

June 19, 1951

M. R. KLEIN

2,557,384

TOTALIZATOR

Filed Dec. 10, 1945

4 Sheets-Sheet 1

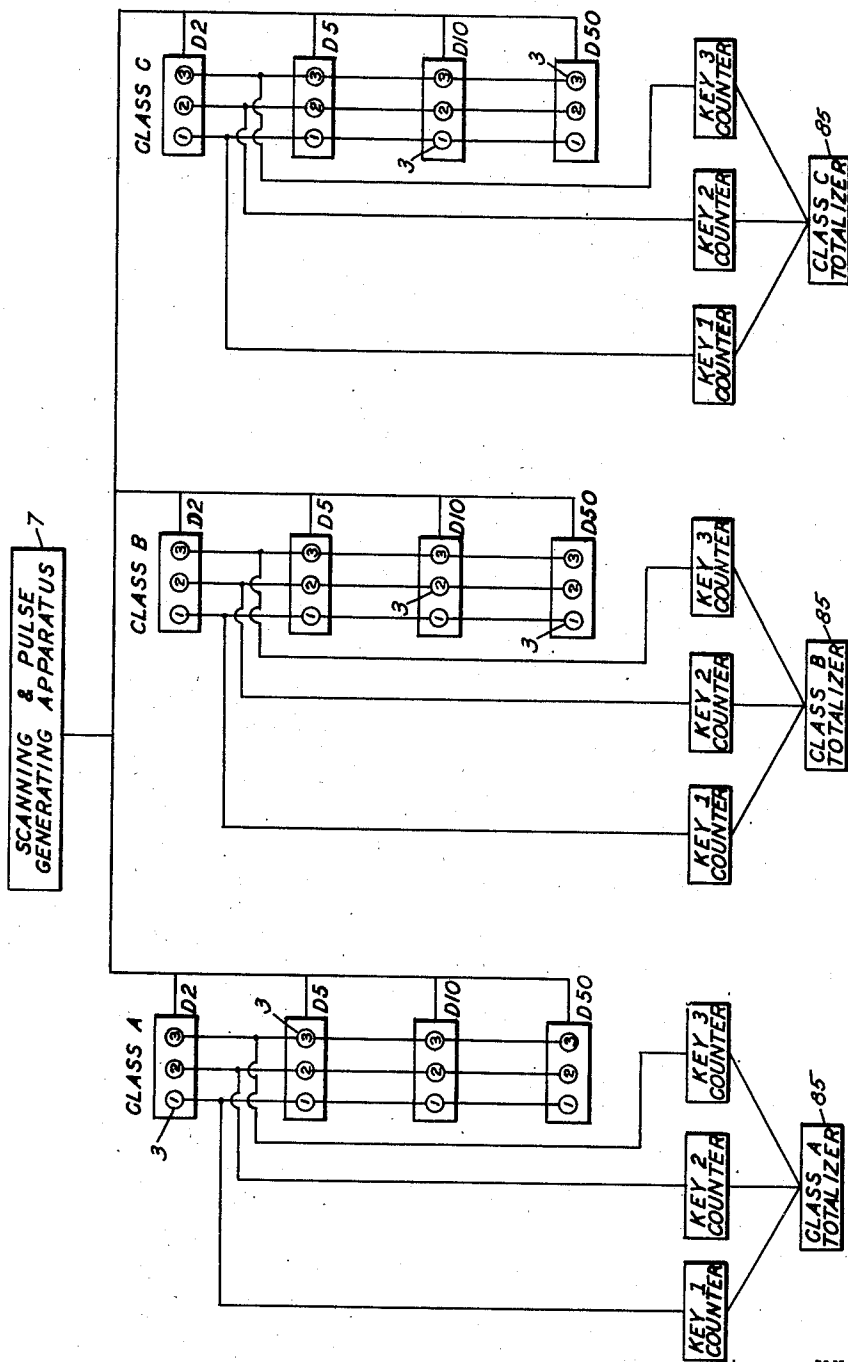


Fig. 1.

INVENTOR.

MICHAEL R. KLEIN

BY

*Lippincott + Metcalf*

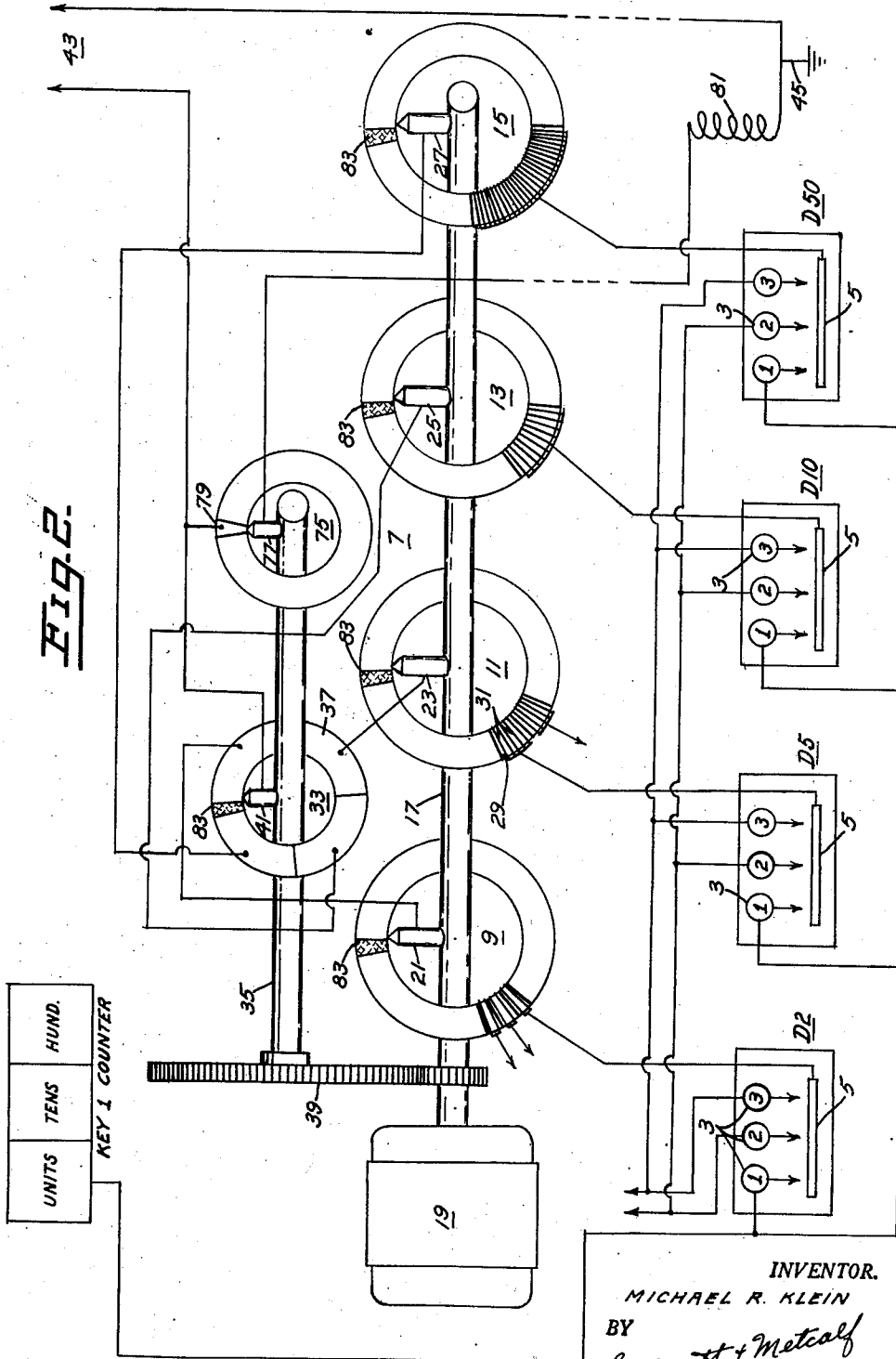
**June 19, 1951**

**M. R. KLEIN**  
**TOTALIZATOR**

**2,557,384**

Filed Dec. 10, 1945

4 Sheets-Sheet 2



June 19, 1951

M. R. KLEIN

2,557,384

TOTALIZATOR

Filed Dec. 10, 1945

4 Sheets-Sheet 3

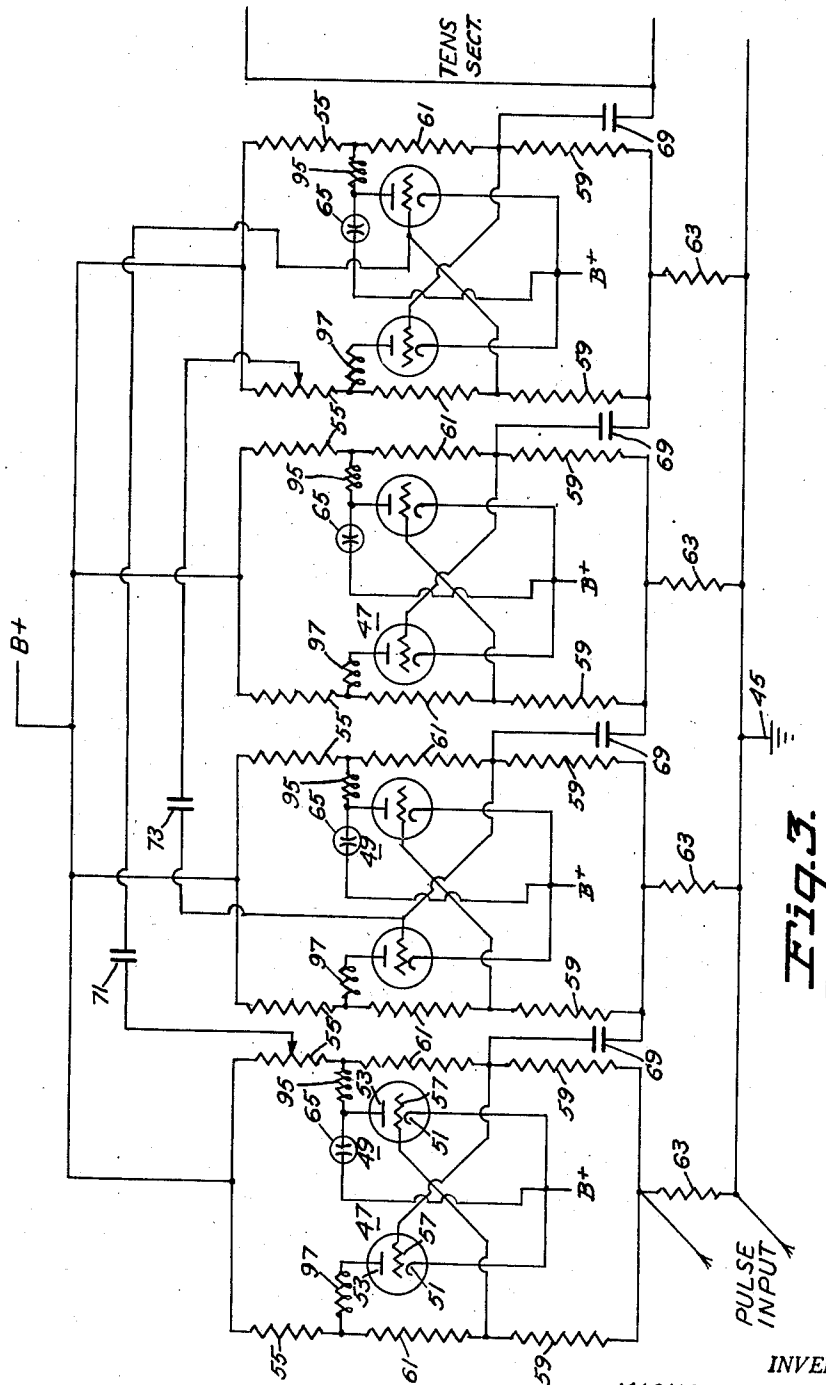


Fig. 3.

INVENTOR.

MICHAEL R. KLEIN

BY

Lippincott + Matcalf

**June 19, 1951,**

M. R. KLEIN

**2,557,384**

TOTALIZATOR

Filed Dec. 10, 1945

4 Sheets-Sheet 4

Fig. 4.

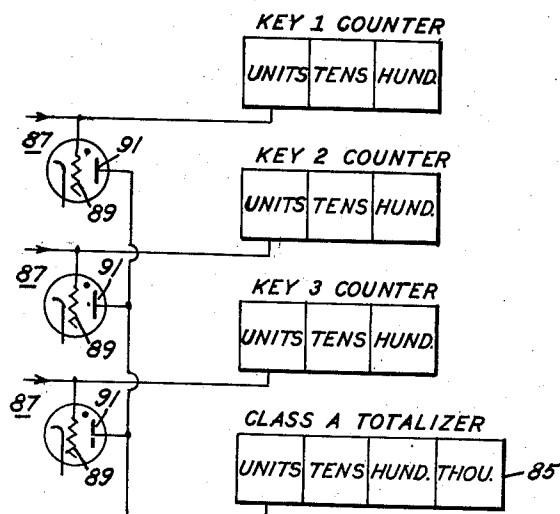
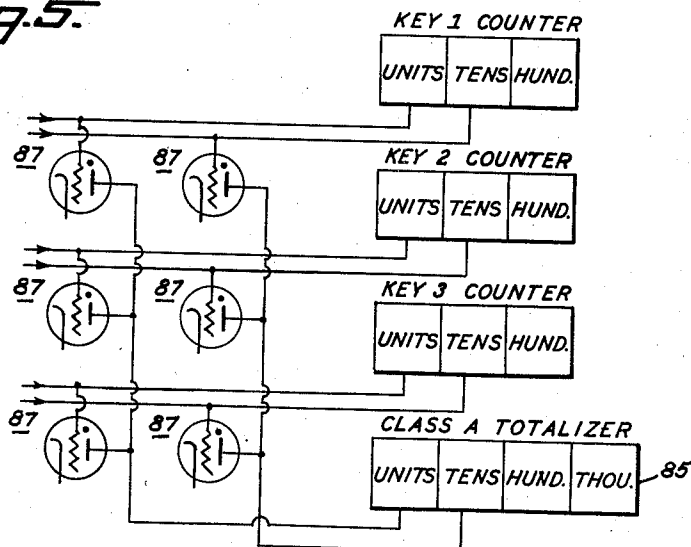


*Fig. 5.*



**INVENTOR.**

MICHAEL R. KLEIN

**BY**

INVENTOR.  
MICHAEL R. KLEIN  
BY  
Lippincott & Metcalf

## UNITED STATES PATENT OFFICE

2,557,384

## TOTALIZATOR

Michael R. Klein, South San Francisco, Calif., assignor to American Totalisator Company, Inc., Baltimore, Md., a corporation of Maryland

Application December 10, 1945, Serial No. 634,031

5 Claims. (Cl. 235—92)

1

My invention relates to totalizers and more particularly to such apparatus for totalling the value of tickets for example, issued from a number of ticket dispensing machines of differing denominations.

In systems of the type to which my invention pertains, a plurality of ticket dispensing machines of differing denominations are provided, each machine having a plurality of numbered actuating keys but adapted to issue tickets of a single denomination only and relating to a particular class. It is very desirable in such system, to know at any instant, the total value of all tickets of a particular class, which have been issued through the actuation of keys of a particular number in a group of machines representing a certain class, also the total value of all tickets of a particular class regardless of key numbers.

A ticket dispensing machine of the type referred to and capable of use in the system of the present invention, is disclosed in and covered by Patents No. 1,732,078, 1,732,079, 1,733,716, 1,815,534, 1,862,446, 1,886,626, 1,886,627, 1,886,769, 1,900,092, 1,994,030, 2,020,594, 2,046,742, 2,115,760, 2,210,729.

Prior art systems for this purpose utilize totalizers in which stepping relays play a major part in the performance thereof. It has been found that in such systems, the rapidity of totalizing has for its limiting factor, the speed with which such relays can be made to function.

The ultimate to be hoped for in a totalizing system is that the information must be recorded within the shortest expected time interval between successive depressions of keys on any machine, and regardless of the number of such machines in use in the system. Since the demand on a machine at times may be so great that the shortest expected time interval will be measured by the maximum speed with which an operator can successively depress the keys of a machine, circuits depending for their operation on stepping relays cannot function quickly enough to meet such possible demand upon them.

Among the objects of my invention are:

(1) To provide a novel and improved totalizer system employing no stepping relay circuits;

(2) To provide a novel and improved totalizer system in which the human element is a speed limiting factor in its operation, whereby an operator cannot possibly exceed the ability of the system to keep up with him;

(3) To provide a novel and improved totalizer system of reduced size and weight as compared to prior systems;

2

(4) To provide a novel and improved system of great simplicity and ruggedness, and one which readily lends itself to servicing if and when necessary.

5 Additional objects of my invention will be brought out in the following description of a preferred embodiment of the same, taken in conjunction with the accompanying drawings wherein—

10 Figure 1 is a block diagram of the system of my invention;

Figure 2 is a schematic showing of the scanning and impulse generating apparatus embodied in my system;

15 Figure 3 is an electronic decade counter circuit forming part of the system combination;

Figure 4 is a view illustrating the manner of totalizing the information transmitted to a plurality of decade counters, when all pulses are of unit value;

20 Figure 5 is a corresponding view when certain of the pulses have a value of ten.

Referring to Figure 1 of the drawings for a broad view of the system embodying my invention, it will be noted that the machines are divided into groups, each group representing a particular class such as Class A, Class B, . . . etc., and comprising a number of machines of differing denominations, designated as D2, D5, . . . etc., with enough machines of any one denomination sufficient to handle the anticipated demand for tickets of such denomination.

Each machine is capable of being actuated into operation through the depression of any one of a plurality of numbered keys 3 with which such machine is provided. The depression of any one of such keys will cause the machine to issue a ticket but, regardless of which key is depressed, the denomination of the ticket will be the same and will correspond with the denominational value of the machine from which the ticket is dispensed.

To evaluate all the tickets of a particular class dispensed by the corresponding keys of the various machines of such class, a counter for all the corresponding numbered keys of each group is provided, whereby the depression of any one or more of similarly numbered keys in a group will condition their associated machines for the transmission of information to the counter. Thus the counter which is associated with the number one keys of one class group, for example, will receive information by way of those machines of this group in which the number one keys have been depressed. By scanning all the machines in

sequence, the information may be transmitted to associated counters and recorded.

The depression of a key merely conditions its associated machine for the transmission of information to the pertinent counter. The source of information is a pulse generator which transmits through each machine so conditioned, pulses corresponding to the denomination of such machine. In this manner, the pertinent counter will record the denominational value of the ticket issued from such machine.

For a detailed description of a preferred embodiment of my invention, reference will be made to the Figures 2 and 3 of my drawings wherein only machines of one class group are depicted, and for purposes of further simplification, only one machine of each denomination is considered in such group.

The machine may be of any conventional type of ticket dispensing machine having a plurality of numbered keys, each capable of conditioning the machine for printing and dispensing a ticket of the denomination assigned to such machine. Such machine, after being conditioned by the depression of the key, is preferably one which is caused to operate through a time cycle within which cycle, the ticket is printed and the key reset. For totalizing purposes, each key of a machine is individually connected in circuit to a separate counter designated in the drawings as key 1 counter, key 2 counter, . . . etc., with which it is to be associated, and upon being depressed, makes contact with a contact bar 5 for the duration of the operating cycle of the machine, that is until the key is reset following the printing and dispensing of the ticket.

The key 1, key 2, . . . etc. counters of a particular class are in turn coupled to a totalizer, designated in the drawings as Class A totalizer, Class B totalizer, . . . etc.

In conjunction with the above, I have provided a scanning and pulse generating apparatus 7 capable of sequentially scanning all machines within the brief period of a machine operating cycle, and transmitting the desired information to the pertinent counter apparatus; and in cooperation therewith the counter apparatus must be capable of recording such information during such brief scanning cycle.

Where the type of machine employed is one operating on a time cycle of operation, as is assumed to be the case here, synchronization of operation of all machines in proper time relationship with the scanning and pulse generating apparatus is essential toward full realization of the results desired.

The particular scanning and pulse generating apparatus illustrated by me (Figure 2) comprises a plurality of stationary pulse commutators 9, 11, 13, 15, . . . etc. in alignment about a shaft 17 driven by a motor 19 and carrying a corresponding brush 21, 23, 25, 27, . . . etc. for each commutator.

Each pulse commutator for simplicity of design and construction, is preferably associated with the machines of a particular denomination only, regardless of class represented thereby, and is made up of a number of segments 29 of insulation material in accordance with the expected number of machines of such denomination to be incorporated in the system. Each of the insulating segments carries radial contacts 31 representing the denominational value of the associated machines, such contacts being connected in parallel to the contact bar 5 of such

machine. Thus the pulse commutator 9, which may for example, be associated with machines of a denominational value of two, may have a large number of insulation segments, with each segment carrying two contacts.

The second pulse commutator 11, which may be associated with machines of a denominational value of five, for example, will in all probability have a lesser number of insulation segments, but each segment in this instance will have five contacts connected in parallel to the contact bar of an associated machine.

Likewise, with the remaining pulse commutators of higher denominational value, each segment of insulation may be provided with a number of contacts in accordance with such denominational value, such contacts being connected in parallel to their associated machine, though it will later be shown how the number of these contacts may be reduced to a single contact per segment in machines of a denominational value of ten, and correspondingly reduced for machines based on multiples thereof.

For each revolution of the motor shaft 17, each brush will simultaneously wipe all contacts on its associated commutator, but since this would produce overlapping pulses in the system, it becomes necessary to transmit such pulses in timed sequence, and for this purpose, I provide a timing commutator 33 associated with an independent shaft 35, such commutator having as many conductive segments 37 as there are pulse commutators. A connection from each conductive segment to a different one of the pulse commutator brushes assures sequential connection of each pulse commutator in the system, whereby overlapping of pulses is definitely avoided.

The timing commutator shaft is driven from the pulse commutator shaft through a reduction gear 39, the ratio of reduction being equal to the number of segments in the timing commutator.

A brush 41 on the timing commutator shaft is connected to one side of a power source 43, the other side of which may be connected through ground 45 or wire connection to the various counters, to complete circuits thereto as will subsequently be discussed in greater detail.

It will be apparent from the above, that the pulse commutators, while they are in continuous rotation, will be connected in circuit sequentially due to the sequential application of power to each of the segments of the timing commutator.

It must be borne in mind, that while the timing commutator runs at a slower speed than the pulse commutators, it is this timing commutator which determines the cyclic scanning period. Since it is this period which should be shorter than any expected time interval between successive depressions of the keys of any one machine, then the timing commutator must execute each rotation within such period.

As previously indicated, corresponding keys of machines representing a particular class are connected to the same decade counter whereby all impulses transmitted by reason of the depression of these keys will reach this particular counter.

One form of such counter, capable of handling the maximum possible number of pulses in the short cycle time under consideration, as would be represented by the simultaneous depression of all like numbered keys in the machine representing a particular class, is that illustrated by me in the drawings. This counter has been

based on a trigger circuit known in the art as the Eccles-Jordan trigger circuit. Such trigger circuit is described on pages 353-356 of Theory and Application of Electronic Tubes, second edition by Herbert J. Rich.

Briefly such trigger circuit, in the form illustrated in the drawings, comprises a pair of triodes 47 and 49 with the filaments 51 connected together to a supply source B+ and the plates 53 connected to a point of higher positive potential on the same power supply source through load resistors 55. The grids 57 of the tubes are connected to the ground connection 45 through resistors 59.

A characteristic of such circuit, lies in the fact that each grid, also, is connected to the anode of the other triode through a coupling resistor 61. When so connected, a slight unbalance in the current flow through one tube, if in the direction of increase for example, will increase the voltage drop in the coupling resistor to the grid of the other tube, making such grid more negative and thus decreasing the current flow in such other tube. This in turn decreases the bias on the first triode, resulting in a further increase of current therethrough. The action is cumulative and so one plate current rises while the other falls to zero.

The initial slight unbalance necessary to cause such operation may be realized by the application of a pulse across a resistor 63 in the common ground lead connection to the grids for example. In the particular system under consideration, such pulse will be one of those developed by the pulse commutators previously described. This is accomplished by parallel connections from the upper end of the resistor to the pertinent keys. The lower end of the resistor being grounded, the circuit is complete through the power source to the timing commutator.

The counter illustrated is made up of a number of stages, each of which embodies one of such aforementioned trigger circuits, to which has been added a signal device 65 such as a neon lamp between the plate and filament of the triode 49.

The first four stages are coupled to represent the units designation of the counter, while the next four stages are similarly coupled to register the tens designation, etc. To do this, each stage is capacitively coupled to the succeeding stage by a condenser 69 connected between one of the grids of the preceding stage and the common connection of the two grids of the following stage. Along with this, a condenser 71 is connected between a point on the load resistor of the first stage tube 49 and the grid of the corresponding tube of the fourth stage, while another condenser 73 is connected between the grid of the second stage tube 47 and the load resistor of the corresponding tube of the fourth stage.

When so coupled, the four stages in the units group may be assigned number values of 1, 2, and 8 respectively, and these values enable one to register any number from one to nine inclusive through the use of the lamps associated with the various stages. Thus, the first pulse will light the lamp in the first stage. The second pulse will extinguish this lamp and light the lamp in stage number two, which has the value two. The third pulse will reestablish lamp number one without extinguishing the lamp number two, thereby totaling to a value three. The fourth pulse will extinguish lamps of value one and two and light the lamp of the third stage which has

been assigned the value four. The next pulse will light the lamp having the value one without extinguishing the lamp of value four, thereby totaling five.

Upon receipt of pulse number six, the lamp of value one will go out while the lamp of value two will go on, leaving lamp of value four burning, thereby designating a total of six. The next pulse will light lamp of value one without extinguishing the lamps of values two and four, thus totaling seven. The eighth pulse will cause the lamp of value eight to light and all the others in the group to be extinguished. The next incoming pulse will add the lamp of value one to give a total of nine.

Upon receipt of the tenth pulse, the presence of condensers 71 and 73 will reset the units group by extinguishing lights one and eight, and the first lamp of the second group will go on. If the lamps of the second group are assigned values ten times those of the corresponding lamps in the first group, and those of the succeeding groups, values ten times those of the preceding group, the ability of the counter to total pulses may be extended to any desired limit.

To assure synchronous operation of the machines, a single contact fixed commutator 75 is associated with the timing commutator shaft on which an associated brush 77 is mounted. The single contact 79 covers an arc of approximately ten degrees and serves momentarily to close a circuit through a motor starting solenoid 81, once every cycle of operation of the scanning and pulse generating apparatus.

Each conventional machine of the type considered in connection with the present disclosure, includes a holding circuit or mechanism which continues the machine functioning for its complete cycle of operation, once such machine has been energized by the motor starting solenoid circuit. Such holding circuit or mechanism is not part of the present invention except to the extent of the time relationship which it bears to the scanning cycle of the system.

For efficient synchronizing purposes, a brief period of quiescence should prevail between successive functioning periods of the machines to enable all machines to get set for their next cycle of operation. The timing and pulse commutators are each accordingly provided with a segment 83 of insulation occupying corresponding angular positions thereon just in advance of the contact 79 of the synchronizing commutator, in point of time, whereby all scanning and pulse circuits will be open and maintained so during the brief time interval consumed by the passage of the various brushes over these segments.

It might be in order at this time to stress the shortness of the periods involved in the aforementioned operation of my improved system. Assuming an operator, at times, can punch out two tickets a second, this means that the cycle period of the system as measured by a complete rotation of the timing commutator must be within one-half second, and the actual totalizing period per cycle will be still shorter by an amount as measured by the aforementioned quiescent period, which may be of the order of one seventy-fifth of a second.

It is apparent from the above description of my system, that the same will fulfill the objects of my invention. It is a relatively simple matter through the utilization of my commutator arrangement, to physically scan the machines and transmit the necessary pulses within the brief

cycle time allotted, and the cooperation therewith of an electronic counter as illustrated and described, permits of the recording or totaling of transmitted pulses practically instantaneously.

As indicated in Figure 1, it is not only desirable in a system of the type described, to evaluate the tickets dispensed by correspondingly numbered keys of a particular class, but also to evaluate all of the tickets dispensed from all of the machines of such class and record the same on a counter 85 which may for convenience be termed a totalizer. This I am able to accomplish in a very simple and effective manner by associating with each counter, an electron tube 87, preferably one of the thyratron type, with the grid 89 thereof connected to the pulse circuit, whereby the same electrical pulses transmitted to a particular counter will be impressed upon the grid of such tube for triggering the same. By connecting the plates 91 of all such thyratrons in parallel and feeding the output from such devices to the units division of the totalizer assigned to that particular class, all the counters of that class will be totalled. It is understood of course that each class group of counters will be similarly totalled.

While I have disclosed one embodiment of my invention in detail, the same is subject to modification and alteration without departing from the underlying principles thereof.

As one possibility, the timing commutator and pulse commutator may be combined into a single commutator having sufficient segments of insulation to accommodate the total number of machines in the system. In this case, each segment will carry the proper number of contacts for the machine to which those contacts are connected. The time of each brush revolution will in this case be within the desired cycle time.

The pulse commutators might well be formed of a complete ring of insulation with the radial contacts inserted at properly spaced points. The term "segments" as previously utilized in describing these commutators should therefore be given sufficiently broad interpretation to cover this latter construction, which may be considered as comprising phantom segments or sections.

In lieu of the commutator construction previously described, a plurality of coils may be utilized for connection to the various counters, the pulses being induced therein by the rotation of an electro-magnet past such coils.

Also in the way of further possible modifications, the pulse commutator segments pertinent to machines of a value of ten or multiples thereof, need have but one-tenth the number of contacts previously indicated. However, when this reduced in number, the keys of these machines must be connected directly to the pertinent tens section of the counters, instead of running the pulses from these machines through the units counters, as previously described.

When, however, certain of these pulses have a value of ten in accordance with the foregoing modification, the unit pulses will be totalized in the same manner as previously described in connection with Figure 4, but as illustrated in Figure 5, the pulses having a value ten, must be totalized independently by way of a similar arrangement of thyratrons, whose grids are connected to that portion of the pulse circuits leading to the tens sections of the various counters. The output of such arrangement will then lead directly into the tens section of the totalizer for the particular class being totalled.

Likewise, should the system be enlarged to the point where certain of the pulses may be given a value of a hundred, then a third set of thyratrons for assembling these pulses from hundreds division of the various counters in a particular class and feeding the same into the hundreds section of the totalizer for such class, will be required.

Although the plates of the various thyratrons of any particular arrangement are connected in parallel, no confusion in the matter of registering pulses can result since the pulses applied to the grids of such tubes are time spaced from each other due to the commutator pulsing apparatus previously described.

In addition to or in lieu of the lamps utilized in the counters, relays 95 may be added in the plate circuits of the same tubes, and these relays will be assigned the same values as the lamps with which they may be associated. By cooperating these relays in accordance with their values, signals may be actuated which require no interpretation.

Corresponding impedances 97 will be added in the plate circuits of the companion tubes to maintain circuit symmetry.

Accordingly, while I have described one form of my invention in considerable detail, I do not desire to be limited in my protection thereto except as may be necessitated by the appended claims.

I claim:

1. In a totalizing system, involving a plurality of ticket dispensing machines, each of the type adapted to issue tickets of a predetermined denomination only and having a plurality of selectively actuatable keys representing different items, for operating such machines to issue tickets therefrom, and registering means assigned in common to keys of said machines corresponding to identical items; means for transmitting to such registering means through each machine having an actuated key, a number of pulses, the total number of pulses resulting from a single key actuation having a value corresponding to the denomination of a ticket dispensed by actuation of such key, said pulse transmitting means including a commutator of a plurality of sections of insulation with each section having a plurality of contacts therein indicative of a ticket denomination, and means parallel connecting the contacts of each section to a different one of said machines in accordance with the denomination of the ticket issued by each such machine.

2. In a totalizing system, involving a plurality of ticket dispensing machines, each of the type adapted to issue tickets of a predetermined denomination only and having a plurality of selectively actuatable keys representing different items, for operating such machines to issue tickets therefrom, and an electronic registering means assigned in common to keys of said machines corresponding to identical items; means for transmitting to such registering means through each machine having an actuated key, a number of pulses, the total number of pulses resulting from a single key actuation having a value corresponding to the denomination of such machine, said pulse transmitting means including a commutator of a plurality of sections of insulation with each section having a plurality of contacts therein indicative of a ticket denomination, and means parallel connecting the contacts of each section to a different one of said machines in

accordance with the denomination of the ticket issued by each such machine.

3. In a totalizing system, involving a plurality of ticket dispensing machines, each of the type adapted to issue tickets of a predetermined denomination only and having a plurality of selectively actuatable keys representing different items, for operating such machines to issue tickets therefrom, and an electronic registering means assigned in common to keys of said machines corresponding to identical items; means for cyclicly scanning said machines in sequence and during such scanning, transmitting to such registering means through each machine having an actuated key, a number of pulses, the total number of pulses resulting from a single key actuation having a value corresponding to the denomination of such machine, said scanning and pulse transmitting means including a commutator of a plurality of sections of insulation with each section having a plurality of contacts therein indicative of a ticket denomination, and means parallel connecting the contacts of each section to a different one of said machines in accordance with the denomination of the ticket issued by each such machine.

4. In a totalizing system, involving a plurality of ticket dispensing machines, each of the type adapted to issue tickets of a predetermined denomination only and having a plurality of selectively actuatable keys representing different items, for operating such machines, and an electronic registering means assigned in common to keys of said machines corresponding to identical items; means for cyclicly scanning said machines in sequence and during such scanning, transmitting to such registering means through each machine having an actuated key, a number of pulses, the total number of pulses resulting from a single key actuation having a value corresponding to the denomination of such machine, said scanning and pulse transmitting means including a stationary cylindrical commutator of a plurality of sections of insulation and a brush rotatably mounted within the same, each sec-

tion having a plurality of radial contacts therein, and means parallel connecting the contacts of each section to a different one of said machines in accordance with the denomination of the ticket issued by each such machine.

5. In a totalizing system involving a plurality of ticket dispensing machines, each of the type adapted to issue tickets of a predetermined denomination only and having a plurality of selectively actuatable keys representing different items, for operating such machines to issue tickets therefrom, and registering means assigned in common to keys of said machines corresponding to identical items; means for transmitting to such registering means through each machine having an actuated key, a number of pulses, the total number of pulses resulting from a single key actuation having a value corresponding to the denomination of a ticket dispensed by actuation of such key, said pulse transmitting means including a commutator of a plurality of sections, each section having a fixed number of pulse generating elements indicative of a ticket denomination, and means parallel connecting the pulse generating elements of each section to a different one of said machines in accordance with the denomination of the ticket issued by each such machine.

MICHAEL R. KLEIN.

#### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

| Number    | Name      | Date          |
|-----------|-----------|---------------|
| 1,340,435 | Bryce     | May 18, 1920  |
| 1,872,370 | Waite     | Aug. 16, 1932 |
| 2,329,048 | Hullegard | Sept. 7, 1943 |
| 2,332,756 | Robinson  | Oct. 26, 1943 |

#### FOREIGN PATENTS

| Number  | Country       | Date          |
|---------|---------------|---------------|
| 337,775 | Great Britain | Oct. 30, 1930 |