National Consignment Dealers CAN'T LOSE

IF THE LIST PRICES GO UP—Our dealers have the privilege of buying outright all the TUBES in their consignment stock.

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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 superhuman 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.
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 broadcasts are made for radio entertainment and theatrical entertainment. Air check, voted to the training of vocal and instrumental talent for the purpose of making records operable by A. Paul, Jr., have installed a technical Service Laboratories. Many of the former the audience point of view, some-thing 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 benefits of aluminum recording have been overcome in this system, and unusual fidelity is being obtained. In fact, the quality achieved is closely compar-able to professional wax recording. In-

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 quali-fied radio technicians in the country and command the respect and remuneration due a trained member of a rapidly ad-
nanced profession.

This course is made possible through the kind generosity of Watson and Wilson, Kierulf and Goddard and the National Union Tube Co. Watson and Wilson and Kierulf and Goddard are distributors of National Union radio tubes. These companies are to be congratulated for the kindness in bringing Mr. Leit-

January, 1934

January, 1934

"THE FIVE METER BAND"

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

PART TWO

ANALYSIS OF CIRCUITS SUITABLE FOR SHORT WAVE OSCILLATORS

We may arrive at a general idea of the circuits suitable for work on short waves by a consideration of those commonly used on long waves. At much lower wavelengths the coupling between grid and plate coils is predominately inductive.

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 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 LcCp is the same as that of LpCp and LpCg. 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 capaci-
ties are then replaced by a single capaci-
ty we have the familiar Hartley cir-cuit. If desired, the connection between the filament and the center of the coil may be omitted by this means, the os-
cillation is left free to locate its nodal point as, or near the center of the in-
cidence.

On shorter wavelengths, however, the electrostatic couplings between the coils and the tube elements become very im-

important and at very high frequencies 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 deter-

mines the suitability of the circuits thus far discussed for work on short waves. If, in the first circuit we let Cgp represent the grid to plate capacity, it will be seen that in the condition of oscillation this capacity acts against the mutual indu-
cation between grid and plate coils. Sup-
pose 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 re-

sistance of the tube will increase and therefore will decrease the plate current.

(Continued on page 8)
THE COMBINED DETECTOR AND OSCILLATOR
By CONTESTANT NO. 4

The combined detector and oscillator is a very important and useful combination in any modern radio circuit. It eliminates one tube, saves space in the construction of small radio sets, and simplifies the construction of the detector and oscillator coils. The two circuits, the detector and oscillator, are more evenly coupled over the wave band that the set tunes to, a more even gain over the wave band is obtained and more consistent performance results.

The functions of the first detector and oscillator tubes of an ordinary superheterodyne may be combined into one tube in the following way. The grid circuit of the tube is tuned to the incoming frequency. The grid bias of the tube.

The grid bias is about one-half the applied to the grid is about one-half the oscillator voltage applied to the grid circuit and the heterodyne voltage is developed across the tuned plate circuit.

In designing a circuit for this work, the oscillator voltage applied to the grid circuit must not be too great or distortion will result. If too great, the grid circuit will draw grid current which is an indication of distortion. The best results to date have been with grid tubes of the 24 type. The 36, 57 and 77 type tubes are giving very satisfactory results in the newer radios. The bias voltages ordinarily used are between 5 and 10 volts, the heterodyne r. m. s. voltage applied to the grid is about one-half the grid bias of the tube.

Occasionally in servicing these receivers, some will be found that will not oscillate over the full range of the dial; if this trouble is not remedied by changing the tube and if all circuits are in proper order, the trouble may be fixed by changing the bias resistor to a slightly smaller value but not too small or distortion will result by the grid drawing current. Be sure and check all by-pass condensers and the alignment of the intermediate stages before making any changes in the circuit.

A VERSATILE TEST INSTRUMENT
By CONTESTANT NO. 5

To efficiently and accurately determine why a radio receiver is not functioning as it should, a set tester must be capable of making the following measurements without removing the chassis from the cabinet.

1. Current in millampere flowing in the wire leading to any tube element.
2. A. C. or D. C. voltage drop between any two elements in a tube.
3. Resistance in Ohms between any two socket connections, either on the same socket or between different sockets.

The set tester, or analyzer, as it is commonly called, described in this article, while it uses but one meter will make all the above measurements in addition to having the following measuring ranges available at pin jacks located on the panel.

- 0, 5, 10, 50, 100, 250, 500, 1000 volts A. C.
- 0, 5, 10, 50, 100, 250, 500, 1000 volts D. C.
- 0, 1, 2.5, 25, 100, 500 M. A.
- 1-100 Ohms, 100-100,000 Ohms, 1000 to 2 Megohms.

.002-.25 Microfarads (capacity).

1-90 Henrys (inductance).

A brief description of the operation of this instrument together with the accompanying drawing will give all the information required to those who wish to construct it.

Plug No. 1 has seven prongs plus a control grid connection and a ground (Continued on page 11).
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 Cgp 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 asymmetrical. 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 derivates. 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, 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 resistance 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 one 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)
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. Ye 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 3.0v-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 286 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 requirements of these sets.

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 MA 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, 50, 81.
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 19)
Let Your Conscience Be Your Guide!!

**Question---**

WHERE DO YOU BUY YOUR RADIO PARTS?

**Answer---**

Radio - Television Supply Company

1000 South Broadway
Los Angeles, Calif.

Open daily except Sundays and Holidays, 8:30 a.m. to 5:30 p.m.
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. 1132? — 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.

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All service men especially invited to preview the new models and receive service information and schematic drawings.

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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 potenti ally, first by results of the census of 1930—showing that a large 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 technicratic 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 salesmen, 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 serve to 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 $0.60, factory for $3.75; 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--let's put it mildly—untechnical 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 1 cent 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)
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. Ludlam, 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. McI. 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 Selectrols, besides offering many improvements such as mechanical interchannel 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:

1. 27, 50, 81.
2. 10, 81.
3. 26, 81.
4. 26, 50, 81.
5. 27, 26, 81.
6. 27, 50, 81.
7. 10, 81.
8. 26, 81.
9. 26, 50, 81.
10. 27, 26, 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 1.5 volt 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 only 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 1.5 volt 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 windings are 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 effects 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 yet 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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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 raise 3 wires and cable. Remove the gang from the aluminum shielding and using 16 and 1/2 inches of bronze cable, put one eyebolt 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.

ARCTURUS ANNOUNCES QUICK-ACTING 2525


For Sale—

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 dynamos 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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