

(No Model.)

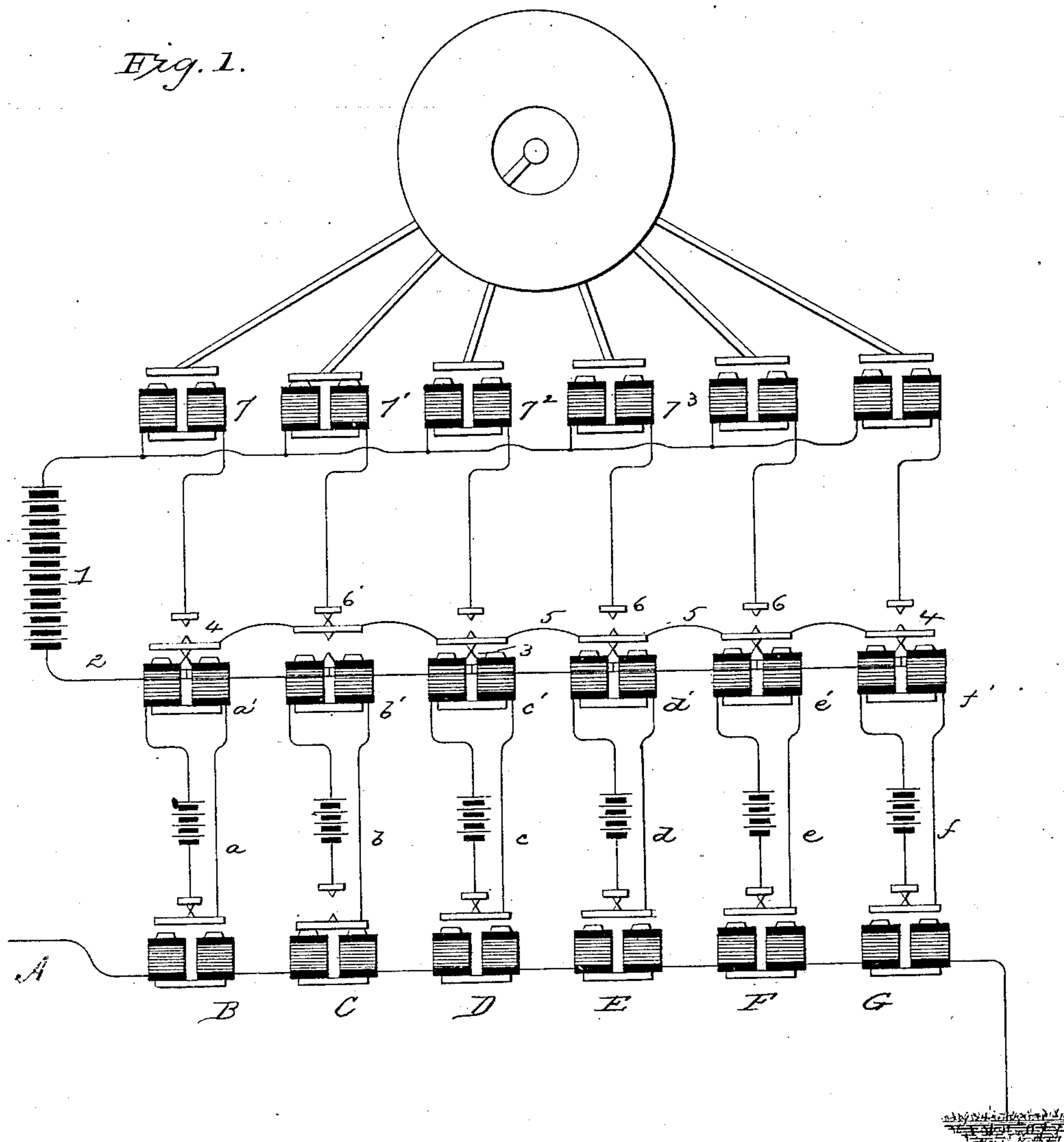
2 Sheets—Sheet 1.

G. A. CARDWELL.
HARMONIC PRINTING TELEGRAPH.

No. 315,121.

Patented Apr. 7, 1885.

Fig. 1.



WITNESSES

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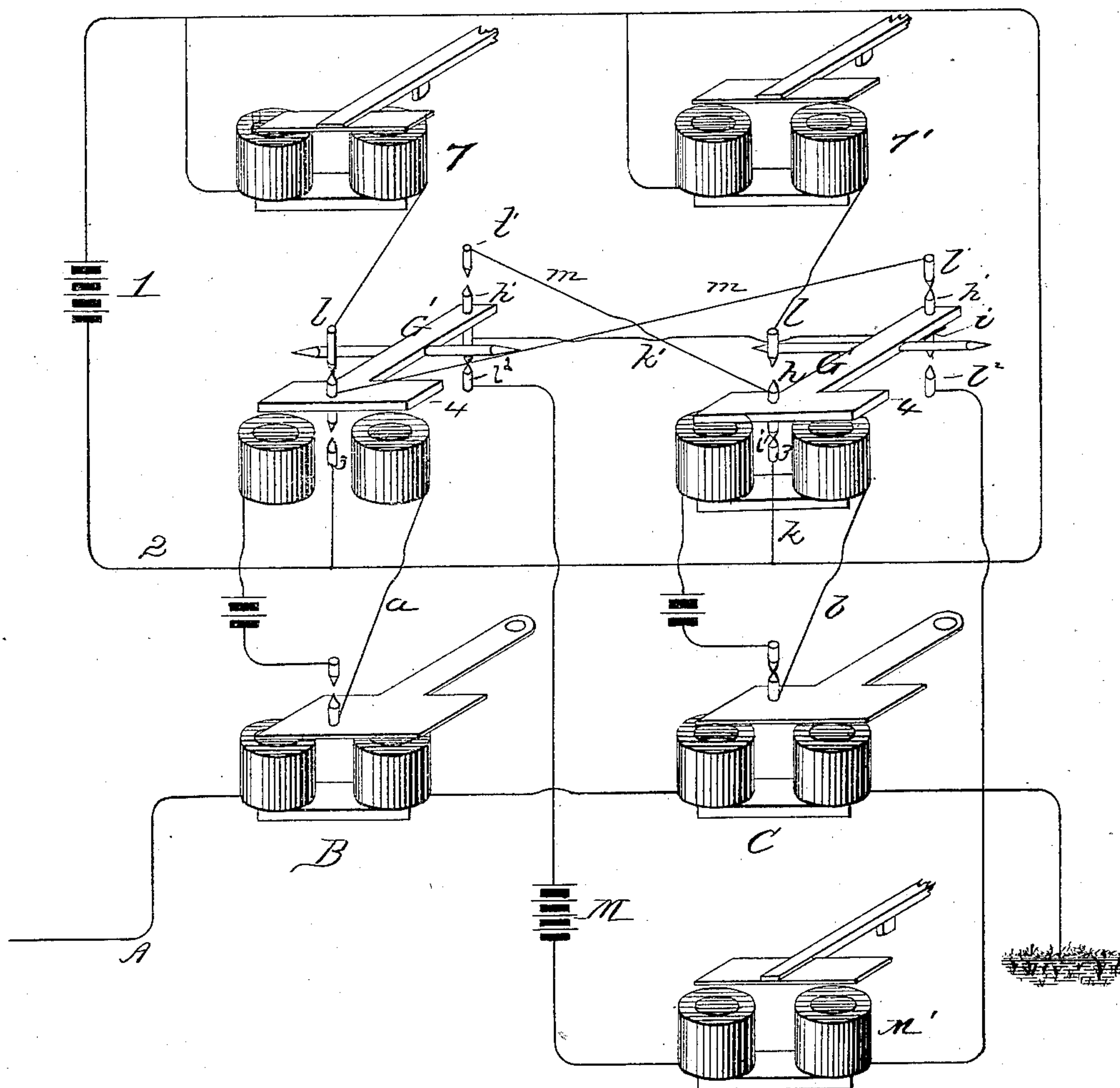
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Fig. 2



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UNITED STATES PATENT OFFICE.

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HARMONIC PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 315,121, dated April 7, 1885.

Application filed September 11, 1884. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. CARDWELL, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Multiple Telegraphy; and I do hereby declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is a diagram of an apparatus illustrating my invention. Fig. 2 is a perspective view of a pair of grouped appliances.

My invention has relation to an improvement in multiple telegraphy; and it consists in a novel method of transmitting and recording signs or signals, whereby I am enabled to not only send and record a separate signal for each distinct pulsatory current sent over a common line, but also to send and record separate and distinct signals for currents of different character when the same are transmitted simultaneously.

In an application filed by me the 4th day of September, 1883, Serial No. 105,525, I have shown and described certain devices whereby my invention is carried into effect, and wherein I have made use of what is known as the "Gray harmonic system of multiple transmission," such system being well adapted to the purposes of my invention, and in the following description I shall also refer to this system in illustration of the character of my improvement, without, however, limiting myself to any specific means of multiple transmission, as the purposes of my invention only require that currents of different character may be transmitted simultaneously over a common line and made, respectively, to energize independent receiving devices.

My invention contemplates what may be termed a "permutation of the multiple system of telegraphic transmission," inasmuch as it involves the combination of currents which independently produce certain results well known in multiple telegraphy, to produce effects different from those following the separate transmission of independent currents. If, for instance, I am employing the harmonic

system of multiple transmission, having normally the capacity of transmitting, say, six distinct pulsatory currents and the recording of as many separate signs or signals responsive thereto, I am by my improvement enabled to transmit and record as many separate and independent signals as there may be permutations or couples of currents.

In the accompanying drawings I have shown, and I shall describe as the means for carrying out my invention, the same devices as have been illustrated in my said application.

Referring to the drawings, A designates the main-line wire of a harmonic telegraph leading to ground at a receiving-station through the magnets B C D E F G, which are provided with the appurtenances of a Gray harmonic relay, so that each reeded armature will respond to its appropriate tone and to no other, and when so responding will open a local-battery circuit, *a b c*, &c., which is normally closed upon a secondary and "open-circuit" relay, *a' b'*, &c.

I term *a' b'*, &c., "open-circuit" relays, because they are normally in an energized state, and, under conditions hereinafter explained, close another local circuit or circuits when their armatures are retracted by the de-energizing of their coils. The relation of the magnets B C, &c., is the same as exists between the harmonic relay and sounder under the usual conditions of harmonic telegraphy.

Each individual tone or pulsatory current is intended to effect the recording of a single character, and as the medium for so recording I employ printing, recording, or sounding devices, which are controlled by the relays which respond to the respective currents.

Fig. 1 is a diagram illustrating the arrangement and relation of the devices whereby the characters are printed in response to the individual currents. 1 designates a local battery, from which a line, 2, leads through front stops, 3, of armatures 4, &c., and thence by lines 5 through all the armatures 4, &c., above which are other stops 6, &c., each having a line to a printing-magnet, 7, &c., and each being in a branch and normally-open circuit with battery 1. Now, supposing it were desired to print the letter "b" in response to the tone C,

the "tone," or current representing the tone, is transmitted and immediately harmonic relay C responds, opening its local circuit and causing armature 4' to fly back against stop 6'.

5 Circuit from battery 1 is now through all the front stops or continuous line 2, thence through armatures until 4' is reached, when the current passes to printing-magnet 7', and thence to battery; all the other printing-magnets being out of or on open circuit. It is obvious
10 that any other tone or current may be made to control and effect the printing of its appropriate character. This much being understood, I will now explain the means by which
15 two currents, when sent simultaneously, will cause the printing of a dependent character, instead of two characters.

The armatures of the secondary relays are pivotal or provided with pivotal arms G, Fig. 2, and carry front and back contacts, *h h'*, and lower insulated contacts, *i i'*. The points
20 *h h'* are connected by lines, as shown. Stops *h h'* are opposed to stationary contacts *l l'*. Stops *h'* oppose contacts *l'*, and stops *i* face
25 contacts *l'*, all being properly insulated.

In the drawings, Fig. 2 is designed to represent, under proper conditions, a pair of armatures belonging to a harmonic group or couple—say G F, which is arranged for printing the character "I." Then the stop *l'* of each
30 is connected by a line, *m*, with the stop *h* of the other, while a line leads from stop *l* above each armature, as already mentioned in explanation of diagram, to a magnet, 7, &c.
35 The stops *l' l'* are in circuit with a local battery, M, and a printing-magnet, M', adapted to print the character "I." Now, normally, the armatures G' being closed or down, a single tone will effect the retraction of but one, and the

circuit will be from battery 1 and line 2 through
40 line *h*, and by way of the attracted armature and stops *h' l'* of said attracted armature and line *m'* to and through stops *h l* of the retracted armature, and thence to printing-magnet 7 in connection therewith, all other circuits
45 being open; but should two tones or currents be sent, both armatures are retracted, and circuit is completed through *i i' l' l'*, line *h'*, battery M, and printing-magnet M', while
50 circuits to 7 7' are open. By an analogous arrangement of circuits and contacts all the secondary relays may be grouped together in pairs. The system of transmission is applicable either to the selection of particular local
55 recording-magnets or to the selection of special lines or circuits.

The mechanical details of the printer, recorder, or sounder do not properly constitute a part of my system, and as their principles are well understood I do not deem it necessary
60 or expedient to describe them.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

The method of producing telegraphic signals which consists in the transmission of
65 separate and distinct pulsatory currents of different characteristics, and effecting thereby independent relays which conjointly control printing, recording, or sounding devices, as
70 set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 27th day of June, 1884.

GEORGE A. CARDWELL.

Witnesses:

A. A. CONNOLLY,
C. E. NYLANDER.