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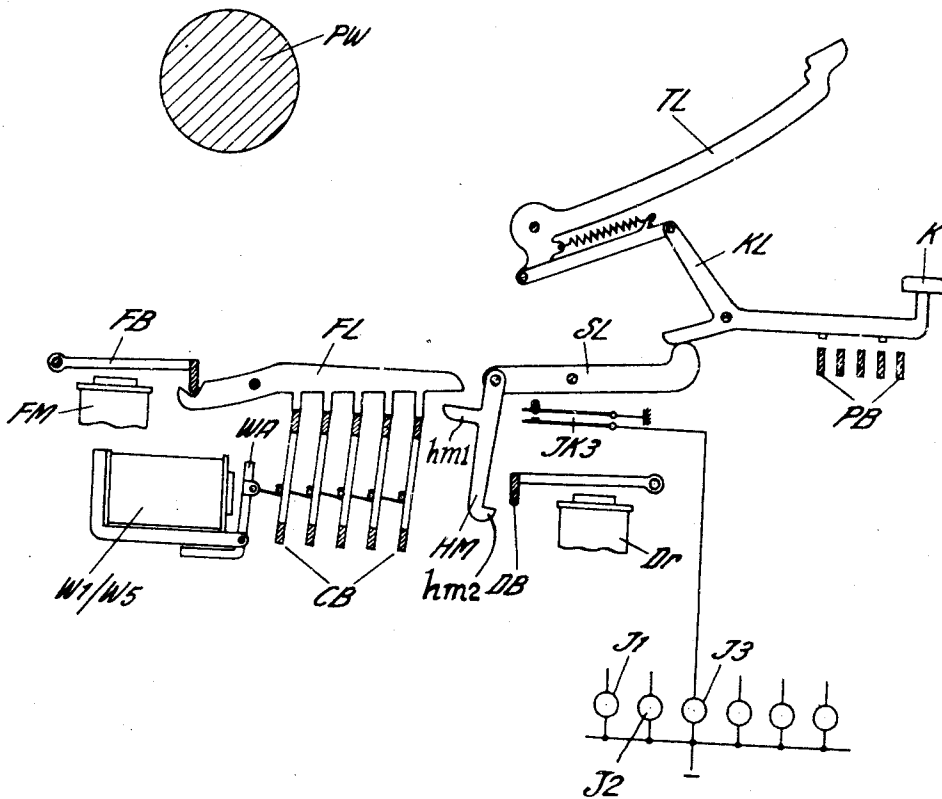
M. HEBEL
TELEPHONE CHARGING DEVICE

2,305,779

Filed April 19, 1937

3 Sheets-Sheet 1

Fig. 1.



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3 Sheets-Sheet 2

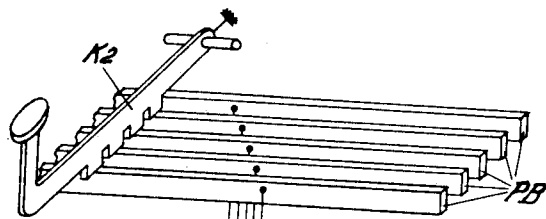
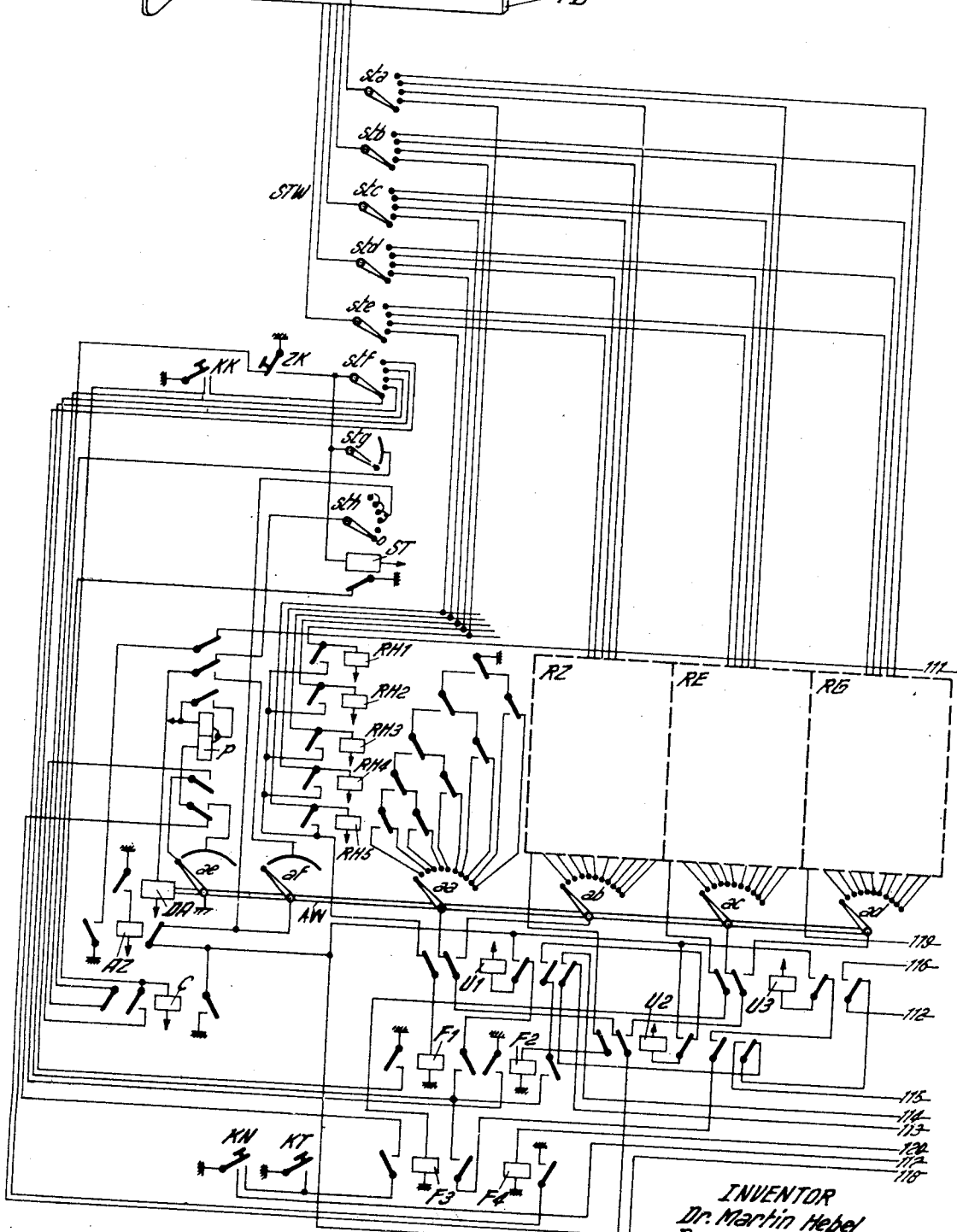
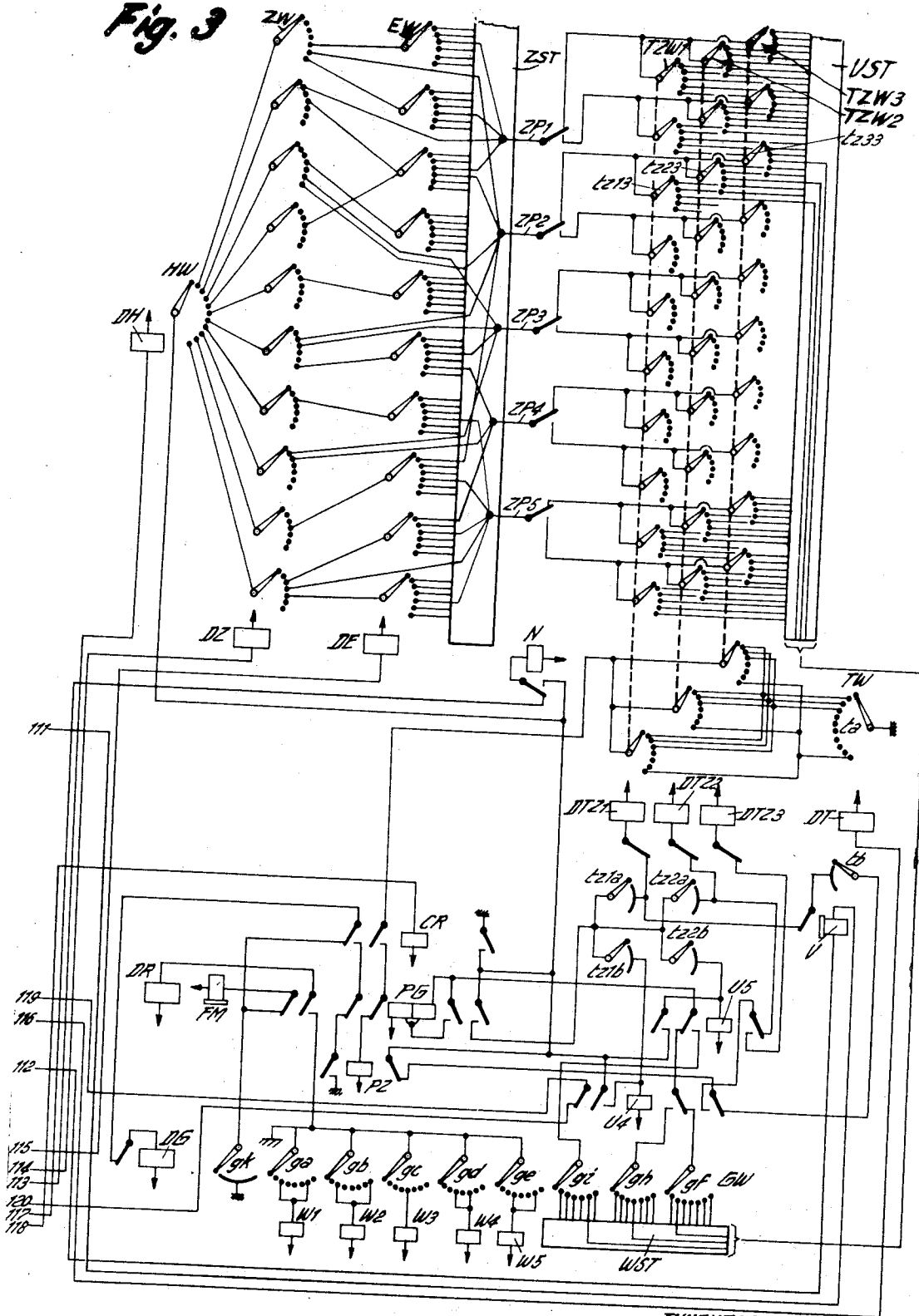


Fig. 2



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Fig. 3



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UNITED STATES PATENT OFFICE

2,305,779

TELEPHONE CHARGING DEVICE

Martin Hebel, Upper Bavaria, Germany; vested
in the Alien Property Custodian

Application April 19, 1937, Serial No. 137,670
in Germany April 18, 1936

9 Claims. (Cl. 235—58)

(Granted under the provisions of sec. 14, act of
March 2, 1927; 357 O. G. 5)

This invention relates to calculating devices for preparing accounts for telephone subscribers.

It is the principal object of the invention to provide a calculating device which will operate automatically and which requires only manual operation of type printing keys to set the device into operation and to cause it to automatically proceed, by electrically operated mechanism, to calculate the amount to be charged to a telephone subscriber having a call to another subscriber in accordance with the data set by the keys.

A further object of the invention is to provide an electrical device which automatically determines the zone value of a telephone connection from a factor characterising the called subscriber's exchange and to provide a further electrical device which automatically determines the charge to be made from the determined zone value and from a factor characterising the duration of the telephone connection.

The calculating device according to the invention enables an operator to write easily the accounts for telephone subscribers from the data characterising the called subscriber's exchange and the data characterising the duration of the connection. In manual operated telephone systems these data are written manually by the operator on a slip or card. In automatic telephone systems, recording devices are used which print or perforate a slip or card for each connection according to the calling subscriber's number, the called subscriber's number the characteristic "figure" of the called subscriber's exchange, the date, the time of day, and the duration of the connection.

The invention is illustrated by way of example in the accompanying drawings, in which

Figure 1 shows portions of a typewriter used for printing the characteristic data and for indicating the determined charge;

Figures 2 and 3 show a suitable circuit arrangement for the electrical devices used for the automatic calculation of the charges.

The typewriter shown diagrammatically in Figure 1 is described in the U. S. Patent No. 2,090,944, to Martin Hebel. It can have the usual four-row keyboard comprising keys such as the key K (Figure 1) and K2 (Figure 2) and a number of additional keys, viz., a key KK (Figure 2) which, on being depressed, prints a K and indicates that the characteristic charge figure of the terminal exchange is about to be recorded by the following actuation of the keys; a key KT

(Figure 2) indicating that the day tariff is in operation; and a key KN (Figure 2) indicating that the night tariff is in operation. (If there are more than two different tariffs for different times of the day, further appropriate special keys are provided corresponding to the keys KT and KN and each characterising a particular tariff.) Further a key ZK (Figure 2) is provided for releasing the different devices. Clearly, these keys could belong to the usual keyboard and serve both to actuate mechanically the associated type levers TL (Figure 1) by means of a detent KL and to initiate the appropriate switching measures by means of contacts. The keys can actuate the associated type levers either mechanically, as in the present example, or electrically.

A series of 5 permutation bars P. B. is arranged beneath the keyboard keys, i. e., not beneath the additional keys KK, KN, KT, and ZK mentioned above. On depression of a keyboard key, certain of these bars are selected in accordance with a 5-unit code and are connected to ground, thus closing circuits for the transmission of current impulses. During the normal operation of the typewriter for recording the call data, these circuits are ineffective. On the other hand, when the key KK has been actuated, they become effective during the recording of the exchange number which follows. This number may have 3, 4 or more digits. In the case which will be described in detail later on, it is assumed that it has 3 digits.

The fundamental requirements of the arrangement are as follows:

The current impulse combination selected on depression of a key of the keyboard is used for storing the characteristic figure in automatic selector devices HW, ZW, EW (Figure 3). The contacts in the contact banks of these selector devices HW, ZW, EW which serve to select the zone appropriate to the connection, are connected to the various zone points ZP1—ZP5, each of which is associated with a different zone. The zone point selected by the selector devices thus indicates the zone in which the called subscriber's exchange lies relatively to the calling subscriber's exchange. Further a time storing selector TW (Figure 3) is provided. Recording on the typewriter of the duration of the connection is to cause the time storing selector TW to be set.

For the setting of each of the selectors HW, ZW, EW and TW a set of relays RH, RZ, RE and RG (Figure 2) respectively are provided which are connected to the permutation bars PB

by means of a control switch STW. The relays of each set control the connection to ground of the contacts of contact banks of a selector switch AW. The contact banks are associated with wiper arms *aa*, *ab*, *ac* and *ad*, and the switch transmits impulses successively to one of the storing selectors HW, ZW, EW or TW as the switch seeks a grounded contact in the respective banks.

Associated with the time storing selector TW (Figure 3) are three auxiliary selector switches TZW1, TZW2 and TZW3. The auxiliary selectors have a number of switch-arms, a pair of which are associated with each zone point. A relay N is provided the contacts of which connect the zone points to one or the other of the switcharms of the auxiliary selectors TZW1—TZW3. When all of the elements have been set, the electrical connections made through the wipers of the auxiliary selectors is characteristic of the charge to be made. An indicating selector GW (Figure 3) is used to cause the indication of the charge. The selector GW selects a code combination made up of 5 current impulses corresponding to the digits (hundreds, tens, units and so on) of the charge. The five current impulses are distributed over five circuits to the five selecting magnets W1 to W5 (Figures 1 and 3) of the typewriter.

Each of the magnets W1—W5 controls by means of its armature WA (Figure 1) one of the pivoted permutation members CB. The relative position of the five permutation members CB is tested by a set of comb-like members FL only one of which is shown in Figure 1. These testing members are held clear of the permutation members CB during movement of the latter by the magnets W1—W5 because of pressure exerted on their tails by the armature FB of a magnet FM which is energised as long as the contact arm *gk* (Figure 3) of the indicating selector GW is out of its normal position. The magnet FM (Figure 1) is of the slow-to-release type and holds its armature attracted for a short time when the relay PG interrupts its energising circuit through its left outermost contact and closes the circuits of the magnets W1—W5. When the permutation members CB have been set, the magnet FM releases and thus the testing members FL are allowed to drop and one of them, depending upon setting of the permutation members, drops further than the rest with its teeth lying between the permutation members. The free end of that testing member FL is thus caused to bear on the projection *hm1* on a pivoted hook HM and thus brings the projection *hm2* of the hook beneath the free end of the pivoted armature DB of the printing magnet DR. The hook HM is pivotally mounted on one end of a lever SL, the other end of which engages beneath an extension of the key K. The key K is connected to a type lever TL by means of the detent KL. When the key K is depressed or when the hook HM associated with this key is drawn down by means of the armature DB, the type corresponding to the key K is caused to strike the platen roll PW. The printing magnet DR is slow to attract and cannot respond until the selecting magnets W1—W5 have been energised and the magnet FM has released its armature.

If the determined charge is to be indicated otherwise than by being printed, for example, visually, indicating instruments J1, J2, J3 . . .

may be provided. These indicating instruments are actuated by means of contacts JK, one of which, the contact JK3 connected to the indicator J3, is shown in Figure 1. It will be seen that when the lever SL is pivoted, the contact JK3 will be closed and a circuit closed for the indicator J3. The indicators J may be constructed in any known manner. They may, for example, be in the form of hinged flaps which, when dropped, reveal particular numbers, or in the form of lamps or in the form of relays which control lamps and so on.

All the selectors and the control switch STW used in the circuit arrangement may be built as known rotary selectors as described by U. S. Patent No. 988,390 to F. Schoenwolf. The relays are built as usual telephone relays described by U. S. Patent No. 822,968, to R. H. Manson.

The general operation is as follows:

On actuation of the key KK (Figure 2), energising circuits are closed for a relay C which closes a holding circuit by its left inner contact, and for the driving magnet ST of the control switch STW. The circuit of the magnet ST passes the switch arm *stf* of the control switch and its zero contact. The energisation of the magnet ST causes the switch arms *sta* to *sth* of the control switch to move out of the zero position into their first position. The five permutation bars PB which lie beneath the typewriter keys are thus connected to a set of relays RH1—RH5 which serve to store up the hundreds digit of the 3-digit number of the terminal exchange. If, for example, the key K2 having the signal combination + + + + - is depressed, the 1st, 2d, 3d, and 4th bars PB will be grounded and the relays RH1, RH2, RH3, and RH4 be energised. These relays close holding circuits including their left working contacts respectively, the outer left contact of a relay U1 and the winding of a relay F1. The relay F1 is first of all short circuited by the depressed key K2; it is only energised after release of the actuated key K2 and then its left working contact closes a circuit for the magnet ST which energises and causes the switch arms of the control switch STW, to step into their 2nd position for the reception of the next signal combination. In the 2nd position of the switch arms *sta* to *ste* a set of relays RZ1 to RZ5 is connected to the five permutation bars PB. This set of relays is arranged in the same manner as the set of relays RH1 to RH5 which are shown in the drawings. By depression of the key corresponding to the tens digit of the exchange number, this digit will be stored in the relays RZ1 to RZ5. On release of this key the relay F2 is energised and the switch arms of the control switch STW are moved into their 3rd position. Now the units digit can, by a similar procedure, be stored in the relays RE1 to RE5 similarly arranged as the relays RH1 to RH5 and relay F3 will be energised.

The next entry made by the typist is the subscriber's number. This is not material in the calculation of the charge, and, therefore, the recording of this number is not accompanied by a shift of the control switch STW. When, however, the key KN or the key KT is depressed to indicate which of the scales of charges is in force, a circuit for the magnet ST is closed passing over the left contact of relay F3 and the switch arms of the control switch STW are moved into their 4th position in which a set of relays RG1 to RG5 similarly arranged as the relays RH1 to RH5 is connected to the permutation bars PB for storing the number of units of time representing the

effective duration of the connection. These relays are held energised in a circuit which includes the relay F4.

The stored combinations now have to be transmitted to a zone determining apparatus. For this purpose, a rotary switch AW is provided having switcharms *aa* to *ae* each wiping over a bank of 10 contacts and a driving magnet DA for stepping these arms. The contacts of each set of relays RH, RZ, RE and RG are arranged pyramidally so that a particular contact in one of the banks wiped over by the arms *aa-ad* can be grounded when a key is depressed and a signal combination is stored. The contacts in these banks characterise the numerals 1-0. Thus, on depression of the key K2 with the control switch STW in its 1st position, the inner right contacts of the relays RH1 to RH4 will be closed and the second contact of the bank of the switch AW wiped by the switch arm *aa* will be grounded. The testing of this contact bank is effected as soon as the control switch takes up its 2nd position. In the 2nd to 5th positions of the control switch STW the switcharm *sth* closes an energising circuit for the driving magnet DA of the switch AW running over the right contacts of relay C, the right contact of a relay AZ, the switch arm *sth*, the upper middle contact of a relay P and the magnet DA. The magnet DA on energisation controls its left contact which closes a circuit for the impulse relay AZ and the right contact of the relay AZ interrupts the energising circuit of the magnet DA while the left contact of the relay AZ transmits an impulse to the driving magnet DH of the zone selector HW (Figure 3) in the circuit:

+ left contact of relay AZ, uppermost contact of relay P, line 111, relay V (Figure 3), line 112, outer right contact of relay U3, outer right contact of relay U2, outer right contact of relay U1, line 113, magnet DH (Figure 3)---

Thus, the switch arms of the selector switch AW and storing selector HW are actuated in steps. When the arm *aa* arrives on a grounded contact (the 2nd in the example under consideration), the relay P connected to the arm *aa* over its outer lower contact, the inner left contact of relay U2 and the inner left contact of relay U1 responds. By means of its lower outer make-before break contact relay P closes a holding circuit for its lower winding including the switcharm *ae* which is only opened when the arm *ae* of the switch AW is restored to its zero position. Also, by means of its middle upper contact relay P closes a new stepping circuit for the driving magnet DA passing over the switch arm *af*, the right contact of relay AZ and the right contact of relay C. The switch arms of the switch AW continue to rotate until the arms reach the normal position in which the arm *af* opens the stepping circuit. During the stepping into the normal position, the upper outer contact of relay P prevents the transmission of impulses to the driving magnet DH of the zone selector HW by means of the left contact of relay AZ. When the normal position of the switch AW is reached, the holding circuit of relay P is interrupted and the relay U1 is energised in a circuit passing through the arm *ae* in its zero position, the lower inner contact of relay P, the right contact of relay F1 and the right inner contact of relay U1. Relays U1 is held in a local circuit closed by its right inner contact. The left inner contact of the relay U1 connects the relay P to the arm *ab* and the right outer

contact of the relay U1 connects the driving magnet DZ (Figure 3) of the zone selector ZW to the driving line 112. Now, on release of the relay P, the switch AW is again stepped and the left contact of relay AZ (Figure 2) transmits impulses to the driving magnet DZ of the zone selector ZW. Over upper outer contact of relay P, line 111, relay V (Figure 3), line 112, right outer contact of relay U3, right outer contact of relay U2, right outer contact of relay U1, line 114 to winding of magnet DZ (Figure 3). When the arm *ab* reaches the contact of its bank which is grounded by the contacts of the set of relays RZ the relay P limits this emission of impulses, determines the re-setting of the switch arms *aa* to *af* and, in the zero position of the switch AW, energises the relay U2. The switch AW is then similarly actuated again, with respect to its third contact bank. In this way, the hundreds, tens, and units digits are successively transmitted to the driving magnets DH, DZ and DE of the zone selectors HW, ZW and EW. The relay U3 is then energised in a circuit passing through the arm *ae* in its zero position, the lower inner contact of relay P, the right contact of relay F3, the right middle contact of relay U2, the right inner contact of relay U3 and the winding of relay U3. The right inner contact of relay U3 closes a holding circuit for this relay and the right outer contact connects the driving magnet DT to the stepping line 112. During the fourth stepping movement of the switch AW which is initiated by the energisation of relay U3, the appropriate number of impulses corresponding to the duration of the connection which is stored by the set of relays RG is transmitted in the same manner to the driving magnet DT of a time selector TW. The zone selectors HW, ZW, EW and the time selector TW, illustrated in Figure 3 are rotary selectors. Strowger selectors, linear selectors, in short selectors of all kinds can also be used. The zone selector HW has a single arm which wipes over a bank of 10 contacts. Each of these contacts is connected to a different one of the ten arms with which the zone selector ZW is provided. The arms of the zone selector ZW wipe over banks of 10 contacts. The zone selector EW also has 10 arms each connected to a contact of the banks wiped by the arms of the zone selector ZW and each wiping over a bank of ten contacts. Connections exist between the contacts of the banks wiped by the arms of the zone selector ZW, the contacts of the banks wiped by the arms of the zone selector EW and the incoming contacts of a distributor frame ZST. This distributor frame has five outgoing contacts or "zone points" ZP1 to ZP5. The connections between the incoming contacts and the "zone points" are different according to the situation of the exchange in which the zone selectors HW, ZW and EW are provided within the system of a plurality of exchanges. The wiring is such that when the wipers of the zone selectors HW, ZW and EW are successively stepped by the magnets DH, DZ and DE as described above, that one of the zone points ZP1-ZP5 will be selected which corresponds to the zone in which the called subscriber's exchange is situated relatively to the calling subscriber's exchange. In general, the connection to a zone point ZP will be effected over one contact in each of the zone selectors HW, ZW and EW. However, in some cases, a connection can be made which does not pass over a contact in the zone selector EW. For example, if all exchanges having numbers 810-819 belong to zone III rela-

tively to the calling exchange, then the first contact in the eighth bank of the zone selector ZW can be wired directly to an incoming contact of the distributor frame ZS¹ connected to the zone point ZP³ as is indicated in Figure 3.

When a zone point has been selected, the connection is extended by means of the appropriate one of a number of two-position contacts of a relay N. These contacts serve to take into account the time of day at which the call is made. It is assumed here that there are two tariffs—a day tariff and a night tariff. In Figure 3 they are shown in the position in which they determine that the call shall be charged for in accordance with the day tariff. In this case key KT (Figure 2) was actuated. If there are more than two tariffs, then the contacts of the relay N must have more than two positions or else extra contacts must be provided. For charging the call in accordance with the night tariff key KN must be actuated. When the key KN (Figure 2) is actuated an energising circuit for relay N is closed passing through line 117, lower contact of relay N and the winding of this relay. Relay N closes then a holding circuit for itself running over its lower front contact and the right contact of relay CR which was energised over line 118 on actuation of relay C (Figure 2).

Three auxiliary selectors TZW¹, TZW² and TZW³ coast with the wiper *ta* of the time selector TW. The wipers of these auxiliary selectors can be stepped by the driving magnets DTZ¹, DTZ² and DTZ³. Each of these selectors has associated with each of the zone points ZP¹ to ZP⁵ as many wipers as there are tariffs (in the present case, two—one for the day tariff and one for the night tariff). According to the state of energisation of the relay N, one or the other of these wipers is connected to the zone point. The contacts of the various contact banks of these selectors are individually connected to the incoming contacts of the distributor frame VST. The outgoing contacts of the frame VST are connected by a cable TW to the incoming contacts of a further distributor frame WST. To the outgoing contacts of this distributor frame WST are the contacts of the contact banks of a selector GW which serves as a charge indicator. In the example under consideration here, the charges are worked out on a decimal system. The selector GW is provided with nine switch arms *ga* to *gk* each wiping a contact bank having ten contacts. The contact bank wiped by the wiper *gf* of the selector GW serves to indicate the hundreds digit of the charge, the contact bank wiped by the arm *gh* the tens digit, and the contact bank wiped by the arm *gi* the units digit. Thus, the contacts of the contact bank wiped by the wiper *gf* are connected by way of the two distributor frames WST and VST to the contacts of the contact banks of the selector TZW¹; the contacts of the contact bank wiped by the wiper *gh* to the contacts of the contact banks of the selector TZW²; and the contacts of the contact bank wiped by the wiper *gi* to the contacts of the contact banks of the selector TZW³. These connections are such that when the three selectors TZW¹, TZW² and TZW³ are set to the contact selected by the setting of the wiper *ta* the hundreds, tens, and units digits of the amount of the charge are characterised on the three contact banks of the selector GW.

It will be assumed that the connection, for which the charge is to be determined, belongs to zone II so that the switcharms of the selectors

HW, ZW and EW have made a connection to the zone point ZP². It will also be assumed that the connection has been made during the day time and, therefore, that relay N is not energised. Finally, it will be assumed that the connection lasted three minutes and the appropriate charge is \$1.45. Since the connection lasted three minutes the wiper *ta* of the time selector TW stands on the third contact. If now the selectors TZW¹, TZW² and TZW³ are successively put into action as described later on, their wipers move to the third contact of their contact banks. It only remains now to make the required connections from the zone point ZP² to the charge indicator

G. These connections are as follows:

Third contact bank wiped by the wiper *tz13* of the selector TZW¹ (third from the top in Figure 2) to the first contact of the contact bank wiped by the wiper *gf* of the selector GW; third contact of the contact bank wiped by the wiper *tz23* of the selector TZW² to the fourth contact of the contact bank wiped by the wiper *gh* of the selector GW; third contact of the contact bank wiped by the wiper *tz33* of the selector TZW³ to the fifth contact of the contact bank wiped by the wiper *gi* of the selector GW. The distributor frames VST and WST are wired to enable such connections to be made and to make all similar connections corresponding to the setting of the selectors HW, AW, EW, TZW¹, TZW², TZW³ and of the upper contacts of the relay N.

The three time setting selectors TZW¹, TZW² and TZW³ are set successively from their rest position when the relay V (Figure 3) releases and the time storing selector TW has been fully set in accordance with the number of units representing the duration of the connection. The energising circuit of the magnet DTZ¹ (Figure 3) passes the winding of magnet DTZ¹, self-interrupting contact of this magnet, contact of relay V, contact and switch arm *tb* of selector TW, right outer contact of relay U⁴, right contact of relay PZ, right contact of relay CR to ground. The switch arms of the selector TZW¹ are rotated until its lowest upper switch arm reaches the contact grounded by means of the switch arm *ta*. Then the relay PZ is energised and interrupts the circuit for magnet DTZ¹. All the arms of the selector TZW¹ wired for indicating the hundreds digits (shown vertically above each other in Figure 3) are then in phase with the arm *ta* of the time storing selector TW. A contact in the bank wiped over by the wiper *gf* of the charge indicator G is thus grounded through the arm of the selector TZW¹ which is connected to the selected zone point ZP². The driving magnet DG of the charge indicator GW is switched in on response of the relay PZ by its left contact. The charge indicator GW rotates its arms *ga*—*gk* until the switch arm *gf* reaches the grounded contact. Then the testing relay PG connected to the switch arm *gf* through the right inner contact of relay U⁵ and the left inner contact of relay U⁵ is energised. The next inner contact of relay PG is energised. The next to the innermost left contact of relay PG interrupts the circuit of the stepping magnet DG. The next to the outermost left contact of relay PG connects the switch arms *ga* to *ge* of selector GW to the printing magnet DR. The permutation bar magnets W¹ to W⁵ are connected to the various contacts of the associated contact banks. In the circuit of magnet DR the selected ones of these permutation bar magnets are also energised and the type associated to the charge value is printed. The left inner contact of relay

PG opens the circuit of relay PZ which releases.

On the response of relay PG further a circuit for relay U4 is closed as follows: right outer contact of relay CR, right outer contact of relay PG, switch arm *tz1b* of selector TZW1, winding of relay U4 to battery. Relay U4 attracts its armature and closes a holding circuit by means of its left inner contact. Now the driving magnet DTZ2 of the selector is switched in a circuit passing the winding of magnet DTZ2, self-interrupting contact of this magnet, right contact of relay U5, right outer contact of relay U4, right outer contact of relay PZ, right outer contact of relay CR to battery. Meanwhile the right outer contact of relay PG closes a new stepping circuit for magnet DTZ1 passing the switch arm *tz1a* which causes the wipers of selector TZW1 to be stepped in their zero position. The switch arms of the selector TZW2 are stepped into a position corresponding to that previously assumed by the switch arms of selector TZW1 whereupon the relay PZ responds again and switches in the driving magnet DG of the charge indicator GW so that the latter determines the tens digit by means of its arm *gh* to which relay PG is now connected. On the second response of the relay PG the appropriate type is printed and the relay PZ is again disconnected. The right outer contact of the relay PG closes an energising circuit for relay U5 which attracts and holds itself by means of its left outer contact. The right contact of relay U5 closes a stepping circuit for driving magnet DTZ3 of the selector TZW3 which steps the switch arms of the selector TZW3 until the upper lowest switch arm reaches the third contact earthed by switch arm *ta*. Relay PZ is energised in the described manner and switches in the driving magnet DG. The units digit is then determined by the arm *gt* of the selector GW to which the relay PG is connected by means of the left inner contact of the relay U5. On the response of the relay PG the cost determined by the setting of the switch arms *ga* to *ge* is printed.

The determination and recording of the charge are thus completed. The operator, by actuation of the key ZK (Figure 2) then effects the line shift in known manner and interrupts the holding circuit of the relay C which releases and interrupts the circuit of relay CR (Figure 3) which also releases. Now the relays U1, U2, U3, U4, U5 and PG which are still attracted release. Stepping circuits (not shown) are closed on the release of the relays C and CR for the driving magnets of all selectors, the switch arms of which are out of their normal position, in order to step these switch arms into their normal position respectively whereupon those stepping circuits are interrupted.

In the example described above, the zone determining device comprising the selectors HW, ZW, EW and the distributor frame ZST is suitable for use at the exchange relatively to which the zone in which the called subscriber's exchange is situated is to be determined. It can be used, for example, for all calls originating in a large city. If, however, the exchange is to deal with calls originating from neighboring exchanges, for example suburban exchanges, it is not necessary to provide a special converting or modifying device for each of these exchanges. All that is necessary is to alter the connections between the contacts of the contact banks of the selectors HW, ZW, EW and the zone points ZP1—ZP5 (see Figure 3.) The various direct

connections between the incoming contacts of the distributor frame ZST connected to the contact banks of the selectors HW, ZW and EW and the zone points ZP1—ZP5 are preferably plug and cable connections which allow alterations and additions to be easily effected.

In the form described above, the device is suitable, in conjunction with the charge-slip printer, for use with automatic telephone operation. It is, however, not restricted thereto. It can be used for converting the charge-slip of manual exchanges into account forms as long as the terminal exchange is indicated on the slip, not by its name but by its characteristic charge number.

The characteristic "numbers" of exchanges are frequently in the form of combinations of letters and may consist of both letters and figures, the dials being then provided with letters in addition to or instead of figures. The letters correspond, of course, to simple figures and the device described above can clearly be used in such cases. It is also usual in large telephone networks for a subscriber's number to include a part of the name of the exchange. In such a case, the letters giving the indication of the identity of the exchange can be used on the charge-slips typed at the exchange and be used in the determination of the charge by the device in accordance with the invention.

When a typewriter provided with adding devices is used which will print the sum of a number of recorded amounts, a completed account can be printed by the machine.

I claim:

1. A device for determining telephone charges from manually set data including a factor characterising the called subscriber's exchange and a factor characterising the duration of the connection, comprising in combination a keyboard having keys operable to set said data, a plurality of permutation circuits controlled by said keys, two groups of storing relays, a sequence switch adapted on operation of said keys for the setting of said first-mentioned factor to connect one of said groups of relays to said permutation circuits and on subsequent operation of said keys for the setting of said second-mentioned factor to connect the other of said groups to said permutation circuits, a plurality of "zone" lines characteristic of said first-mentioned factor, electrical switch means controlled by said first-mentioned group of storing relays for the selection of one of said zone lines and electrical switch means controlled by said second-mentioned group of storing relays for the connection a circuit characteristic of both of said factors to said selected zone line.

2. A device for determining telephone charges from manually set data including a factor characterising the called subscriber's exchange and a factor characterising the duration of the connection, comprising in combination a keyboard having keys operable to set said data, a plurality of permutation circuits controlled by said keys, two groups of storing relays, a sequence switch adapted on operation of said keys for the setting of said first-mentioned factor to connect one of said groups of relays to said permutation circuits and on subsequent operation of said keys for the setting of said second-mentioned factor to connect the other of said groups to said permutation circuits, a plurality of "zone" lines characteristic of said first-mentioned factor, means including a plurality of zone selectors controlled by the keys used in setting said first-mentioned factor

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for the selection of one of said zone lines, a plurality of charge characterising circuits, and electrical switch means controlled by the keys used in setting said second-mentioned factor for the connection of a circuit characteristic of both said factors to said selected zone line.

3. A device for determining telephone charges from manually set data including a factor characterising the called subscriber's exchange and a factor characterising the duration of the connection, comprising in combination a keyboard having keys operable to set said data, a plurality of permutation circuits controlled by said keys, two groups of storing relays, a sequence switch adapted on operation of said keys for the setting of said first-mentioned factor to connect one of said groups of relays to said permutation circuits and on subsequent operation of said keys for the setting of said second-mentioned factor to connect the other of said groups to said permutation circuits, means including electrical switch means controlled by the keys used in setting said first-mentioned factor whereby to close a circuit characteristic of said first-mentioned factor, a time selector controlled by the keys used in setting said second-mentioned factor, a further selector controlled by said time selector and having a plurality of switch arms each connected to one of said circuits characterising said first-mentioned factor, and a plurality of charge characterising circuits connected to the contact bank of said further selector.

4. A device for determining telephone charges from manually set data including a factor characterising the called subscriber's exchange and a factor characterising the duration of the connection, comprising in combination a keyboard having keys operable to set said data, a plurality of permutation circuits controlled by said keys, two groups of storing relays, a sequence switch adapted on operation of said keys for the setting of said first-mentioned factor to connect one of said groups of relays to said permutation circuits and on subsequent operation of said keys for the setting of said second-mentioned factor to connect the other of said groups to said permutation circuits, a plurality of "zone" lines characteristic of said first-mentioned factor, electrical switch means controlled by said first-mentioned group of storing relays for the selection of one of said zone lines and the consequent preparation of a plurality of charge characterising circuits, electrical switch means controlled by said second-mentioned group of storing relays for the selection from said plurality of prepared charge characterising circuits of a circuit characteristic of both said factors, a type printing device for printing the determined telephone charges, a plurality of selecting magnets controlling said type printing device, a selector switch having two groups of contact-banks and switch arms, one of said groups of contact banks being connected to said charge characterising circuits and the other to said selecting magnets, and electrical testing means controlling the setting of said selector switch and actuating said selecting magnets over said switch arms.

5. A device for determining telephone charges from manually set data including a factor characterising the called subscriber's exchange and a factor characterising the duration of the connection, comprising in combination a keyboard having keys operable to set said data, a plurality of permutation circuits controlled by said keys, two groups of storing relays, a sequence switch

adapted on operation of said keys for the setting of said first-mentioned factor to connect one of said groups of relays to said permutation circuits and on subsequent operation of said keys for the setting of said second-mentioned factor to connect the other of said groups to said permutation circuits, a plurality of zone selectors controlled by the keys used in setting said first-mentioned factor, a plurality of zone lines connected to the contacts of said zone selectors, a plurality of time selectors controlled by the keys used in setting said second-mentioned factor having switch arms connected to said zone lines, a plurality of charge characterising lines connected to the contacts of said time selectors and a charge selector used in selecting one of said charge characterising lines.

6. A device for determining telephone charges from manually set data including a factor characterising the called subscriber's exchange and a factor characterising the duration of the connection, comprising in combination a keyboard having keys operable to set said data, a plurality of permutation circuits controlled by said keys, two groups of storing relays, a sequence switch adapted on operation of said keys for the setting of said first-mentioned factor to connect one of said groups of relays to said permutation circuits and on subsequent operation of said keys for the setting of said second-mentioned factor to connect the other of said groups to said permutation circuits, means including electrical switch means controlled by the keys used in setting said first-mentioned factor whereby to select a zone point characteristic of said first-mentioned factor, a time selector controlled by the keys used in setting said second-mentioned factor, at least one auxiliary selector controlled by said time selector and having a plurality of switch arms each connected to one of said zone points characterising said first-mentioned factor, a charge indicating selector, a plurality of charge characterising circuits connecting the contacts of said auxiliary selector to the contacts of said charge indicating selector, testing means for setting said auxiliary selector whereby to select one of said charge characterising circuits and consequently to characterise one of said last-mentioned contacts, and switch means for setting said charge indicating selector on to said characterised contact.

7. A device for determining telephone charges from manually set data including a factor characterising the called subscriber's exchange and a factor characterising the duration of the connection, comprising in combination a keyboard having keys operable to set said data, a plurality of permutation circuits controlled by said keys, two groups of storing relays, a sequence switch adapted on operation of said keys for the setting of said first-mentioned factor to connect one of said groups of relays to said permutation circuits and on subsequent operation of said keys for the setting of said second-mentioned factor to connect the other of said groups to said permutation circuits, means including electrical switch means controlled by the keys used in setting said first-mentioned factor whereby to select a zone point characteristic of said first-mentioned factor, a time selector controlled by the keys used in setting said second-mentioned factor, a plurality of auxiliary selectors controlled by said time selector and each having a plurality of switch arms each connected to one of said zone points characterising said first-mentioned factor, a charge indicating selector having a plurality of

switch arms one for each digit of the charge and a like number of contact banks wiped each by one of said arms, a plurality of charge lines each connecting the contacts of one of said auxiliary selectors to the contacts of one of the contact banks of the charge selector, the contacts of another of said auxiliary selectors to another of said contact banks, and so on, switch means for setting said auxiliary selectors whereby to select a plurality of said charge lines connecting one of said contacts of each of said auxiliary selectors to one contact in each of said contact banks and consequently to characterise said contact in each of said contact banks and testing means for successively setting said arms of said charge indicating selector one on to one of said characterised contacts, another on to another and so on.

8. A device for determining telephone charges from manually set data including a factor characterising the called subscriber's exchange and a factor characterising the duration of the connection, comprising in combination a keyboard having keys operable to set said data, a plurality of permutation circuits controlled by said keys, two groups of storing relays, a sequence switch adapted on operation of said keys for the setting of said first-mentioned factor to connect one of said groups of relays to said permutation circuits and on subsequent operation of said keys for the setting of said second-mentioned factor to connect the other of said groups to said permutation circuits, a plurality of "zone" points characteristic of said first-mentioned factor, electrical switch means controlled by the keys used in setting said first mentioned factor whereby to select a zone point characteristic of said first-mentioned factor, a time selector controlled by the keys used in setting said second-mentioned factor, tariff discriminating means, an auxiliary selector having a plurality of switch arms for each of said zone points, contacts controlled by said tariff discriminating means for connecting one of said last mentioned switch arms to one of said zone points, a charge indicating selector, a plurality of charge lines connecting the contacts of said auxiliary selector to the contacts of said charge indicating selector, switch means controlled by said time selector for setting said auxiliary selector whereby to select one of said

charge lines and consequently to characterise one of said last-mentioned contacts, and means for setting said charge indicating selector on to said characterised contact.

9. A device for determining telephone charges from manually set data including a factor characterising the called subscriber's exchange and a factor characterising the duration of the connection, comprising in combination a keyboard having keys operable to set said data, a plurality of permutation circuits controlled by said keys, two groups of storing relays, a sequence switch adapted on operation of said keys for the setting of said first-mentioned factor to connect one of said groups of relays to said permutation circuits and on subsequent operation of said keys for the setting of said second-mentioned factor to connect the other of said groups to said permutation circuits, a plurality of "zone" lines, a plurality of zone selectors controlled by the keys used in setting said first-mentioned factor for the selection of one of said zone lines characteristic of said first-mentioned factor, a time selector controlled by the keys used in setting said second-mentioned factor, three auxiliary selectors controlled by said time selector and having each twice as many switch arms as there are zone lines, tariff discriminating means controlling contacts each connected to one of said zone lines and connecting one or another of said switch arms of said auxiliary selectors, a charge indicating selector having three contact rows and three switch arms corresponding to the hundreds, tens and units digits of the charge, a plurality of charge lines each connecting the contacts of each of said auxiliary selectors to one of said contact rows of said charge indicating selector, switch means for making said switch arms of said charge indicating selector effective one after another, switch means controlled by said time selector for setting said auxiliary selectors whereby to select a plurality of said charge lines leading one to each of said contact rows and consequently to characterise a contact in each of said rows and switch means for stepping said charge indicating selector three times over said contact rows each time with a different arm effective whereby to set said selector successively on to each of said characterised contacts.

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