

Aug. 5, 1952

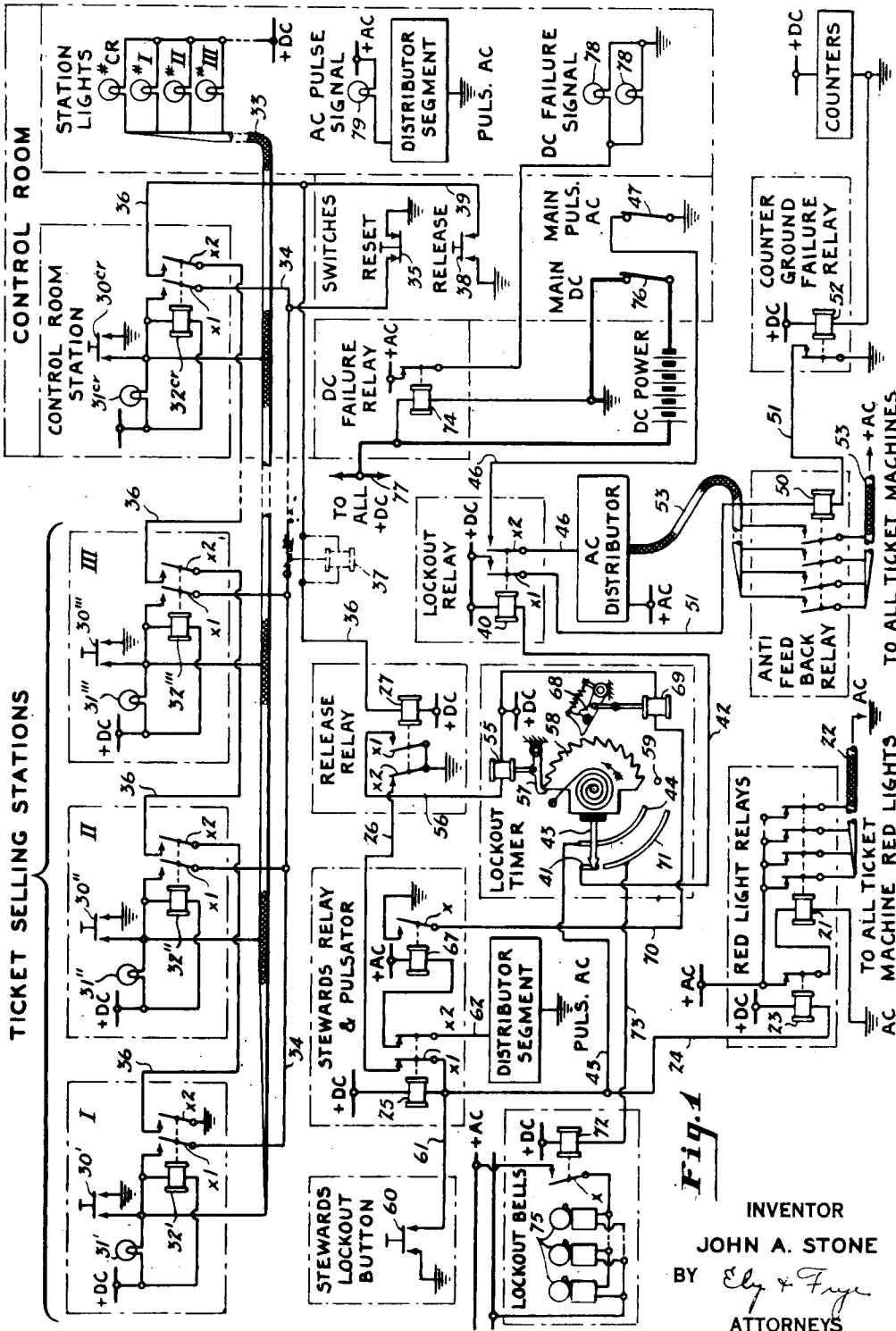
J. A. STONE

2,605,967

TICKET PRINTING AND TOTALING APPARATUS

Filed May 19, 1944

14 Sheets-Sheet 1



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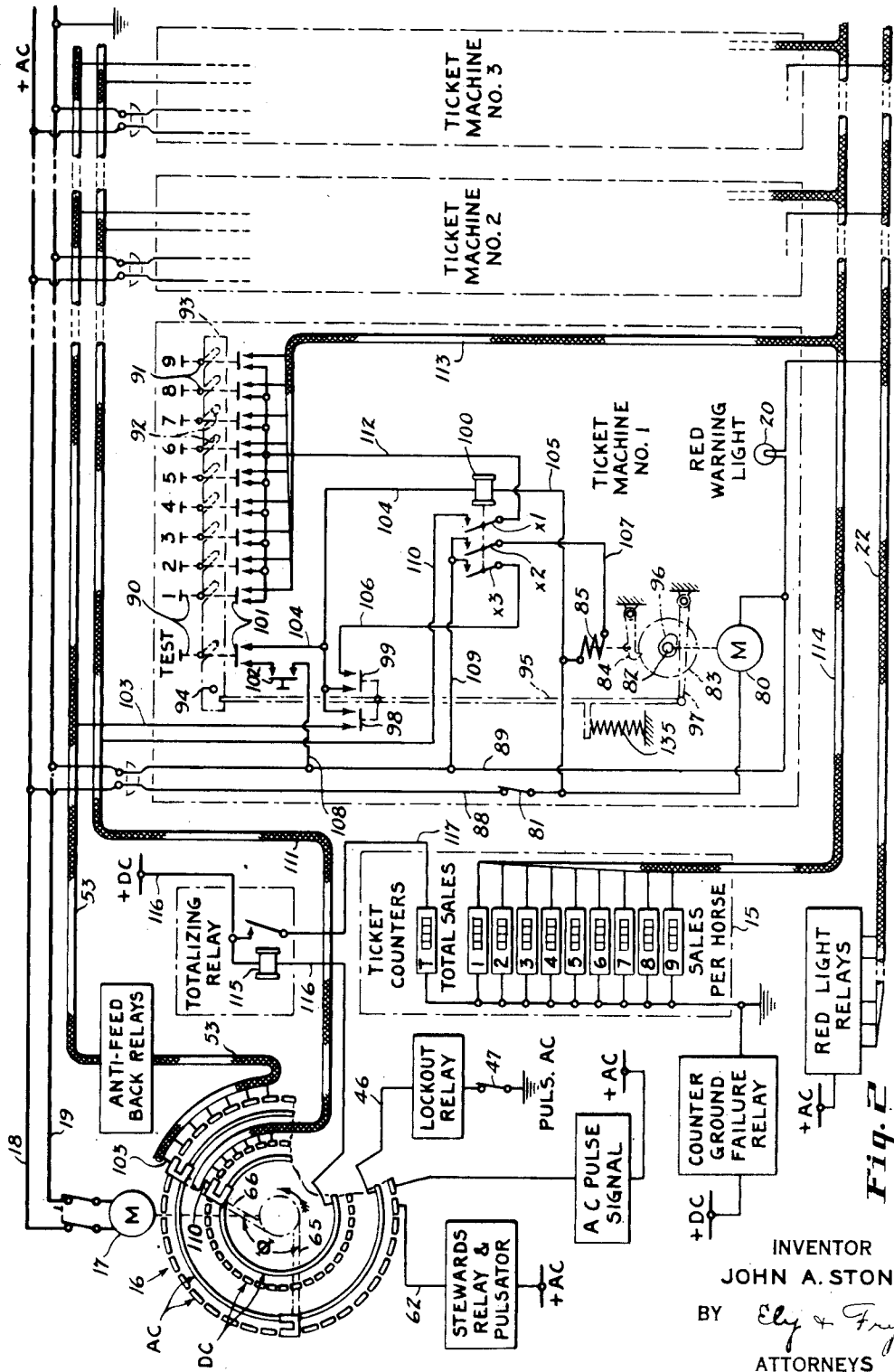
J. A. STONE

2,605,967

TICKET PRINTING AND TOTALING APPARATUS

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14 Sheets-Sheet 2



INVENTOR
JOHN A. STONE
BY *Ely & Frye*
ATTORNEYS

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J. A. STONE

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14 Sheets-Sheet 3

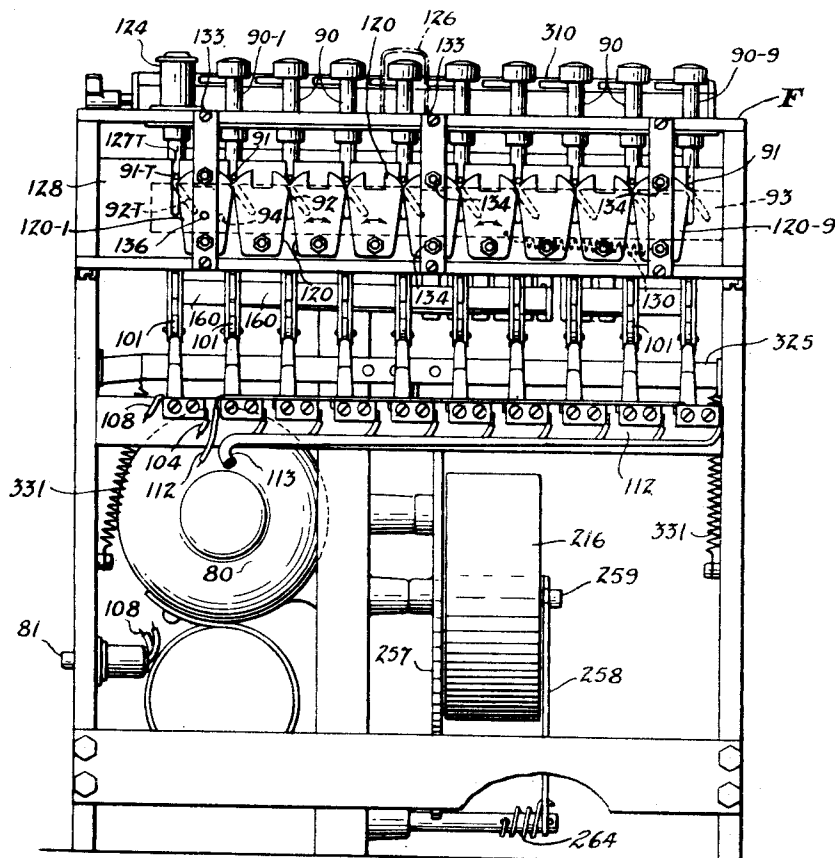


Fig. 3

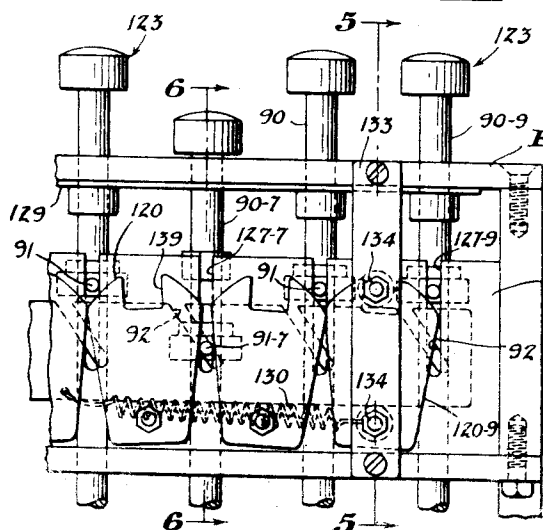


Fig. 4

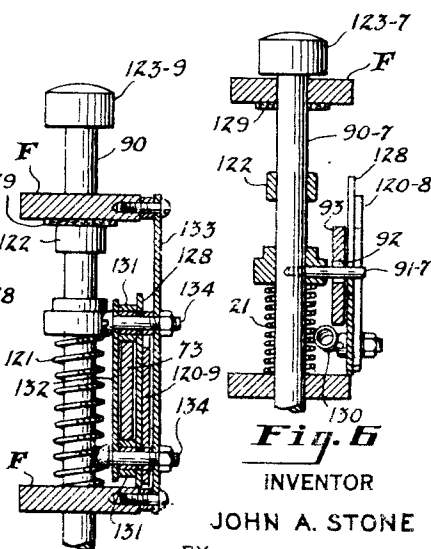


Fig. 6

INVENTOR
JOHN A. STONE

BY *Ely & Faye*
ATTORNEYS

Aug. 5, 1952

J. A. STONE

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14 Sheets-Sheet 4

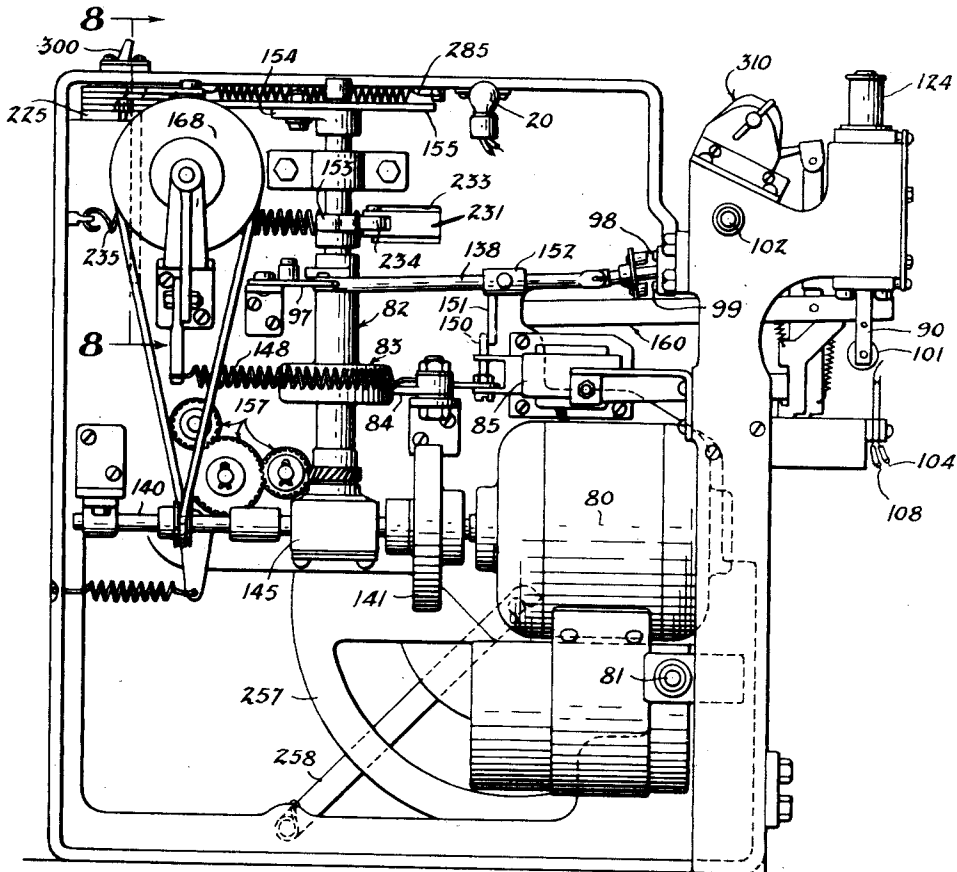


Fig. 7

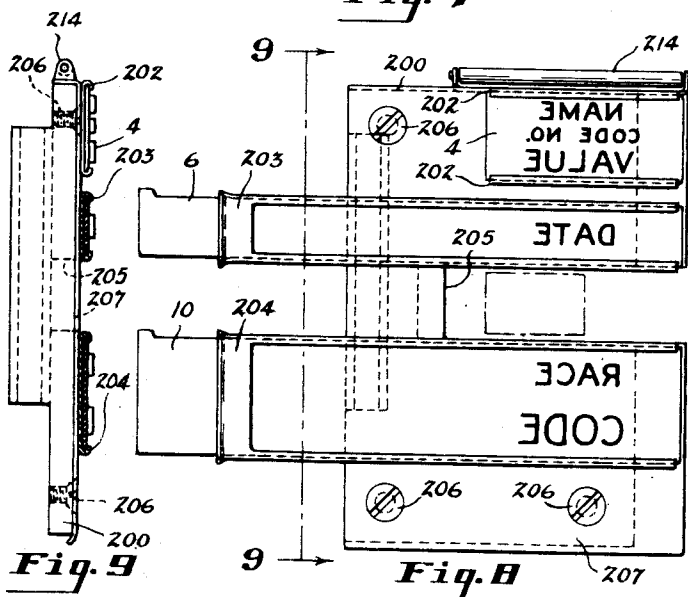


Fig. 9

Fig. 8

NAME	2
CODE NO.	7
VALUE	3
DATE	5
RACE	11
CODE	8
	9

Fig. 10

INVENTOR

JOHN A. STONE

BY *Ely & Frye*
ATTORNEYS

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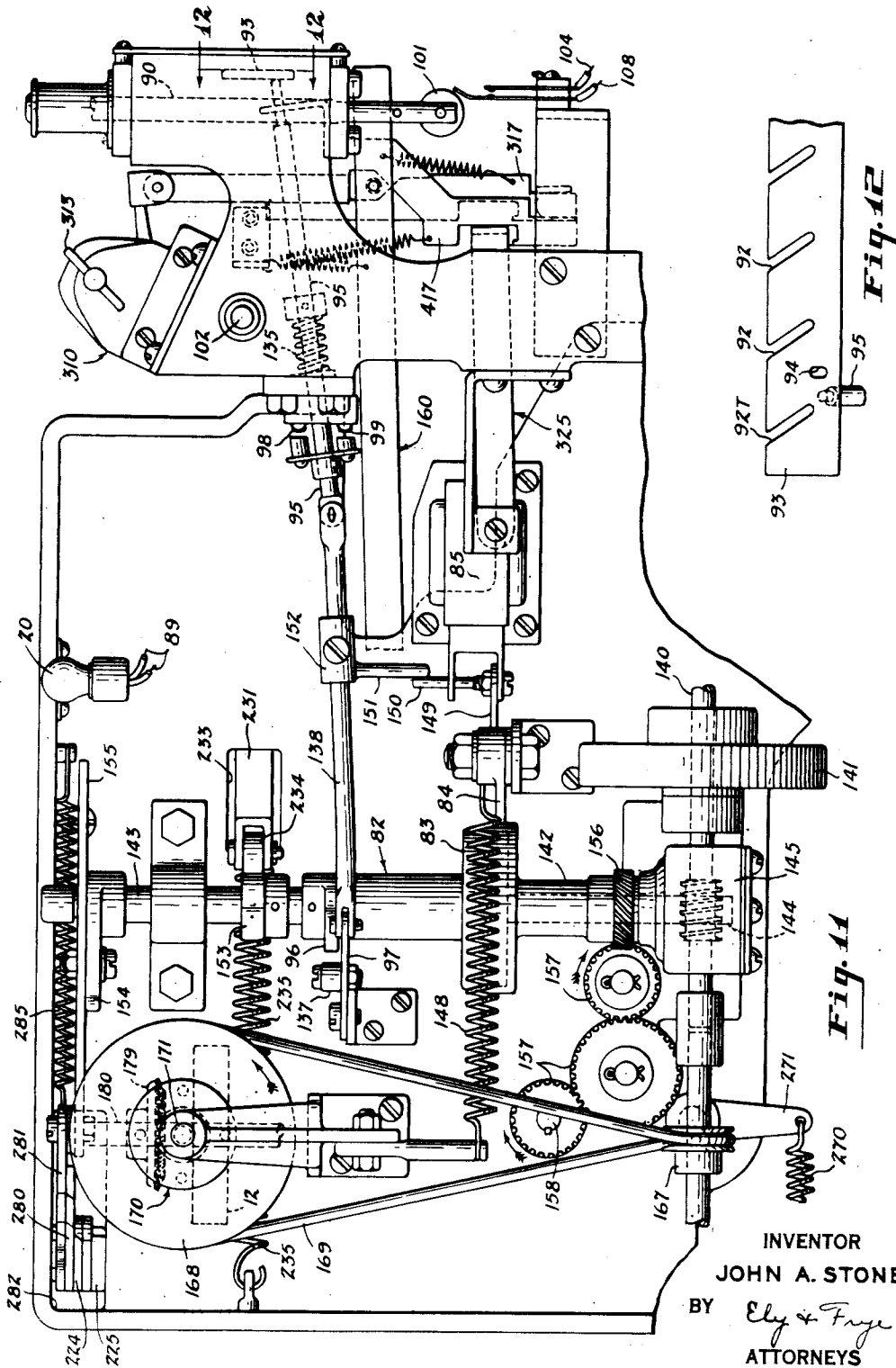
J. A. STONE

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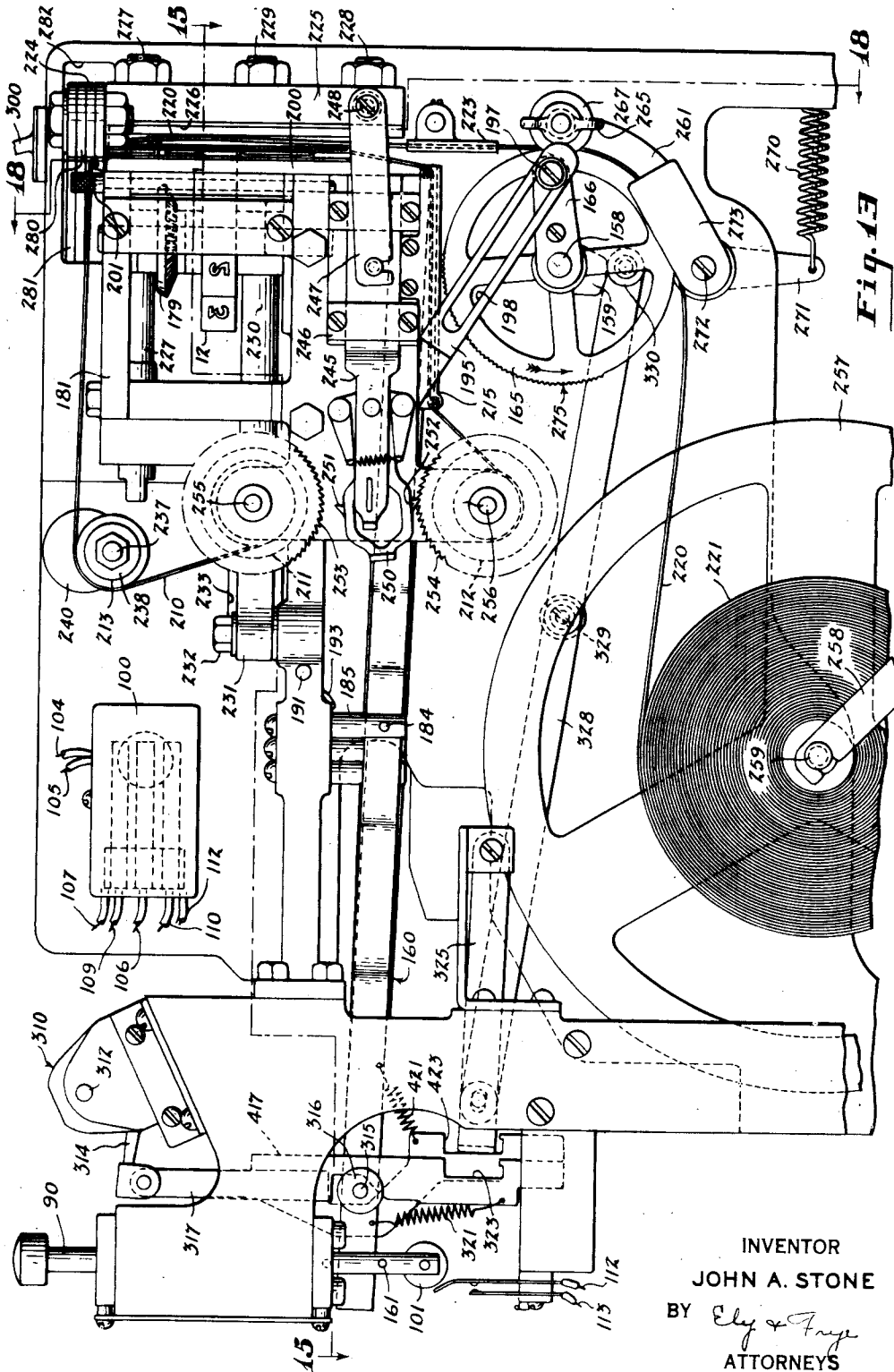


Fig. 13

INVENTOR
JOHN A. STONE
BY *Ely & Frye*
ATTORNEYS

Aug. 5, 1952

J. A. STONE

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14 Sheets-Sheet 7

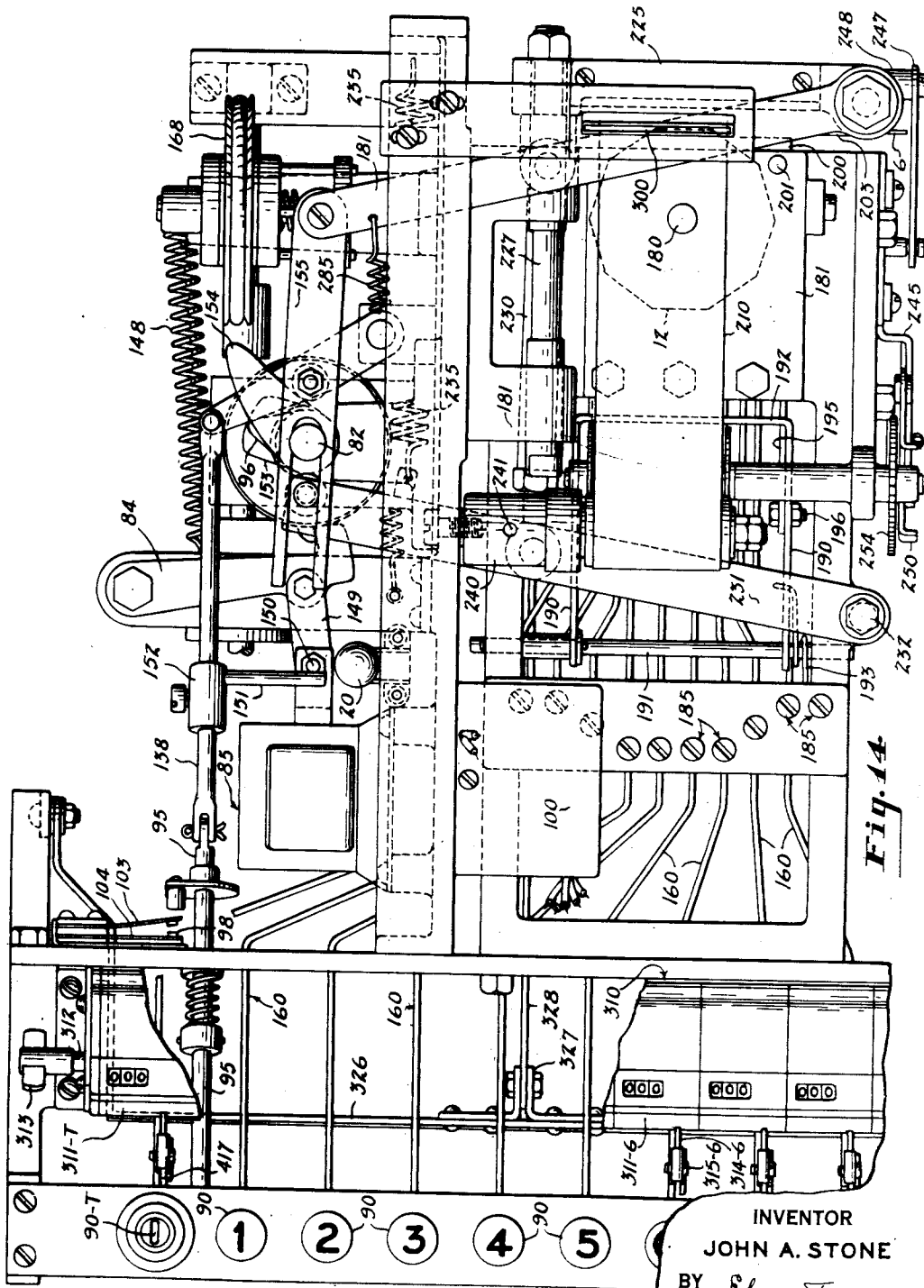


Fig. 14.

INVENTOR
JOHN A. STONE
BY *Ely & Frye*
ATTORNEYS

Aug. 5, 1952

J. A. STONE

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14 Sheets-Sheet 8

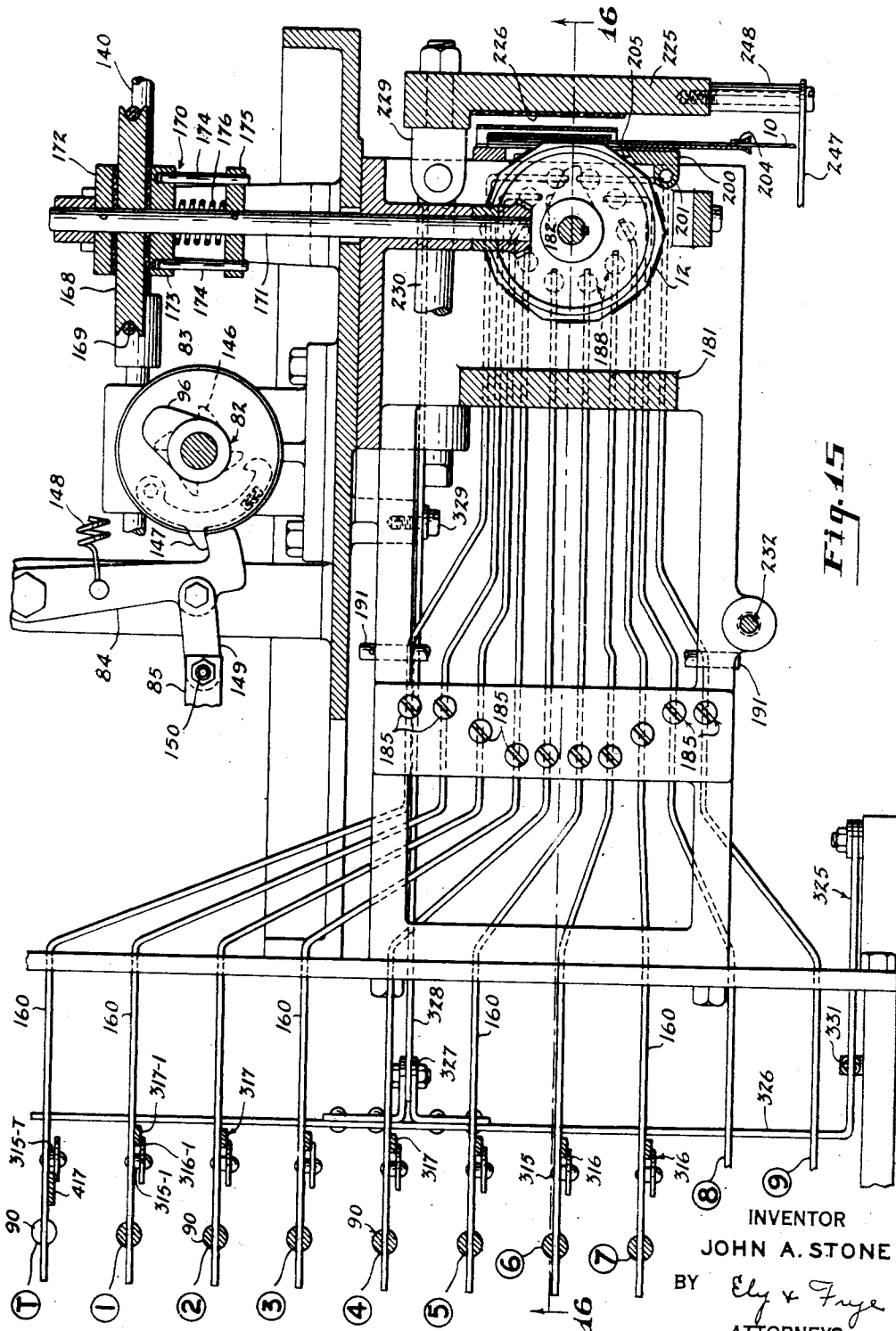


Fig. 15

INVENTOR
JOHN A. STONE
BY *Ely & Frye*
ATTORNEYS

Aug. 5, 1952

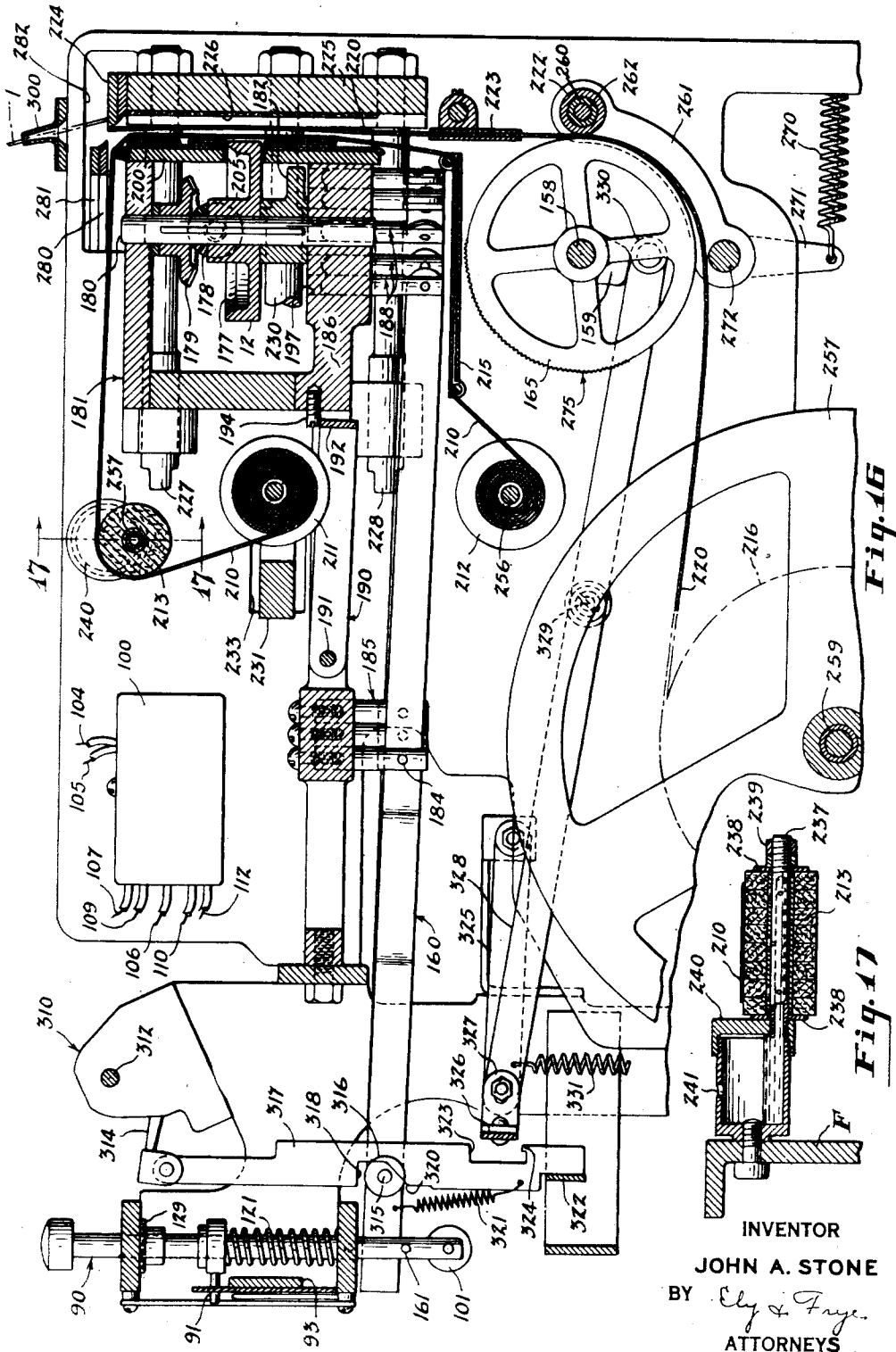
J. A. STONE

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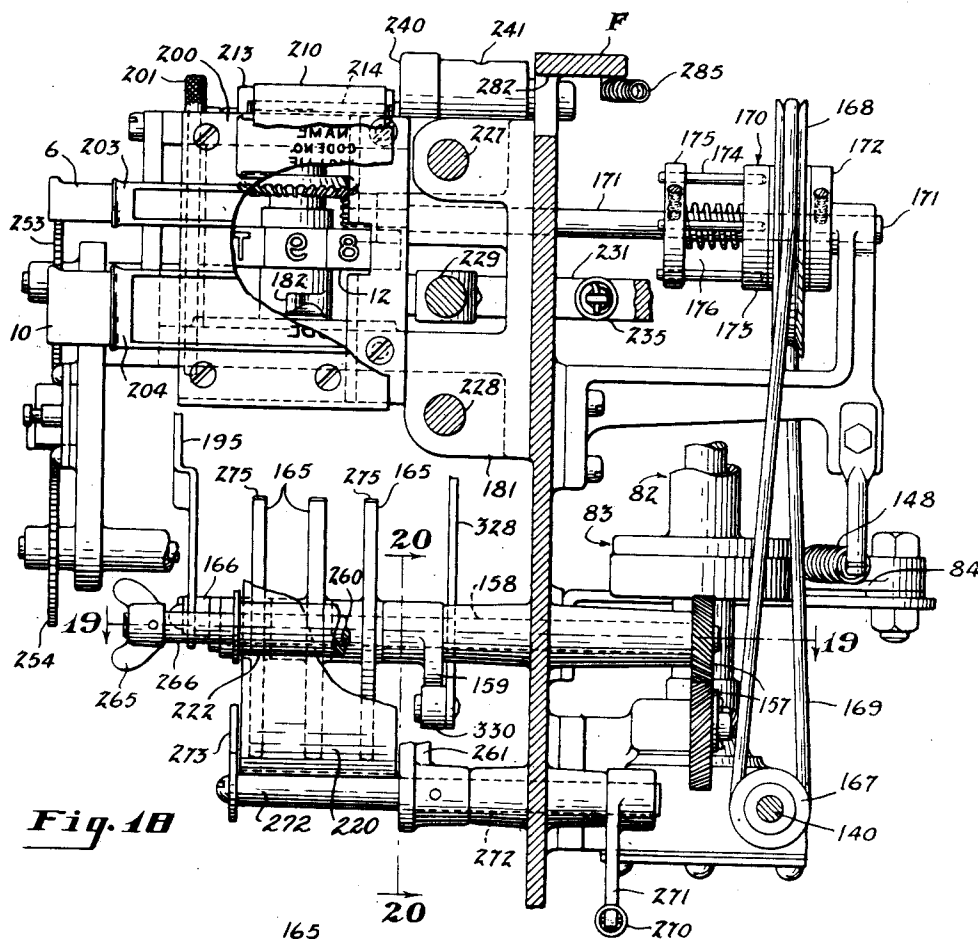


Fig. 18

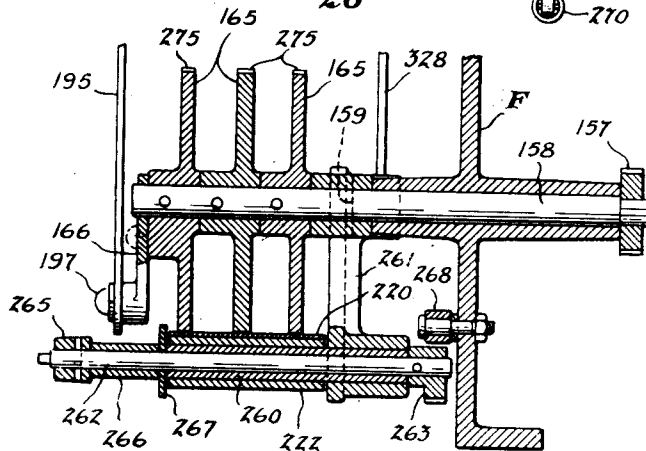


Fig. 19

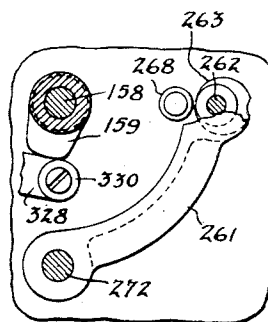


Fig. 20

INVENTOR
JOHN A. STONE
BY *Ely & Faye*
ATTORNEYS

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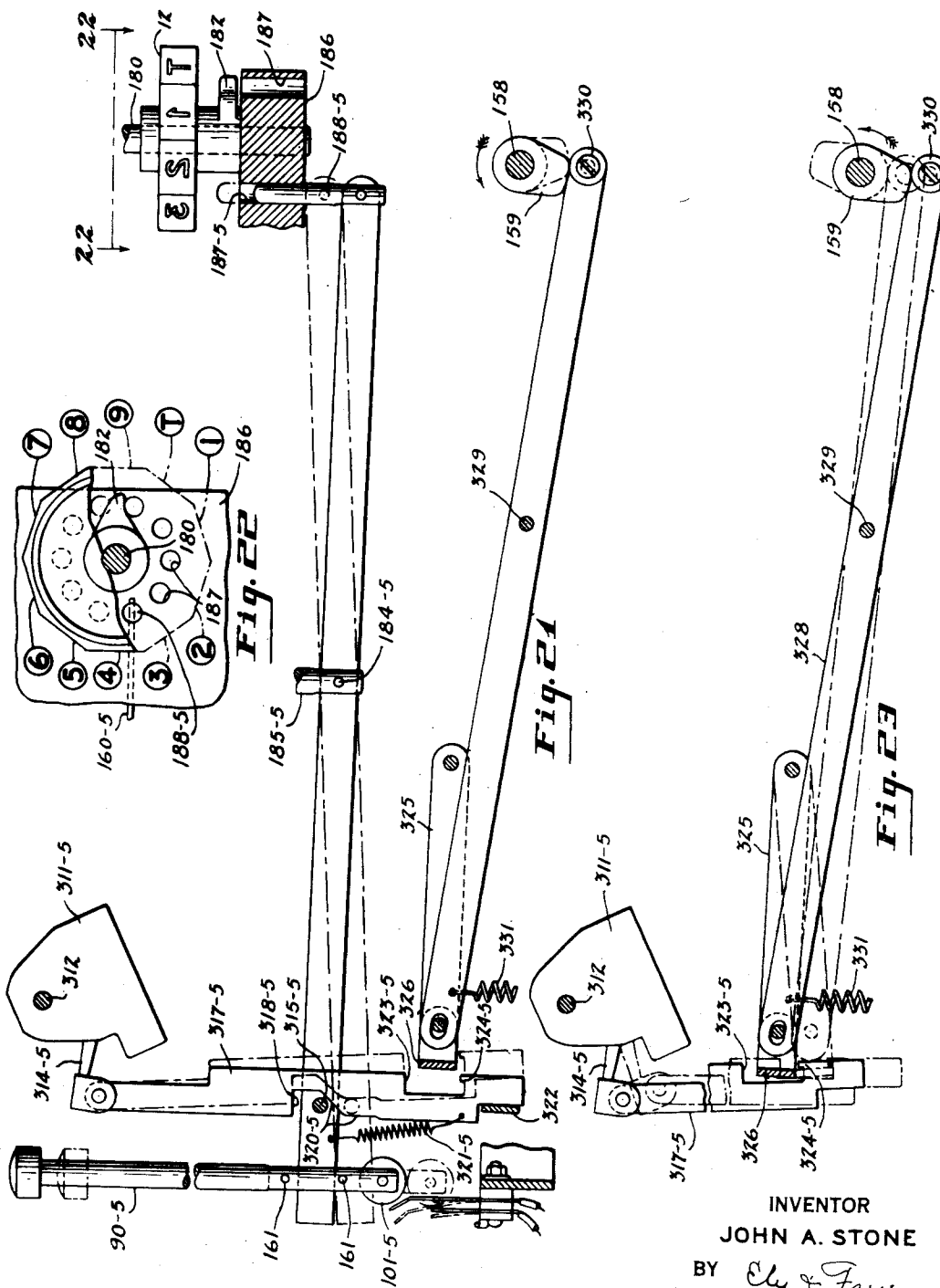
J. A. STONE

2,605,967

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INVENTOR
JOHN A. STONE
BY *Ely & Frye*
ATTORNEYS

Aug. 5, 1952

J. A. STONE

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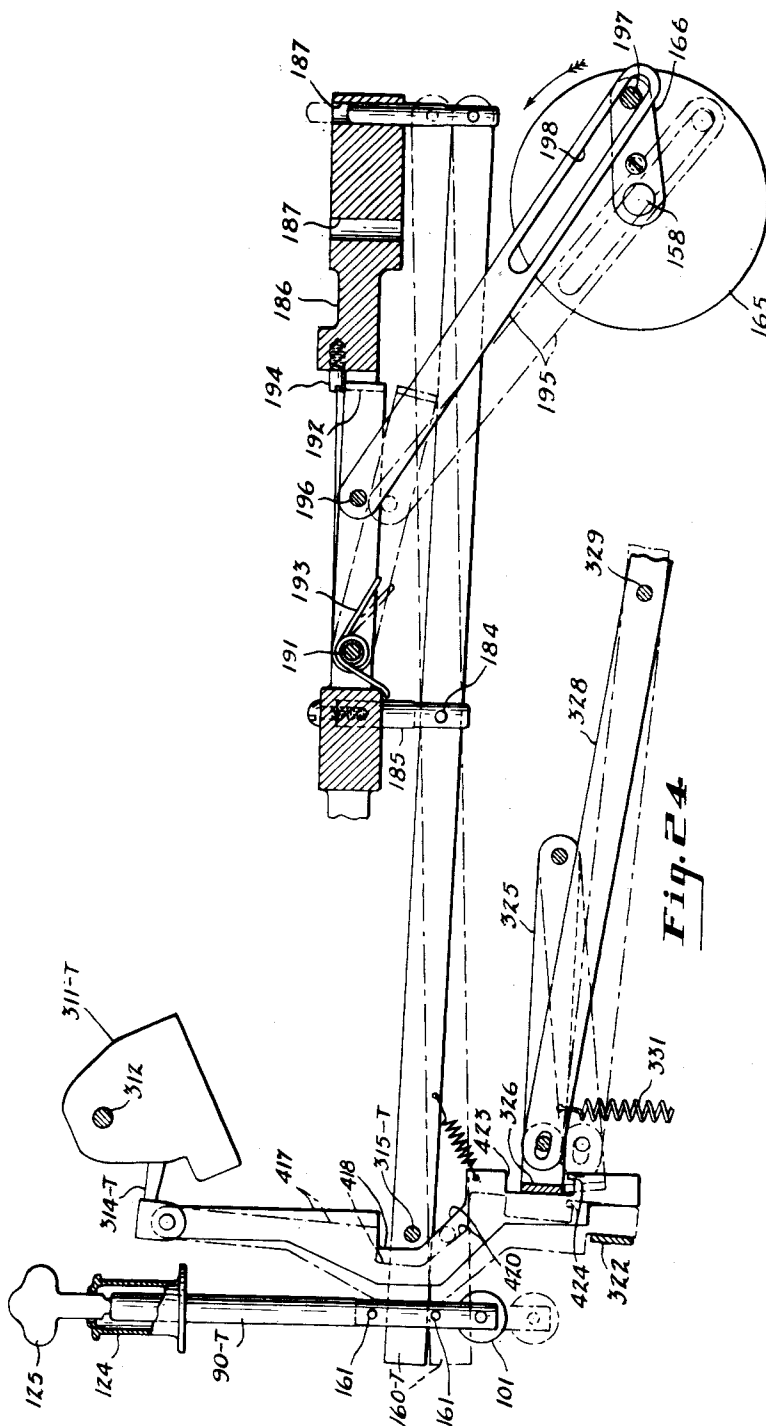


Fig. 24

INVENTOR
JOHN A. STONE
BY *Ely & Frye*
ATTORNEYS

Aug. 5, 1952

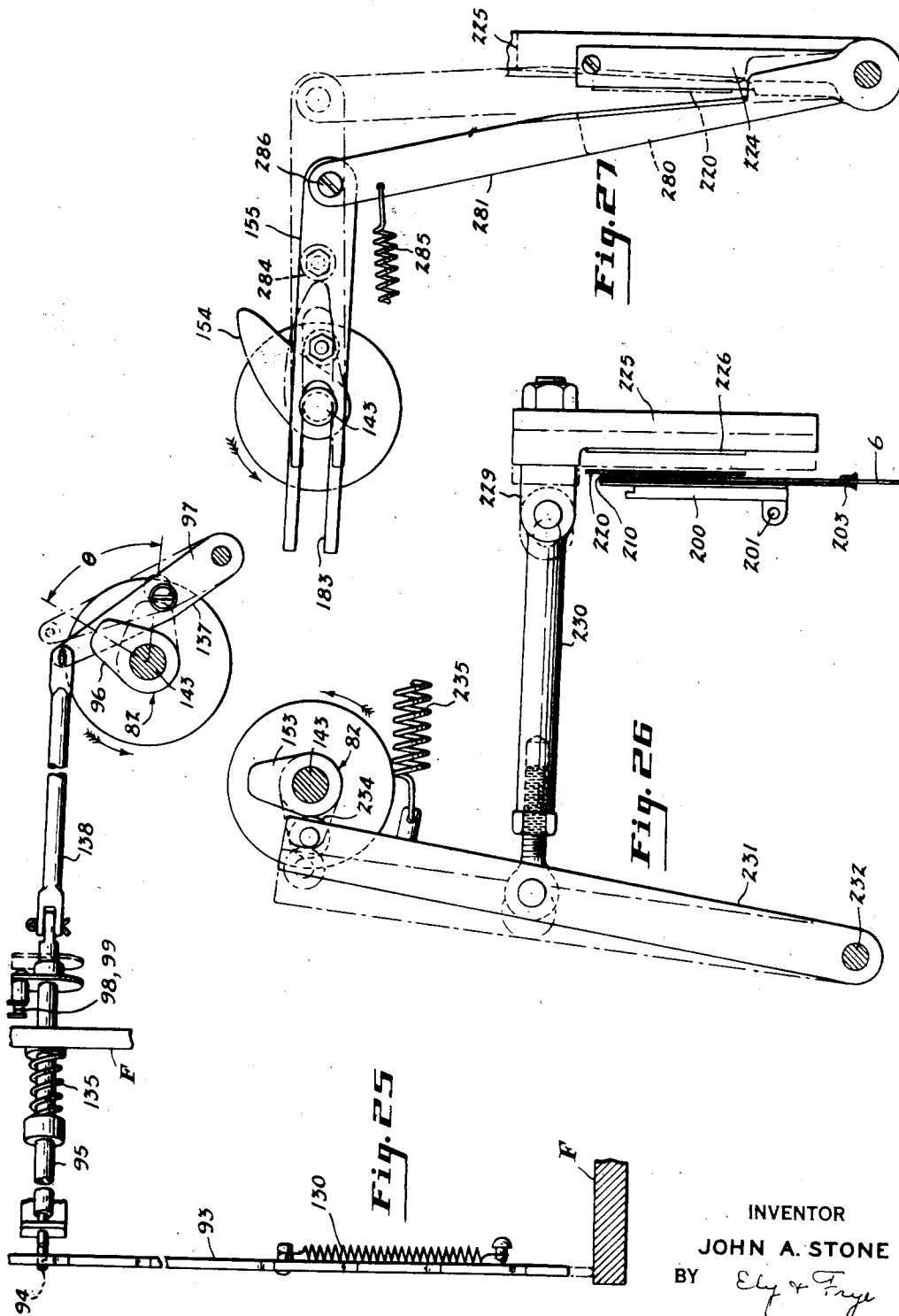
J. A. STONE

2,605,967

TICKET PRINTING AND TOTALING APPARATUS

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INVENTOR
JOHN A. STONE
BY *Ely & Faye*
ATTORNEYS

Aug. 5, 1952

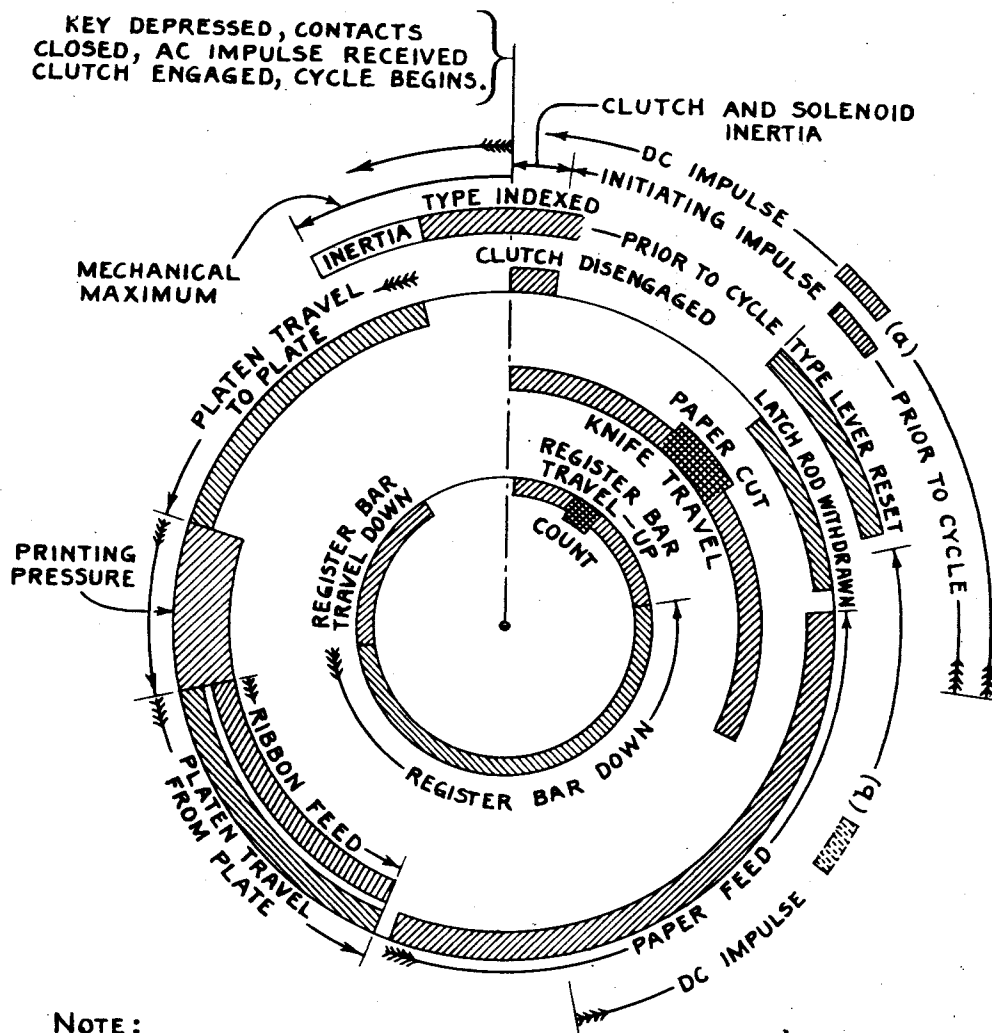
J. A. STONE

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TICKET PRINTING AND TOTALING APPARATUS

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NOTE:

- (a) DC IMPULSE, CYCLE INITIATED BY AC IMPULSE
DUE TO DISTRIBUTOR ARM 66.
 - (b) DC IMPULSE, CYCLE INITIATED BY AC IMPULSE
DUE TO DISTRIBUTOR ARM 65.
- [CYCLE FOR CONSTANT SPEED MOTOR]

Fig. 28

INVENTOR
JOHN A. STONE
BY *Ely & Frye*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,605,967

TICKET PRINTING AND TOTALING
APPARATUSJohn A. Stone, Detroit, Mich., assignor to Moto,
Inc., Cleveland, Ohio, a corporation of Ohio

Application May 19, 1944, Serial No. 536,417

15 Claims. (Cl. 235-92)

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This invention relates to improvements in ticket printing machines and a control and totaling system therefore. More particularly, this invention relates to a machine which will print tickets at the time of sale, indicating on the face of the ticket the value and selected purpose thereof. This invention also relates to an electrical system for both totaling sales by the same machine and other machines operating in conjunction with it and for controlling the operation of said machine in conjunction with similar machines. The particular embodiment disclosed is designed for use in a pari-mutuel system and not only meets all the rigid requirements of State racing commissions for prompt recording of sales, but also provides control by track stewards for positively and substantially instantaneous locking out all machines against further sales.

My invention possesses many advantages over machines and systems heretofore employed for the same general purpose.

It is the object of this invention to provide a ticket printing machine in which the operator merely presses the desired selector button. Thereafter a ticket will be printed rapidly and all the work of indexing type and other operations are handled automatically in a cycle initiated by a central distributing system, during which cycle the selection will be recorded both on the individual machine and at the central totaling board, the ticket will be printed, fed out of the machine, cut off for delivery to the customer, and a new length of paper will be fed for the succeeding ticket. It is an advantage of this invention that, once the operator has selected the indication to be printed, the operator is powerless to alter the selection or influence the cycle. Another advantage is that the selector is instantaneous and the actual printing cycle is rapid and positive, paper feed is certain, and simple but positive means are provided to prevent tickets from falling back or being fed back into the machine to interfere with subsequent ticket printing operations or ticket paper feed. Another advantage of my invention is that the operation of printing occurs first in the cycle of ticket printing and feeding operations so that delivery of the printed ticket seems instantaneous. A still further advantage of my invention is that slugs containing information as to date, race, and code words may be quickly and rapidly changed by supervisors between races; supervisors may also print test tickets any time on my machines.

As to the totaling of sales, it is an object of

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my invention to provide a central system in which all electrical sales recording impulses will be recorded instantaneously and storage of such impulses (as in most prevalent systems) is thus avoided. This is an advantage in that the system is simpler, more positive, and avoids the necessity of recording sales for an appreciable period of time after sales are supposed to have stopped. It is another advantage of my system that the registering of a particular sale may occur after the printing cycle has commenced, thus avoiding the delay in prior art systems where sales registering was necessary before the printing cycle could commence.

As for the control effected by my system, it is an object of my invention to permit the track stewards to initiate a timed cycle during which ample warning is given to both the customers and the operators and at the end of which no more sales can be initiated. It is an advantage that once the stewards have initiated the warning cycle, the machines will be locked out from making further sales after completion of the warning cycle. Thereafter, no further sales can be made until all supervisors at ticket selling stations have indicated to the track manager in the control room that the machines are ready to commence selling tickets again, unless the track manager, himself, wishes to recommence selling. In normal operation, the locked out machines are not released for further ticket sales until all supervisors at ticket selling stations have signalled to the control room superintendent that the machines have been prepared to commence selling tickets again. Thereupon the control room supervisor will actuate a similar signal and automatically release the locked out machines. When the machines have been released, the automatic lockout release is reset, either manually or automatically, for subsequent lockout of the machines and thereafter the stewards may lockout at any time. My system is also provided with suitable controls and indicators which will stop sales instantly and automatically upon failure of the necessary counting and printing impulses, said controls being provided with suitable signals to indicate the failures.

Still further objects and advantages of this invention will be apparent from the following specification, claims, and drawings, in which:

Fig. 1 is a diagram of my control system.

Fig. 2 is a diagram of my counting and printing impulse distributing and totaling system as connected with the control system shown in Fig.

1, said figure also showing the distribution and counting system wiring in one machine of a series.

Fig. 3 is a front elevation of my machine with the locked casing removed.

Fig. 4 is an enlarged detail view of the upper right hand corner of Fig. 3.

Fig. 5 is a detailed section taken along the line 5—5 of Fig. 4.

Fig. 6 is a detailed section taken along the line 6—6 of Fig. 4.

Fig. 7 is an elevation of the left side of my machine shown in front elevation in Fig. 3.

Fig. 8 is a detailed elevation of the printing plate indicated in dotted lines in Fig. 7, said elevation being taken at the line 8—8 of Fig. 7.

Fig. 9 is a side elevation of the printing plate shown in Fig. 8, said elevation being taken at the line 9—9 of Fig. 8.

Fig. 10 is a view of the ticket printed in the machine disclosed.

Fig. 11 is an enlarged detail view of the upper portion of the elevation shown in Fig. 7.

Fig. 12 is an enlarged fragmentary detail elevation of the locking bar shown in section in Figs. 5 and 6, and indicated in dotted lines in Figs. 3 and 4, the end of which is indicated in dotted lines in Fig. 11, said elevation being taken at the line 12—12 of Fig. 11.

Fig. 13 is a detailed elevation of the upper portion of the right side of my machine shown in front elevation in Fig. 3.

Fig. 14 is a top plan view of my machine, partly broken away.

Fig. 15 is a sectional detail plan view taken along the line 15—15 of Fig. 13.

Fig. 16 is a detailed vertical section taken along the line 16—16 of Fig. 15.

Fig. 17 is a detailed vertical section taken along the line 17—17 of Fig. 16.

Fig. 18 is a detailed vertical section, partly broken away, taken along the line 18—18 of Fig. 13.

Fig. 19 is a detailed horizontal section taken along the line 19—19 of Fig. 18.

Fig. 20 is a detailed vertical section taken along the line 20—20 of Fig. 18.

Fig. 21 is a fragmentary elevation showing the operation of the type selecting and counting impulse switch closing mechanism.

Fig. 22 is a fragmentary plan view of the type wheel, taken along the line 22—22 of Fig. 21.

Fig. 23 is a fragmentary elevation showing the operation of the individual ticket sale counter mechanism.

Fig. 24 is a fragmentary elevation showing the operation of the test ticket type indexing bar, the operation of the type indexing bar reset mechanism, and the ticket sale totaling mechanism of each machine.

Fig. 25 is a fragmentary plan view showing the mechanism for releasing the locking bar latch.

Fig. 26 is a detail plan view showing the operation of the printing platen.

Fig. 27 is a detail plan view showing the operation of the ticket cut-off mechanism.

Fig. 28 is a diagram illustrating the comparative duration and the sequence of operations of my ticket machine.

My machines, as disclosed herein, are employed for printing a ticket for the horse selected by a customer in the pari-mutuel system generally employed at race tracks.

As shown in Fig. 10 of the drawings, the tickets 1 are printed with the name of the track 2 and the value of the ticket 3, which indicia is printed

by a substantially permanent slug 4 [Fig. 8] changed only when the machines are moved to another track or when an individual machine is moved to a different station selling a different value of ticket. Further indicia printed on tickets is the date 5, such indicia being printed by a slug 6 changed daily. Either or both of the name and date slugs may also carry code numbers 7 (shown only on the name slug) indicating the machine from which the ticket was sold and thus aiding in detecting forged or altered tickets. Further indicia printed on the ticket is the race number 8 and a code word 9, such indicia being printed by a slug 10 changed before the race for which the tickets are sold; the code word is employed for the purpose of preventing tickets from being forged in advance of the race. And finally, the ticket carries a large number or letter 11 indicating the horse on which the ticket was sold, such indicia being printed by indexing the type wheel 12 each time a ticket is printed.

The great advantage of machines which print the tickets at the time of sale is that the sales on individual horses as well as the total of all sales for a race may be totaled on a central totaling board 15 [Fig. 2], in which the total value of all tickets sold by all machines is recorded on the counter T and the sales per horse are recorded in the counters designated by the horse numbers 1 to 9. The brain of my ticket machine operating and counting system is a distributor 16, driven at a constant speed by the motor 17 connected through a normally closed switch to the main A. C. power lines having a "hot" or positive line 18 and a ground line 19. The distributor 16 distributes A. C. impulses to each of the several ticket machines to initiate ticket printing cycles and D. C. impulses to each of the machines to count sales, as will be described below. Since the distributor 16 is preferably a constantly operating distributor, the following control system is employed to control the sale of tickets between each race:

Ticket sale control system

Fig. 1 of the drawings discloses my ticket sale control system, all relays and switches being shown in the condition extant at the time when the track stewards have stopped the sale of tickets for one race by initiating a timed warning cycle. The warning cycle terminates by simultaneously opening anti-feed back relays between the ticket machines and A. C. commutator segments of the distributor 16 and a lockout relay between the slip ring of the A. C. commutator and ground. As this time red warning lights 20 are on in each machine. These lights 20 stay on until the machines are to recommence ticket sale, the circuit being from positive A. C. through the closed (normally open) switches of the red light relay 21 and cable 22 to red lights 20 and thence to A. C. ground line 19 through the machine A. C. power plugs. The red light relay 21 is actuated by A. C. through the closed (normally open) switch of the D. C. red light control relay 23, the circuit for the relay 23 being from positive D. C. through the line 24 to the closed (normally open) steward's relay switch 25 and thence through the line 26 to ground through the normally closed release relay switch 27.

The numerous ticket machines operating on impulses from the distributor 16 or parallel distributors are located at various selling stations throughout the race track grandstand and clubhouse, three such stations, I, II, and III, being

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indicated in Fig. 1. As soon as selling is stopped the supervisors immediately commence preparing for the succeeding race, being occupied with various duties, such as noting the total and individual sales at each machine, changing slugs 10, etc.

Assuming that the supervisor at station I finds all his ticket machines are ready to recommence selling, he signals the control room by pressing the button 30' at his station. The button 30' temporarily establishes a ground for the station signal light 31', the control room relay 32', and, from the positive D. C. source at the control room signal panel, a ground for the control room station light #1 through the cable 33. As soon as the relay 32' is actuated, the normally open switch 32'x1 is closed and a holding current is established for the relay 32' and the signal lights previously grounded through the button 30'. This is accomplished by the connection of the switch 32'x1 to the common station ground line 34, the common station ground line 34 being grounded through the normally closed reset switch 35. Actuation of the relay 32' also closes the normally open switch 32'x2, connecting the series release relay line 36 to ground.

Actuation of the button 30 at any of the other stations similarly establishes a holding current through the particular relay 32 and lights a corresponding station light in the control room signal panel, the only difference between operations at stations other than station I being that, instead of connecting the series release relay line 36 direct to ground, the corresponding switch 32x2 simply closes the line 36 across that station.

As should be evident, the various station lights in the control room signal panel may come on in any order, since the station signal lights and corresponding relays 32 are connected in parallel from a positive D. C. source to the common station ground line 34, the order in which the lights come on being dictated by the chance order in which the several station supervisors find their respective groups of machines prepared to recommence selling. When the track superintendent observes that all station lights are lighted except the control room station light, indicating that all machines are prepared to recommence selling, he presses the corresponding control room station button 30^{cr} to light the signal 31^{cr} and station light #CR and to actuate the relay 32^{cr}, thus establishing a holding current through the normally open switch 32^{cr}x1. Closing of the relay switch 32^{cr}x2, however, closes the last relay switch 32x2 in the series release relay line 36 and establishes a holding current for the release relay 27, the circuit being from positive D. C. at the release relay through the line 36 and the series of station relay switches 32x2 to ground at station I. Of course, if one selling station is temporarily shut down, or if the track superintendent wishes to release the lockout relay 27 for test purposes prior to the races, the relay 27 may be actuated by simply closing the normally open release switch 38, which connects the line 36 to ground through the shunt line 39. It should be apparent, however, that if the release relay is actuated in the normal manner through the several station relay switches 32x2, the relay 27 will remain actuated until the common ground line 34 is opened by pressing the normally closed reset switch button 35, which, by opening the common ground line 34, will thus reset all the station relays to their normally open position as shown in Fig. 1.

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Actuation of the relay 27 will close the normally open switch 27x1 and open the normally closed switch 27x2.

Opening of the switch 27x2 breaks the ground for the holding current of the steward's relay 25 and, consequently, deactivates the red light control relay 23, shutting off the red warning lights 20 in the several machines. Opening of the line 24 by the opening of the switch 27x2 also deactivates the lockout relay 40, allowing the switches 40x1 and 40x2 to return to their normally closed positions, the holding circuit for the lockout relay being from positive D. C. at the relay to the lockout relay contact point 41 in the lockout timer through the line 42, thence across the lockout timer contact arm 43 to the grounding plate 44 which is connected to the line 24 by the line 45. Closing the switch 40x2 will re-establish a ground connection for the A. C. distributor through the line 46 and main pulsating A. C. switch 47 in the control room. Closing the switch 40x1 will also activate the antifeed-back switches, the circuit being from positive D. C. at the lockout relay through the line 51 to the normally closed counter ground failure relay 52 to ground. Thus, opening of the switch 27x2 will both extinguish the red warning lights 20 and establish a circuit for pulsating printing-cycle-initiating A. C. to the several machines, said circuit for pulsating A. C. being (for most segments of the A. C. distributor) from positive A. C. at the machines through the antifeed-back relay switches, by means of the cable 53, to the A. C. distributor and thence to ground through the switch 40x2, line 46, and switch 47. With this circuit established, ticket selling may be recommenced.

Closing of the switch 27x1 will actuate the lockout timer pawl release solenoid 55, the circuit being from positive D. C. at the lockout timer through the line 56 to ground through the switch 27x1. Actuation of the solenoid 55 will lift the pivoted pawl 57, releasing the lockout timer ratchet segment 58 which carries, insulated therefrom the contact arm 43. Urged by a suitable spring (or weight) the contact arm 43 will rapidly sweep over and beyond contact with the grounding plate 44 and against the stop pin 59.

When the release relay switches are returned to their normal positions by operation of the reset switch 35, the ticket-printing-cycle-initiating A. C. impulses may again be locked out by the track stewards, as follows:

By pressing the stewards' lockout button 60, a temporary ground is established for the stewards' relay 25, the circuit being from positive D. C. at the relay through the line 61 to ground. As soon as the switch 25x1 is closed, however, a holding current is established through the switch 25x1 and through the line 26 to ground at the normally closed switch 27x2. Closing of the switch 25x1 will light the red warning lights in the several machines, as explained above, indicating to the machine operators that no more sales should be begun.

It is the closing of the switch 25x2 which initiates the timed warning cycle. The switch 25x2 is connected by the line 62 to a segment on the A. C. distributor. As the distributor arms 65 and 66 (Fig. 2) sweep over the A. C. distributor segments, the pulsator relay 67 receives A. C. impulses, the circuit being from the positive A. C. at the pulsator through the switch 25x2 and line 62 to the A. C. distributor segment and then, at intervals, across the brushes of the arms 65 and 66 (Fig. 2) to the slip ring of the distributor to

ground through the line 46 across the lockout relay and through the switch 47. Pulsation of the relay 67 will actuate the pivoted ratchet 68 in the lockout timer, the circuit being from positive D. C. at the lockout timer through the ratchet solenoid 69 and thence by the line 70 to ground through the opening and closing (normally open) switch of the relay 67. As the ratchet 68 is pivoted by the solenoid 69, it indexes the segment 53 against the counter urging of the segment spring, the segment being held by the pawl 57. As the ratchet segment is indexed, the contact arm 43 bridges the contact plate 71 and the grounding plate 44 to actuate the lockout bells relay 72, the circuit being from positive D. C. at the relay through the line 73 to the contact plate 71 and thence across the arm 43 to the grounding plate 44, the ground connection of the plate 44 having been explained above. Actuation of the relay 72 will ring numerous lockout bells 75 placed throughout the plant, the parallel A. C. bell circuit from the main A. C. line being established by the closing of the normally open switch of the relay 72. The bells will continue to ring until the contact arm 43 is carried past the plate 71 and into contact with the lockout relay point 41. The closing of the circuit through the line 42 and point 41 opens the lockout relay switches, which, in turn, will deactivate the relay 50 and open the several antifeed-back switches. Thus, the system will be returned to the condition shown in Fig. 1. Opening of the lockout relay switches will, of course, stop the pulsator 67.

The duration of the automatic warning cycle will depend upon the number of impulses necessary to sweep the arm 43 over the plate 71 and the frequency of the impulses. Since the frequency of the impulses is substantially fixed, the duration of the warning cycle is effectively dependent upon the number of impulses required. It is to be understood that substantially any ratchet motor may be used in place of the rather schematic showing of the motor indicated in the lockout timer. It is also to be understood that resetting the second station relays may be accomplished automatically, as by the relay 37 connected in parallel with the line 36, so that when a current for actuating the relay 27 is established, the relay 37 will open the common ground line 34, automatically deactivating the selling station relays 32 and thus deactivating the release relay 27. Other automatic resetting means may likewise be employed.

Fig. 1 also shows several signal and safety devices which may be advantageously employed. Failure of all A. C. current will, of course, stop all operations and will be indicated by failure of the general lighting system; failure of all D. C. power will likewise stop operation of the machines, by allowing the antifeed-back relay to open, but such failure would not be so immediately apparent in the control room. To provide an immediate indication of D. C. failure, a D. C. failure relay 74 is connected between the ground side of the main D. C. switch 76 and the trunk 77 to all positive D. C. connections. With the relay 74 closed, an A. C. circuit is established to the parallel D. C. failure signal lights 78. If both of said lights 78 go out, failure of all D. C. is indicated. (Two lights 78 are employed to avoid the false signal which would be obtained if only one light were used and that light burned out.)

To obtain an immediate signal in the control

room of failure of the pulsating A. C., a signal light 79 is connected between positive A. C. and an A. C. distributor segment. The regular flickering of the light 79 will indicate that the A. C. is being pulsated properly. Of all the effects of electrical failures, the effect of failure of the D. C. ground for the totaling board 15 is the one to be particularly prevented. Such failure would nullify the whole counting and totaling system. Accordingly, the counter ground failure relay 52 is connected to the ground side of the counter board 15 (Fig. 2). Failure of the counter ground will thus open the switch of the relay 52 and, in turn, open the ground of the antifeed-back relay line 51, opening the pulsating A. C. cable 53 and stopping selling operation.

Machine circuits and counting system

Each machine is provided with a motor 80 (Fig. 2) which, when the machine is plugged into the main A. C. power line and the main A. C. machine switch 81 is closed, is a constant running motor supplying the power for the several printing operations. The several printing mechanisms, however, are driven from the main cycle shaft 82 which, in turn, is driven only upon engagement of the normally disengaged one-revolution clutch 83 connected to the shaft of the motor 80. To engage the clutch 83 and thus drive the cycle shaft 82, the clutch pawl 84 is disengaged from the clutch 83 by the clutch solenoid 85.

Each machine is provided with a plurality of keys 90, ten in this instance, nine selector keys designated by the auxiliary numbers 1 to 9, to provide a maximum selection of nine horses or entries upon which tickets may be bought and a tenth or test key to permit test tickets to be printed without interfering with or independently of counting operations. Each key carries a cam pin 91 which will engage in a normally mating cam slot 92 in the spring retracted locking bar 93. The locking bar 93 is provided with a latch opening 94 into which the spring-urged latch rod 95 will fall when the locking bar 93 is cammed toward the latch rod 95 by depressing one of the keys 90. It should thus be apparent that if one of the keys 90 is depressed to the point where the locking bar 93 is latched, the key will be held depressed until the latching bar 95 releases the locking bar. Due to the fact that camming of the locking bar by depressing one key 90 will throw the cam pins 91 of the remaining keys out of register with the corresponding cam slots, the latching of one key will prevent any other key from being depressed. Suitable toggle plates 120 (shown in Figs. 3 and 4) prevent the depressing of more than one of the keys 90.

When the one-revolution clutch 83 disengages, the latch cam 96 on the cycle shaft 82 will always have just cleared the latch cam arm 97 to which latch rod 95 is connected. To release the locking bar 93, therefore, the cycle shaft must make approximately one complete revolution before the cam 96 will engage the cam arm 97 to pull the latch rod 95 out of the latch opening 94 and thus release the locking bar 93 to allow a locked and depressed key 90 to return to its initial position. The duration of the printing cycle, determined by the time required for one revolution of the cycle shaft 82, is very short. Thus, the inertia of the locking bar 93 and keys 90, while slight, is appreciable in the split-second operations of the machine. Due to such inertia and to the fact that contacts 98 and 99 (explained below) pref-

erably open slightly before the locking bar is released, the counting operations and printing cycle will be completed before a second key can be depressed. It should be apparent, therefore, that in my machine, only one key 90 can be depressed at a time, that the depressed key will be locked until a printing cycle is substantially completed, and that no other key 90 may be depressed after a first key has been depressed until a printing cycle has been completed for the first depressed key 90.

A. C. power is supplied to the electrical elements in my machine by the A. C. power lines 88 and 89, said lines being connected through the machine plug to the main power lines 18 and 19, respectively. Thus, the line 88 constitutes a source of positive A. C. and the line 89 is an A. C. ground. The electrical switches in my machine (in addition to the main power switch 81 in the line 88) comprise a pair of normally open contacts 98 and 99 carried by the latch rod 95, said contacts being closed when the rod 95 latches the locking bar 93. The heart of the electrical system in each of my machines is the triple relay 100 having the switches 100x1, 100x2, and 100x3. The double contacts 98 and 99 are employed to separate the loads of the A. C. impulse and A. C. holding currents mentioned below. The switches 100x2 and 100x3 are likewise used to separate the load on the points of the holding current and clutch solenoid current also mentioned below. Each of the keys 90 terminates in a normally open contact 101 which closes a pair of points when the key is depressed. One of the points closed by the test key is in series with the auxiliary test button 102.

Each machine is connected to one segment in the A. C. commutator of the distributor 16 through the cable 53, the line for the Ticket Machine No. 1 as shown in the drawings being designated as 103, said line leading to a point of the contact 98. The other point of the contact 98 is connected to the line 104 leading to the relay 100, which relay is connected to the positive A. C. line 88 by the line 105. One point of the contact 99 is connected to the line 104 and the other is connected to the relay switch 100x3 by the line 106. The clutch solenoid 85 is connected to the positive power line 88 through the line 105 and is connected to the relay switch 100x2 by the line 107. Both contact points of the switches 100x2 and 100x3 are connected to the ground line 89 by the line 109. One point of the test key contact is connected to the line 104 and the other is connected to the ground line 89 by the line 108.

Each machine is connected to one segment in the D. C. commutator of the distributor 16, the line for the Ticket Machine No. 1 as shown in the drawings being designated 110, said line being connected, through the cable 111, to the contact point of the relay switch 100x1. The switch 100x1 is connected by line 112 to one of the contact points of the selector key contacts 101. The other points of the selector key contacts are connected to corresponding sales per horse counters in the totaling board 15 through the cables 113 and 114, which counters are connected to a common ground.

The slip ring of the D. C. commutator of the distributor 16 is connected to a positive D. C. source through the totalizing relay 115 by a line 116. The switch of the totalizing relay 115 is connected to the line 116 in parallel with the relay 115 and, by the line 117, is connected to the total sales counter of the counting board 15. The total

sales counter is connected to the common ground of the individual sales per horse counters.

Operation of the A. C. impulses and A. C. machine circuits.

Assume, for example, that the operator has depressed the horse selector key 90-1, latching the lock bar 93 and closing the contacts 98 and 99, just prior to the instant that the brushes of the distributor arm 66 are passing over the segments of the A. C. and D. C. distributors connected, respectively, to the lines 103 and 110, as shown in Fig. 2 of the drawings. An A. C. impulse will pass from the line 88 to the relay 100 through the line 105, closing the relay 100; from the relay 100, the A. C. impulse will go to ground through the line 104, contact 98 and line 103 to the A. C. commutator segment for the Machine No. 1. The A. C. commutator segments are grounded through the brush, slip ring, and line 46 as explained above. As soon as the relay 100 is closed, a holding current is established within the machine from positive A. C. line 88, line 105, relay 100, line 104, contact 99, line 106, switch 100x3, line 109 to ground through the line 89. Also, when the relay 100 is actuated, the solenoid 85 is actuated by current from the line 105 passing through the line 107 to the switch 100x2 and thence to ground through the lines 109 and 89. Actuation of the solenoid 85 releases the pawl 84 and allows the clutch 83 to engage and drive the cycle shaft 82.

The circuits established by the momentary A. C. impulse and maintained by the holding current through the contact 99 and switch 100x3 will remain closed until the cam 96 engages the latch cam arm 97 near the end of the revolution of the cycle shaft 82. Then the cam driven arm 97 withdraws the latch rod 95 and opens the contact 99 to break the holding current for the relay 100 thereby opening the switches of that relay. Opening of switch 100x2 will deactivate the clutch solenoid 85, allowing the pawl 84 to reengage with the clutch 83 and thus disengage the clutch from the shaft of the motor 80 at the end of one revolution of the clutch. Thus, the printing cycle is completed, the depressed selector key is returned to its initial position, and the machine set for another sale.

If the brush of the commutator arm 66 had passed over the segment to which the line 103 was connected just prior to the time the contacts 98 and 99 were closed, the operation would be the same as above, except that the relay 100 would not be closed and the cycle initiated until the brushes of the advance A. C. commutator arm 65 passed over the segment connected to the line 103. Grounding of the line 103 by the brush on either of the arms 65 or 66 will commence the operation of the printing cycle by release of the clutch 83. For counting purposes, only the arm 66 carries a brush for the D. C. commutator. Thus, the maximum angle of advance ϕ for the lead of the arm 65 over the arm 66 is determined so that the period of time represented by the angle ϕ is less than the minimum period of time in which the printing cycle will be completed in any ticket machine connected to the distributor 16. Therefore, a D. C. counting impulse will occur within any printing cycle, whether initiated by the arm 66 or the arm 65. By the same token, the angle ϕ must be such that the time represented by the lead of the arm 66 over the arm 65 is greater than the maximum amount of time required by any machine connected to the distributor 16 to complete a

printing cycle. Thus one, but only one, D. C. counting impulse may pass through a machine during a printing cycle. The distributor may carry additional A. C. impulsing arms between the arms 65 and 66 to accelerate initiation of the printing cycle if the contacts 98 and 99 are closed while the machine's A. C. commutator segment is included in the angle ϕ , but since the period of time represented by the angle ϕ in normal operation represents but a fraction of a second, little is accomplished by such additional distributor arms.

If the test key, rather than one of the selector keys, had been depressed, the printing cycle would have occurred as described in the preceding paragraphs, since, when the machine is operating on impulses from the distributor 16, the printing cycle is initiated by the closing of the contacts 98 and 99 and the grounding of the machine's A. C. commutator segment. Depression of the test key cams the locking bar and closes the contacts 98 and 99 the same as a selector key. Sometimes, however, it is desired to print a test ticket when the distributor 16 is not connected to the machine or when the distributor is not operating. For example, when the distributor 16 is locked out between races, it is desirable to print a test ticket to see that the newly changed race and code word slug 10 is printing properly. To print a test ticket independently of the distributor, the test key is depressed and locked and the auxiliary test button 102 is pressed momentarily. This establishes an A. C. impulse through the line 105, relay 100, line 104, test key contact 101, auxiliary test button 102, and line 103 to initiate a printing cycle. It is to be noted that the button 102 is in series only with the contact points of the test key and that when the contacts 98 and 99 are closed by depression of a selector key, only an A. C. impulse from the distributor 16 will initiate a printing cycle.

Operation of counting circuits

Assuming that the contacts 98 and 99 are closed by depression of the selector key 90-1 to permit a printing cycle to be initiated, when the D. C. brush on the distributor cam 66 connects the machine's D. C. segment to the D. C. slip ring of the D. C. commutator, a D. C. impulse will pass from the positive D. C. source through line 116 and totalizing relay 115 to the D. C. slip ring, across the D. C. brush to the segment and line 110, and thence through the closed relay switch 100x1, line 112, closed selector key contact 101-1, cable 113, and corresponding horse #1 counter at the totaling board 15 to ground. Passage of a D. C. impulse through any one of the horse counters at the board 15 will record the sale of a corresponding ticket at the machine. Because the D. C. commutator distributes the D. C. counting impulses to the machines one at a time and in the order in which the machines are connected to the segments of the D. C. commutator, there is no possibility of the counting impulses "piling up" on one another. If the printing cycle is initiated by an A. C. impulse due to the impulsing distributor arm 65, the D. C. counting impulse will pass through the machine during the printing cycle, as explained above. It is to be noted that the A. C. segments for a given machine are indexed slightly in advance of the corresponding D. C. segments. This is to insure that a machine will not receive an A. C. impulse sufficient

to initiate a printing cycle and, at the same time, pass a D. C. impulse insufficient to operate a counter at the board 15. If the contacts 98 and 99 are closed at the instant the arm 66 is over the machine's A. C. segment and if the A. C. impulse is sufficient to close the relay 100, a D. C. impulse sufficient to operate a counter at the board 15 will pass through the machine. If the A. C. impulse is insufficient to close the relay 100, no D. C. impulse will pass through the machine nor will a printing cycle be initiated.

The totaling of all sales, regardless of the horse on which the sale is made or of the machine at which the sale is made, is accomplished by a simple circuit leading from the line 116 through the switch of the relay 115, line 117 and total sales counter on the board 15 to ground. Every time a sale is made on any horse through any machine, a horse counting impulse passes through the line 116 and actuates the totalizing relay 115 to momentarily close that relay switch. Thus, an auxiliary totaling impulse will be sent to the total sales counter. If, at the time the D. C. brush is passing over a machine's D. C. segment and no key 90 is depressed or if only the test key is depressed, the horse counting impulse circuit will be open at the end of the line 112, no horse counting impulse will be created, and, of course, no totaling impulse will be created.

Ticket machines

My ticket machines are each provided with a suitable frame F (Fig. 3), characterized by a vertical partition running from adjacent the front to the rear and dividing the machines, as illustrated, into a left or motor and drive side and a right or printing side, said partition having, of course, suitable openings to accommodate elements extending from the drive to the printing side of the machine. Each machine is also substantially completely enclosed in a case (not shown) secured to the frame F and removable only when the machine is being substantially disassembled. The top of the case is provided with openings through which the keys 90 extend and also with other openings for viewing the machine's mechanical counter and the red warning light and, of course, for delivery of the printed tickets. The right side of the case is provided with a locked door permitting access by the station supervisors for changing the printing slugs and paper rolls and to permit refilling of the ink reservoir. To discourage the possible dishonest supervisors from manipulating the type wheel while printing test tickets when the right side of the case is open, the subframe supporting the type wheel may be enclosed in a suitable subcase (not shown). The lower left side of the case is provided with an opening permitting access to the auxiliary test button 102 and the upper left side of the case is provided with a keyhole to permit the insertion of a key to reset the mechanical counters.

Keys and operation of key locking and release mechanisms

As shown particularly in Figs. 3 to 6 of the drawings, the several keys 90 are rods suitably journaled in the upper front portion of the frame F for vertical movement. Each key rod 90 is urged upwardly by a compression spring 121, vertical upward movement being limited by a collar 122 which engages a suitable shock absorbing pad 129 on the frame F when a key is in its nor-

mal upwardly projected position. The upper ends of the selector keys 90-1 to 90-9 are capped with suitable buttons numbered to identify the keys, said buttons also serving as stops for limiting downward movement of the keys. The test key 90-T is preferably hooded with a permanent hood 124 having a suitable keyhole to permit the test key to be actuated only by a person having a suitable actuating key 125 (see Fig. 24). Similar, but temporary, hoods 126 (shown in dotted lines over selector key 90-4 in Fig. 3) may be dropped over the selector keys having numbers higher than the number of horses in a race or over a selector key bearing the number of a horse which has been scratched from a race, thus preventing the accidental sale of an invalid ticket.

Each key 90 is prevented from turning by the horizontal cam pin 91 which extends through a mating vertical slot 127 in the fixed guide plate 128. The locking bar 93 is held against the frame F (in the normal retracted position shown in Fig. 3) by the tension spring 130 so that the openings of the oblique cam slots 92 will be in register with the corresponding slots 127 of the guide plate 128. The locking bar 93 is mounted for longitudinal movement in back of the guide plate 128, being mounted between antifriction rollers 131 and being loosely held against the back of the guide plate 128 by the strips 132 (one strip 132 per strap 133, as shown in Fig. 5). As shown in Fig. 5, the strips 132, rollers 131, and guide plate 128 are all mounted on the vertical guide plate mounting straps 133 by the bushed pins 134, the bushings on the pins 134 serving to space the strips 132 from the straps 133, the rollers 131 spacing the guide plate 128 from the strips 132 and a toggle plate 120 (described in further detail below) spacing the guide plate 128 from the mounting strap 133. Thus, the whole guide plate assembly is removably secured to the frame F by the straps 133. Three straps 133, suitably spaced from the frame F, are employed; it is to be noted that the center strap 133 and the pins 134 are exactly centered between a central pair of keys 90, and, more particularly, the end straps 133 and the pins carried thereby are, respectively, exactly centered between the first two of the keys 90, i. e., 90-T and 90-1, and between the last two of the keys 90, i. e., 90-8 and 90-9.

As shown in Fig. 11, the latch rod 95 is journaled for fore and aft movement (being mounted on a slant in the embodiment disclosed to provide clearance with cams on the shaft 82). When the guide plate assembly is mounted, the forward end of the latch rod 95 normally bears against the back of the locking bar 93 under the pressure of the compression spring 135, the normal position of the latch rod 95 with respect to the latch opening 94 in the bar 93 being indicated in dotted lines in Fig. 12.

With all keys 90 projected and with the locking bar 93 retracted in the normal position, as shown in Fig. 3, the machine is set to print tickets. Assuming that a customer wishes to buy a ticket on a horse designated as 7, the operator depresses the key 90-7. As the cam pin 91-7 travels down the guide slot 127-7 and enters the registering cam slot 92-7 of the locking bar 93, the pin 91-7 begins to cam the locking bar 93 to the left. As should be apparent from Fig. 4, because the widths of the cam slots 92 are substantially equal to the diameters of the cam pins 91, once one cam pin has begun to cam the locking bar 93, no other key 90 can be depressed until the locking bar is

returned to its normal retracted position. As the locking bar is further cammed to the left, the latch opening 94 comes into register with the latch rod 95, which is then shot home, through the locking bar 93 and the particular toggle plate 120 located over the latch opening 94, into the keeper opening 136 in the left-hand mounting strap 133. Thus, the key 90-7 is locked in its depressed position and the remaining keys 90 are locked in their projected positions, as shown in Fig. 6.

The contacts 98 and 99 carried by the rod 95 do not close their respective points until the latch rod 95 is well into the latch opening 94, thus insuring that no A. C. impulse will actuate the relay 100 and start a printing cycle and electrical counting operation until after the keys are well locked. This timing of the closing of the contacts 98 and 99 also insures that, upon withdrawal of the rod 95, the relay 100 will be open before the depressed key is released.

As shown in Figs. 3 and 21, for example, the ends of the keys 90 are forked to accommodate the key ends of the corresponding type indexing levers 160, vertical movement of a lever within and with respect to the tines of a forked key rod being limited by a pair of transverse pins 161. At the very end of a key 90 a contact 101 is provided, said contact simply being a nonconducting wheel adapted to engage and close the corresponding spring contact points. As should be apparent from Fig. 21, for example, the counting circuit contact points for a key will be closed before the key is locked. Such early closing of the contact points 101 is necessary to insure that the balance of a D. C. counting circuit will be closed when the key is locked and the contacts 98 and 99 are closed to actuate the relay 100 and the counting circuit relay switch 100r1.

The locking bar is unlatched shortly before the end of a printing cycle in order to allow the solenoid 85 to release the pawl 84 and thus actuate the one-revolution clutch 83 and stop the cycle shaft 82 at one revolution. As explained briefly above in the description of the A. C. impulse and machine A. C. circuit operations [see, also, Fig. 25 of the drawings], when the cycle shaft 82 nears the end of its revolution, the latch cam 96 on the cycle shaft 82 bears against the cam follower 137 on the cam arm 97, forcing the cam arm 97 to retract and withdraw the latch rod 95 (the arm 97 being connected to the rod 95 by the connecting link 138), thus releasing the locking bar 93.

The angle θ (the angle of lead of latch rod release over the position of the cam 96 at the end of the printing cycle) must be large enough so that the clutch pawl 84 will be certain to be released by the solenoid 85 and thus disengage the clutch 83 to stop the cycle shaft at one revolution; otherwise the cycle shaft might make two revolutions and the machine would issue two tickets, the second being smeared or of a hazardous selection, on one sale. On the other hand, the angle θ is preferably no larger than necessary in order that the lead angle ϕ of the A. C. impulsing arm 55 of the distributor 16 may be as large as possible. It is to be remembered that the angle ϕ could be no greater than the minimum amount of time required by any machine to complete a printing cycle. In so far as the distributor 16 is concerned, the printing cycle is completed when a selector key is released and the D. C. counting impulse contact 101 is broken. [In no event should the θ be so large

that the keys 90 will be released before the actual printing operation is completed, such might result in smeared tickets because the type wheel 12 normally begins to move when a key is released, as explained below.]

Toggle plates and operation

The locking bar 93, as described above, will lock a single key 90 in a depressed position and will lock the balance of the keys 90 in the normal projected position until the locking bar is unlatched near the end of the printing cycle and the depressed key is released. If only the locking bar 93 were employed in the key control mechanism of the guide plate assembly, it would be possible to depress two or more keys simultaneously. To insure that one and only one key 90 may be actuated at one time, the toggle plates 120 are employed.

Each toggle plate 120 in this embodiment is roughly pentagonal in shape, the apex being relieved by a square toggle limiting notch 139; the shape of the plates 120 is immaterial so long as the plates are provided at their greatest width with opposite blocking points defined by an upper camming surface and a lower slightly relieved surface. The number of toggle plates employed is one less than the number of keys and the notch 139 or other toggle limiting means is important only in the first and last of the series of plates employed. In this instance, the first toggle plate 120-1 is provided with an opening (not shown) which will permit the latch rod 95 to pass through to the keeper-hole 135.

The toggle plates 120 are pivotally mounted on the front of the guide plate 128 between adjacent keys 90. When the toggle plates are in a vertical position, their blocking points touch the blocking points of adjacent plates at a height substantially equal to that of the openings of the cam slots 92, the widths of the toggle plates at their blocking points being substantially equal to the distance between centers of the keys 90. Thus, when the toggle plates 120 are in a vertical position, each blocking point will cover one-half of a guide slot 127.

The upper bushed pins 134 in the mounting straps 133 pass through the center of the limit notches 139 in the toggle plates pivotally mounted on the lower bushed pins 134. The width of the limit notches 139 is equal to the diameter of a bushed pin 134 plus the diameter of a cam pin 91. Because the several toggle plates touch at their blocking points, no toggle plate can tilt without also tilting all plates beyond it in the direction it is tilted. And since the upper pins 134 are centered in the limiting notches 139, the tilting of any toggle plate is limited to an angle such that the blocking point moves only a horizontal distance equal to one-half the diameter of a cam pin 91.

In operation, therefore, depression of the test key 90-T will cause the came pin 91-T to engage the left upper cam surface of the toggle plate 120-1 and tilt all toggle plates to the right, thus uncovering the guide slot 127-T and completely covering all other guide slots 127 so that only the cam pin 91-T may enter its corresponding cam slot 92-T. If, instead, the selector key 90-9 were depressed, the toggle plates 120 would all tilt to the left, leaving only the guide slot 127-9 uncovered. As shown in Fig. 4, if, instead, the intermediate selector key 90-7 were depressed, the cam pin 91-7 would spread the touching toggle plates 120 to leave only the guide slot 127-7

uncovered. The function of the notches 139, therefore, is to so limit the motion of the toggle plates 120 that one and only one cam pin can pass below the blocking points at a time, and, because the blocking points are at an elevation equal to the openings of the cam slots 92, when one cam pin has passed the blocking points, the locking bar 93 will prevent any other key from being depressed until the first depressed key has been released and projected to its normal position.

Cycle shafts and drives

As explained above, each ticket machine is provided with a constantly running motor 80. The motor 80 is in the lower left-hand portion of the embodiment disclosed (see Figs. 3, 7) and is provided with a drive shaft 140 suitably journaled and carrying the fly wheel 141 to absorb the rather sudden loads of the several ticket printing and issuing operations.

In this embodiment as shown in Fig. 11, the vertical cycle shaft 82 is comprised of the driven housing 142 of the one-revolution clutch 83 and an extension 143 pinned in the bore of the housing 142. The cycle shaft 82 is driven by the internal stub drive shaft 144, which, in turn, is driven from the main drive shaft 140 through the gear box 145. The transmission in the gear box 145 is preferably a worm drive in order to obtain a great reduction in the speed of the stub shaft 144 with respect to that of the main drive shaft 140, thus permitting the use of a comparatively small high-speed motor 80 and a small fly wheel 141, said stub drive shaft carrying the internal four-tooth clutch gear 146 at its upper end, located in the housing of the clutch 83. The one-revolution clutch may be of any standard type, the clutch 83 employed in this embodiment having a spring-pressed gear-engaging dog 147 (see Fig. 15) pivoted in the housing 142 and normally held out of engagement with the gear 146 by the pawl 84. Said pawl 84 is normally held in engagement with the clutch housing 83 and dog 147 by the tension spring 148. The pawl 84 carries a pivoted connecting link 149 connected to the armature of the solenoid 85 by the upstanding connecting pin 150. The connecting pin 150 normally engages or nearly engages the safety rod 151 carried by a set collar 152 secured to the connecting rod 138 of the latch rod 95.

The upper part of the housing 142 carries the latch cam 96, above which, on the cycle shaft extension 143, is fixed the print cam 153. Also fixed to the cycle shaft extension 143 is the knife cam 154, said shaft 143 further serving as a fixed pin for the knife cam yoke 155.

On the lower part of the housing 142 is the helical gear 156, which, through a suitable train 157, drives the transverse auxiliary cycle shaft 158. Because the gearing 157 is of a one-to-one ratio, the shaft 158 is driven at the same speed and to the same extent as the shaft 82. Extending into the printing side of the machine, the auxiliary cycle shaft 158 carries the count cam 159, the paper feed rolls 165, and the type-lever knock-down crank 166. (See Figs. 18 and 19.)

As explained briefly above, when the locking bar 93 is cammed to latching position, the latch rod 95 is shot forward to close the contacts 98 and 99. An A. C. impulse then actuates the solenoid 85 to withdraw the pawl 84, said solenoid continuing to withhold the pawl due to a holding current established by the relay 100. When the pawl 84 is withdrawn, the dog 147 (Fig. 15) is

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projected inwardly within the clutch 83 and engages a tooth of the clutch gear 146 to drive the housing 142 (Fig. 11) and the extension 143 making up the cycle shaft 82 and, through the nonreducing train 157, also driving the auxiliary cycle shaft 158. When the latch cam 96 causes the solenoid to release the pawl 84 near the end of one revolution of the shaft 82, the tension spring 148 returns the pawl 84 to its normal position against the housing of the clutch 83. As the dog 147 engages the pawl 84, the dog is pulled out of engagement with the clutch gear 146, thus disengaging the clutch 83 and stopping the cycle shaft 82 and auxiliary cycle shaft 158 at precisely the end of one revolution. Thus, all operations of the elements driven by the several cams on the cycle shafts 82 and 158 always occur in a fixed timed relationship within a cycle, the timing of the operation of such elements with respect to each other being determined by their relative angularity on the cycle shafts.

The cycle of the printing and ticket delivery operations in my machine is: print, feed (for delivery of the printed ticket and feed of fresh paper for the subsequent ticket), and cut-off. Accordingly, the print cam 153 is indexed on the cycle shaft 82 so that actual printing of the ticket will occur early in the cycle; the feeding portion of the paper feed rolls 165 is indexed on the auxiliary cycle shaft 158 so that paper feed will not occur until after the printing operation is completed; and finally, the knife cam is indexed on the cycle shaft 82 so that the ticket will be cut off from the tape of ticket paper at the very end of the cycle. The operation of counting the delivery of a ticket by the machine occurs any time during the cycle and the counting cam 159 is so designed and is so indexed on the auxiliary shaft that operation of the counting cam 159 requires substantially the entire time of a cycle, the actual count occurring near the end of a cycle. The operation of insuring that the type levers are reset must occur at substantially the same time as the locking bar is unlatched, as will be explained below, and, accordingly, the type-lever knock-down crank is indexed on the auxiliary cycle shaft 158 so that its operations will occur substantially simultaneously with the withdrawal of the latch rod 95. (See Fig. 28.)

Since lint from the ticket paper may carbonize on the contacts 98 and 99 and tend to cause a lag in the desired sharp break of the holding current for the solenoid 85, due to sparking at the contacts, the connecting pin 150 and safety rod 151 constitute a mechanical safety mechanism for positively withdrawing the solenoid armature to release the pawl 84 when the latch rod 95 is withdrawn by the cam 96, thus insuring that the clutch dog 147 will not escape the pawl 84 at the end of one revolution of the cycle shafts 82 and 158.

Type wheel drive

As shown in Figs. 11 and 18, the end of the main drive shaft 140 is provided with a small pulley 167 which drives a large pulley 168 rotatably mounted on the upper transverse type wheel drive shaft 171 by means of the belt 169. The end of the type wheel drive shaft 171 carrying the rotatable pulley 168 is provided with a friction clutch 170 comprised of a pair of clutch plates 172 and 173, each faced with suitable low coefficient friction material, such as felt, which plates engage the pulley 168 therebetween. The

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clutch plate 172 is fixed to the shaft 171 and the clutch plate 173 is radially fixed, but axially slidable, with respect to the shaft 171, being slidably supported on the axially extending pins 174 carried by the fixed pin plate 174. A compression spring 175 between the plates 173 and 175 supplies the pressure for the clutch plates 172 and 173.

The right end of the shaft 171 overhangs an annular well 177 in the type wheel 12 and carries a bevel pinion 178 driving a bevel gear 179 keyed to the vertical type wheel shaft 189 journaled in the type wheel housing 181 (see Fig. 16). The lower end of the hub of the type wheel 12, keyed to the shaft 180, carries a stop lug 182, preferably provided with a vertical leading face and a beveled trailing face (see Figs. 18 and 21). As best shown in Figs. 21 and 22, the type wheel 12 is a ten-face wheel, the faces carrying in clockwise order type for the numbers 1 to 9 (for the nine selections provided by my machine) and type for the letter "T" or "test" (for printing upon test tickets).

It should be apparent that normally the type wheel 12 is being driven constantly by the motor drive shaft 140 through the pulleys and belts 167, 168, and 169, friction clutch 170, drive shaft 171, and bevel gears 178 and 179. Although the reduction effected by the pulleys 167 and 168 is in the nature of five-to-one in this embodiment, the type wheel 12 is normally driven at a high speed in comparison with the driven speed of the stub drive shaft 144 (and cycle shafts), the reduction effected by the worm transmission of the stub shaft 144 being in the nature of thirty-to-one in this embodiment.

Type indexing mechanism and operation

As explained above and as shown in Figs. 15, 16, and 21, for example, each key 90 is forked at its lower end to receive a type lever 160, said type lever being retained in the forked key by the pins 161. Each type lever 160 is pivoted for movement in vertical planes, being supported on pivots 184 carried by the grouped pivot forks 185. As best shown in Fig. 15, the several type levers 160 are suitably bent in a horizontal plane to permit the levers to extend from the comparatively widely spaced keys 90 to the relatively closely grouped pivot forks 185. From the pivot forks 185, the several type levers are again more closely bent together to extend rearwardly to the desired point beneath the stop-pin bearing block 186 (Fig. 16) of the type wheel housing 181, which also serves as the lower bearing for the type wheel shaft 180. The bearing block 186 is provided with ten equally spaced vertical bores 187 grouped concentrically about the shaft 180 (see Figs. 21 and 22). In each of the bores 187 is a vertically slidable stop pin 188 normally maintained in a retracted position below the upper surface of the bearing block 186. The lower ends of the stop pins 188 are slotted and pinned transversely to hold the ends of a type lever 160 loosely, the ends of the type levers being suitably bent adjacent the stop pins 188 to permit the ends of the levers to be received in the stop pin forks and to avoid interference with adjacent levers (see Fig. 15). The upper ends of the stop pins 188 are preferably rounded to exert a suitable camming action.

To index type on the wheel 12, the operator simply depresses a key 90, latching the key in a depressed position and closing the contacts 98 and 99 so that the machine is set for an A. C.

impulse to initiate a printing cycle, as explained above. As the operator depresses any one of the keys 90, for example, 90-5 (see Fig. 21), the type lever 160-5 is pivoted on the pin 184-5, projecting the stop pin 188-5 above the upper surface of the bearing block 186 into the path of lug 182, which is sweeping over the bores 187 at a high rate of speed. When the lug 182 hits the raised pin 188-5, the type wheel 12, shaft 180, bevel gearing 178 and 179, and type wheel drive shaft 171 are stopped, although the upper type wheel drive pulley continues to rotate on the shaft 171 due to slippage of the low coefficient friction clutch 170. The friction at the clutch 170, however, exerts a constant force holding the lug 182 tightly against the raised stop-pin 188-5.

As should be evident from Figs. 15 and 22 of the drawings, the linear arrangement of the keys 90 is, in effect, bent around in a circle at the bearing block 186, so that the stop-pins 188 are arranged in counterclockwise order around the type wheel shaft 180. With the type faces on the wheel 12 arranged in clockwise order and the lug 182 indexed with respect to the type wheel so that, when the lug 182 is engaged against a given stop-pin, the corresponding type face is rearward and in a transverse vertical plane (the printing position), then, when any given stop pin 188 is engaged by the lug 182, the corresponding type face will be similarly indexed. Thus, as shown in Fig. 22, when the lug 182 engages the stop-pin 188-9, the type face #9 of the type wheel 12 is indexed; because of the counter order in which the stop-pins 188 are arranged in the bores 187 with respect to the order in which the corresponding type faces are arranged, on the type wheel 12, when the lug 182 engages the stop-pin 188-5, the type face #5 will be indexed in printing position. It should be apparent, therefore, that, when any indexing linkage is actuated by depression of a key 90, due to the counter order of arrangement of the stop-pins 188 and the type wheel faces, the corresponding type wheel face will be indexed in printing position.

Because the locking bar 93 will latch and hold a key 90 in a depressed position until the latch rod 95 is withdrawn near the end of a cycle, a stop-pin 188 will likewise be raised and the type wheel will be held in its indexed printing position against the raised stop-pin 188 by the pressure exerted by the friction clutch 170. When the pin is retracted upon release of the depressed key, the torque of the friction clutch 170 will thereupon commence to rotate the type wheel in the normal manner. The primary force for withdrawing a stop-pin 188 is supplied by the compressed key spring 121 through the key 90, pin 161, and lever 160.

The top of each stop-pin 188 is preferably rounded and the undersurface of the lug 182 is preferably beveled upwardly from the lower edge of the vertical pin-engaging face of the lug. If the pin 188 is raised at such an instant that the crown of the pin strikes the beveled edge of the lug 182, the lug will pass over the raised pin, since the frictional drive of the clutch 170 and the inertia of type wheel 12 will be greater than the frictional holding force exerted by the point contact of the crown of the pin 188 against the beveled edge of the lug 182. If the pin 188 is raised just after the beveled edge of the lug 182 has passed over the crown of the pin, the pressure of the pin against the beveled undersurface of the lug will cam the type wheel forward in the direction of rotation of the wheel and the wheel

will have to make a substantially full rotation before it is indexed. If the lug 182 strikes a pin 188 just below its crown, the crown will cam the type wheel backward against the drive of the clutch 170, indexing the type wheel immediately.

Due to the fact that the rotational speed of the type wheel is approximately six times that of the rotational speed of the cycle shaft, in this embodiment, and because a stop pin 188 is raised to indexing position when a key 90 has traveled approximately half way to its latched position, the theoretical mechanical maximum amount of time required to index the type wheel would be the first twelfth of a cycle. However, due to the fact that there is little lost motion in the type indexing linkage, whereas the inertia of the cycle initiating elements may be an appreciable fraction of cycle time (as in the present embodiment where the entire cycle consumes approximately a second), and because an amount of time equivalent to a fourth of a cycle may elapse before the clutch 83 engages, the type wheel is usually indexed before a cycle commences and, in any event, is index before about half of the theoretical mechanical maximum fraction of the cycle has elapsed. (See Fig. 28.)

Type lever reset mechanism and operation

As explained above, the primary force tending to withdraw a stop-pin 188 to its normal retracted position below the surface of the bearing block 186 is the force of the compression spring 121 on the corresponding key rod 90. A very slight secondary force is exerted by the tension spring 130, tending to retract the locking bar 93 and to cam the keys 90 upwardly. The pins 188 fit as closely as possible while still providing a good running fit in the bores 187 in order to distribute over the whole bearing surface of a bore 187 the pounding which a pin 188 takes in stopping the type wheel 12. In the course of time and constant operation, however, the lubrication of the pins in the bores may become impaired and the hardened pins 188 may sufficiently pound the bores 187 out of round so that there would be a tendency for a pin 188 to cant and become frozen in its bore while the pin is in a raised position. If this occurred, the key 90 of the locked pin would be held down, the locking bar 93 would be cammed in its forward position, and the latch rod 95 would return to its latching position in the latch opening 94 as soon as the latch arm follower 137 was passed by the raised dwell in the latch cam 96, thus resetting the machine for printing a second ticket. In order to prevent the machine from thus "running away with itself" and continuously repeating the ticket printing operations, all because a stop-pin 188 became frozen in its bore 187, positive mechanical means are provided to reset a type lever 160 when the locking bar 93 is released by the latch rod 95 near the end of each cycle.

The means employed to perform the operation of resetting a type lever 160 comprise a yoke 190 pivotally mounted on the rod 191 located above the type levers 160 and to the rear of the pivot forks 125, said yoke 190 extending from the rod 191 rearwardly toward the type wheel housing 181 and the knockdown bar 192 of said yoke extending transversely of the type levers beneath it. (See Figs. 14, 16, and 24.) The yoke 190 is normally held above the type bars 160 and out of contact therewith by the torsion spring 193 supported on the rod 191, one end of said spring 193 being caught under an arm of the yoke 190 and

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the other end of the spring being held by the adjacent frame, upward movement of the yoke 190 being limited by the set pin 194 fastened in the bearing block 186 and engaged by the knockdown bar 192. The right leg of the yoke 190 carries a short wrist pin 196 on which is pivoted the yoke link 195, said wrist pin 196 being spaced from the knockdown bar sufficiently so that when the yoke 190 is in its raised position against the set pin 194 and the center line of the yoke link 195 is tangent to the crank circle of the crank pin 197 on the knockdown crank 166, the yoke link 195 will just clear the under edge of the knockdown bar 192. The swinging end of the yoke link 195 is provided with an elongated slot 198 in which the crank pin 197 is slidably received. The slot 198 extends toward the wrist pin 196 a sufficient distance to accommodate the crank pin 197 when the crank 166 is on dead-center toward the wrist pin 196; the length of the slot 198 is such that, when the yoke 190 is depressed so that the knockdown bar 192 engages the levers 160 in their normal position and when the crank 166 is on dead-center away from the wrist pin 196, the crank pin 197 will bear against the end of the slot 198. (See Fig. 24.)

As shown in Fig. 24, as the auxiliary cycle shaft 158 commences to rotate, the crank pin 197 moves in the slot 198, first toward the wrist pin 196 and then away from it. As the crank 166 nears its dead-center position away from the wrist pin 196, the crank pin 197 bears against the end of the slot 198, pulling down the yoke 190 until the bar 192 reaches its extreme knockdown position. Continued rotation of the crank 166 will allow the spring 193 to raise the yoke against the set pin 194 and then the crank pin 197 will move in the slot toward the wrist pin 196. The knockdown action of the bar 192 may occur any time during the cycle, depending upon the angularity between the knockdown position of the crank 166 and the initial position of the crank. As explained above, the crank 166 is indexed on the cycle shaft 158 so that knockdown movement of the bar 192 commences simultaneously with or shortly after withdrawal of the latch rod 95.

The angularity of the yoke link 195 with respect to the yoke 190 is such that the knockdown movement of the yoke 190 is very rapid. Thus, if any lever 160 is held up by its stop-pin 188 being stuck or frozen in its bore 187, the knockdown bar 192 will strike the raised lever a sharp blow, freeing the stop-pin 188 in its bore, allowing the key 90 to be projected from its depressed position and allowing the lock bar 93 to retract so that, when the dwell on the latch cam 96 has passed its follower 137, the latch rod 95 will bear against the locking bar 93, preventing the contacts 98 and 99 from being re-closed.

Printing mechanism and operation

The type wheel housing 181 carries as its rear vertical wall the printing plate 200, said printing plate 200 being removably secured to the housing 181 by the removable pin 201. As shown in Figs. 8 and 9, on the face 207 of the printing plate 200 (which faces rearwardly in the machine) is the guide 202 for receiving and holding the substantially permanent name, code number, and value slug 4, said slug 4 being removable only when the printing plate 200 is removed from the machine. Extending across the face 207 and beyond the outside edge of

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the plate 200 are the guides 203 and 204 for receiving and holding the date slug 6 and the race and code word slug 10, respectively. It is to be noted that the open outside ends of the guides 203 and 204 are slightly flared and tubular and that the ends of the slugs 6 and 10 project beyond the ends of the guides when the slugs are fully seated, as shown in Fig. 8. This permits the slugs to be readily accessible for withdrawal when the right-hand side of the machine is opened. The flared tubular ends of the guides 203 and 204 aid in the insertion of new slugs, it being important that the slug 10 should be readily and quickly changeable between races.

The printing plate 200 is provided with an open slot 205 through which the rear periphery of the type wheel 12 will protrude when the plate is secured on the type wheel housing 181. (See Figs. 15 and 16.) The face 207 of the plate 200 is removably secured to the plate 200 with the flat-headed machine screws 206 so that the face may be suitably shimmed in order that the type face on the several slugs will lie in the same plane as the type face on the type wheel 12. It is to be noted that the slug 4 and the type on the slugs 6 and 10 are so arranged that type carried by the plate 200 will be approximately centered with the type face of the wheel 12 (shown in Fig. 8 in dotted lines within the opening of the slot 205).

Ink for the type carried by the plate 200 and by the faces of the type wheel 12 is supplied by the wide typewriter ribbon 210 which is wound between the upper ribbon spool 211 and the lower ribbon spool 212, the course of the ribbon 210, as best shown in Figs. 13 and 16, being from the upper spool 211 over the inking pad roll 213 to the guide roll 214 on top of the plate 200, then down across the type carried by the plate 200 to the first guide roll carried by the ribbon guard plate 215 (said guard plate 215 being located below the stop-pins 188 and above the paper feed rolls 165), thence forward over the guard plate 215 and its second guide roll to the lower spool 212.

Paper stock 220 for the printed ticket 1 is fed from the supply roll 221 under the paper feed rolls 165 and up between the feed rolls 165 and pressure roll 222 through the paper guide 223 to the lower fixed cut-off knife 224 between the ribbon 210 and the platen 225, as also shown in Figs. 13 and 16.

The actual printing of the ticket 1 is done by the movable platen 225, which is a heavy vertical plate located in the rear of and normally spaced from the printing plate 200, the forward surface of said platen being faced with a resilient pressure pad 226 aligned with the type on the plate 200. The platen 225 is mounted on the upper and lower forwardly extending horizontal staffs 227 and 228 fixed to the platen and journaled for fore and aft movement in the type wheel housing 181. Intermediate of the staffs 227 and 228, the platen 225 is provided with the fixed pivot stud 229 in which is pivoted the adjustable connecting link 230 pivotally connected to the print cam arm 231. The print cam arm 231 is mounted on the pivot pin 232 at the extreme right side of the machine and extends through an opening 233 in the frame partition to the print cam 153, said print cam arm 231 being provided at its swinging end with a cam-following roller 234 and being held against the print cam 153 by the tension springs 235 (see Fig. 26).

Shortly after the cycle commences, the print cam 153 engages the follower 234 pivoting the cam arm 231 forward and pulling the platen 225 and staffs 227 forward by the connecting link 230, thus engaging the paper stock 220 between the resilient pad 226 and the ribbon 210 covering the type on the plate 200 and on the index face of the indexed type wheel. Actual printing pressure is applied as the follower 234 rides over the raised dwell on the cam 153, the amount of printing pressure exerted being determined by the length of the adjustable connecting link 230. When the cam 153 rides past the follower 234, the tension spring 235 returns the platen 225 to its normal position spaced from the plate 200.

Type ribbon inking and feeding mechanisms

The type ribbon 210 is maintained in a well inked condition by passing over the inking pad roll 213. As shown in Fig. 17, the roll 213 is comprised of a number of dense disks of felt or other wicking material mounted on the drilled arbor 237 and maintained in a compressed condition between the washers 238 by the nut 239. The open end of the drilled arbor 237 extends into the bottom of the ink reservoir 240 mounted on the frame F. The reservoir may be refilled from time to time through the upper opening 241. Ink slowly flows from the reservoir 240 into the drilled arbor 237, whence, through suitable lateral openings, it slowly wicks to the surface of the pad roller 213 where ink is picked up by the passing ribbon 210. In addition to keeping the ribbon well inked and thereby assuring strong prints, the reservoir 240 and pad 213 constitute a means for supplying special inks not found in standard typewriter ribbons and thereby adding a special element to the printed ticket to discourage forgery.

The inking ribbon feed mechanism is best shown in Fig. 13 and is comprised of a plate 245 slidably mounted in ways 246 secured to the outside of the type wheel housing 181. The plate 245 is provided with a pin over which the notched link 247 is dropped to connect the plate 245 to the platen 225, the link 247 being pivotally mounted on a laterally extending pin 248 carried by the platen 225. The forward end of the plate 245 carries a spring-snapped toggled double pawl 250 having an upper pawl tooth 251 and a lower pawl tooth 252. The ribbon spools 211 and 212 are each provided with ratchet wheels 253 and 254, respectively, the teeth on the upper ratchet wheel 253 being directed in a clockwise direction and the teeth on the lower ratchet wheel 254 being directed counterclockwise.

With the pawl 250 snapped down (Fig. 13), as the platen 225 is moved forward by the print cam 153, the connected plate 245 carries the pawl 250 forwardly over the teeth of the ratchet wheel 254. After the cam follower 234 has ridden over the dwell in the print cam 153 and the printing pressure is relieved, the platen 225 moves rearwardly, carrying with it the plate 245 and the pawl 250 having its lower tooth 252 engaged in the ratchet wheel 254, thus winding up a short length of ribbon 210 on the lower spool 212. It is to be noted that ribbon feed does not occur, therefore, until after printing is completed and the platen 225 is being spaced from the plate 200. Release of printing pressure tends to allow the platen to snap away so that the ribbon 210 may move without smearing the printed ticket which has not yet been severed from the ticket stock 220.

The ribbon spools 211 and 212 are rather

tightly mounted on their respective arbors 255 and 256, so that there is no tendency of the ribbon to overrun when being wound on a spool and also so that the ribbon is always under a slight tension, thus keeping the ribbon smooth over the type face and preventing bad prints due to a wrinkled ribbon. The ribbons are securely anchored on the spools so that, when one spool is completely wound, the wound spool is prevented from being turned by the pawl 250; the pull of the link 247 will then cause the toggle to snap the pawl 250 into engagement with the other ratchet wheel, thus reversing the ribbon feed.

Paper feed mechanism and operation

The replaceable supply rolls 221 of the paper stock 220 are carried on the large reel 257, each supply roll 221 being retained on the reel by the notched retainer 258 which is received in the grooved arbor 259 of the reel 257. The retainer 258 is suitably pivoted near the bottom of the frame F and is normally held against the grooved arbor 259 by the torsion spring 264. (See Fig. 3.) Thus, the rolls 221 may be quickly replenished between races by simply pivoting the retainer 258 away from the arbor 259 to free the end of the arbor 259.

As best shown in Fig. 16, the strip of paper stock 220 is led from the supply roll 221 under and up around the paper feed rolls 165, the stock 220 being loosely held against the rolls 165 by the pressure roll 222. The pressure roll 222 is rotatable on the fixed sleeve 260, which is carried by the curved bell crank arm 261. The sleeve 260 supports internally the eccentric shaft 262, to the inner end of which is secured the eccentric 263 (Figs. 19 and 20). The outer end of the eccentric shaft 262 extends beyond the end of the auxiliary cycle shaft 158 in order that the pinned wing nut 265 may clear the knockdown crank 166. The wing nut 265 holds the eccentric 263 tightly against the sleeve 260 by means of the spacer sleeve 266 and the friction washer 267 which bears against the other end of the sleeve 260 and also serves to retain the roll 222. The pressure exerted between friction washer 267 and the eccentric 263 is considerable, so that the leverage afforded by the wing nut 265 is necessary to turn the shaft 262. Thus, once the shaft 262 is indexed with respect to the sleeve 260 and bell crank arm 261, the eccentric 263 remains in its indexed position. (See Fig. 19.) The eccentric 263 bears against the roller 268 carried by the frame F. The space between the pressure roll 222 and the paper feed rolls 165, and thus the degree of looseness with which the paper stock 220 is normally held therebetween, is adjustable by turning the wing nut 265 to index the eccentric 263 with respect to the roller 268.

The eccentric 263 is held against the roller by the tension spring 270 acting between the frame F and the crank arm 271 located on the motor side of the machine, said crank arm 271 being secured to the crank shaft 272 which is journaled in the frame partition. Said shaft 272 extends to the printing side where it supports the bell crank arm 261 secured thereto. The shaft 272 preferably extends just beyond the outer paper feed roll 165 where it supports a guide plate 273 to prevent the paper stock from slipping laterally away from the feed rolls 165.

Paper stock 220 is fed upwardly through the guide 223, between the platen 225 and type ribbon 210, between the cutting edges of the fixed knife 224 and the movable knife 280 and out through the ticket delivery and holding guide 300. This

feed is accomplished by the projecting teeth 275 on a serrated segment of the periphery of the feed rolls 165, the balance of the periphery of the feed rolls being smooth, as shown, for example, in Figs. 13 and 16. The feed rolls 165 turn constantly during a cycle, being secured to the auxiliary cycle shaft 158. Because the eccentric 263 limits the pressure roll to normally holding the paper stock 220 rather loosely, there is no feed of paper while the smooth periphery of the feed rolls 165 traverses the line between the center of the feed rolls 165 and the pressure roll 222. As the serrated segment of the feed rolls commences to pass this line of centers, however, the projecting teeth 275 press the paper stock 220 against the pressure roll and thus force the eccentric away from the roller 268 so that the pressure roll 222 bears against the paper stock 220 with the full force exerted by the tension spring 270, thus causing the teeth 275 to bite into the paper stock 220 and feed it upwardly. The paper stock continues to be fed so long as the serrated periphery of the feed rolls 165 passes the pressure roll 222. Accordingly, the circumferential length of the serrated segment of the feed rolls is equivalent to the length of the ticket to be printed, or, in terms of the machine, equal to the vertical distance from the bottom of the slug 10 to the cutting edges of the knives 224 and 280. The timing of the paper feed within the cycle is determined, of course, by the indexing of the feed rolls on the shaft 158. As explained above, the paper feed must occur after printing is completed and before the ticket severing operations commence. Accordingly, the feed rolls are indexed so that the teeth 275 commence to pass the pressure roll 222 after the printing operation ceases (see Fig. 28) and the diameter of the feed rolls is sufficient to allow the desired length of stock to be fed before the severing operation commences.

Ticket severing mechanism and operation

The ticket length of paper stock 220 fed above the cutting edges of the knives 224 and 280 by the printing rolls 165 bears, of course, the indicia printed on the stock 220 by the preceding printing operation. The lower knife blade 224 is termed a fixed knife because it is fixed to the top of the platen 225, being spaced therefrom by a suitable shim or spacer. The movable knife blade 280 is secured to the knife arm 281 which is pivoted on the upper right corner of the platen 225 and, extending through an opening 282 in the frame partition, is pivotally connected at its swinging end to the knife cam yoke 155. The knife cam yoke is pivotally and slidably mounted on the cycle shaft extension 143 by means of the open-ended slot 183 in which a suitably grooved portion of the shaft extension 143 is slidably received, said yoke 155 riding on the shaft 143 just above the knife cam 154. On the underside of the cam yoke 155 is the roller cam follower 284, said cam follower being spaced from the pivot 286 connecting the yoke 155 to the knife arm 281 so that the follower is normally riding on the base of the knife cam and the knife arm is held open. The follower 284 is normally held against the base of the cam 154 and the knife arm is held open by the tension spring 285 connected between the knife arm and frame.

As shown in Fig. 27, the initial indexed position of the cam 154 is just in advance of the position the cam occupies at the point of maximum throw. The lead surface of the cam 154 is steep

so that the ticket severing operation does not commence until nearly the end of the cycle. When the lead surface does engage the follower 284, the yoke 155 is very quickly thrown rearwardly along the line of instant centers of the shaft 143 and the pivot 286, thus rapidly closing the edge of the knife 280 over the edge of the fixed knife 224 to sever the ticket 1 from the stock 220. The return surface of the cam 154 is only slightly divergent from radial, thus providing an even quicker return of the cam yoke and opening of the knife arm 280 by the spring 285. It is desirable that the action of the cam 154 be as quick as conveniently possible, first, so that the operation of cutting the ticket length from the stock may occur close to the end of the cycle, thus allotting a greater proportion of the time of the cycle to the preceding operations of printing and feeding, and second, so that the moving knife 280 will quickly cut the ticket stock, rather than tear it.

As the strip of ticket stock 220 is fed upwardly by the feed rolls 165, the printed end portion is fed into the ticket delivery and holding guide 300, said strip being guided by the guide 223, the edges of the knives 280 and 224, and the preferably divergent lower opening of the guide 300. (See Fig. 16.) The guide 300 is a short, flattened tube directed forwardly so that the rear edge of its upper opening is at least slightly forward of the edge of the fixed knife 224. Thus, in being issued out of the guide 300, the rather stiff stock 220 is bent slightly forward. When the upper moving knife 280 shears off the ticket 1, the bottom of the ticket 1 is carried rearwardly of the edge of the knife 224 so that, as the ticket snaps from its curved to a relatively straight condition, the ticket will rest on the upper surface of the knife 224 well back of the edge. Due to the slant of the guide 300, it is therefore impossible for a severed ticket to fall past the forward edge of the rear knife 224 and thus back into the machine to jam the paper feed and interfere with the printing of subsequent tickets. Instead, the ticket will be held by the guide 300 and knife 224 in a nearly upright position so that the ticket may be conveniently picked up by the operator. The slanting walls of the guide are preferably sufficiently spaced so that, in the event the operator neglects to remove a ticket after it has been severed, one or two more tickets may be issued before the guide 300 will be jammed. Because the rear edge of the guide 300 is forward of the edge of the rear fixed knife 224, it is rather difficult for an issued ticket or other paper even to be forced down below the knife edges.

Register mechanism and operation

In order to keep a record of sales of each selection and to check the total receipts of the operator, each machine is provided with a register 310 located to the rear of the keys 90, the register 310 being comprised of ten mechanical counters 311. Nine of the counters 311 are each aligned with a selector key 90 to record the sales made on the corresponding selections and a tenth or total counter 311-T is aligned with the test key. (Tickets issued by depressing the test key 90-T are for test purposes only and are otherwise void; the number of test tickets is, therefore, immaterial for record purposes.) The several counters 311 are of a standard mechanical type mounted on a common reset shaft 312 which, when turned, will drive all counters backward to quickly reset them to zero. The left end of the reset shaft 312

in this embodiment is provided with a winged nut 313 to permit a suitable key to be inserted into the machine to reset the register. Each counter in the register is provided with a trigger 314 normally maintained in a raised position by an internal spring (not shown). Each trigger 314, when depressed and allowed to return, will register a count near the end of the upstroke of the trigger.

Each type lever 160 is provided near its key end with a cam pin 315 carrying a retaining washer 316 (Fig. 16). Depending from each trigger 314 for the selector key counters 311 is a swingable register link 317 having an enlarged notch 318 which opens forwardly, said notch 318 having a downwardly and then vertically sloping lower edge 320 which serves as a cam surface for the cam pins 315 on the corresponding type lever 160. A small tension spring 321 between a register link 317 and the corresponding type lever 160 holds the cam surface 320 substantially in engagement against the rear of the cam pin 315, the register being held against lateral movement by the lever 160 and the retaining washer 316. A transverse stop bar 322 carried by the frame limits forward movement of the links 317 by engaging the suitably relieved forward edges of the end of the links. Below the notch 318, each link 317 is provided with a counting notch 323 opening rearwardly and having a small catch 324 on its lower edge.

A substantially horizontally extending register yoke 325 is pivoted at each side of the machine and extends forwardly to the point where its transverse register bar 326 will just clear the rear edges of the links 317 when the links are held in their normal forward position by the springs 321. The center of the register bar 326 is provided with an integral bracket 327 to which is loosely pinned, through a suitable lost-motion slot, the register lever 328. The register lever 328 is fulcrumed on a pivot 329 below and rearwardly of the yoke 325, the rear end of the register lever 328 being provided with a follower 330 for the count cam 159. The count cam is indexed (due to the position of the pivot 329 with respect to the yoke 325) on the auxiliary cycle shaft 158 so that in the normal position shown in Fig. 16, for example, the follower 330 engages the raised dwell on the count cam 159, the follower 330 being held against the cam 159 by the tension springs 331 which tend to pull the yoke 325 downward.

To record a sale made on a given selection, the desired selector key 90 is depressed and latched to index the type wheel 12 and set the machine for initiation of a printing cycle, as explained above. Assuming that the selection was #5, then, as shown in Figs. 21 and 23, as the type lever 160-5 is moved down by the key 90-5, the cam pin 315-5 bears against the cam surface 320-5, forcing the register link 317-5 rearwardly so that the register bar 326 is within the notch 323-5 forwardly of the catch 324-5. The link 317-5 and register bar 326 will remain in such relative position until the raised dwell of the count cam 159 has passed over the follower 330. Then the register bar 326 will be lowered and will pull link 317-5 and counter trigger 314-5 with it, the throw of the count cam 159 and the leverage of the register lever 328 being such that the trigger 314-5 will be depressed sufficiently to register a count on the upstroke. While the link 317-5 is pulled down, the catch 324-5 prevents the link from escaping the register bar 326 under the influence of the forward pull of the spring 321-5.

As the cycle nears completion, the cam 159 forces down the follower 330 and raises the register bar 326 against the pull of the springs 331, allowing the spring-pressed trigger 314-5 to raise itself and the link 317-5 and record a count for the ticket issued by depressing the again projected key 90-5. As the raised dwell of the cam 159 is returned to its initial position at the end of the cycle, the register bar 326 is raised clear of the catch 324-5 and the register link 317-5 is pulled to its normal forward position against the stop bar 322 by the spring 321-5.

The register link 417 for the total counter 311-T associated with the test key 90-T is somewhat similar to the selection register links 317, the principal difference being that the link 417 is enlarged to provide a large rearwardly facing notch 418 in which the lower edge 420 slopes downwardly and rearwardly, rather than downwardly and forwardly as in the corresponding notches 318 of the register links 317. Below the notch 418 the total register link 417 is provided with a counting notch 423 having the catch 424. The link 417 is positioned so that the camming edge 420 is normally held in substantial engagement with the forward surface of the cam pin 315-T, a small tension spring 421 between the link 417 and the test type lever 160-T urging the link 417 rearwardly. Rearward movement of the link 417 is limited by the register bar 326 which is normally received within the counting notch 423. Sufficient space is provided within the notch 418 forward of and above the cam pin 315-T so that the cam pin 315-T will not interfere and prevent the total register link from being pulled down and slightly rearwardly by the register bar 326.

In the usual operation, when the machine is set for a printing cycle by depressing a selector key, the total register link 417 is pulled down and allowed to raise by the register bar 326 as the register bar is raised and lowered in the cycle, thus registering a count on the total counter 311-T. If, however, the test key is depressed to issue a test ticket, then, as shown in Fig. 24, the test type lever 160-T, through the cam pin 315-T, cams the total register link 417 forward against the stop bar 322 so that the notch 423 is pulled away from the register bar 326, thus allowing the bar to clear the link 417 in its downward travel during the cycle of printing a test ticket.

In the usual operation of my machine, therefore, two counts are recorded by the register 310 when a selector key is depressed to sell a valid ticket, one on the counter 311 corresponding to the depressed selector key and the other on the total counter 311-T. If, however, a test ticket is issued, the register bar does not pull down either the link 417 or one of the links 317 and, accordingly, no count is recorded. Thus, at any time during the sale of tickets and prior to clearing the entire register to zero, the counter 311-T of the register 310 will show the total number of tickets sold and each of the remaining counters will show the number of tickets sold on its corresponding selection. Due to the standard clearing operation of the reset shaft 312, in which the number wheels of all counters are turned back simultaneously, an effort by the operator to surreptitiously partially reset the register will be revealed by the discrepancy in the total count; to discourage any such effort the wing nut 313 is located within the casing so that the shaft 312 can only be turned by a suitable key insertable through a suitable adjacent opening in the casing.

All the automatic ticket printing, totalling of sales, and even the ticket machine lockout operations are in some measure dependent upon the operation of the distributor 16, constantly driven by the motor 17 to distribute two differently functioning pulsating currents to the ticket machines, (a) the A. C. printing cycle initiating currents and (b), the D. C. counting impulses.

The several ticket printing machines are successively connected to the successive segments of the D. C. commutator of the distributor so that counting impulses are distributed seriatim to the several machines. Thus, there is no possibility for the counts to "pile up" and storage of counts is avoided. Accordingly, the counting board 15 gives instantaneous totals of sales on the machines served by the board, both as to the grand total of all sales and the total of sales per selection. As the D. C. impulses are distributed to the machines, each machine distributes the impulse to the individual counters which collect impulses distributed according to selections and thus total the sales on individual selections as made by all the machines. The distributed impulses automatically operate a grand total counter of all sales by operating the totalizing relay 115, thus setting up a second set of counting impulses which parallels the distributed impulses and operates only the grand total counter in the counting board 15. If a greater number of machines is employed than can be served by one distributor, duplicate distributors and counting boards are employed for the additional machines. Since it is the practice to sell tickets having different values [e. g., \$2, \$5, \$10, and \$50 tickets] and for different purposes [i. e., win, place, and show], machines selling different values of tickets for different pools are usually grouped on different distributors and a counting board is set up for each group of machines. It is not to be understood, however, that one distributor is limited to serving machines selling one type of ticket. The ring of the D. C. commutator, itself, may be segmented in order to provide separate lines for the separate totalizing relays operating on the separate counting boards set up for each of the groups of machines served by the one distributor.

The primary function of the A. C. impulses distributed by the A. C. commutator of the distributor 16 is to initiate or otherwise time the printing cycle of a particular machine so that one, but only one, ticket will be issued for a counting impulse transmitted by the machine. In this embodiment, this function is obtained by providing a main relay 100 which must be actuated by an A. C. current before the printing cycle can commence and to close a common D. C. impulse line 112 to the several D. C. selector contacts 101. A machine-supplied holding current maintains the relay 100 closed until the printing cycle is nearly completed. Subsequent A. C. impulses received by a machine after a printing cycle has commenced are ineffective, since the only purpose of an A. C. impulse in so far as these disclosed machines are concerned, is to initiate a printing cycle. In this embodiment, the proper indexing of the A. C. impulse brushes on distributor arms 65 and 66 with respect to D. C. impulse brush insures that one, but only one, D. C. counting impulse is transmitted by the machine for each ticket issued by the machine. The locking bar 93 and toggle insures that one,

and only one, selector key 90 can be actuated for each valid ticket printed by the machine.

The issuance of invalid test tickets by the machine may be initiated either by A. C. impulses from the distributor 16 or by an impulse to the relay or independently of the distributor by an impulse obtained by momentarily closing the auxiliary test switch 102. Since the auxiliary test switch 102 is in series with the test key contact 101-T, a printing cycle can be initiated independently of the distributor when the test key 90-T is depressed. Thus, any ticket issued by the machine other than upon an A. C. impulse received from the distributor will be void and no count therefor will be recorded on the counting board because D. C. counting impulses are transmitted only through the contacts 101 of the selector keys.

The machines are locked out between selling periods by the lockout relay 40, interposed between the line and the A. C. commutator, and the antifeed-back relays 50, interposed between the A. C. commutator segments and the machines connected thereto. The antifeed-back relays are employed to prevent the main relay 100, in a given machine, from being actuated by induced currents resulting from breaking the A. C. circuits in adjacent machines as the lockout relay 40 is opened, such induced feed-back currents being otherwise transmitted as the A. C. brushes would bridge the gaps between adjacent A. C. segments in the distributor. The antifeed-back relays 50 are alone sufficient to prevent cycle-initiating impulses from passing through the machines and are so employed when the counter ground failure relay opens the line 51 actuating the antifeed-back relays. The lockout relay 40, by means of the positively opened switch 40x2, is insurance against continued operation by a given machine in the event that machine's particular antifeed-back relay fails to open.

The D. C. impulse lines are not opened when the machines are locked out because a machine may well be in the midst of a printing cycle when the lockout relay and antifeed-back relays are opened and the count for such a cycle must be recorded.

The A. C. commutator serves a secondary function in that one segment is used to operate the pulsating A. C. signal 79 in the control room. Another secondary function of the A. C. commutator is to directly or indirectly actuate the lockout timer.

The machines are locked out, after the reset switch 35 has been actuated, when the stewards press the lockout button to establish a holding current in the stewards' relay 25, thus establishing circuits to the red light relays 21 which turn on red warning lights in all the machines and also establishing a circuit for the pulsating current for the lockout timer. As the lockout timer operates, it first actuates the warning lockout bells 75. Then, after a period of time determined by the number of impulses received by the pulsator 67 from the distributor, the lockout bell operating relay 72 is disactivated and the lockout relay is closed. Closing of the lockout relay opens the antifeed-back relays, thus preventing any further ticket printing cycles from being initiated. The lockout timer is held in its lockout position by the pawl 57.

To release the locked out machines for recommencing sales, the ticket selling station supervisors signal the control rooms by establishing holding currents in the parallel connected sta-

tion relays 32 having the common holding current ground line 34, which line also serves as a ground line, through the relay holding current switches 32x1, for the signal lights 31 at the several stations and the station signal lights in the control room. When all of the several station relays 32 have been closed, then the release relay 27 will be activated by a current through the series connected switches 32x2. Activation of the release relay 27 will release the lockout relay by disrupting the common ground for the lockout relay (and the red light relays) and also by actuating the solenoid 55 to disengage the pawl 57, allowing the lockout timer to return to its normal released position. The release relay 27 will remain closed until the several relays 32 are opened by operation of the normally closed reset switch 35 to break the current in the common ground line 34. In addition to being reset manually by operation of the switch 35, automatic means, such as the relay 37, may be employed. After the release relay 27 has been reset to its normal position, the lockout warning cycle may be initiated at any time by operation of the stewards' button, except as the track manager may interrupt the lockout warning cycle by closing the release switch 38; absolute control of lockout operation may be given to the stewards by grounding both the switches 35 and 38 through a normally closed contact [not shown] operated by the stewards' button 60. The switch 38, however, is normally used only for operating the release relay during maintenance and inspection periods when supervisors may not be present at the ticket selling stations.

General failure of A. C. current, or failure of the pulsating A. C. impulses, will inherently prevent further sale of tickets; the first will obviously be indicated by all signal lights going out and the second will be indicated by failure of the signal 79 to flicker. Failure of the D. C. power source will also stop further ticket sale by opening both the antifeed-back relay and the counter ground failure relay, indicated by extinguishment of both the A. C. pulse signal 79 and, through release of the relay 74, the two D. C. failure signals 78. Failure of the counter ground, alone, will open the antifeed-back relay and will thus be indicated by the failure of the A. C. pulse signal.

The ticket machines are set for initiation of a printing cycle by depressing one of the keys 90, the toggle plates 120 permitting only one key to be depressed at a time. The locking bar 93 and latch rod 95 lock the depressed key and the remaining keys until a printing cycle is completed. When the latch rod 95 is fully latched, the contacts 98 and 99 are closed and the automatic ticket printing cycle will commence upon activation of the main relay 100 and operation of the solenoid 85 to disengage the pawl 84 and engage the one-revolution cycle clutch 83. Further operation of the machine is graphically shown in Fig. 28.

As explained above, the movable type is indexed as a key 90 is depressed, indexing usually occurring before the cycle commences and, in any event, shortly after the cycle has commenced. As shown in Fig. 28, the cycle does not necessarily commence immediately after the relay 100 is actuated. Due to the fact that the clutch 83 in this embodiment happens to be a four-tooth clutch, it is possible for as much as a quarter of the cycle time to elapse (if the motor 80 is a synchronous motor) before the clutch 83 engages

and the cycle shaft 82 commences to rotate. If the motor 80 is an induction motor, the proportion of the average lag in clutch engagement will decrease due to the decrease in speed of the motor under load. The doubtful positiveness after wear renders a generally relatively faster acting one-revolution clutch less desirable than the jaw clutch employed. Because the loads of the various operations vary and because such loads may vary in individual machines, the graph in Fig. 28 is based on a constant speed motor 80.

When the cycle is initiated by an impulse from the commutator arm 66 the D. C. counting impulse will pass through the machine substantially simultaneously with the actuating A. C. impulse before the cycle commences, the average time being shown at (a) in Fig. 28. If the cycle is initiated by an impulse from the commutator arm 65, the D. C. impulse may be transmitted in the very latter part of the cycle as the latch rod is being withdrawn but before the contacts 98 and 99 are opened, the average time being shown at (b) in Fig. 28. If the cycle is initiated by additional A. C. impulsing arms between the arms 65 and 66, the D. C. impulse transmission may occur at any time between the extreme (a) and (b) positions, depending upon the indexing of the additional arm and the clutch lag in the particular cycle.

The lengthiest operation in the cycle is that of printing, platen travel commencing almost immediately after the cycle begins and continuing for nearly half of the cycle, actual printing occurring at approximately the quarter point in the cycle. After the printing pressure is applied, ribbon feed begins and continues until platen travel stops. Almost immediately after the platen travel, the ticket length of the printed portion of the paper stock 220 is fed out of the machine. In approximately the last quarter of the cycle, the travel of the movable knife 280 commences and continues to the end of the cycle, the actual cut occurring about halfway in the knife travel and well after paper feed has ceased. Also, in approximately the last quarter of the cycle, the latch rod 95 is withdrawn and substantially simultaneously the type lever 160 is reset.

As shown in Fig. 28, the register operation occupies substantially the entire time of the cycle, the actual count occurring near the very end of the cycle. In this connection, it is to be noted that the greatest portion of the gap in register operation occurs during the first portion of the cycle and that the operation does not commence until after the mechanically possible maximum time for type indexing has elapsed. This timing is obtained by indexing the count cam 159 on the shaft 158 so that the follower 330 will just begin to ride on the raised dwell portion of the cam at the end of the cycle. The register cycle is so timed to insure that the type will be indexed and the register bar 326 will be in the counting notch 323 of a link 317 [or out of the notch 423, in case a test ticket is to be issued] before the register bar commences its downward register actuating movement.

I have disclosed a preferred embodiment of my invention; it is to be understood, however, that my invention is not to be limited to the embodiment disclosed, which embodiment may be modified in whole or in part by those skilled in the art, the limitations of my invention being those of the following claims.

What is claimed is:

1. In a ticket printing and totaling apparatus, a plurality of ticket printing machines, each including indexable type, means for feeding ticket stock over said type, means operating in a cycle to print said stock when said type is indexed, actuate said feed means to feed said printed stock beyond said type, and then sever the printed portion from said stock to provide a ticket, an impulse initiated control means normally disengaging said cycle operating means, normally open contacts connecting said control means to a distributor, a plurality of selector keys, a plurality of pairs of normally open count-distributing contact points, each pair being associated with one of said selector keys, a common trunk connecting one of each pair of contact points, a plurality of count-collecting lines, each connecting the remaining point of a pair of count-distributing contact points to corresponding points in other ticket-printing machines, each of said selector keys being operable to index said type, close said control contacts, and to close its associated pair of count distributing points; a plurality of impulse-operated counters, each connected to a count-collecting line; a distributor including a commutator to distribute impulses seriatim to the cycle control means in each machine through said cycle control contacts, when closed, to initiate the engagement of said cycle operating means, a normally closed relay for interrupting the distribution of the cycle initiating impulses, and a second distributor to distribute counting impulses seriatim to the machines and thence to a counter; means to open said relay including a timer to open and hold open said relay upon completion of the operation of said timer and means to initiate the operation of said timer, and means to release said timer to release said relay and thereby reinstate the distribution of the cycle-initiating impulses.

2. In a ticket printing and totaling apparatus, a distributor normally supplying electrical impulses, a ticket machine comprising indexable type, means for feeding ticket stock over said type, ticket printing means operating in a cycle to print said stock, actuate said feeding means and sever the printed portion of said stock to provide a ticket, means normally preventing operation of said ticket printing means and actuable by impulses from said distributor to allow said ticket printing means to operate for one cycle, a normally open control switch connecting said control means to said distributor, a plurality of selector keys, means operated by any one of said selector keys to close said control switch, means operated by said selector key to index said type in accordance with the key operating said means, a normally open counter contact associated with each selector key, whereby operation of one of said keys will index said type, close said control switch and close its associated counter contact, and means to prevent more than one selector key from being operated until the ticket printing means has been operated by an impulse transmitted from said distributor to said control means through said control switch; an impulse operated counter connected to one side of each of the normally open counter contacts, means to supply one counter operating impulse to the other side of the counter contact for each operation of the ticket printing means, a normally closed relay through which the control means actuating impulses are transmitted, means to open said normally closed re-

lay to prevent actuation of said control means, said relay opening means including a timer, a warning signal operated by said timer before said normally closed relay is opened, and means to actuate said timer to operate said warning signal and then open said normally closed relay, and means to reinstate the transmission of said impulses including means to release said timer and to deactivate said timer actuating means.

3. In a ticket printing and totaling apparatus, a plurality of ticket printing machines, each containing a plurality of selector keys, means to print and deliver tickets bearing printed indicia corresponding to an operated selector key, means to prevent the operation of more than one key at a time and, after one key has been operated, to lock all keys until a ticket has been printed; an impulse operated control relay to initiate the operation of said ticket printing means, means operated by any one of said selector keys to connect said control relay to a distributor, a plurality of count collecting lines each corresponding to a selector key, means operated by said selector keys and connected to a counting impulse distributor through said control relay to distribute a counting impulse from a trunk to one of said collecting lines in accordance with the operation of a selector key; a plurality of impulse operated counters, each connected to collecting lines corresponding to similar selector keys in the several machines; a distributor distributing seriatim impulses to initiate operation of said control relays of said machines and counting impulses to the trunks of said machines to be there distributed to said impulse actuated counters, said control relay operating impulses and said counting impulses being distributed in timed relationship with respect to each other, a relay operated by each of said counting impulses to create corresponding counting impulses in a line parallel to said collecting lines and an impulse operated grand total counted in said parallel line; lockout relays to prevent transmission of the control relay operating impulses from said distributor to said machine, means to operate and hold said lockout relays, and means to deactivate said lockout relay operating means and hold said means deactivated and a reset switch for rendering said deactivating means inoperative.

4. In a control system in apparatus of the class described, a distributor, a plurality of ticket machines operating when impulses are received from said distributor, a lockout relay normally transmitting impulses distributed by said distributor to said ticket machines, means for operating said lockout relay to interrupt transmission of said impulses and to operate warning signals prior to operating said lockout relay comprising a timer in a normally inoperative position, a lockout relay operating switch, a warning signal operating switch operated by said timer prior to operating said lockout relay, means to initiate operation of said timer, and means to hold said timer in said lockout switch operating position.

5. In a control system as defined in claim 4, a second warning signal which is operated by said means to initiate the operation of said timer.

6. A control system as defined in claim 4 in which said means to initiate the operation of said timer include a relay, a pulsator to operate said timer and a switch to operate said relay,

establish a holding current therein, and establish a circuit to operate said pulsator.

7. In a control system as defined in claim 4, in which said means to initiate operation of said timer include a normally open stewards' relay in the lockout relay operating circuit, a release relay having a normally closed switch and a normally open switch, a line from the normally closed switch of said release relay to said stewards relay, a switch to operate said stewards relay to establish a holding current for said stewards relay through said line to said normally closed release relay switch, a line from the lockout relay switch in said timer to the holding current line for said stewards relay, whereby said normally closed release relay switch and said timer lockout relay switch are both interposed in the lockout relay operating circuit, a plurality of normally open station relays connected in parallel with each other to a station relay holding current line and in series with each other and said release relay, a solenoid to release said means for holding said timer in said lockout switch operating position, and means to establish holding currents in said station relays, whereby, when holding currents are established in all of said relays, a current will be established through said release relay and said station relay to hold said normally open switch closed and said normally closed switch open, thereby breaking the lockout relay circuit and releasing said timer to return to its normal inoperative position.

8. In an apparatus of the class described, a release relay operating system comprising a release relay, a plurality of station relays, each having a holding current switch and a series switch, both normally open, said holding current switches connected in parallel to a common holding current line, a signal light for each station relay connected to said holding current switch, said series switches being connected in series with each other and said release relay, means to operate each of said relays to close said holding current switch, establish a relay holding current and a signal light current through said holding current switch, close the associated series switch, whereby, when all of said station relays are operated, a release relay operating and holding current will be established through said release relay and said series connected series switches, and a normally closed reset switch in said holding current line in series with each of said holding current switches, whereby operation of said reset switch will interrupt said holding current, reset all of said station relays and said release relay to their normal inoperative condition, and extinguish said station signal lights.

9. In a release relay operating system as defined in claim 8, a normally open release switch connected to said release relay in parallel with said station relays.

10. In apparatus of the class described, a distributor comprised of a first commutator and a second commutator, each of said commutators comprised of a slip ring and a concentric series of segments, a plurality of ticket printing machines, an impulse operated control relay in each machine, a control switch in a line connecting the control relay of each machine to a separate segment of said first commutator, a plurality of selector keys and a test key in each machine, means operated by any one of said keys to close said control switch, a count switch

closed by said control relay, a plurality of count distributing switches, each operated by one of said selector keys, a plurality of collecting lines, each connected to one of said count distributing switches, a trunk connecting said count switch to all of said distributing switches; a plurality of impulse actuated counters, each connected to corresponding collecting lines in the several machines and a line from the count switch in each of the machines to a separate segment of the second commutator, whereby operation of any one of said selector keys will close said control switch and permit an impulse from said first commutator to actuate said control relay and will distribute an impulse from said second commutator to a counter thus selected by the operated selector key.

11. In apparatus as defined in claim 10, means to prevent more than one key in a given machine from being operated at a time and to lock all keys in such machine as said control switch is closed until after the said second commutator has passed over the segment to which such machine is connected.

12. In apparatus as defined in claim 10, a line to said control relay parallel to said line from said control switch of a given machine to the segment in the first commutator for such machine, a switch operated by said test key and a second switch operated by an auxiliary test key in series in said parallel line, whereby operation of said test key and said auxiliary key will operate said control relay independently of said first commutator.

13. In apparatus as defined in claim 10, a ticket printing means in each machine operating in a cycle, means actuated by operation of said control relay to initiate the cycle of operation of said ticket printing means and to hold said control relay closed during said cycle, a first arm on said distributor to distribute control relay operating impulses, a second commutator arm on said distributor to distribute control relay operating impulses, and means to distribute counting impulses from said second commutator to a given machine substantially simultaneously with the control relay operating impulses distributed by said second arm to such machine, said first arm being indexed with respect to said second arm so that the control relay operating impulse distributed by said second arm will be received while said relay is held closed when said relay is operated by an impulse distributed by said first arm and so that said relay will open before receiving an impulse distributed from said first arm.

14. In apparatus as defined in claim 10, means to prevent the operation of said control relays comprising a closed relay switch in each line leading to a segment of said first commutator to a control relay, and means to open said relay switches substantially simultaneously to prevent feed back of induced currents across the segments of said first commutator.

15. In apparatus of the class described, a plurality of ticket printing machines for printing tickets according to a plurality of selections, a plurality of impulse actuated selection counters connected to a common line leading to a power source, a commutator for distributing impulses from the power source seriatim to the several machines, means in each machine for distributing said impulses to collecting lines in accordance with a selection made at the machine, lines connecting corresponding collecting lines

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in the said machines to one selection counter, a total counter connected to the common line of said counters, a totalizing relay switch operated by a solenoid interposed between said commutator and the power source, a line connecting said total counter to said power source in parallel with said commutator, said totalizing relay switch making and breaking the circuit through said total counter, whereby said selection counters will each register the total number of times each selection was made and the total counter will register the total of all sections, means to prevent any machine from distributing impulses, a counter failure relay rendering said distribution preventing means inoperative when said counter failure relay is closed, said counter failure relay being connected to said common line at the point where said counters are connected to said line, a second line, in parallel with said commutator and said totalizing relay switch, connecting said counter failure relay to the power source to hold said counter failure relay closed so long as the common line for said counters and counter failure relay is uninterrupted.

JOHN A. STONE.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
718,176	Treadway	Jan. 13, 1903
907,885	Richardson	Dec. 29, 1908
939,295	North	Nov. 9, 1909
953,819	Conrad	Apr. 5, 1910
1,154,355	Wales	Sept. 21, 1915
1,744,771	Julius	Jan. 28, 1930
1,818,587	Schmutz	Aug. 4, 1931
2,036,027	Ecker	Mar. 31, 1936
2,066,698	Simpson	Jan. 5, 1937
2,068,719	Troutman	Jan. 26, 1937
2,121,164	Robinson	June 21, 1938
2,167,513	Johnston	July 25, 1939
2,179,698	Levy et al.	Nov. 14, 1939
2,186,922	Hampton et al.	Jan. 9, 1940
2,345,212	Nelson	Mar. 28, 1944

FOREIGN PATENTS

Number	Country	Date
412,675	Great Britain	July 5, 1934