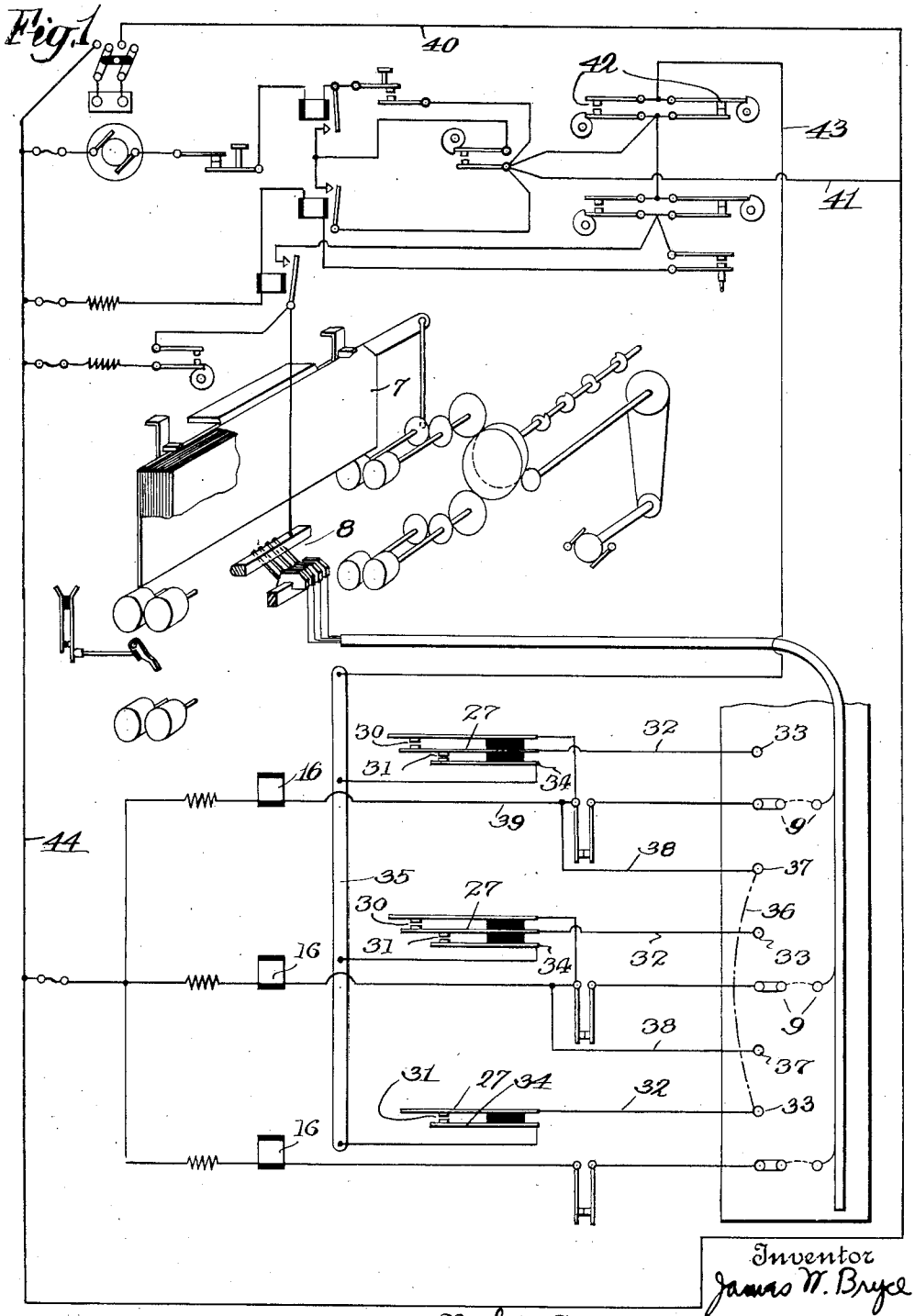
Aug. 6, 1929. J. W. BRYCE 1,723,499

TRANSFER DEVICE FOR ACCOUNTING MACHINES

Filed June 21, 1924 3 Sheets-Sheet 1

Fig. 1.



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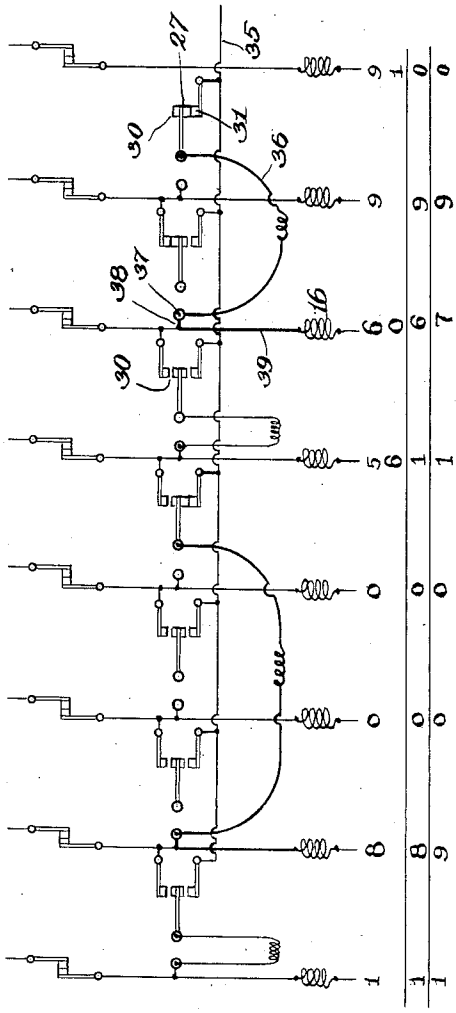


Fig. 2.

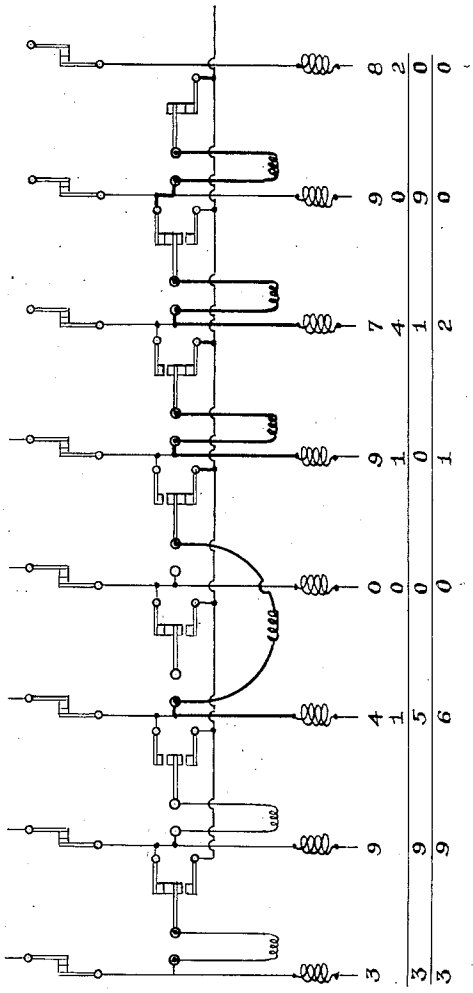


Fig. 3.

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Fig. 4.

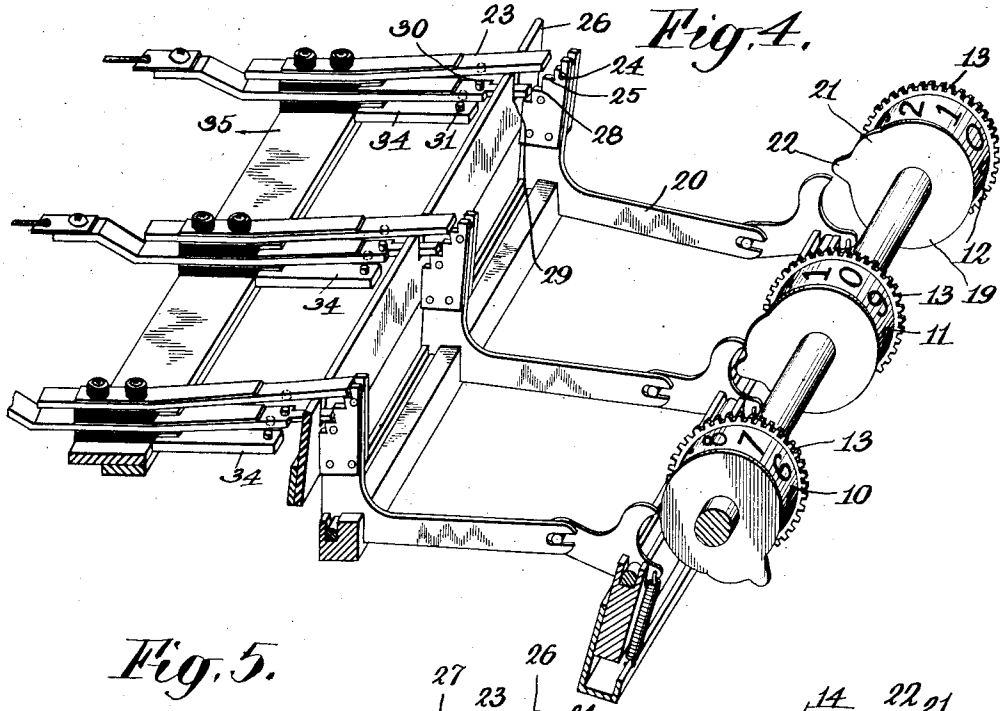
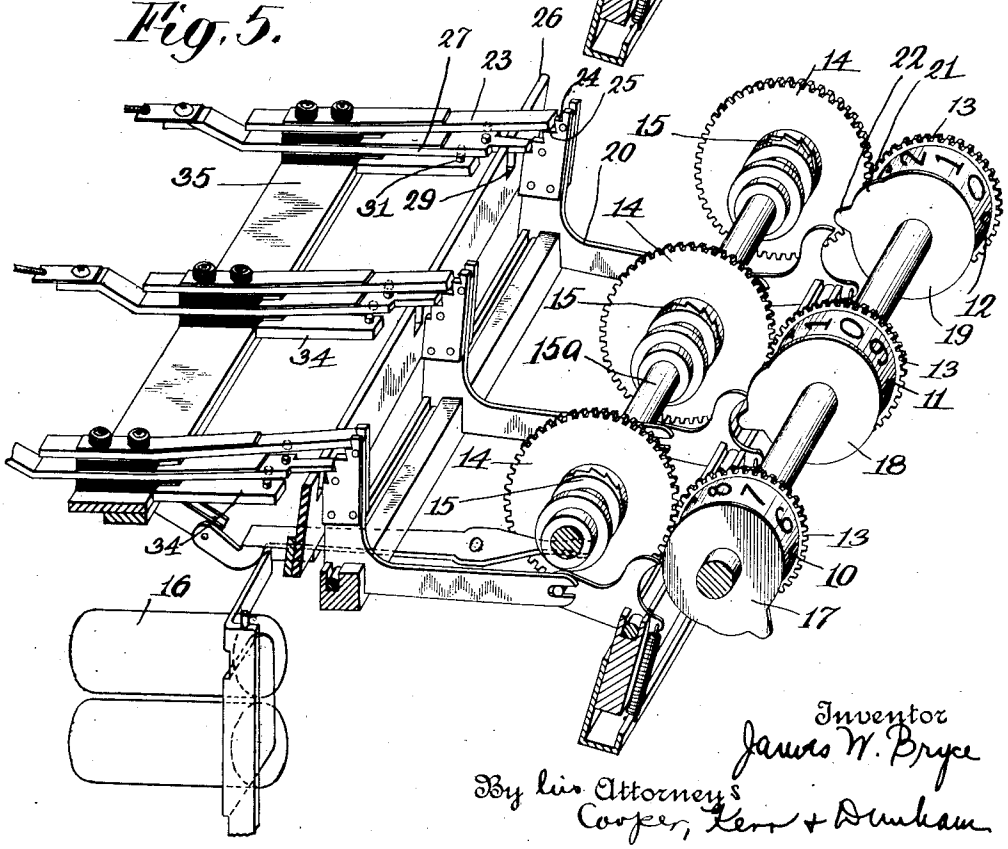


Fig. 5.



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UNITED STATES PATENT OFFICE.

JAMES W. BRYCE, OF BLOOMFIELD, NEW JERSEY, ASSIGNOR TO THE TABULATING MACHINE COMPANY, OF ENDICOTT, NEW YORK, A CORPORATION OF NEW JERSEY.

TRANSFER DEVICE FOR ACCOUNTING MACHINES.

Application filed June 21, 1924. Serial No. 721,504.

This invention relates to improvements in accumulator devices and more particularly to improvements in the transfer devices of accumulators.

Usually with accumulating devices it is the practice to have the transfer devices fixed in their general nature so that transferring operations always occur from a predetermined wheel or wheels to other wheel or wheels. With the usual decimal system transfers are arranged to occur from units to tens, tens to hundreds, and so on. Other systems of measure or count have corresponding methods of transfer but in all of them the machine once built always transfers in an identical manner.

In certain developments in the accounting and adding machine art it may be desirable to have the machine so arranged that transferring operations need not necessarily invariably occur from a given column to a predetermined other column but on the other hand the transferring operations may be desired to be effected from a given column to, say, any one of several other columns as selected by the operator. With previous machines such results could not be secured without rebuilding the transfer parts of the accumulating mechanism.

As an illustration of one use of the selective transfer, I may mention a card controlled printing tabulating machine having an accumulator which derives items from record cards and having printing devices for printing items and totals. In tabulating it is sometimes desirable to separate the recorded columns such as those showing the units and tens from the hundreds in order to set out a report in a clearer manner. This necessitates the omitting of adding and transferring into any given column on the accumulator but makes it necessary that provision be made for transferring amounts from higher orders, skipping one or more intermediate orders and entering the transferred items into a unit or wheel of still higher order. Assume that in an accounting apparatus such as one of the tabulating type there is an eight wheel accumulator. Normally if 5 column totals were entered into this accumulator the items would be entered in the 5 right hand wheels and a printed record derived therefrom would appear thus 19170 or if hyphens are used to represent unused accumulator columns from which no amount is printed the result would be represented thus – – – 19170. Suppose it be desired to set off and space the resulting record by utilizing the previously unused wheels of the accumulator and by omitting the entering of items and the deriving of the total amounts therefrom on columns where blank spacing is desired. Thus suppose it be desired to enter the items and show the total thus on an eight wheel accumulator—

19 – – 17 – 0

Now if this amount were derived from the addition of two items such as 18 – – 56 – 9
and – – – – 60 – 1
the proper total would be 19 – – 17 – 0

However, if the accumulator be of the fixed transfer type, this result would not be obtained as the ones derived from the transfer would spill over into the adjacent unused columns of the accumulator and would be lost in printing the total. Thus the erroneous calculation would be as shown below—

Item—	18 – – 56 – 9
Item—	– – 60 – 1
Erroneous result	18 – – 16 – 0

Here the one derived from the transfer on the units column has spilled over to the normal tens column of the accumulator from which no total record is derived and the one from the transfer on the thousands column has gone to the ten thousands column from which no printed record is derived.

The present invention is directed to the provision of an apparatus for handling calculations such as above outlined and provides means for securing the transferring operation into any desired column which may or may not be adjacent.

Other examples of use of my invention may be given but one only need be here mentioned. In an ordinary adding machine having keys for entering the items it may be desired to only use the key captions which are remotely spaced from each other. This may be desirable due to the particular coloring of the key caps. It may, however, be desired to effect transfers from non-adjacent accumulator columns into higher order columns on which items are entered from other non-adjacent keys. With an ordinary adding machine even though it employ the well known

split devices such a result could not be obtained inasmuch as the transferred items would be lost since they would only go, due to the inherent character of transfer construction of the machine, to wheels of normally the next higher order.

It will be understood that broadly the invention is not limited to any such specific use but that it may be utilized in accumulating apparatus of any sort and for any purpose where a so-called tied-up transfer device is not desirable.

Further objects and advantages of the present invention resides in the provision of means for permitting the transferring of items in an accumulator or the like from selected orders to other selected orders as desired.

Further objects of the present invention reside in the provision of simple means for selectively coupling the columns from and to which transfers are to take place.

Other objects and advantages will be hereinafter pointed out in the accompanying specification and claims and shown in the drawings which by way of example portray a preferred embodiment of the invention.

In the drawings:

Fig. 1 is a circuit diagram of a tabulating machine embodying my invention.

Figs. 2 and 3 are circuit diagrams showing in conjunction therewith the additions and transfers which are being performed and illustrate the machine as adapted to various transferring operations.

Figs. 4 and 5 show in perspective the main elements of the accumulator with the associated transfer controlling devices.

The main circuit diagram shown in Fig. 1 requires no detailed description. In general it is the same as that of other tabulators which handle record cards and sense the readings thereof and add up items therefrom.

The record cards 7 are fed in the usual way past brush reading devices 8 which connect by suitable wires to the usual plugboard sockets. Suitable adjacent sockets are provided from which lines 9 lead to the units of the accumulator devices.

The accumulator may be of any desired type but more conveniently it is of the Hollerith class in which stationary wheels are clutched by magnetically controlled clutches at differential times, depending upon the perforations in the record cards.

As a convenient means of effecting the normal transferring operations in connection with adding I preferably utilize the mechanism shown and described in Lake Patents Nos. 1,307,740 and 1,372,965.

The latter patent discloses an electric transfer control which particularly lends itself to the incorporation therewith of my present improvements in which transferring operations may be selectively effected from one column to any of a plurality of other columns or from any of a plurality of columns or orders to a single other column or a plurality thereof as selected by the operator.

Counters of this type embody counter wheels such as are shown at 10, 11 and 12 in Figs. 4 and 5. Each counter wheel is provided with a gear 13 fixed thereto which meshes with clutch gears 14. Clutches 15 are provided for clutching the constantly rotating shaft 15^a with the gears 15. The engaging of these clutches for adding operation is effected by the energization of the usual counter magnets one of which is shown at 16 in Fig. 5. The means for disengaging the clutches at the proper times in the machine cycle is not herein illustrated as these parts are fully described in Lake Patents Nos. 1,307,740 and 1,372,965.

The invention will be explained in connection with the diagrammatic example shown in Fig. 2. It will be assumed that three wheels show the amount 699; that 1 is added to the units wheel; and that the operator desires to transfer from the units column to the hundreds column instead of to the tens column as is customary in ordinary addition. Thus the result will be the numeral 790 instead of 700 as with usual transfers.

On each of the respective adding wheels 10, 11 and 12, for controlling transferring operations there are transfer cams 17, 18 and 19. It will be assumed that the unit amount has been added into the units wheel 12. Transfer cam 19 has rocked the contact shift or trip lever 20 two steps forward corresponding to the two steps 21 and 22 on cam 19. The contact 23 has rocked off the upper step 24 and the intermediate step 25 and is held up by the insulated bail 26. Contact 27 has rocked off the intermediate step 28 and is now resting on the notch 29 in the bail 26. Contacts 30 and 31 are still open. Inasmuch as it is desired to step the transfer over the next adjacent adding column special selective plug connections are provided. As shown in the various diagrams a suitable connector (or wire 32 as shown in Fig. 1) connects each contact blade 27 with a plug socket 33 suitably disposed upon a plugboard which, if desired, may be the main plugboard of the tabulator. The lower fixed contact blades 34 which carry one of the contacts making up the contact pair 31, are all connected to a common wire or connecter 35 (see Fig. 1). Suitable removable plug wires or connectors 36 are provided, one of which in present operation is plugged between socket 33 and socket 37 which has connected to it a lead 38 extending to wire 39 which extends to the clutch or counter magnet 16 pertaining to the hundredths adding wheel 10. It will be understood that suitable transfer plugging sockets 33 are provided upon each column and corresponding sockets 37 are also

provided so that by merely plugging up the plug connections 36 as desired the transfer can be arranged to take place to any desired column as selected by the operator.

The next step in the operation is shown in Fig. 5. In this figure the bail 26 has been lowered thereby permitting contacts 31 of the unit order wheel 12 to close. Current then flows at the proper time in the machine cycle from the line 40 through wire 41, cam contacts 42 now closed, wire 43 to common wire or bar 35. Current thence flows through units contacts 31, blade 27, wire 32, plug socket 33, plug wire 36, plug socket 37, wires 38, 39 to magnet 16, and thence back by wire 44 to the other side of source 45. The magnet 16 remains energized long enough to engage the clutch 15 pertaining to hundredth wheel 10 and maintains the clutch engaged long enough to add one on the hundredth wheel 10. At the proper time after one is added the circuit 43 is broken by the contact combination 42 and the clutch is disengaged.

By referring to Fig. 2 it will be seen that the contacts 30 which pertain to the hundreds column are open. This condition prevents a transferring pulse to be transmitted through the plug connection 36 to the thousands wheel magnet. These contacts 30 are closed when a wheel reaches a nine position so that a transferring pulse is needed to the next higher order wheel.

Referring to Fig. 1 it will be seen that there is a corresponding transfer plug socket 37 for each magnet 16. Similarly there is a plug socket 33 for each column. If ordinary straight transfer from a lower decimal order to the next higher decimal order is desired the plug connection 36 instead of being disposed, as shown in Fig. 1, would be plugged from the lowermost socket 33 to plug socket 37 just above it and pertaining to the next decimal order. Similarly another plug connection would be employed between plug socket 33 pertaining to the next decimal order, i. e., from the second socket 33 from the bottom of the figure, and extending to and plugged into the socket 37 pertaining to the next higher order, i. e., this plug connection would extend to the point or socket marked 37 to which the present dotted line plug connection 36 extends. As clearly shown in Fig. 1 there is a complete absence of any fixed circuit connections from any socket 33 to the sockets 37 pertaining to the next higher order. Thus with all plug connections 36 omitted there would be no transferring operation performed inasmuch as there would be no circuit path to bring about the energizing of the magnet 16 of the next higher order. Transfer occurs only when a plug connection is employed and it takes place to and from the columns selected which are plugged up by the operator.

The circuit diagram.

Figs. 2 and 3 show various examples of addition with skipping of columns in the transferring operation, i. e., Fig. 2 shows units wheel transferring to hundreds, hundreds transferring in the normal way to thousands while the thousands wheel skips its transfer to the million wheel or column. Fig. 3 shows a different numerical example with thousands skipping the tens of thousands and transferring to hundreds of thousands.

The present invention is in part directed to the provision of an accumulating device with a transfer organization coordinated for selective diversion of transfer impulses or action as heretofore set forth. The printing devices which are adapted for coordinated use are not herein claimed nor illustrated. Such printing devices may be of a variety of types adapted to be split and the suppression of printing in unused columns may be effected in a variety of ways as by means of the hammer lock described in Lake Patent No. 1,501,001, dated July 8, 1924. The explanatory matter heretofore set forth related to intermediate hyphens upon the printed record has been merely here introduced for the sake of clarity in the disclosure to more vividly point out the distinctive reasons for the particular use of the accumulator and transfer herein claimed. The distinctive character of the record would also be obtained without employing intermediate hyphens, but their employment in a written description simplifies the explanation materially and they have been heretofore employed in the description for this reason.

What I claim is:—

1. A transfer device for an accumulating apparatus involving a plurality of orders of elements, means for suppressing the transferring operation upon any desired order of element and for selectively effecting said transfer into other elements.

2. A transfer device for an accumulating apparatus involving a plurality of elements and in which transfers are normally effected from an element to the next higher order element, means for suppressing transferring operations between a pair of adjacent elements of lowest and next higher order and for effecting such transfer from the one element of lower order to an element of higher order which differs from that order into which transfer has been suppressed.

3. In a device of the class described, in combination with a transferring means for an accumulator or the like embodying elements of a plurality of orders, with selectively manipulatable means with provisions for effecting transferring from a unit of one order to any of a plurality of other orders as selected by the operator.

4. In a device of the class described in combination with denominational order adding elements, transferring devices therefor, and means manipulable by hand operations for adjusting said devices so as to be controlled at the will of the operator by any one of a plurality of the adding elements.

5. In a device of the class described, in combination with denominational order adding elements, transferring devices therefor, and means for manipulatively adjusting said transferring devices to effect transfer to any of a plurality of said elements from a certain element of other order.

6. In an adding mechanism, in combination, means for transferring amounts to be carried over from order to order, and means for adjusting the transferring devices to effect transfers from any desired orders to any other desired orders.

7. In an adding mechanism, in combination, means for transferring amounts to be carried over from order to order, and means for adjusting the transferring devices to effect transfers from any single order to any of a plurality of other orders.

8. In an adding mechanism, in combination, means for transferring amounts to be carried over from order to order, and means for adjusting the transferring devices to effect transfers from any plurality of orders to any single order as desired.

9. In an adding mechanism, in combination, means for transferring amounts to be carried over from order to order, and means for adjusting said transferring means for effecting transfer into another higher order than the next higher order to which the transferred item would normally be transferred.

10. In an adding mechanism, in combination, transfer devices for transferring amounts to be carried over from lower to higher orders, and means for adjusting said transfer devices to effect a transfer of an item into any one of plurality of higher orders as desired.

11. In a device of the class described, in combination with adding devices having electrical transfer devices therefor, and means for selectively associating said transferring devices with the elements of the adding devices with which they are to cooperate, said means including provisions for variously selectively diverting the transfer impulses in variable and selective paths to provide permissive variability of the transfer action between various selected adding elements.

12. In an adding device having elements of various denominational orders which initiate a transfer action from some elements and which receive a transfer upon other elements, electrical transferring devices therefor, and means for selectively associating said transfer devices with the various different elements from which a transfer initiation is to come to provide for selective transfer action by the selective association of the transfer devices with the elements from which transfer is initiated.

13. In an adding device having elements of various denominational orders, certain of which elements initiate a transfer action and other of which elements receive a transfer, electrical transferring devices, and means for selectively associating said transfer devices with the various different elements to which the transfer is to go to provide for selective transfer action among the different elements by selectively controlling the destination of the transfer impulses from the said devices.

14. The invention set forth in claim 12 in which the means for selectively associating the transfer devices and adding elements comprise electric plugging connections which are selectively adjustable to associate the transfer devices with selected elements from which a transfer initiation is to come.

15. The invention set forth in claim 13 in which means for selectively associating the transfer devices and adding devices comprise electric plugging connections which by their selective associations with the adding elements to which the transfer impulse is to go, selectively determine the destination of said transfer impulses.

In testimony whereof I hereto affix my signature.

JAMES W. BRYCE.