

July 10, 1928.

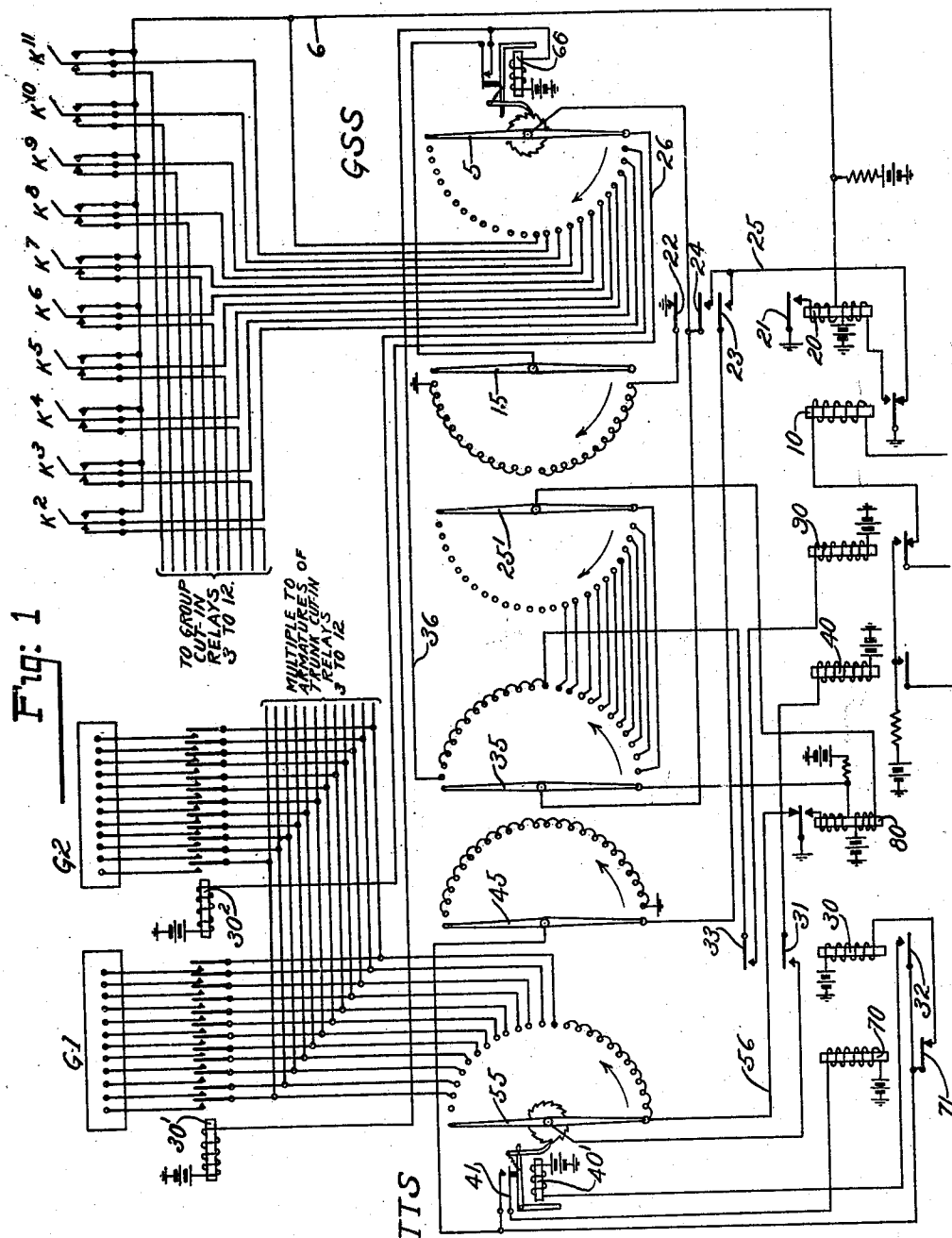
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J. E. OSTLINE

TRAFFIC RECORDING EQUIPMENT FOR TELEPHONE SYSTEMS

Filed July 12, 1924

2 Sheets-Sheet 1



Inventor
John E. Ostline

John E. Ostline

R Richardson Attor:

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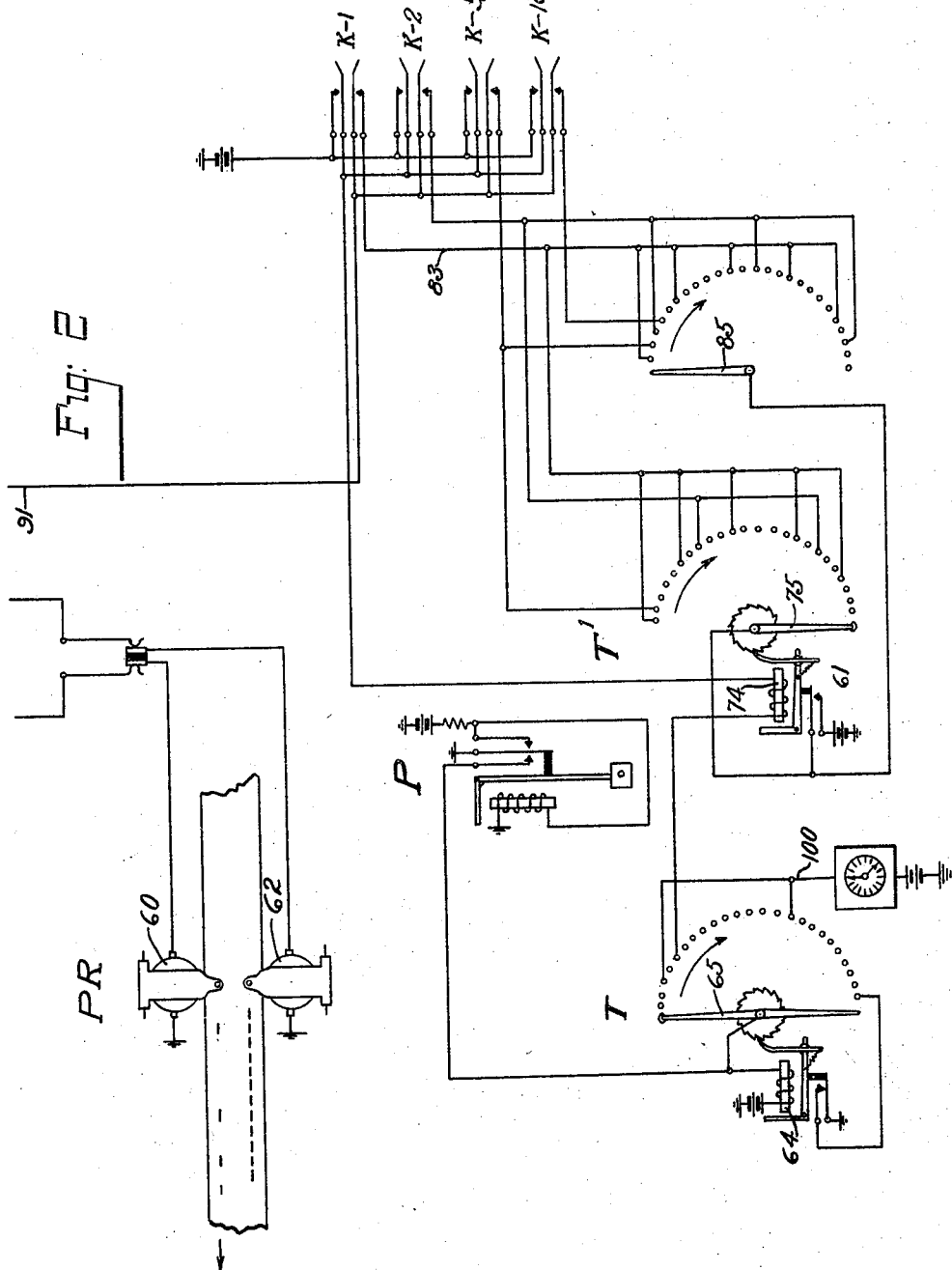
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2 Sheets-Sheet 2



Inventor
John E. Ostline

Richardson, Att'y.

UNITED STATES PATENT OFFICE.

JOHN E. OSTLINE, OF LIVERPOOL, ENGLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
AUTOMATIC ELECTRIC INC., OF CHICAGO, ILLINOIS, A CORPORATION OF DELA-
WARE.

TRAFFIC-RECORDING EQUIPMENT FOR TELEPHONE SYSTEMS.

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The present invention relates in general to traffic recording equipment for telephone systems, and among the particular objects of the invention is to provide means for registering at regular intervals the busy trunks of a group with which the equipment is associated, and in addition, recording the particular number of each busy trunk in the group. This is of great value in determining if the group is properly distributed.

Another feature has to do with the provision of a novel timing device for determining the time interval between each registration, the particular time interval selected being determined by the frequency at which the readings are desired.

Other features of the equipment not mentioned above will be fully brought out in the description which is to follow.

The drawings comprising Figs. 1 and 2, when Fig. 1 is placed immediately above Fig. 2, show sufficient of the recording equipment to make clear the invention when referred to in conjunction with the accompanying detailed description.

Referring now particularly to Fig. 1, this figure shows two switches, TTS and GSS, which are of the well known rotary type often used as line switches in automatic telephone systems. The main function of the trunk testing switch TTS, as its name implies, is to test the trunks. In the present system, it has been found convenient to allot only twelve of the bank contacts of this switch for trunk testing purposes, and in order to make this switch capable of testing more than twelve trunks switching means comprising group relays have been provided for switching the conductors extending from the bank contact of switch TTS into connection with any one of a number of trunk groups of twelve trunks each. The major function of the group selecting switch GSS, therefore, is to select, and cause the operation of, the various group relays at the time at which their associated group of trunks is to be tested. In using the usual twenty-five bank contact type of switch it is found convenient to utilize only twelve bank contacts for controlling the group relays and therefore the recording equipment is adapted to handle up to twelve groups of twelve trunks each or a maximum of 144 trunks.

The various relays and keys which are diagrammatically shown are of the ordinary type used in telephone systems, and their function and operation will be described hereinafter.

For each of the twelve subgroups of trunks a terminal block is provided where the private conductor of each of twelve trunks, on which traffic is to be recorded, may be fastened. Only two of these blocks are shown, these being designated as G^1 and G^2 , respectively.

Referring to Fig. 2, this figure shows a timing device comprising switches T and T', which are mechanically the same as the switches shown in Fig. 1. The timing device P consists of a relay with a weighted pendulum, with the weight so adjusted that it operates to transmit impulses at one-half second intervals. These impulses are effective to operate switch T, and switch T' through the medium of switch T, the switch T' in turn transmitting battery pulses out over conductor 91 at intervals dependent on which combined time control and start key, K-1, K-2, K-5, and K-10, has been operated.

In the upper part of Fig. 2 is diagrammatically shown a pen register which may be of any well known type provided with a pair of electromagnetically operated pens adapted to make like markings on a moving tape.

The timing apparatus and all equipment shown in Fig. 1 is located in the same office, while the pen register may be located in the same office or in a centrally located office as desired.

The timing equipment is arranged with bank contacts of switch T' multiplied so that, depending on the key thrown, it transmits impulses to conductor 91 at one, two, five, and ten minute intervals. In order to secure these results the switch T' must take five steps per minute. The operating conductor of magnet 74 of switch T' extends to only one bank contact of switch T and it is, therefore, necessary that wiper 65 of switch T engages this bank contact to complete the circuit of magnet 74 once every twelve seconds. In other words, it is necessary to move wiper 75 five steps per minute. Now if the switch T makes one-half revolution per twenty-four impulses, every twelve

seconds, it will be evident that magnet 74 will be operated once every twelve seconds. A standard switch such as T, however, is provided with twenty-five contacts and only makes a half revolution every twenty-five steps. Now in order to be able to use this switch, and still accurately operate switch T' once every twelve seconds, an auxiliary operating circuit for magnet 64 of switch T is provided extending through a pair of interrupter contacts on magnet 64 of switch T. When the wiper 65 of switch T engages its twenty-fifth contact it is immediately stepped on to its first contact between pulses produced by time device P, and therefore moves its wipers the required half revolution, twenty-five steps, every twelve seconds.

Now taking Figs. 1 and 2 together, the operation of the system as a whole will be described. For this purpose, it will first be assumed that a reading is desired on the condition of the trunks of all twelve groups at this time, and that readings are desired at one minute intervals. The attendant therefore operates the combined start and time interval key K—1. Now one-half second after the wiper 65 arrives at its sixth bank contact an impulse is transmitted for operating the motor magnet 64 of the switch T to move its wiper to the seventh bank contact. This impulse also causes the motor magnet of the switch T' to be operated via wiper 65 and its sixth bank contact. Since the sixth bank contact of the switch T is the only one having a conductor extending to the motor magnet of the switch T', it will be apparent that the motor magnet of the switch T' will be operated but twice per revolution of the wiper 65 of the switch T which makes two and one-half revolutions per minute. The wipers 75 and 85 are advanced one step by the first operation and release of the motor magnet 74, and upon the second energization of this motor magnet an impulse is transmitted to the start relay 10 of the recording equipment. This circuit extends from battery, contacts 61 of motor magnet 74, wiper 85 now positioned on its first bank contact, lower contacts of key K—1, conductor 91, winding of relay 10, back contact and armature of relay 90, pen register magnet 62 to battery. The resistance of relay 10 is very high compared to that of magnet 62 and, therefore, only relay 10 operates at this time. Relay 10, upon operating, completes a circuit for the lower winding of relay 20. Relay 20, upon operating, at its armature 21 completes a locking circuit for itself through its upper winding, at its armature 22 removes ground from the first twelve private bank contacts over which the wiper 15 of the group selecting switch GSS moves, and at its armatures 23 and 24 prepares operating circuits for relays 30 and 30'. Since the circuit for

relay 10 was only completed during the momentary energization of the motor magnet of switch T', this relay almost immediately falls back, and at its armature and back contact now completes a circuit for relays 30 and 30'. The circuit for relay 30 extends from grounded conductor 25, front contact and armature 23, first bank contact of trunk testing switch TSS, wiper 45, armature 71 and its back contact, and the winding of relay 30 to battery. The circuit for relay 30' may be traced from grounded conductor 25, front contact of armature 24 and the said armature, wiper 5 positioned on its first bank contact, conductor 26, and the winding of relay 30' to battery. Relay 30' in operating connects up the first twelve of the group of trunks to be tested. Relay 30, upon operating, at its armature 33 closes a point in the operating circuit of relay 90, and at its armatures 31 and 32 completes circuits for the relay 40 and motor magnet 40', respectively, the circuit for relay 40 extending from grounded armature of relay 80 and its back contact, conductor 56, bank contact of switch TTS, wiper 55, front contact and armature 31, and the winding of relay 40 to battery. The circuit for magnet 40' extends from ground at lower back contact of relay 10, front contact 23, first bank contact and wiper 45 of switch TTS, armature 32, and its front contact to the winding of magnet 40' and battery. Relay 40, upon operating, completes a circuit for the pen register magnet 60 which, in turn, makes a registration on the tape. Motor magnet 40', upon operating completes a circuit for relay 70, this circuit extending over the grounded conductor 25, through contacts 41 of motor magnet 40', and the winding of relay 70 to battery. Relay 70, upon operating, opens the circuit of relay 30. Relay 30, upon restoring, at its armature 33 opens a point in the operating circuit of the relay 90, at its armature 31 opens the operating circuit of relay 40, and at its armature 32 opens the circuit extending through motor magnet 40'. Relay 40, upon restoring, opens the circuit of the pen register magnet 60, which thereupon removes its recording pen from engagement with the moving tape. Motor magnet 40', upon restoring, moves its wipers 35, 45 and 55 forward one step, and at its contacts 41 opens the circuit of relay 70. As soon as the wiper 35 engages its second bank contact a circuit is completed for relay 80, this circuit extending from the grounded conductor 25, front contact and armature 24 of start relay 20, wiper 35 and its associated second bank contact, first bank contact of the bank associated with wiper 25' of switch GSS, wiper 25', and the lower winding of relay 80 to battery. Relay 80, upon energizing, removes ground from the previously described circuit for relay 40 and

locks itself up through its upper winding. Relay 70, upon deenergizing, at its armature 71 again completes a circuit for relay 30 over the previously described path except that ground is supplied by the permanently grounded bank contact associated with wiper 45. Relay 30 therefore again operates, this time, since the relay 80 is energized, relay 30 does not close an operating circuit for the pen register control relay 40 at its armature 31 as it did in the previous case, but at armature 32 it again closes a circuit for motor magnet 40' which, upon energizing, again completes a circuit for relay 70, the relay 70 in turn opening the circuit for relay 30 and relay 30 in turn restoring to open the circuit of magnet 40' which, upon restoring, moves its associated wipers into engagement with their third bank contacts. The magnet 40', upon deenergizing, also again opens the circuit of relay 70, which, upon restoring, again completes a circuit for relay 30, this time via the third bank contact and wiper 45. Since the second to twenty-fifth bank contacts associated with wiper 45 are all grounded, relay 30, motor magnet 40' and relay 70 operate repeatedly in the above described order as long as wiper 45 engages grounded bank contacts. As soon as wiper 35 arrives at its thirteenth bank contact, a circuit is completed for pen register control relay 90, this circuit extending from the grounded conductor 25, front contact and armature 24, wiper 35 and its thirteenth bank contact, armature 33 and its front contact, and the winding of relay 90 to battery. Relay 90, upon operating, completes a circuit for pen register magnet 62. Since bank contacts thirteen to twenty-four, inclusive, associated with wiper 35 are all connected in common, it will be evident that during the next thirteenth to twenty-fourth steps of switch TTS that the pen register magnet 62 will be operated twelve times, causing twelve like markings to be reproduced on the pen register tape. The thirteenth to twenty-fourth bank contacts associated with wiper 55 are at this time connected to the first group of twelve trunks via contacts of group relay 30' and the terminal block G¹, and, therefore, as the wiper 55 moves over its thirteenth to twenty-fourth bank contacts completes a circuit for pen register control relay 40 each time a busy trunk is engaged, the busy condition of a trunk being indicated by a ground potential. The circuit for relay 40 extends from one of the grounded bank contacts, wiper 55, front contact and armature 31, and the winding of relay 40 to battery. Each time relay 40 energizes it completes a circuit for the pen register magnet 60 which causes a registration to be made on the pen register tape.

Referring now to the pen register tape, the registration indicated at the extreme left, and brought about by the operation of pen register magnet 60 prior to any registrations on the lower half of the tape, indicates the group being tested which in this case is group 1. Since a mark is made on the lower half of the tape only each time a trunk is being tested it serves to enable the number of the trunks which were busy during the testing operation of a group to be readily identified. According to the markings on the tape shown trunks 2, 5 and 11 were the only ones busy during the first test.

Continuing now with the operation of the system, wiper 35, upon engaging its twenty-fifth bank contact, completes a circuit for the motor magnet 66 of the group selecting switch GSS, this circuit extending by way of grounded conductor 25, front contact and armature 24, wiper 35 and its twenty-fifth bank contact, conductor 36, and the winding of the motor magnet 66 to battery. Motor magnet 66, upon energizing, opens its interrupter contacts which are without effect at this time. As soon as wiper 35 of the switch TTS advances to its normal position as shown in the drawing, magnet 66 deenergizes and in so doing advances its wipers 5, 15 and 25 one step. Wiper 5 upon disengaging itself from its first bank contact breaks the circuit of group relay 30¹, which relay restores, disconnecting the first group of twelve trunks from association with switch TTS. Wiper 5, upon engaging its second bank contact completes a circuit for the second group relay 30² which operates to connect the second group of twelve trunks with the bank contacts of switch TTS. Wiper 35 of switch TTS, upon engaging its normal or first bank contact, shunts battery from the holding winding of relay 80, and this relay therefore restores to normal again placing ground potential on conductor 56. An instant later, following the deenergization of relay 70, relay 30 energizes and again completes a circuit for pen register control relay 40, this circuit extending from the grounded armature of relay 80 and its resting contact, conductor 56, bank contact of wiper 55, front contact and armature 31, and the winding of relay 40 to battery. Relay 40, upon operating, completes a circuit for the pen register control magnet 60. Wiper 55 in passing from its first contact to its second contact opens and again closes the above described circuit for the relay 40. As the wiper 55 moves from its second to its third bank contact it again opens this circuit, but due to a circuit completed for relay 80, when wiper 35 reaches its third bank contact and before the energization of relay 30, relay 40 is not operated at this time. The operating circuit for relay 80 may be traced from the grounded conductor 25, front contact and armature 24, wiper 35 and its

third bank contact, the second bank contact and wiper 25', and the winding of the relay 80 to battery. Relay 80, upon operating, locks itself up over its upper winding and at the same time disconnects ground from conductor 56. It will be evident that no further operations of relay 40 will take place until wiper 55 engages busy trunks of the group being tested. As soon as wipers 55 and 35 arrive at their thirteenth bank contact the operation of relay 40 and relay 90 will take place in the previously described manner to control pen register magnets 60 and 62.

Since the operations which take place following the testing of a group are the same in each instance, with the exception that the operations which take place following the testing of the twelfth group, a description of the operation of testing groups three to twelve, inclusive, will be unnecessary.

Taking up the operation at the point where wiper 35 of the switch TTS is shifted from its twenty-fourth to its twenty-fifth bank contact, at which time wipers 15 and 25' of the switch GSS will be positioned on their twelfth bank contacts, the wiper 35, upon reaching its twenty-fifth bank contact, completes a circuit for the motor magnet 66 of the switch GSS, and as soon as this wiper steps to its normal position this circuit is broken and motor magnet 66 causes the wipers of the switch GSS to advance one step. Since bank contacts thirteen to twenty-five associated with wiper 15 are multiplied together and grounded, magnet 66 will now operate as a buzzer and rotate wipers 5, 15 and 25' to their normal position as shown. Wiper 5 upon arriving upon its thirteenth bank contact shunts battery from the holding circuit of start relay 20, causing this relay to deenergize and restore its armatures. Now when wiper 45 engages its normal contact, ground potential having been removed therefrom by the deenergization of relay 20, relay 30 will not be again operated and therefore switch TTS will remain in its normal position until relay 20 is again energized responsive to a second impulse from the time mechanism. When this occurs the entire above operations will again take place.

In the above description it was assumed that there were twelve groups of twelve trunks each, and that it was desired to test all groups. In certain cases there may be less than 144 trunks, or it may be desirable that only a certain portion of 144 trunks be tested. For this reason a number of controlling keys have been provided which enable an attendant to cut out any group control relays not to be used, the remaining groups being then tested repeatedly in the same manner as if the entire group of 144 trunks were being tested. It is assumed that there never will be less than 24 trunks under test

at one time and for this reason no provision is made for testing less than 24 trunks. Assuming that there are five groups of twelve trunks each, the attendant operates key K⁵ thereby connecting the branch of the conductor 6, which normally extends to the thirteenth bank contact associated with wiper 5, into connection with the sixth bank contact associated with this wiper. Therefore, as soon as the fifth group has been tested and wiper 5 shifted to its sixth bank contact, relay 20 will be shunted out and will therefore deenergize to prevent further operation of the trunk testing switch until another impulse is received from the timing mechanism. The relay 20, upon deenergizing, this time also applies ground to the first twelve bank contacts associated with wiper 15, causing the switch GSS to rotate to normal. From this it will be evident that a group containing from 24 to 144 trunks may be tested periodically, as required.

By providing the various start keys K—1, K—2, K—5 and K—10, the frequency of testing the trunk group may be varied as desired.

It will be noted that the pen register equipment is connected with the observing equipment through the medium of a jack, and it will be recalled that in starting the trunk testing equipment in operation by the operation of a start and time key that this start circuit included the winding of one of the pen register magnets. From this it will be evident that if desired the pen register may be disconnected from the other equipment and a combined time and start key may be operated without starting any of the switching mechanism of the recording equipment. Now, should the pen register be plugged in to connection with the recording equipment, the circuit for the start relay will be completed and the recording equipment will function the same as if started by operation of one of the start keys.

Now, since only two conductors are required to connect the recording equipment with the pen register, it will be evident that if desired each of a large number of offices may be equipped with the recording equipment shown, each having a two-conductor trunk extending to a centralized point, in which case each of the jacks will be brought out on a common panel where it will be convenient for an attendant to plug in the pen register into connection with the recording equipment of any office in which it is desired that a record be taken. Under these conditions it would be the practice to leave one of the combined cut-in and time control keys operated at all times. If at any time it should be desirable to change the frequency of testing, it would only be necessary for the attendant at the central office to

communicate with an attendant of such office who would then make the desired change.

A lead 100 connected to two bank contacts of switch T is also provided to permit the operation of an electric clock if desired.

From the above it will be readily seen that applicant has invented a traffic recording system which is very simple and positive in operation, and which is practical for use in either small or large systems.

What is claimed is:

1. In a telephone system, groups of trunk lines, a trunk testing switch common to said groups, means for associating said groups with said switch, in a definite order and for causing said switch to determine the busy or idle condition of each trunk of a connected group, and means responsive to each group testing operation for making two separate records indicating the number of the group tested and the individual numbers of the busy trunks in the tested group, respectively.

2. In a telephone system, groups of trunk lines, means for periodically determining the busy or idle condition of all trunks in the groups, in a definite group and trunk order, and means for making two separate records indicating the numbers of the groups tested and the individual numbers of the busy trunks in the tested groups, respectively.

3. In a traffic recorder for recording traffic conditions existing in grouped telephone lines, means for testing said lines successively, a moving tape, and means responsive to said testing means for making two records on said tape, from one of which records the numbers of the groups under test may be determined and from the other of which the line number of each busy line may be determined.

4. In a traffic recording device for recording the traffic conditions in grouped telephone lines, means for testing said lines one at a time to determine the busy or idle condition of each line, a moving tape recording device, said device including means for making indications on said tape whereby the busy or idle condition of the respective tested lines may be determined, there being separate spaced portions of the tape for each group, and means for recording on the tape indications of the numbers of the respective groups in the spaces on the tape between the said separate spaced portions.

5. In a traffic recording device for recording the traffic conditions existing in grouped telephone lines, said recording device including a double pen moving tape recorder, means for testing said lines successively one at a time, means for operating the first pen of the recorder to make a record indicating the group numbers and indicating the busy

and idle condition of the lines in the various groups, and means for operating the other pen of said recorder to make a record indicating the numbers of the lines in the various groups irrespective of their busy or idle condition.

6. In a telephone system, groups of lines, a recording device, means for testing said lines, and means for causing said recording device to automatically make two records on separate portions of said recording device indicating respectively the group number and the line number of each tested line.

7. A traffic recorder for recording traffic conditions in telephone lines comprising a recording device and a testing device, a timing device for sending spaced momentary impulses, said testing device being responsive to each of said impulses to test said lines, manually operable switching means for connecting said recording device to said testing device and for disconnecting said recording device from said testing device, and means for preventing the operation of said testing device in case said recording device is disconnected.

8. In a traffic recorder for recording the traffic conditions existing in grouped telephone lines, a set of test conductors common to a plurality of groups of lines, testing means for testing said test conductors successively, and connecting means for connecting said test conductors with the groups of lines successively.

9. In a traffic recorder for recording traffic conditions in grouped telephone lines, means for testing said groups of lines successively, and means effective immediately prior to the testing of any group for making a record indicating the number of the group about to be tested.

10. In a traffic recording system for recording the traffic conditions in grouped telephone lines, a group of test conductors common to a plurality of groups of lines, means for connecting said test conductors to any group of lines, a test switch, means for advancing said switch step-by-step from a given position preliminarily to testing the connected group of lines through the medium of said common test conductors, and means controlled by said switch when operated in its preliminary movement to make a record indicating the number of the instant connected group of lines.

11. In a traffic recording system for recording the traffic conditions in grouped telephone lines, a group of test conductors common to a plurality of groups of lines, means for connecting said test conductors to any group of lines, a test switch, means for advancing said switch step-by-step from a given position preliminarily to testing the connected group of lines through the medium of said common test conductors, means con-

trolled by said switch when operated in its preliminary movement to make a record indicating the number of the instant connected group of lines, means for continuing the advance of said testing switch after said recording operation has been completed and until the first of said test conductors is encountered, and for then advancing said test switch over said test conductors to test individual lines in the connected group.

12. A traffic recording device for recording traffic conditions in grouped telephone lines comprising a testing switch and a group selecting switch, means for operating said testing switch over and over to test said groups successively, means for operating said group selecting switch step-by-step to associate said groups successively with said testing switch, and means effective after a portion of said groups have been tested and prior to the testing of the remaining groups for automatically advancing said group selecting switch the remaining distance to its normal position and for stopping said trunk testing switch in its normal position.

13. In an apparatus for testing the condition of each of a number of conductors, means effective when the apparatus has been started to continue the operation of the same until all of the conductors have been tested, means effective upon the termination of the test on the last conductor to be tested for stopping the apparatus, means for periodically restarting said apparatus, a plurality of keys for controlling the interval between the periods, and circuit arrangements controlled by any one of said keys for initially starting said apparatus.

14. In combination with a testing apparatus for testing the condition of each of a number of conductors, a unitary recording apparatus controlled by the testing apparatus, means including a manually operable switch for readily connecting and disconnecting said recording apparatus from said testing apparatus, and means controlled by the recording apparatus, for starting said testing apparatus into operation.

15. In combination with a testing apparatus for testing the condition of each of a number of conductors, a unitary recording apparatus controlled by the testing apparatus and readily disconnectable therefrom, a timing apparatus, and means jointly controlled by the timing apparatus and the recording apparatus for starting said testing apparatus into operation.

16. In combination with an apparatus for successively testing the condition of each of a number of grouped conductors, a recording device, and means controlled by the testing apparatus for operating the recording device to make alternately records from one of which the number of the group tested and from the other of which the condition of the

individual conductors in the group may be determined.

17. In combination with an apparatus for successively testing the condition of each of a number of grouped conductors, a recording device, and means controlled by the testing apparatus for making indications on different portions of the recording device, whereby the number of the group tested and the condition of the individual conductors in the group may be determined.

18. In combination with a plurality of groups of conductors, an apparatus for testing and recording the condition of the individual conductors in each group, said apparatus including means for testing individual conductors, a device for associating the conductors of any group with said means, group testing means for determining which of the groups of conductors is associated with the conductor testing means, a recorder, and means for operating the recorder first under the control of one of said means and then under the control of the other of said means.

19. In a telephone system, groups of trunk lines, a trunk testing switch common to said groups, means for associating said groups with said switch in a definite order, and means for making two successive tests for each group of trunks associated with said switch, one of said tests determining the group of trunks associated with said switch, and said other tests determining the busy or idle condition of each trunk in an associated group.

20. In an apparatus for testing the conditions existing in grouped telephone lines, a set of test conductors common to a plurality of lines, testing means for testing said conductors successively, and connecting means for connecting said test conductors with the lines of different groups successively.

21. In a traffic testing device for testing the conditions in grouped telephone lines, means for testing said groups of lines successively, and means effective during the interval between the testing of the lines of successive groups for testing to determine the number of one of said last mentioned successive groups.

22. In a traffic testing device for testing traffic conditions in grouped telephone lines, means for testing said groups of lines successively, and means effective immediately prior to the testing of the lines of any group of lines for determining the number of the group about to be tested.

23. In a system for testing the individual conductors in a plurality of groups of conductors, a group of test conductors common to a plurality of groups of conductors to be tested, means for connecting said test conductors to any group of conductors to be tested, a test switch, means for advancing said switch step by step from a given posi-

tion preliminary to testing the connected group of conductors through the medium of said common test conductors, and means controlled by said switch when operated in its preliminary movement for testing to determine the instant group of lines connected with said common test conductors.

24. In a system for testing the individual conductors in a plurality of groups of conductors, a group of test conductors common to a plurality of groups of conductors to be tested, means for connecting said test conductors to any group of conductors to be tested, a test switch, means for advancing said switch step by step from a given position preliminary to testing the connected group of conductors through the medium of said common test conductors, means controlled by said switch when operated in its preliminary movement for testing to determine the instant group of lines connected with said common test conductors, means for continuing the advance of said testing switch after said group testing operation has been completed until the first of said test conductors is encountered, and for then ad-

vancing said test switch over said test conductors to test the individual lines in the connected group of lines.

25. In combination with an apparatus for successively testing the condition of each of a number of grouped conductors, means for associating successive groups of conductors with said apparatus, and means for successively testing for the numbers of the groups connected with and the condition of the individual conductors in the group.

26. In combination with a plurality of groups of conductors, an apparatus for testing the condition of the individual conductors in each group, said apparatus including means for testing individual conductors, a device for successively associating the conductors of different groups with said means, group testing means for determining which of the groups of conductors is associated with the conductor testing means, and means for operating said first named means and said second named means alternately.

In witness whereof, I hereunto subscribe my name this 20th day of June, A. D., 1924.

JOHN E. OSTLINE.