JOURNAL

OF THE

SOCIETY OF BROADCAST ENGINEERS

VOLUME TWO NUMBER FOUR MARCH 1966

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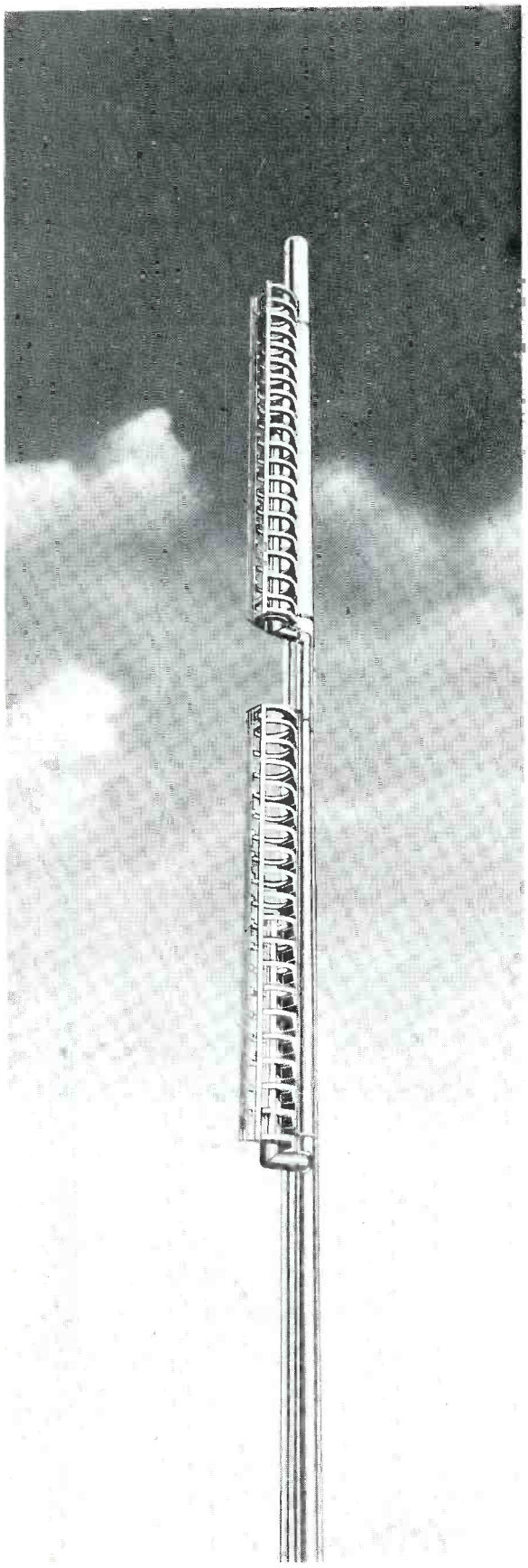
Contents of this Issue

ATTEND THE THIRD ANNUAL MEETING ON MARCH 27 DURING NAB CONVENTION AT CONRAD HILTON HOTEL, CHICAGO, WILLIFORD "C" ROOM 2:30 P.M.



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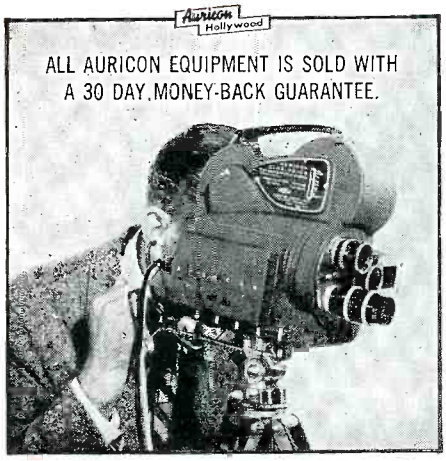

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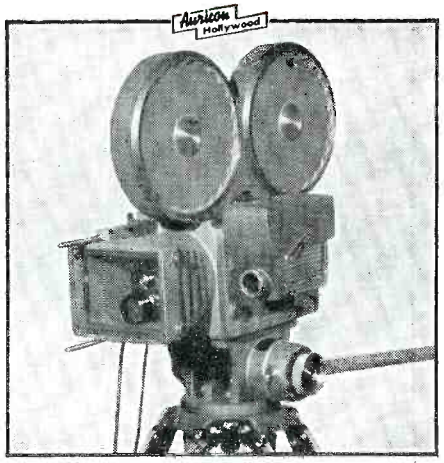

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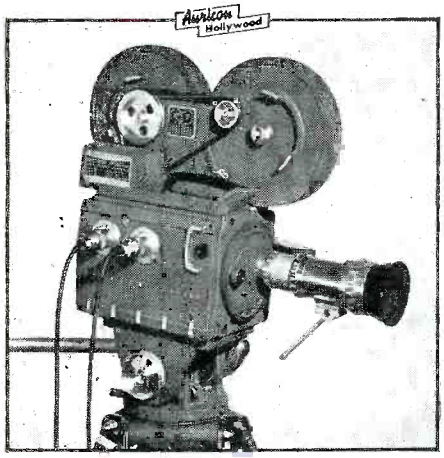

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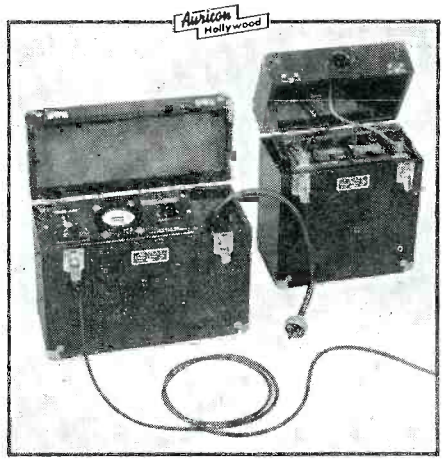

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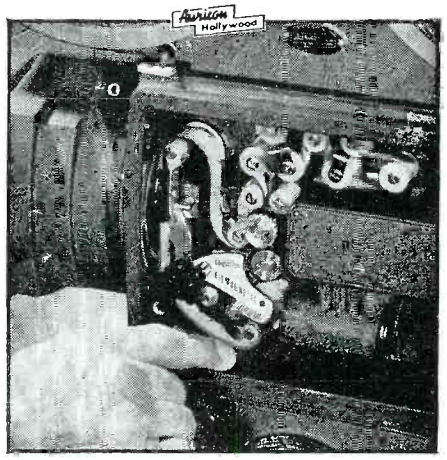

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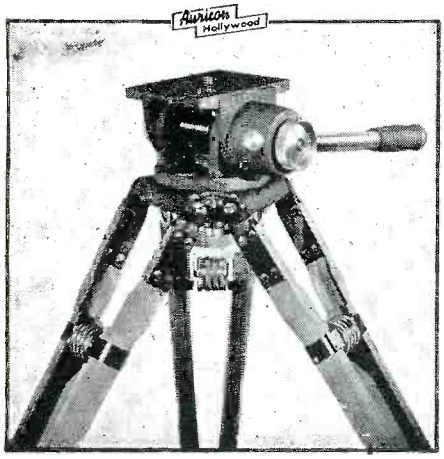

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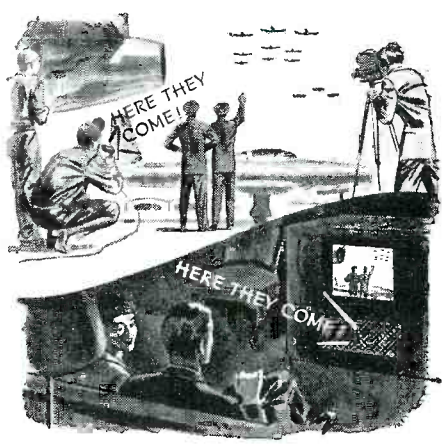

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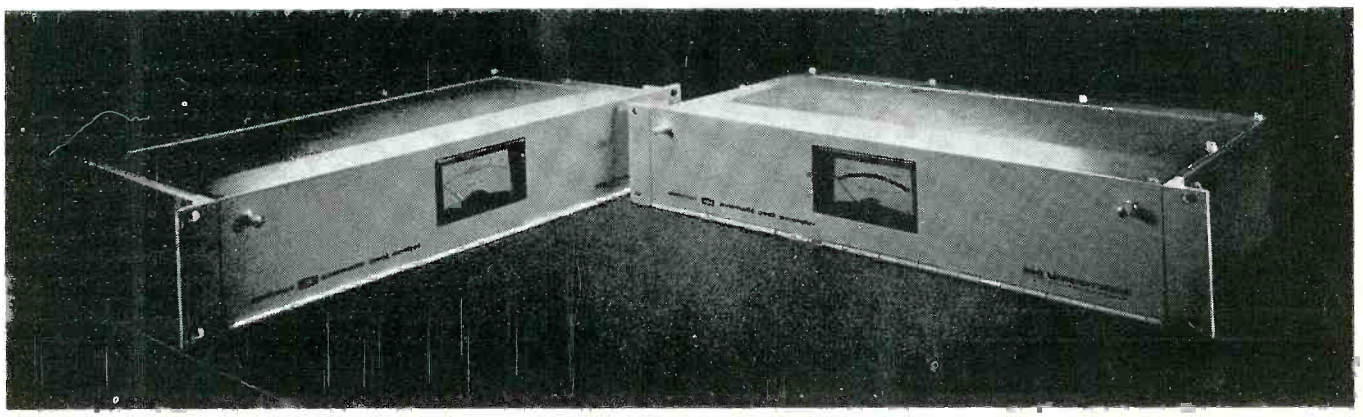

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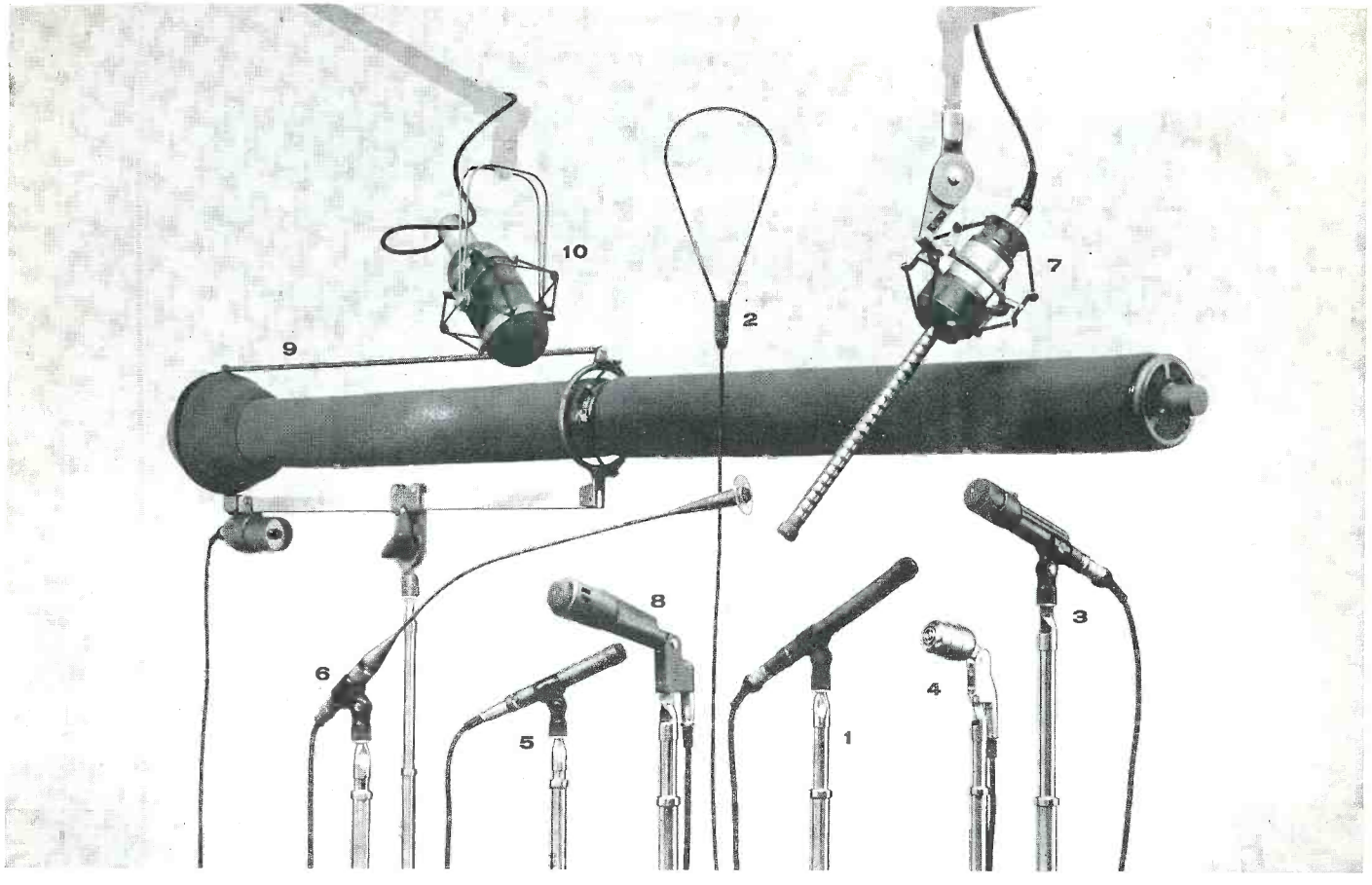
Edited and Produced by - John H. Battison



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8. ECONOMY is vital in every studio operation, yet quality must be upheld. And the E-V 665 is ideal where superb cardioid performance is needed, but the utmost in mounting flexibility is not required.

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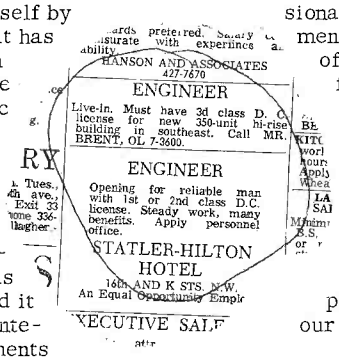
BROADCAST ENGINEERS

Recently there has been an upsurge in the demands of the professional engineering groups to prohibit the use of the title "engineer" by anyone who is not a professional registered engineer. The FCC has been requested to cease labelling the chief of a broadcast station "Chief Engineer". In most, if not all, states only a registered engineer can call himself by the title of "engineer". In the broadcast industry it has been the practice for years to use the term, and in general it is justified. There are many chief engineers without degrees or other professional academic recognition who are as capable (and in many cases more so) as any registered engineer. The registration requirement really applies more to consulting engineers who hire themselves out to public use in the design of building and other construction that can have dangerous effects on public safety....at least that is our feeling! Elsewhere in this issue we have some comments on the situation, and it is one that really falls directly within the area of interest of this Society. As long as we see advertisements like the following in our national newspapers Broadcast Engineers are real "engineers"!



This Society is incorporated in the District of Columbia and presumably by reference all members are "engineers". However, in our opinion a mail campaign to the chairman of the FCC protesting the deletion of the term "Chief Engineer" from official recognition and usage is very much in order...to protect your right to be known as a Broadcast Engineer.

PROGRESS

Well, we've published our eighth issue of JOURNAL, after two years of growth. We are over 400 in membership, and growing faster every day. This issue sees our change to glossy paper giving us far superior reproduction and appearance, and pride in standing up beside the other professional publications. Look out for continuing improvements as our Society continues to grow and prosper A lot of our growth is the result of the help we have had from the National Association of Broadcasters, who for the third time have donated space at the NAB Convention in Chicago for our Third Annual Meeting which will be held at 2:30 p.m. on March 27, 1966 in the Williford "C" Room of the Conrad Hilton Hotel in Chicago. Also we owe them thanks for letting us print some of the extremely interesting papers that were presented at the last NAB Convention. These papers have been read with great interest by all our members.

CHAPTERS

The race is on! At this point we are not sure which one of three chapters is ahead---Number one, Binghampton..... Number Two, North Eastern Pennsylvania.....or a late comer....Number Nine, Phoenix, Arizona! At last count Number Two may have a slight head with 18 paid up members! How about you other chapter chairmen? Now is the time to get out and build up interest in getting active chapters going.

SOME REMARKS BY THE RETIRING PRESIDENT

Fellow members of the Society of Broadcast Engineers, it is with the greatest pride that I hand over the reigns of office to Charles Hallinan your President Elect. For the past several years, from the time when the Society was an idea in my mind, to the time when you elected me Chairman of the Steering Committee, and to last year when you did me the honor of electing me President of the Society, the SBE has taken the most of my working hours and "spare" time. At times, much to the disgust of my wife has had to put up with late hours, and preoccupation while Society affairs were handled, and the Society and the JOURNAL have taken all my time. But now both are in fine shape, and although I shall now bow out of the role of helmsman I shall still be active in Society affairs, and as Past President I hope to have a hand in stimulating our growth.

Even though I am stepping down as President, I shall continue to edit the JOURNAL and I hope that under my guidance---undivided this time----it will continue to grow and soon become bi-monthly, and then monthly!

I know that Charles Hallinan and the fine group of officers who have been elected to work with him, will do a fine job of promoting the SBE. And in any case it is quite possible that some time before too long in the future I shall run again for election as President as a write-in!! My sincere thanks to all those members who joined with me in 1963 and 1964 to form the nucleus, and to all the members who joined subsequently and helped us build the Society of Broadcast Engineers.....and may every success attend the efforts of the new President and his Officers.

John H. Battison
President - 1965/66

ELECTION RESULTS

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The terms of the above Officers commence at the annual meeting.

NAB CONVENTION

SBE HOSPITALITY SUITE 1235A CONRAD HILTON HOTEL MARCH 26 THROUGH 29.
ALL MEMBERS ARE WELCOME, ----ESPECIALLY IF THEY BRING A NEW MEMBER!

SBE NET

Ken Benner, K7VJF, Richfield, Utah, is trying to get a 20 meter phone net going. It meets every Tuesday evening at 18.30 EST (16.30 MST) on 14.25 mc. W3EIQ, the HQ Station of the SBE will be participating from the East.

ONE MAN'S OPINION

Ever since I hooked up the Line Dehydrator with plastic, instead of copper tubing, I haven't had to replace a fuse or valve solenoid after a lightning strike.

One of the little things that peeve me is the odd-ball color code system used by wire manufacturers in cable. What's the matter with the Western Electric standard? All you have to remember is Blue-Orange-Green-Brown-Slate for any number of wires or pairs. While I am being peeved, I do wish that someone would step in and eliminate about 90% of the transistors types now available. I strongly suspect that there is much overlapping of characteristics, and we could get along with about 10% of the present list. A 6BH6 of any make is a 6BH6. Why can't a 2N404A be the same from any source?

For the benefit of the younger Members, just a note on "what you can get for free" that will do you a lot of good in the battle to try and keep up with things:

First, there's the old stand-by, "RCA BROADCAST NEWS". Full of RCA write-ups, naturally-but you can learn more from this magazine than you can from most correspondence courses. Free-write your RCA Rep., or RCA, Camden, N.J. Ask for "RCA Tube Tips", too.

Collins Radio, Cedar Rapids, Iowa, publishes the "Collins Signal". Also free Collins. I like this one-it covers everything Collins has a finger in, which involves a suprisingly wide range of subjects.

Gates Radio, Quincy, Illinois is the source of "What's Going on at Harris-Intertype", a house organ which devotes very little to Gates, but covers a wide range of subjects that the parent company is involved in. Also free.

AT&T has a wide range of publications, some free, some by subscription, but all are worth every cent from the "Bell Labs Journal" to the "Bell System Magazine". They also publish a variety of books and leaflets germane to many of our jobs. They have the only booklet that I know of that covers TV transmission from A to Z.

I hered of a pretty good stunt the other day-when you subscribe to a magazine, use a different initial each time; i.e. E for Electronics, G for National Geographic, etc. Middle initial, that is. Then when assorted rubbish arrives in the mail, along with all of those fancy insurance offers, look at which initial is on the stencil. Then write the publisher, tearing off a strip or two for selling his mailing list to these schlock peddlers.

There has been mail about CE Qualifications, both sides of the question represented so far. I wonder, after looking at it from all angles, if a higher "Chief Engineer" class of ticket is completely the answer. Anybody who can bone up enough to pass a First "Fone" can probably study a bit more to pass a more difficult exam. I still think that a set period of experience on the job is the only answer: after all, the stations maintenance records will show up a knucklehead in short order with outages, troubles, and lost time. A good man has very few outage entries in his Maintenance Log-and very little time lost off the air.

Any of us can lose a rectifier or a PA tube in the middle of the day - or a fuse in the Console power supply, so an outage-free record is open to at least a raised eyebrow. But-an honestly kept Maintenance Log sure shows up the difference between a good man and one with just a ticket.

And speaking of Maintenance Logs, this can be more of a blessing than a nuisance. If you keep it like a diary, with entries of about everything you do around the place, you will at least know where to look for the information, next time you need it. The FCC insists on the basic information

as far as I know, they have no objection to more information logged therein. I enter tube changes in it, repair jobs on equipment, not just the transmitter, and so on. If a tube record card gets lost or misplaced, you can always dig back in the Maintenance log for the starting hours for the tube.

It is now standard to use "Hz" instead of "c/s". I don't know about you, but it will always be "Kilocycle" and "Megacycle" with me- none of this "Kilohertz" business. This is one standard that I categorically refuse to have anything to do with. Anyhow, "Kc" is shorter than "KHz", and makes a lot more sense to me.

And this is about all I can find to growl about, this quarter. Let's have more mail, Pro and Con, on what qualifications a Chief Engineer should have. Ever since I walked into the transmitter shack of a daytimer, found the Mod Monitor VU up against the pin most of the time, and then discovered that the kid "Chief" wasn't concerned at all about it, I have been absolutely convinced that something has got to be done about these things. If you fellows can come up with some concrete suggestions, perhaps we can work them up into a Resolution to pass along to the Commission.

73, F.C. Hervey - The Horizontal Engineer

VERTICALLY POLARIZED FM ANTENNAS AND POWER DIVIDER

E. S. GAGNON, Manager Product Marketing

Gates Radio Company
A Subsidiary of Harris-Intertype Corporation
Quincy, Illinois

The advantages of using a dual polarized FM antenna system are: (a) improved reception by receivers using vertical antennas, specifically automobile radios and home receivers with built-in antennas, (b) signal levels may be increased in the null areas of a horizontal antenna.

The FCC FM Rules and Regulations require the transmission of horizontal polarization. Revisions made some years ago authorize the transmission of a vertical component, which, in no event, is to exceed the effective radiated power authorized.

The Commission's Rules and Regulations on this subject are as follows:

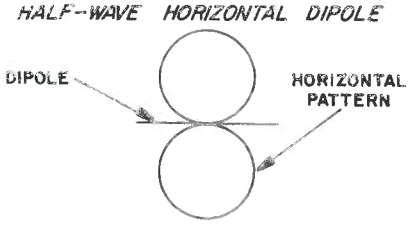
> Paragraph 3.310, Definitions in the FM Technical Standards: "The term 'effective radiate power' means the product of the antenna power (transmitter output power less transmission line loss) times (1) the antenna power gain, or (2) the antenna field gain squared. Where circular or elliptical polarization is employed, the term 'effective radiated power' is applied separately to the horizontal and vertical components of radiation. For allocation purposes, the effective radiated power authorized is the horizontally polarized component of radiation only."
>
> Paragraph 3.316, Antenna Systems, Paragraph (a): "It shall be standard to employ horizontal polarization; however, circular or elliptical polarization may be employed if desired. Clockwise or counterclockwise rotation may be used. The supplemental vertically polarized effective radiated power required for circular or elliptical polarization shall in no event exceed the effective radiated power authorized."

Paragraph 3.310, states the effective radiated power authorized is the horizontally polarized component of radiation only. Paragraph 3.316 on antenna systems states, the vertically polarized effective radiated power shall not exceed the effective radiated power. Therefore, an amount of power equivalent to the effective radiated power in the horizontal plane may be radiated by a station in the vertical plane. This does not preclude the fact that specific application must be made under Paragraph 3.257 requesting authority to make a change in the antenna system, if we are talking about an existing station or a CP that has been granted.

The radiating elements of current horizontal FM antennas are modified dipoles. These are spaced one above the other to obtain the desired antenna power gain. It is this power gain times the antenna input power that determines the effective radiated power of a given FM station.

It is standard practice to stack the antenna radiating elements or bays approximately one wavelength apart. The bays are then fed in phase along a transmission line that may support from one to sixteen bays or radiating elements electrically connected in parallel. The impedance of each diple, antenna element, or bay is made greater than the transmission line impedance by the number of bays. The input impedance of the antenna, however must be 50 ohms to meet the standard coaxial line transmission impedance.

The horizontal radiation pattern of a dipole is a Figure 8. See figure 1.



If we take the dipole and bend it into a semi-circle, we have a circular dipole and, for all practical purposes, an antenna that will radiate a uniform omni-directional signal within plus or minus one db in free space. The circular dipole is usually end loaded with capactive plates to provide a more uniform current along the antenna length.

The standard horizontal dipole with a Figure 8 horizontal radiation pattern has, when we look at the end of the dipole, a circular vertical pattern.

Up to this point we have been discussing the dipole as we normally know it in the horizontal position. Let's tip the dipole up on end. The horizontal becomes the vertical and the vertical becomes the horizontal, and we have a circular radiation pattern from the dipole antenna. The resulting radiation pattern is graphically shown as a cross sectional view through the antenna in figure 2.

A typical antenna now in production and use is the Type 300. The circular free space radiation pattern is within plus or minus one db. The radiating element is approximately

RADIATION PATTERN FOR A VERTICAL DIPOLE

Figure 2

forty-five inches long with a thirty-six inch horizontal choke and matching section between the coaxial feedpoint and the radiating element. All sections are three and one-eighth inches outside diameter.

The matching section provides a low VSWR and proper impedance when more than one element is installed and separated by one wavelength section of feedline. The choke provides electrical balance without openings, which would subject the antenna to ice and moisture, and thus necessitate the use of deicers.

Deicing the vertical antenna element is not necessary due to the broad bandwidth characteristics of the dipole plus the broad cross section and completely enclosed balancing choke section previously described. Electrically, the antenna covers a frequency range of 88-108 megacycles. The standing wave ratio is 1.1 to 1 or less as tuned at the factory. Each element has a power rating of three kilowatts.

Vertical antennas may be used in combination with other types of horizontally polarized ring or V antenna; but, as stated before, it is not permissible as the sole source of radiated transmission energy under existing Rules and Regulations. Consider the combinations of dual polarized antennas possible. Horizontal antennas are available, consisting of from one to sixteen bays on either 1-5/8" or 3-1/8" line. The vertical type 300 is available in similar configurations. There are three general methods which may be used for mounting the combinations.

One configuration, is with the horizontal elements mounted above the vertical elements. The center of vertical radiation is considerably lower than the horizontal center of radiation, a large section of tower must be available to mount the complete unit.

A second method is intermingling of the horizontal and vertical bays. This requires less tower space and places the vertical center of radiation approximately five feet below the horizontal.

A chind method of mounting which tends to the distribute the total weight on the tower is with the vertical elements on one side of the structure and horizontal elements on the opposite.

Antennas consisting of one to nine radiating elements are end fed. Antennas with ten elements and more are center fed. If the antenna consists of an odd number of elements, the feed point is at a point one-half bay below the center. In other words, an eleven bay antenna is fed at a point one-half way between the sixth and seventh bay, or 55 feet from the top.

POWER DIVIDERS

With dual polarization we have to consider the gain of the horizontal elements, the gain of the vertical bays, and the power supplied to each. The gain of the vertical section is not identical to the equivalent number of horizontal sections.

GATES CYCLOID FM ANTENNA
GAIN AND PATTERN DATA
DUAL POLARIZED

HORIZONTAL

No. of Loops	Power Gain	Field Gain	Mv/M/KW
1	0.9	0.95	131
2	2.0	1.41	194
3	3.0	1.73	238
4	4.1	2.02	278
5	5.2	2.26	311
6	6.3	2.51	345
7	7.3	2.70	372
8	8.4	2.90	399
9	9.4	3.07	421
10	10.5	3.24	446
11	11.5	3.40	468
12	12.7	3.56	490

VERTICAL

No. of Loops	Power Gain	Field Gain	Mv/M/KW
1	.950	.975	134.7
2	1.969	1.403	194.0
3	3.120	1.766	244.2
4	4.198	2.049	283.2
5	5.310	2.304	318.4
6	6.393	2.528	349.4
7	7.500	2.738	378.5
8	8.571	2.928	404.6
9	9.755	3.123	431.6
10	10.960	3.310	457.6
11	11.870	3.445	476.1
12	13.195	3.632	501.9

TABLE 1

For example, three horizontal bays have a power gain of 3 and a field gain of 1.73. An equivalent number of vertical bays has a power gain of 3.12 and a field gain of 1.766. Therefore, if we want to operate with the same horizontal and vertical E.R.P. and are using one transmission line to the antenna, we must contro the power to the vertical and horizontal assemblies. This may be done with a power divider. Due to the many combinations of antennas, R.F. power and resulting effective radiated power, the power divider is presently customed designed for each specific installation.

A variable transformer, may be used between the power divider and vertical and horizontal antennas to assure proper matching and power distribution. Fixed power dividers are available, assuming we have exactly matched loads on the power divider output. For example, if we want to divide 3/4 of the available power and supply it to the horizontal antenna and the remaining one-fourth to the vertical, and we know the input power, a standard power divider may be provider. Currently the loss in the power divider has been assumed to be the loss obtained from an equal length of transmission line.

COMMUNICATIONS FREQUENCY MEASUREMENTS

by Ken Benner
Chief Engineer, KVSC
Richfield, Utah

An important factor in the development of modern carrier communications developed is the ability to generate electrical waves of precise accuracy. This ability has developed the ability to measure electrical frequencies with great precision.

In this article, some of the method devices used in the measurement of electrical frequencies are described.

Frequency, like the measurement of all quantities involves, a comparison with a fundamental unit. Thus electrical frequency is normally expressed in cycles per second, kcs per second, or mcs, per second. The various methods of measuring frequency may be separated into five general categories: (1) comparison methods, (2) tuned circuit methods, (3) balanced bridge methods, (4) wave-length measuring methods, and (5) pulse counting methods. Each of these encompasses a wide variety of different approaches to the same genrale method. Regardless of the approach, every measurement of frequency involves either directly or indirectly a comparisoon with a standard interval of time.

Any stable oscillator whose frequently has been accurately determined may be used as a reference to measure other frequencies and is known as a frequency standard. There are primary and secondary standards. A primary standard in one whose frequency has been determined directly in terms of time. A secondary standard is one whose frequency has been determined by comparison with a primary standard.

A typical primary standard might consist of a high quality crystal-controlled, oscillator driving very precise clock. A time interval as measured by the clock is compared with the same time interval as determined by astronomical observations. The number of seconds measured by the clock, multiplied by the frequency at which the clock is designed to operate gives the total number of cycles which occured in the astronomocally deterimed interval of time. Thus the frequency of the primary standard is determined directly in terms of astronomical time.

Among the best known and most accurate primary standards are those maintained by the National Bureau of Standards. The bureau operates two radio stations, WWV in Washington shortly to move to Colorado, and WWVH in the Hawaiian Islands each of which, transmit signals for measuring and calibrating the frequencies of secondary standards. The average error of WWV is about one part in 100 million.

In many cases such accuracy is not necessary. For such measurements, the carrier frequencies of commercial broadcast stations may often be used as standards.

Since frequency standards are so readily available, one of the most obvious methods of measuring frequency is the direct comparison of the unknown frequency with a standard frequency. When the relationship (displayed on the screen of an oscilloscope) of the known to unknown frequency is a ratio of whole numbers, a stationary pattern called a Lissajous figure will be formed on scope screen. Lissajous figures are complicated and in many cases difficult to identify except for very small ratios.

Another form of comparison makes use of the beat frequency which is produced when two different frequencies are mixed. The beat frequency is the difference between the two frequencies.

One application of the beat frequency technique is used in heterodyne frequency meters. The basic instrument consists of a stable local oscillator, a mixing device, and a monitor. The output of the oscillator is mixed with the unknown frequency, and the beat frequency is monitored by headphones, a meter or other device. The local oscillator is variable and usually has its tuning control calibrated in terms of frequency. The variable oscillator is tuned until a zero beat is obtained.

Among the simpler methods of frequency measurement are those using the principle of electrical resonance in tuned circuits which are series or parallel combinations of capacitance and inductance. By holding the inductance at a fixed value and varying the capacitor (or vice verse), the resonant frequency of a tuned circuit can be varied over a relatively wide range of frequency.

One of the simplest of tuned circuit frequency measuring devices is known as a wavemeter. Wavemeters which read directly in terms of frequency may employ either a series or parallel circuit. A sensitive current reading instrument is usually incorporated in the circuit as an indicating device. The source of the unknown frequency is connected to the wavemeter and the circuit is tuned through resonance as indicated by a maximum current reading for a series circuit or a minimum current reading for a parallel circuit. A rudimentary series wave meter is shown in figure 1.

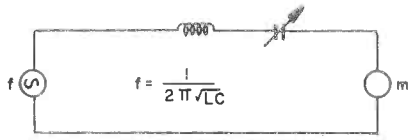


FIGURE 1

Many different types of measuring devices use the tuned frequency principle. Common among them are grid dip meters, Q meters, and sharply tunable instruments, such as frequency selective voltmeters. In fact, a well designed radio receiver makes a frequency measuring device suitable for many purposes.

Audio frequencies may be measured accurately by means of various bridge networks. A typical circuit for this application is the Wien bridge shown in figure 2. The circuit elements are so arranged that when a signal of unknown frequency is applied to the input, the bridge will be balanced for only one particular setting of two variable resistors. The point of balance is determined experimentally, usually by connecting a telephone headset or vacuum tube voltmeter across the output and adjusting the variable resistances to obtain a null.

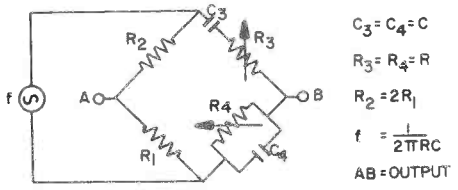


FIGURE 2

The two variable resistors are constructed so that they can be adjusted to the same value simultaneously by means of a common dial. The dial can then be calibrated to read frequency directly. An accuracy of less than 1 percent is not

uncommon with carefully designed frequency-measuring bridges of this type. However, harmonics of unknown frequency sometimes prove troublesome in the measruing process process as they tend to be conspicuous in the output and may mask the null.

As indirect method of frequency measurement involves the principle of resonance and the use of standing wave patterns on transmissions lines. Since frequency and wavelength have a fixed relationship to each other, frequency may be computed readily when the wavelength is known. Mathematically, frequency is equal to the velocity of wave propagation divided by the wavelength. The velocity of wave propagation is usually taken as the velocity of light, 300 million meters per second. At higher frequencies, measurements may be made by measuring the wavelength along the transmission line.

The method consists of connecting a sensitive current-reading device across the line and adjusting its position along the line until a part of minimum voltage (maximum current) is obtained. The distance between any two successive points when multiplied by two is equal to the wavelength. Figure 3 representation of a voltage standing wave pattern on a transmission line:

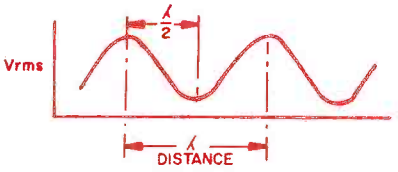


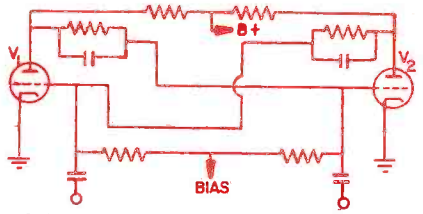
FIGURE 3

The measurement of frequency by directly measuring wavelength has certain distinct advantages. One of these is the directness of reading. The result obtained is a measurement of length and is independent of comparison with a frqeuency standard. Also, since resonant lines normally have a high Q the accuracy of such methods is quite good and may reach a precision that is accurate to within plus or minus 0.1%. The basic problems of this method apply both to open-wire lines and coaxial cables in the latter case a slotted cable is used.

A variation of this method uses a slotted waveguide. In this application, a probe is shifted along the length of a waveguide to determine the minimum voltage points of the standing wave pattern. The distance between these points is then read from a calibrated scale along the side of the waveguide.

Perhaps the most modern and one of the most convenient frequency measuring instruments is the electronics counter on scaler. The basis for such a device is a network which converts the signal to be measured into pulses and then counts these pulses against an accurate time base.

A circuit commonly used in such frequency measuring applications is the Eccles-Jordan circuit shown in figure 4.



A circuit of this type has two stable conditions with a large area of unstable operation between. In one of the stable states, tube 1 is conducting and tube 2 is non-conducting (biased beyond outoff). In the other stable condition, tube 2 is conducting and tube 1 is non-conducting (biased beyond cutoff.) The shift from one stable state to the other is almost instantaneous and is brought about when the grid of one tube is excited by a voltage pulse of the proper polarity and sufficient amplitude. Such circuits are referred to as trigger or flip-flop circuits.

When operating in one of its stable states, the circuit is triggered by a negative pulse of sufficient amplitude applied to the grid of the conducing tube or a positive pulse to the grid of the non-conducting tube. The circuit then "jumps" to its other stable state. When another pulse of the proper polarity is applied to the proper grid, the circuit will jump suddenly back to its original stable state. Such a system therefore completes one cycle for every two pulses fed to it and may be said to count or scale by a factor of two.

Each cycle of the trigger circuit may be converted to a pulse and fed to another trigger circuit. Thus for two such trigger circuits, four original pulses are required to complete one cycle in the second circuit. This process can be extended through several stages until the desired division factor is obtained. When used to generate lower frequencies than the original imput frequency, this process is known as frequency division or subharmonic generation.

When such a circuit is used to measure frequency, the signal of unknown frequency is first converted to pulses which are used to trigger the counting circuit. This count is then compared against an accurate time base furnished by a frequency standard which may be incorporated either in the counter instrument itself or external to it. Thus the counting circuit gives the number of pulses which occur in a given interval of time as determined by the standard. Most frequency counters of this type are designed to display the reading by means of rows of neon lights which are energized in the correct order to provide a direct reading of the measured frequency at the end of each sampling period.

* * *

LETTERS TO THE EDITOR

Dear Editor:

This is in reference to the letter in the December issue by Fred Hervey in regard to the title "Chief Engineer".

He suggests that 10 years experience plus 10 years with first class phone be the requirement but I would like to take exception to this for the following reasons:

First, with all this experience a small (1KW) station could not afford to pay for this especially if the station were directional and required more than one engineer. I think that the experience requirements are aptly met at the larger stations by their employment practices. A smaller station especially, those "out in the sticks" mostly have to take those they can get.

In regard to the continuous numbering of licesnes, I'm for it and it would make for easier bookkeeping. I would like to see the numbering start by the length of time of holding the license, that is, those having held a First Class license longest would have the lowest number in his area and a letter after the license would indicated the class, i.e. AP for Third Class phone, and At for third class telegraph

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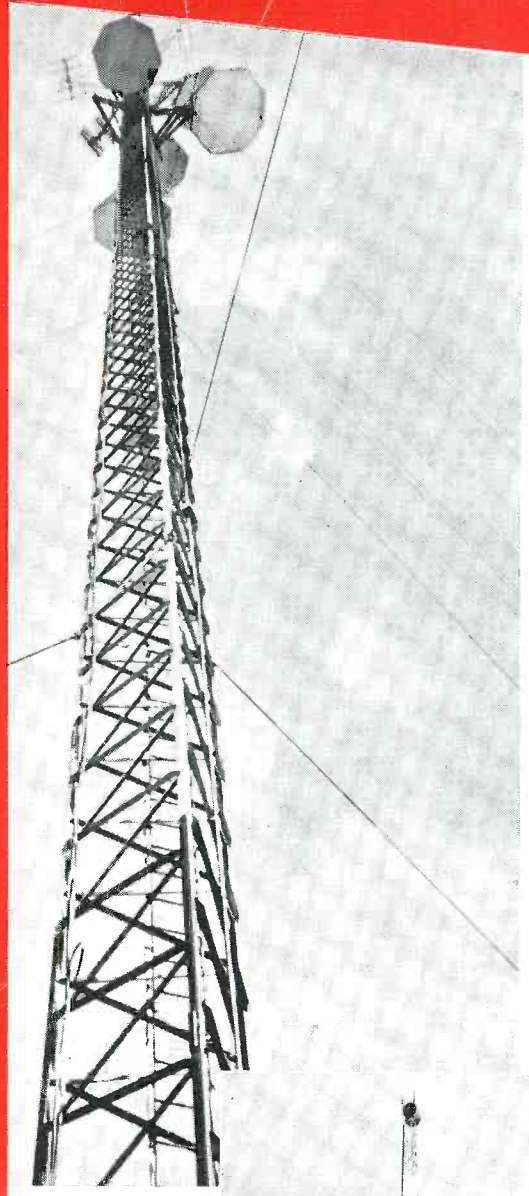

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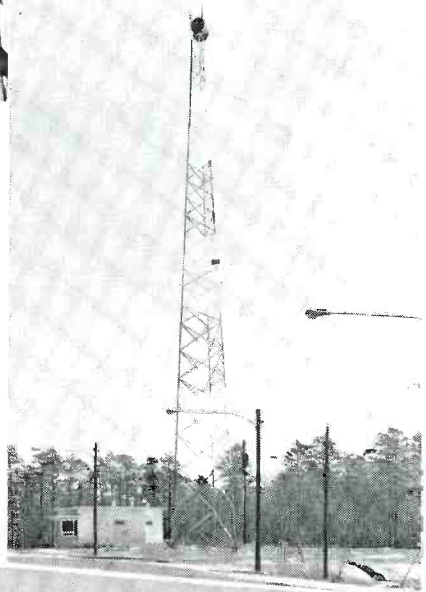

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and the letter R added for Radar. The FCC could at a glance, tell the type of license a person has, and the same number would carry right along instead of changing with the class of license.

I think Chapter One's idea for student chapters is a good one because most schools have radio stations run by the students and usually at least one of them has a first class license and the rest have third class and probably would carry on in radio. Also there are many schools that graduate first class phone licensed personnel and these schools would form a good nucleus for student chapters.

Also I liked the article on station "Housekeeping". I think Fred Hervey, The Horizontal Engineer, should be prevailed upon to write another article under the column heading "One Man's Opinion". He write a good one.

Waiting for the next issue.

Yours truly,
B.B. Landry
WARE
Ware, Mass.

Dear Sir:

I've a couple of comments on material in the December 1965 "Journal".

If our friend "The Horizontal Enginerr" out there in Wisconsin still has those air jets cooling his mercury vapor rectifiers at this time of year -especially if the transmitter building is unheated- he's got a full time job just replacing rectifier tubes!

In case anyone hadn't noticed, there are both lower and upper ambient termperature limits for MV Tubes.

As many have discovered, solid state HV rectifiers are not an unmixed blessing either. I replaced several smaller rectifier tubes-5U4, 5R4, etc with the plub-in solid state units, and after a couple of years AM back to the tubes.

Our remote controlled transmitters out in the rural suburbs get unusually stable average voltage regulation. Line voltage almost never strays more than 2 or 3 percent either way; but a scope will show rather surprising transient spikes even during "normal" times; and when there's a severe electrical storm its a sight to behold.

Therefore, we find the old mercury vapors not only much cheaper, but with the precautions, much less trouble prone.

My Gates BC1T am transmitter uses a couple of 8008s (replaced the 866-As with 3B25's) and the FM1B a pair of 673s. I get fifteen or twenty thousand hours service out of these, but it wasn't that way at the outset. The first real cold morning after I'd installed the BC1T, the morning man had to dig me out of bed! Temperature inside the transmitter building was about 30 degrees and that cold air was being wafted right through the transmitter cabinet by those two axial fans. Despite the fact that we have a time clock that turns on all filaments 30 minutes before sign on, the ambient temperature around the rectifiers was around 35 degrees F. and when he pushed the HV button: Bingo! out went both 30 amp. line fuses. I operated that day with the fans disconnected and that night installed a thermostat, located underneath the rectifier tube sockets to stop the fans when the ambient temperature at that point dropped below about 55°. When I installed the FM1B a year or so later, I added a thermostat to do the same job for the single axial cabinet fan. The plenum chamber blower of course still runs continuously. While these provisions apply particularly to these Gates units one would assume that most other transmitters use similar ventilating arrangements susceptible of similar treatment.

So much for provisions against cold weather; but comes summer time and 90-degree-plus outside temperatures when, despite a husky exhaust fan, the temperature inside the transmitter building soars, and even more so that inside the equipment cabinets. This has been provided for by the installation of small blowers, aimed directly at the HV rectifier sockets. However, winter will come again, so this blower should have its own thermostat, positioned directly in the cabinet's air intake and set to shut the blower off when the incoming air drops below about 65 or 70 degrees. Lots of thermostats, but they'll last for years with proper lubrication and maintenance, and are much cheaper than rectifier tubes.

Now let's comment on Fred Hervey's letter on page 17, anent licensed operator requirements. There are two sides to this issue and being both management and engineering I can see both.

Due to the tremendous demand by government and non-broadcast industry for competent technicians, there just are not enough to go around. Even if one includes all the 6-weeks wonders, and others who obtained a ticket by memorizing the answers to questions which most of these worthies only vaguely understand, there was an increasingly short supply of "first phones" to comply with the former rule requiring at least one full timer on every staff, and additional ones on directional and/or higher powered stations.

NAB notwithstanding, one must doubt that FCC would have relaxed that rule to permit part-time "contract" licensees in certain stations had they not been faced with the hard fact of operator shortages.

Therefore, for the Commission again to require "a first phone man on duty at all times".. would be to demand the near impossible. Not to overlook the fact that having to add two or three featherbedders whose principle task would be to keep a half-hourly log-even if such were readily available - would in many stations mean the difference between operating at a moderate profit, and running at a loss!

Furthermore, I'll say flatly if I were forced to choose between a competent technician on a part-time "contract" basis; and any of an appalling proportion of today's first phone ticket holders, I'd choose the former hands down-even if the cost were substantially the same. Many of the latter would blanche at even the thought of having to change a tube.

I'd firmly agree that every station should have the services of at least one qualified technician, able to devote in the neighborhood of eight or ten hours a week to routine repairs and preventive maintenance; but I'll argue like blazes that in the average small to medium market station, a man with no other duties than "engineering" is certain to be the most under-worked person on the staff; even if he's the dedicated type who keeps his gear in apple pie order. A job he should be able to do under normal circumstances without eating even half-way into a nominal 40 hour week.

He won't be able to do so, however, if he's the type who waits until stuff begins to fall apart before he bothers with it. Even the finest equipment, without proper care, will soon become trouble-prone junk. From that point on he will have a full-time job to keep such gear just limping along. The problem, as I see it, is not a requirement to hire additional and unneeded personnel, but rather to upgrade the quality of the necessary ones. How this can be done practically - I'm danged if I know.

John Carl Morgan
Gen. Mgr./Chief Engineer

WFVA - WFVA-FM
Fredericksburg, Va.

Dear Sir:

May I add my comments to Fred Hervey's fine letter in the September issue of the Journal.

Experience is a vital ingredient in today's world, but there is also a great deal of difference between ten year's experience and one year's experience repeated ten times!

I would very much like to see:

1. A standardized number system on the licenses. Not only would it save the Commission much record keeping as well as being easier for a license holder to remember. How about a number being assigned permanently, with a suffix to denote the number of renewals? This would show immediately the length of time a ticket holder had been licensed.
2. A return to the service record being maintained on the license with a record of citations received, and specifying type of work done.
3. Active work as a non-renewable second class broadcast license holder for two years before being eligible for a First Class, the same as for radiotelgraph license - holders.
4. A practical test for a Chief Engineer's endorsement on the regular First Class license, like that for radar. Taking of this test to be preceded by the two years as a second class operator, plus two years of Master-Con-Control Room operator, or as a Combo Man. More reasons for this later.
5. Chief Engineers to achieve Quasi-official inspector status, and be required to inspect other stations in a given area at least once a year with a copy of this advisory report to be filed with the FCC. I can hear the screams now --BUT--this would give us some internal industry self-policing, and help prevent a few of those expensive citations. I, for one, would be glad of the chance to meet with other engineers, swap ideas, have some oversights of mine caught, get some ideas for better engineering. And that man who inspects my station is not going to ride me, because I will be inspecting his station soon. The Inspector would look over ALL reports, and take no action...but could see for himself, if repeated discrepancies from several inspectors showing up, this would certainly appeal to a station engineer's pride, if nothing else.

The reasons for items no. 3 and 4 are obvious. This would put a damper on the present flood tide of "Cram Course" first class tickets, held by people who cannot read a meter, let alone put a transmitter on the air. Of course, it would require a ruling that second class operators be permitted. And, frankly, I would much prefer to have an interested 2nd class ticket holder, than a know all "Cram Course" first ticket working in my station.

It is imperative that we self police our own professional field before NAB and FCC decide they can do without us altogether and there are plenty of reasons for management feeling that an engineer is only a necessary evil.

I inspected a station for a new manager last week. The first thing that caught my eye after sign off, was the fact that the Remote Antenna Current meter was still indicating normal current with the transmitter off! There was no fail safe on the remote control. Power could not be controlled from the remote control point. Transmitter efficiency less than 51%, a battery and resistor hooked to the frequency monitor so it always read within 2 CPS, and the needle would swing if the crystal check button was depressed. The telephone line (audio) at the transmitter was terminated with a piece of lamp cord to a wirewound L pad laying on a damp cement floor, connected to the input of the limiter, also setting on the floor. And these were just a FEW of the things I found.

I ask, what had management been paying a Chief "Enginner" for? And this is not an isolated case! I could fill a book with what I've seen and heard this year alone.

Back to item 4. What about the experienced (20 years) engineer who installs a loud snap switch on a turntable in a combo-operation control room? When the manager complains about the noise, he gets a blast of..."What the H--- is the matter now...? It works, don't it?" Or the engineer who complains about the cartridge machines being used---because it wears them out".

Let's face it, gentlemen, the days of reclining in an easy chair at the transmitter, reading comic books and filling out the log when it's thought about every three or four hours, are long gone! Machines are here NOW that can do it more accurately, and much cheaper, and a manager doesn't get smart answers and gobbledygook replies to questions from it. I am very strongly in favor of, and agree with most FCC inspectors, that a First Class ticket should be on duty every minute every transmitter is operating but with the kind of engineering many stations are now getting.. who needs them? There are two sides to every coin... but the main part of it is in the middle---right were engineers are between management and the FCC!

Unfortunately, the type of "engineers" we are talking about are NOT the kind who will be reading this. I've talked to many about membership in the Society and after looking at their operations, I have mixed feelings---they are not the professional kind who would help us, so perhaps we are better off without them...but they are the ones giving our profession a very large, and very black eye, and providing NAB with ammunition to shoot us all down. I feel that these recommendations, if you gentlemen approve, and, as a body, we exert the right pressure in the right places, just may extend our professional lives a while.

Let's hear some more suggestions from the membership--then form a committee to correlate them---and let's try to do something!

Thane S. "Jack" Garrison
WRAP, Norfolk, Va.

Dear Sir:

Regarding Mr. Harvey's note in the "Letters" column of your last issue, I would suggest that gentlemen take a memory course if he is unable to remember his license number from renewal to renewal.

As far as the title "Chief Engineer" is concerned, this is as broad a title as any that encompasses small responsibilities such as 250 watt one tower stations, to multi-tower high power am stations not to mention some stereo fm, and television layouts.

With normal training in mathematics, all phases of radio and television engineering from proofs of performance to station and equipment design can be accomplished, and should be a capability to all possessors of the First Phone ticket. It is my contention that a good Chief engineer should be well versed in personnel handling, training and all phases of business management as well as a "consultants" knowledge of engineering. This Sirs would be far more effective a qualification for a chief engineer than a ludicrous "years of ticket holding" standard.

Let's not prostitute professional radio engineering in the manner that amateur radio has been, idolizing years "in" in place of knowledge and experiences.

Sincerely,

Elmer Smalling III
WBUX, Doylestown, Pa.

Dear Sir:

There is a subject which I would like to go into more detail on sometime later, if it would be of interest to you or to someone else in the SBE.

The subject comes under the general heading of "Engineer". I understand that the PE groups have requested that the FCC (among others) discontinue the use of the word "engineer" except where a registered professional engineer is referred to. This is part of their general campaign, which has become more intensive in the past 2 or 3 years, to excluse all others but themselves from the title "engineer".

If they're successful, broadcast engineers, chief engineers, maintenance engineers, non-registered consultants (plus other capable "engineers") might have to look for some other satisfactory job titles.

Many broadcast engineers are not aware of this request by PE groups to the FCC. Many don't even know the different between, professional engineer, registered professional engineer, etc. They just go in "engineering". Maybe they should be doing a little lobbying or politicking, too.

A good many broadcast engineers, I'm convicned , are better all-round engineers than many registered PE's I've known personally. Several PE's I know have done no real engineering but have been sales reps, sales engineers, power-plant meter-watchers, etc. Many, many of course are highly qualified so no disrespect is meant for the majority of PE's.

My initial feeling in this matter is that SBE should evaluate this "engineeer" situation and consider how it might best be of service to a qualified broadcast engineer. One approach might be to investigate whether the national PE society would create a new area of specialization (Broadcast Engineering) and admit for membership (and register) qualified broadcast engineers who have had 4 or more years of responsible experience and some technical school education of respectable level. To start with, perhaps for a 2 or 3 year period, "qualified people might be admitted under a "grandfather" policy. After that, admission would be by graduation from an accredited school plus experience, or by passing a written exam plus experience. Many present PE's got in this way, themselves. Maybe such a project might be combined with a proposed higher level of FCC license, and tighter qualifications for chief engineer positions in the broadcast industry.

Another approach would be to ignore the PE society and campaign on the latter points, above, especially petitioning the FCC not to accept the PE's request to delete "engineer" from their laws, etc. except where a registered PE is meant; instead, perhaps, "broadcast engineer" might refer to someone of demonstrated qualifications as determined by a higher-level FCC exam, (or a special new exam, which might be taken in the presence of any one of many qualified" members of the SBE throughout the U.S.), or 4 more years of responsible chief's or engineering supervisors work and 2 years or more of appropriate technical school study.

Yet another possibility for consideration is that the SBE might be instrumental in creating a new engineer category --something like "non-professional broadcast engineer" it would actually mean nothing but with press releases and continued publicity the dignity of the legitimate broadcast engineer might be raised.

The SBE, I feel, should assume a responsibility to the broadcast engineer, in at least informing him of present trends, and protect his interest and dignity before the eyes of other engineers.

Perhaps someone qualified, who knows the facts, could write a controversial article might be prepared to alert and arouse the interest of SBE members and non-members, and, at the same time, to serve notice on the PE society that we are not to be dealt with lightly.

I hope you'll consider this letter as somewhat confidential, unofficial, off the record, etc. I'm certainly not full informed in this whole matter, and would not be a good one to "carry the ball". I've just put some random thoughts on paper, to go along with whatever other thoughts might have come to your attention. Perhaps rightfully, you'd feel, as a registered professional engineer, yourself, that others less qualified should not be registered --- and for this I wouldn't blame you. And there may be other better ways in which SBE can expend its energies in members' interests. Maybe a stand against the PE society would do us more harm than good. (But the broadcast engineer would have an advantage of easy access to one publicity media to make known his side of the story -- the radio-tv station.

Now I can relax -- at least I've said my piece to a body that is really in a position to judge the overall situation.

Thanks for listening, and best regards,

Name Withheld

Editor:

I would like to submit for possible comments, a slight problem which I have come up against in the installation of WOLA-FM. It is in regards to lightning protection for the tower and antenna. I have reviewed several texts for possible solutions but nothing to date has given me what I can consider an adequate means of protection for my particular case.

We have a Collins 6 bay ring antenna mounted on a 70 foot guyed galvanized steel tower which are on top of an 80 foot high, six story office building. I have broken up the guys with 3 evenly spaced insulators each. All the surrounding terrain below the building is cement on paved driveways. The building owners are quite reluctant to allow any exposed drain leads running down the side of the building. The tower base is adjacent to a water cooling tower for the building's air conditioning. The base is at a level even with the top of the cooling tower. The building itself is the tallest structure within almost a mile radius at the least.

I would very much appreciate any comments from anybody who might have had a similar experience or for anybody who might have something to offer. While lightning is not quite as severe here as in some other places in the north, on occasion it can really build up.

In hopes for some early reply to the above questions and with my advance appreciation for same, I again wish to express my most heartfelt compliments to all of you who have joined in your efforts to make the society possible for all of us and to wish you all the very best for a happy and prosperous 1966.

Sincerely,

Albert R. Saladin
S.B.E.
WOLA-FM
San Juan, P.R.

WHY THE GREAT FEAR OF AUTOMATION?

Norman J. Gagnon
Suncook, N.H.

Today the American public is possibly more preoccupied by thoughts of automation than at any other time in its history. In most cases these thoughts of automation are manifested in fear and resentment, which is only human nature....the fact that we have an inherent fear of something that we cannot comprehend. Automation today is becoming very sophisticated and is happening at a rate faster than ever before, posing too great a pressure on a society, that will accept changes, but only after a lengthy probationary period. This brand of thinking is symbolical of individuals with selfish points of view, and the degree of dissention depends on the degree of involvement by the individual.

Automation has reached the broadcasting industry in the last few years. There has been widespread difference of opinion on the feasability (and the future) of automation by the different departments that might be directly involved. But the great disservice to the industry is the arguments (no matter how valid they may be made to sound) that come back to the old selfish motive of HOW WILL IT AFFECT ME? Will I have to retrain? Will this mean that I will be out of a job? And many, many more. Judgement is not based on the merit of the subject. This type of reasoning is so short sighted that it accurately may be termed consistent with the stone age. To try and hold back the progress is as futile as trying to stop the sunrise.

Progress, is what has made this country the great world leader that it is today....The same kind of progress that our pioneering ancestors made!

Management in most instances would be in favor of automation, but the bottleneck so often comes from the technical personnel and talent. Management would be in favor because of the amount of money that could be saved over a period of years. Talent, and technical people fear for the possible loss of their jobs and income. Direct involvement in the project is the cause of this wave of negative thinking again motivated by selfish interests.

In American life today an automatic transmission in one's automobile and an automatic heating system in the home are accepted as a way of life. But no matter how one may try to rationalize this fact away it is AUTOMATION!

Most people will agree that Automation can do the job far better than anyone could, or would, do for himself. The individual is directly involved in driving and keeping warm, but John Q. Citizen is 100% in favor of this. He has nothing to fear from this type of Automation according to his way of thinking! No one can argue the point that automatic gear shifting and heating are great improvements over the old system; are more error free, and provide for smoother operation than ever before possible. These two examples have not put anyone out of work, but rather have created new job openings, and have provided a boost to the American economy.

This same type of reasoning applies to broadcasting automation. Whatever form or shape automation may assume in broadcasting, it will do nothing except benefit everybody in the industry. We already have proven forms of automation, and in fact have had them for years. Such things as transmitter cycling and re-cycling, in cases of monentary overloads or power failure, have relieved the broadcast engineer of the inconvenience of manual operation, and can perform the switching in a fraction of the time required for manual operation.

A recent development the tape cartridge system, which is in use by all but a few radio stations across the country can be labelled automation. In most cases the cartridge system was readily accepted by the control room operator. As in any other industry the technician is expected to perform more and more duties as the company grows. Cartridge tape relieved the operator of the tedious repetition of manually cueing reel-to-reel tapes, thus giving him free time to perform other duties.

Some stations may desire to automate completely their operations; while in other plants token automation may be initiated. In most instances, stations that automate do not dismiss personnel. Instead, most of the employees involved will be retrained to maintain and program the system, or will be transferred to a compatible department. Then one might say, "Why should management invest many thousand dollars(in some of the larger systems) and still maintain the same amount of personnel?" The reasons may be many. One reason would be to offer some additional services to the community that might not otherwise be profitable if additional manpower had to be obtained, such as providing separate programming for an FM facility. Another reason might be to relieve the pressure on the operating personnel in segments that require tight or repetitious operations, such as TV station breaks.

Many people will say, "Oh, I've seen some of 'those' station breaks" or "I've heard some of 'those' stations" BOY CAN THEY EVER FOUL UP". There's only one answer to these comments: If the real culprit were to be known it would not be the automatic equipment, but rather a human error which was generated by someone who programmed the sequence. The automatic equipment on the market today is quite reliable and will provide years of dependable service. If properly programmed and this is where the human element enters it can provide perfect operation every time. Automated equipment can "think" faster than any human being and is immune from human errors in thinking when under pressure.

It would be well to note at this point that any automated system or computer is only as intelligent as the people who build and program the equipment. This brings to mind the story about the computer which had not been "told" that it could not divide by zero. Given a mathematical problem the computer tried and tried to arrive at an answer. Frustrated from trying in vain to divide by zero the computer went out of its memory bank and finally succombed to a fatal attack; later diagnosed as an "open fuse"!

An electric thinking machine has no way of "knowing" something, unless it has been "told" or built to handle the particular situation. The big advantage that computers have over human thinking is the speed with which they can analyze a situation and can correlate its findings into an answer.

The age of automation is here whether any of us care to admit to this fact or not. We, in the broadcast industry, should welcome this progress with open arms, since our

(Continued on Page 18

CHAPTER TWO

The December meeting, at WNEP TV Studios, attended by 19 people, featured two representatives from RCA's Mountaintop semi-conductor plant who talked about solid-state applications in the broadcast field. Their presentation and discussions which followed proved most interesting to everyone. Again, people stayed long afterward discussing solid state equipment, their problems, solutions to somebody else's problems, old times, how broadcast engineering has changed, and who knows what else?

Chapter 2, Northeastern Pennsylvannia, Society of Broadcast Engineers, met Tuesday, January 11, 1966, 8 P.M. at WBRE TV Studios, 62 South Franklin St., Wilkes Barre, Pa. An interesting tour and inspection of the WBRE TV studios and facilities followed.

On February 8, the NE Pennsylvania Chapter met at WBRE-TV and were addressed by John H. Battison, the President of the Society. He talked about changes in FCC Rules and Regulations, and commented on the need for Broadcast Engineers to consider the impact of recent efforts of professional engineering societies to persuade the FCC to cease referring to Broadcast Engineers as "engineers". A very havy attendance was noted, and a number of new members enrolled.

CHAPTER NEWS

Arizona had a statewide meeting of the SBE on January 25, 1966 to which everyone active in broadcast engineering was invited and a number of new members joined.

There were 30 people in attendance from all over the state and the prospects of having a growing, active chapter are very good. Contact Albin Hillstrom, KOOL, Phoenix for details.

ANOTHER NEW CHAPTER - Connecticut

Another new chapter is in forming in Connecticut---Carmine Ianucci, the Chief Engineer of WNHC is in the process of organization---any SBE members in the area should contact him. He will welcome offers to help in setting up the necessary initial organization.

CHAPTER ONE

Chapter One held its fourth meeting of the 1965-1966 season Tuesday 14, December at the Colonial Motor Inn, Vestal, New York.

A talk was presented by Mr. Bernard Wise, President of CCA Electronics Corporation on "AM & FM Transmitter Design Philosophy".

Chapter one held its fifth meeting of the 1965-1966 season Tuesday, 11 January 1966 at the Colonial Motor Inn Vestal New York.

A talk and demonstration was presented by Mr. Charles Hults, Sales Engineer for the Hewlett-Packard Corporation on "Cable Testing with Time Domain Reflectometry".

LATE CHAPTER NEWS

Good news for Members in Michigan! Walter Wierzbicki, Technical Director of Panax Corporation, Box 289, East Lansing, Michigan, is anxious to form Chapter 15 in Michigan. All interested Members could contact him as soon as possible. Perhaps we can welcome a new Chapter in our next issue!!

NEW ANTENNA SYSTEM CATALOG

Andrew Catalog 24 presents the widest selection of antenna system equipment ever offered. The 104 page catalog covers detailed product information on UHF, VHF and microwave antennas for commercial and military application. HELIAX, flexible coaxial cables and elliptical waveguides, antenna positioners, RF switching devices, pressurization equipment, rigid transmission lines and waveguides are offered for complete and integrated antenna systems.

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(Continued from Page 17)

present occupations are a result of a brainchild of this century. We should accept the challenge that is offered to us and meet it fully and squarely, not retreating as scared and selfish individuals, but forging ahead in an effort to conquer all frontiers.

PROFESSIONAL CARDS

Rates $ 5.00 per issue (Members)
$10.00 per issue (Non-Members)

SUSTAINING MEMBERS

It is with the greatest appreciation that the Society of Broadcast Engineers list the following organizations as Sustaining Members. It is their Support that has helped make these JOURNAL issues possible.

The Alford Manufacturing Company*
299 Atlantic Avenue
Boston 10, Massachusetts

Manufacturers of Antenna Systems, transmission lines and equipment, etc.

Burke and James, Inc.
333 West Lake Street
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Suppliers of every conceivable form of photographic equipment for TV.

Electro Voice Incorporated*
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Noted for top quality broadcast microphones and loudspeakers.

Andrew Corporation
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CBS Laboratories*
Stamford, Connecticut

Moseley Associates, Inc.*
Santa Barbara, California

Manufacturers & designers of top quality, AM, FM and TV remote control system.

*Also an advertiser. SBE JOURNAL rates available on request.

The original Society was conceived by John H. Battison a consulting engineer, who in 1962 wrote several editorials in the technical press commenting on the lack of a professional technical organization for the broadcast engineer. The response to these editorials was so great that plans were prepared, and at the end of 1963 the first group was formed.

The Society of Broadcast Engineers, Incorporated was actively formed in 1963 as the Institute of Broadcast Engineers. During the 1964 NAB Convention the Society's first general meeting was held; and by popular vote and suggestion the name was changed to its present form. In 1965 the Society was incorporated in Washington, D.C. as a non profit organization.

The membership is now close to 400 and grows daily. This figure includes Canadian as well as US engineers. A number of companies intimately connected with broadcasting have become sustaining members and actively support the Society. There are thirteen regional chapters and the number is also growing.

The Society's aim may be very briefly stated as providing a forum for the exchange of professional discussion of mutual broadcast engineering problems, a means of providing professional recognition of members, and a grouping together of broadcast engineers generally to provide a professional body to assist in the professional education and raising of the technical standards of the broadcast engineer.

Grades of Student, Member, Senior Member, and Fellow are offered. The qualifications for member requires at least possessionof a first class license, and adequate experience. The full requirements for all grades of membership are contained in the "Constitution and By-laws" which is sent to all members on acceptance. Membership certificates and cards are furnished to members, and lapel pins in blue and silver bearing the insignia of the Society are available at $2.50 each post paid.

Elections are held annually immediately prior to the NAB Convention for the positions of President, Executive Vice President, Treasurer and Secretary; write in names and votes are invited and anyone can run for any office. Members are encouraged to offer their services on committees, et cetera.

Membership dues are $10 annually and include subscription to the JOURNAL of the SBE which is published quarterly. Members are invited to contribute material to this publication to help increase its value and interest to readers.

This is an organization that is being built by and for the broadcast engineer. It is only by the active participation of its members in the Society that it can grow and become the great influence that it can be for the prestige and benefit of the broadcast engineer.

SOCIETY OF BROADCAST ENGINEERS

P.O. Box 1841, Annapolis, Md.

APPLICATION FOR MEMBERSHIP

Application is hereby made in the SOCIETY OF BROADCAST ENGINEERS. The following information is supplied to assist the admissions committee in assessing qualifications and grade.

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ADDRESS _____ CITY _____ STATE _____

EMPLOYER _____

ADDRESS _____ CITY _____ STATE _____

(check preferred mailing address)

Engineering Qualifications _____ Degree? _____ University _____ Year _____

FCC Licenses _____

Years of Responsible Engineering Experience _____

Brief Professional History _____

_____

_____

Fields of Engineering Activity: Radio ___ Television ___ Transmission ___ Studio ___ Other _____

Two references who are familiar with my work:

Name and address _____

Name and address _____

Annual dues of $10 are herewith enclosed. (No action can be taken if dues do not accompany this application.) I agree to abide by the Constitution and By-Laws of the Society if admitted.

SIGNED _____

DATE _____

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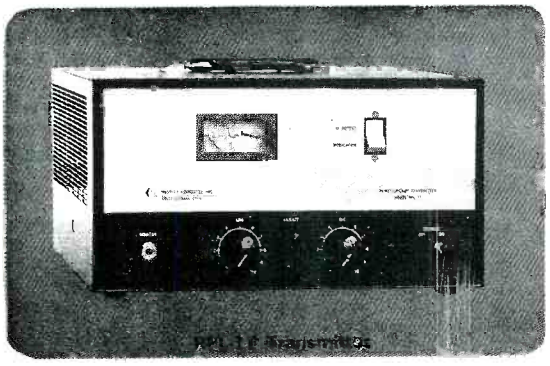

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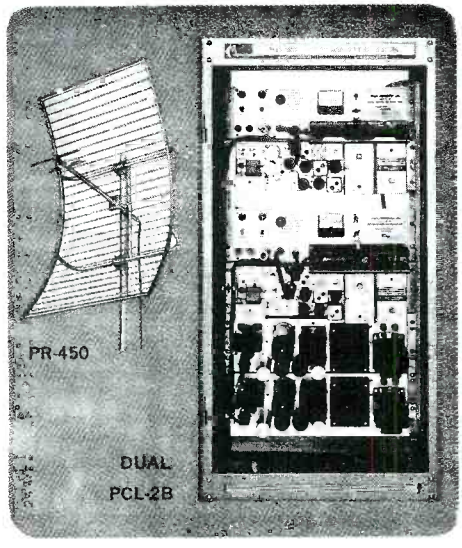

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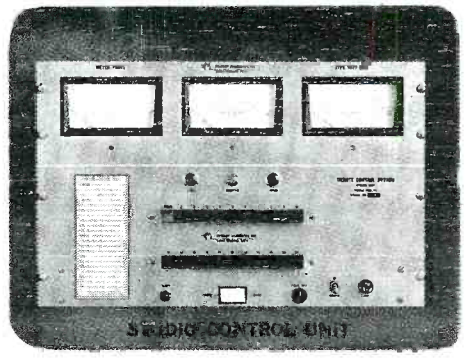

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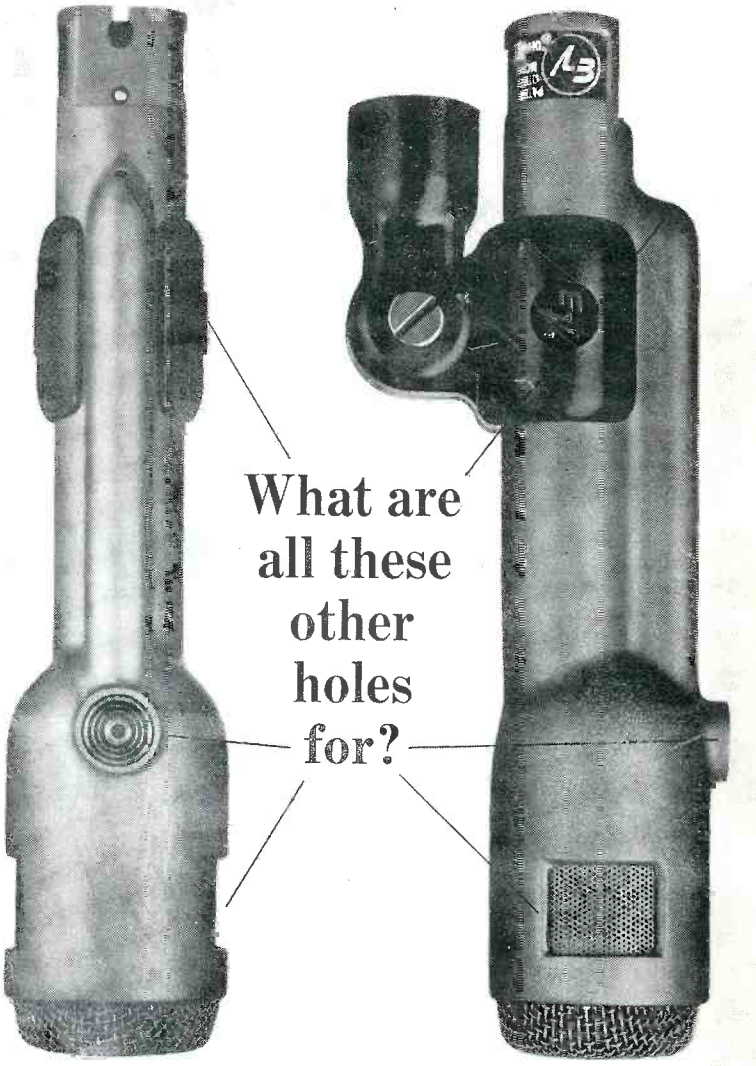

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