

Feb. 17, 1942.

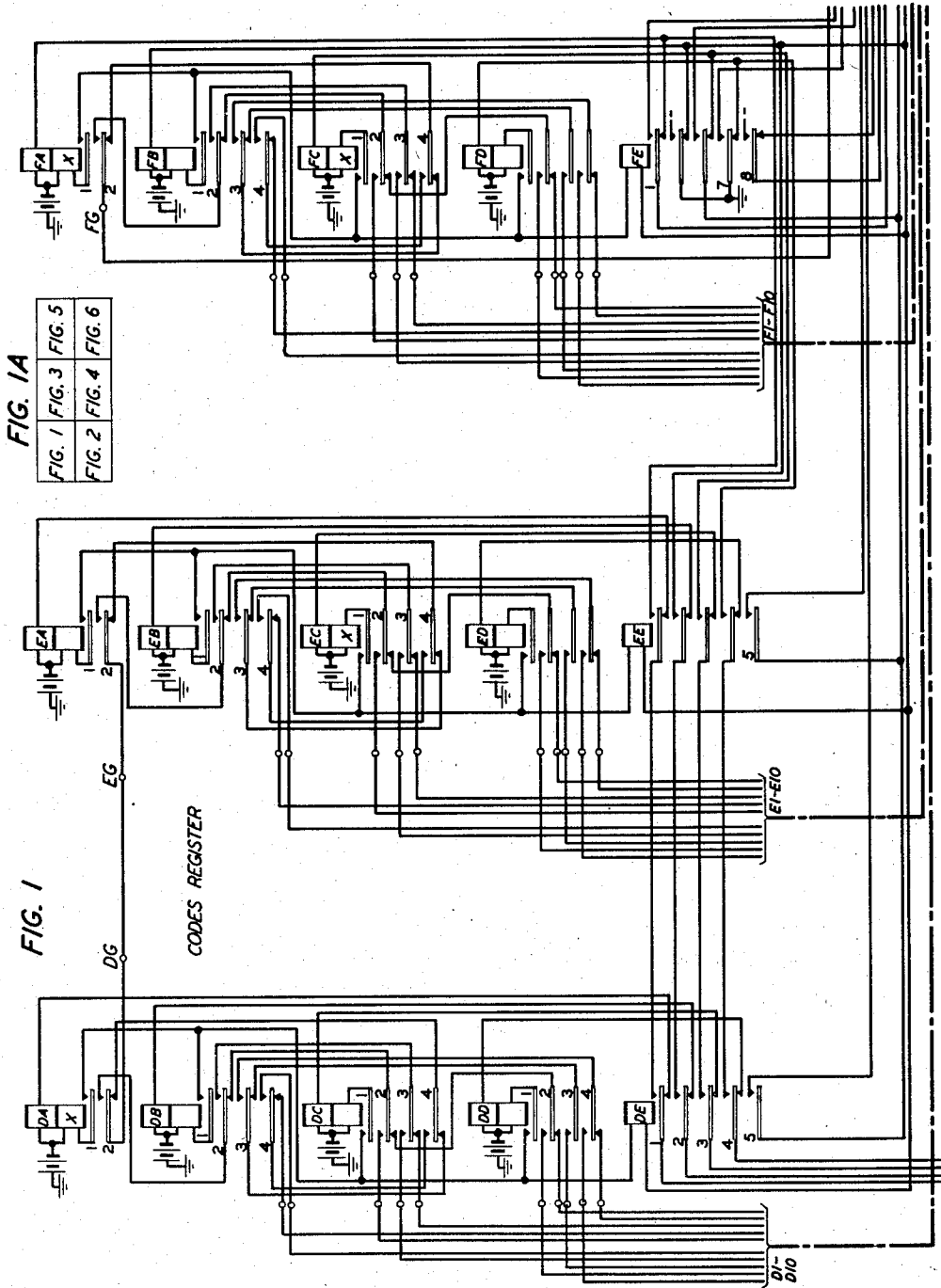
E. P. G. WRIGHT

2,273,165

TARIFF DETERMINING EQUIPMENT FOR TELEPHONE SYSTEMS

Filed Feb. 25, 1939

7 Sheets-Sheet 1



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Feb. 17, 1942.

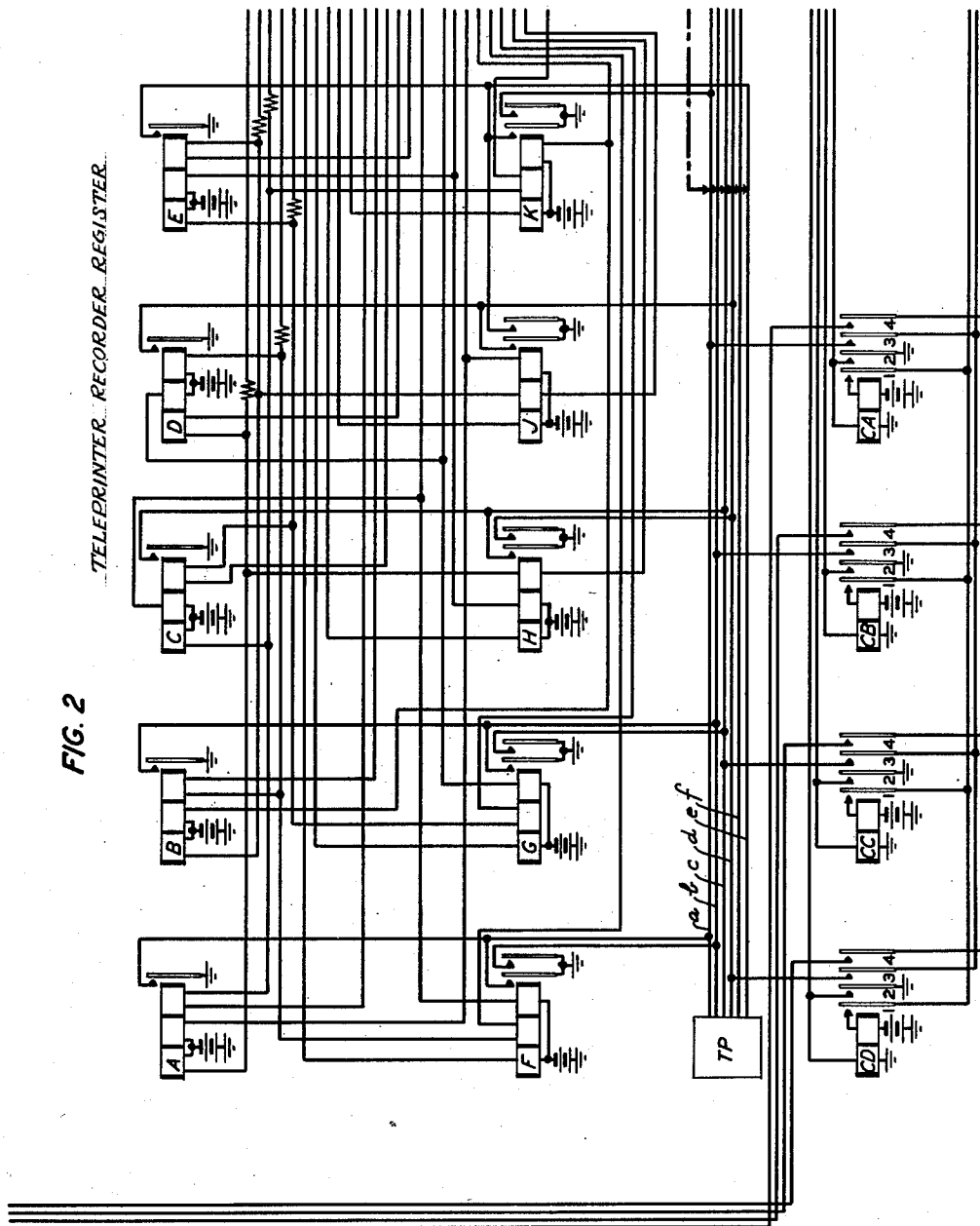
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TARIFF DETERMINING EQUIPMENT FOR TELEPHONE SYSTEMS

Filed Feb. 25, 1939

7 Sheets-Sheet 2



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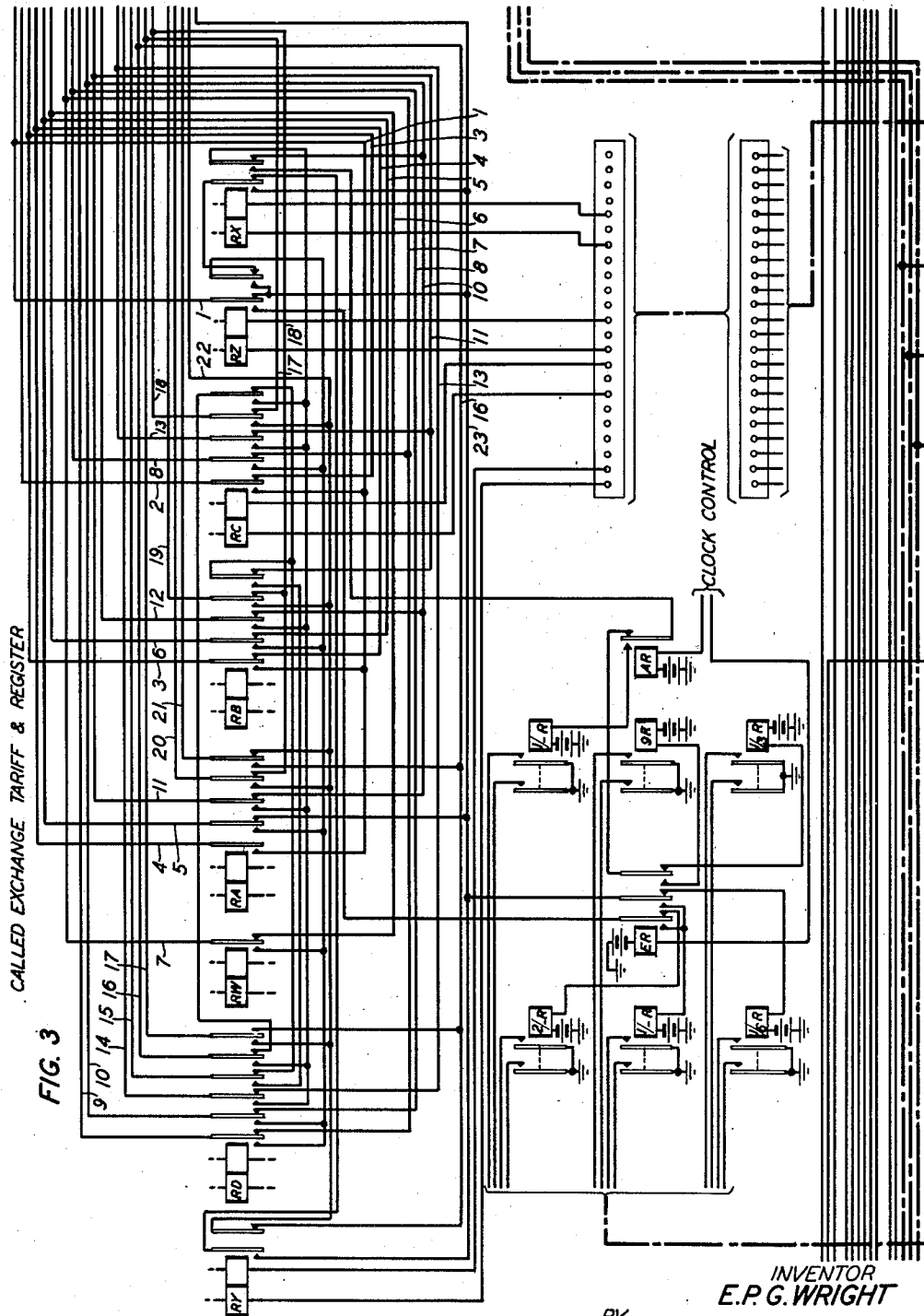
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TARIFF DETERMINING EQUIPMENT FOR TELEPHONE SYSTEMS

Filed Feb. 25, 1939

7 Sheets-Sheet 3



CALLED EXCHANGE TARIFF & REGISTER

FIG. 3

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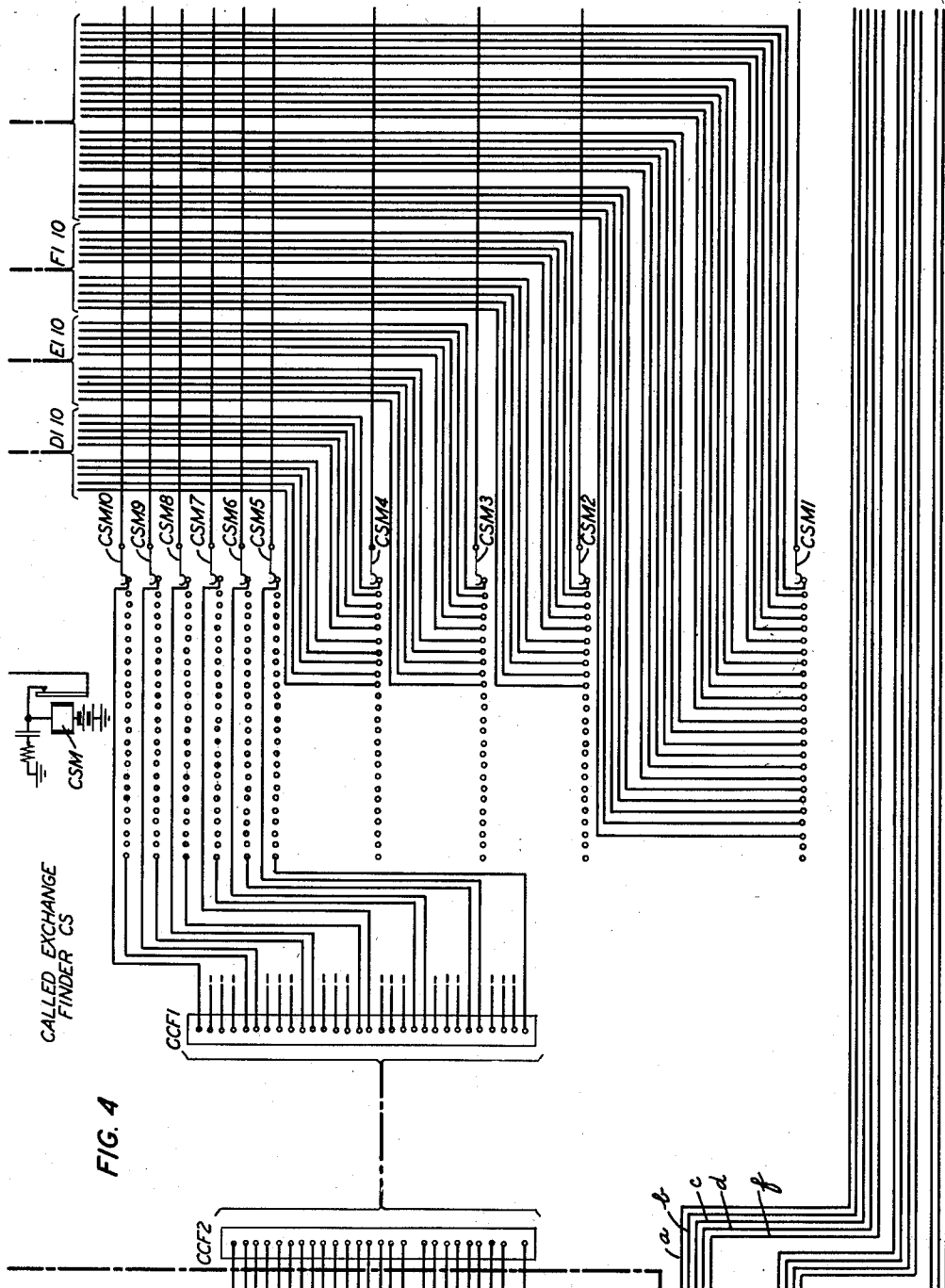
E. P. G. WRIGHT

2,273,165

TARIFF DETERMINING EQUIPMENT FOR TELEPHONE SYSTEMS

Filed Feb. 25, 1939

7 Sheets-Sheet 4

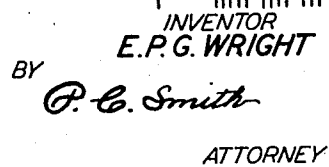


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7 Sheets-Sheet 6



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7 Sheets-Sheet 7

		ASH	BARHAM	BIRCHINGTON	BOUGHTON	BRIDGE	BROADSTAIRS	CANTERBURY	CHARTHAM	CHESTFIELD	GILHAM	CHISLET	DEAL	DOVER	EASTRY	ELHAM	HERNE BAY	KEARNEY	KINGSDOWN	LITTLEBOURNE	MANSTON	MARGATE	MINSTER	NONINGTON	PETHAM	PRESTON	RAMSGATE	ST. MARGARETS BAY	ST. NICHOLAS AT WADE	SANDWICH	SELLING	SHEPHERDS WELL	STELLING MINNIS	STURRY	WESTGATE	WHITSTABLE	WINGHAM	
ABBEY etc.	X																																					
ACORN	X																																					
ADDISCOMBE					1/3		1/3	1/3	1/3	1/3															1/3						1/3						1/3	
ALBERT DOCK					1/3	1/3	1/3	1/3	1/3	1/3							1/3			1/3				1/3						1/3		1/3	1/3			1/3		
ARNOLD																			2/						1/3				2/									
BARNET	X																																					
BECKENHAM					1/3	1/3	1/3	1/3	1/3	1/3							1/3								1/3						1/3	1/3	1/3			1/3		
BOWES PARK					1/3																											1/3				1/3		
BUCKHURST					1/3		1/3	1/3	1/3	1/3							1/3							1/3				2/	2/		1/3		1/3			1/3		
BYRON						2/								2/	2/													2/	2/									
CHISWICK	X																																					
COLINDALE	X																								1/3						1/3					1/3		
CROYDON					1/3		1/3	1/3	1/3	1/3															1/3						1/3					1/3		
EALING	X																											2/										
EDGWARE														2/														2/										
ELTHAM			1/3	1/3	1/3		1/3	1/3	1/3	1/3	1/3					1/3				1/3					1/3						1/3	1/3	1/3	1/3	1/3			
ENFIELD																																						
ENTERPRISE																																						
FINCHLEY	X																								1/3						1/3							
FOREST HILL					1/3		1/3	1/3	1/3	1/3															1/3						1/3	1/3	1/3			1/3		
GIPSY HILL					1/3		1/3	1/3	1/3	1/3															1/3						1/3				1/3			
GRANGEWOOD					1/3	1/3	1/3	1/3	1/3	1/3							1/3			1/3				1/3						1/3	1/3	1/3			1/3			
GREENWICH					1/3	1/3	1/3	1/3	1/3	1/3							1/3			2/				1/3				2/	2/		1/3	1/3	1/3			1/3		
HARROW						2/								2/	2/					2/								2/	2/									
HENDON	X																1/3								1/3													
HILLSIDE	X																																					
HITHER GRN.					1/3	1/3	1/3	1/3	1/3	1/3							1/3								1/3						1/3	1/3	1/3			1/3		
HOUNSLOW						2/								2/						2/								2/	2/									
HOWARD					1/3				1/3	1/3																												
ILFORD			1/6	1/6	1/3	1/3	1/3	1/3	1/3	1/3	1/3					1/6			1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6	1/6		
KINGSTON	X																																					
LARKWOOD					1/3			1/3	1/3	1/3	1/3						1/3									1/3						1/3	1/3	1/3			1/3	
LEE GREEN					1/3	1/3		1/3	1/3	1/3	1/3						1/3								1/3						1/3	1/3	1/3			1/3		
LEYTONSTONE					1/3			1/3	1/3	1/3	1/3														1/3						1/3	1/3	1/3			1/3		
LIBERTY																																						
LIVINGSTONE					1/3		1/3	1/3	1/3	1/3	1/3														1/3						1/3	1/3	1/3			1/3		
MALDEN	X																																					
MARYLAND					1/3		1/3	1/3	1/3	1/3	1/3						1/3								1/3						1/3	1/3	1/3			1/3		
MILL HILL	X																																					
MITCHAM					1/3			1/3	1/3	1/3	1/3																											
PALMERS GN.					1/3																																	
PERIVALE	X																																					
POLLARDS					1/3			1/3	1/3	1/3	1/3																											
POPESGRVE	X																																					
PROSPECT	X																																					
RAVENSBOROUGH			1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3						1/3	1/3	1/3	1/3					1/3						1/3	1/3	1/3			1/3		
RICHMOND	X																																					
RIPPLEWAY					1/3	1/3	1/3	1/3	1/3	1/3	1/3						1/3			1/3					1/3						1/3	1/3	1/3			1/3		
SILVERTHORNE					1/3		1/3	1/3	1/3	1/3	1/3						1/3																					
SOUTHALL						2/														2/									2/	2/								
STREATHAM					1/3		1/3	1/3	1/3	1/3	1/3															1/3					1/3	1/3	1/3			1/3		
SYDENHAM					1/3		1/3	1/3	1/3	1/3	1/3						1/3								1/3						1/3	1/3	1/3			1/3		
THORNTON H.					1/3		1/3	1/3	1/3	1/3	1/3						1/3								1/3						1/3	1/3	1/3			1/3		
TIDEWAY					1/3		1/3	1/3	1/3	1/3	1/3						1/3								1/3						1/3	1/3	1/3			1/3		
TOTTENHAM					1/3		1/3	1/3	1/3	1/3	1/3						1/3								1/3						1/3	1/3	1/3			1/3		
VALENTINE					1/3	1/3	1/3	1/3	1/3	1/3	1/3						1/3			1/3				1/3						1/3	1/3	1/3			1/3			
WALTHAMSTOW					1/3		1/3	1/3	1/3	1/3	1/3						1/3								1/3						1/3	1/3	1/3			1/3		
WANSTEAD					1/3		1/3	1/3	1/3	1/3	1/3														1/3						1/3	1/3	1/3			1/3		
WEXLOW						2/								2/	2/					2/								2/	2/									
WEMBLEY	X																																					
WIMBLEDON																																						
WOOLWICH			1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3					1/3	1/3			1/3					1/3						1/3	1/3	1/3			1/3		
WORDSWORTH														2/						2/									2/									

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UNITED STATES PATENT OFFICE

2,273,165

TARIFF DETERMINING EQUIPMENT FOR TELEPHONE SYSTEMS

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Application February 25, 1939, Serial No. 258,394 In Great Britain April 6, 1938

8 Claims. (Cl. 179-7.1)

This invention relates to telecommunication exchange systems, and particularly to tariff calculating equipment for use in conjunction with automatic ticketing facilities associated with the lines of said systems.

In such systems, automatic calculation of tariffs for connections is usually limited to calls within local networks and the equipment is situated at the originating exchange. In considering the application of automatic tariff calculation to more remote areas, complex problems may arise if the calculating equipment is to be associated with the toll lines extending to such areas.

In large multiexchange areas, such as London with a diameter of 20 or 25 miles, it is found that the tariff to a particular toll exchange outside of said area is different from different originating exchanges inside the multiexchange area itself, providing the size of the area is not too small in relation to the distance between the toll exchanges. Moreover, when it is the practice to calculate the tariff according to the actual distance between the exchanges, it is impossible to make a general grouping of the originating exchanges and apply such practice to calls for all exchanges in the area served by said distant toll exchange.

The object of the invention is to provide calculating equipment capable of handling such problems.

The main feature of the invention comprises tariff determining equipment for telecommunication exchange systems which includes equipment adapted to be set to a position or condition characteristic of the identity of a calling exchange, equipment adapted to be set to a position or condition characteristic of the identity of a called exchange, and tariff registering equipment adapted to be set to any one of a number of different conditions or positions characteristic of different tariffs under control of the setting of the calling exchange and called exchange equipments.

It is a further object of the invention to reduce the number of different combinations of calling and called locations with which the calculating equipment has to deal.

It is possible by means of the invention to modify the tariff according to the class of calling subscriber.

The invention will be clearly understood from the following description of one embodiment thereof shown in the accompanying drawings in which:

Fig. 1 shows the codes register;

Fig. 2 shows the teleprinter recorder register; Fig. 3 shows called exchange tariff register; Fig. 4 shows the called exchange finder CS; Fig. 5 shows the calling exchange tariff finder CV and the dial register finder CH; Fig. 6 shows the sequence progress circuit SS; Fig. 1A shows the manner in which the above figures are to be arranged with respect to each other to completely disclose the invention; and Fig. 7 is a chart showing the toll tariffs for calls between different exchanges of the London and Canterbury toll areas based on map distances. In Fig. 7 all squares not filled in represent a 1s. 6d. tariff. The Abbey exchange represents all exchanges in the London 5-mile circle as these exchanges all have the same tariffs for every exchange in the Canterbury area. Calls from London exchanges marked "X" have a 1s. 6d. tariff to all exchanges in the Canterbury area. Obviously the "5-mile area" exchanges can be treated as a group, and by an inspection of the tariffs from the other London exchanges it is found that in this particular instance the London exchanges can be split into twenty-three groups, each having a single tariff, as follows:

No.	Exchange
1.....	Byron, Harrow, Waxlow.
2.....	Hounslow, Southall.
3.....	Edgware, Wordsworth.
4.....	Arnold.
5.....	Enfield, Enterprise, Liberty, Wimbledon.
6.....	Abbey and all 5-mile circle.
7.....	Bowes Park, Palmers Green.
8.....	Mitcham.
9.....	Howard.
10.....	Pollards, Streatham, Tottenham.
11.....	Addiscombe, Croydon, Gipsy Hill, Thornton Heath.
12.....	Larkwood, Silverthorn, Walthamstow.
13.....	Livingstone.
14.....	Forest Hill.
15.....	Buckhurst, Maryland, Wanstead.
16.....	Sydenham, Tldeway.
17.....	Beckenham, Greenwich, Hithergreen, Lea Green.
18.....	Albert Dock, Grangewood, Rippleway.
19.....	Ilford, Valentine.
20.....	Ravensbourne.
21.....	Eltham.
22.....	Woolwich.
23.....	Acorn, Barnet, Chiswick, Colindale, Ealing, Finchley, Hendon, Hillside, Kingston, Malden, Mill Hill, Perivale, Popesgrove, Prospect, Richmond, Wembley.

On the other hand, there are thirteen exchanges in the Canterbury area having a flat toll tariff of 1s. 6d. from every exchange in London—both Kingsdown and St. Margarets Bay have identical tariff rates from every exchange in London, while both Broadstairs and Ramsgate likewise have identical tariff rates. The Canterbury area exchanges can, therefore, be considered as 36-12-1-1 possibilities=22. For twen-

ty-one of these possibilities different combinations of register relays RA, RB, RC, RD, RX, RY, RZ in Fig. 3 are operated, as shortly to be described, while for the twenty-second, namely, the thirteen flat-rate exchanges, no relay is operated. The relay combinations corresponding to the exchanges are as follows:

Destination	Relays operated
Kingsdown and St. Margarets Bay	RZ, Ra
Deal	RZ, RB
Broadstairs, Ramsgate	RZ, RC
Dover	RZ
Selling	RA
Boughton	RB
Chartham	RC
Chestfield	RD
Chilham	RC, RD
Whitstable	RX
Patham	RX, RA
Herne Bay	RX, RB
Canterbury	RX, RA, RB
Stelling Minnis	RX, RC
Sturry	RX, RD
Bridge	RY, RD
Littlebourne	RY, RC
Chislet	RY, RB
Elham	RY, RA
Barham	RY, RZ
Wingham	RY

The tariff calculating equipment will now be described with reference to Figs. 1 to 6, inclusive.

The switch CS of Fig. 4 is set by means described hereafter to indicate the exchange called. The switch CH of Fig. 5 is used for association between the calculating circuit and a register circuit, which is associated with the particular toll line. The switch SS of Fig. 6 acts as a sequence switch. The register circuit comprises condenser register groups of the kind described in the copending application of M. S. Snell and E. P. G. Wright Serial No. 185,858, filed January 20, 1938, for three code and four numerical digits of the called party's number, and for three code and four numerical digits of the calling party's number received from calling party identification equipment. It is intended that the record of the call shall be printed by a teleprinter TP connected to the circuit, Fig. 2, via five impulse leads *a* . . . *e* and a signal lead *f*, and that the teleprinter and calculator will be associated with the register circuit only for a short period after the completion of the call.

The calculator is seized from a register circuit at the end of a call by ground via lead STL, Fig. 6, the home position, and wiper *ssm4*, No. 1 back contact of relay TT, winding of relay ST. ST closes a circuit for the magnet CHM of switch CH over the No. 4 back contact of relay TT, the No. 2 contact of relay ST, and when the calling register circuit is reached, as is evidenced by the presence of battery on its hunt terminal in the bank accessible to brush *chm1*, relay TT operates via the No. 4 contact of relay ST, wiper *chm1*, opening the stepping circuit of the switch CH.

Ground on the *f* lead from the teleprinter TP is connected through the No. 1 contact of relay CK, the No. 5 contact of relay TT, wiper *ssm1*, position 1, to operate relay CR over its right winding. Contacts 3 to 6 of relay CR connect the teleprinter wires *a*, *b*, *c*, *d* to the wipers *ssm8*, *ssm1*, *ssm3*, *ssm2*, respectively. In position 1 all these wires are grounded, thereby causing a figure shift combination to be sent to the teleprinter, which removes the ground from the *f* wire, releasing relay CR. Contact 1 of relay CR, however, has previously closed a circuit for the magnet SSM of switch SS over the No. 1 contact of relay CR to ground at the No. 4 contact

of relay TV or No. 5 contact of relay CJ and, when CR releases, SS advances to position 2. When ground is reconnected to the *f* wire, relay CR again operates over the previously described circuit carried through terminal 2 accessible to wiper *ssm1*, and the wires *a*, *b*, *c*, *d* are connected, respectively, to common wires DT1, DT2, DT3, DT4. These common wires DT1 to DT4 inclusive will be grounded in combination from a clock-controlled mechanism (not shown) according to the date of the month and, in consequence, the teleprinter TP will type a tens figure that will designate the tens digit of the month. Ground will then be removed from the wire *f*, advancing switch SS to position 3 over a circuit previously described.

Meanwhile, the relays CA, CB, CC and CD have been connected through wipers *chm2* . . . *chm5*, respectively, to a combination of condensers in the call register circuit, and a combination of these relays corresponding to the first code digit of the called number will be operated. The relays lock to ground at the No. 1 back contact of relay CG. Ground through contact 1 of relay CJ (Fig. 6) and the No. 4 contact of any operated relay of the group CA, CB, CC and CD causes the operation of a combination of the relays DA, DB, DC, DD corresponding to the operated CA, CB, CC and CD relays, the circuit path for relay DA, for example, extending from ground over the No. 1 contact of relay CJ, the No. 4 contact of relay CA, the No. 1 contact of relay DE through the winding of relay DA. Relays DA . . . DD lock in series with relay DE through their No. 1 contacts to ground at the No. 4 contact of relay CG. When the switch SS reaches position 3, ground on the wire *f* passes through the No. 8 contacts of relay FE, No. 5 contacts of relay TT, wiper *ssm1*, No. 5 contacts of relay DE to operate relay CG, which through its No. 2 contacts operates relay CR over its left winding. In this position wires *a* to *d* are connected to the common wires DT5 to DT8, a combination of which is grounded to indicate the units digit of the date of the month.

Switch SS steps as before. However, the operation of the relay CG has caused the release of the relays CA to CD and applied ground through its No. 3 contact to the wiper *chm5* to cause the advance of the register circuit, so that when relay CG releases (when ground is removed from the *f* wire in the teleprinter TP) a new combination of the relays CA to CD is energized from the call register circuit and due to the locked condition of transfer relay DE, Fig. 1, the corresponding relays EA to ED are energized, these relays locking in series with relay EE.

In position 4 of switch SS wire *d* is grounded at *ssm2* to cause the teleprinter to print a dash. Switch SS now advances to position 5, where ground on the *f* wire from the teleprinter TP passes through the No. 5 contact of relay EE to operate the relay CG and subsequently relay CR. The wires *a* to *d* are now connected to further common wires DT to receive the tens digit of the month of the year, which is typed, and the switch SS advances to position 6. As before, relay CG releases the operated relays CA to CD. The second digit of the month is transmitted and printed, and the third digit from the call register causes the operation of a combination of the relays FA to FD, which lock in series with relay FE. SS steps to position 7 over the No. 7 contact of relay CK, No. 1 contact of relay TS and No. 1 contact of relay FE and a path

is closed for the driving circuit for the magnet CSM of the switch CS.

Each position of switch CS is individual to an exchange code of three figures and, therefore, CS is to be set in accordance with the values of three digits recorded in the calculator relay groups DA . . . EA . . . FA. The bank contacts associated with the wiper *csm4*, Fig. 4, are each connected to one of ten terminals D1 to D10. The terminal DG is connected to the terminal EG and the ten terminals E1 to E10 are connected to the bank contacts associated with the wiper *csm3* which is connected to *csm2* via the No. 2 contact of relay CK. The contacts associated with the wiper *csm2* are connected to one of the ten terminals F1 to F10, Fig. 1, and contact FG is connected over the No. 8 back contact of relay CK to the winding of relay TS, Fig. 6. If, for example, it is desired to set the switch CS to an exchange position in response to the digits 3, 4, 5, registered by the operation of relays DA, DB, EC, FA and FC, the switch CS will advance until it reaches position 5 over a circuit from battery through CSM, No. 1 contact of relay FE, No. 1 contact of relay TS, No. 7 contact of relay CK, at which position relay TS operates over No. 8 back contact of relay CK, No. 2 front contact of relay FA, No. 2 back contact of relay FB, No. 2 front contact of relay FC, terminal F5, wiper *csm2*, No. 2 contact of relay CK, wiper *csm3*, terminal E4, No. 4 back contact of relay EB, No. 4 front contact of relay EC, No. 2 back contact of relay EA, No. 2 front contact of relay DA, No. 2 front contact of relay DB, No. 3 back contact of relay DC, terminal D3, wiper *csm4* to ground at the No. 4 contact of relay CK. In a similar way, any combination of the digits can cause the setting of the switch CS by closing a circuit from ground connected through the No. 4 contact of relay CK for the relay TS, which locks over its No. 4 contact to ground at the No. 4 front contact of relay TT.

It might be required that the switch CS should be positioned entirely by the first digit received, and this can be achieved by connecting relay TS for the appropriate contacts of relays DA . . . DD similar to relays FA . . . FD, the combination so provided grounding contacts associated with the wiper *csm2* independently of the wipers *csm3*, *csm4*.

The operation of the relay TS permits ground on the *f* wire to be connected over the No. 1 contact of relay CK, No. 5 contact of relay TT, wiper *ssm1* in position 1 of switch SS and No. 2 contacts of relay TS to cause the operation of the relay CR. In position 1 the wires *a*, *c* and *d* are grounded over wipers *ssm8*, *ssm3* and *ssm2*, respectively, to cause a letter shift to be effected in the teleprinter, and the removal of ground from lead *f* releases CR so that switch SS steps to position 8.

It is assumed that the exchange names have six letters. Bank contacts in levels *csm5* . . . *csm10* are connected to a cross-connecting frame CCF1 and from there they are cross-connected to the terminals of cross-connecting frame CCF2 from which, in turn, they are connected to relays A . . . K in Fig. 2 so as to operate these relays in different combinations each indicative of an exchange when ground is connected to each of them via No. 2 contact of relay CR, wiper *ssm9* and one of the wipers *csm5* . . . *csm10* as *ssm9* progresses through positions 8 to 13, inclusive. If desired, one or more

of the six contacts in a position of switch CS could be wired to send a space signal instead of a letter signal by cross-connecting with the appropriate relay combination of relays A . . . K which designates the space signal.

With SS in position 8, a selection of relays A . . . K is operated via wipers *ssm9* and *csm5*. A corresponding letter code is connected by contacts of said relays via wires *a* . . . *e* to teleprinter TP. The letter is printed and relay CR, which was reoperated via the No. 2 contact of relay TS is position 8 of wiper *ssm1* to ground on lead *f* after the letter shift, is released to step switch SS to position 9.

In a similar way, in positions 9 . . . 13 of switch SS, five further letters are printed under control of wipers *csm6* . . . *csm10*. Switch SS then steps to position 14, in which position relay CJ operates via wiper *ssm5* to open the operating circuits for the storage relays DA . . . FE, and relay CG operates via wiper *ssm1* to ground on lead *f* to send a signal to the call register circuit via the No. 3 contact of relay CG, wiper *chm6* and to open the locking circuit of said storage relays DA . . . FE, releasing those relays which have been operated. A figure shift signal is also sent to the teleprinter in this position by grounding leads *a*, *b*, *c*, *d* via wipers *ssm2*, *ssm3*, *ssm7* and *ssm8*, respectively. When the figure shift takes place, ground is removed from lead *f* so that relays CG and CR, which were also operated, are released and switch SS steps to position 15, relay CJ releasing momentarily.

In position 15, relay CG is operated from ground on lead *f* as before, followed by relay CR, while relay CJ operates over wiper *ssm5*. The group of storage condensers storing the first numerical digit of the called party's number is now connected to wipers *chm2* . . . *chm5* and a selection of relays CA . . . CD is operated and locked via their front contacts, No. 1 front contact of relay CG and No. 4 contact of relay CJ to ground on lead *f*. Contacts such as *ca2* close to ensure full discharge of the condensers in the register circuit.

The reconnection of ground to *chm6* causes circuit changes in the register circuit for causing the connection of the next condenser group. Meanwhile contacts of relays CA . . . CD connect a figure code to leads *a* . . . *e* (ground to the various leads being supplied over the No. 2 contacts of relay CJ) and the figure is printed. Relays CG and CR are released and switch SS steps to position 16, relay CJ being momentarily released to release the operated relays CA . . . CD. The remaining three digits are transferred and printed in positions 16, 17 and 18, switch SS then stepping to position 19.

A sequence shift signal is sent to the register circuit in position 18 over the No. 3 contacts of relay CG and wiper *chm6* and the first calling party's code digit is now received by relays CA . . . CD. As neither relay CJ nor relay CG is now operated, corresponding relays DA . . . DD energize in response to relays CA . . . CD and lock in series with relay DE. Relay CG operates via the No. 5 contact of relay DE and wiper *ssm1* to ground on lead *f* followed by relay CR. A space shift code is sent to teleprinter TP in position 19. When the printer moves the tape, ground is temporarily removed from lead *f* releasing relays CG and CR, so that switch SS steps to position 20.

In position 19 of switch SS, ground via the

No. 3 contact of relay CG and wiper *cmh6* caused the condenser storage group storing the second code digit in the register circuit to be connected to wipers *chm2* . . . 5. In position 20, the second code digit is transferred by relays CA . . . CD to relays EA . . . ED. At the same time a letter shift signal is sent to the teleprinter TP by grounding leads *a* and *d*. The relays EA . . . ED which are operated, lock in series with relay EE whose No. 5 contacts close an energizing circuit for relays CG and CR. Relay CK is energized via wiper *ssm9* and No. 2 contacts of relay CR. A signal is sent by the No. 3 contacts of relay CG to the register, and switch SS steps to position 21 when the teleprinter releases relays CG and CR in the described manner.

In position 21 the third code digit is recorded on a selection of relays FA . . . FD which lock in series with relay FE.

Relay CK opens the test circuit of switch CS at its No. 2 and No. 4 contacts and the stepping circuit of said switch at its No. 7 contacts. Over its No. 6 contacts and the No. 7 contacts of relay FE, relay CK closes the stepping circuit for motor magnet CVM of switch CV, and over its No. 3 and No. 5 contacts establishes the test circuits as explained hereinafter.

The code letters and numerical digits of the calling party's number are now printed in positions 22-32 in exactly the same way as those of the called party's number were printed in positions 7 . . . 18 of SS, after which SS steps to position 33.

Switch CV is now set to a calling exchange position via contacts of banks *cvm1* . . . 3 in exactly the same way as switch CS was positioned, relay TV energizing over contacts of relays DA . . . FD, shown in Fig. 1, when the calling exchange position is found.

Tariff relays 9R, 1/-R, 1/3R, 1/6R, 2/-R, are provided, and are adapted to be selectively operated according to the setting of called exchange and calling exchange switches CS, CV.

The toll trunk with which the circuits are associated is for London to Canterbury traffic and, therefore, the Canterbury area exchange is the called exchange identified by the position of CS while the London exchange is the calling exchange identified by the position of CV. Via contacts of bank of switch CS, relays RA, RB, RC, RD, RX, RY, RQ are operated in different combinations required according to the group of exchanges to which the called exchange belongs.

Ground via the No. 5 contact of relay TV, the No. 1 back contact of relay PB and wiper *cvm8* passes via contacts of the relays RA . . . RZ to operate a tariff relay, R in Fig. 3. The contact springs of the relays RA to RZ are arranged to form control circuits over their front and back contacts so as to keep the number of relay contact springs small and yet obviate the possibility of the wrong tariff relay or more than one tariff relay being operated. The outlets of level *cvm8* are multiplied to wires 1 . . . 23, Fig. 4, according to the groupings of the London exchanges previously given. Therefore the tariff relay R operated is determined by the originating and terminating exchanges of the connection.

Contacts of relay PB which are included in the operating circuit for the tariff relays are shifted by any well-known means if the call is to a private branch exchange. In such circumstances it is assumed that the tariff to be charged may be different from that charged for single-line sub-

scribers and the tariff relay operating circuit is taken over wiper *cvm7* which has access to a different combination of the wires 1 . . . 23 for making effective a different group of contacts of the called tariff register.

The circuits to the tariff relays pass via the contacts of relays ER and AR, the evening and afternoon rate relays, respectively, which may be operated in any suitable manner under time control to alter the tariff for the various connections at different times of day.

Each of the rate relays is provided with a suitable number of contacts which extend to the *a* . . . *e* leads of the teleprinter TP. When a rate relay operates, the appropriate leads are grounded in the required combination to print the tariff for the connection.

What is claimed is:

1. A tariff determining equipment for telecommunication systems comprising a register sequentially settable in accordance with the digits of a called office code and a calling office code, a first switch responsive to the first setting of said register to mark a terminal individual to the called office code, a second switch responsive to the second setting of said register to mark a terminal individual to the calling office code, and tariff registering means adapted to be set in response to the setting of said first and second switches.

2. A tariff determining equipment associated with a group of long distance telecommunication trunks connecting two different exchange areas each of which includes a large number of telecommunication exchanges divisible into subgroups having identical tariffs to or from every other exchange in the area and comprising a register sequentially settable in accordance with the digits of a called office code and a calling office code, a called exchange finder responsive to the first setting of said register to mark a series of terminals individual to the called office code, a calling exchange finder responsive to the second setting of said register to mark a series of terminals individual to the calling office code, tariff registering means adapted to be set in response to the setting of said called exchange finder and said calling exchange finder, and means responsive to the setting of said tariff registering equipment for determining the tariff according to the subgroups embracing the calling and called exchanges.

3. A tariff determining equipment for telecommunication systems comprising a register sequentially settable in accordance with the digits of a called office code and a calling office code, a group of relays selectively operable in any one of a number of different combinations in response to the first setting of said register to indicate the called exchange, a finder switch responsive to the second setting of said register to mark a terminal indicating the calling exchange, tariff registering equipment, and means for controlling the circuits of said tariff registering equipment through the bank contacts and a wiper of said switch and the front and back contacts of one or more relays in said group of relays.

4. A tariff-determining equipment as claimed in claim 1 comprising time controlled relays operable at different times of day to change the tariffs to be charged and adapted to control the setting of the tariff-registering equipment.

5. A ticket producing equipment for telecommunication exchange systems comprising a first means adapted to be set in response to a char-

acteristic of the identity of a calling exchange, a second means adapted to be set in response to a characteristic of the identity of a called exchange, tariff registering means adapted to be set in response to the setting of said first and second means to indicate a tariff for a connection between said calling exchange and said called exchange, and means responsive to the setting of said tariff-registering means for producing record printing signals characteristic of the setting of said tariff-registering means.

6. A ticket producing equipment for telecommunication exchange systems comprising a first means adapted to be set in response to a characteristic of the identity of a calling exchange, a second means adapted to be set in response to a characteristic of the identity of a called exchange, a third means adapted to be set in response to the setting of said first and said second means to indicate a tariff for a connection between said calling exchange and said called exchange, a fourth means adapted to be set in response to a characteristic of the day and hour, and means responsive to each of the separate settings for producing a group of record printing signals characteristic of each of the settings.

7. A ticket producing equipment associated with a group of long distance telecommunication trunks comprising in combination a recording mechanism for each trunk, a plurality of signal conductors, means for connecting the recording mechanism of a trunk with said plurality of signal conductors, a first means adapted

to be set in response to a characteristic of the identity of a calling exchange connected to one end of said trunk, a second means adapted to be set in response to a characteristic of the identity of a called exchange connected to the other end of said trunk, a third means adapted to be set in response to the setting of said first and said second means to indicate a tariff charge for a connection between said calling and called exchange over said trunk, a fourth means adapted to be set in response to a characteristic of the date and hour of said connection, and means responsive to the setting of each of said four separate means for establishing circuits over one or more of said plurality of signal conductors for actuating said recording mechanism to record a separate designation of the setting of each of said four means.

8. A tariff-recording equipment as claimed in claim 3 in which said relay combinations are less in number than the number of exchanges in one area and at least some of which are each operable for a plurality of exchanges having identical tariffs to or from every other exchange in said other area, in which individual exchange terminals of said calling exchange finder switch are multiplied in groups for identical tariffs between the exchanges in the subgroups of one area and every other exchange in the other area, and in which individual tariff relays are each operable via one or more circuits through said relay contacts and switch bank contacts.

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