microphones and head screws are being used exclusively with very satisfactory results, according to Mr. Paul.

NOTICE TO ADVERTISERS AND THEIR PATRONS

Beginning with Dec. issue each advertiser will be furnished with suitable cards to display in the proper places which will signify that the holder of the card has advertised in the "TECHNICIAN" for the month shown on the card. Advertisers will place these cards in their windows and on their counters. Technicians are urged to patronize only those firms whose advertisements appear in these pages. These men are soliciting your business and are supporting your efforts to progress—it is only fair to reciprocate by giving your business exclusively to those who evidence a willingness to help us.

NEW LECTURE COURSE IN PRACTICAL ENGINEERING

Beginning January 15th, Mr. Richard G. Leitner, eminent consulting radio engineer, will present a lecture course in practical radio engineering starting with the elementary principles of algebra and physics as applied to radio equipment. This course will continue throughout the year and will cover the entire field of radio including the design of test equipment and amplifiers. The men availing themselves of this opportunity should conscientiously study the assignments recommended by Mr. Leitner and faithfully keep notes as outlined. If they will do this and encourage discussion of obscure points it is a foregone conclusion that they will rank among the best qualified radio technicians in the country and command the respect and remuneration due a trained member of a rapidly advancing profession.

This course is made possible through the kind generosity of Watson and Wilson, Kierulff and Goddard and the National Union Tube Co. Watson and Wilson and Kierulff and Goddard are distributors of National Union radio tubes. These companies are to be highly commended for their kindness in bringing Mr. Leitner's lectures to the radio technicians of Southern California.

UNPRECEDENTED DEMAND FOR COPIES OF THE "TECHNICIAN"

Due to the unprecedented demand for copies of the "TECHNICIAN" from every quarter we have been forced to more than double our previous circulation with this issue. In accordance with this increase in circulation and the recent advances in the cost of printing and materials it has been necessary to raise the advertising rates slightly. Information regarding the new rates may be obtained by calling the advertising manager, John A. Orme, at Atlantic 9501.

"THE FIVE METER BAND"

By J. J. GLAUBER
Chief Engineer, Arcturus Radio Tube Company
PART TWO

ANALYSIS OF CIRCUITS SUITABLE FOR SHORT WAVE OSCILLATORS

Single Tube Circuits

We may arrive at a general idea of the circuits suitable for work on short waves by a consideration of those commonly used on longer wavelengths. The usual method of making a tube oscillate at these wavelengths is to transfer energy from the plate circuit to the grid circuit of the tube until at least as much energy is taken from the plate current supply as that lost in the tube and its attendant circuits. Two representative circuits used in transmitters some years ago are shown in figures 1 and 2.

The circuits are very similar except that in one the tuned circuit is between plate and filament while in the other it is between grid and filament. These two circuits may be combined to make a single circuit in which both grid and plate are tuned as shown in figures 3 and 4 and this circuit may be redrawn as in figure 5.

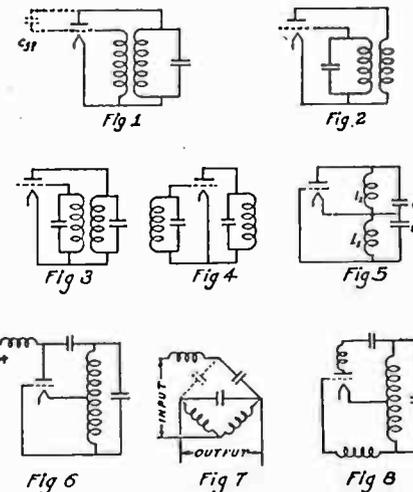
Now if the inductance of the grid coil and that of the plate coil is the same, and the capacities are also equal, the period of oscillation of the two circuits is the same. Also the natural frequency of the circuit L_1C_1 is the same as that of L_2C_2 and L_1C_1 . This means that as far as the oscillating current is concerned, we may omit the connection between the common point of the inductances and the condensers without changing the constants of the circuit. If the two capacities are then replaced by a single capacity we have the familiar Hartley circuit. If desired, the connection between the filament and the center of the coil may be omitted; by this means, the oscillation is left free to locate its nodal point at or near the center of the inductance. In some cases at short wavelengths this is a definite advantage, since it is unnecessary to find the exact electrical center of the inductance, which is the only point that should be held at the filament potential.

If the connection between the center point of L_1L_2 and C_1C_2 be omitted and the filament left connected to the common point of the condensers a circuit often referred to as the Colpitts circuit is derived.

So far the method of supplying power to the tube has been neglected. There are two methods of supplying power to these circuits, that is either series or par-

allel feed. In most circuits it is necessary to insert a blocking condenser in series with the grid in order to render this independent of the high voltage supply.

There may be a small difference in the behavior of such oscillators on long and short wavelengths. At medium and long wavelengths the coupling between grid and plate coils is predominately inductive.



Drawn by J. J. Glauber

On shorter wavelengths, however, the electrostatic couplings between the coils and the tube elements become very important and at very high frequencies may exceed the magnetic coupling. Care must therefore, be taken in the layout for high frequencies as the capacitive and inductive couplings are usually of opposite sign.

It is the small capacity inside the tube between the grid and plate which determines the suitability of the circuits thus far discussed for work on short waves. If, in the first circuit we let C_{gp} represent the grid to plate capacity, it will be seen that in the condition of oscillation this capacity acts against the mutual induction between grid and plate coils. Suppose the grid becomes temporarily of greater negative potential than its normal steady D. C. value. A pulse of current will flow from filament to grid. The resistance of the tube will increase and therefore will decrease the plate current

(Continued on page 8)

THE "FIVE METER BAND"

(Continued from page 5)

with a consequent rise in plate voltage. The mutual induction between plate and grid coils should be such as to assist this action. When the grid increases in positive potential therefore the plate voltage should fall. The capacity C_{gp} tends to stop this action and in doing so decreases the amplitude of oscillation. The effect of this capacity, however, is small except at very high frequencies, and we are left with the result that the first three circuits mentioned are suitable for work on medium and long waves, but unsuitable for the shorter wavelengths, say below 100 meters.

The Hartley and Colpitts circuits as derived are symmetrical about the D. C. supply while the first two circuits are unsymmetrical. Also, in both the Hartley and Colpitts circuits the grid to plate capacity is balanced by another condenser at the opposite end of the oscillatory circuit. This may be seen by considering the Hartley circuit and its equivalent diagram in figures 6, 7 and 8.

The input supply and output in this circuit are at opposite corners of a bridge circuit. This arrangement has been found advantageous in short-wave oscillators and has led automatically from the asymmetrical circuits, suitable for long and medium wavelengths to their symmetrical derivatives. In actual practice the blocking condenser is greater than the grid plate capacity in order not only to neutralize the plate to grid capacity, but

also to provide reaction of the proper sign between the plate and oscillatory circuit.

The single tube circuits thus far discussed can be made to oscillate at very short wavelengths by a careful selection of the inductance, condenser, tube and adjustment of the D. C. supply circuits. While in most cases smooth and continuous alteration of wavelengths can be obtained by a variation of the tuning condenser, it is sometimes found that the oscillation frequency suddenly jumps from one value to another and higher value not harmonically related to the first. Also in other cases oscillation may cease entirely if the frequency is raised above a certain critical value. The first effect is probably due to the fact that the connecting leads to the tuned circuit are comparable in reactance to the inductance, and that the system really comprises two circuits coupled by the main tuning condenser and having two degrees of freedom. The validity of this explanation is supported by the fact that the value of the second or higher frequency referred to is dependent upon the capacity of any coupling condenser inserted in the connecting leads. The cessation of oscillations entirely when the frequency is raised above a certain critical value is often caused by an action taking place within the tube itself. A certain amount of the electron stream constituting the space current, or rather which would under ordinary circumstances, constitute the space-current, escapes from the control of the electrode potentials owing to the electron-lag effect. These stray electrons produce a powerful space-charge effect which, since they are outside the normal control of the electrodes, cannot be neutralized by modifying the electrode potentials. By placing the hand on the glass envelope or by pasting tin-foil on the glass envelope oscillations will again start. The effect may be explained as follows: The potential sign of the electron cloud of which the independent space charge consists is of course, negative. This induces a positive charge upon the tin-foil, with the result that the electron cloud is attracted towards the foil, most of it being held against the inner wall of the bulb, away from the elements where it cannot interfere with the operation of the tube. The foil may be left free or connected to a high positive potential.

(Continued in next issue)

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EDUCATIONAL INTERVIEW

By I. O. KORFHAGE

"I was just tha-rilled when Mrs. Swan-kum told me she was having the famous scientific explorer, Prof. Ulyssus S. Scroggs here tonight also! And to think that I am actually having an opportunity to talk to you! Not many young girls would be interested but I've always been different. I'm so interested in people who do things—I don't even care what they may look like! You must tell me all about the places you've explored. Let me see, you discovered the North Pole—or was it the South?"

"Well-er-not exactly. I've penetrated north as far as—"

"Oh yes, its north, of course! Tell me, did you ever have any adventures with those funny white polar bears?"

"Why yes. I was once cast adrift with one on an iceberg for a few harrowing hours. It—"

"Oh, how perfectly tha-rilling! It reminds me of a frightful experience I had with a mouse one time. I was all alone in the room when the horrid little thing appeared. I though my hair would turn white before someone heard my screams and came and frightened it away! But do tell me more of your experiences. I suppose you've seen Eskimos too?"

"Why-er-yes. I lived in an Eskimo village for a year once, while preparing my book on the lives of—"

"Oh, isn't that interesting! I suppose you know all about their habits n'everything. They live on blubber and dwell in ice houses. Of course I know they don't eat Eskimo pie! By the way, have you ever eaten one of those ice cream pies with strawberries crushed and spread all over the top if it, Professor? My chum and I discovered that way of eating them and if it doesn't make you sick, its simply delicious! But do tell me some more—have you ever seen the Northern Lights? What are they like?"

"Indeed, young lady, I have seen them very often. They create a most profound impression on one as accompanied by that crackling, indescribable sound—"

"Oh, have they sound effects too? It makes me think of a talkie I saw the other day called 'Iceman's Folly.' You should see is Professor, as it tells all about the frozen north. Its about a girl and a man—Oh, must you go, Professor. Well, anyway, I'm so glad to have met you. Its so interesting to have talked with someone who has done things—so educational."



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HIGH POWERED MULTI-TAP

By *G. McL. COLE

Ye proverbial stork has made a visit with the result that a new cousin is in the "Multi-tap" family. This Multi-tap is a big strapping fellow—rarin' to go. How he can handle those 281's and 210's. Yes Sir!—those big radio sets and power amplifiers are just his meat.

Recently it was shown that a single transformer readily handled many different types of sets with just about every combination of tubes now in use. (Fig. 1) This transformer is the Multi-tap. Four Multi-tap transformers replace defective units of these various set types in 4 to 10 tube sets. Notice that the transformers supply correct voltages to 1.5v-26's, 2.5v-24's, 2.5v-45's, 2.5v-82's, or 5.0v-80. Also that by using series combinations of the filament windings it supplies 6.3v heaters with either 6.3v power tubes or the new 2A3, 2A5 or 2B6 power tubes. In either case the 2.5v-82 or the 5.0v-80, 83, 5Z3 may be used. There is one type of set, however, whose conditions cannot be met with these four Multi-taps. This refers to those sets using 210 or 250 power tubes with 281 Rectifier tubes.

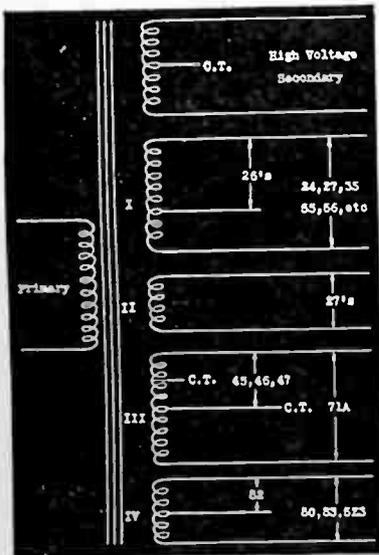


Figure 1

The 210 type tubes require high voltage at high current drain such that the normal A C plate voltage of the second-

ary is 1400 volts at about 150 M A drain—105 watts in the high voltage circuit alone. The usual 10 tube set using 24's, 27's, 47's and an 80 rectifier only drains about 105 watts for plate power, filament supply—everything. While the Multi-taps could readily have been extended to include the 210—281 tubes as well as the 24, 27, etc. combination, for which they are intended, why penalize, say, a six or seven or any of this type set with a much too large transformer for the sake of super-super universality? No, it was better to draw the line and make one transformer to supply power to all such sets and amplifiers. Hence, the new addition to the Multi-tap family. Figure 2 shows the general circuit diagram of this transformer. Let us list some of the well known set types using 210 or 250 power tubes and 281 rectifier and then see how the transformer meets the requirements of these sets.

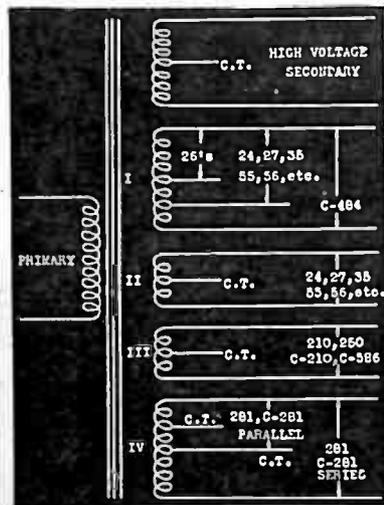


Figure 2

This listing follows:

1. 26, 27, 50, 81.
2. 27, 50, 81.
3. 27, 27, 50, 81.

Then there are the 3v tubes:

4. C-484, C-210 or C-586, C-281
5. C-226, C-484, C-586, C-281

In the amplifier and Public Address

(Continued on page 11)

VERSATILE TEST INSTRUMENT

(Continued from page 7)

clip located on the handle. The nine wire cable leading to the tester proper is wired to a combination 4-5-6- prong socket in parallel with a combination large and small 7 prong socket.

Each one of these wires with the exception of the ground wire passes through a D. P. D. T. push button switch. These switches when depressed connect the milliammeter into the circuit corresponding to the button pressed. For example, pushing the button marked "PLATE" will indicate on the meter the current flowing to the plate connection on the socket, etc.

The contacts on the two 10 point single layer rotary switches are connected to the various socket contacts, and as the arms are connected to the voltmeter, the difference in potential between any two tube elements can be read.

For point-to-point resistance measurements, the button marked "POINT-TO-POINT" is depressed, this substitutes the ohmmeter for the voltmeter, and the resistance between any two contacts on

the same socket can be measured. By turning one of the switches to contact 10, one ohmmeter lead is transferred to the arm of another 10 point switch the contacts of which are connected to plug No. 2. This enables one to measure the resistance between various socket contacts on two different sockets. The various volt and milliamperage ranges are selected by rotary switches. However, for the protection of the meter the maximum range is normally in the circuit until the buttons marked "LO-RANGE" are pressed, this connects the range at which the switch is set.

It is believed that this analyzer will prevent obsolescence of test equipment and as it uses only a 7 to 6, 7 to 5, 7 to 4 and 7 large to 7 small adapters, the expense of constantly buying adapters is eliminated.

STOLEN RADIOS

Philco Model 19B, No. J34175, Baby Grand Table model with shadow tuning. Philco Auto Radio, Model 5, No. K14257. Was, or still is, in the possession of Mr. Douglas Swanson. Installed in a Moon sedan, 1925 model, license No. 3N9469.

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TECHNICAL QUESTION AND ANSWER DEPARTMENT

Conducted by CHARLES MILLER
Chairman, Technical Board

Q. Can the beat note interference be eradicated from a Jackson-Bell, Ser. No. 11327? —R. A. Y.

A. Your trouble is due to images, hence the only cure is to rebuild the set, taking care to shield all of the RF circuits. Preselection would give still further improvement.

Q. In what way might an AF transformer cause distortion? —A. A. S.

A. The most common causes of distortion are insufficient copper or iron, or both. Too low a primary impedance discriminates against the lower frequencies. High distributed capacity cuts the high frequency response. Saturation of the core causes harmonic distortion.

Q. What is a simple setup for testing for gassy tubes? —A. A. S.

A. The usual method is to add several megohms resistance between the control grid and the point of grid return.

Q. How might a noisy AF transformer be detected? —A. A. S.

A. The most common method is with a head-set and B battery. If the set is still in the cabinet continuation of the noise with the preceding tube removed and cessation of the noise with the removal of the succeeding tube is a good indication. Replacement with a new transformer is the surest proof.

OPEN FORUM

Jan. 13, 1934

The "TECHNICIAN"—C. R. T. A.

Dear Editor:

May we express our wish for the success of your helpful and necessary publication. We feel that it should be given the great support of all technicians and the advertisers as well.

The contents are fine, interesting and educational and trust you will improve contents as time goes on.

You will have the support of our organization at all times and we ask you to call on us for any editorial contributions we have that you may desire.

Greetings to you and your staff.
W. L. SEXTON.

Radio "Doc."
721 So. Main Street.

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GRUNOW

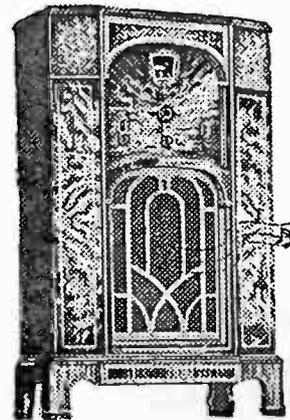
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SALESMANSHIP

By GEORGE KIS

Now that the depression is over and we are confident that the new year is going to bring us all prosperity, a little non-technical discussion won't do any harm. Even if some will think that the question we are to discuss is beyond the limits of this magazine, we think it is of enough importance to take up some of its space.

There is indeed too much being written about what should be done and what can be expected in the future. We confess that we too found many of the world-saving plans quite fascinating, but were scared to death by the outlook given in others. Take for instance, Technocracy, one of the outstanding and most widely discussed theories of last year. Who would object to the \$10,000 minimum income of that plan, even if they call it "Watts" instead of dollars? On the other hand the statement that in 1929 we had reached that state in which we were producing more than we could consume, due to technological development and mass production, sounds bad enough to all of us who expect to make a living doing some kind of work. Luckily the statement was proven absolutely untrue, both actually and potentially, first by results of the census of 1930—showing that a larger percentage of the total population over 20 years old was gainfully employed in the United States than at any previously recorded period in our history and that total employment here was higher than in any other civilized country compiling accurate data. (Some wise guy once made the bold statement that statistics is the science through the aid of which anything and the contrary of anything can be proven. This may be true, probably is true, and yet, until someone develops a better method, we have to draw our conclusions from statistical data for better or worse). Second: by sound reasoning. Who can speak of overproduction when there are millions without adequate shelter and food, tens of millions without cars, hundreds of millions without a good radio-receiver?

The technician doing service work is comparatively safe in the technocratic community anyhow: his work will never be done by machinery. And yet don't let us overlook the fact that our work is far from being fully appreciated; its valuation is rather slipping downward constantly. Is this fact only due to generally poor business conditions, is it due to an "overproduction" of competent technicians, or is there something else at the bottom of our troubles?

We have been told that we have to become better salemen, yes even that salesmanship really is more important than technical competence. What is the proportion in the valuation of technical work versus selling ability anyhow?

We see that all the labor saving inventions added to the elimination of the workers in the factory, only to let them climb aboard the product on its way from the factory door to the ultimate consumer. Reliable sources tell us, that in a motor car selling for \$3,000, there is only about \$180 worth of direct factory labor cost, while it takes \$1,200 to sell the car—40 per cent of the total price. A certain motor accessory contains thirty-five cents worth of direct labor; the manufacturer sells it F. O. B. factory for \$5.00; the consumer pays \$25.00 . . . These facts seem to indicate that modern industry is saving labor at one end only and that the less important one. It is whittling away manfully at production costs, which are often relatively small, and doing rather worse than nothing in respect to distribution costs, which are relatively huge. Every business man is out after as much of the purchaser's dollar as he can possibly get; the scarcer the dollars, the sharper the struggle, the more valuable the high-pressure salesman becomes. And becoming more valuable he cuts out more and more of the technician's, the laborer's share of the purchasing dollar. And strange as it is: the technician is doing all he can to encourage this process. The design-engineer is more often than not directed by the—let's put it mildly—un-technical ideas of the salespeople in his designs but gets all the blame for the failures. The production engineer works overtime to cut off 1/2 of 1c of the production cost, because this will mean quite a substantial reduction in the price the customer will pay for the product—or rather increase the margin between production cost and consumer's price. The service technician is out to sell tubes and parts for replacement rather than technical work, aiding thus to bring about a more universal undervaluation of his worth as a technician as against salesmanship.

We have to improve our salesmanship if we want to stay in business. The question is, whether we should try to outsell the salespeople or learn how to sell our technical services? In order to

(Continued on page 20)



SYLVANIA Set Tested Radio Tubes



1. The Sylvania Line now includes photo-cells, transmitting tubes and many tubes adaptable to replacement in industrial equipment.
2. Stable price policy insures full compensation to the dealer.
3. Many years experience in the manufacture of lamps guarantee a product of high quality and uniform characteristics.
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Los Angeles

I. R. E. ELECTS NEW OFFICERS

At the December meeting of the Los Angeles Section of the Institute of Radio Engineers new officers were elected for the coming year. Mr. H. C. Silent, of Electrical Research Products, Inc., was elected chairman and Mr. W. F. Ludlum, of Harrison Sound Equipment, vice-chairman. Norman B. Neely, secretary-treasurer last year, was re-elected for a second term. Mr. Dean T. Smith and H. B. Axtell, of the Southern California Telephone Company presented two sound pictures and a very interesting and informative paper on the theory, operation and use of cathode ray tubes.

THANK YOU, MR. HITT

Through the kind cooperation of Mr. Bill Hitt, manufacturer's representative, we are able to present the Multi-Tap transformer article in this issue of the "TECHNICIAN." Mr. G. McL. Cole, chief engineer of the General Transformer Corporation, manufacturers of the Multi-Tap line, has written this article explaining the use and purpose of the new high-

powered unit especially for the "TECHNICIAN" at the request of Mr. Hitt.

NEW GRUNOW HAS HIGH QUALITY AUDIO SYSTEM

Definite proof that radio engineers are beginning to regain at least part of their sanity is shown in the new Grunow receivers using good old 245 tubes for real quality reproduction. The new Grunow Selectrol, besides offering many improvements such as mechanical inter-channel noise suppression, employs 4 type '45 tubes in push-pull parallel arrangement in the last audio stage. This model, as demonstrated at a recent meeting of the Certified Radio Technicians Association, gives exceptionally fine quality at any volume from a whisper to auditorium power. The Grunow Company is one of the very few nationally known companies using Class A triode amplification in the output stage and their engineers are to be highly complimented in their choice of our old friend, the '45, in preference to some of the later type tubes.

HIGH POWER MULTI-TAP

(Continued from page 10)

field there are such combinations as the following:

6. 27, 50, 81.
7. 10, 81.
8. 201A, 50, 81.
9. 26, 81.
10. 26, 50, 81.
11. 24, 50, 81.
12. 27, 27, 81.

These combinations are called set types. It is understood of course, that only the type of tube is considered since the total number of tubes may vary from say six to ten or eleven. Considering No. 1—the 26, 27, 50 and 81 combination. The 26 tubes are supplied by the 1.5v portion of winding I. The 27's by II, the 210 (or 250) by III and the 281 by the 7.5 volt portion of winding IV. For No. 2—using 27's, 50's, 81's—the 2.5 volts for the 27's is supplied by the 2.5 volt section of winding I. The 50's and 81's are connected to winding III and IV in the same manner as before.

Sets using 3-volt heater tubes offer no special problem. The C-484, C-210 or C-586, C-281 combination is connected similar to the 27, 50, 81 combination as explained above. The one difference is that the C-484 tubes utilize the whole of winding I which delivers 3 volts. The C-210 and C-281 are supplied by windings III and IV respectively. If the C-484's are used in combination with C-226 these latter tubes may receive their filament supply from either half of winding II, or better, from the 1.5v portion of I. Since the C-484's are indirect heaters, no complications arise. The greater portion of set types call for straight simple hook-ups. No. 7 is slightly different, however, since the 201A tubes require 5 volts and No. 5 volt winding is supplied. Series connect the 2.5 volt portion of winding I to II. Result, 5 volts and everybody's happy.

Some sets and amplifiers split the 27's placing some on one filament winding and some on an additional winding. Two such windings are supplied so that the solution is simple. A study of the diagram calls to light many combinations not discussed such as the use of 6.3 volt tubes. It can be done and still use 2A3 and 2A5 as power tubes.

Some of the old style sets used 199 type tubes in combination with the 210 and 281's. If there are any of these sets still requiring service, the 99's fit nicely on winding I, the 3 volt portion. Single or push-pull power tubes were not taken into consideration since this merely

affects the total drain on the high voltage winding which is ample to stand either condition.

It is, however, assumed the 281 tubes to be full wave with filaments paralleled since this is the usual set-up. This is not a criterion for by using only one half of the high voltage winding a half wave rectifier is satisfactorily supplied with power. Winding IV has 15 volts total which takes care of those sets with 281 filaments in series.

It was rightly predicted that the Multi-tap transformers would service 90 per cent of all radios now on the market. With the addition of the "new cousin" it is very conservatively estimated that the five Multi-taps can be used to properly service 95 per cent of all radios, past and present.

*Chief Engineer General Trans. Corp.

WINDOW CARDS

This month the cards furnished advertisers to display to their customers will be red. Before making a purchase be sure to locate this card. If it is not in evidence ask for it and insist upon seeing it. Again, we urge you to support those who evidence and maintain a desire and honest effort to support us.

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RESEARCH WORKER RE-APPEARS

Technicians and engineers will be glad to know that the AEROVOX RESEARCH WORKER is again being published in bigger and better form than ever. Information regarding this interesting and informative house organ of the Aerovox Corporation may be obtained by writing to the RESEARCH WORKER, in care of the Aerovox Corporation, 70 Washington street, Brooklyn, N. Y.

TROY ANNOUNCES NEW MODELS

The Troy Radio Manufacturing Co., located at 1815 Venice boulevard, manufacturers of the well-known Troy quality line announces a new series of four, five, six, seven and nine tube superheterodynes of unusual performance. The outstanding set of the new line is the four tube super which has exceeded all expectations in preliminary tests in which coast to coast reception has been accomplished. Troy radios are R. C. A. licensed and are designed and built in Southern California by Southern California engineers and workmen.

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SALESMANSHIP

(Continued from page 16)

do this, first we have to see our own value as technicians and not as a salesman in disguise.

Stuart Chase wrote in his book "Men and Machines" (1929) "Wherever mechanical industry has taken decisive effect, the community lives from hand to mouth in such a way that its livelihood depends on the effectual working of its industrial system from day to day . . . By themselves alone the technicians can, in a few weeks, effectually incapacitate the country's productive industry . . . No one who will dispassionately consider the technical character of this industrial system will fail to recognize that fact . . . If the 200,000 trained enginemen were blotted out of existence tomorrow, the social and industrial life of the nation would be paralyzed. Mines, factories and public utilities would cease production. Food supplies would accumulate remote from the great markets. Babies would die while men and women fought for bread and meat. It would not take months, but years to train the men necessary to restore the constant reliable flow of commerce . . ."

The blotting out of all radio technicians only, would not result in such serious conditions, and yet we can well imagine what the customer would say when offered the best high-pressure salesman instead of a competent technician in case of a break-down.

NEW CONTRIBUTOR

I. O. Korfhage, popular young radio continuity writer, has very kindly offered to contribute humorous skits for publication in the "TECHNICIAN." The first contribution by this enterprising writer, entitled, "Educational Interview," will be found elsewhere in this issue and we may expect more material of a similar nature for future publication in these columns.

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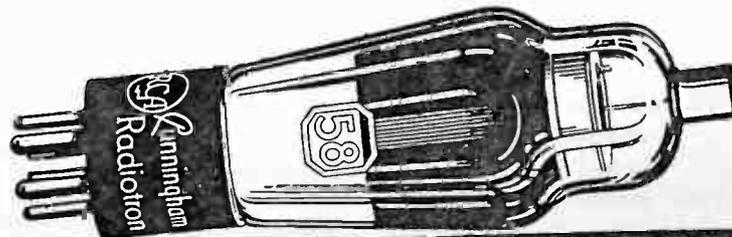
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SERVICE KINKS AND PET EQUIPMENT

To replace dial cable on a Sonora A40: First: Charge at least \$3.00. Second: Remove the tuner chassis. Mark and release 3 wires and cable. Remove the gang from the aluminum shielding and using 16 and 1-2 inches of bronze cable, put one eyelet at the end to start, twist cable and solder a loop. Wind 3 turns over the drive spindle (don't solder on hub till final). The spring take-up can be pulled up and cable lapped over and soldered to itself to anchor. Now solder drive cable to center of drive spindle hub.

At last a use for the corrosion from a storage battery terminal. When trying to solder on a steel surface, first smear a little of the corrosion on the surface to be soldered, wipe off and tin the surface. Then solder.

—JOHN L. VINCENT.

How To Make A High Class Vernier Dial
Just another one of those matters of getting the job done for less money and better precision. Buy two three inch brass or German silver protractors, measure in from the outside edge about one inch and cut across the straight bar, do

the same from the other side. Repeat on both protractors, now having removed the center part from the straight bar of each, put them back-to-back evenly. Measure in from the edge about 3-4 of an inch and centerpunch and drill for suitable machine screw, tap the holes.

Get from the stock drawer a National type A Velvet Vernier Dial, take it apart so the large dial is free to work on. Now cut in from the outer edge exactly 7-8 of an inch, removing all the outer numbered portion up to the first ridge. Round off neatly and carefully smoothing the remaining portion of the dial edge. Lay it flat on the bench and with a file, cut across the narrow highest ridge between any of the screw holes making a slot half inch wide and 1-16 inch deep for the pointer to lie in.

Make a brass or German Silver pointer from part of the stock you cut out, shaping to fit the slot and bent to fit (out of the way of the driving knob). The pointer may be knife edge or flat and to a sharp point or to suit your fancy. When finished you have degrees as accurate as the protractors and a dial unusually attractive.

—JOHN L. VINCENT.

ARCTURUS ANNOUNCES QUICK-ACTING 25Z5

One of the outstanding tube developments of the year is the new quick-acting Arcturus 25Z5 rectifier which operates in 17 seconds, enabling sets to operate in one-third the usual time, announced this week by the Arcturus Radio Tube Company, Newark, N. J. Many of this year's sets, particularly the a. c.—d. c. models, use the 25Z5 as well as the 43, both indirectly heated tubes which have required 60 seconds or longer to operate.

The new Arcturus 25Z5, as well as the Arcturus 43 which also is a quick-heater, enables these sets to operate in 17 seconds or one-third the time formerly required.

Laboratory and field tests have further proved that this quick-action extends the life of other tubes in the series operated a. c.—d. c. receivers as well as protects the filter condenser. The quick-heating feature permits the tube to reach the value of hot or high filament resistance in a shorter time and thereby eliminates the excessive over-voltage on other tubes usually caused by slow-heating, low resistance tubes.

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For Sale—

We have a few 60 cycle 900 RPM synchronous Television Motors on hand. Made expressly for Don Lee reception. Price very reasonable. Phone or write to E. B. Dunn Co., 3948 Halldale Ave., Los Angeles. UNiversity 4938.

Victor 10-69—Automatic Record Mechanical, complete with matching input transformer. \$15.00; and Western Electric 25B Amplifier, \$10.00. Mission Radio Service, WHitney 7364.

Class sign "Certified Technician," 8 1/2 x 24 inches, with 2 inch gold and black or silver and black letters. \$1.50 ea. Estimates gladly given on any window lettering desired. C. D. Curtis, 4223, So. Hoover St., Phone ADams 13106.

DeForest 250 and 281 tubes. \$1.35 each. Brand new. Hurry. VAndike 3104.

1—Thordarson power transformer No. 2950. 1—1220 volt C. T. 2-7.5 volt 3 amp, \$5.50. 1—Thordarson choke 3099 dual 30 henry, 160 mils, \$3.00. Radio Specialties Co.

For Sale or Trade—

One Weston 0-4 A. C. Voltmeter, like new. One Weston 0-19 D. C. Milliammeter. Roy K. Tate.

Wanted—

Six and three foot trumpets and dynamic units, new or used. Box X-3, c/o The "TECHNICIAN."

Cash paid for stamp collections. H. I. O'Brien. 1348 E. Colorado Boulevard, Glendale.

Readrite analyzer for sale or trade. H. I. O'Brien, 1348 E. Colorado Blvd., Glendale.

Complete amateur transmitter. About 50 watt. Wanted for export purposes. Mr. Romero, MUtual 3485.

Wanted second hand or new short wave phone transmitters, also P. A. systems or any radio apparatus suitable and in working order for radio students. Address Prof. Luis Lopez Romero, 406 Sunset Blvd., Los Angeles.



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