PROFESSOR GRAY'S TELEPHONE.

We noticed last week the exhibition of Professor Gray's telephone in this city, the instrument being operated in Philadelphia. In the annexed engravings, reproduced from the New York *Daily Graphic*, the apparatus is very fully represented.

Although the operation of the instrument is intricate, the description is not difficult, because all the effects that are produced by the magnetization and demagnetization of iron, by means of electric currents passing through coils of wire, may be briefly referred to without the necessity of going into an explanation of how the wires are placed, or as to the arrangement and effect of the main and local batteries. By referring to the picture of the apparatus used by the performer in Philadelphia, the reader will observe, beneath the keyboard of two octaves, a series of small pieces of apparatus placed on shelves. These are allalike, with an exception that will be noted hereafter. An enlarged view of one of them is shown, representing a tongue of metal, A, vibrating between coils of wire, B. This tongue of metal vibrates automatically. When it is attached to the right, for example, its own movement is made to affect the electric current in such a manner that the bar of soft iron within the coil loses its power, and at the same time the bar on the left is invested with attractive power. To accomplish this was a simple problem in electro-magnetism and requires no description here. The tongue of metal, which corresponds to a tuning fork, is thus set to moving rapidly backwards and forwards, but the number of times per second depends entirely upon its own length. No matter how violently or how softly a tuning fork may be struck, the number of vibrations is always the same per second for the same fork. The pieces of apparatus beneath the keyboard areall provided with vibrating tongues of metal of different lengths—that is of such length as will give all the notes of two octaves. As often as any particular key is pressed down; and as long as it is kept down, the electric currents operate to make the corresponding metallic tongue vibrate. These vibrations constitute the music that the performer hears, but they are by no means the music that is heard at the other end of the line. As the tremulous tongues fly back and forth with a rapidity that defies vision, they open and close the circuit of the main wire. This, then, is all that is done so far. Each vibration is reproduced at a distance in successive waves of electricity.

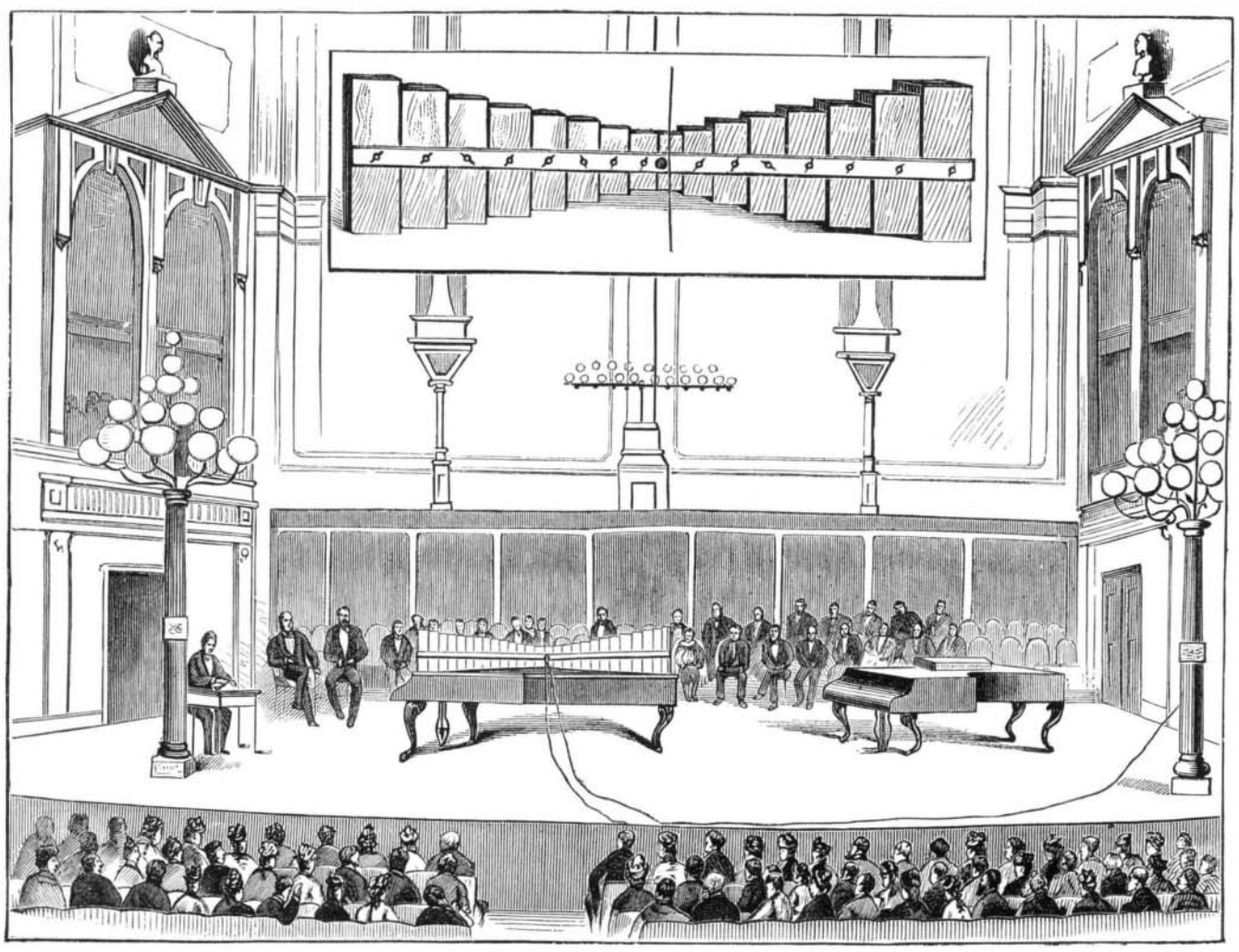

Fig. 1.—PROFESSOR GRAY'S TELEPHONE IN NEW YORK.

Just here it is necessary to explain a peculiar discovery that has made the telephone, as a musical instrument, possible. If only one key were pressed at a time it is easily conceivable how the wavelets of electricity peculiar to that key could be sent over the wire from Philadelphia to New York. But suppose two, five, or the entire sixteen notes are struck at the same time. Can one wire carry all these wavelets without confusion to New York? It can. How it can is a matter of theories. What is absolutely known is that the wavelets corresponding to each note are carried safely and independently of those of all other notes. Following, then, these multifarious but separately cared-for elements of "Home, Sweet Home" to New York, we have to discover how they are received, sorted, and translated into air vibrations that may strike the tympanum of the ear. The wavelets are passed through sixteen pieces of apparatus, each consisting of an ordinary electro-magnet, C, having, instead of an armature, a steel ribbon, D, stretched in a metallic frame. This ribbon is tuned to vibrate at a particular pitch. Now, it is a fact, that when a piece of iron is magnetized it is increased in size very slightly, and when it is demagnetized it is restored to its original dimensions. This change is accompanied by a slight sound, supposed to be due to the arrangement and re-arrangement of molecular particles.

The wavelets of electricity produced in Philadelphia by vibrations of the metallic tongue, tuned to the note, D, for example, will pass through all the apparatus in New York, whose ribbon is tuned to C, without effect; but as soon as it comes to the D apparatus the ribbon begins to vibrate, producing the note of D. In this way the New York apparatus sorts out the wavelets of electricity and transmutes them into music. These sixteen pieces of apparatus in New York are each inclosed in an oblong sounding box, to increase the sound of the vibrating ribbons. A picture of these boxes, arranged in symmetrical order, is also presented herewith.

EXPORTS OF ICE.—The fine new ship C. C. Chapman, built at Bath, Me., recently cleared from Boston. Her cargo consisted of 2,200 tons of ice for Calcutta and 350 bales of drills for Madras. The bark R. R. Allen, which cleared from Boston in the same week as the C. C. Chapman, took 600 tons of ice for Havana. The same company have two other vessels loading with ice for export.

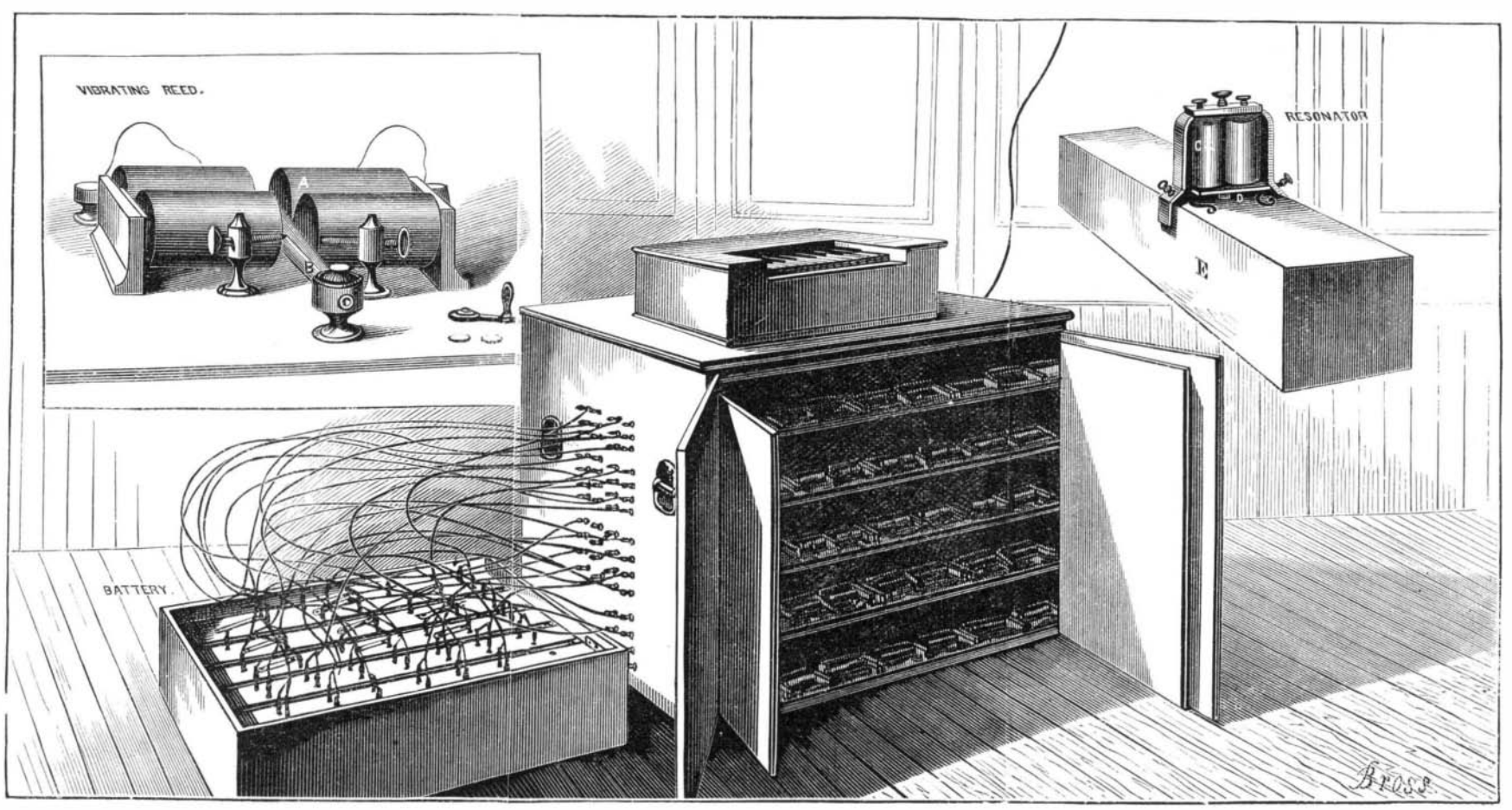

Fig. 2.—PROFESSOR GRAY'S TELEPHONE IN PHILADELPHIA.