INCREASING THE POWER OF A TALKING MACHINE BY MEANS OF COMPRESSED AIR.

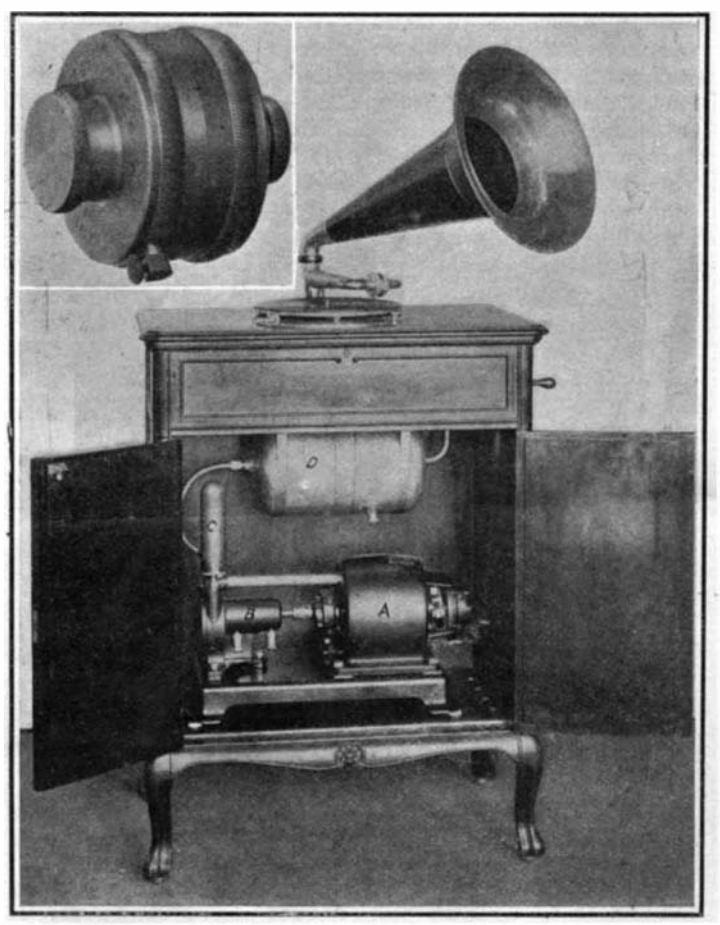
Heretofore it has been practically impossible to reproduce sounds "life size" on a talking machine. By using large horns it has been possible to concentrate the sounds produced by the diaphragm, and, by thus limiting the area over which they are projected, to give them a volume almost as great as that of the sounds originally impressed upon the record. But this concentration is secured at the expense of the quality of the tone; for to the sound waves produced by the record are added the vibrations of the horn itself, causing a harsh metallic sound.

The Victor Talking Machine Company has just perfected a machine which produces sounds of greater amplitude than can be obtained in the ordinary talking machine, avoiding the objectionable features of the large horn. The auxetophone, as the new machine is called, comprises a small air compressor and a talking machine of standard make. The usual diaphragm is, however, dispensed with in the machine, and the needle or stylus which travels over the record operates a balanced gridiron valve through which the compressed air is passed. In operation the air issues from the valve in intermittent jets, which are modified in frequency and character by the action of the needle in such a manner as to reproduce the sound originally impressed on the record. The needle and valve act merely as a relay, while the sound is actually produced by the compressed air.

To more thoroughly understand the philosophy of the machine, it may be well to discuss the form and action of sound waves. It is a common error to compare sound waves with waves of water in which, as is well known, the particles of water oscillate vertically, or at right angles to the direction in which the waves are traveling. In sound waves, however, the oscillations coincide in direction with the travel of the disturbance; that is, instead of having alternate elevation and depression, the wave disturbance produces alternate areas of compression and rarefaction. As the wave disturbance takes place equally in all directions under normal conditions, it follows that sound travels through air in a series of ever-expanding spherical areas of compressed and rarefied air which have their center in the source of the sound. In only two particulars can these sound waves vary, one being the rapidity of vibration, which governs the pitch, and the other being the amplitude of the vibration, that is, the length of travel of the vibrating particles, or the density and rarefaction, and this governs the volume or loudness of the sound. In a pure tone the oscillations are rhythmical, but various qualities of tone are produced by interference with the rhythm of the oscillation. However, these irregular movements take place in the direction in which the sound is traveling.

With this brief description of the principles of sound, we may be better able to understand the exact operation of the compressed-air attachment used on the auxetophone. In the usual form of talking machine, a diaphragm is employed which is connected with a needle in such a manner as to vibrate, causing alternate waves of compression and rarefaction to be emitted from the sound box. The compressed-air apparatus is more powerful because when the valve is opened to permit the issuing of a jet of air, this air travels through a greater distance in a given time than would the air set in motion by the diaphragm; consequently, waves of greater alternate density and rarefaction are produced, giving a much louder and rounder tone.

The accompanying illustration shows the new machine with the compressor attachment. It consists of a cabinet in the lower portion of which is a 1-6-horse-power electric motor, direct-connected to a blower. The air from this blower passes through a condenser, the office of which is to remove the moisture and oil it may contain. A flexible tube conducts the air from the condenser to a reservoir provided with a safety valve set to blow off at a pressure of 4 pounds. Thence the air is filtered and passes through a flexible tube to the sound box in which the valve connected to the needle is located. This valve is of a very delicate construction and responds to the slightest vibration of the needle. The record disk, which is of the usual form, is revolved under the needle by a spring motor, as in the regular talking machine. The electric motor which operates the compressor may be driven by power furnished from the city lighting system and may be started or stopped by means of push buttons at the side of the cabinet. One of the principal advantages of this improvement is that all the richness and mellowness of tone is retained. The new machine will, undoubtedly, prove of great value in large concert halls where machines of previous type have been of too low a power to give satisfactory results.



The Sound Box.

Front View, Cabinet Open to Show Air Compressor.

Rear View Showing Compressed Air Connection to Sound Box.

INCREASING THE POWER OF A TALKING MACHINE BY MEANS OF COMPRESSED AIR.

EYE-SPOTTING IN NATURE.

BY PERCY COLLINS.

While brilliant colors, striking contrasts, and more or less complicated patterns are common in nature, anything like a centralized design is extremely rare. One need only examine a number of birds' skins or butterflies in a museum to be convinced of this. Indeed, almost the only notable design seems to be that circular grouping of colors which, from its likeness to an eye, has been termed ocellus. Ocelli, or eye-spots, are seen at their greatest perfection upon the feathers of certain birds, such as the peacock, the peacock pheasant, and the argus pheasant. Among birds, too, and notably in the case of the peacock, we are able to gain a glimpse of the evolutionary process through which the eye-spot came into being. Before, therefore, we turn to a general consideration of the eye-spot, we will devote a few moments to the peacock's eye-spot in particular. It is, perhaps, the most lovely of all natural ornaments depending for their effect solely upon an arrangement of color. Yet this exquisite gem was not always what it is to-day. Its amazing complexity of beauty was acquired by slow degrees from a very small beginning. Moreover, we may trace, as it were, the successive steps in this wonderful progress upon the inconspicuous feathers toward the root of the peacock's tail.

If the reader will glance for a moment at the series of feathers which were taken from the skin of one Indian peacock for the purpose of illustrating this article (Fig. 1), he will notice that the first feather is pale in color, barred by darker areas; there is no sign whatever of the glorious eye-spot that is to be. It is probable that the ancestors of the peacock were completely clothed in these dull-colored feathers, just as are certain species of grouse and turkey at the present day. But Nature willed that the peacock should become of all birds the most magnificent. Thus, in the second and third feathers of the series we can trace dimly a small colored spot in the center of each. This spot is the commencement of the eye-spot; and if we continue to pass the feathers in review, we see this spot grow larger and more brilliant. The colors settle themselves, as it were, into rings, the feather itself increasing in size with every improvement, until, by closely-linked stages, each of which is represented by an actual feather in the peacock's train, the triumph of the perfect eye-spot is reached.

Now if, as seems highly probable, we have just been treated to a glimpse of the innumerable stages of gradual improvement through which this wonderful ornament was brought to perfection, we are justified in asserting that the eye-spot is far from being a thing of chance. It is obviously the outcome of intention. Some mysterious power has been constantly at work, age after age, with the definite object of producing a thing of superb beauty. So far as our present knowledge enables us to judge, this power consists in what we may call the inherent tendency to vary which is evinced by all living things. This is, as it were, the motive force; but it is harnessed, restrained, and driven along a definite channel by what Darwin called "natural selection."

So much for the production of the peacock's eye-spot; nor is there any reason for doubt that the other recurrences of the eye-spot in nature are all the outcome of a similar evolutionary process. For, be it noted, the distinction of the ocellus does not belong only to birds. The mark is present in a crude form on the hides of certain mammals, such as the jaguar, the leopard, and the ocelot. Two or three kinds of fish also show it. The North American eared sunfish, for instance, has in the breeding season a beautiful and very perfect eye-spot just where one would expect to find the ear of a higher animal. It is from this mark that the fish takes its popular name. Further, among insects, especially among certain groups of butterflies and moths, the eye-spot is extremely common; while it is again recognizable on several shells of the pretty cowrie group.

We may now ask: What is the meaning of this strange spot, so laboriously perfected by Nature, and of which—if we may judge by her constant reproduction of it—she is so proud? It is not possible to assign one reason which will explain the existence of the spot in every case. But if the reader will carefully examine the facts which will be brought to his notice in the following paragraph, he will probably share the writer's conclusion, namely, that in every case of its recurrence the eye-spot is not solely a thing of beauty, but that it also has some definite and utilitarian connection with the life histories of those creatures which possess it.

Take first the mammals. It may be said at once that the crude eye-markings on the hides of these big cats are certainly protective. To those who know the leopard and the jaguar only as captives in zoological collections, this may not be obvious. But all hunters and naturalists who have observed these creatures at home in forest or jungle agree that the eye-spots (Fig. 2) resemble closely patches of shade and sunlight, cast upon the ground through a screen of foliage. It only remains to be said that the jaguar and the leopard are both frequenters of forest land, and the protective value of their spotted hides becomes obvious. Moreover, besides hiding them from possible enemies, the eye-spots are of assistance to these beasts when they are lying in wait for their prey. Among the branches of a tree the jaguar is unobserved by its victim, which wanders unsuspectingly to its doom.

With birds, there can be little doubt that the eye-spot is an ornament pure and simple, albeit an ornament with a very definite use. It bears a most important part in bird courtship. Birds are particularly punctilious in all matters in connection with love-making, and it is invariably the male who makes the first advances. The female, especially in the case of species where the male is resplendently colored, is generally coy and watchful. She makes it clear to her suitor that she will not surrender her liberty at once; and the cock bird must make use of all the charms with which Nature has endowed him ere he may possess himself of his bride. Indeed, it may be said that as a general rule the most gorgeous and sprightly cock will find the least difficulty in providing himself with a hen. These facts doubtless account