



JOHN MULLIN, seen today with Bing Crosby, records today with one of the Magnetophones which he brought to the U.S. as war souvenirs.

The most unforgettable moment in my life was the one when I stood before my Magnetophone. I had just received the "PLAYBACK" button for the first time in the presence of Bing Crosby, John Scott Trotter, and Bing's producers, Bill Morrow and Murdo McKenzie. Everything was at stake. By invitation I had been present with my colleague, Bill Palmer, to record the first radio show of the 1947-48 season of the NBC-ABC studio complex in Hollywood. And now we were to hear the result of our efforts and to be judged by perhaps the most critical ears in the world of radio and recording.

To be sure, this was in August, 1947, and the show would not be broadcast until Oct. 1, but the policy was to record it well in advance of release time in order to enable it to be edited down from an indeterminate running time to a neat half-hour program. This technique gave Bing the ability to be relaxed, to ad lib as he chose and never to be concerned about timing.

The policy had been to record casually on 16-inch lacquer disk. Editing was later accomplished by re-recording from disk to disk, but the losses in tone quality had at times been excessive. Throughout the Bing Naughton series, the golden ears of the producers, network executives, advertising agency representatives, and Bing himself at times underwent considerable torture as they listened to the final disk assembly was played on the air coast-to-coast on the full ABC radio net-

work. The audience rating had been falling badly. Philco, the sponsor, was unhappy and it had been pretty well decided that if I felt a Magnetophone was the start of the new season, Bing would have to go back to live broadcasts.

Prior to our invitation to come down to Hollywood from San Francisco to record and possibly, just possibly, to edit our tape into a complete show, the producers had looked into every alternative means of recording sound that showed any promise of success. They had been employing variations of disk recording methods and photographic sound-on-film systems. ABC had even arranged for tests to be made at the Magnetophone Laboratory in New York, L.I. Col. Richard Ranger's Rangertone, but the results had been completely unacceptable. None of them had shown any promise of success. They had been employing, I am sure, they had tried out little hope for success in testing our apparatus.

The tape came up to speed—then, Opening theme—Crosby: "Blue of the Night" Applause. Conductor: Fatter: Crosby and Carpenter. Song—Crosby: "My Heart is a Hobo" Applause.

Murdo McKenzie signaled me to "stop." I pressed the "STOP" button. There were surely no more than two seconds of silence, which seemed more like an eternity to me, and then a shower of compliments. One small machine, one of a pair, side by side on a make-shift table—the only two of their kind in the United States arranged to record and reproduce magnetically with such remarkable fidelity, that in a listening demonstration lasting almost five minutes had up-

One function of our organization was to collect data and samples of German developments and send them to the Signal Corps Laboratories and the Department of Commerce. In the U.S. After dutifully complying with this service with regard to the Magnetophone in this more significant form, I was able to obtain two of the remaining low quality machines and send them to my home in San Francisco as souvenirs of war. By now we had a goodly supply of tape as well, and I was able to send home about 50 rolls of it. Each roll ran for only twenty-two minutes at the speed in use at the time, 30 inches per second.

One of the regulations concerning war souvenirs was that anything to be sent had to be small enough to fit into a U.S. mail bag. I had to completely dismantle my two machines and send them in the tape, in 18 different packages. The project was challenging and the results rewarding. All 18 boxes arrived in San Francisco in early 1946.

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High Frequency Bias
Until now, the machines which had been sent in to the laboratory for testing had only a casual inspection and then been sent back to the Signal Corps. When we returned to Paris, I immediately pulled out the two machines from our storehouse and set to work with Capt. James Menard to duplicate the electronics that I had found in the German tape. After several days' work we had the machine operating splendidly.

Mechanically, the machines were well designed so that they drove the tape at very constant speed. In either the low fidelity or high quality version of the Magnetophone this resulted in completely acceptable wow or flutter. The use of plastic tape, integrated or coated with iron oxide, a development of the Germans, contributed to a uniformity and smoothness of sound never previously achieved in magnetic recorders which used steel wire or ribbon. But the one great difference in the machines we had previously found and those in the German tape was the use of high frequency bias. This was achieved in the employment of a very high frequency mixed with the audio signal to provide what is termed "bias." This was achieved by requiring a form of bias, but the lower quality ones used direct current. The tremendous dynamic range brought about by using high frequency bias had never been approached by direct current methods.

These three things, a splendid mechanism, a highly developed tape, and the employment of high frequency bias, were the three elements of the Magnetophone far above any other magnetic recorders, anywhere in the world at the time. To be sure, the Germans had never been aware of each of these three elements, but nowhere had they been brought together so effectively.

Joins Bill Palmer
Col. Ranger and his friend, Jim Menard, were still in France and I soon learned from him, after I was back in civilian life in San Francisco, that they had been making aircraft motors during the war and were now looking for some new field of post-war activity. Since they were interested in high quality audio, they were considering the possibility of making

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Bill and I immediately got them to work in his standing in San Francisco, where we found them most useful for recording off-screen voice and music for films. We worked out cutting and splicing techniques. We prepared a tape for a complete reel of film (12 minutes) long on tape. Then, a single reel of film (12 minutes) long could be made resulting in a final product that sounded much better than any previous re-recording process. I had no knowledge, at the time, that the first time magnetic recording was ever used, at least in this country, to record sound for motion pictures.

I remember well the first public demonstration I gave in San Francisco to the local chapter of the Institute of Radio Engineers on May 14, 1947. We prepared a tape at KFRC of orchestra, vocalists and pipe organ. We had a large attendance and the enthusiasm was terrific.

Bill did I know that night that the audience were several men with whom I would later have a close and long association. Oddly enough, they were particularly interested in the sound of a small German loudspeaker I used as a monitor during part of my demonstration. They contacted us later, wanting to know if they could come to our studio to see it at closer range. We were, of course, happy to let them do so and they did so. They were, of course, Harold Lindsey and Myron Stolaroff, representing a small company of only six people in San Carlos on the Peninsula. They had been making aircraft motors during the war and were now looking for some new field of post-war activity. Since they were interested in high quality audio, they were considering the possibility of making

ing speakers or even a disk recording lathe. Their company was headed by a gentleman named A. M. Poniatoff. Borrowing his initials, SMPT, now known as SMPTE, they had named the company Ampex.

Film Studio Demonstration
While their first interest was the loudspeaker, this soon gave way to an expanding interest in the Magnetophone and it was not long before they decided the undeveloped field of professional magnetic recording should be their area of specialization.

In October of 1946, Bill and I attended the annual convention of the Society of Motion Picture Engineers (SMPTE) in Hollywood. There were few references to magnetic recording, but one or two papers were scheduled to be presented on the experimental work which was being carried on. In particular, I remember that Marvin Camras of Armour Research presented a demonstration of sound reproduction from a film which he had coated with a form of iron oxide, using a paint brush. It sounded pretty good, but it was not as good as the work which was being carried on in the back of Bill's car.

Bill and I got to talking with a man who ran a rather exclusive radio-piano and record store in Beverly Hills, Art Crawford by name. He was excited about the potential for tape in the home and we told him we had one of our machines in the back of Bill's car. He was anxious to see it, so we set it up in our hotel room. He nearly flipped when he heard it and immediately got on the phone, calling Douglas Shearer, the head of sound at MGM; Tom Moulton, the head of sound at 20th Century-Fox; and John Hilliard, chief engineer of AMPEX, now known as SMPTE. They were made with each of them for visits at their plants and the next two days saw a series of local radio demonstrations. I spent particularly the few hours we spent at MGM.

Since they had never heard of a new sound recording system might be comparable to their lat-

est system of sound-on-film recording (so-called "200 mill push-pull" recording), they arranged to feed us some music, a piano solo by Arthur Schnitzler, played back from their magnetic recording test reel they particularly prized as having exceptional quality. I recorded it on the Magnetophone.

In assembling the Magnetophone, I had used an "A-B" switch. In the "A" position one was able to listen directly to the source material. In the "B" position the Magnetophone took in an actual disk and reproduced the tape less than 1/10 of a second after it had passed over the record head. This, instantaneous comparison was possible. This in itself opened their eyes. They could not tell whether we were listening to their film directly or on playback from the tape.

Their system had the highest dynamic range of any available at the time, yet when they cut off the Magnetophone, they were quite all aware of a drop in noise level, but the tape continued merrily running on with much less inherent noise than the single generation film had had given way to a most cordial and warm visit. Before we had left, they had us make a tape of the Magnetophone stage where Jose Iturbi was playing piano with Georgia Stoll and the full MGM symphony orchestra. This was followed by an arrangement of a Rumanian Rhapsody featuring Larry Adler, the harmonica virtuoso. These gentlemen accompanied us on their visit. He returned home with great enthusiasm, resolved to get into the business of making tapes. We agreed to keep in touch, with the hope that W.A. Palmer & Co. would be able to produce a tape when he got into production.

Ranger Machines Tried
We were able to set up our machines in a day or two in advance in the recording department at NBC, but without considerable concern on behalf of Les Cully, head of the recording department, who wondered about this encroachment on his "never-never-land." We then met Col. Ranger at the Union Depot. He had come by train and had indeed brought two machines with him, but alas, no tape. He set up his machines the next day.

Thus, we came to the most unforgettable moment in my life. The show was performed in the early evening, NBC's recording department was in the building, and Les Cully, head of the recording department, who wondered about this encroachment on his "never-never-land." We then met Col. Ranger at the Union Depot. He had come by train and had indeed brought two machines with him, but alas, no tape. He set up his machines the next day.

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