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## MARVELS OF SCIENCE

### *Wonder Work Turned Out by Professor Gates*

***Making Invisible Rays of Light Visible—The X-Ray to Be  
Outdone—New Technique for Artists—New Instrument for  
Producing Emotional Music—The "Psychology of Acoustics"***

[Special Correspondence of the *Transcript*]

Washington, April 22

That there is a distinct relation between emotions and musical notes has long been recognized and thus the line of investigation already described merges naturally into some very remarkable experiments in regard to music. Professor Gates declares that he will be able to construct an instrument that will produce such music as has never been dreamed of in the world hitherto. It will represent and comprise the effects of all instruments now known, as well as of many others never devised. He says: "When Music, heavenly maid, was young, she was full of discords and imperfections which, now that she is nearing her marriage with Science, should be dropped for the more perfect emotional expression demanded by the purer, truer and better music of the future."

It was discovered long ago by the famous German, Von Helmholtz, that the emotional qualities of music depend upon what are called the "overtones" or "harmonics." You cause a wire to vibrate, say, at the rate of sixteen times a second and it gives forth a note. At the same time, however, certain portions of the wire may actually be vibrating thirty-two times a second, sixty-four times a second, and so on, thus producing the overtones. For every fundamental note there are at least fourteen of these overtones. Those of them which represent the lower numbers of vibrations produce in the music solemn, mournful and majestic effects. The middle overtones give effects that are a mixture, as of smiles veiled by tears while the harmonics of high vibratory rates are joyous and gay.

In a piano the same fundamental tones and the same overtones are employed for playing a dirge as for a "coon song" or other joyous melody. There is no modification of the harmonics to adapt

them for the expression of the suitable emotion—an obvious absurdity, as anyone may see. If it were practicable to produce the fundamental tones pure and simple, and to associate with them the overtones, such of them as were wanted, in any arrangement that might be demanded, effects could be obtained which are wholly beyond use reach of the present-day piano, or of any other musical instrument now known. This, however, is exactly what will be accomplished by the instrument which Professor Gates has devised. Each fundamental tone is struck by itself and likewise each of harmonics belonging to that tone. With the aid at a proper arrangement of stops, a piece of music performed on it may begin with sadness and wind up with laughter, thus obtaining a new kind of musical climax.

Helmholtz said that the power of music to express emotions depends upon the overtones. This has long been recognized as proved beyond question, and it is well understood by musicians today that the low harmonics are those of mournfulness and solemnity, and that the high harmonics are those of joy. Well, then, Professor Gates proposes for the first time to utilize this knowledge by applying it in a practical way for the production of musical effects. The music of the future will be a music of the emotions; it will touch the human heart as no music hitherto has ever done. With its aid a skilled composer will be able to play upon the emotions of a throng of auditors as upon a harp, rousing them to patriotic fervor, drawing from them their tears, or plunging them, if he so chooses, into agonies of despair.

Professor Gate has found that most human voices, even the best, have within them only about one-half of the overtones which are necessary to the emotional quality of music. He has discovered that this condition of affairs may be greatly improved by a certain process of training the emotions of the singer, who, by encouraging the experience of tender emotions, aesthetic emotions, and various other kinds of moral emotions, produces in his or her brain alterations of structure that bring into the voice harmonics which it previously did not possess. This is termed by Professor Gates the “psychology of acoustics.” The method adopted for “practicing” emotions is very interesting, but there is not space here for a detailed description of it.