April 11, 1950 W. T. GOLLWITZER 2,503,906

PRINTING MACHINE

Filed June 19, 1946 6 Sheets-Sheet 1

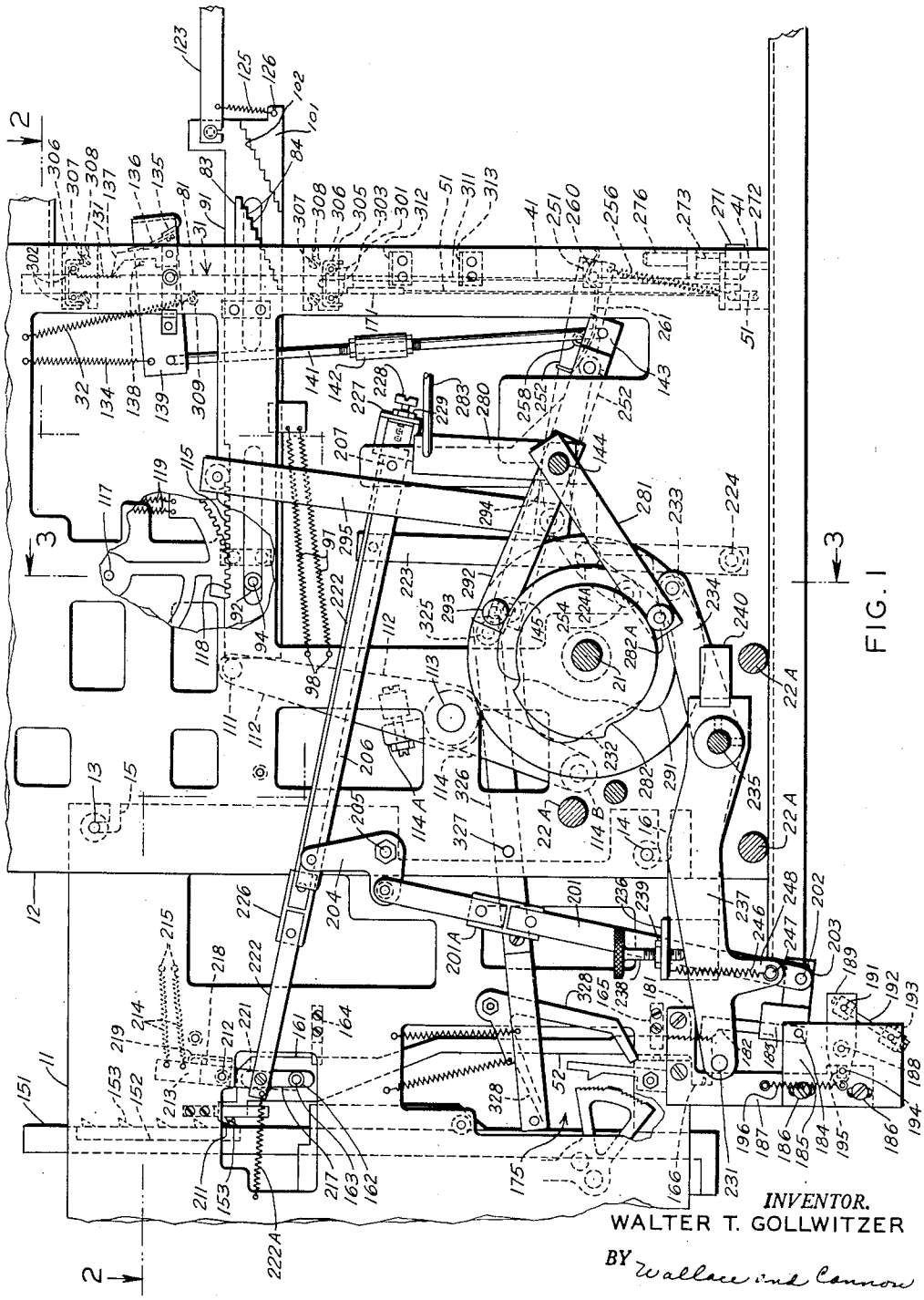


FIG. 1

INVENTOR.
WALTER T. GOLLWITZER
BY Wallace and Cannon
ATTORNEYS

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PRINTING MACHINE

Filed June 19, 1946 6 Sheets-Sheet 2

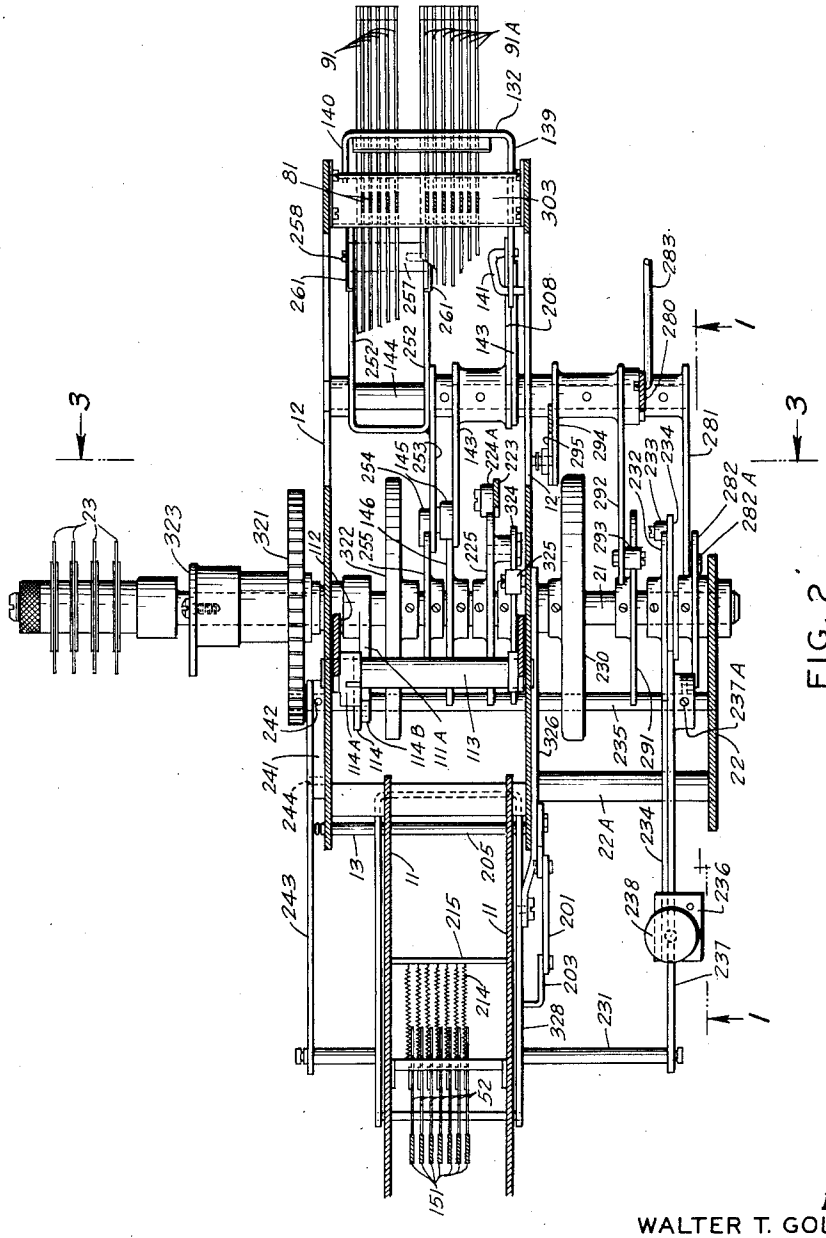


FIG. 2

INVENTOR.
WALTER T. GOLLWITZER
BY Wallace and Cannon
ATTORNEYS

April 11, 1950 W. T. GOLLWITZER 2,503,906

PRINTING MACHINE

Filed June 19, 1946 6 Sheets-Sheet 3

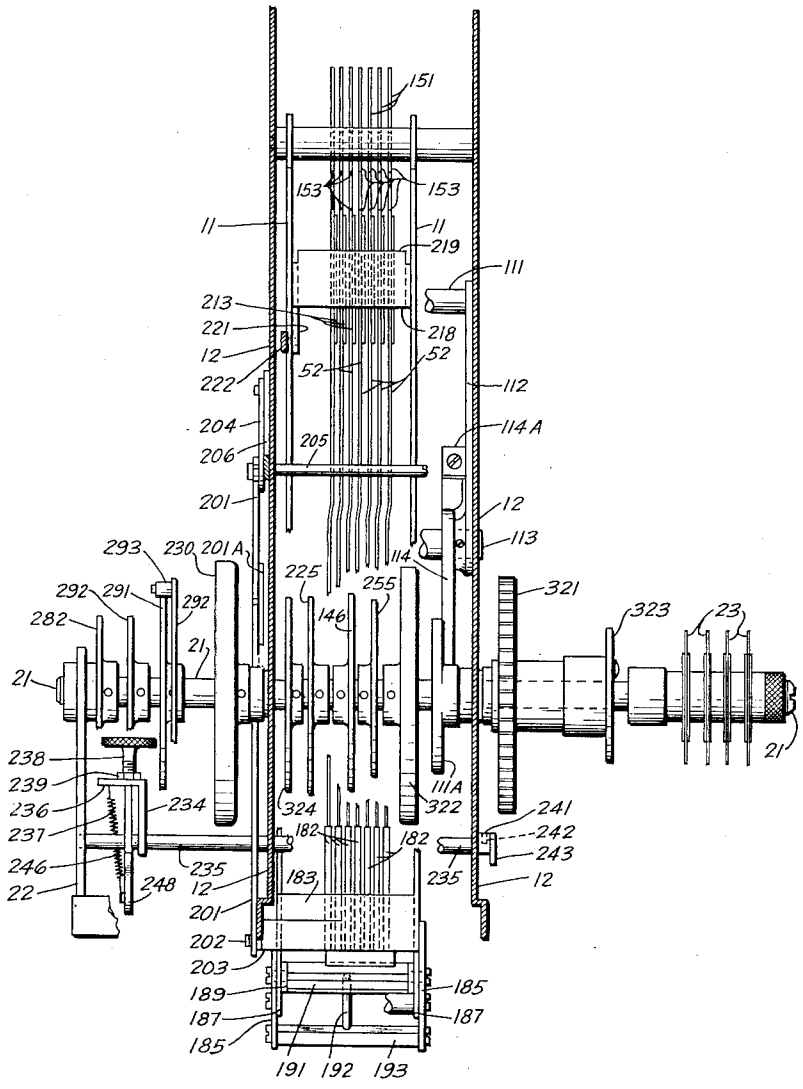


FIG. 3

INVENTOR.
WALTER T. GOLLWITZER
BY Wallace and Cannon
ATTORNEYS

April 11, 1950 W. T. GOLLWITZER 2,503,906

PRINTING MACHINE

Filed June 19, 1946 6 Sheets-Sheet 4

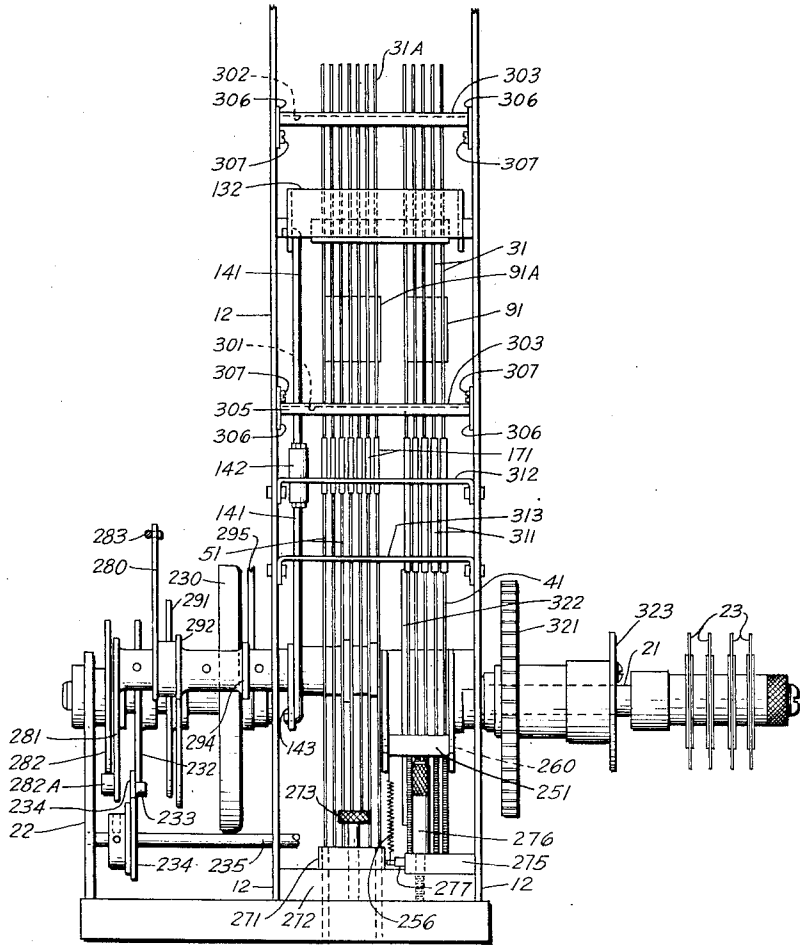


FIG. 4

INVENTOR.
WALTER T. GOLLWITZER
BY Wallace and Cannon

ATTORNEYS

April 11, 1950 W. T. GOLLWITZER 2,503,906

PRINTING MACHINE

Filed June 19, 1946 6 Sheets-Sheet 5

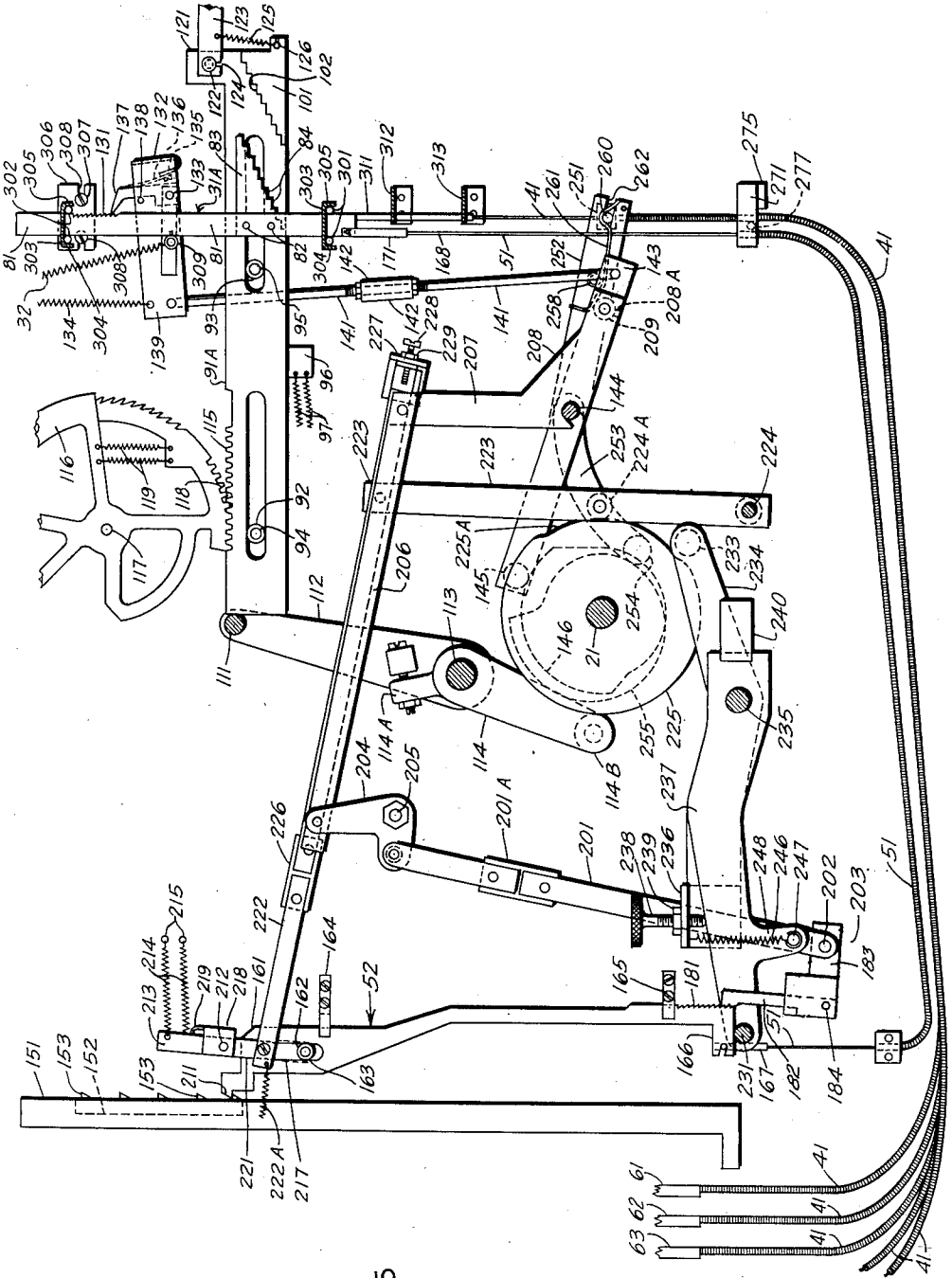


FIG. 5

INVENTOR.
WALTER T. GOLLWITZER
BY Wallace and Cannon

ATTORNEYS

April 11, 1950 W. T. GOLLWITZER 2,503,906

PRINTING MACHINE

Filed June 19, 1946 6 Sheets-Sheet 6

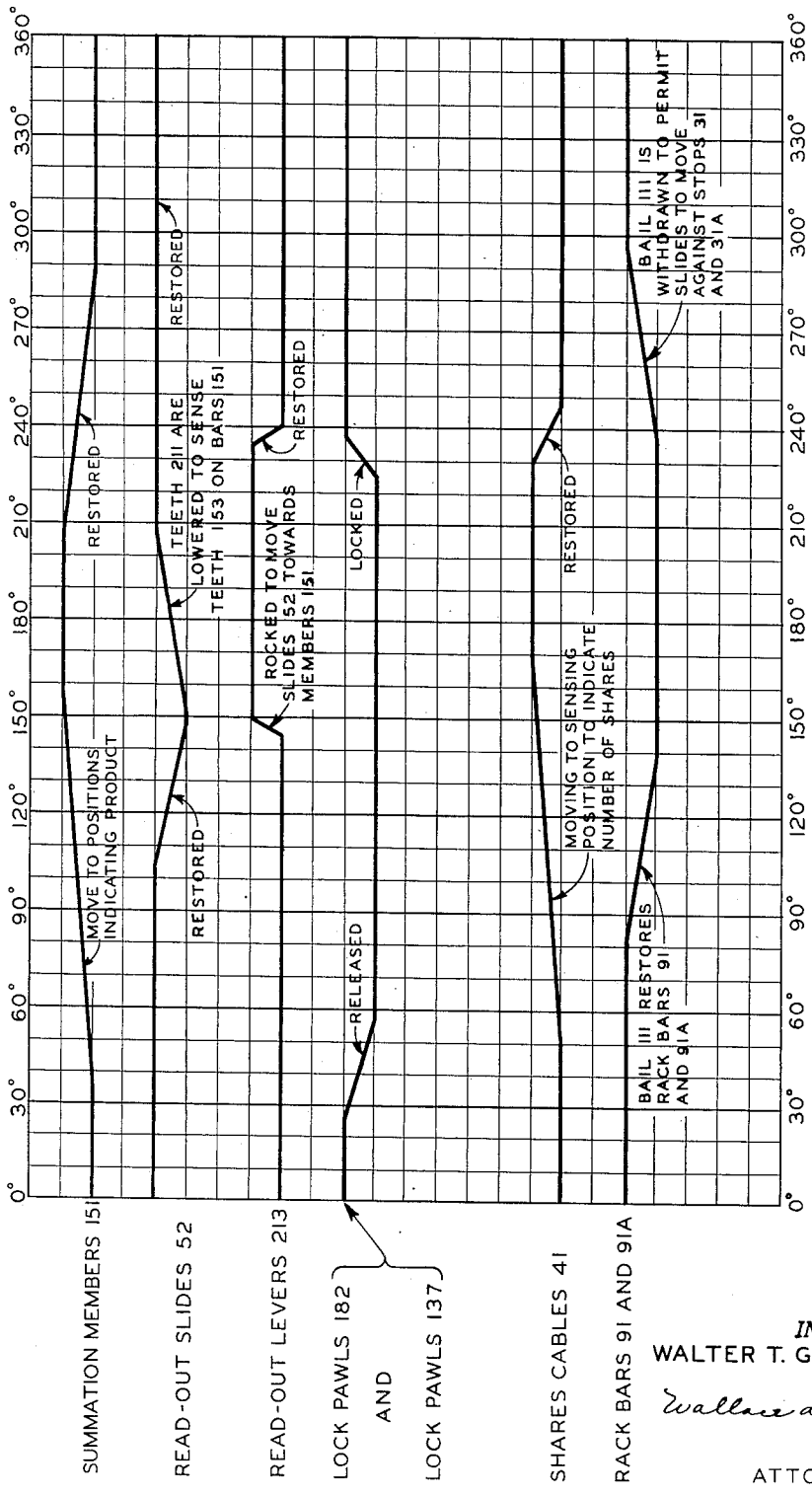


FIG. 6

INVENTOR.
WALTER T. GOLLWITZER
Wallace and Cannon
ATTORNEYS

Patented Apr. 11, 1950

2,503,906

UNITED STATES PATENT OFFICE

2,503,906

PRINTING MACHINE

Walter T. Gollwitzer, Euclid, Ohio, assignor to Addressograph-Multigraph Corporation, Wilmington, Del., a corporation of Delaware

Application June 19, 1946, Serial No. 677,798

2 Claims. (Cl. 235—60.33)

1

This invention pertains to a printing machine and particularly to the type of printing machine adapted for use in the preparation of business instruments where computing operations and the like are involved. More particularly, the present invention pertains to a read-out mechanism in a printing machine, that is mechanism for reading out data from computing mechanism and the like and for transferring such data to movable members for setting up variable printing elements and/or accumulating devices and the like.

A machine of the general character referred to above is disclosed in detail in my copending application Serial No. 416,745, filed October 27, 1941, now Patent No. 2,427,049. The present invention relates only to certain aspects of such machine and will be described in part by reference to the disclosure of said copending application. The present invention involves means for reading out data at certain points in the apparatus of said copending application and transferring it to other points in said apparatus. It replaces and is an improvement upon certain transfer mechanism disclosed in said copending application.

Printing apparatus of the character to which the present invention pertains is particularly suited for use with selective printing and control devices of a type well known in the art. Such devices commonly comprise a light framework carrying a printing element, such as an embossed printing plate or equivalent which changes with each device, and a control element or area which also varies from one device to another and which serves to perform certain control functions in the printing machine. Data carried by the printing element may be a name and address, and other identifying data if desired, a printing and control device usually being provided for each customer, subscriber, stockholder or the like. The control element or area mentioned above may comprise indicia such as perforations or protuberances in or on a sheet, plate or the like which may be sensed by appropriate means to control operations which lead to the setting up of variable printing wheels, accumulator wheels and the like.

As described in the aforesaid copending application a particular application of the apparatus described therein, and the apparatus to which the present invention relates, has to do with the preparation of business instruments such as dividend checks which are issued periodically to stockholders of corporations. In corporations having large numbers of stockholders, a large

2

amount of work is involved in computing dividends for the various stockholders, preparing checks in payment of such dividends and maintaining proper records of payments made. The present invention will be described in connection with such an application although it will be understood that such invention is not limited thereto.

In the machine to which the present invention relates a series of printing and control devices of the character mentioned above are passed sequentially through the machine in timed relation with sheets such as blank checks to be printed by and under the control of such printing and control devices. In this case the printing and control device comprises a printing member carrying a name and address and a control element comprising a group of perforations arranged according to a predetermined code to represent the number of shares held by the stockholder. As such printing and control devices are passed through the machine impressions are taken from the printing members embodied therein directly onto sheets such as blank checks, and the control elements of such devices are sensed to initiate the setting up of variable printing elements to print numerical data on the check blanks. As described in the aforesaid copending application, the variatble data printed may include both the number of shares and the amount of the check computed by multiplying the number of shares by a factor which is the dividend rate.

In order to accomplish the foregoing, the control element of a printing and control device is sensed to read out therefrom the number of shares represented by the coded indicia. If this number of shares is to be printed, suitable connecting means are provided between the primary sensing means which sense the data on the control element and suitable printing elements. For computing the amount of the check the same data are read into computing mechanism, as described in the aforesaid copending application, and the results of a computing operation which takes place in such mechanism are read out and transferred to movable members which are effective to set up appropriate printing elements such as variable printing wheels.

In order to transfer data, such as the number of shares, from a primary sensing means, and in order to transfer a numerical quantity, such as an amount of money, from a computing mechanism it is necessary that reliable and positively acting elements be employed. Since the parts which are used in such apparatus are necessarily

numerous and since available space is relatively small, it is not practicable to use rigid or heavy linkage. However, the magnitude of movements involved in representing numerical data is of a low order, generally, due to the fact that a large number of positions must be assumed by each movable member to represent a range of values, hence there is little operating tolerance for the parts which communicate data from such mechanism to printing, accumulating, and recording elements. It is therefore essential that the operating parts of a read-out mechanism, of the character to which the present invention pertains, be both light and small in size and at the same time be highly accurate and positive in operation.

Accordingly it is an object of my invention to read-out data from one point in the machine and transfer it to another point to initiate the setting up of data representing members by the use of light and positively operating elements.

A further object is to take direct readings of movable members which represent numerical quantities by their selective positions and to transfer such direct readings through simple and direct means to other movable elements for controlling the setting up of printing members and/or other recording devices.

Another object of my invention is to accomplish the foregoing by using a simple organization and a minimum quantity of mechanical parts.

A still further object of my invention is to read out data from a computing mechanism and to move variable printing elements selectively under the control of such data by means which operate under control of a single cam shaft.

Still another object of my invention is to take a direct reading from movable bars, which represent the result of a computation by their position, and to transfer such reading directly to stop members which are correspondingly positioned to limit the movement of control devices for printing members and accumulator elements.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show a preferred embodiment and the principle thereof and what I now consider to be the best mode in which I have contemplated applying that principle. Other embodiments of the invention embodying the same or equivalent principle may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings,

Fig. 1 is a front elevational view of the read-out mechanism which comprises the present invention, certain parts being broken away and other parts being shown in section, this view being taken substantially along the line 1—1 of Fig. 2;

Fig. 2 is a horizontal sectional view of the mechanism shown in Fig. 1, taken substantially along the line 2—2 of Fig. 1, certain parts being omitted or broken away for clarity of disclosure;

Fig. 3 is a vertical sectional view taken substantially on the line 3—3 of Figs. 1 and 2;

Fig. 4 is an elevational view taken looking from the right in Fig. 1;

Fig. 5 is a diagrammatic view showing certain operating elements of the read-out mechanism; and

Fig. 6 is a timing diagram showing the order in which the various operations occur.

The mechanism shown in Fig. 1 includes certain elements of the machine described in the aforesaid copending application Serial No. 416,745. Thus at the left in Fig. 1, there are shown certain frame elements 11 which house a multiplying or computing mechanism not shown herein but described in detail in said copending application. The frame members 11 are also utilized in the present machine to support certain operating elements as will be more fully described hereinafter.

To the right of the frame members 11, as seen in Fig. 1, there are provided another pair of frame members 12 to which the frame members 11 are secured in an appropriate manner. The frame members 12 are provided with spacing pins or rods 13 and 14 which are adapted to be received in slots 15 and 16 respectively of the frame members 11. As will be seen by referring to Fig. 2, the frame members 11 are not as widely separated as are the frame members 12 and the pins or rods 13 and 14 support the frame members 11 at intermediate points.

A cam shaft 21 is supported in suitable bearings in the frame members 12 and it extends a substantial distance both to the front and to the rear of such frame members as best shown in Fig. 3. That part of the shaft 21 which extends forwardly carries certain cam members which will be referred to in further detail hereinafter, and the forward end of the shaft is supported in an outboard frame member 22 as shown in Figs. 2 and 3. Bolts or rods 22A secure member 22 to front frame member 12. The rear end of the shaft 21 carries certain commutator elements 23 which form no part of the present invention, similar parts being described in the aforesaid copending application.

The cam shaft 21 bears a number of cams which operate various levers at predetermined times to control the mechanism which reads out numerical data from apparatus at the left, as seen in Fig. 1, and transfers such data to a group of rack bar stop members 31 and 31A shown in the right-hand portion of Fig. 1. These will be described in detail hereinbelow.

In the particular machine to which this present invention pertains it is desirable to print and accumulate numerical data relating to two different subjects, for example, the number of shares held by each stockholder and the amount of dividends paid to each stockholder. These separate sets of data are read out and transferred by separate mechanisms both of which are embraced in the present invention. As best shown in Fig. 5, a group of five Bowden cables, which may be referred to collectively hereinafter as shares cables 41, extend from the left, where they are attached to elements of a primary sensing mechanism, to the right where they control the movement of a group of rack bar stops 31 mentioned above. The five members 31 are shown at the right in Fig. 4. These may be referred to as the share stop members or the stop members for the share rack slide bars.

Another group of seven Bowden cables, indicated generally at 51, Fig. 5, leads from a group of seven sensing or read-out slides 52 shown at the left in Figs. 1 and 5 to the group of seven rack bar stops 31A. These seven rack bar stops 31A are shown at the left in Fig. 4 and since they control the setting up of printing elements for printing the amount of money due or paid to each stockholder they may be referred to hereafter as "money" stop bars. Likewise the cables

51 which lead to them are referred to as "money" cables and similar terms are applied to various operating elements connected therewith.

The general operation of the apparatus will first be described by reference to Fig. 5 and thereafter a detailed description will be given.

The shares cables 41 are Bowden cables which have their armored sheaths anchored in a block 251 and which have their left ends, Fig. 5, abutting against sliding elements 61, 62 and 63. Two other sliding elements, not shown, are provided for the two cables at the extreme left in Fig. 5, their construction being identical with the slide bars 61 to 63 just mentioned. By means not necessary to describe herein but shown in the aforesaid copending application, the bars 61, 62 and 63 are moved longitudinally in response to the numerical data sensed on each printing and control device as it passes through the machine. Hence these slides represent the number of shares held by each stockholder as indicated on the printing and control device bearing that stockholder's name and address. Through the Bowden cables 41 the number of shares held by each stockholder is thus transferred to mechanism at the right, as seen in Fig. 5, to movable members comprising the slidable share bar stops 31, and these stops move to a position to control horizontal sliding movement of a group of rack slide bars 91.

The stops 31 each comprise a vertically slidable bar 81 to which is attached as by rivets 82, or the like, a stop plate 83 having a series of rectangular shoulders 84 on the lower right edge thereof.

A series of rack bar slides 91 and 91A are mounted for horizontal sliding movement on a pair of rollers 92 and 93 supported on shafts 94 and 95 respectively. The shafts 94 and 95 are suitably mounted in the frame members 12 and there are as many rack bars 91 and 91A, respectively, as there are stops 31 and 31A. Bars 91 relate to "shares" and bars 91A relate to "money."

Each of the rack slide bars 91 or 91A carries a depending lug 96 to which is attached a coil spring 97. The opposite end of each coil spring 97 is attached to one or the other of two transverse rods 98 extending between the side frame members 12, the springs 97 being staggered or alternated, as shown in Fig. 1, so as to permit close spacing of the rack bars 91. Thus for reading out the number of shares held by a customer, the Bowden cables 41, actuated by the slide bars 61, 62, and 63, etc., move the sliding stops 31 comprising shouldered members 83 into the path of other shouldered elements 101 carried by each of the rack slide bars 91. Likewise stops 31A are positioned to locate the "money" rack slide bars 91A. Vertical shoulders 102, arranged in stair-step relation, determine the extent to which the rack slide bars 91 or 91A may move to the left, as seen in Figs. 1 and 5 under influence of springs 97.

A bail member 111, connected by a pair of arms 112 keyed to a shaft 113 extending between the frames 12, moves the rack bars to the right, as seen in Fig. 5, against the force of springs 97 at certain intervals and at other intervals is withdrawn to the left to permit the springs 97 to draw the rack bars 91, 91A toward the left until the stop members 101 contact the opposing stop members 83 carried by the sliding stops 31 or 31A. An operating arm 114 is pivoted on shaft 113 and has its upper end adjustably connected to one of the arms 12, as indicated at 114A. The lower end of arm 114 is actuated by a cam 111A on shaft 21 as described hereinafter. A cam follower 114B is carried on the lower end of arm 114. By these means the rack slide bars 91 and 91A are selectively positioned to represent numerical quantities corresponding to those represented by the positions of the slides 61, 62, etc., and those represented by other read-out elements to be described hereinbelow.

Each rack bar 91 or 91A has a rack portion 115 formed on its upper edge, near the left end thereof as seen in Figs.1 and 5. A series of variable printing sectors 116 are carried by a shaft 117 mounted in the side frame members 12. An arcuate rack member 118 is assembled with each of the printing sectors 116 in a manner described in the aforesaid copending application, tension springs 119 serving normally to cause these two members to be rotated together. The rack member 118 meshes with the rack 115 on each rack bar 91 or 91A so that each rack bar is effective to position one of the printing members 116 as it is moved to position abutting the stop member 31. The particular construction and operation of the printing mechanism forms no part of the present invention.

At their outer ends, to the right as seen in Figs. 1 and 5, the rack bars 91 and 91A each carry an upwardly extending ear or lug 121. Each ear 121 is provided with a headed stud or rivet 122. The left end of a connecting link 123 is provided with a notch 124 in its lower edge which sets over the shank of the rivet 122, thus being detachably connected for sliding movement with the rack bar 91. A tension spring 125 extends between the link 123 and an ear 126 on the lower edge portion of the right end of each bar. This spring is readily detachable from the ear 126 and tends to keep the link 123 engaged with the stud 122. The link 123 extends to the right as seen in Figs. 1 and 5 to connect with accumulator operating slides, not shown herein, in a manner described in detail in my aforesaid copending application. By disconnecting the link 123 from the stud 122, the accumulator operating mechanism may be separated from the rack bars 91 and 91A, as also described in my aforesaid application.

Each of the vertical bar portions 81 of the stop members 31 or 31A is provided on its outer or right edge as seen in Figs. 1 and 5 with a series of teeth 131. A U-shaped bar or bail member 132 is pivotally supported in frame members 12 on a pin extending between such members as indicated at 133, a tension spring 134 being secured to the left end of this member as seen in Figs. 1 and 5 to rock it clockwise. The member 132 incorporates an upturned flange element 135 to which is secured a comb spring 136. A series of pawls 137 are assembled on the pin 133 which serves as a pivotal support for the member 132. One pawl 137 is positioned opposite each bar 81 and is urged toward it by a finger of comb spring 136. A rod 138 extends transversely between the two arms 139 and 140 of member 132, these arms constituting the sides of said member 132, and rod 138 serves as a bail to lift the pawls away from the teeth 131 when the member 132 is rocked clockwise about pivot pin 133.

A link 141, provided with a longitudinal adjustment 142, extends from the left end of the member 132 downwardly to connect to a lever 143 pivoted on a shaft 144 mounted in the frame members 12. The lever 143 carries a cam follower 145 at its opposite end which is adapted to coop-

erate with a cam 146 carried by the cam shaft 21. Hence at appropriate intervals the bail member 132 is rocked clockwise to release the sliding stop members 31 and 31A comprising vertically slidable bars 81 and at other times it is rocked counterclockwise so that the pawls 137 will hold the sliding bars 81 and associated stops in the position at which they have been set by reading-out mechanism. This position depends upon the movement imparted to such bars through their respective Bowden cables 41 and 51. Through the mechanism just described, the slides or rack bars 91 and 91A are selectively positioned as indicated above, the group of five "shares" bars being effective to set up printing members and accumulating elements representing the number of shares corresponding to each printing and control device passed through the machine. The seven "money" bars set up printing members and accumulating elements to print and accumulate sums of money representing dividends.

The manner in which elements operated by the money cables 51 are effective to set up printing elements and accumulator elements to represent the output of the computing mechanism will next be described.

The computing mechanism per se is not shown herein but its output is represented by movement longitudinally of a series of seven slides or summation bars 151 shown at the left in Figs. 1 and 5. These slides are moved downwardly various distances, depending upon the digit to be represented. Subsequently they are returned, by means not shown herein, to their zero positions.

The operation of the computing mechanism may involve, for each order of the final product, a number larger than nine, that is a units representation and a tens representation, and therefore each of the slides 151 must be capable of moving through a distance representative of more than ten digits. The mechanism to which this invention relates, as more particularly described in the aforesaid copending application, and as described in still further detail in my Patent No. 2,296,277, patented September 22, 1942, is adapted to record up to a five digit number of shares and to multiply such a number by a five digit number to produce a result having as many as ten digits of which not more than seven digits are to be printed. In other words, each of the factors to be multiplied may have as many as five digits, that is, the number of shares which can be recorded may be as great as 99,999. Since the multiplication of a five order number by another five order number involves the addition of five partial products, plus a carry over, there may be as many as 49 numbers in addition to zero for each digit of the final product, as more fully explained in the aforesaid patent and copending application. Hence the movement to be imparted to any of the slides 151 may involve movement to as many as fifty different stop positions.

Accordingly, each of the slides 151 is provided with a plate 152 mounted on the side thereof near its upper end and secured as by spot welding, riveting or the like. The plate 152 has five shoulders or teeth 153 thereon, the spacing between adjacent teeth being representative of ten increments corresponding to ten different digits. In other words movement of the slide from one of the teeth 153 to the next one represents a change of ten consecutive numbers in the amount represented thereby, and the five teeth 153, with the spaces therebetween, represent a total of fifty positions.

For each of the slide members 151 there is provided a sensing or read-out slide 52, mentioned above, which comprises a long bar having a wide top portion 161 mounted for limited vertical sliding movement on a roller 162, each roller being carried by a pin 163 mounted in a manner to be described presently. A slot 217 in each element 161 receives the roller 162. The right edge of each of the slides 52, as seen in Figs. 1 and 5, is guided in a slot provided in a block member 164 near its upper end, a similar guide member 165 being provided near its lower end. At its lower end each of the slides 52 has a foot portion 166 to which is attached a clevis 167 having secured thereto the end of a Bowden cable 51, mentioned above, connection being to the inner or movable cable part of each of the group of "money" cables 51. Hence vertical movement of the slide 52 is effective to move the Bowden cables 51 and through these cables to move the stop members 31A. The group of seven stop members 31A are connected at their lower ends to clevises 171 secured to the Bowden cables 51 in the same manner that the clevises 167 are secured to bars 52.

The sensing or read-out slides 52 are capable of movement only through a sufficient distance to represent the digits from zero to nine. Hence, they are effective only to measure the displacement of one of the teeth 153 from a given fixed point, without distinguishing one tooth from another. Means described more fully in my aforesaid copending application and in Patent No. 2,296,277, aforesaid, are provided for carrying the tens digits of numbers greater than nine on any slide 151 into the slide 151 of the next higher order, a carry operation taking place when each or any of the teeth 152 passes a given point in the positioning of the slide 151. For example, movement of a slide 151 to a distance such that the read-out slide is opposite the point between the second and the third tooth 153 might represent a number such as "27." Movement of a slide 151 to carry two teeth past the reference point is effective to transfer the "2" to the slide 151 representing the next higher order in the final product, through the carry mechanism just mentioned. Hence the sensing or read-out slide senses only the digit "7." This carry mechanism is shown generally at 175, Fig. 1, but since it constitutes no part of the present invention, it is not described in detail herein. There are ten summation bars 151 but only the seven of highest order are opposed by sensing bars 52. The reason for this is that dividend rates are sometimes four or five place decimal fractions and the lowest three orders would represent small decimal fractions of a cent which need not be recorded.

The exact extent to which the read out slide 52 is moved before contacting a tooth 153 on bar 151 determines the digit which will be represented ultimately on the printing elements 116, because movement of bar 52 controls the positioning of the stop element 31A which indirectly determines the position of printing members. In order to retain the parts in position while printing is being accomplished, meanwhile permitting the bars 151 to be restored to zero positions for another computing operation, the slides 52 are each provided on their right lower edge portions, as seen in Fig. 5, with a series of teeth 181. A series of locking pawls 182 are carried by a bail member 183 pivoted on a transverse rod 184 mounted in the side frames 185 of an adjustable auxiliary frame assembly, one pawl 182 being opposite each slide 52. This assembly, as shown in the lower left hand part of Fig. 1, comprises the two plates 185,

adjustably secured by screws 186 to a rigid frame element 187. A transverse pin or shaft 188 extends between the frame members or plates 185 and a U-shaped bracket 189 is pivotally mounted on such pin. A pin 191 extends between the side arms of bracket 189, this pin being enlarged and substantially square in cross section and being drilled and tapped to receive the upper end of an adjusting screw 192. The head of this adjusting screw abuts against the lower surface of a square pin 193 through which the screw 192 passes. The left ends of the arms of bracket 189 carry a pin 194 which engages a pair of notches 195 in the fixed frame element 187. A spring 196 tends to raise the sub-frame assembly 185 with respect to the fixed frame member 187. By adjustment of the screw 192 the bracket 189 may be rocked to raise or lower the sub-frame assembly and thereby to raise or lower the locking members 182. This provides for accurate positioning of the locking members with respect to the teeth 181 on the slides 52 so that they will correctly represent the numbers indicated by the summation slide bars 151 of the computing mechanism.

The locking members 182 are rocked to operative and inoperative positions, respectively, by movement of a link 201 pivotally secured, as indicated at 202, to an extension 203 of the bail member 183. The link 201 is adjustable in length, as indicated at 201A, and is moved upwardly or downwardly at intervals by a bell crank 204 pivotally secured to one of the frame members 12 at 205. Another link 206, secured to the upstanding arm of the bell crank 204, is adapted to be operated by the vertical arm of a two armed lever 207 to which its opposite end is attached. The lever 207 is pivoted on shaft 144, its other arm 208 being notched at 208A to fit over a stud 209 carried by the lever 143. Hence lever 143 operates lever 207 at certain times.

The operation of the mechanism just described is as follows. After each of the slides 151 has assumed a position determined by the computing mechanism, its position is sensed by sliding movement of the opposing read-out slide 52 to contact one of the teeth 153 on silde 151. Movement of the slide 52 imparts corresponding movement to the corresponding rack bar stop 31A through the Bowden cable 168 and associated parts. After this movement has been completed the lock pawls 182 are moved to cooperate with the teeth 181 on each of the read-out slides 52 which are thereby retained against further movement.

In order to permit the slides 151 to return to their zero positions while the read-out slides 52 are still locked by the means just described, means are provided for disengaging the upper ends of the slides 52 from the teeth 153. As best shown in Fig. 5, each of the slides 52 has a tooth portion 211 which, in the position shown in this figure, opposes a tooth 153 on slide 151. Contact between a tooth 211 and a tooth 153 determines the read-out position of each slide 52. Above each of the slides 52 a transverse pin or shaft 212 is secured between the side plates 11. On this shaft there are pivoted seven levers 213, one being opposite each of the slides 52. Each of the levers 213 has a coil spring 214 secured to the upper end thereof, the opposite ends of such springs being anchored to suitable rods 215. The springs are staggered to provide adequate space for them to move freely.

The lower end of each of the levers 213 carries the pin 163 and roller 162, previously mentioned. The roller 162 rides in the slot 217 in each of the slides 52. Hence the sliding bars 52 may move vertically without interference, their lateral position being controlled by the levers 213.

A U-shaped bar 218 is pivotally mounted on the same shaft 212 that carries the levers 213. This bar constitutes a bail member as it has a projecting plate portion which is bent toward the levers near their upper ends to contact all of them at certain times, this part being shown at 219. The bar 218 also has a depending arm 221 on one side thereof, the lower end of which is attached to an adjustable link 222. Near its right end, as seen in Figs. 1 and 5, the link 222 is secured to the upper end of a lever 223 the lower end of which is pivoted on a pin 224 suitably mounted in the side frame members 12. At an intermediate point, the lever 223 carries a cam roller 224A which is adapted to follow a cam 225 mounted on cam shaft 21. An adjustable connection 226 is provided in link 222 to provide for the proper relationship between the tooth 211 on each of the slides 52 and the teeth 153 on slides 151. A spring 222A attached to the end of link 222 keeps cam follower 224A in engagement with cam 225.

The operation of the parts just described is as follows. Rotation of the cam 225 moves the lever 223 at appropriate intervals to rock the arm 221 about the shaft 212, thus causing the upper end plate 219 of the U-shaped bar or bail member 218 to contact the seven levers 213 and rock them counterclockwise, as seen in Fig. 5. When this occurs the rollers 216 on the lower ends of the levers 213, which are positioned in the slots 217 of the slides, cause the slides to be withdrawn to the right as seen in Fig. 5, thus releasing teeth 211 from teeth 153 and freeing the slides 151 which are then restored to their upper zero positions. The restoring means are not shown herein but may be operated by a suitable cam 230 on shaft 21, as described in the aforesaid prior patent and copending application.

After printing and other operations have been accomplished the slides 52 must also be released and restored to their normal or zero positions. At this time the lever 207 releases the lock member 182 through the linkage previously described and a bail member 231 is operated to raise the slides 52 to their initial positions.

The multiplying or computing mechanism which sets up the summation slides or bars 151 requires a major part of a machine cycle to complete its operations. For this reason it is desirable to have the teeth 211 on sensing slides 52 engaged with the teeth 153 on the summation members just long enough to accomplish the necessary setting up functions. Hence, as soon as the slides 52 come to rest in a sensing movement, they are locked by the lock pawls 182 and immediately thereafter the lever 223 is operated, as described above, to disengage the teeth 211 from teeth 153 and permit the summation bars 151 to be restored to zero position for a new computing operation.

Meanwhile the stop members 31A have been positioned and are locked in their positions by the pawls 137 and lever 112 has been withdrawn counter-clockwise or to the left, Figs. 1 and 5, to permit the rack bars 91A to move under influence of springs 97 to the left as seen in said figures, and these rack bars thus set up the printing members 115. Simultaneously, through links 123, accumulator mechanism, not shown herein, is set up as described in my aforesaid copending application.

The high part of cam 225 extends around almost three-quarters of its periphery. Hence the summation slides or racks 151 are free more than half the time to be positioned by the computing or multiplying mechanism. However, when the low dwell 225A of cam 225 acts on roller 224A, permitting the teeth 211 to move to the left, Fig. 5, in position to engage teeth 153, the lever 207 is held momentarily by means next to be described in a manner to keep lock pawls 182 disengaged from slides 52.

The link 222 extends to the right or beyond lever 223, as shown in Figs. 1 and 5, and at its end bears an angle member 227 in which an adjustable screw 228 is threaded in a position to abut against the right vertical edge of lever 207. Hence when lever 223 swings to the left, as seen in Figs. 1 and 5, the screw 228 moves lever 207 in a counter-clockwise direction by lifting its notched portion 208A off the stud 209 carried by lever 143. Lever 143, at this time is still in its lowered position. Most of the time levers 143 and 207 are operated together, but by adjusting screw 228 the precise time for moving the pawls 182 may be varied somewhat. Normally, however, it is desired to allow pawls 182 to engage teeth 181 at the same time that pawls 137 are permitted to engage stops 31 and 31A. The teeth on bars 81 are so shaped that the bars and associated stop elements may continue to move upwardly after pawls 137 are engaged.

The mechanism for operating the bail 231 comprises a cam 232, Figs. 2, 3 and 4, and a cam follower 233 carried by a lever 234 pivotally mounted on a shaft 235. The lever 234 extends to the left, as seen in Figs. 1 and 5, and at its left end carries an angle member 236, the upper end of which is bent to overlie an arm 237 which is fixed to the shaft 235 as by a pin 237A, Fig. 2. An adjusting screw 238 is threaded into the angle member 236 and its lower end contacts the upper edge of the arm 237 to provide an adjustment between the lever 234 and said arm. A lock nut 239 is provided to retain the parts in adjusted position. A plate 240 secured to arm 234, overlaps the end of arm 237 to keep arm 234 in proper alignment with the cam 232.

At its rear end, as shown in Fig. 2, the shaft 235 carries a short arm 241 which is fastened to said arm as by a pin 242. Another arm 243 is pivotally mounted on the shaft 235 adjacent the short arm 241 and an eccentric pin or the like 244 provides an adjustment between the arm 241 and arm 243. By this means arm 243 may be accurately adjusted to a position parallel with that of the arm 237.

The bail member 231 is carried by arms 237 and 243 and a spring 246 attached to a pin 247 mounted in a projection 248 below arm 237 tends constantly to rotate arm 237, shaft 235 and arm 243 clockwise as seen in Figs. 1 and 5. By this means the bail member 231 raises the slides 52 and restores them to their zero positions whenever permitted to do so by the cam 232, assuming that lock pawls 182 have been released.

The Bowden cables 41 are restored to their zero positions, thereby restoring the stops 31 to zero positions, by an anchor block 251 pivotally mounted between a pair of parallel arms 252 of a U-shaped member pivoted on the shaft 144. One of the arms 252 is secured to a curved arm 253 mounted pivotally on the shaft 144 and the left end of such arm, as seen in Figs. 1 and 5, carries a cam follower 254 which is operated by a cam 255 on the shaft 21. By the means just

described the rack bar stops 31 for representing the number of shares are zeroized. A coil spring 256 attached to one of the arms 252 causes the cam follower 254 to remain in contact with its cam and restores the cables 41 when permitted to do so by said cam. A spacer block 257 is secured between arms 252 by screws 258, and leaf springs 261 latch the pivot pins 260 of block 251 in slots 262 in the ends of arms 252.

The block 251 which restores the Bowden cables 41 has the cables anchored thereto in a suitable manner and the spring element 261 is of a shape best shown in Figs. 1 and 5, serving to hold the studs or pins 260 projecting from the block 251 in the slots 262 so that block 251 may be easily removed from the levers 252 when desired. At an intermediate point, the springs 261 are held under tension by the screws 258 which hold the spacer block 257 between the two arms 252.

The sheaths of the money cables 51 are secured at their right ends, as seen in Figs. 1 and 5, to a block member 271. This member is fastened to a supporting block 272 at the right end of the machine which in turn is secured to the frames 12. A thumb screw 273 having a knurled head is used for this purpose, to permit the cables to be readily detached when desired. The clevises 167 and 171 have pins which rest in sloping notches in slides 52 and 31A, respectively, so that these parts can be quickly disconnected when desired.

The shares cables 41 are guided by a block member 275 which is detachably secured to the block 272 by appropriate means such as a stud 276 having a knurled head so that it can be inserted or removed manually. The cables 41 are passed under a roller 277 carried by this block.

In addition to the parts described, certain cam operated levers are provided for other parts of the apparatus which, per se, are not part of the present invention. Thus an arm or lever 280 is integral with another arm 281, pivoted on shaft 144 and provided with a cam follower 282A which is operated by cam 282 on cam shaft 21. A link 283 is attached to the arm 280 and leads to certain safety mechanism by means of which slides not shown herein, but connected to the rack bars 91 and 91A, described above, may be disconnected. This construction is more fully described in my aforesaid copending application.

Another cam 291 on shaft 21 operates an arm 292 which is provided with a cam follower 293. Arm 292 is integral with another arm 294 pivoted on shaft 144 which operates a link 295 which extends generaly in a vertical direction to connect to certain latching mechanism associated with the printing mechanism. This mechanism also is not shown herein, forming no part of the present invention, but it is described in detail in the aforesaid copending application.

The bars 81, which comprise the sliding vertical elements of the stops 31 and 31A, are guided for vertical movement between two pairs of guide rollers 301 and 302, best shown in Fig. 5. A slotted plate 303, provided with downturned flanges 304 and 305, rests on each pair of rollers to keep the slide bars 81 properly spaced. The rollers are mounted in end plates 306 suitably secured to the side frame members 12 by screws 307. Slots 308 in the plates 306 permit adjustment to the right or left, as seen in Fig. 5, to adjust the bars 81 in proper relationship with the lock pawls 137.

Eyelets 309 are secured in the rear or left edge of each of the bars 81 for attachment to the

springs 32. Through springs 32 each of the bars is urged upwardly and these springs pull the Bowden cables and hence cause attached members such as slides 52 to move downwardly whenever released.

The Bowden cables 41 for representing the "shares" are not attached to clevises but are secured, at their right ends, Figs. 1 and 5, to pins 311 which are guided for vertical movement in a pair of spaced brackets 312 and 313 suitably mounted on the frame members 12.

The cam shaft 21 may be driven from a suitable source of power through a gear 321 secured thereto and it may be provided with additional cams 322 and 323 for other functions which are not pertinent to the present invention. Another cam 324 operates on a follower 325 carried by a lever 326 pivoted to the front frame member 12 at 327, Fig. 1. This lever operates certain carry mechanism restoring elements 328 of the computing mechanism and is not part of the present invention.

While it is believed that the operation of the machine will be obvious from the above description, a brief résumé of such operation is as follows. Referring to Fig. 5, the shares cables 41 are operated by slides 61, 62, etc. which are controlled by perforations in a printing and control device passing through the machine bearing data representing the number of shares held by each stockholder. The cables 41 move the slides 31 to position stops which will limit movement to the left as seen in Fig. 5 of the five rack bars 91 which pertain to the number of shares. When these stops are so positioned, rack bars 91 move under the influence of springs 97 until they are stopped at various selected positions determined by the stop members, the bail 111 being completely withdrawn to the left. At this point the stops 31 are locked by the pawls 137 so that printing and other operations may take place. After such has been accomplished, the lever 143 rocks the bracket 132 clockwise and pin 138 withdraws the pawls 137 from the notches 131 in the stop slides 31, thus releasing them to be restored to their zero positions by the operation of block 251 in levers 252.

The money cables are controlled by the read-out slides 52 which, after descent of the bail member 231, are lowered until the tooth 211 on each slide contacts a tooth 153 on the slide 151. This operation moves the stop members 31A to a position representative of the digit corresponding to that indicated by the slide 151. Springs 32, attached to each of the slides 31A, cause them to rise whenever permitted to do so by their Bowden cable connections. As in the case of the shares rack bars 91, upon movement to the left of the bail 111, Figs. 1 and 5, the money rack bars 91A are positioned according to the position of the stop members 31A and the amount represented by the computing mechanism is thereafter printed and accumulated in the manner described in the aforesaid copending application.

It will be understood that the slides 52 do not take any reading to distinguish the particular tooth 153 by which they are stopped. This is taken care of by the transfer mechanism 175 shown in Fig. 1 and described in detail in the aforesaid application and as briefly described hereinabove.

The order in which various operations occur, generally under control of cams on shaft 21, can be seen by reference to Fig. 6. Assuming that a printing and control device has been moved to

sensing position, sensing elements not shown herein but described in my aforesaid prior patent and copending application are effective to read or sense from such device the number of shares indicated thereon. The data thus read or sensed is communicated both to the computing mechanism and to the shares cables 41.

The shares cables 41 are moved and the stops 31 connected thereto are raised selectively to permit movement of rack bars 91 under the influence of spring 97 to set up printing elements and accumulating elements. These movements are indicated on the two lower lines of Fig. 6.

Meanwhile the computing mechanism, which also received a reading of the number of shares and set it up as one factor, has multiplied the number of shares by the dividend rate and the summation members 151 have moved, as indicated in the top line, Fig. 6, to indicate the product.

The read-out slides 52 are rocked toward the summation members 151 by the read-out levers 213, as indicated in the chart, Fig. 6, third line from the top. Thereupon the slides 52 are permitted to descend, as indicated in the line next to the top, Fig. 6.

During this time pawls 182 and 137 are ineffective, but as soon as sensing of teeth 153 by teeth 211 has been completed, pawls 137 are swung to their latch posiitons by movement of lever 143. However, pawls 182 are not locked until the levers 213 begin to draw teeth 211 away from teeth 153. Pawls 182 are held disengaged from the teeth on slides 52 by the contact of the screw 228 carried by link 222 against lever 207. Pawls 182, which are disengaged at the same time as pawls 137, also reengage at the same time, but adjustable screw 23 permits a slight variation on the time for reengaging pawls 182. The bars 81 which comprise the sliding elements of stops 31A can continue to rise past the pawls 137, even after these are permitted to engage.

Although I have described my invention as being particularly adapted for use in a printing machine employed for printing dividend checks, it will be understood that its use is not by any means limited thereto. The mechanism obviously may be employed in connection with various recording, printing and computing equipment.

Thus, while I have illustrated and described the preferred embodiment of my invention, it is to be understood that this is capable of variation and modification and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. The combination which comprises a group of elements, each capable of being moved to various positions representative of data, stop members carried by each of said elements, sensing means adapted to sense the positions of said stop means, means for moving said sensing means into and out of position for sensing said data, means for locking said sensing means in a position representative of data sensed, means for withdrawing said sensing means from association with said stop members after said sensing means have thus been locked, and means for restoring said elements to initial positions while said sensing means remain locked.

2. A reading-out mechanism for data indicated by the longitudinal position of a computer ele-

ment, comprising a group of transversely and longitudinally movable sensing elements, lock pawls for each of said elements, flexible cable means connected to each of said elements, a movable stop member controlled by each of said cable means and having stepped stop elements adapted to be variously positioned in accordance with data sensed, lock pawls for each of said stop members, means for operating all said lock pawls simultaneously, means for moving said sensing elements transversely, means for moving said sensing elements longitudinally, and control means for recording mechanism, said control means being controlled by said stop members.

WALTER T. GOLLWITZER.

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