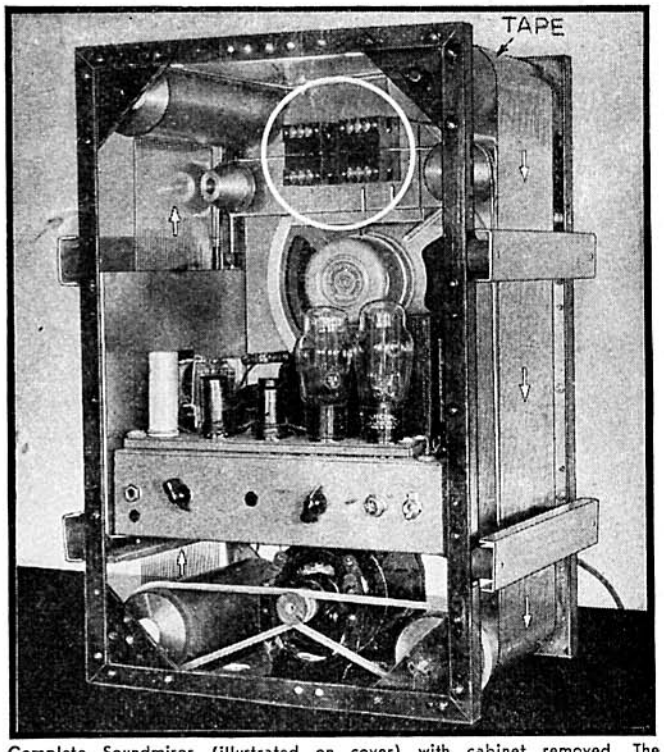
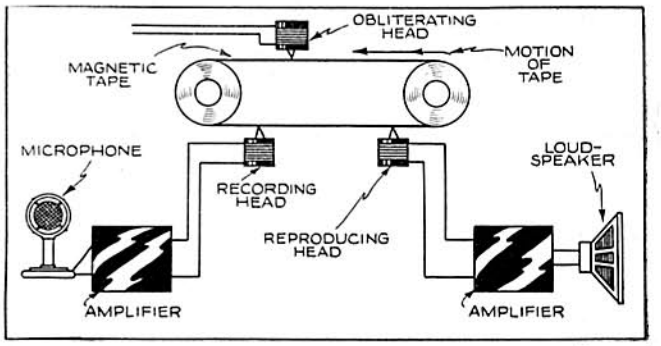


Complete Soundmiror (illustrated on cover) with cabinet removed. The steel wire tape is a 35-turn coil that revolves on 4 cylinder bearings; recordings on this tape automatically repeat every few minutes. The recording-and-playback, and erasing heads are encircled.

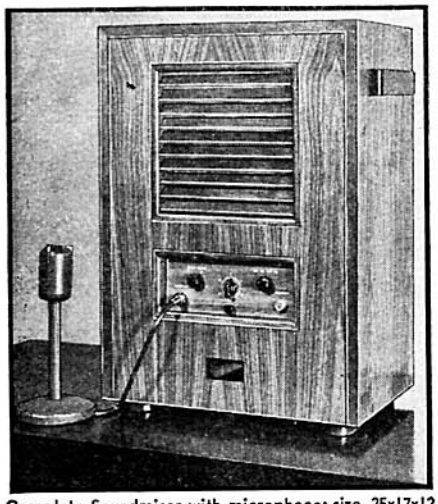


Theoretical diagram of the Soundmiror. Although separate recording and playback are shown here, in actual practice one head automatically serves these dual functions.

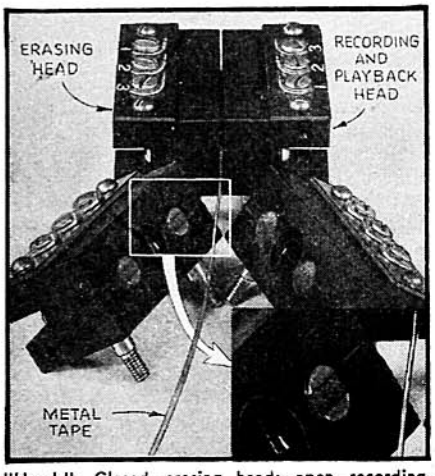
SOUND-

A specific model of sound recording production. It operates by magnetiz- the electrical currents produced duction is then accomplished by trans- reproducing by loudspeaker into

• COVER FEATURE •



Complete Soundmiror with microphone; size, 25x17x12 ins. deep. Control panel consists of volume control, amplifier motor switch, timing dial and 2 connecting plugs, one for mike and the other for recording and reproducing phonograph records.



"Heads". Closed—erasing head; open—recording-playback head. Inset is a close-up of the pole pieces.

THIRTY-NINE years ago Prof. Vladimir Poulson demonstrated a method (1) for recording sound on a moving iron wire and of reproducing that sound, at leisure *and without processing*, as many times as desired; and of erasing the sound and re-recording new sounds *on the same wire*. Last month a well-known engineering group culminated years of intensive research by announcing the availability of a "Soundmiror" that demonstrates the commercial practicability of Poulson's principle of magnetic recording and playback of sound.

During the interim, *sound-on-film* and *sound-on-disc* had its innings, and many laboratory experiments in recording and reproducing sound were undertaken; an interesting, recent experiment being the use of a static charge on moving paper tape (2). Underlying all the progress in these directions, however, was the fact that "magnetic phonography" possessed inherent advantages over all other methods. For this reason many independent researches were made toward overcoming the faults in technique that, since the fold-up of Prof. Poulson's venture into the commercial field with his "Telegraphone," had delayed the commercialization of *sound-on-wire* (or tape).

DEVELOPMENT

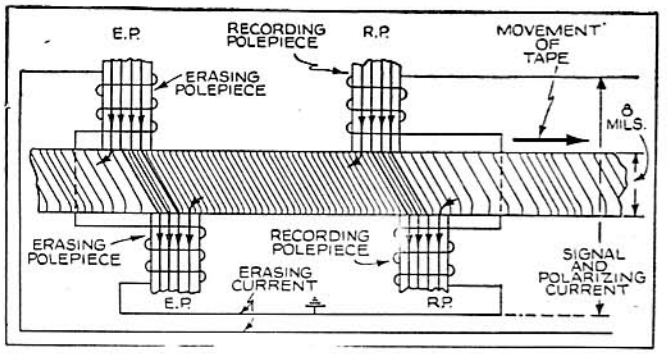
Bell Laboratories (3), for instance, is one group that found ways and means of utilizing technical advances and inventions—in (mainly) magnetic materials, amplifier designs, frequency filters—to overcome what were otherwise insurmountable obstacles in the methods and apparatus originally employed by Prof. Poulson. The New Jersey Bell System has found magnetic recording-playback a practical means of giving up-to-the-minute announcements of potato prices, and car movements and loadings, over the local telephone system in the farming district of Hightstown, N. J. Other applications are being developed.

Coincident progress has been made in Europe. The British Broadcasting Corp. is now regularly using a highly-perfected type of magnetic recorder and playback (in lieu of the sound-on-disc ["transcription"] method universally employed in America as program fill-ins) known as the Marconi-Stille Recorder and Reproducer (4, 5); this device, with a frequency-reproducing range out to about 8,000 cycles (with *no* background noise), shows the advance that has been possible mainly through the use of the tube-type amplifier and, last but not least, *steel tape*. In Germany, the "R.R.G. of Berlin" recently introduced the Magnetophone (a non-inflammable film, 6.5 mm. wide, "coated with a thin layer of powdered metal") (6) for portable recording, due to it being completely unaffected by jolts in moving vehicles!

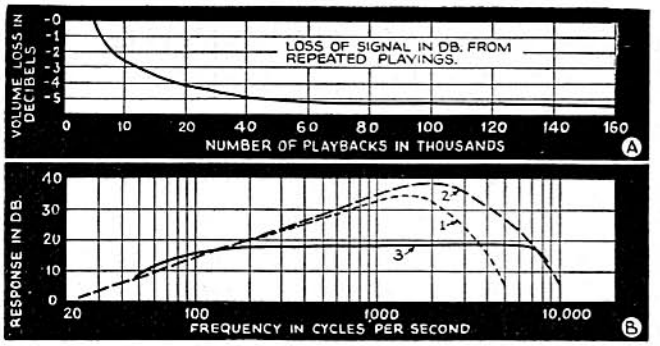
COMMERCIALIZATION

First sign of American supremacy in this field, insofar as it concerned Mr. John Q. Public, came in the Spring of 1937 with the announcement by Dr.

(1) "Sound Recording on Magnetic Materials," **Radio-Craft**, Mar., 1936.
(2) "On the Electrographic Recording of Fast Electrical Phenomena," **Journal of Applied Physics**, Oct., 1938.
(3) "Magnetic Recording and Reproducing," **Bell Laboratories Record**, Sept., 1937.
(4) "Storing Speech and Music," **Newnes Practical Mechanics**, Apr., 1938.
(5) "The Steel Tape Recorder," **Practical and Amateur Wireless**, July 2, 1938.
(6) "Recording for Re-Broadcasting in Germany." **Wireless World**, Mar. 31, 1938.



Schematic detail of erasing and recording actions. Maximum magnetic influence is obtained by virtue of the pole pieces touching the moving tape; by applying D.C. to polarize the winding and then modulating this D.C. with the signal; and by magnetizing the longest path through the tape.



Graph A illustrates the loss of signal in db. from repeated playings of magnetic sound record on tungsten steel, 120 x 8 mils thick. Graph B shows frequency response of Soundmiror; an attenuation network makes curve 3 possible.

ON-WIRE TAPE!

and reproducing machine, the Soundmiror, is now in ing a sound pattern on a steel tape in accordance with by sound vibrations entering a microphone. Reproferring the magnetic pattern into electric currents and sound. Many valuable results are obtained.

R. D. WASHBURNE

Begun and S. K. Wolf of a "30-sec. unit for use by teachers and students in voice culture ([7]); the frequency range was 100 to 8,000 cycles. Second sign came last year, in an article by Dr. Begun ([8]), with the introduction of a larger machine capable of operating "from 15 seconds to several minutes"; (readers interested in this subject will find it worthwhile to look up one of the references [9] mentioned here.

A perfected form of Dr. Begun's magnetic recorder-reproducer just announced is the "2 to 10 minute" Soundmiror shown here and on the cover of this issue of *Radio-Craft*. Details of this machine made available by Acoustic Consultants, Inc., include excerpts (some of which we reproduce below) of a Report by Prof. George R. Harrison, Director of Physics, Applied Physics, and of Research Laboratory and Experimental Physics, Mass. Inst. of Technology.

(7) "Magnetic Recording-Reproducing Machine for Objective Speech Study," **Journal of the S.M.P.E.**, Vol. XXIX, No. 2, 1937.

(8) "Magnetic Recording," **Electronics**, Sept., 1938.

(9) "Some Aspects of Magnetic Recording and Its Application to Broadcasting," **Proc. I.E.E.** (London), Mar., 1938.

Q. & A.

Questions and answers regarding the Soundmiror quickly disclose the construction, sales and service aspects and possibilities of this new development in sound-on-steel-tape.

1—How expensive is the soundmiror? Actual dollars-and-cents figures cannot be given here but it is evident by inspection that due to the absence of an exciter lamp, photocell and the attendent, necessarily precise construction, it is far less costly to produce than sound-on-film equipment. And, since there is no additional cost for recording discs, no breakage, no wearing out of the recording due to needle pressure and deformation, and the more rugged principle of operation, it is on these

(Continued on page 684)

APPLICATIONS OF THE SOUNDMIROR

Primarily, for use in the educational fields, for colleges, high schools, and grade schools in their language departments, debating, elocution, drama and music groups, and for elementary vocabulary and pronunciation teaching.

In the entertainment field, by radio stations for auditions, transcriptions, background effects, and practice work (and in checking program delivery, timing, etc.).

These applications can also be made in theatres, movie studios, and auditoriums.

Entertainment personalities will find this method of sound recording and reproducing a great advance in training methods.

In the commercial field, it may be used as an announcement and call system, repeating the message over and over as many times as desired.

In stores, a master unit may be set up to deliver sales messages to loudspeakers in many departments. Individual units at counters may be used to call attention to items being featured, and their merits.

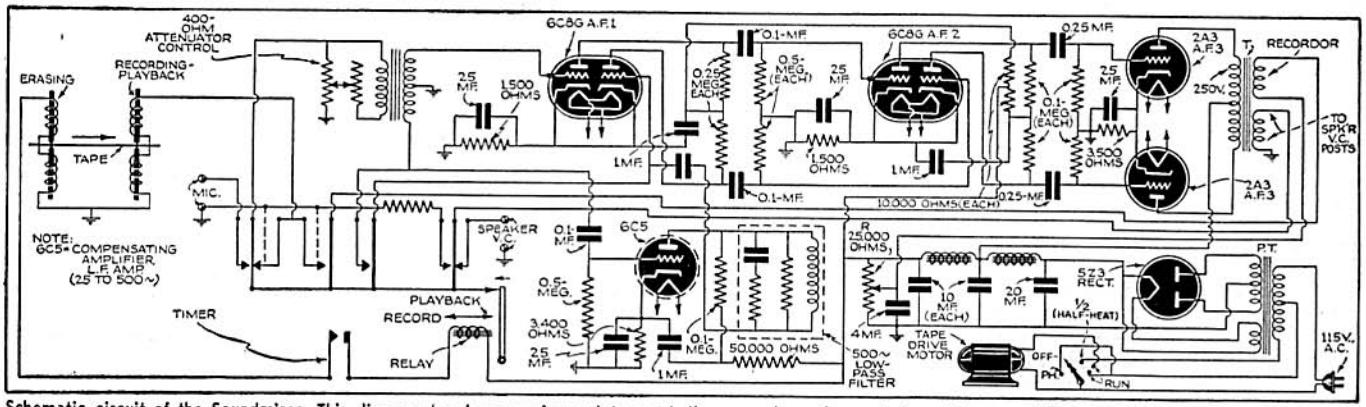
The microphone, amplifier and loudspeaker may be used separately as a 12-watt public address and call system.

Pickup heads spotted at 5 or 6 points on the steel-tape helix may be used to introduce a time factor in the reproduction; thus an *echo effect* of any desired length of echo may be synthesized for use in broadcast station programs.

Alarm systems in banks, lofts, etc., may be arranged to start the Soundmiror operating to repeat a previously-recorded message, calling attention to the alarm and sending location information, etc., over wires to police headquarters or/and over short waves to be picked up by radio police cars.

Placed at street intersections, these Soundmirors, in modified form, may soon

(Continued on page 685)



Schematic circuit of the Soundmiror. This diagram has been engineered to meet the unusual requirements in making recordings on steel tape over a frequency range equalling or exceeding that encountered in high-fidelity broadcasting.

form a continuous winding; one of the 4 cylinders is driven by the small motor which keeps the coil in continuous motion in one direction.

Thus, if it is desired to immediately relisten to a portion of the recording it is necessary to wait 2 minutes until that portion of the recording is again under the pickup coil, in this particular model of the soundmiror.

It is most convenient to run the tape through the recording-playback and erasing heads on the diagonal return-path of the tape. A slight amount of tension keeps the tape taut at all times. The welded joint is about as strong as any other part of the tape.

The endless helix has a recording length of about 360 ft. for making recordings 2 minutes long. Shorter lengths of tape may be used to obtain almost any desired length of "playing" time. In general, however, reels instead of a helix would be used for recordings much exceeding 12 minutes' duration.

Although the tape of the machine here described travels at the rate of 180 ft. per minute this speed may be increased or decreased within wide limits (depending considerably upon the required recording- and playback-frequency ranges) to accommodate other recording-playback durations.

The timer is electrically-driven by the synchronous motor which drives the tape and is set by means of the Timing dial on the instrument panel to repeat the playback after any predetermined period; it also controls the erasing current. One position of the power switch permits the power amplifier to be utilized in P.A. work, for call and announcement purposes, or as a phono amplifier; only in the "RUN" position of the switch is the tape drive motor put into operation.

APPLICATIONS OF THE SOUNDMIROR

(Continued from page 655)

be used to send traffic information and directions up to 400 yards by radio to be picked up in any radio-equipped car capable of tuning just above the broadcast band (on about 550 kc.). The Federal Communications Commission is considering this application as a means of aiding World's Fair traffic this summer.

In talkie studios, numerous recordings can be made on the steel tape and the final, perfected recording dubbed into the sound track of a sound-film. This represents a tremendous saving; particularly, when it is recalled that immediate steel-tape playback of each experimental recording is possible without any processing (developing, etc.).

Incidentally, May 1938 *Radio-Craft* contained the article, "37 Hours of Sound on Single 16 MM. Reel!". A diamond-stylus head indents 40 sound tracks side-by-side on a specially-prepared acetate cellulose film. A second, and similar, head affords immediate playback.

Also in May, 1938 *Radio-craft*, in "Make Your 'Silent' Movies into Home Talkies," a sapphire-needle recorder indents on the non-emulsion side of motion picture film. Same head, recording weight removed, plays back.

In March, 1939 *Radio and Television*, in "Records on Paper Tape from Mike or Phono," Merle Duston's sound-on-paper tape system was described. The recording stylus discolors, at audio frequency, a chemically-treated cellophane or glassene tape. For immediate playback the discolored tape interrupts a light beam directed on a photocell.—*Author*