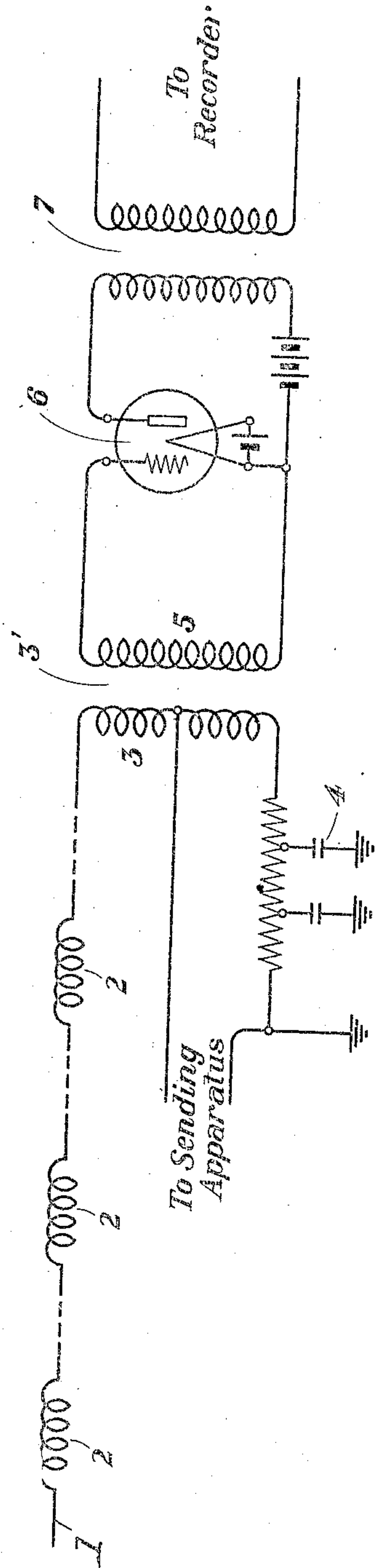


1,406,998.

H. S. OSBORNE.
SIGNALING SYSTEM.

APPLICATION FILED JUNE 21, 1918.

Patented Feb. 21, 1922.



INVENTOR.
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UNITED STATES PATENT OFFICE.

HAROLD S. OSBORNE, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

SIGNALING SYSTEM.

1,406,998.

Specification of Letters Patent. Patented Feb. 21, 1922.

Application filed June 21, 1918. Serial No. 241,246.

To all whom it may concern:

Be it known that I, HAROLD S. OSBORNE, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Signaling Systems, of which the following is a specification.

This invention relates to signaling over circuits in which the distortion and attenuation due to the characteristics of the line impair seriously the speed and efficiency of operation. The ocean cable is the marked instance of a transmission line involving these difficulties and it is a well known fact that the speed of signaling over such cables is extremely slow compared with that over properly designed land lines. The object of the invention is to improve the signaling speed over such circuits. The invention will be described in connection with the accompanying drawing in which the figure illustrates diagrammatically one embodiment thereof.

It is a well known fact that if a long transmission line over which impulses are to be sent, be loaded with inductance coils connected in series at the proper intervals in accordance with the invention set forth in a patent to Pupin, 662,230, June 19, 1900, that the distortion of the signaling impulses can be reduced and the transmission generally improved.

If inductance of this character is introduced into the lines of the character under consideration, the amplitude of the signal impulses may, in fact, be increased while the distortion is decreased, but with loading of this kind the losses increase as the speed of the signaling increases so that if telegraph signals of maximum speed are put upon the line, the losses rise to a point where the signals received at the opposite end will be so attenuated as to be little improved, for commercial purposes, over those received in the operation of cables as now used. According to the present invention it is proposed to introduce inductance into the line to preserve the wave form even at the high speeds and to make up the losses incident to such speeds by the use of thermionic amplifiers designed to introduce no distortion of their own into the faint signals thus received. By the employment of an amplifier of the thermionic type, sufficient amplification can be secured to render the reception of such weak signals

practicable and without the introduction of any distortion due to the amplifier itself. Referring to the drawing, 1 indicates the main line which may be an ocean cable provided with series inductance loading 2. The symbols used are intended to indicate series loading whether of the lumped or continuous type. The line may conveniently terminate at one end of the primary winding 3 of transformer 3'; the other side of the winding being connected to the artificial line 4 customarily used for duplex operation. The center point of the winding 3 may be used for the connection to the sending branch of the duplex set. The secondary winding 5 of the transformer is connected to an amplifier 6 in a well known manner, the amplifier shown being of the thermionic type which may be designed to give high amplification without distortion. The output circuit of the amplifier conveniently may be connected through another transformer 7 to the leads running to the recording devices.

It will be understood that the invention is not limited to the connection of the amplifier into the circuit in the manner here described as any known connection may be used which does not introduce objectionable distortion into the faint received signals to be amplified. It will also be understood that the invention does not necessarily exclude the use of leakage in connection with the loading of the line for preserving the form of the signal impulses.

What is claimed is:

A method of improving the efficiency of transmission in circuits of normally great distortion which consists in introducing inductance into the line to preserve the wave form of the impulses without substantial current loss at low signalling speeds, increasing the speed of the signal impulses to take advantage of the improved wave form at the expense of current strength and compensating the loss due to the high speed signals by amplifying the faint received impulses without substantial alteration of wave form.

In testimony whereof, I have signed my name to this specification this 20th day of June, 1918.

HAROLD S. OSBORNE.