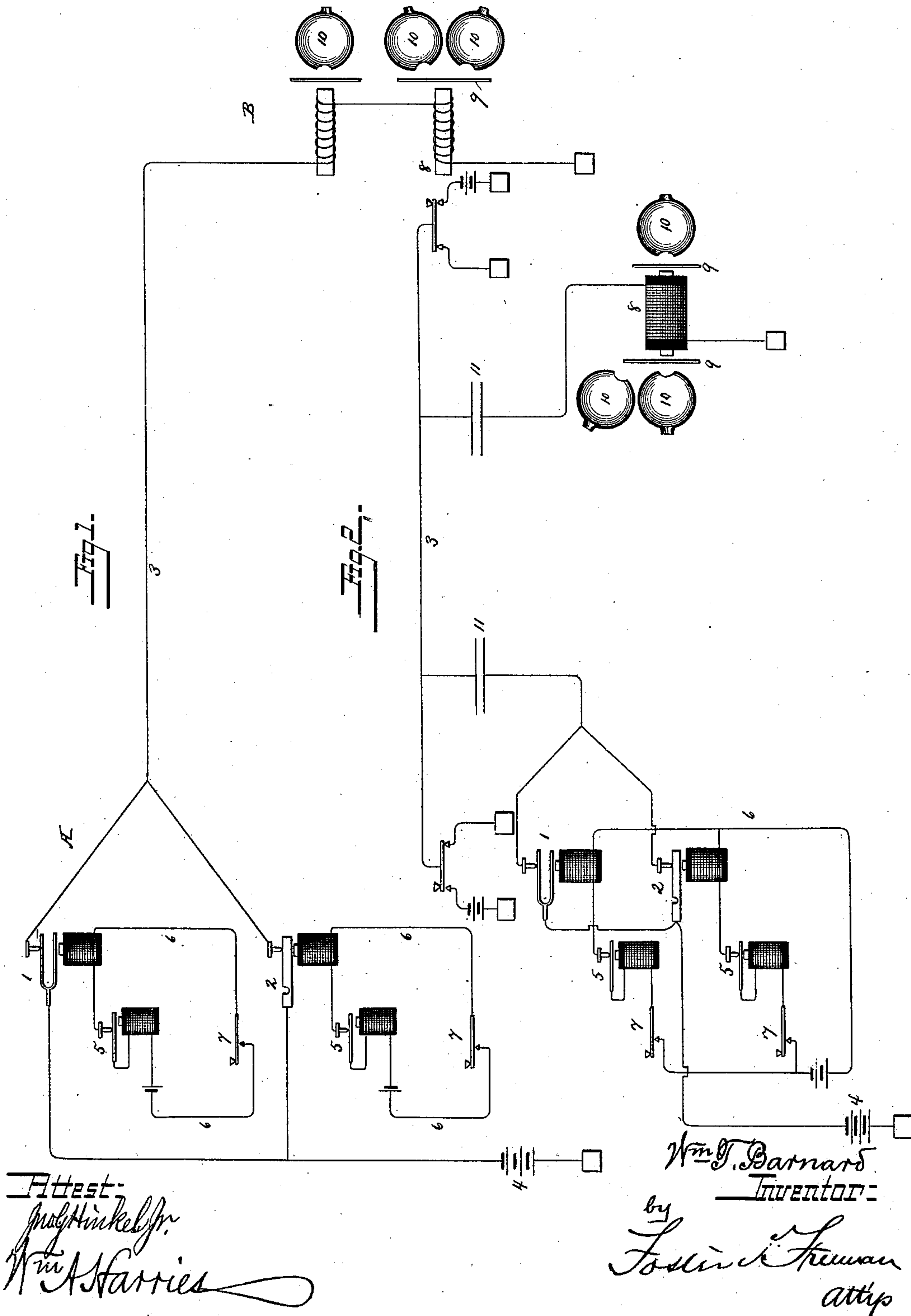


(No Model.)

W. T. BARNARD.
TELEGRAPHY.

No. 360,844.

Patented Apr. 12, 1887.



UNITED STATES PATENT OFFICE.

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TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 360,844, dated April 12, 1887.

Application filed October 5, 1886. Serial No. 215,379. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM T. BARNARD, a citizen of the United States, and a resident of Baltimore, Maryland, have invented certain new and useful Improvements in Acoustic or Tone Telegraphy, of which the following is a specification.

My invention relates to acoustic or tone telegraphy, and has for its object the simultaneous transmission and reception of a number of independent messages over the same line-circuit; and it consists, more especially, in the combination and arrangement, with a number of independent transmitters connected with the line-circuit, of one or more acoustic receivers, also connected with the line, and with resonator-analyzers for selecting the independent messages, as more fully explained hereinafter.

I am aware of efforts having been made by other inventors to increase the capacity of a single-line wire for telegraph purposes by the employment of tuning-forks, vibrating reeds, and other suitable devices for originating at the end of a line-wire a series of vibrations, electrical impulses, or waves, so as to give rise at the distant or receiving end of the line to musical tones, the intention of such inventors, generally stated, being that the musical tones thus originated and thus transmitted should be received by those acquainted with telegraphic codes as telegraphic messages.

I am also aware of the fact that under existing patents the number of commercial or practicable messages simultaneously originated and transmitted over a single wire by means of such musical tones or electrical vibrations have been quite limited, as also of the obstacles other inventors have encountered in their endeavors to increase the number of separate sets of vibrations or series of signals that could be received at the distant end of the line, so as to enlarge the number of commercial messages thus simultaneously received, and of other various devices patented to that end, which devices have, however, as aforesaid, enabled them to multiply only within a very limited scope the number of commercial mes-

sages which could be simultaneously sent and received over a single wire or on metallic circuits composed of two or more wires. Further, I am familiar with the Helmholtz and other resonators and their known uses, and I am aware of the fact that they have been utilized by other inventors in various combinations with tuning-forks, tuned reeds, diaphragms, and other vibrating devices, adjusted to receive tones transmitted over a line-wire, such use being intended, however, only to increase the volume of sound of a given note transmitted as aforesaid.

In the art of multiple telegraphy the purpose of my invention is to increase the number of practicable or commercial messages that may be simultaneously transmitted over a single wire or through a metallic circuit composed of two or more wires paralleling each other, or otherwise, by an arrangement at the receiving-station whereby the tones or vibrations received from a line-wire by one or more receivers are separated or singled out. Thus each separate tone received by a receiver is heard and understood by the receiving operator as an independent message, so that when a number of tones or series of vibrations or electrical impulses are simultaneously sent out upon a wire by a given number of operators the arrangement at the receiving-station is such that an equal number of operators thereat, or a less number, would each simultaneously receive out of the mass of tones or notes received upon one or more receiving-instruments those signals belonging to the note or tone transmitted from the other end by that operator who for the time being was operating the corresponding transmitting-instrument at the originating point, and at the same time exclude from all other operators at the receiving-station, to a practical extent, the other tones or notes comprising the signals which were simultaneously being transmitted by the other operators on the same line to their respective correspondents at the receiving-station, who would each enjoy the same exclusiveness as regards his special correspondent as above specified. For the purpose of accom-

plishing this result I may use at the transmitting or originating station any device which transmits to the telegraph-line vibrations, undulations, or impulses giving rise to a tone or to similar vibrations in the receiving-instrument. I may, for instance, have tuning-forks, or vibrating reeds, or string-instruments, or revolving wheels tuned to various musical notes—as do, re, me, or do', me², sol³—which in their actions will send on the line electrical pulsations equal to the number of vibrations constituting their respective notes; or I may use any other means to secure upon the line electrical pulsations of a given number or capacity.

At the receiving station I locate a magnet or series of magnets in electrical connection with the main line, having a vibrating armature or armatures of such construction that it will respond to any and all of the pulsations which are sent to line by the transmitters from the transmitting-station. Such armature or armatures will therefore simultaneously reproduce all the tones from which simultaneous impulses were sent to line, and the function of a resonator placed in proper relation to such armature is to make audible to the ear of the receiving operator one of these tones, to the exclusion of all others.

Referring to the accompanying drawings, forming a part of this specification, for a more specific description of my invention, Figure 1 is a diagrammatic view of one form or arrangement of my invention, and Fig. 2 is a similar view of a modified form.

In Fig. 1, at the transmitting-station A, I have shown two well-known forms of vibratory circuit-breakers adapted to send each its own definite number of electrical impulses to the main line 3 from a main battery, 4. These circuit-breakers are shown as being controlled by rheotomes 5 in a local circuit, 6, which in turn is controlled by a key, 7. It is evident that in place of the rheotomes shown any other form of circuit-controller may be used—such, for instance, as a telephone-transmitter actuated by a continuous sound or other well-known means.

At the receiving end B of the line is shown a magnet, 8, included in said line, which actuates a suitably-mounted diaphragm, 9. It is well known that a diaphragm is capable of responding to all rates of vibration, not only successively, but also simultaneously. The diaphragm will therefore simultaneously reproduce all tones which correspond to the rate of vibrations of the circuit-breakers 1 2 which may be in operation at the transmitting end at any given moment. I have shown two circuit-breakers; but there is no practical limit to the number which may be used, and if all of them should be put into operation by the simultaneous closure of the keys 7 the diaphragm 9 at the receiving end would at the same time respond to all the vibrations impressed upon the line.

To an ear applied to that diaphragm a compound sound having in it as constituents the note of each circuit-breaker would be audible, and no single one could be distinguished with certainty. If, now, a Helmholtz resonator, 10, is applied to the ear and arranged in proper relation to the diaphragm, the operator will hear the note of the resonator if the same corresponds to the note of one of the circuit-breakers at the transmitting-station. This note will sound in his ear with such force that it will practically obliterate all other notes proceeding from the diaphragm. This is the fundamental principle of my invention, and I utilize it for receiving by one receiving-instrument all the notes which may simultaneously be sent to line, and I prefer to do it in the following manner: If only one receiving-instrument is used, I group about the same as many resonators as there are transmitters at the distant station, each resonator corresponding in pitch to the rate of vibration of one of the transmitters, whereby I am enabled to analyze the sound emitted by the receiver and receive each message sent from the distant station.

Instead of a single receiver, I may use two or more, as is shown in Fig. 1, each receiving all the messages.

In Fig. 2 I have shown the transmitters and receivers as used in derivation from a main line provided with ordinary Morse instruments, and being connected to the line by separators or condensers 11. The transmitters are shown as being actuated by rheotomes arranged in multiple-arc branches of a local circuit. The receiver in this case is shown as an electro-magnet having a diaphragm, 9, at each end, and one or more resonators, 10, are arranged in proximity to each diaphragm.

While I have thus described some of the preferred forms of embodying my invention, it is evident that numerous and varied modifications may be made by those skilled in the art without departing from the principle thereof, and therefore do not limit myself to any particular construction or arrangement of devices.

What I claim is—

1. As an improvement in the art of multiple telegraphy, the method, substantially as hereinbefore described, consisting in producing upon a line superimposed series of impulses and in analyzing such superimposed series of electrical impulses made audible in a receiver.

2. As an improvement in the art of multiple telegraphy, the method, substantially as hereinbefore described, consisting in producing upon a line superimposed series of impulses and in reproducing in a receiver such superimposed series of impulses and separating each series from the other acoustically.

3. The combination of a main line over which several series of electrical impulses are transmitted, a receiver responding to all of these impulses simultaneously, and analyzers, substantially as described.

4. The combination of a main line over which
several series of electrical impulses are simul-
taneously transmitted, one or more receivers
responding to all of these impulses, and ana-
5 lyzers each corresponding to one of the series
of impulses, substantially as described.

In testimony whereof I have signed my name

to this specification in the presence of two sub-
scribing witnesses.

WILLIAM T. BARNARD.

Witnesses:

M. J. SHEA,
GEO. GREGORY.