Jan. 22, 1935. J. E. W. GREVE 1,988,898

MULTIPLE REGISTER MACHINE

Filed March 31, 1933 3 Sheets-Sheet 1

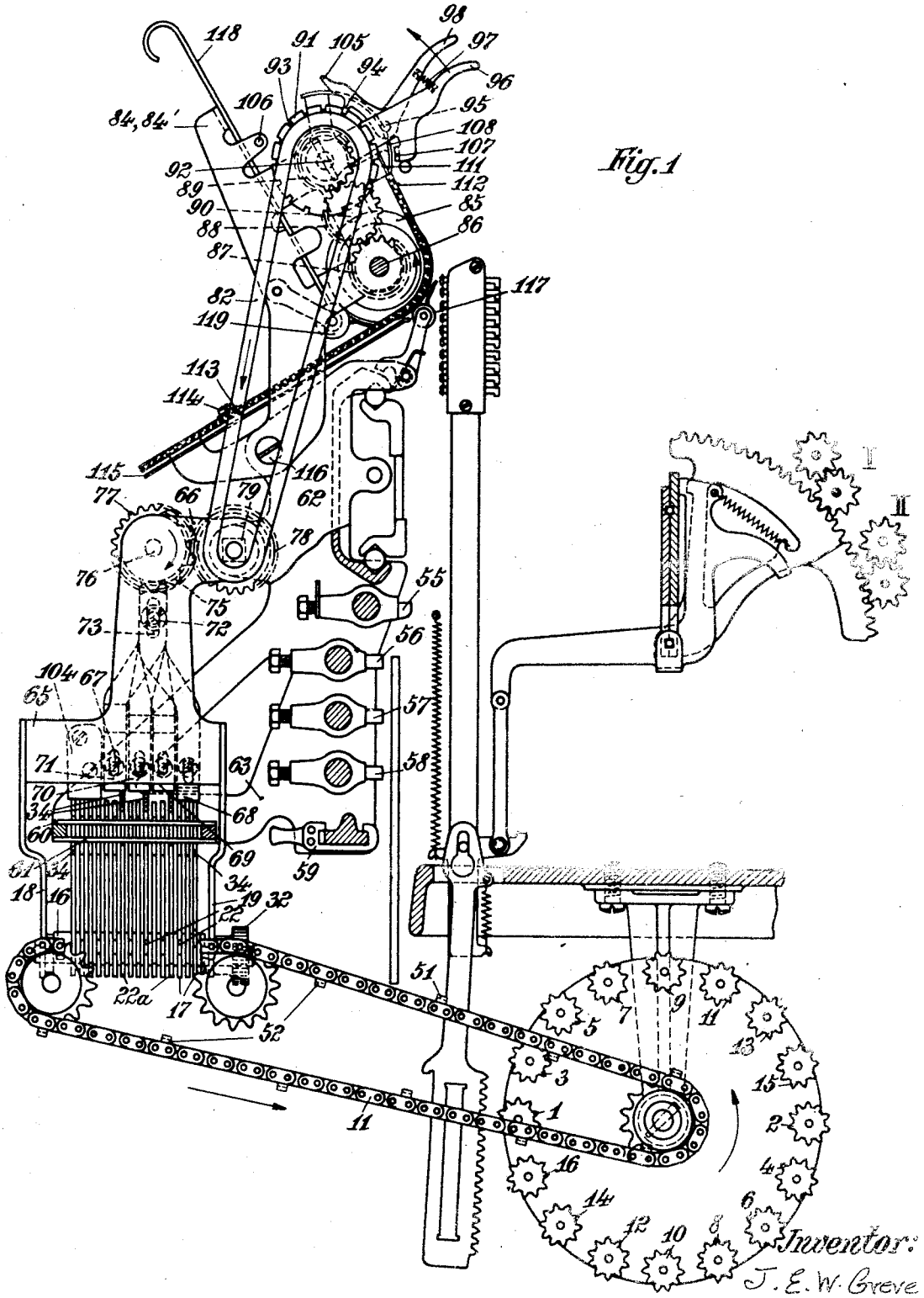

Fig. 1

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MULTIPLE REGISTER MACHINE

Filed March 31, 1933 5 Sheets-Sheet 2

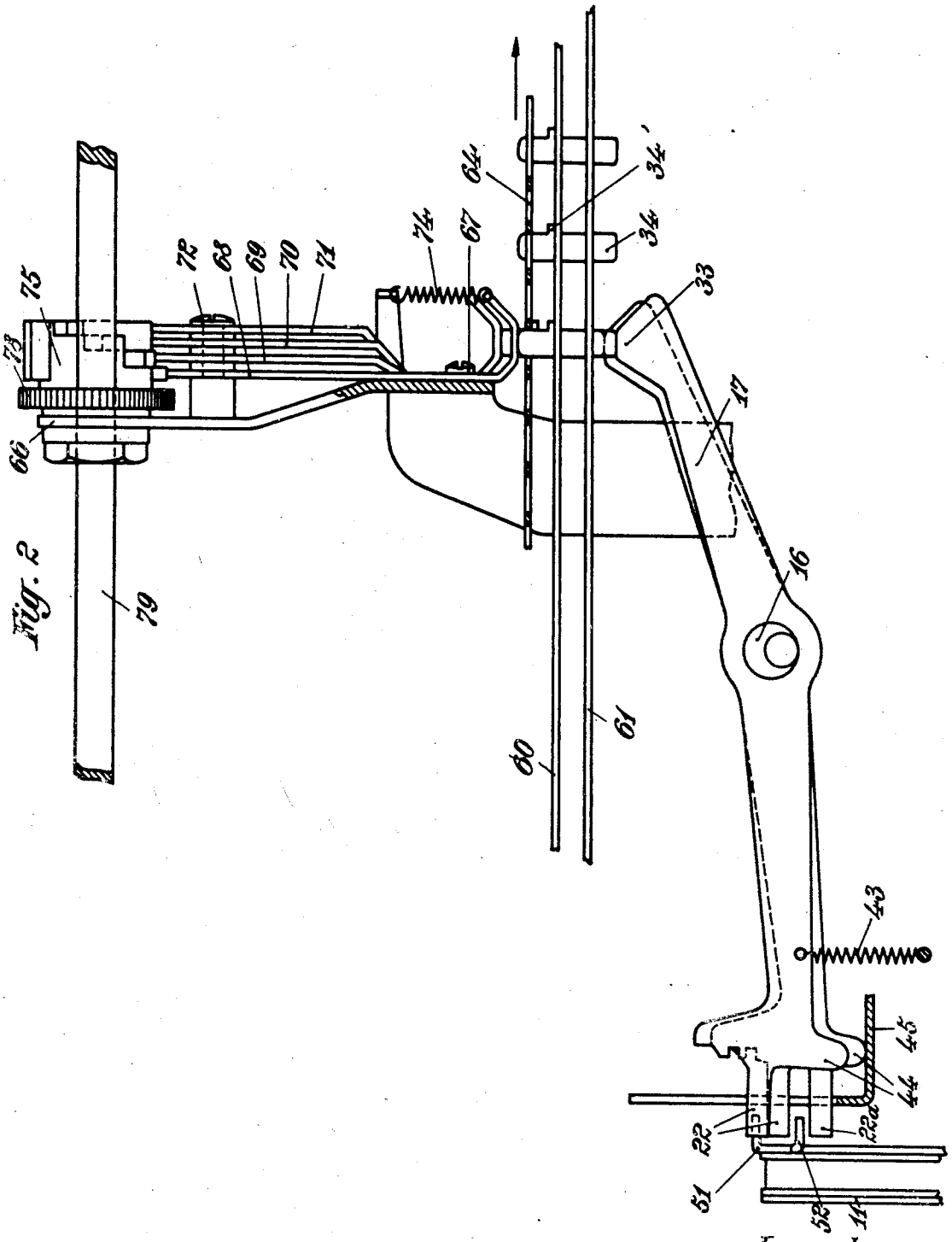

Fig. 2

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MULTIPLE REGISTER MACHINE

Filed March 31, 1933 5 Sheets-Sheet 3

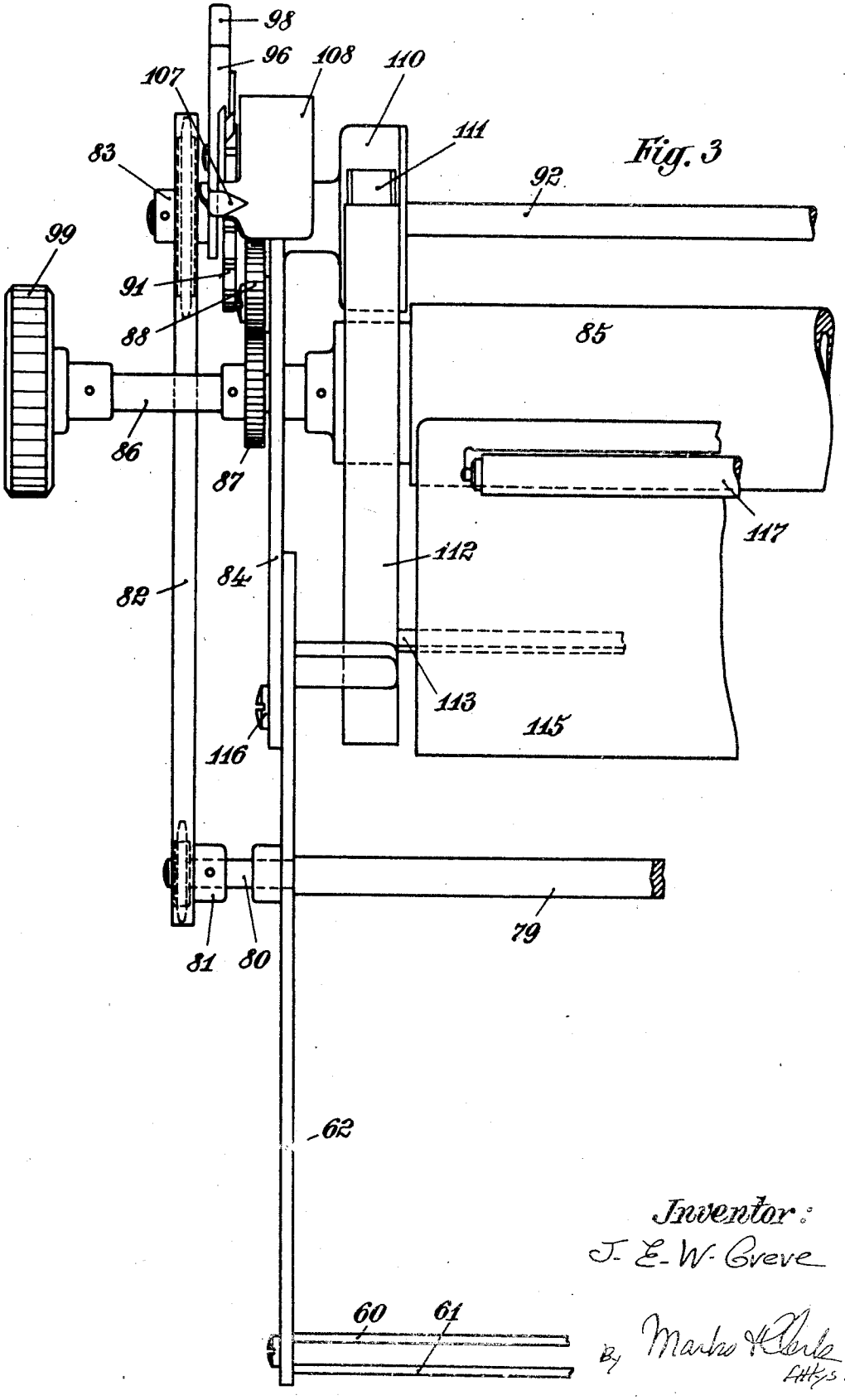

Fig. 3

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MULTIPLE REGISTER MACHINE

Filed March 31, 1933 5 Sheets-Sheet 4

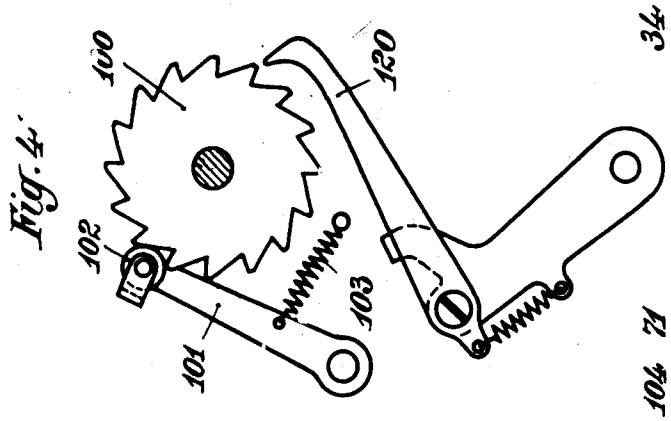

Fig. 4.

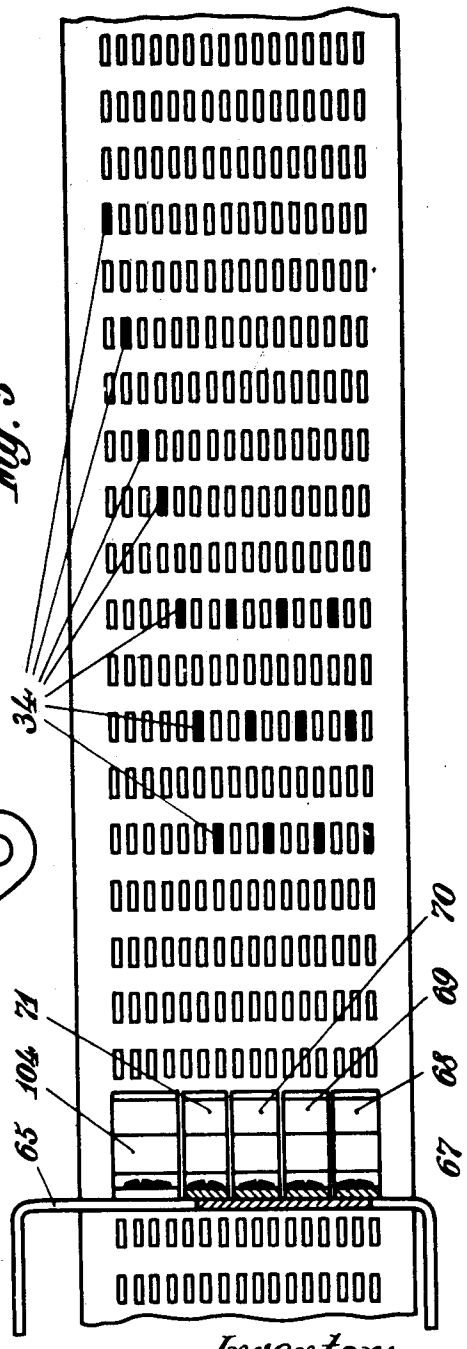

Fig. 5

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MULTIPLE REGISTER MACHINE

Filed March 31, 1933 5 Sheets-Sheet 5

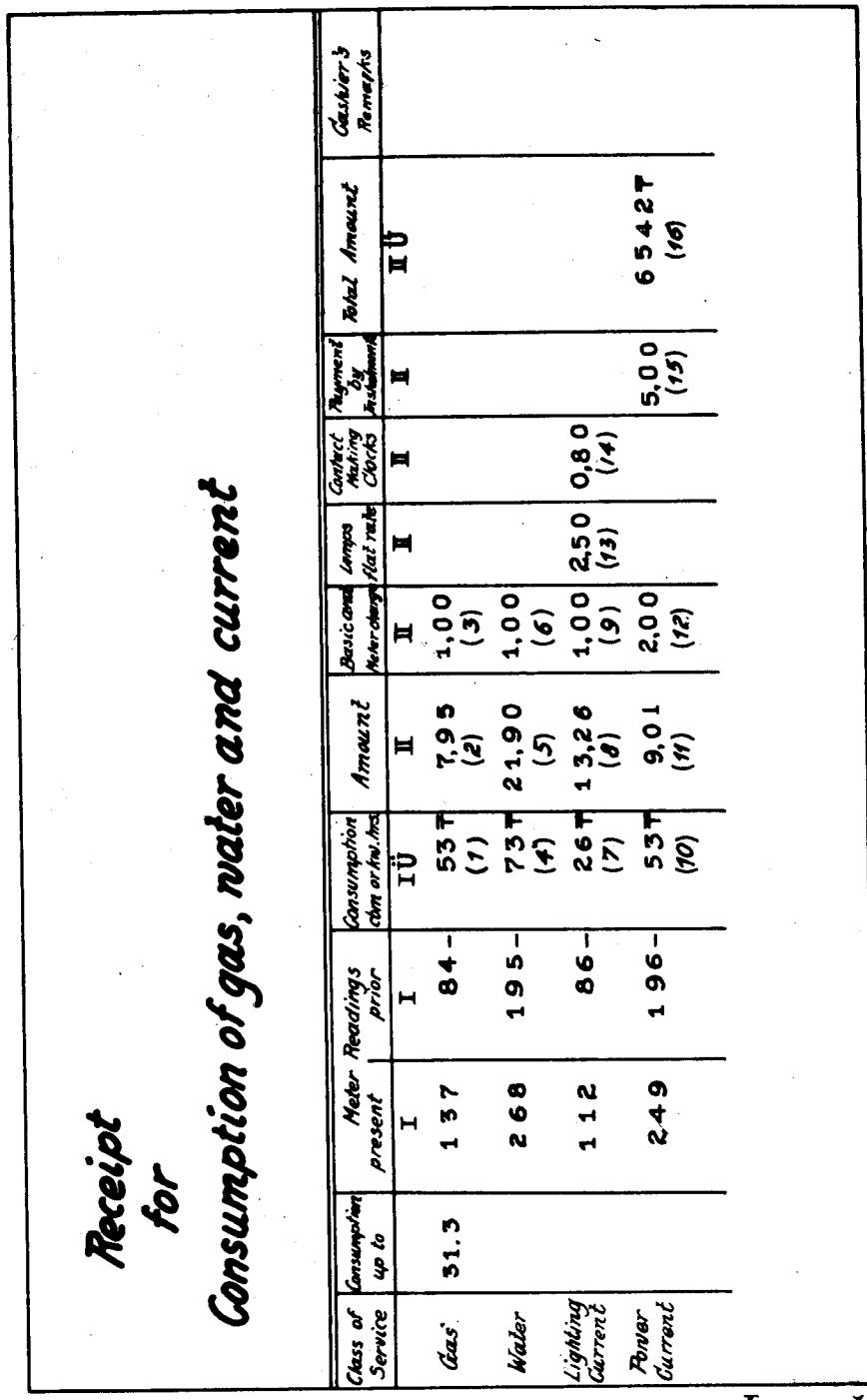

Fig. 6

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UNITED STATES PATENT OFFICE

1,988,896

MULTIPLE REGISTER MACHINE

John E. W. Greve, Chemnitz, Germany, assignor to Astrawerke Aktiengesellschaft, Chemnitz, Germany

Application March 31, 1933, Serial No. 663,838
In Germany April 26, 1932

5 Claims. (Cl. 235—60)

The United States patent application Number 624,129 filed July 22, 1932, relates to a multiple register machine, wherein the counting mechanisms are brought into operative position relatively to their driving means by a movable frame driven from a special source of power. Adjustable stops are provided for the selection of the counting mechanisms and one of the stops is moved by hand, for instance by keys or by studs previously adjusted on the paper carriage or on another controlling member, into a position in which this stop arrests the counting mechanism frame in the operative position corresponding to the selected counting mechanism.

The machine is adapted for column operations, wherein the items to be calculated are written successively in horizontal rows and are received by different counting mechanisms whereby vertical columns are formed whose totals can be printed at the foot of the columns from the various counting mechanisms. During these operations, the counting mechanisms or the adjustable stops inter alia may be operated by the lateral projection of the paper carriage or by the movement of another controlling member which carries the studs. It is also possible to work with the machine equally as well and directly in vertical columns and to receive the individual items by different counting mechanisms by operating the latter as before either by means of keys or by the motion of the machine but controlling the sheet vertically and not horizontally.

This invention relates to an improvement which resides in the fact that the counting mechanisms operate in dependence on the vertical control, that is to say the line spacing of the sheet to be printed and that when the sheet is adjusted with respect to the printing line either by means of keys or automatically by the machine, the corresponding counting mechanism will always be brought into operative position. It is immaterial whether the sheet or the writing roller is moved forward or backward.

A constructional form of the machine according to the invention is shown in the accompanying drawings by way of example, in which,

Figure 1 is a side elevation of the machine, partially in section;

Figures 2 and 3 are partial front elevations;

Figure 4 shows the line spacing mechanism;

Figure 5 shows the arrangement of the studs, and

Figure 6 shows a working example.

A machine, of which the present invention is an improvement, is fully described in the above mentioned application Serial Number 624,129 filed July 22, 1932. In the hereinafter described construction according to the present invention, the said machine is improved by a second algebraic accumulator whereby the utility of the machine is rendered more extensive.

The control of the counting mechanisms is arranged in such a manner that the machine is adapted to work with the algebraic accumulators I and II (Fig. 1) separately or with both mechanisms simultaneously, these algebraic accumulators being capable of calculating in the same direction or in opposite directions. The sixteen accumulators provided in a movable drum under the base plate may also be operated separately and also with each of the two algebraic accumulators or also with both algebraic accumulators simultaneously.

It is possible to print automatically from all accumulators totals and sub-totals including negative totals in the algebraic accumulators I and II and these totals may be transferred from one counting mechanism to the other counting mechanism in a known manner.

The counting mechanisms are brought into operative position by keys or automatically during the motion of the machine by studs previously secured to the paper carriage or another member.

Studs 55 (Fig. 1) are the column stops which are adjusted on their guide rod in accordance with the sheet and limit the lateral movement of the paper carriage. The algebraic accumulators I and II are actuated by studs 56 during the lateral movement of the paper carriage while the studs 57 adjust these accumulators either for addition or for subtraction. The studs 58 have for their object to disconnect the calculating operation of the accumulators in the respective column. The lower studs 59 belong to the automatic retraction of the carriage. The accumulators provided below the base plate of the machine are actuated by studs 34 previously secured to the paper carriage. The arrangement of these studs differs from that described in earlier application above referred to in that the studs are mounted loosely in a cage which consists of two slotted plates 60, 61 secured between the side walls 62, 63. The studs have a projection 34' which prevents the studs from falling through the slots of the plates 60, 61. A slotted plate 64, which is adapted to move in the direction of the arrow above the plate 60, prevents the studs 34 from jumping out upward. The plate 64 is held in the position shown in Figure 2 by a spring

(not shown) and is moved by hand in the direction of the arrow if the studs are to be removed. In the displaced position, the slots of the plate 64 release the projection 34' of the studs so that the studs can be readily removed.

The studs 34 cooperate with the projections 33 of the double arm levers 17 which are rotatably mounted on a common eccentrically mounted shaft 16. A spring 43 tends to pull the double levers 17 downward until the stop 44 comes in contact with the angular guide plate 45. The upright member of this guide plate is provided with slots through which the adjustable stops 22, 22a extend which are guided in these slots. The stops 22, 22a are arranged stepwise and the stops 22 belong to the first, third, fifth, etc. of the double arm levers 17 while the lower stops 22a are mounted on the second, fourth, sixth etc. of the double arm levers 17. A chain 11, which is positively connected to the accumulator drum, is moved past the stops so that its locking members 51 come in contact with the stops 22 and 22a as soon as the latter are adjusted. This arrangement is sufficiently described and shown in application Serial Number 624,139, and is only again explained herein for enabling a better understanding of the present invention.

The eccentric shaft 16 is rotatably mounted in the side walls 18, 19 and is rotated through 180 degrees by the toothed wheel 32 which is keyed on to the said shaft whereby the double levers 17 are raised to such an extent that the projections 33 abut against the studs 34. The toothed wheel 32 is connected to a hand lever which is rocked when changing from the accumulator control by keys to automatic control by the studs 34. This arrangement is described also in the earlier application Serial Number 624,139.

In the position shown in Figure 2, the eccentric shaft 16 is turned upwards so that the projections 33 of the double levers 17 come within reach of the studs 34. According to the invention, controlling members are arranged above the studs in operative position and by means of these controlling members, the studs which readily move up and down in the slots of the plates 60, 61, are forced into the lower position wherein they act on the double levers 17 and their projections 33 respectively. The frames 18, 19 secured below the machine are extended upward and carry a cross piece 65 which is connected to both frames and is provided with an upwardly extending arm. On this cross piece, controlling rods 68, 69, 70 and 71 are guided on screws 67, and adapted to move in slots, the upper end of said rods being bent in such a manner that all four ends of these controlling rods are guided on a common pin 72 passing through the slots 73. The stop pin 72 is secured in the arm 66. Each controlling rod is drawn by a spring 74 against a controlling member 75 provided with cams. This controlling member is rotatably mounted on a bearing bolt 76, which is secured in the part 66, and is secured to a toothed wheel 77 which constantly engages with a toothed wheel 78. The toothed wheel 78 is rotatably mounted in a bushing riveted in the arm 66. The said wheel is driven by a square shaft or spindle 79 which freely slides therethrough. This square shaft is rotatably mounted between the side walls 62, 63 of the paper carriage and carries on its left end 80 a sprocket wheel 81, over which a chain 82 passes, which is driven by a second sprocket wheel 83. Each of the side walls 62, 63 carries a further wall 84 or 84' between which the platen 85 is rotatably mounted on the shaft 86.

A toothed wheel 87 is mounted on the shaft 86 and drives a toothed wheel 89 through the medium of an intermediate wheel 88. The toothed wheel 88 is mounted on a bolt or pin 90 which is secured in the plate 84. The toothed wheel 89 is connected to a disk 91 and rotatably mounted on a shaft 92 which is also rotatably mounted between the plates 84 and 84'. The disk 91 is provided on its periphery with notches 93 wherein a pawl 94 engages which is rotatably mounted at 95 on a hand lever 96. A pressure spring 97 tends to hold the pawl 94 in constant engagement with the notches 93. The pawl 94 is adapted to be disconnected from the disk 91 by the upper arm 98 which is designed as a handle. The lever 96 is securely fastened on the shaft 92 which is rotatably mounted between the plates 84, 84', and the sprocket wheel 83 is also securely fastened on the said shaft so that by operating the lever 96 both shafts 92 and sprocket wheel 83 are rotated. It is obvious that by operating the lever 96 when the pawl 94 is engaged, the coupling disk 91 will also be rotated and the platen 85 will likewise be rotated through the medium of the toothed wheels 89, 88 and 87. When the hand lever 96 is rocked in the direction of the arrow, the platen will thereby be rotated in the direction of this arrow and the paper provided on the roller will be conveyed in this direction. Vice versa, the coupled lever 96 may also be moved by turning the platen by its hand wheel 99 because the connection by the toothed wheels is positive.

When operating the hand lever 96, the square shaft 79 will also be rotated through the medium of the chain 82 and the toothed wheel 78 will also be rotated which drives the toothed wheel 77 and the controlling member 75 provided with cams. Assuming that the handle 96 is rocked in the direction of the arrow, the controlling member 75 will be rotated in the direction of the arrow indicated in Figure 1 through the medium of the chain 82 and the toothed wheels 78, 77. In this figure, the controlling member is shown in such position that its first cam has depressed the control rod 68 against the tension of its spring 74. For a hereinafter explained reason, the control rods 68, 69, 70 and 71 are so wide that they extend over three slots for the studs 34. In order to be able to perform the operation shown in Figure 6, the studs 34 are inserted in the slots of the plates 60, 61 in the manner shown in Figure 5. In Figure 2, the position of the carriage is such that the first series or group of studs 34 is below the control rods 68 to 71. With regard to these four studs, the first one has been depressed by the control rod 68 thereby rocking the double lever 17 and raising its stop 22 into operative position in which it cooperates with the stop 51 of the chain so that the accumulator 1 is brought into operative position relatively to its driving members in the known manner. If the lever 96 is now further rotated one division in the direction of the arrow, the second control rod 69 will be depressed by the second cam of the controlling member 75 while control rod 68 returns to normal position through the medium of its spring 74. By means of the control rod 69, the next stud 34 of the first row will then be depressed whereby the counting mechanism 4 is brought into operative position. The rockable lever 17 of the first accumulator has been retracted to normal position again by the spring 43 upon the release of the

stud for accumulator 1. Consequently, by the rocking of the lever 96 in the direction of the arrow, all four studs of the first column may be successively depressed and the corresponding accumulators operated. The first column contains studs for accumulators 1, 4, 7 and 10. If the paper carriage is shifted to such an extent that the second vertical row of stops 34 comes under the control rods, the counting mechanisms 2, 5, 8 and 11 will be operated during the same operation of the lever 96 and in the third column the counting mechanisms 3, 6, 9 and 12 will be operated.

The line spacing is automatically effected as usual during the motion of the machine, for instance, by the line spacing pawl 120 and the line spacing wheel 100 which is rigidly secured on the platen. It is advisable to provide a rocking lever 101 which with its roller 102 ensures the accurate positioning of the platen in that this roller is pressed by spring 103 into the tooth spaces of the wheel. In the present case, the wheel 100 has sixteen teeth and the coupling disk 91 is therefore also provided with sixteen notches 93.

The machine is specially designed or built for performing operations as shown in Fig. 6. For this reason, the coupling of the disk 91 with the platen is effected by the pawl 94 of the hand lever 96. However, another coupling may also be provided which allows of a complete rotation of the coupling disk as compared with the above coupling. If the controlling member 75 is then provided with sixteen cams, it will also be able to depress sixteen individual push rods so that all counting mechanisms of the drum can thereby be operated without a lateral movement of the paper carriage or stud carrier being necessary.

As already stated, operations are to be chiefly performed on the machine which are shown in Figure 6 and for this purpose, only four control rods are required which are operated by the controlling member 75; moreover, a fixed controlling member 104 is necessary which extends over four slots of the studs 34.

In the position shown in Figure 1, the hand lever 96 is in its upright end position which is limited by a stop (not shown); the coupled lever is adapted to move four divisions in the direction of the arrow, whereupon the inclined cam surface 105 of the pawl 94 comes in contact with a pin 106 which is secured in the plate 84 and effects the uncoupling of the pawl 94. In the position of the lever 96 shown in Fig. 1, the first cam of the controlling member 75 is in operative position and the first control rod 68 is therefore depressed. The second, third, and fourth cams operate the control rods 69, 70, 71 successively. There are three shifting movements from the first cam to the fourth cam and during the fourth shifting movement of the lever the fifth cam is brought into operative position and extends over the entire width of the control rods and depresses all four control rods simultaneously. By depressing all of the control rods by said fifth cam, the vertical paper feed, and the corresponding platen rotation is no longer effective to control accumulator selection. The selection is then accomplished entirely under control of, and by columnar shift of the carriage. It will be observed that at all times the selection of accumulators depends on the depression of control members 68—71 coupled with the lateral displacement of the carriage which brings a particular row of prearranged control studs 34 to effective position depending on the arrangement of studs 34. When any one of the first four cams on disc 75 is effective and its corresponding slide 68—71 is depressed, certain predetermined studs 34 will be effective, while others will be permitted to rise freely, and, therefore, will not control levers 33. When the fifth cam of member 75 is effective, all pins 34 in any single row will be effective to control levers 33. By providing a single pin in each column of control plates 60, 61, with said fifth cam effective the selection of a totalizer will depend entirely upon the lateral displacement of the carriage. If more than one pin is provided in each column, the first pin, i. e. that nearest to stop 51 will be effective. The hand lever 96 is provided laterally with an index 107 which moves over a scale 108 having numerals or characters corresponding to the counting mechanisms which are rendered operative in the respective position of the lever 96.

In order to be able to move the sheet to be printed in exact relation to the hand lever 96, a guiding drum 110 is keyed on the shaft 92 above the two ends of the platen and steel bands 111 are secured in the drum, the loose ends of which are each passed into a guiding channel 112. The guiding channels are secured to the plates 84, 84'. The outermost ends of the steel bands 111 are united by a cross-piece 113 which is angular and bears with its angular end 114 on the guiding plate 115, of the paper. When turning the shaft 92 by the hand lever 96 or by the platen itself, the steel bands 111 are either wound up in the drum 110 or forced out of same whereby the stop 114 on the paper guiding plate 115 is moved up and down. The plates 84, 84', which carry the platen and also the shaft 92, are rockably mounted on screws 116 in the side members 62, 63 of the machine so that the platen can be moved away from the paper pressing rollers 117. The paper carriage is designed in such a manner that a ledger or journal sheet may be placed on the guiding plate 118 and passed around the platen through the medium of the transport rollers 119 while accounts or bills to be filled in are placed in front of the platen which is turned back with the ledger sheet. The accounts or bills are then moved under the platen on to the guiding plate 115 until they come in contact with the stop 114 whereupon the roller is again moved into the position shown in Figure 1 and the account or bill in front is now pressed by the rollers 117 against the roller or against the ledger sheet. This guiding of the paper is known per se but it is new by being combined with the adjustment or setting of the counting mechanisms.

In order to perform operations according to Figure 6, the studs 34 are placed in their holders as shown in Figure 5. The first row of studs corresponds to the column "Consumption" and contains studs for the accumulators 1, 4, 7 and 10. In the second row, the studs are so arranged that the accumulators 2, 5, 8 and 11 are operated and this row corresponds to the column "amount". The accumulators 3, 6, 9 and 12 are provided for the third row of studs of the column "Basic or meter charge" and the studs are set accordingly. The remaining four columns receive only one accumulator each. For the purpose of a better understanding, the numbers of the accumulators are bracketed below the items in Figure 6 and the numbers of the algebraic accumulators I and II are indicated at the top of the columns so that it is clearly obvious which

accumulators must operate in the respective columns. The added letter "U" indicates the amount transferred from the algebraic accumulators to one of the adding accumulators on the drum.

The account sheet is inserted in the described manner until it comes in contact with the stop 114 while the hand lever 96 occupies the position shown in Figure 1 and in which position the index 107 points to "Gas" on the scale. In this position, the first line of the account or bill is in printing position which is also designated "Gas". The first item 137 is now entered in the machine and received by the algebraic accumulator I; the date may also be printed simultaneously with the said item. The paper carriage then moves into the next column and the item 84 is inserted and subtracted from the algebraic accumulator I. The accumulator has been automatically shifted by the carriage movement to subtraction and after the next carriage escapement, the difference 53 is printed in the column "Consumption". In this column, the first four studs 34 are under the control rods 68 to 71 or 104; since, however, only control rod 68 is depressed, the accumulator 1 is actuated. During the addition, the item 53 is transferred to the accumulator 1 and the algebraic accumulator I is then again at zero. The paper carriage now moves into the column "Amount" and the algebraic accumulator II and accumulator 2 are operated, the algebraic accumulator II by the stud 56 and the accumulator 2 by the stud 34 which is in the second row of holes of the stud carrier owing to this stud being depressed by the control rod 68 during the escapement of the carriage. In the column "Amount" the item 7, 95 is now printed which is therefore simultaneously received by the algebraic accumulator II and by the accumulator 2. For the next columns, the algebraic accumulator II will always remain in operative position and cooperate therein with another accumulator. After the paper carriage is brought into the column "Basic or meter charge", the amount 1.00 is printed which is simultaneously received by the algebraic accumulator II and accumulator 3. The return key of the machine is struck whereby the paper carriage is automatically returned to the starting position and the platen undergoes a line spacing. During the return of the machine, the sheet has been shifted by the pawl 120 (Fig. 4) to the line "Water" and owing to the positive connection of the lever 96 with the platen, the index 107 now points to "Water". The control rod 69 is depressed by the rocking movement of the hand lever 96 and the control rod 68 is returned to normal position by its spring 74. The same procedure takes place as previously described and the same algebraic accumulators are used in the respective columns as heretofore. In the columns "Consumption" and "Amount" also "Basic and meter charge" the accumulators 4, 5 and 6 are used instead of 1, 2 and 3, because the former are actuated by the depressed control rod 69. When the last amount of the line "Water" is printed, the paper carriage is again returned and the platen is advanced one line. The control rod 70 is thereby depressed while the control rod 69 returns to normal position. The various items for lighting current are now inserted, of which those in the columns "Consumption", "Amount" also "Basic or meter charge" are received by the accumulators 7, 8 and 9, whose studs are actuated by the control rod 70. The paper carriage moves into the column "Lamps, flat rate" wherein the amount 2.50 is written which is received by the algebraic accumulators II as well as by the accumulator 13. The paper carriage now jumps into the column "Contact making clocks" wherein the amount 0.80 is printed which is also received by the algebraic accumulator II and by the accumulator 14. The studs 34 of the accumulators 13, 14 are actuated by the fixed controlling member 104. The paper carriage is now returned to the starting position and a line spacing is effected whereby the sheet is adjusted to "Power current". The hand lever 96 thereby undergoes a further rocking movement in the direction of the arrow, the control rod 71 is thereby depressed and the control rod 70 returns to normal position. In the same manner as before, the various numbers for "power current" are now entered. After the amount 2.00 appears in the column "Basic and meter charge", the paper carriage moves into the column "Payment by instalments" wherein the accumulator 15 is operated in addition to the algebraic accumulator II. The amount 5.00 is printed therein and the algebraic accumulator II now contains the total of all amounts which have been printed on the bill or account. This total is now printed in the column "Total amount" from the algebraic accumulator II and is simultaneously transferred to the accumulator 16. The algebraic accumulator II is thereby again set to zero. The accumulator 16 was brought into operative position as its stud 34 came under the fixed controlling member 104. While all amounts of the bill or account have been received by the algebraic accumulator II and the total is now in the accumulator 16, the accumulators 1, 4, 7 and 10 contain numbers 53, 73, 26, 53 of the column "Consumption".

All accounts are made out in the above described manner and when the work is done, the accumulators 1, 4, 7 and 10 contain the total amounts of the actual consumption of gas, water, lighting current and power current. The accumulators 2, 5, 8 and 11 contain the four totals of the amounts of these categories, the counting mechanisms 3, 6, 9 and 12 contain the four totals of the "basic and meter charges", the counting mechanisms 13, 14, 15 contain the actual totals for "lamps", "contact making clocks" and "payment by instalment" while the accumulator 16 contains the total of all amounts of the entire accounts or bills. These amounts are now printed on the ledger sheet, the setting of the counting mechanisms by the studs 34 having been made ineffective and the accumulators being selected by their keys.

If the machine is to be operated only in horizontal rows, the lever 96 is turned back so that the pawl 94 is disconnected owing to the inclined face 105 bearing against the pin 106. As already described, all four control rods 68, 69, 70 and 71 are thereby depressed so that all studs, which are inserted in the plates 60, 61, are actuated during the movement of the paper carriage.

The gist of the invention resides in the fact that owing to the accumulators being controlled in dependence on the shifting movement of the platen in connection with operations, as shown for example in Fig. 6, all the necessary counting mechanisms are automatically brought into operative position by the motion of the machine. The line spacing and the platen of the machine may also be connected directly to the counting mechanisms drum without departing from the inventive idea.

What I claim is:

1. A multiple counter calculating and registering machine comprising a rotatable drum and accumulators therein, a carriage and a platen on said carriage for feeding a writing sheet laterally and line by line in the vertical direction, and means controlled by the platen in its line by line movement of the writing sheet to selectively present the accumulators, in predetermined sequence, in operative position.

2. A multiple counter calculating and registering machine comprising a rotatable drum and accumulators therein, a carriage and a platen on said carriage for feeding a writing sheet laterally and line by line in the vertical direction, and means controlled in dependence of the line by line movement of the platen to selectively present the counting mechanisms, in predetermined sequence, in operative position, said means including a plurality of movable studs, and members operated during line by line movement of the platen to operatively position the studs in groups.

3. A multiple counter calculating and registering machine comprising a rotatable drum and accumulators therein, a carriage and a platen on said carriage for feeding a writing sheet laterally and line by line in the vertical direction, means controlled in dependence of the line by line movement of the platen to selectively present the counting mechanisms, in predetermined sequence, in operative position, said means including a plurality of movable studs, members operated during line by line movement of the writing sheet to operatively position the studs in groups, and members operated by said studs during the lateral feed of the carriage to control the positioning of the counting mechanisms.

4. A multiple counter calculating and registering machine comprising a rotatable drum and accumulators therein, a carriage and a platen on said carriage for feeding a writing sheet laterally and line by line in the vertical direction, means controlled in dependence of the line by line movement of the platen to selectively present the counting mechanisms, in predetermined sequence, in operative position, said means including a plurality of movable studs, and means operated, in part, during the line by line feed movement of the platen, and in part, during the lateral feed of the carriage to operatively position said studs.

5. A multiple counter calculating and registering machine comprising a rotatable drum and accumulators therein, a carriage and a platen on said carriage for feeding a writing sheet laterally and line by line in the vertical direction, means controlled in dependence of the line by line movement of the platen to selectively present the counting mechanisms, in predetermined sequence, in operative position, said means including a plurality of movable studs, means operated, in part, during the line by line feed movement of the platen, and in part, during the lateral feed of the carriage to operatively position said studs, and members operated by said studs to control the positioning of the counting mechanisms.

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