

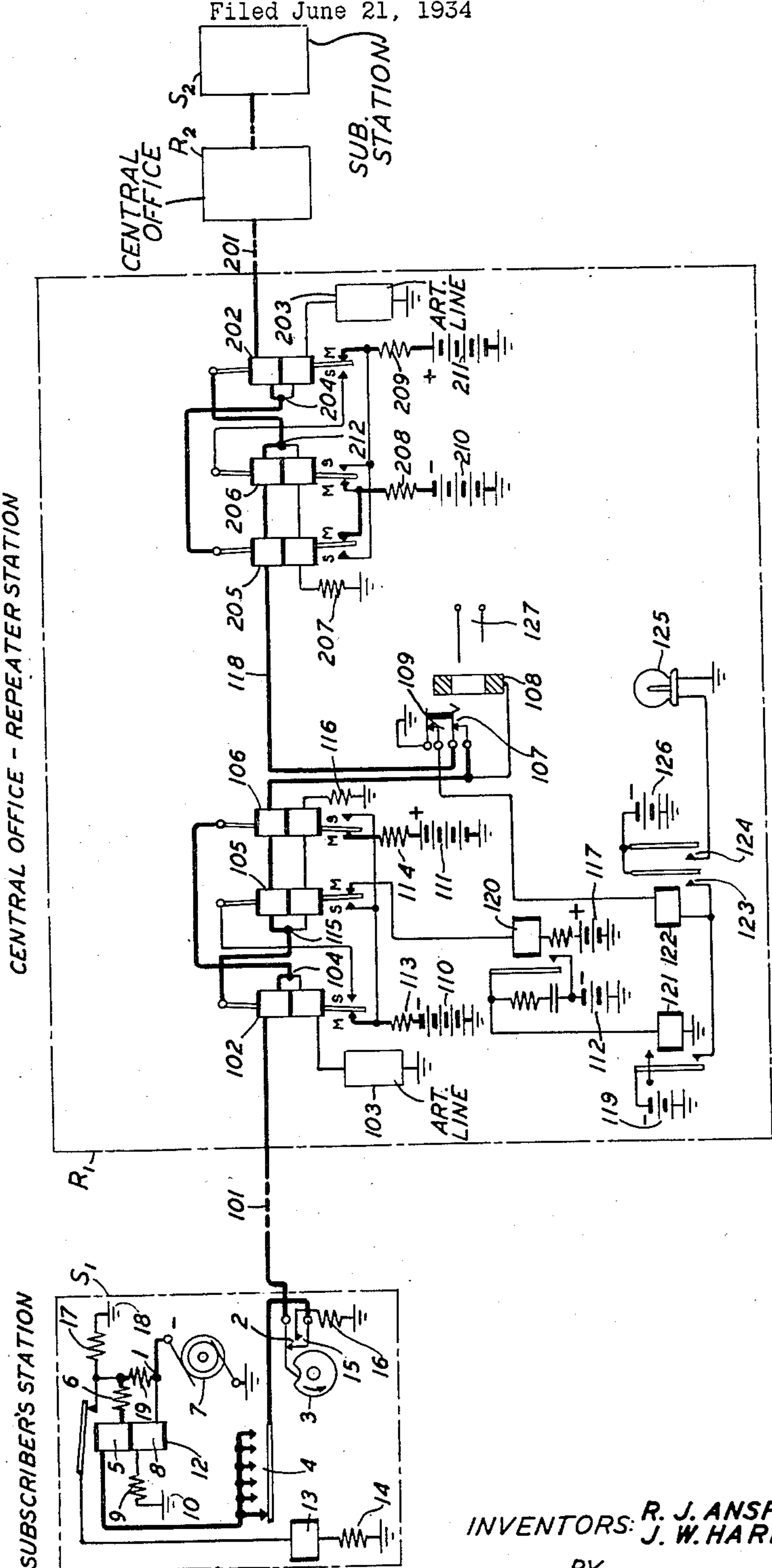
Jan. 28, 1936.

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2,028,818

PRINTING TELEGRAPH SYSTEM

Filed June 21, 1934



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UNITED STATES PATENT OFFICE

2,028,818

PRINTING TELEGRAPH SYSTEM

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Application June 21, 1934, Serial No. 731,740

10 Claims. (Cl. 178—69)

This invention relates to printing telegraph systems and more particularly to calling-in arrangements for use in printing telegraph systems.

It is an object of this invention to provide an improved subscriber's calling-in arrangement for use in printing telegraph systems. The purpose of this calling-in arrangement is to enable a subscriber at a receiving printing telegraph station to notify an attendant at the nearest printing telegraph central office repeater station that the teletypewriter apparatus at the receiving station is not functioning properly.

In printing telegraph systems, there often is a possibility that an operator at one printing telegraph station might transmit, by means of sending teletypewriter apparatus at that station, significant current variations over a telegraph line to receiving teletypewriter apparatus, located at another printing telegraph station, which might not be functioning properly. Normally, the operator at the sending station would have no immediate knowledge that the significant current variations were not being properly received at the receiving station. In order to obviate this undesirable contingency, it is necessary to employ some arrangement for informing the operator at the sending station that the teletypewriter apparatus at the receiving station is not functioning properly and also to inform the attendant at the nearest central office repeater station in order that the trouble may be remedied.

Heretofore, in printing telegraph systems, this problem has been met by installing apparatus at a receiving station for retransmitting messages received at that station back to the sending station. The objections to this procedure are that it cannot be readily applied to any printing telegraph system and that it requires additional apparatus which is expensive.

In accordance with this invention, a simple and inexpensive arrangement is provided in a printing telegraph system for notifying both an attendant at a central office repeater station and an operator at a sending station that the teletypewriter apparatus at a receiving station is not functioning properly. In using this arrangement, the subscriber at the receiving station opens the telegraph line, leading from that subscriber's station to the sending station, for a pre-assigned period of time, such as five seconds. This long open condition of the telegraph line causes the teletypewriter at the sending station to cease printing a home copy thereby informing the sending operator of trouble.

At the same time, this long opening of the line

will cause the receiving relay at the central office repeater station to operate its armature to the spacing position. While in the spacing position, the armature of the receiving relay will close a path for energizing and operating a second relay also located at the central office. When this second relay operates, it closes a path for energizing a slow-to-operate relay which operates after a period of delay, such as five seconds, and closes a path for operating an alarm device located at the central office. The operation of the alarm device at the central office can be discontinued by the insertion of a plug in a jack located in the circuit for the alarm device. After the telegraph line is closed by the receiving subscriber, all the line relays will operate their armatures to their normal positions.

The invention is illustrated diagrammatically in the accompanying drawing, which shows the equipment necessary at a teletypewriter subscriber's station and central office repeater station for practicing the features of this invention.

The drawing represents in schematic form a telegraph central office repeater station R_1 having oppositely extending telegraph lines 101 and 201. A single teletypewriter subscriber's station represented at S_1 is shown connected to line 101, it being understood that the end of line 201 may terminate in another repeater station R_2 or in another subscriber's station S_2 . The subscriber's station S_1 is shown in schematic form with the usual well known elements such as sending contacts 4, selecting magnet 13, and generator 7. Stations R_2 and S_2 may or may not, depending upon circumstances, be equipped with a calling-in arrangement similar to that of stations R_1 and S_1 .

With telegraph lines of the kind here shown, it is the usual practice to provide a sensitive relay 12 with a biasing winding 8 and a resistance 17 for reducing the negative voltage from generator 7 used in providing a negative voltage through winding 5 of relay 12 to the line 101. The purpose of this arrangement is to enable working over uncommonly short line circuits. A part of this invention further includes the modification of the subscriber's station S_1 to include a timing device, such as cam 3, which, when operated, causes the line 101 to be held open for five seconds or more.

Under normal conditions, the circuit of line 101 is closed from positive battery 111, resistance 114, armature and M contact of the sending polar relay 106, and then to the junction 104 of the windings of the receiving relay 102. From this point the circuit divides, one path being traced

through the lower winding of receiving relay 102 and artificial line resistance 103 to ground, and the other path through the upper winding of receiving relay 102 and out over line 101 to the subscriber's station S₁.

At station S₁ the path leads through the contacts 2 of cam 3, sending contacts 4, upper winding 5 of relay 12, and resistances 6 and 19 to junction 1 which, in this particular case, has a negative voltage of about 10 volts to ground. The amount of voltage may be regulated by varying resistances 17 and 19, since resistance 17 acts as a shunt on the higher voltage of the generator 7. Relay 12 is held operated by current through the upper winding 5, and the selecting magnet 13 is held in an operated position by means of current passing from generator 7, through the contact and armature of relay 12, selecting magnet 13, resistance 14, and then to ground.

The flow of line current in the upper winding of receiving relay 102 sets up a flux which overcomes, but is opposed, by the flux set up by current through the lower winding of relay 102 thereby causing the armature of relay 102 to remain on its M contact as shown. Normally, negative current flows through the dummy loop 118 from battery 110, resistance 113, M contact and armature of relay 102 to the junction 115 of the windings of break relay 105 and sending relay 106. At junction 115 the circuit divides, one path being traced through the lower windings of relays 105 and 106, through resistance 116, and then to ground. The other path leads through the upper windings of relays 105 and 106, contact 107 of jack 108, conductor 118, upper windings of sending relay 205 and break relay 206 to junction 212, armature and M contact of receiving relay 202, resistance 209, and then to positive battery 211.

Another circuit passes from ground through resistance 207, lower windings of relays 205 and 206, and then to junction 212. As was stated above, a similar circuit leads from ground through resistance 116, lower windings of relays 106 and 105, and then to junction 115. The flux set up by current in the upper windings of relays 105, 106, 205 and 206 is greater than the flux in their lower windings so that their armatures remain on their M contacts as shown in the drawing.

Negative current from battery 210 is connected through resistance 208, M contact and armature of relay 205, to junction 204 of windings on relay 202. Here the circuit divides, one path being traced through the lower winding of relay 202, artificial line 203, and then to ground. The other path leads through the upper winding of relay 202, and then out over line 201 to another repeater station R₂ or subscriber's station S₂. The flux in the two windings of relay 202 are opposing but the flux in the upper winding is greater so that its armature rests on its M contact as shown.

When telegraph signals are transmitted from the subscriber's station S₁, the sending contacts 4 open and close intermittently according to the marking and spacing impulses of the letter code being transmitted. Relay 12 follows these interruptions and successively opens and closes the circuit through magnet 13 thereby causing a record to be made at station S₁ of the signals being transmitted. At the repeater station R₁, every opening of the line 101 by a spacing impulse causes the armature of relay 102 to move to its S contact. This connects positive battery 117 through relay 120, armature and M contact of relay 105, armature and S contact of relay 102,

junction 115 of the windings of relay 105, and then over conductor 118.

At the same time, positive current from battery 211 will pass through resistance 209, armature and M contact of relay 202, and then to junction 212. When the current from battery 117 meets the current from battery 211 at junction 212, the result will be that no current will flow in the top windings of relays 105, 106, 205, 206. This accomplishes no useful result in the case of relays 105 and 106, but relays 205 and 206 will now operate and enable positive current from battery 211 to pass through resistance 209, armature and S contact of relay 205 to junction 204 of the windings of relay 202, and then out over line 201, thereby repeating the signal to the distant office R₂ or station S₂. When the sending contacts 4 at subscriber's station S₁ transmit a marking signal and close the line 101, the relays 102, 205 and 206 release and restore negative polarity to line 201.

In a similar manner, when signals are being transmitted to the subscriber's station S₁, relay 202 operates on every spacing signal to cause relays 105 and 106 to operate and close a path for negative current from battery 110 to pass through resistance 113, armature and S contact of relay 106, to junction 104 of the windings of relay 102. From this point the circuit divides, one path being traced through the artificial line 103 to ground and the other path being traced over line 101, contacts 2 of cam 3 at station S₁, contacts 4, winding 5 of relay 12, resistances 6 and 19, to junction 1. As was stated above, there is approximately a 10 volt negative potential at junction 1 caused by current passing from generator 7, through resistances 17 and 19, and then to ground 18. Relay 12 now operates because the flux in the top winding 5 now aids the flux in the bottom winding 8. The operation of relay 12 opens the circuit through the selecting magnet 13 which causes the signal to be recorded.

If, during the transmission of messages, the teletypewriter apparatus at station S₁ fails to function properly for some reason, it is desirable that the subscriber notify the attendant at the central office R₁ in order that the trouble may be remedied. To do this, the subscriber depresses a key (not shown) which controls the cam 3 and its associated spring contacts 2 and 15. A timing arrangement, such as clockwork mechanism, not shown (of the key causes cam 3 to rotate only one complete revolution during a preassigned period of time, such as 5 or 6 seconds. The spring contacts 2 are opened during this period and cause the line 101 to remain open. The spring contacts 15 are closed during this period and enable the circuit at station S₁ to remain closed and connected to ground through contacts 15 and resistance 16.

The opening of line 101 by the opening of contacts 2 is the equivalent of sending a spacing signal. Therefore, relays 102, 205 and 206 will operate as has been previously described. Relay 102 will close a circuit for positive current from battery 117 to pass through relay 120, armature and M contact of relay 105, armature and S contact of relay 102, and then to junction 115. Of the two paths from this point, the one through the upper windings of relays 105, 106, 205 and 206 may be traced to positive current from battery 211 as previously described. However, little or no current flows in this path whereas current does flow in the other path through the lower windings of relays 105 and 106 through resistance

116 to ground. As a result, the armatures of the relays 105 and 106 will be maintained in the positions shown in the drawing.

Since the circuit to junction 115 includes the winding of relay 120, relay 120 will operate and close a path through its armature for current from battery 112 to pass through the relay 121 to ground and thereby operate relay 121. Relay 121 is a slow-to-operate relay and requires a definite time interval, such as 5 seconds, in which to operate. Therefore, the transmission of regular signals never gives relay 121 time enough to fully operate. However, when the cam 3 at station S₁ is operated, relay 120 remains operated for a sufficient length of time to allow relay 121 to operate and to enable current from battery 119 to pass through the armature of relay 121, winding of relay 122, contacts 109 of jack 108, and then to ground. Relay 122 then operates and closes a locking circuit for current from battery 126 to pass through an armature and contact 123 of relay 122. At the same time, current from battery 126 will pass through another armature and contact 124 of relay 122, through an alarm device, such as lamp 125, and then to ground. As a result, lamp 125 will light and give a warning, or indication, of trouble to the attendant at the repeater station. The attendant, on noticing this warning signal, places a plug 127 in jack 108 to discontinue the signal (by opening contacts 109 and thereby opening the energizing path through relay 122) and to communicate with the subscriber at station S₁, or to take such other action as may be necessary. It is to be understood that any other suitable alarm device, such as a bell or buzzer, could be used instead of, or in addition to, lamp 125.

The holding open of line 101 by means of the cam 3 not only lights lamp 125 for notifying the attendant of trouble but it also causes positive current from battery 211 to be connected to the line 201 in the same manner as when sending an ordinary spacing signal. The continuance of this spacing signal at the repeater station R₁ causes the sending teletypewriter to cease printing a home copy thereby indicating to the operator at the sending station, such as station S₂, that there is trouble.

The operation of the alarm device, such as lamp 125, at repeater station R₁ indicates definitely to the attendant that the trouble is at the receiving station S₁ and not at some other station, such as sending station S₂. If, for example, line 201 were to remain open for an interval of time longer than an ordinary spacing signal, such as 5 seconds or more, then lamp 125 would not light because the energizing circuit for relay 120 would remain open at the M contact of relay 105 because, under this condition, relay 105 would have operated its armature to its S contact.

Because, in accordance with this invention, the calling-in signaling arrangement is always located at the repeater station R₁ on the line nearest the subscriber station S₁ and because a long open interval on the line beyond the repeater station R₁ does not cause lamp 125 to be lit, the operation of the cam 3 at station S₁ always serves to operate only the alarm apparatus 125 at station R₁ but never the calling-in alarm apparatus at a distant repeater station, such as station R₂. As a result, the indication of trouble is not given to parties other than those intended to receive it.

What is claimed is:

1. A printing telegraph exchange system comprising in combination a plurality of telegraph

lines connected to a plurality of printing telegraph central office repeater stations, a plurality of subscribers' printing telegraph stations connected to the central office repeater stations by the telegraph lines, and instrumentalities for enabling a subscriber to warn an attendant at only one central office repeater station of the improper functioning of teletypewriter apparatus located at that particular subscriber's station, said instrumentalities including a normally closed circuit extending from a subscriber's station to the nearest central office and a cam at the subscriber's station for opening said circuit for a preassigned time interval.

2. A printing telegraph exchange system comprising in combination a plurality of subscribers' printing telegraph stations connected by a plurality of telegraph lines to a plurality of printing telegraph central office repeater stations, alarm apparatus located at each central office repeater station, and instrumentalities for enabling a subscriber to operate the alarm apparatus at only the central office repeater station to which he is immediately connected, said instrumentalities including a slow-to-operate relay located at the central office to which the subscriber is immediately connected, said relay having an energizing circuit which is normally open, and control means at the subscriber's station for closing said energizing circuit for operating said slow-to-operate relay.

3. In a printing telegraph system having a plurality of subscribers' printing telegraph stations connected by a plurality of telegraph lines to a plurality of printing telegraph central office repeater stations, a circuit for warning an attendant at a central office repeater station of the improper functioning of teletypewriter apparatus located only at a subscriber's station which is immediately connected to that particular central office repeater station, said circuit including an instrumentality located at a subscriber's station for maintaining the telegraph line connected thereto open for a predetermined definite fixed interval of time, an alarm device located at the central office repeater station, and instrumentalities at that particular central office repeater station for operating the alarm device in response to the opening of the telegraph line for said predetermined interval of time.

4. A printing telegraph system comprising in combination a subscriber's teletypewriter station connected by a telegraph line to a teletypewriter central office repeater station, and a calling-in circuit for enabling an operator at the subscriber's station to give an indication to an attendant at the repeater station that teletypewriter apparatus at the subscriber's station is not functioning properly, said calling-in circuit including cam operated contacts for holding the calling-in circuit open for a preassigned definite fixed interval of time.

5. A printing telegraph system including in combination a receiving teletypewriter station connected by a telegraph line to a sending teletypewriter station, and a calling-in circuit for enabling an operator at the receiving station to notify an operator at the sending station that teletypewriter apparatus at the receiving station is not functioning properly, said calling-in circuit including an alarm device having an energizing circuit which is normally open at the armature of a normally unoperated first relay, said first relay having an energizing circuit which is normally open at the armature of a second nor-

mally unoperated relay, and control means at the receiving station for operating the second relay to operate the first relay for closing the energizing circuit of the alarm device.

5 6. A printing telegraph system including in combination a first teletypewriter station connected by a telegraph line to a second teletypewriter station, and a calling-in circuit for enabling an operator at the first station to cause
10 an indication to be made at the second station of the improper functioning of teletypewriter apparatus located at the first station, said calling-in circuit including a cam operated contact for holding the circuit open for a preassigned
15 period.

7. A printing telegraph system comprising in combination a subscriber's receiving teletypewriter station connected by a plurality of telegraph lines to a teletypewriter central office repeater station and to a sending teletypewriter
20 station, and a calling-in circuit for enabling an operator at the subscriber's station to inform simultaneously both an attendant at the repeater station and an operator at the sending teletypewriter station that teletypewriter apparatus located at the subscriber's station is not functioning properly, said calling-in circuit including a contact operated by a cam driven by clockwork mechanism.

8. A printing telegraph system including in combination a first teletypewriter central office repeater station connected by only one telegraph line to a first subscriber's teletypewriter station, a second teletypewriter central office repeater
30 station connected by only one telegraph line to the first repeater station, said second repeater station being connected by only one telegraph line to a second subscriber's teletypewriter station,

an alarm device located at each repeater station, and instrumentalities at the first subscriber's station for operating the alarm device at only the first repeater station and for informing the subscriber at the second subscriber's station of the improper functioning of teletypewriter apparatus located at the first subscriber's station.

9. A printing telegraph system including in combination a first teletypewriter central office connected by only one telegraph line to a first subscriber's teletypewriter station, a second teletypewriter central office connected by only one telegraph line to the first central office, said second central office being connected by only one
15 telegraph line to a second subscriber's teletypewriter station, alarm apparatus located at each central office, a timing device at the first subscriber's station for opening the telegraph line leading from that station to the first central office for a preassigned period for operating only the alarm apparatus at the first central office.

10. A printing telegraph system including in combination a first subscriber's teletypewriter station connected by a single telegraph line to a first teletypewriter central office repeater station, a second subscriber's teletypewriter station connected by a single telegraph line to a second teletypewriter central office repeater station, said repeater stations being connected to each other
30 by a single telegraph line, and instrumentalities for informing only the attendant at the first repeater station and the operator at the second subscriber's station of the improper functioning of teletypewriter apparatus located at the first subscriber's station.

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