

May '30, 1933.

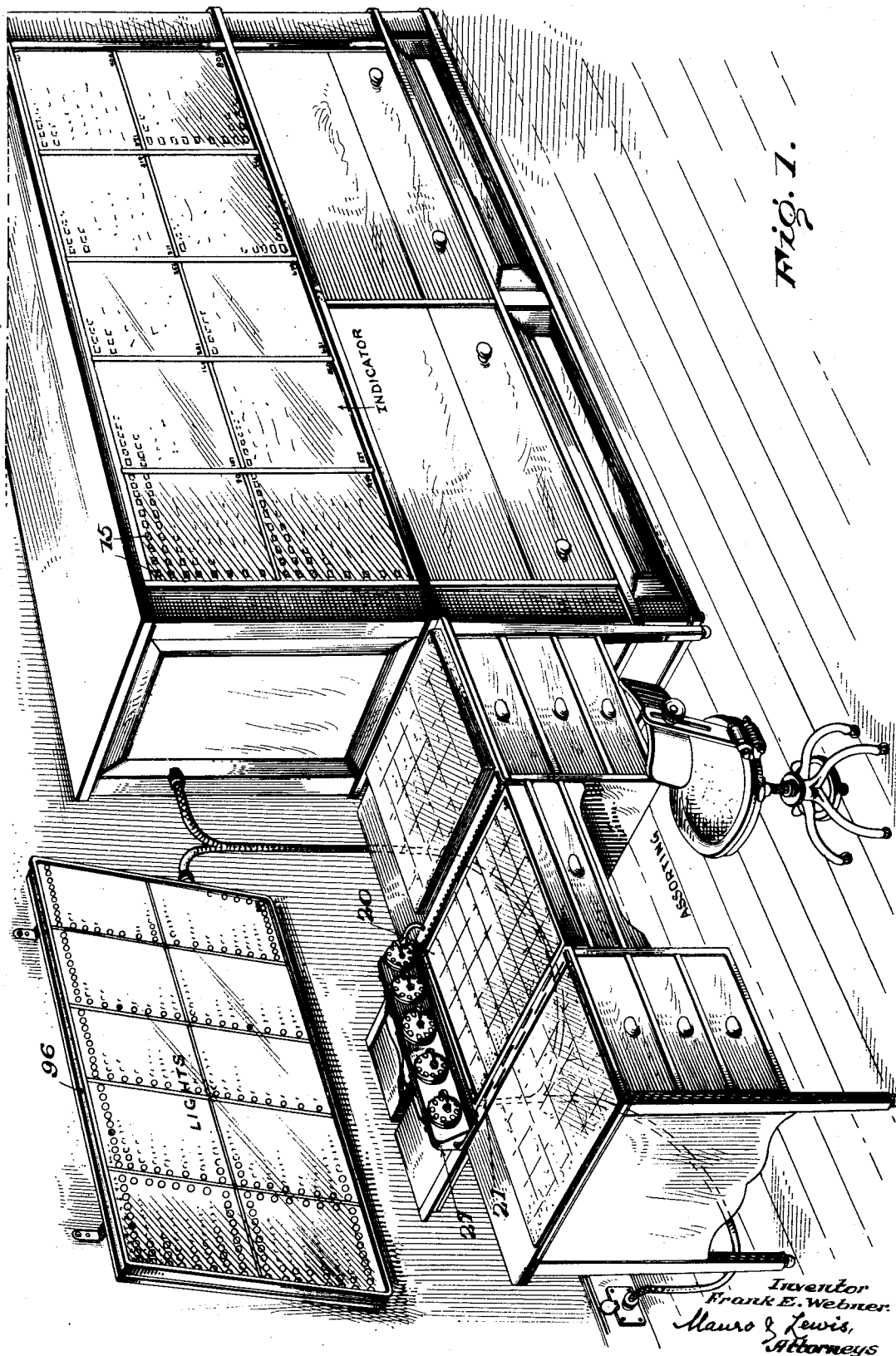
F. E. WEBNER

1,911,863

MECHANICAL CALCULATOR

Filed June 13, 1927

4 Sheets-Sheet 1



May 30, 1933.

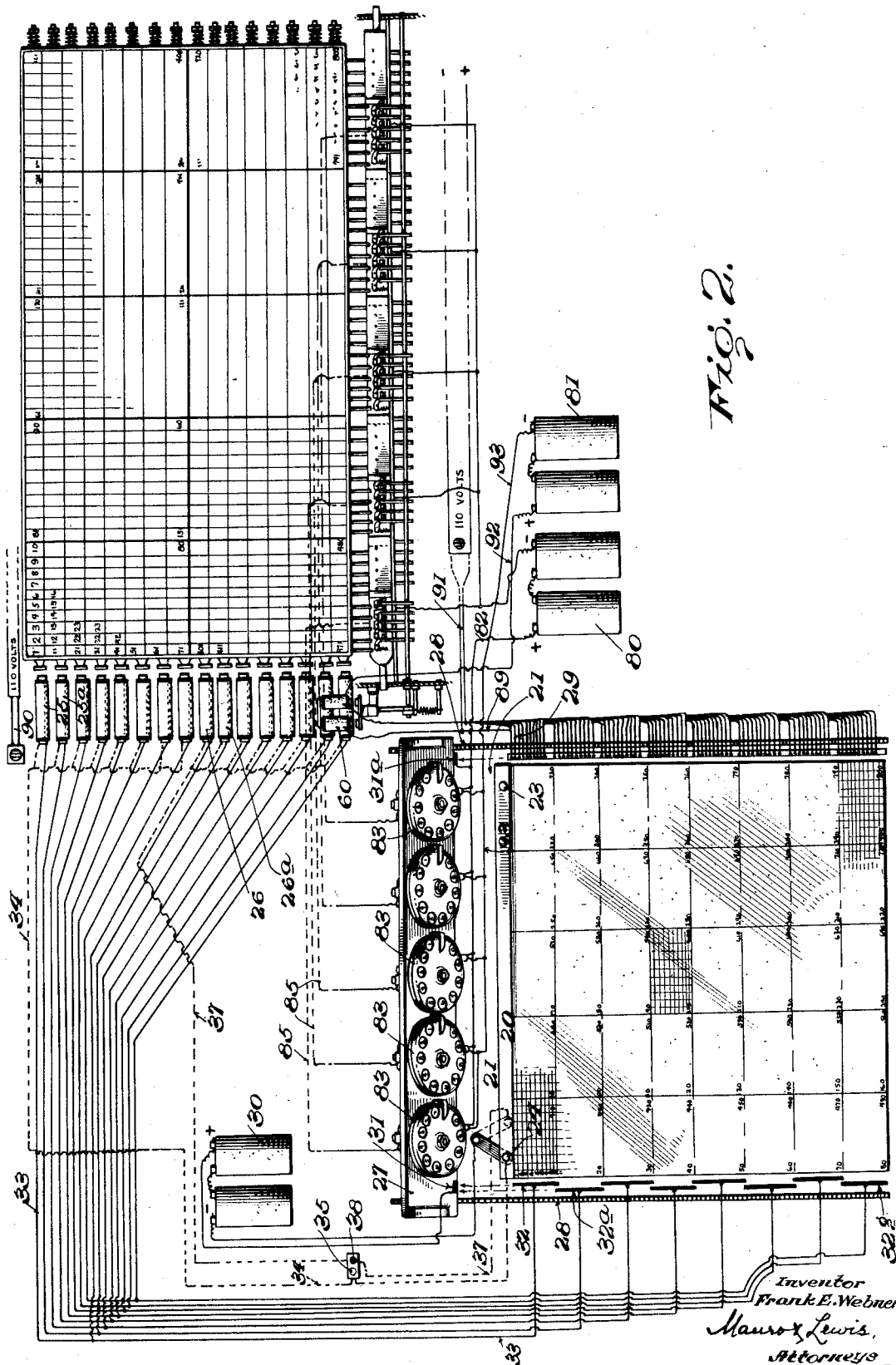
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4 Sheets-Sheet 3

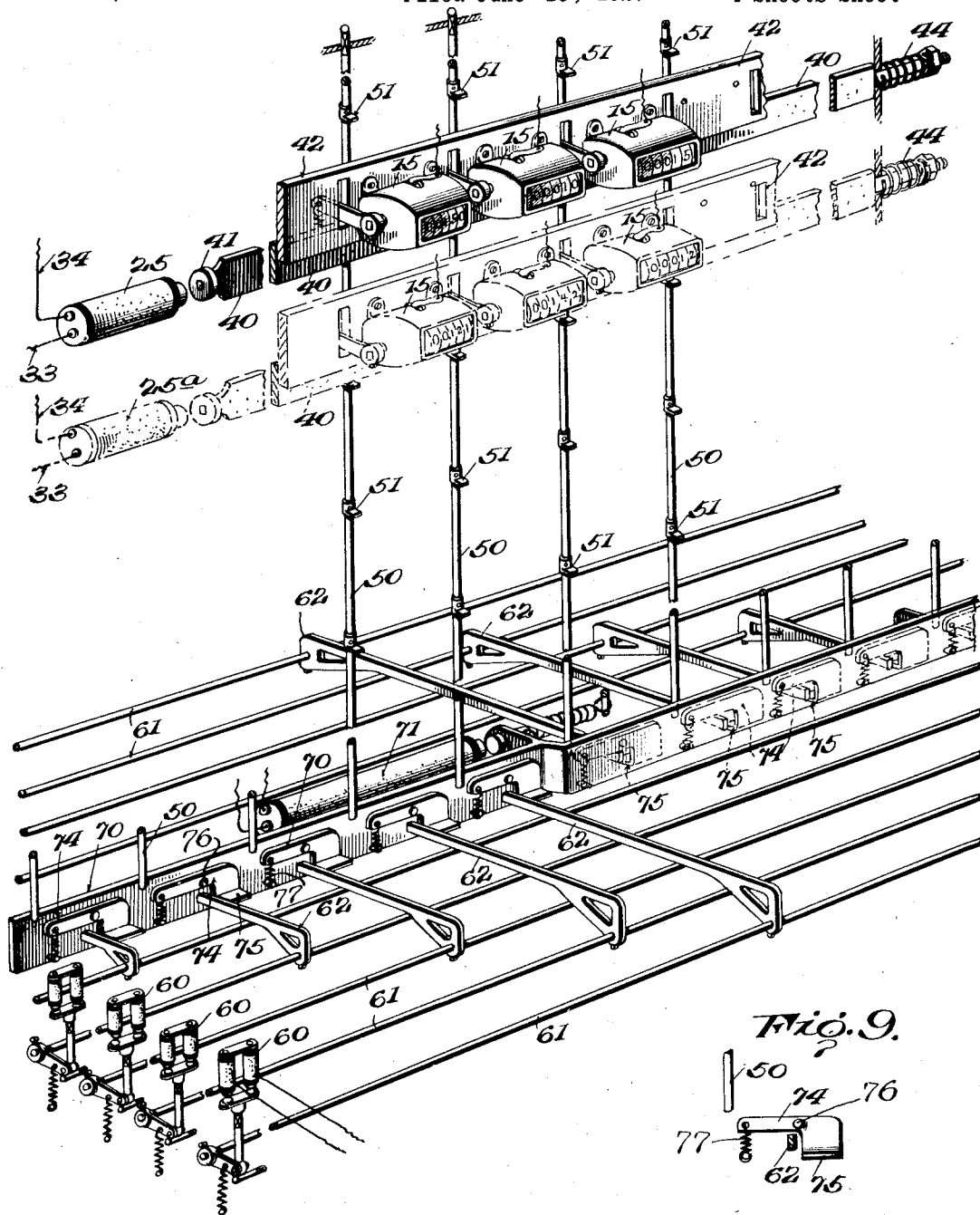


Fig. 3.

Fig. 9.

Inventor
Frank E. Webner.
Mauro & Lewis,
ATTORNEYS

May 30, 1933.

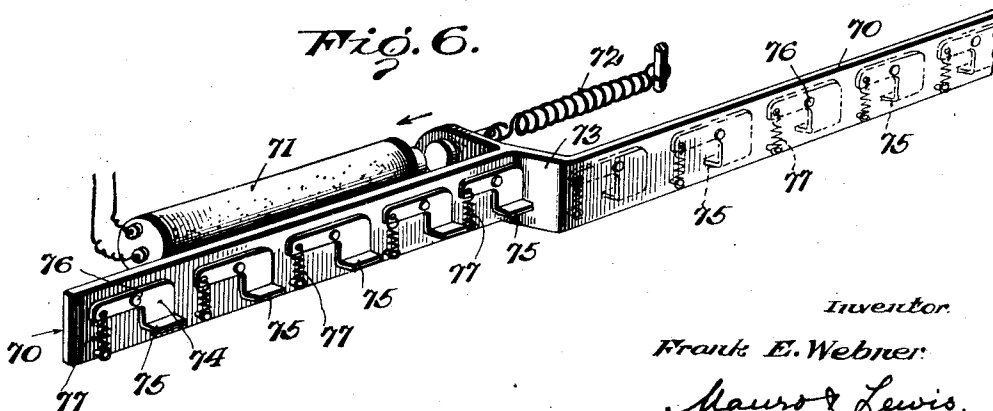
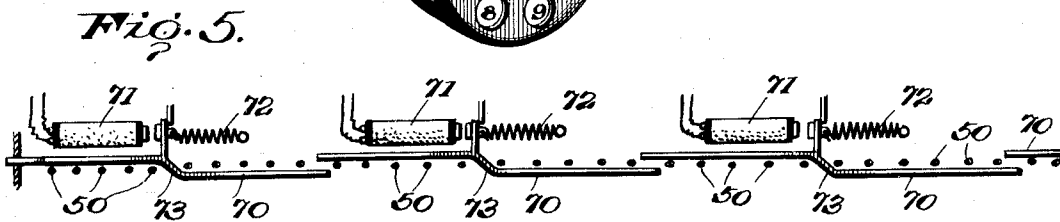
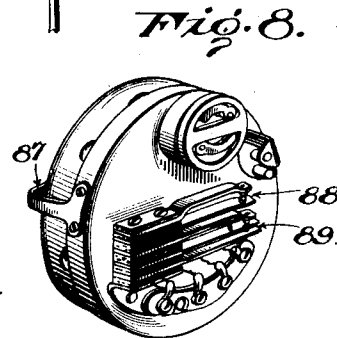
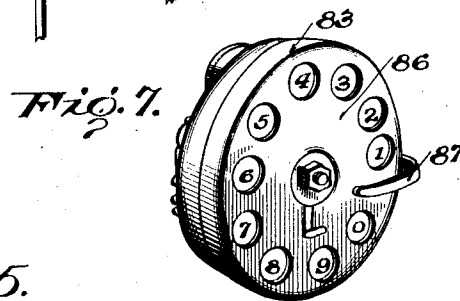
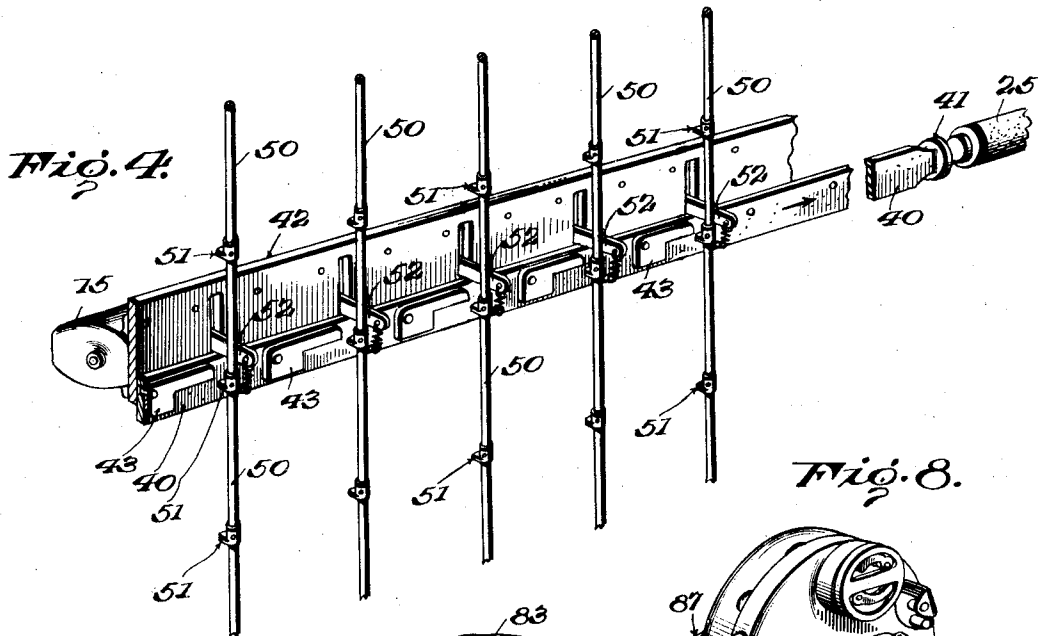
F. E. WEBNER

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MECHANICAL CALCULATOR

Filed June 13, 1927

4 Sheets-Sheet 4



Inventor
Frank E. Webner
Mauro & Lewis,
ATTORNEYS

UNITED STATES PATENT OFFICE

FRANK E. WEBNER, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR, BY DIRECT
AND MESNE ASSIGNMENTS, TO WEBNER DEVICES INCORPORATED, OF WASHINGTON,
DISTRICT OF COLUMBIA, A CORPORATION OF DELAWARE

MECHANICAL CALCULATOR

Application filed June 13, 1927. Serial No. 198,557.

This invention relates to electrically operated calculating machines (using the term in its broadest sense); and its main object is to provide a simple and efficient machine of
5 that character which shall be serviceable for a variety of purposes; as for example, calculating and making a registration of the total number of units of each of the entire list of stock items of a business organization (such
10 as a chain store system), as requisitions therefor are received at the central office or distributing depot, or as they are shipped out from the same to the several branch stores or sales agencies. The invention has for
15 its further objects, amongst others: (1) to supply means for readily effecting successive registrations, which may be summated either for statistical purposes, or for use purely as a going inventory; the stock accessions being,
20 in the latter case, registered in the device and thereafter treated as a minuend with successive registration of subtrahends; (2) to supply means for recording or printing the digits registered for a succession of single transactions; (3) to make possible the speedy and
25 accurate recording or indicating of summations, or of remainders under individual segregations, by the operation of selecting or allocating mechanism which requires no
30 mathematical calculations or selections on the part of the operator (such calculations and selections being effected automatically), and which dispenses with keyboards and similar devices that require manipulation for each
35 separate digit of the code number used in allocating given items, it may be to the number of a thousand, or even more.

Other objects of said invention will be obvious from the description hereinafter given
40 of an apparatus which constitutes what is, up to the present time, the preferred embodiment thereof, but which may be modified in many and important respects without departing from the spirit and principles of said invention.
45

The said preferred embodiment of said invention hereinafter described has been devised for use in connection with a certain
"duplex" order blank or sheet now in extensive use by chain store organizations. In

systems which employ the aforesaid duplex order blanks, the sales reports and requisitions for various stock items come to the central distributing depot entered upon a pair
55 of sheets, each sheet ruled horizontally and vertically so as to present separate spaces for 400 stock items, said spaces being arranged in five columns of eighty lines each. But the apparatus can obviously be adapted for use
60 in systems which employ a single order sheet as a basis, and in connection with sheets ruled or subdivided in any desired manner, and having spaces for the entry of any number of items within limits of practicability.

Itemized reports or requisitions are usually sent in at stated intervals from each branch office or retail establishment; and from those numerous reports the central office must keep track of the amount of stock in gross on hand in the storehouse, and of the amount of each
70 individual item thereof. This is commonly done at present by an adaptation of the card index system, such as the following: The reports or requisitions coming to the central office from the various stores or branches are
75 entered, as already stated, upon specially ruled sheets, each space on the sheet being designated by a particular number, which number corresponds to a particular stock item. That is to say, the order sheets do not,
80 or need not, specify the several items of stock by name, but by number. At the central office is a file case (or series of file cases) wherein is a drawer or compartment for each stock item of the general inventory; that is
85 to say, the cards in any drawer or compartment represent each one "unit" of a particular stock item; and hence each drawer or compartment corresponds to a particular
90 number on the stock list and to a particular space on the order sheet. The cards differ from each other and are distinguished by the various punchings thereon. When therefore a certain number of "units" of any stock
95 item go into the distributing warehouse or depot, the same number of cards, each having the identifying perforations whereby that article is designated, are placed in the drawer or compartment pertaining to that
100 particular item of stock; and when requisitioned

tions for that article come in (or when orders therefor are filled) the same number of cards are removed from the drawer as there were units ordered or shipped. The cards thus removed are used, in one way or another, for crediting the inventory, and debiting the store or branch from which the order came. Usually, those cards, along with cards similarly removed from other drawers, are put through a tabulating machine. On the other hand, the cards remaining in the several drawers constitute a going inventory of goods in the warehouse or depot.

Systems of the general character briefly outlined above are in extensive use, notwithstanding they are cumbersome, slow, and expensive to install and to operate; and notwithstanding that the information they preserve as to the state of the various articles in stock from day to day, is hidden from view in the various drawers of the general file case. The reason why these objectionable systems are so widely used is, of course, that nothing better has yet been brought into practical use.

Furthermore, the only way of collecting and tabulating the entries on the numerous sheets coming in at stated intervals is by the slow and uncertain "tally" system, which is objectionable for various reasons, and particularly because it is very liable to errors in segregating and totalling the various entries, and in transferring the same to the general inventory.

The sheets then go to the delivery room, where a record must be made of all the supplies that are shipped to the various stores or branch offices. It is a matter involving much labor and great difficulty to keep up a current inventory by this method; in consequence whereof supplies of an article in great demand are often exhausted before the management is aware that the stock is running low; and serious losses of business result.

According to the preferred embodiment of the present invention there is installed at the central office a table or platen corresponding in size and shape to the standard duplex order sheet above referred to; means being provided whereby the sheet whose entries are to be tabulated can be accurately positioned upon the platen. In conjunction with said platen is a movable circuit controlling device, preferably in the form of a bridge, so mounted as to be capable of traversing the entire platen, and adapted to be moved by hand, or by foot, or otherwise. By means of said movable member or bridge, circuit controlling devices are put into operation automatically, the particular circuits to be closed, and registering devices to be actuated, being determined solely by the position to which said member or bridge is moved. In other words, the mere act of moving the circuit controlling mem-

ber or bridge to a position corresponding to any line on the order sheet automatically makes the necessary selections for reaching the registering device that is to be actuated.

Said traveling member or bridge also carries other circuit controlling devices, preferably in the form of the well known signalling dials commonly used for making selective telephone calls. These dials or equivalent devices cooperate with the automatic circuit controllers to provide a simple, compact and efficient mechanism whereby all the necessary operations may be performed for selecting the desired receiving devices and making the desired registrations thereon; and whereby those operations may be performed promptly and accurately, with very little mental effort and no calculation at all on the part of the operator, and with a minimum liability to error.

In the said preferred embodiment of the invention, use is made of an ordinary mechanical counter, such as the Veeder counter for registering and totalizing the items entered upon the order sheets; or it may be for subtracting from the amount previously shown thereon. There is a separate counter for each stock item, so that for each space on the order sheet there is a separate counter; and electrically operated means are provided whereby any desired counter can be selected, instantly and automatically, and whereby its actuating lever can be given the precise number of strokes entered in the corresponding space upon the order sheet.

In the selecting and registering mechanism just referred to (and which will be described in detail hereafter) important advantages are secured by the use which is made therein of the broad idea of interposing a finger, latch, trigger, or other tripping device, between a power transmitting member, and a lever, arm, rod, or other part intended to be actuated thereby. By applying this idea in the manner hereinafter described, or in analogous ways, the desired one of a large number of counters (or other registering devices) may be quickly selected and actuated through the intermediary of a relatively small number of power-transmitting elements. Thus, for example, in the embodiment of the invention hereinafter described in detail, as many as eight hundred counters are operated individually through the medium of only ten rock shafts; and the principle may be extended to an apparatus comprising several thousands of individual registering devices, or as large a number in fact as any inventory of merchandise kept in stock is likely to contain.

A special aim of the invention is to reduce to a minimum the manual operations of the operator, and the liability on his (or her) part to error. A further object is to make the operations required of the operator in using the apparatus so simple that they can

be learned quickly, and with but little effort. In these respects the present invention differs greatly from the many mechanical calculators and recording devices which employ a keyboard; and also from the numerous systems wherein variously perforated cards are used as an element of the selecting mechanism.

In apparatus constructed according to the present invention, the circuit connections for selecting the particular counter (or other recording or receiving element) that is to be operated, are made for the most part automatically, and by the simple act of moving the traveling carrier or bridge to the line upon which the item to be recorded appears on the order sheet. This act requires no skill; it takes no time to learn how to do it; and it is hardly possible to make a mistake in the doing of it.

All that remains for the operator to do, after moving the carrier to the line on which appears the entry that is to be registered is to take the final selective step; which is the picking out of that one of the group of five counters which corresponds to the particular column on the record sheet upon which the entry about to be recorded is found,—and the operating of the selected counter the requisite number of times. Of these operations the first is performed automatically by means of one of five signal dials of common construction, which are carried by the bridge; and the other is performed by the act of using that dial in the usual way, that is, by inserting the finger in the proper hole of the pivoted signalling disk, and turning it until the hand is arrested by contact of the finger with the limiting stop, and then releasing.

Any other suitable selective signalling device—a small keyboard for example, having a key for each digit—could be substituted for the dials. In that case, there would be, of course, one such keyboard for each dial.

The invention, or parts thereof, may be used for many different purposes. Thus, it may serve as an order register; as an order classifier; as an item cumulator and indicator; as an inventory register and indicator; as a progressive inventory indicator; as a sales analyzer; as a sales segregator; as a current stock indicator; as a stock and sales register; and for yet other purposes.

The accompanying drawings, which form part of this specification, illustrate by way of example a mechanical, electrically operated, calculating apparatus constructed in accordance with the present invention. In said drawings:—

Fig. 1 is a perspective view showing how the apparatus as a whole may be conveniently arranged;

Fig. 2 is a diagram showing an arrangement of the electric circuits and the location of the main elements of the apparatus;

Fig. 3 is a skeleton perspective view showing parts of two horizontal tier bars, parts of four unit rods, and parts of all the ten rock shafts;

Fig. 4 is a partial perspective from the rear, illustrating the working of the tier bars and unit rods;

Fig. 5 is a top plan view showing three of the five stack-selectors and their operating magnets;

Fig. 6 is a perspective view of one of the stack selectors;

Figs. 7 and 8 are perspective views from front and rear respectively of one of the signalling dials.

Fig. 9 is a side view showing one of the pivoted lugs 74 in its normal position relative to its unit rod 50 and rock arm 62.

In the apparatus illustrated in these drawings, the receiving or registering devices consist of a series of mechanical counters 15 (Figs 1 and 3), such as the well known Veeder counter. These are arranged upon a suitable indicator board (which may constitute the front of a cabinet) in horizontal rows or tiers and vertical lines, as indicated in Fig. 1. According to the plan adopted for the purposes of this explanation, there are sixteen horizontal rows of counters, each row containing 50 counters; and the sixteen rows are divided horizontally into two major divisions, each containing eight rows, or 400 in each division, making a grand total of 800. For some purposes it would be preferable to have ten rows of these counters in each division, instead of eight. This would make the grand total of counters 1,000, and would allow of any desired decimal arrangement. The counters are divided vertically into five groups, panels, or "stacks", each stack containing ten vertical rows of counters.

The number and grouping of the receiving or registering elements may be varied indefinitely; but the arrangement illustrated in the drawings has been adopted because it is capable of operation in connection with a standard duplex order sheet or order blank, now in extensive use in a certain chain store organization. Said duplex order blank, one of which is indicated at 20 (Figs. 1 and 2) is of a standard size and shape, consisting of two sheets of identical pattern, each sheet being ruled crosswise into eighty parallel lines, and divided by equidistant vertical lines into five columns. Thus each column contains 80 separate spaces for the names of different stock items, making 400 separate spaces on each of the two sheets, or a grand total of 800 spaces. The lines or spaces of column I are numbered from 1 to 80; those of column II from 81 to 160; those of column III from 161 to 240, etc.

Each stock item of the entire inventory is designated by a particular number; and inasmuch as each space on the order sheet has

its definite and invariable number, each stock item has its own place on the order sheet. Therefore, a certain figure, say 8, entered in a certain space on an order sheet, would mean
 5 that the store from which that order sheet had come required eight units (each unit consisting of a certain definite number of cans or packages) of the particular stock item (as cans of tomatoes, or packages of laundry
 10 soap) designated by the number allotted to that space. It will be understood that all stock items whose designating numbers are from 1 to 400 are entered upon sheet 1 of the duplex order blank, and all whose number is
 15 from 401 to 800 are entered upon sheet 2 thereof.

In the practical use of the apparatus, the object of each separate operation is to transfer a number entered upon the order sheet to that particular counter (or other registering device) which corresponds to the space which said number occupies upon the sheet. Thus, for example, if a given order sheet showed the figure 7 in space No. 19, and the figure 9
 20 in space No. 47, then the duty of the recording clerk would be to operate the apparatus in such manner that the actuating lever of counter No. 19 would be reciprocated seven times (thereby adding seven to or subtract-
 30 ing seven from the number previously showing upon the indicator of said counter); and then to operate the apparatus in such manner that 9 would be similarly registered on counter No. 47, and be added to or sub-
 35 tracted from the total previously showing upon the indicator of that counter.

In the operation of registering the several items entered upon an order sheet 20, the latter is, placed upon a platen 21; and for
 40 the accurate positioning of the order sheet, it is provided with a perforation in each upper corner, the perforations being adapted respectively to fit pin 23 on the platen and pin 24 on the end of a two-point switch. That
 45 switch, when in the position shown in full lines (Fig. 2), makes connections which place battery 30 in circuit with one or another of the upper series of eight tier-bar operating magnets 25, 25a, etc.; and when in the posi-
 50 tion shown in dotted lines, said switch makes connections which put one or another of the lower series of eight operating magnets 26, 26a, etc., into circuit with said battery.

The upper series of magnets control 400
 55 counters, corresponding to stock items Nos. 1-400, inclusive, listed on sheet 1 of the duplex order blank; and the lower series control the other 400 stock items, Nos. 401-800, listed on sheet 2 of the order blank. By
 60 this arrangement of the circuit connections, and the use of the two-point switch, a platen 21 the size of only one of the duplex sheets, is made to serve for both. In other words, the capacity of the platen is doubled. This
 65 principle can obviously be extended.

The electrical circuits of battery 30 are clearly shown in Fig. 2. They will be further described later on.

At the upper part of the desk or table which supports platen 21 is a movable carrier, shelf, or bridge 27, which straddles the platen crosswise, and is mounted to run the full length thereof, as upon rack-bars 28, 28, one on each side of the platen.

Bridge or carrier 27 carries an electrical
 75 contact or circuit maker 31 on its left-hand side, which contact is connected directly with one pole of battery 30, and is adapted to make circuit connection successively, as the carrier moves forward, with contact
 80 plates 32, 32a, etc., to 32g. There are eight of these contact plates, each being of such length and so located as to extend across ten lines on the order sheet. These may be ap-
 85 propriately called the "tens" contacts, because of the function they discharge, and also to distinguish them from the "units" contacts on the other side of the platen, pres-
 90 ently to be described.

When contacts 31 and 32 are in electrical
 90 connection, the circuit of battery 30 proceeds from the + pole through said contacts 31, 32 by wire 33, through the coils of one or another of the tier-bar magnets 25 (which
 95 are connected in multiple) returning via the common return wire 34 through signal lamp 35 to the two-point switch, and thence back to the negative pole of the battery. The
 100 circuit connections are such that when the movable contact 31 is in connection with contact plate 32a, the circuit of magnet 25a will be closed; and so on through the entire series of contact plates and the correspond-
 105 ing tier-bar magnets of the upper series of eight magnets.

Sheet 2 of the duplex order blank has its left-hand perforation so located that the switch must be shifted to its dotted line po-
 110 sition in order that pin 24 may register with that perforation. This causes the circuit of battery 30 to be shifted so that it returns from one of the lower series of tier-bar mag-
 115 nets 26, 26a, etc., by wire 37 (through signal lamp 38) to the said switch and back to the negative pole of battery 30, as clearly shown in Fig. 2.

The effect of the closing of the circuit of battery 30 through one of the magnets of series 25 (or series 26) will be understood by reference to Fig. 3, where two of said
 120 magnets are shown. The armature 41 of each magnet is fixed upon the end of a horizontal crossbar 40, mounted to slide in ways in supports 42, which are parts of the frame-
 125 work of the cabinet, and which support also the counters 15. Thus, when one of the mag-
 130 nets 25 (or 26) is energized, its armature being attracted, draws the tier operating bar 40 upon which it is mounted to the left. When the circuit of the operating magnet 130

is broken, a spring 44 returns the tier bar to its normal position.

On the rear side, shown in Fig. 4, each tier bar 40 carries a series of pivoted fingers 43, each finger being adapted, when brought into its operative position by the displacement of the bar 40 by which it is carried, to serve as a connection between one of the rods 50 (herein called "unit rods") and the actuating lever 52 of one of the counters 15. The particular apparatus illustrated by way of example in the accompanying drawings requires fifty of these unit rods; and they are mounted in the frame of the machine in such manner as to be capable of vertical reciprocation by means of actuating devices hereinafter described. There are also fifty pivoted fingers 43 on each tier bar 40, one for each unit rod; and each rod has a lug 51, or similar tripping device, one for each of the tier bars, said lugs or trippers being riveted or otherwise attached to their respective unit rods. Normally each finger has its extremity in close proximity to its lug or tripper 51, but not in the path thereof; so that the vertical reciprocation of any of the unit rods would be without effect upon the registering mechanism so long as the tier bars 40 are in their normal position. When, however, one of the tier bars is drawn by its magnet to the left (Fig. 3) or to the right (Fig. 4), its fifty fingers will be brought each into such position that it will stand in the path of its tripper 51, while its extremity will be just beneath the actuating lever 52 of the corresponding counter 15. Consequently, when a tier-bar is in this (working) position, any one of the fifty counters in the corresponding tier may be operated. All that is necessary to that end is that one of the unit rods 50 be reciprocated.

The means for selecting and operating the unit rods will now be described.

On the right side of platen 20 is a series of contacts 29, arranged in line with the travel of a contact plate 31a on the right side of the carrier or bridge 27, corresponding in function to contact 31 on the left side thereof. There are eighty of these "units" contacts, and they are divided, as shown in Fig. 2, into eight groups of ten each. Thus, for each "tens" contact at the left side of the platen, there are ten "units" contacts at the right side. These latter may be regarded as numbered, the first group from 1 to 10, the second from 11 to 20, the third from 21 to 30, the last from 71 to 80. They are electrically connected in such a way that all the 1's (1, 11, 21, 31, 41, etc.) are in the same circuit and give impulse to the same rocker magnet; all the 2's likewise (2, 12, 22, etc.) are connected in parallel branches of one and the same magnet; all 3's likewise; and so on. One of these ten rocker magnets is indicated at 60, Fig. 2; and four of them are shown in Fig. 3. There are ten rock shafts 61, and each carries five rock arms

62, one for each of the five vertical stacks of unit rods. The purpose of this arrangement will shortly appear.

It will now be understood that when carrier 27 is moved forward over the platen 21, it automatically makes contacts on the left side thereof which successively close the circuits of the tier-bar operating magnets 25, and also makes other contacts on the right side thereof, which in like manner close successively the circuits of the rocker magnets 60; the difference being however, that whereas a traverse of the carrier across the entire platen will bring each of the eight tier-bar magnets 25 (or 26) only once into circuit, it will bring each rocker magnet eight times into circuit, once at each of the eight groups of ten lines. When, therefore, the carrier 27 has been moved forward and brought to a stop at any point above the platen, it will have automatically made two selections: (1) It will have selected, and also will have moved to its operative position, one of the horizontal tier bars 40 thus temporarily connecting the actuating levers of one row of fifty counters to the fifty unit rods; and (2) it will have selected one of the rocker magnets, but without operating the latter, for the reason that another operation hereinafter described is needed to send a current through the coils of that magnet. But it should be observed that the particular rocker magnet which is to be immediately energized, and hence the rock shaft that is to be operated, has been selected automatically by the contact of terminal 31a on the bridge with one of the series of units contacts 29.

As has been stated, each rock shaft 61 carries five rock arms 62 (splined or otherwise secured thereto) one for each vertical stack of rods. Hence, when a rock shaft turns in its bearings all five arms turn in unison with it. Therefore, it is necessary to make still another selection in order that the desired unit rod 50, and none other, may be operated. The means for accomplishing this final selection will now be described. They comprise a series of what may be appropriately called "stack interceptors", for they determine from which of the five stacks the unit rod and counter are to be chosen. It will be remembered that, by the left hand contact of the traveling carrier fifty out of four hundred counters were selected, and by the right hand contact, five out of the fifty were selected; so that now it remains to select one of the five. Fig. 6 shows, in perspective, one of five stack interceptors and its operating magnet; Fig. 3 shows, in perspective, one of the stack interceptors in its relation to other parts of the apparatus; and Fig. 5 shows three of them in plan.

Each interceptor comprises a bar 70 horizontally disposed in proximity to the lower ends of the rods 50, and mounted in any suit-

able way upon the frame work, so as to be capable of a slight horizontal movement. Each bar has an operating magnet 71 for shifting it in one direction (to the left, as shown) to bring it into operative position, and has also a spring 72 for returning it to its normal position when the circuit through the coils of the magnet is broken. Each bar has a bend or offset 73 midway; so that its two halves are in different vertical planes. This detail of construction is merely a matter of convenience, conducing to compactness. It enables each bar to cooperate with ten unit rods 50, disposed five on one side and five on the other (Fig. 5) all in close proximity thereto. Each interceptor bar has mounted upon it a series of ten pivoted lugs or fingers 74, each having a horizontal ledge or lip 75. The lugs or fingers are carried five on one side of bar 70 and five on the other. Each lug is pivoted at 76 and has a return spring 77 (Figs. 3 and 9).

The series of ten rock shafts 61 are disposed five on one side and five on the other of the plane of the units rods 50; and the free end of each rock arm 62 is in close proximity to the lip or ledge 75 of one of the pivoted lugs or fingers, but is not in a position to make contact therewith should the shaft on which it is mounted be moved.

Such being the arrangement of the parts, it is evident that if any one of the ten rock shafts be turned in its bearings, the five arms carried thereby (one arm for each of the five vertical stacks of rods 50) would be depressed at their free ends. But so long as the stack interceptors are all in their normal positions, the movements of the rock arms would be idle movements, unproductive of any result; for the reason that normally none of the lugs 74 is in operative relation with the adjacent rock arm. And furthermore, the lugs 74 are normally out of operative relation with their respective unit rods. For, as shown in Fig. 3, the tip of each lug 74 is in close proximity to the lower end of one of the rods 50, but not in a position to touch it if tilted on its pivot 76. When, however, any one of the series of stack interceptor magnets 71 is energized, the corresponding interceptor bar 70 is shifted into its operative position (to the left), thereby accomplishing two things: first, it brings its ten pivoted lugs each directly beneath the end of one of the ten unit rods of that particular stack; and second, it brings lips 75 of the fingers on that interceptor bar directly beneath and hence in position to be operated by the corresponding rock arms 62 (see Fig. 9). In other words, it makes a temporary connection between one of the rock-shafts and five of the unit rods, similar to the temporary connection described above between the unit rods and the actuating levers of a row of fifty counters. Hence, if now one of the ten

rocker magnets 60 be energized, causing its rock shaft 61 to turn in its bearings, all five of its rock arms will be depressed at their free ends; but one only of these will encounter an interceptor finger or lug 74, and one only of the rods 50 will be reciprocated. Furthermore, and as has been already pointed out, of the sixteen trippers 51 carried by the unit rod thus brought into action, one only will encounter a finger 43, and hence one only of the counters 15 will be actuated. It will be understood that, for every stroke of said rod, that is to say, for every make and break of the circuit of that particular rocker magnet, a separate registration will be effected upon the selected counter.

It has been already explained that, by means of the right hand or units contact plates (31a on carrier 27 and series 29 on the right side of the platen) one of the rocker magnets has been selected as that to be operated when a circuit shall be completely closed through the coils of said magnet and through battery 80. Now the circuit of this battery not only includes terminal 31a on the carrier or bridge 27, so that it is closed (or strictly speaking, is partly closed) when that terminal makes electrical connection with one or another of the units contact plates 29, but it also runs through a circuit breaker on each of the five signalling dials 83; that is to say, those signalling dials are connected in multiple in branches of said battery circuit. This may be seen by tracing the circuit from the + pole of battery 80 by wire 82, from which a branch wire runs through a circuit breaker 88 at the back of each dial (Fig. 8), whence the circuit continues through one or another of the stack interceptor magnets 71, back to the other pole of the battery. From said dials the circuit proceeds by parallel branch wires 89 (Fig. 2) to the several rocker magnets 60.

Said dials 83 are of well known construction and operation, being extensively used for selective telephone calls, and for other like purposes. They, therefore, need no description, it being necessary only to shown how they operate as an element of the mechanical calculator illustrated in the accompanying drawings. Each dial has the usual rotatable disk 86, which covers the face of the dial and has finger holes, ten in number, one for each digit, and has also the stop 87, located in the path of the operator's finger, for arresting the rotation of the disk at the proper point for the registration of the number of the particular hole in which his finger was placed.

Each dial has also within its case the usual mechanical devices (not shown) for returning disk 86, when released, to its normal position; the return being a step-by-step movement, whereby the circuit of the rocker magnet is opened and closed the exact num-

ber of times represented by the designating number of the particular hole in which the operator's finger was inserted.

We have seen that, by the action of the units contacts a particular rocker-magnet has been selected, and the apparatus has been set for the sending of an impulse, or impulses, through that particular magnet, when the circuit thereof is closed through one of the dials; but that no current has yet been sent through the coils of the selected rocker-magnet 60. This current for the energizing of the rocker-magnets is obtained from the battery 81, the + pole of which runs by wire 92 to magnets 60 (Fig. 2) returning by wire 93 after passing through one of the dial branches.

It will be understood, however, that before the circuit of the rocker magnet is made and broken by the return motion, step-by-step, of the rotating disk 86, the circuit of the stack interceptor magnet 71, corresponding to the particular dial manipulated by the operator, will have been closed by the forward motion of said disk 86, whereby the proper interceptor finger or lug 74 will have been placed in position to engage the corresponding unit rod 50.

It will be observed that, in addition to the initial selection of either the upper or lower series of four hundred counters (which selection is effected by means of the two-point switch 23, 24) there are three other selections to be made. The first is the selection of one of the horizontal rows comprising fifty counters; the second is the selection of five of said fifty counters; these five being distributed so that one is in each of the five stacks; and the third selection is the choice of one of these five counters for operation by the dial mechanism.

It will be further observed that the three selections just referred to are effected automatically, and incidentally to operations performed by the operator at the desk. The movement of the carrier down to the space on the order sheet which contains the item that is to be registered incidentally and automatically selects, as has been shown, a group of fifty counters occupying one of the horizontal rows or tiers, and also selects a sub-group of five of that fifty, by closing the circuit of one of the selector magnets 71. Finally, when the disk of the proper signalling dial is operated for the purpose of actuating (on its return movement) the selected counter the indicated number of times, the forward movement of the said disk incidentally and automatically selects one counter out of the sub-group of five by completing the circuit of one of the rocker magnets.

Describing now the operation of the apparatus, the order sheet whose entries are to be registered is placed in position on the platen; whereby, if it be sheet 1 of the duplex

order blank, the two point switch will be accurately placed in its left-hand position, as shown in full lines in Fig. 2; or if it be sheet 2, said switch will be placed in its right-hand position (dotted lines, Fig. 2). We will assume the former alternative.

The operator now moves the carrier or bridge 27 forward until its front edge, which must form a straight line parallel to the lines ruled on the order sheet, coincides with the line just above the first entry on said sheet. Assume that the first entry is the figure 7 standing on line 2 in the third column. That would mean that 7 units of the article designated by number 162 on the stock inventory were required (or had been sold, or something analogous, depending upon the general purpose for which the apparatus is being used). Hence the duty of the operator is to register seven units upon counter (or other receiving device) No. 162. That counter stands in the first horizontal row, in the third vertical panel or stack, being the second counter of that row in that stack.

The bridge 27 having come to a stop just above line 2 of the order sheet, two circuit connections are established automatically and immediately, namely: (1) the circuit of the first tens contact plate is closed by contact 31, and therefore the first tier-bar with its fifty pivoted fingers 43 (Fig. 4) is immediately shifted to its operative position (to the left, Figs. 2 and 3); and (2) the circuit of the 2's units contact is made at the right side of the platen; but the rocker magnet 60 corresponding thereto is not yet energized, because the circuit is still open through the several branches which contain the five dials 83, and therefore no action takes place.

The position of the entry to be registered indicates instantly which of the five dials is to be manipulated. In the instance assumed, it is dial number 3, because the entry is in column 3, which is immediately below and in line with dial 3. Therefore, the operator knows instantly that his finger is to be inserted in the finger hole where Figure 7 appears in the third dial, and the signal given in the usual way.

It will be observed that, in the two manual operations of (1) moving the bridge forward to the proper place, and (2) selecting and using the proper dial, there is but a very slight mental effort required of the operator, and scarcely the possibility of making a mistake.

And now finally, the apparatus having been all "set" automatically for the operation of counter 162, the operator has only to insert his finger in finger hole 7 of dial number 3, turn the signalling disk 86 to the limit, and then release it. This accomplishes two things: first, at the very beginning of the forward motion of disk 86 the circuit of the third stack interceptor magnet 70 is closed (that magnet being in the branch circuit which

passes through the third dial) and thereby all ten of the interceptor fingers of stack 3 are set in position beneath their respective unit rods 50, and lips 75 of said ten fingers are brought each under the end of its rock-arm 62; and second, upon the return movement of disk 86, (which is performed in seven steps in the assumed case) the rocker magnet connected with the series of 2's contacts, which magnet has been already selected automatically, as explained above, receives seven successive impulses; and therefore it oscillates number 2 rock shaft seven times; and this gives, through rock arm belonging to stack number 3, seven strokes to the unit rod which operates the second vertical line of counters in that stack.

When the apparatus is used as a going inventory, it may be desirable in some cases to have a warning signal, such as the glowing of a red light, to show when the supply of any article carried in stock is running low, and needs to be replenished. For this purpose, a series of lights may be used, one for each counter, and arranged as shown on a board 96 (Fig. 1) correspondingly to the arrangement of the counters. Each lamp should be connected in circuit with its corresponding counter in such manner that when the indicator thereof reached a predetermined figure, the circuit would be closed and the warning signal be displayed.

It will be observed that important results in the nature of simplicity and compactness are secured through the use made in the described apparatus of the broad idea of interposing a finger, latch, trigger, or similar device, between the arm, lever, or other member to be actuated and the power-operated device, of whatever kind it be, which is to press, push, lift, throw or otherwise displace it; the effect being that, although each element of the power transmitting devices acts (or may act) upon a plurality of correlated elements, the movement will be communicated only to that one of the series in the path whereof the movable finger, latch, trigger, or other tripping device has been interposed. In the apparatus herein described, use is made of this idea in connection with the tier bars, and again in connection with the stack interceptors, whereby a relatively small number of unit rods, and a still smaller number of rock shafts, are made to serve the entire series of counters. And the general idea is capable of being used in many different ways, and through specific mechanical devices of various kinds.

It is further to be observed that, in accomplishing a relatively large number of selections through the intermediary of a relatively small number of power transmitting devices, advantage is taken of all three dimensions of space. For the bars and rods are in horizontal and vertical lines respectively, in

the same plane; whereas the rock shafts are in a plane at right angles to that of the other two series of power transmitters.

For the sake of simplicity and clearness, it has been assumed in the foregoing description that the magnets 25, 26 act directly upon the tier bars, and that the rocker magnets 60 are directly in the circuit of the units contacts 31a and 29. But in practice, from considerations of safety and efficiency, or because local police regulations require it, the magnets in the main circuits would function merely as relays to open and close low voltage local circuits in which the operating magnets would be placed. Such local circuits are indicated at 90 (Fig. 2) in connection with the tier bar circuits, and at 91 in connection with the rock shaft circuits. Since this is a mere matter of wiring, within the ordinary practice of electricians, no further explanation thereof is needed.

The invention has been shown and described herein as applied to stock or inventory purposes involving the use of but one order of digits, namely, units; but it is equally applicable to the registration of higher orders of digits for quantities, as may be required in the handling of weights or measures of various kinds (including money under the decimal system or otherwise); so as to be serviceable in banks, counting houses, department stores, and business offices in general; which may be accomplished by means of a plurality of the same devices, as a dial for each of the higher orders involved, i. e. units, tens, hundreds, units of thousands, tens of thousands, etc., to such a maximum order of digit-values as may be required in any given case.

What is claimed is:—

1. The combination with a series of registering devices, such as mechanical counters, of electrically operated means for selecting and actuating any of the series, said means comprising a movable member having circuit controlling devices thereon and mounted for traverse across a positioned order sheet, two series of electrical circuits each branching through individual operating magnets, and two series of electrical contacts in the path of said movable member, whereby at each stopping position of the latter one branch circuit in each series will be closed, and power transmitting devices operated by said magnets respectively.

2. The combination of a series of registers arranged in horizontal and vertical lines, power transmitting elements similarly arranged, electromagnets for operating said elements, a movable carrier with circuit controllers thereon mounted for traverse across a positioned order sheet, and two series of contacts in the circuits of said magnets, adapted to be operated successively by the movement of said carrier, one series control-

ling the magnets that operate the horizontally arranged elements, and the other the magnets that operate the vertically arranged elements.

3. In combination with a series of registers and power transmitting elements for actuating the same, said elements being arranged in two sets, means for selecting and actuating any desired one of the series of registers, said means comprising a movable carrier having two contact makers in different circuits, said carrier being mounted for traverse across a positioned order sheet, two sets of stationary contacts, one set in the path of each of the contact makers on the carrier, the contacts of one set being in the circuits of magnets which operate one set of power transmitters, and those of the other being in the circuits of magnets which operate the other set of power transmitters.

4. The combination with registering devices and power transmitting elements for actuating the same, said devices and elements being in two sets, one set disposed horizontally and the other vertically, a carrier adapted to traverse a positioned order sheet containing the items to be registered and having two contact makers, two main electrical circuits, one branching to magnets which operate the horizontal power transmitting elements and also to fixed contacts in the path of one of the contact makers on said carrier, the other circuit branching to magnets which operate the vertical power transmitting elements and also to fixed contacts in the path of the other contact maker on said carrier, whereby a desired registering device may be selected, and other circuit controllers and connections for actuating the selected registering device any desired number of times.

5. The combination with individual registering devices and electrically operated power transmitters for actuating the same, said devices and power transmitters being arranged in two sets, of selecting and operating means comprising a platen adapted for positioning an order sheet, two series of contacts one set on each side of such order sheet when positioned on the platen, one series in branches which severally include the operating magnets for the horizontally arranged transmitters, and the other series in branches which severally include the operating magnets for the vertically arranged transmitters, a traveling member or bridge mounted to traverse said platen, two circuit makers thereon, one for each of said series of contacts, and a plurality of selective circuit controllers for sending any desired number of impulses through the actuating magnet of the selected registering device.

6. The combination with individual registering devices and electrically operated instrumentalities for actuating the same, of

selecting and operating apparatus comprising a platen, pins for positioning an order sheet thereupon, one of said pins being carried by an electric switch, two main electrical circuits, one having branches that severally include contacts on one side of the platen, and the other having branches that severally include contacts on the other side thereof, one of said circuits branching also to the several contacts of said electrical switch, and electromagnets in the several branch circuits for operating said register actuating instrumentalities.

7. The combination with individual registers arranged in horizontal tiers and vertical stacks, of selecting and actuating mechanism comprising horizontally movable tier bars, vertically movable unit rods, and rock shafts having rock arms mounted thereon, one arm for each stack of registers, and electrically energized means for operating the said bars, rods and rock shafts.

8. The combination with the individual registers arranged in tiers and stacks, of selecting and actuating mechanism comprising a series of horizontally movable tier bars, a series of vertically movable unit rods, a series of rock shafts carrying arms, one arm for each stack, a series of stack interceptors, and electrically energized means for operating the said bars, rods, rock shafts, and interceptors.

9. The combination with a plurality of registers arranged in horizontal tiers and vertical stacks, of selecting and actuating mechanism comprising a series of horizontally movable tier bars, a series of vertically reciprocating rods, each tier bar carrying a series of connecting devices cooperating with said rods and registers, a series of rock-shafts carrying arms, one arm for each stack, a series of stack-interceptors, and electrically energized means for operating said bars, rods, rock-shafts and interceptors.

10. The combination with a plurality of registers arranged in horizontal tiers and vertical stacks, of selecting and actuating mechanism comprising a series of horizontally movable tier bars, a series of vertically reciprocating rods, each tier bar carrying devices for making temporary connection between said rods and registers, a series of rock-shafts carrying arms, one arm for each stack, a series of stack interceptors, each carrying devices for making temporary connection between said rock-shafts and said rods, and electrically energized means for operating said bars, rods, rock-shafts and interceptors.

In testimony whereof I have signed this specification.

FRANK E. WEBNER.