

VOCAL PHYSIOLOGY AND HYGIENE

A Treatise on Vocal Physiology and Hygiene; with Especial Reference to the Cultivation and Preservation of the Voice. By Gordon Holmes, L.R.C.P. (Edinburgh: Churchill, 1879.)

IT is one of the most singular facts connected with music that, notwithstanding the very wide spread of musical education, the kind of performance which is within the most general reach, namely, singing, receives the least amount of earnest culture. Almost every individual in ordinary health possesses the means of singing, which consist simply of a voice that can produce musical tones, and an ear that is capable of guiding its inflections. The latter qualification is, it is true, not so common as the former; but in all probability the cases where the human ear is absolutely wanting in the discrimination of musical pitch are extremely rare. Yet out of this great mass of mankind what a small proportion actually sing; and of those who do, what a still smaller proportion even aim at singing well!

Let us consider for a moment how the case stands in regard to that small fraction of mankind who attempt to sing in some fashion or other. The great majority of these never *learn* at all; they sing by the light of nature, using their voices in any way that will produce the notes their ears guide them to; and, no doubt, with naturally good voices and naturally good ears, music may sometimes result, which is quite tolerable, though infinitely inferior to what it might be made. But many persons do "learn to sing," and instruction of this kind forms a tolerably large professional avocation. What, then, does this imply? In most cases, unfortunately, little or nothing, so far as the true art is concerned. If a girl who finds she can sing a little asks for some lessons from an ordinary teacher, we know pretty well what will be done: there may be, just as a matter of form, a few exercises given; but the great aim will be to teach her the notes of certain songs, so as to provide her with a small repertory for social exhibition. This, however, is rather teaching *music* than singing, and the same may be said of the large number of classes for vocal performance in parts, where nothing is attempted beyond attention to the pitch of the notes used, and the time they are sung in. If we go a little further and include the cases where the teachers endeavour to give their pupils some idea of style, we about exhaust the category of vocal instruction which is common in private circles, and we need not wonder at the fact that, to educated judges, ordinary amateur singing, when it is not offensive, is at all events wretchedly poor. To learn to sing in the proper sense of the word is quite a different thing from learning songs; the voice is an instrument, the capabilities of which, in many respects, transcend those of any other known, and the cultivation of the voice, and of the singer's power over it, so as to use it to the best advantage, requires not only careful and judicious training, but long, hard, and laborious practice. It is consequently only among the professional ranks that we are accustomed to expect thoroughly good singing, and even here, whether from deficient education, imperfect powers, or defective taste, it is not often that what we expect is really found.

We might extend these remarks, in some measure to

speaking. Although the natural use of the voice suffices for common practical purposes, there are cases where considerable art and education are required to employ it to the best advantage, and yet little or no attention is paid to the matter, as is evidenced by the miserable attempts at untrained elocution we are so often doomed to listen to, in preaching, reading, and public speaking. The stage is an exception, as there the artistic management of the voice is indispensable, a fact at once perceived when amateur acting is compared with that of the members of the dramatic profession.

Undoubtedly one of the great causes of the evil in both these cases is the general ignorance as to the nature of the voice and the manner in which it admits of management; and we welcome with pleasure the appearance of a work which sets forth these and kindred topics in a way that cannot fail to be largely useful. Although written by a man who is fully conversant with all the technicalities of his subject, it is yet essentially popular in its style, and may be studied with advantage by all who are interested in the cultivation of the voice for any object whatever.

The introduction and the first chapter are devoted to an Historical Review of the Origin and Progress of Vocal Culture, and to an explanation of the general nature of musical sounds. These are somewhat lengthy, occupying one-fourth of the book; but one may fairly allow for the author's wish to render his treatment of the subject complete. In the remainder of the work he is more clearly on his own ground. Chapter II. is devoted to a description of the anatomical construction of the vocal organs, and Chapter III. to an investigation of their physiological mode of action. Both these are admirably treated of, and are illustrated, where necessary, by copious figures. The author gives, under the latter head, an interesting survey of the various theoretical attempts that were made to explain the vocal phenomena before the great invention of the laryngoscope in 1854, by Manuel Garcia, gave the power of actually observing the processes at work. By the aid of this ingenious apparatus, the explanation became comparatively easy. There are, however, some points, particularly connected with the falsetto voice, which are yet somewhat obscure.

Chapter IV. is the one to which, probably, the greatest importance is to be attached; it treats of "The Physiological Principles of Vocal Culture." The author says:—

"The cultivation of the voice amongst civilised nations has for its object the complementary development of the powers of organs which have already attained a high degree of perfection in the performance of their functions. Through the exertion of influences acting from without, and not directly controlled by the will, man *proceeds* instinctively and intuitively as a mere agent to the *evolution* of speech and language. But here, as in *many other* of his relations, beyond a certain point the *unerring guide* of nature leaves or only follows him with a *perpetually* widening interval, and his further advance is *made voluntarily* and with self-consciousness of his aim. . . . Hence we may recognise two grades in the employment of the voice—the first necessitated by the conditions of social life as a means of intercommunion, and the second undertaken with a view to the æsthetic observation of the listeners.

"The technical training of the voice lies immediately in the hands of teachers of elocution and singing. On

their taste and genius, as well as on the aptitude and natural vocal gifts of their pupils, depend in the greatest measure the success obtained and the perfection of the result. But whatever methods be adopted, the base of operations is vital organisation and action, of which the true apprehension and normal guidance must lead most directly and certainly to the desired end."

This, we take it, is the great aim, and the most useful tendency of the book, namely, in the first place to make known to those who desire to excel, either in singing or in elocution, that something more is necessary than they can obtain by the mere light of nature; and secondly, to enunciate the important truth that the art of using the voice to the best advantage can only be effectively taught by the aid of a competent knowledge of the nature and capabilities of the natural organ—matters of which great numbers of those who profess to teach have absolutely no idea at all. The value, therefore, of such information as is conveyed in this work, both to teachers and learners, can scarcely be overrated. It is not possible here to enter into details; suffice it to say that the chapter treats fully of vocal force, timbre, compass, and execution; of the modes of development; of the management of respiration; of the vibrating elements, the resonance apparatus, and the articulation; and it adds some useful data as to the treatment of that troublesome vocal defect—stammering.

The last chapter is devoted to a subject of vital interest to those who have to make public use of the voice, namely, vocal *hygiene*. The maintenance of the vocal powers is a matter of no less importance than their cultivation; but there is much ignorance and misunderstanding on this point, and the advice the author gives, coming as it does from one having authority, is most valuable.

WILLIAM POLE

THE COPPER-TIN ALLOYS

Preliminary Investigation of the Properties of the Copper-Tin Alloys. A Report, Edited by Prof. R. H. Thurston, of a Committee on Metallic Alloys, Presented to the United States Board (Washington: Published at the Government Printing Office, 1879.)

IT is not a little remarkable that the study of the metallic alloys has been so generally neglected. Alfred Riche observes that this may in part be due to the fact that the characteristics upon which we rely in ascertaining the constitution of bodies are usually inapplicable to alloys. It is difficult for instance to determine with accuracy such physical constants as their melting points, for in many cases molecular rearrangement takes place when the alloys are heated, and, again, the properties of alloys are often greatly altered by the presence of impurities in such small quantities that it is impossible to estimate them by the balance.

Systematic efforts to clear up the obscurities with which the structure and nature of alloys are surrounded have, however, not been wanting. Thus, not to mention the well-known experiments of Hatchett, published in 1803, in 1855 Calvert and Johnson communicated to the British Association the results of a series of experiments, and in 1862 this body requested the late Dr. Matthiessen to continue his experiments on the chemical nature of alloys, the result being a report which certainly modi-

fied the views concerning them that had to that time prevailed. England then has certainly not been behind other countries in actual advance in metallurgical processes, but it is nevertheless true, as was pointed out by Abel in an address as president of the Chemical Section of the British Association in 1877, that the comparative ease with which triumphs may be won in the field of organic research has led the younger chemists to underestimate the importance of rigorous analytical work by which their science has been built up.

With regard to France the researches of Levol and of Alfred Riche will always hold a high place in scientific history; and in Germany there are many classical researches, such as those of Karsten and of Wertheim.

The volume before us affords abundant evidence that the Americans are not unmindful of the importance of metallurgical investigation. It appears that a committee, consisting of Prof. Thurston and Messrs. L. A. Beardslee and David Smith, was appointed in 1877 by the Government of the United States, to "assume the charge of a series of experiments on the characteristics of alloys," and the first result of their labours is an octavo volume, edited by Prof. Thurston, of nearly 600 pages, illustrated with photographs of fractures, and plates of curves representing the various physical constants of the alloys of copper and tin. The committee hope soon to present a similar report on the alloys of copper and zinc, and a third report on the triple alloys of copper, tin, and zinc will follow. They state that "the whole field has now been explored and the useful alloys are proved to occupy but a limited portion of its great extent, and it has now been shown that a comparatively narrow band, extending from ordnance bronze on the one side of this triangular territory to Muntz metal on the other, contains all the best of the alloys that are generally useful."

The necessary researches were conducted in the mechanical laboratory of the Stevens Institute of Technology, and the committee trust that this preliminary work will prove "to have been so satisfactorily done that its repetition may never be required, and that in future attention may be confined to matters of detail which have been shown to be of most promise." The committee did not seek to determine the character of chemically pure metal, but endeavoured to ascertain the practical value of commercial metals, melted in the way that is usual in the preparation of alloys in the foundry. The purest metals that could be obtained in commerce appear, however, to have been selected, the greatest care being taken to ascertain by a minute analysis the amounts of impurities in the metals employed and the composition of the twenty-seven alloys forming the subject of the Report.

After carefully noting the characteristics as to fracture, colour, and hardness of each alloy, their resistance to transverse stress was examined. Tests by tensile stress then follow, and the results agree, in general, very closely with those given by transverse stress. The alloys were then submitted to torsional stress in a machine devised by Prof. Thurston, and, if the autographic strain-diagrams given by the machine are compared with the curves representing resistance to transverse and tensile stress, a marked similarity will be evident. Experiments proved that the maximum resistance to compression is given by the alloy containing 69.84 per cent. of copper, and the