The New Priess TELEVISION SCANNER

A new scheme in "scanning" with a periodic system of vibrators in which the process is a continuously progressive one back and forth

Elmore B. Lyford

RADIO has had at its disposal for some time, now, practically everything that it needs for successful television transmission and reception except a good, cheap and rugged scanning device. Radio engineers working on this problem have recognized that the lack of such a scanner is really the "neck of the bottle" and are concentrating the bulk of their efforts along this line. A dozen important developments along the line are going forward in as many different laboratories at the present time, and at least one of these developments has reached the stage at which it can be announced. This is the so-called "periodic scanner" which is the work of Mr. William H. Priess. This particular scanner differs radically from either the Nipkow disc or the cathode-ray tube, and incorporates in its design several novel features.

In its essentials, this new Priess scanner consists of a small metal mirror which, by electro-mechanical means, is made to vibrate in two different planes simultaneously, thus reflecting a beam of light to all parts of a receiving screen. The light beam may come originally from an incandescent or an arc lamp, and may be modulated by a Kerr cell or other similar arrangement—these things have already been done.

It is the design and operation of the scanner itself which is new and of the greatest interest. In its details, this scanning unit consists of a small metal mirror, about ¼ inch square, firmly attached to the middle of a steel wire about three inches long. This wire is mounted in a special frame, held tightly at both ends, and caused to twist back and forth slightly by means of a magnetic field generated in a coil mounted behind the mirror, and acting upon a small vane attached to the back of the mirror. When a beam of light is focussed upon the mirror, this twisting motion causes the beam to "sweep" back and forth across any screen upon which it may be reflected.

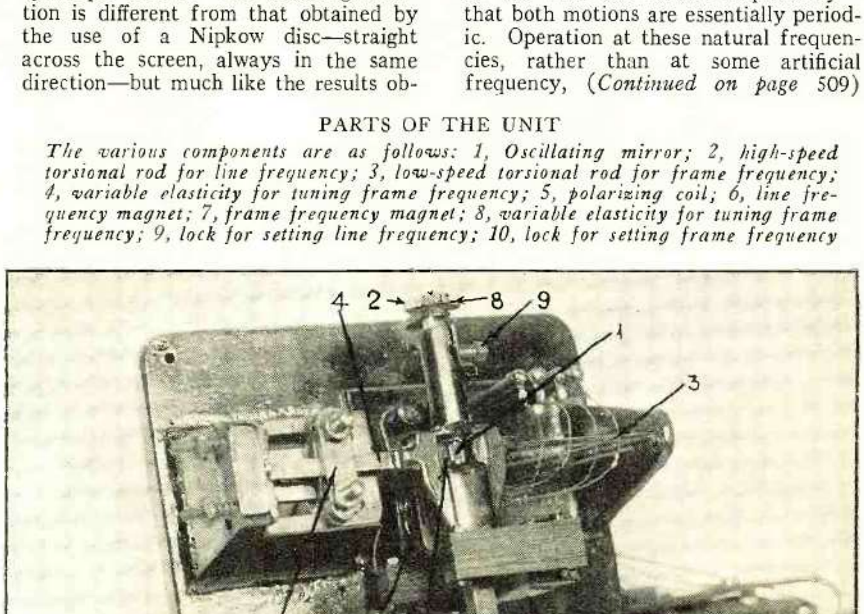
Simultaneously with this action, the entire frame which holds the wire is caused to tip backwards and forwards slightly, by a similar coil arrangement. This action is relatively much slower, is in a direction at right angles to the twisting motion of the mirror, and causes the reflected beam to "sweep" up and down upon the screen to which it is reflected. The two actions of twisting and tilting happening together cause the beam of light to be reflected or "sprayed" to all parts of the receiving screen, in regular progressive order—just what is needed in television scanning.

The frequency of the twisting motion is controlled by the length and stiffness of the steel wire on which the mirror is mounted, and is adjusted to be about 5000 cycles-per-second in the models which Mr. Priess is now using. The tilting action of the frame is likewise controlled by the mass and stiffness of the assembly—just as in the case of a tuning fork—and is adjusted to have its natural period at a frequency of 24 cycles-per-second. The scanning direction is different from that obtained by the use of a Nipkow disc—straight across the screen, always in the same direction—but much like the results obtained by the use of a cathode-ray tube, i.e., back and forth across the screen working from top to bottom, and then from bottom to top. At the frequencies being used at present, there are 10,000 lines to be divided among 24 double frames-per-second, or a definition of about 200 lines-per-picture (horizontal). The definition-per-line will depend, of course, upon the efficiency of the transmitting and receiving devices and modulating system, but can be made equally as fine without any great technical difficulty. The net result promised by Mr. Priess is a picture three feet square, with the definition and brilliance of the average home-movie projector.

Most important of all in the design of this scanner, perhaps, is that the twisting motion of the wire and the tilting motion of the frame both come, as has been pointed out, at the natural periods of the wire and frame respectively—that both motions are essentially periodic. Operation at these natural frequencies, rather than at some artificial frequency, (*Continued on page* 509)

PARTS OF THE UNIT

The various components are as follows: 1, Oscillating mirror; 2, high-speed torsional rod for line frequency; 3, low-speed torsional rod for frame frequency; 4, variable elasticity for tuning frame frequency; 5, polarizing coil; 6, line frequency magnet; 7, frame frequency magnet; 8, variable elasticity for tuning frame frequency; 9, lock for setting line frequency; 10, lock for setting frame frequency



The "Ham" Shack

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be blessed with the space for such antennae. In general, its length is not critical. The usual practice is to make it 23.7% of its length in meters (i.e., length in meters divided by 4.2). Wavelength (in meters) may be determined by dividing the frequency (in kc.) into the velocity, 300,000. That means 125 feet will be adequate for the 150-meter band. On the other hand, it will be seen that the 80-meter Hertz will form an excellent quarter-wave (Marconi) antenna, when operated against a counterpoise or ground.

Calls Heard

By Lewis F. Miller, 4614 North Paulina Street, Chicago, Ill. On 20-meter 'phone: LU8BR, PY2AK, TI2EP, K4SA, K6BAZ, VP6MR, HI8X, HI7G, HI6S, CM6XS, CM2SE, CM2QY, CM2WZ, CM2AN, CM2SV, CM2RA, CM2LL, CM2JM, X1G, X1AI, X1AX, X1BR, X2N, VE4BF, VE4IG, VE4HW, VE4DU, VE4GO, VE4LL, VE4KX, VE4FI, VE4CY, VE4HQ, VE4EA, VE2GK, VE2BG, VE2DX, VE2CH, VE3XQ, VE3GK, VE3CF, VEGS, VE3JG, VE3HC, VE1CO, VE1DR, VE1BV and VE5CP. Mr. Miller reports hearing more than 750 amateur stations in the United States in every state in the Union.

By M. Mickelson, P.O. Box 2754, Bloomington Station, Bloomington, Minn. On 20-meter 'phone: K6UA, K6CMC, K6BAZ.

By N. C. Smith, Forge House, High Street, Foots Cray, Sidcup, Kent, England. On 20-meter 'phone: FM4AA, RW59, W3GDL, W2ZP, K4SA, F3BN, I1KG, W2GOQ, G6VP, VE5FY, W1GPE, W2AIE.

By Sam J. Emerson, 1097 Galewood Drive, N. E., Cleveland, Ohio: Heard on several bands: HI6F, HI7G, HI8X, X1G, CM2WZ, CM6XS, VE4HQ, VE2EE, OA4B, CM2AN.

Television Scanner

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results in power savings which Mr. Pries computes to be of the fourth magnitude—i.e., one ten-thousandth of the power that would otherwise be required. In the scanner as built at present, for example, the wire builds up a twisting moment at the mirror of about eight degrees—more than enough for television requirements—with an applied power in the coil of less than one-half watt. The tilting motion of the frame is likewise required with a power of only five one-hundredths of a watt. Since the required power is so small, Mr. Preiss proposes that it shall be obtained directly from the receiving amplifier, by the building up of a pulse sent over the air, thus assuring exact synchronization of the receiver with the transmitter, and doing away with all necessity for driving motors, high voltage transformers, or anything of the sort.

The scanning units built by Mr. Preiss, and illustrated in the accompanying photographs, are small and rugged, and cost about as much to build as does a good dynamic speaker. Test models have been operated through several billion swings of the scanning mirror without showing the slightest trace of deterioration, since the entire action is obtained through the inherent elasticity of the various parts of the unit, without dependence upon any bearings or other similar devices.