

The Electric Gramophone

Some important considerations concerning selection and wear



THIS last year or so we have heard a great deal about the radio and gramophone combination, and it now appears that these two industries are rapidly merging into one. The quality of reproduction from records now possible is so very near natural that the electric reproducer must become very popular.

We all remember a few years ago when gramophones first came on the market. They were small, and the tone, at least in the extremes of the musical scale, was very thin and unnatural, and yet it was all very wonderful. We all know that it was Edison who introduced the first gramophone, and I want to quote to you Edison's account of the discovery.

"I was experimenting on an automatic method of recording telegraph messages on a disc of paper laid on a revolving platen, exactly the same as the disc talking-machine of to-day. The platen had a spiral groove on its surface, like the disc. Over this was placed a circular disc of paper; an electro-magnet, with the embossing point connected to an arm which travelled over the disc; and any signals given through the magnets were embossed on the disc of paper.

"If this disc was removed from the machine and put on a similar machine provided with a contact point, the embossed record would cause the signals to be repeated into another wire. The ordinary speed of telegraphic signals is thirty-five to forty words a minute; but with this machine several hundred words were possible.

"From my experiments on the telephone, I knew of the power of a diaphragm to take up sound vibrations, as I made a little toy which, when you recited loudly in the funnel, would work a pawl connected to the diaphragm, and this engaging a ratchet wheel, served to give continuous rotation to a pulley. This pulley was connected by a cord to a little paper toy representing a man sawing wood. Hence, if one shouted "Mary had a little lamb," et cetera, the paper man would start sawing wood. I reached the conclusion that if I could record the movements of the diaphragm properly, I could cause such record to reproduce the original movements imparted to the diaphragm by the voice, and thus succeed in recording and reproducing the human voice.

"Instead of using a disc, I designed a little machine, using a cylinder provided with grooves around the surface.

Over this was to be placed tinfoil, which easily received and recorded the movements of the diaphragm. A sketch was made and the piecework price, eighteen dollars, was marked on the sketch. I was in the habit of marking the price I would pay on each sketch. If the workman lost, I would pay his regular wages; if he made more than the wages, he kept it.

"The workman who got the sketch was John Kruesi. I didn't have much faith that it would work, expecting that I might possibly hear a word or so that would give hope of a future for the idea. Kruesi, when he had nearly finished it, asked what it was for. I told him that I was going to record talking, and then have the

machine talk back. He thought it absurd.

"However, it was finished, the foil was put on; I then shouted "Mary had a little lamb," et cetera. I adjusted the reproducer and the machine reproduced it perfectly. I was never so taken aback in my life. Everybody was astonished. I was always afraid of things that worked the first time. Long experience proved that there were great drawbacks found generally before they could be got commercial; but here was something there could be no doubt of."

That was the beginning of the gramophone, and since then gradually improved until we had the instrument of a year or two back, but the intro-

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by
COLIN W. SMITH, B.A.

duction of radio changed everything and since the combination of the two instruments both have gone ahead very rapidly.

Making Sound Solid.

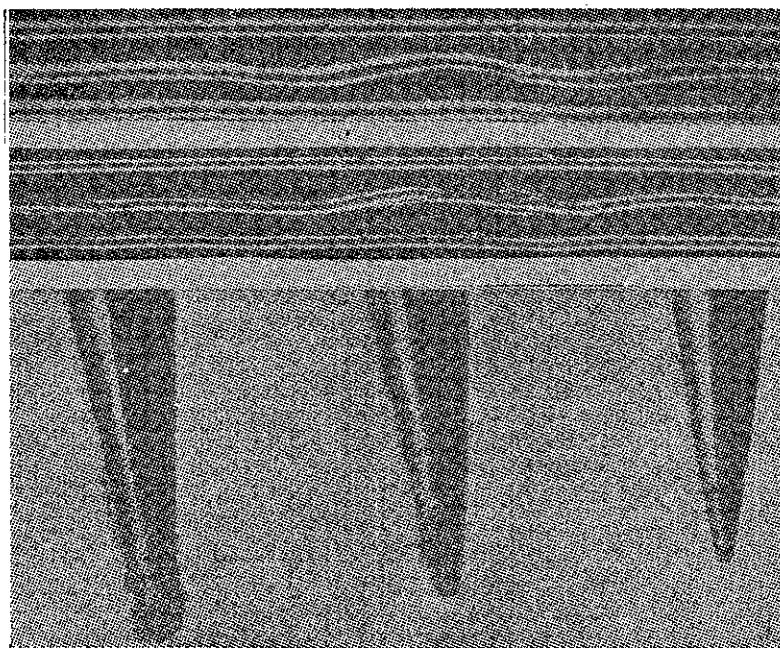
LET us for a moment examine the method in which sounds are made solid. You will remember in my second talk I told you how the microphone picked up the minute vibrations in the air and transformed them into electricity. A microphone is used in the production of gramophone records and in the sound recordings for the talkies. The sounds are picked up, transferred to electricity, and then an instrument that may be regarded as the opposite of the pick-up is used to transform the electric vibrations back to mechanical vibrations which cut the grooves of the record. For best results a triangular needle must be used, and if we could use such a needle in reproducing our results would be much better, but we cannot because they would cut the records too deeply.

When a deep note is registered the impression in the groove being cut, swings widely, and when a high note comes through the impressions are small and close together.

Now this is important, and later on I shall come back to this point for you will realise that these wide notes caused by the bass will have a definite limit, because the grooves must be kept fairly close together. Furthermore, it will be apparent that it is going to be difficult for a needle to reproduce the fine variations caused by the high notes. We shall not pause to consider how records are commercially made from this original record, but pass on to consider the more useful points in gramophone reproduction.

REPRODUCTION is the exact opposite to recording. A needle moves in the grooves, and if the proper speed is attained, the impressions cause the needle to vibrate in the groove at the same rate as did the waves in the air when sound was made. Now if the needle is attached to a diaphragm the vibrations will be transferred to it, and so to the air, and we hear them. This is how the earlier gramophones worked. A horn was used to somewhat magnify the sounds.

Nowadays, the needle moves between two electric magnets, and causes an electric current to flow in the fine wire round these magnets. This current, of course, will vary in



The top illustration shows a section of undamaged record. The large curves are bass notes. The centre portion illustrates the way grooves can be damaged by thick needles. The effect of this wearing process, and the dust collected from the record, is shown on the needles.