DATA-PROCESSING SYSTEM FOR DETERMINING GAINS AND LOSSES FROM BETS

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References Cited

UNITED STATES PATENTS


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ABSTRACT

In an establishment in which wagers are placed on the outcome of a fortuitous event, such as the roll of a pair of dice, the spin of a roulette wheel, the result of a horse race, or the like, a player operates a remote selector panel on which a register displays a previously established credit balance. Bets on the event are made from the panel by wagering any amount up to the limit of the credit balance. The amount wagered is automatically deducted from the credit balance, and in the event of a win the amount wagered is multiplied by a predetermined odds factor for the event and added to the credit balance.

10 Claims, 17 Drawing Figures
SEARCH EACH ACCOUNT FOR "LIVE" WAGER ON THIS WINNER

HIT?

FIRST-HALF TWIN DOUBLE?

FIRST-HALF BIG EXACTA?

DIVIDE WAGER BY TWO

MULTIPLY $2 PAYOFF PRICE BY ONE-HALF WAGER

UPDATE UNITS BALANCE

UPDATE & BALANCE

CONVERT LIVE WAGER TO "DEAD" WAGER

SEARCHED ALL LIVE WAGERS?

EXIT

FIG. 9d
DATA-PROCESSING SYSTEM FOR DETERMINING GAINS AND LOSSES FROM BETS

This application is a division of my application Ser. No. 25,227, now U.S. Pat. No. 3,810,627, filed 2 April 1970 as a continuation-in-part of my prior application Ser. No. 699,509 filed 22 Jan. 1968 and now abandoned.

The present invention relates to a data-processing system for placing wagers from a remote location on the outcome of a fortuitous event, such as the rolling of dice, the spinning of a roulette wheel, or the outcome of a horse race, in which means are provided to automatically calculate the results of the wager based on the outcome of the event.

In conventional gambling casinos, the players usually crowd around the dealer, croupier or banker at a location such as a dice, roulette or card table which shall be referred to hereinafter as a banker's station. The number of participants in any such game of chance is thus limited by the physical dimensions of the table and the room in which it stands. Also, in a game in which the players may place bets subject to widely differing odds, the presence of a large number of participants complicates the proceedings and may give rise to errors in paying off the winners.

Wagers on the outcome of horse races are placed at pari-mutuel windows at race tracks. Prior to each race the player stands on line at the appropriate seller's window at which tickets for specified denominations of money and selected positions are sold for each race. Thus to place a $10 bet on a horse to "win," the player must stand on the $10 win line, and to make a different bet as to amount and/or position the player must then go to the end of the different line. If the player is successful in his wager he must eventually return to different cashier's window to collect his winnings. Each cashier only pays off for a specified amount and finishing position so that a player successful on more than one bet on a given race must stand at a corresponding number of cashier's windows at the end of that race.

Tickets for wagers on a race are usually sold only after the previous race on the track program has been completed and prior to the running of the race on which the wagers are to be made. Except for some tracks where wagers may be made in advance on the last two races of the day's program, betting tickets may not be purchased for any race on the program other than the immediately succeeding race with the exception of certain special races, such as Exacta or Quinella, in which the wagering is usually opened two races prior to the special race. As a result the player is required to stand on what is often a long line to place his bets on a race, and must repeat this process for each race on which he wishes to place his wager. If the player wishes to place wagers of different denominations on different horses in a single race, or make a win wager on one horse or a place and/or show wager on that horse or another horse running in that race, he must stand on a number of lines all before the race begins and the taking of wagers is terminated.

The need for repeatedly standing on long lines is an annoying and often frustrating experience for many players and needlessly diminishes some of the pleasures to be obtained at the track, and in fact may occasionally discourage some less dedicated players from placing a wager on a race. The sophisticated player usually prefers to wait until the last possible moment to place his wager, as this additional time gives him the opportunity of noticing any changes in odds (which occur continuously until the betting is closed), and allows the player to view the horses as they enter the track. Thus as the time for the closing of bets nears, the waiting lines at the betting windows often grow longer and many players are often unable to reach the window in time to place their wagers. Moreover, the sellers at the ticket windows often rush to complete the taking of wagers before the start of the next race. This need for haste may cause human error resulting in the possible loss of revenue to the track, or in the issuing of an incorrect ticket to the great annoyance and inconvenience to the player and an adverse effect on the management of the track. Moreover, a player, particularly one who has had a successful day at the track, often carries large sums of money to and from the track each day that he frequents the track. This presents the possibility of loss or theft of the player's funds and thus further reduces the pleasurable aspects of his attendance of the event.

It is, therefore, the general object of the present invention to provide an improved wagering system as well as a method of operating same, in which the aforementioned disadvantages of the known wagering operations are avoided by an automatic wagering-payoff and credit-balance registration.

It is another object of this invention to provide a wagering system and method allowing for the participation of any number of players at locations remote from the site of an event on whose outcome wagers are to be placed.

It is still another object of the invention to provide a wagering system of the type described in which the need for the player to carry large sums of money to and from the event is significantly reduced, thereby decreasing the chances of loss or theft of those funds.

It is a further object of the present invention to provide a wagering system allowing for increased facility and enjoyment for the player in making a wager, and a reduction in the possibility of error in calculating payoff on the wager.

These objects are realized, pursuant to my invention, by the provision of a selector panel or board individually assigned to each player or groups of players and enabling the player or players to place bets on the outcome of any fortuitous and recurrent event then in progress, such as the aforesaid gambling operations. An open phase of operation is initially established during which bets may be placed, followed by a closed phase during which a bet just made or left standing is locked up while the event takes its course. The amount of the wager is initially subtracted from the player's previously established credit balance. After the event has taken place, the outcome is signaled to all the panels for automatic determination of the amounts won by the winning players which are then added to their respective balances.

In order to qualify for the placement of a bet, a player must first establish a credit balance on a display register disposed on or next to his selector panel, this register being inaccessible to the player (except, possibly, for the purpose of increasing his balance) during the subsequent phases of operation in which the amount displayed is augmented as a result of a winning wager. To register the initial credit balance, the prospective
player may make a payment to a banker or to a teller who thereafter presents the register, e.g. by the use of a tool or key or with the aid of a control panel at his station or by communicating the amount of the initial payment to a computer memory. In accordance with a more particular feature of my invention, however, I prefer to allow each player to register his own initial credit balance by purchasing from the banker a token representing a predetermined cash value, this token being then irretrievably inserted into a slot associated with the register. It should be understood in this connection that the term “token” is to be broadly construed as including not only coin-like disks to be received by a collection box but also special keys and identification credit cards and similar implements which, once inserted and used to set the register, cannot be withdrawn for re-use except by an authorized person; in principle, real coins could also be used. The player, having bought one or more of these tokens, may invest them all at once or may save some of them for later insertion to restore a depleted balance. In any event, the arithmetic unit of each panel will not accept a bet exceeding the available credit balance and, advantageously, will turn on a light or other alarm signal whenever a player attempts to overdraft. If the player’s credit balance is sufficient the amount of the wager is reduced immediately upon the registering of the wager.

During the open phase, which may be indicated by a signal lamp on the panel switched on by the banker, the player may operate his selectors to choose both the amount of his stake and the outcome on which he places his wager; if desired, he may annul his selection by pressing a cancellation button. In the closed phase, also indicated by a banker-controlled signal such as a sign reading “no more bets,” the selector position is locked up and cancellation of the bet is inhibited so that the wager previously made cannot be altered until the win or loss has been determined. In certain instances, such as a line bet in a dice game, the outcome at a particular stage may be indecisive and may require the bet to be held over for one or more cycles of operation until a decision occurs; in this case, the selection remains “frozen” even during subsequent open phases until the arithmetic unit registers either a win or a loss.

To register a win, an “add” channel is enabled by the arithmetic unit or computer which should also include a multiplier to take into account the odds governing the selected bet. Thus, if the panel offers a choice between a variety of bets at different odds, a signal may be sent to the multiplier stage of the computer to indicate the odds factor whenever a particular selector is actuated. This odds factor, of course, has no influence upon the “subtract” channel and the overdraft indicator. The cumulative value of all the bets simultaneously placed may be shown on a separate register for visual comparison with the available credit balance.

In a resort hotel featuring a casino, the panels may be located in the several hotel rooms in combination with closedcircuit television to give each player a direct view of a roulette wheel, dice table or other gambling facility used in the establishment. Such a player, of course, will not directly participate in the game but will place his bets on the outcome of an operation performed by the croupier or by some other player at the banker’s station.

According to another aspect of the invention a system is provided for placing wagers on the outcome of a horse race or the like from a betting panel conveniently located at the track. The system comprises a plurality of betting panels tied into the main track computer. The latter computer is of the type commonly provided at race tracks for the purpose of calculating the odds based on the amount of money wagered. Each betting panel is used at the track by an individual player or players. The player opens an account by depositing an amount of money at a special teller’s window provided at the track. The teller transmits this information to a control computer to identify the new player and the amount deposited. That amount is stored and is reflected as the initial credit balance at the panel assigned to that player.

A player may place a bet on the outcome of a race by operating the appropriate members on the panel to transmit the wager data to the control computer, which in turn transmits them to the track computer. The placing of a bet of a selected amount reduces the player’s credit balance. When the results of the race have become official, the track computer transmits the pay-off data (i.e. the return on a unit wager multiplied by the odds factor) to credit the account of a successful player by an amount corresponding to the winnings, and transmits the pay-off information to the appropriate panel.

Many race tracks allow the placing of bets on certain combinations of races in which there is the possibility of winning larger amounts of money on a wager. These combinations include the Daily Double, Big Exacta, and Twin Double. The Exacta and Quinella are special races which may be provided by the track to provide the player with the opportunity for achieving a large payoff. The panel and control computer of the invention contain suitable operating members and logic circuitry to permit the making of such wagers from the panel. According to another aspect of the horse-race betting system of this invention, the better may at his choice select all permutations and/or combinations of a given number of horses in an Exacta or Quinella wager by a so-called “boxing” technique by actuating suitable members of the panel, the actual permutations or combinations being calculated and determined by suitable circuitry or a computer program.

The invention will be described in greater detail with reference to the accompanying drawing in which:

FIG. 1 is a diagrammatic view of a player’s selector panel as used in an automated dice game embodying features of my invention;

FIG. 2 is a circuit diagram of an associated banker’s station;

FIGS. 3A and 3B, when vertically juxtaposed, show elements of the panel of FIG. 1 together with associated logic circuitry;

FIG. 4 is a partly diagrammatic cross-sectional view of a roulette wheel and associated circuitry forming part of another system in accordance with the invention;

FIG. 5 is a diagrammatic view of the layout of a selector panel and associated circuitry co-operating with the arrangement of FIG. 4;

FIG. 6 is a block diagram of an automatic horse-race wagering system according to a further embodiment of the invention;

FIG. 7 is an elevation view of a betting panel for use in the system of FIG. 6;
FIGS. 8a, 8b and 8c illustrate in schematic block-diagram form the logic circuitry of the betting panel of FIG. 7.

FIGS. 9a – 9d are program flow-charts illustrating the steps in the operation of the computer of the system of FIG. 6; and

FIGS. 10a – 10b are similar program flow-charts illustrating the operating steps in the computer to perform Quinella, Exacta and boxing operations.

Reference will first be made to FIG. 1 which illustrates a somewhat simplified selector panel 100 together with a receiver 101 of a closed-circuit television system whose camera (not shown) is trained upon a dice table 102 at a remote banker's station. The two dice visible on the receiving screen have been designated 'D' and 'D'". The assembly shown in FIG. 1 is assumed to be disposed in a hotel room for use by an occupant during times when a dice game is in progress at an associated casino. Since the occupant of the room has no immediate access to the game itself, he will wager on points rolled by a direct participant while actually betting against the house or the bank; thus, the person rolling the dice is disinterested in the stake of the remote player and, like the banker, does not know what bets have been made by him so that the possibilities of a rigged game are minimized. Generally, the player at the board 100 may make his bets during a succession of different dice throwers; however, if no direct participants are available, the game could also be played with the banker rolling the dice himself.

At the top of panel 100 I have shown several slots 103a, 103b, 103c for the insertion of tokens to be purchased in advance, e.g., in denominations of $10, $100 and $500, respectively. A register 104, suitably protected against tampering, displays the credit balance established by the deposited token or tokens as modified by subsequent wins or losses. Another register 105 indicates the total amount wagered at any one time. Two alternately illuminated signs 106, 107, respectively labeled "BETTING OPEN" and "NO MORE BETS," indicate the two phases of operation together constituting a betting cycle. A further sign 108, reading "OVERDRAFT," lights up whenever a player attempts to place a bet for an amount exceeding the credit balance displayed at the register 104. The elements so far described could be present on any selector panel according to the invention, regardless of the type of recurrent event on whose outcome bets are to be placed.

With the specific game of chance known as "bank craps" for which the panel 100 is particularly designed, a player may wager on a succession of rolls or on a single roll. The first type of wager is known as a "line bet" and is made with the aid of several digit wheels (only two shown) for the selection of the stake, i.e., a wheel 109 for the units digit and a wheel 110 for the tens digit of the dollar amount to be wagered; these digits appear on display wheels 111 and 112 in respective windows adjoining the corresponding selector wheel 109, 110.

Apart from choosing the amount of his bet, the player may press either a "DO" button 113 or a "DON'T" button 114 to choose either a "PASS" or a "DON'T PASS" sequence as more fully explained hereinafter. A "CANCEL" button 115 may be depressed to annul this selection as long as the sign 106 is lit. Actuation of button 113 or 114 lights a sign 116 reading "PASS" or a sign 117 reading "DON'T PASS," respectively, and also locks the selector 109 – 112 in the position last imparted thereto.

As an example of a one-shot selection, panel 100 offers the choice of a "field bet" which calls for the appearance of any one of several points at the next roll, specifically the point 2, 3, 4, 9, 10, 11 or 12. The corresponding stake selector again includes a units wheel 109a, coupled with a display wheel 111a, and a tens wheel 110a, coupled with a display wheel 112a. To make this kind of bet, the user depresses a button 113a labeled "FIELD"; an associated cancellation button is shown at 115a. A sign 116a lights up when the selection button 113a is depressed.

After any roll, the field bet is canceled and may be renewed by reoperation of button 113a; whenever the sign 106 is lit, button 115a may be depressed to cancel a field bet registered during the same open phase. Upon such cancellation, the stake selector 109a, 110a may be reset after having been previously locked upon the actuation of button 113a. As long as button 113a is not depressed, selector wheels 109a, 110a may also be shifted during the closed phase (sign 107 lit) but this will have no effect upon the betting.

On the other hand, a player depressing either of the two buttons 113 and 114 commits himself to a full sequence of throws from the moment the sign 107 lights up for the first time. This sequence of operations, in the arrangement here shown, is independent of the sequence of rolls entered into by the actual dice thrower and may be started at any time by the player using the panel 100. As with ordinary bank craps, however, the player at the panel wins if the next roll is a 7 or 11 but loses if that throw is "craps," i.e., a 2, 3 or 12; in all other instances, i.e., if a 4, 5, 6, 8, 9 or 10 is rolled, the point is registered by the lighting of a corresponding lamp 118 and the player wins if the same point is subsequently rolled again before the next 7 comes up. This mode of operation requires actuation of "DO" button 113; if, instead "DON'T" button 114 is depressed, the situation is reversed, i.e. the player wins on "craps" during the first roll and on 7 during subsequent rolls while losing on 7 or 11 during the first roll or on a recurring point during subsequent rolls.

Another possibility of playing the game with the board 100 of FIG. 1 is the player's own choice of a point to be made by actuation of any one of ten push-buttons 119 along with button 113, the wager being that the point will recur before a 7 is rolled. Again, operation of button 114 in lieu of button 113 reverses the outcome as well as the corresponding odds. These odds have been listed in FIG. 1 alongside the corresponding pushbutton 119 and range from 6:1 for point 2 or 12 to 6:5 for point 6 or 8. It is to be understood that these odds, as well as others shown in the drawing, are subject to some modification by the house rules, depending also on whether or not the bank adds a markup or "vigorish" to the purchase price of the tokens.

If a betting sequence is initiated by the actuation of one of the buttons 119 in addition to button 113 or 114, the corresponding lamp 118 also lights up and the further operation will be the same as with a "PASS" or "DON'T PASS" bet except that the first roll of a 7 will cause either a loss or a win whether occurring immediately afterwards or at some subsequent cycle and the roll of an 11 will be ineffectual unless this happens to be the selected point. This mode of operation is charac-
terized by the lighting of a sign 120, reading “COME,” or a sign 121, reading “DON’T COME,” in lieu of signs 116 and 117. The player may also choose to increase his odds on a “COME” or “PASS” bet by pressing a button 122 marked “HARDWAY” whenever the point to be made is 4, 6, 8 or 10, signifying that the roll is to be a “double” in order to win; in that case the player loses when the point comes up in any different combination of eyes. A sign 123 is lit in response to this choice.

A set of further lamps 124 are controlled by the banker to indicate the point actually rolled during each closed phase, as monitored on television receiver 101; another lamp 125, also labeled “HARDWAY,” shows that a double has been rolled on any of the four even numbers mentioned above.

In the system particularly described hereinafter, actuation of any pushbutton 119 will be ineffectual if a line bet has already been irrevocably placed, i.e. if any of the signs 116, 117, 120, 121 is lit and the time for cancellation has passed. The player, however, may switch during any open phase from “DO” to “DON’T” by depressing button 114, or vice versa by depressing button 115a; similarly, the “HARDWAY” choice can be made during any cycle in the open phase thereof (if a proper even-numbered point is indicated by the lamp 118) and revoked by operation of button 115a. These shifts are thus representative of further one-shot selections, it being understood that the system may be expanded to include other point combinations so selectable and that the panel 100 could also be modified to make the “COME” or “DON’T COME” selection through buttons 119 a one-shot proposition. Also, a negative or “wrong” field bet could be added, i.e. a wager that none of the 7 points listed adjacent button 113a will come out on the next roll. As specifically illustrated, a pass bet and a field bet both pay even money; thus, a shift from “PASS” to “DON’T PASS” does not alter the odds any more than would a reversal of a field bet.

FIG. 2 shows the circuitry of the banker’s station partly visible on the television screen of FIG. 1. Two sets of switches S1’ – S4’ and S5’ – S8’ are concurrently operable by the banker, e.g. with the aid of pushbuttons, to indicate the point thrown, the subscripts denoting the number of eyes of a respective die; naturally, it is immaterial which die D’, D” happens to be associated at any time with either set of switches. A starting switch S serves to indicate the closing of the betting phase and is momentarily depressed by the banker before the dice are thrown. Switches S1’ – S4’ control respective line conductors whereas switches S5’ – S8’ control respective column conductors of an orthogonal conductor array having a matrix of 36 AND gates 126 disposed at their respective junctions. After the roll, simultaneous closure of two switches – one from each set -- locks one of these AND gates 126 whose outputs energize respective numerical leads L1 – L12; each of these leads, with the exception of the first and the last, also includes an OR gate 127 to combine the outputs of several AND gates 126 in accordance with the multiple possibilities of rolling any of points 3 through 11. Certain of these AND gates, located at the junction of a line and a column from two switches with identical subscripts (i.e. S1’, S1’; S3’, S3’; S4’, S4’; S5’, S5’), respectively energize a group of further leads L23, L34, L45 and L56 all terminating at an OR gate 128. Another OR gate 129, also acting as a delay network, has 11 inputs respectively connected to lines L1-L12 and works into a reset terminal of a flip-flop 130 which can be set by the phasing switch S and has an output line A energized in its reset condition. Other flip-flops, collectively designated 131, are individually settable by signals from respective leads L5 – L14 and are resettable by voltage on line A. An additional flip-flop 132 is settable by the output of OR gate 128 and is also resettable by flip-flop 130 at the end of an operating cycle. The outputs of flip-flops 131, respectively energized in their set conditions, are 11 lines A5 – A11; a similar line A12 emanates from flip-flop 132. Signal lamps forming part of a set of luminous signs 133 are individually connected to lines A5 – A11 to light up when any of these lines is energized, displaying the value of the point rolled; a similar lamp lights a sign 134 reading “HARDWAY” whenever a “double” is rolled to energize OR gate 128. Finally, a lamp connected to line A illuminates a sign 135 reading “NO MORE BETS” to apprise players near the dice table that the closed phase has been started.

The 13 output lines A, A2 and A3 originating at the banker’s station branch out, as diagrammatically illustrated in FIG. 2, to the several remote players’ stations, briefly described above, one of which has been shown in detail in FIGS. 3A and 3B. It will be noted that FIG. 3B contains a number of elements already discussed in conjunction with FIG. 1 and designated in the same manner.

I shall first describe the construction of the two selectors 109 – 112 and 109a – 112a; since the selectors are identical, this description will be limited to the wheels 109 – 112. The wheels 109, 110 have knurled rims projecting slightly from slots in the panel; each wheel pair 109, 111 and 110, 112, rotatable independently of the other pair, is rigid with a notched disk 136, only the one associated with the units pair being visible; disk 136 has ten marginal indentations 137 engageable by a detent 138 under the control of a solenoid which has been designated 139 in the case of the tens wheels and 140 in the case of the tens wheels. A signal generator 141, shown diagrammatically as an arcuate resistor, produces a voltage whose magnitude depends on the rotational position of the respective digit wheel, this voltage appearing on a lead 142 for the units position and on a lead 143 for the tens position. Leads 142, 143 include front contacts and armatures of a relay 144 and terminate at respective inputs of a multiplier 145. In the deenergized condition of solenoids 139 and 140, detents 138 lock the disks 136 and thereby the respective digit wheels against rotation. These solenoids are jointly energizable over a back contact and armature of a locking relay 147, an associated front contact serving to operate the relay 144 when the relay 147 is energized. Such energization takes place under the control of either switch 113 (“DO”) or switch 114 (“DON’T”) which completes a circuit to the line A extending from the banker’s station. Since this line carries current only during the open phase, relays 147 and 144 cannot be operated at any other time so that a rotation of selector wheels 109, 110 during the closed phase has no effect upon the multiplier 145. If, on the other hand, relays 144 and 147 are energized, solenoids 139 and 140 are deactivated so that these selector wheels are locked by their detents 138.

The locking relay 147 has a holding circuit which extends over an armature and back contact of an over-
draft relay 148 to a normally closed switch controlled by cancellation button 115 and thence via an armature and back contact of a relay 149 to potential on a bus bar 151. Another armature and back contact of relay 149 connect bus bar 151 to an auxiliary bus bar 152 by way of pair of armatures and back contacts of a signaling relay 153 whose winding is directly connected to lead A; the holding circuit of relay 147 extends to this auxiliary bus bar through the aforementioned armature and back contact of relay 148 so that this circuit cannot be broken by actuation of cancellation button 115 as long as none of the relays 148, 149 and 153 is energized. An armature of relay 153 also controls the illumination of signs 106 and 107 in the operated and unoperated condition, respectively, of that relay.

Another shunt circuit across the contacts of cancellation button 115 extends over an armature and front contact of a relay 154 which is energizable from an AND gate 155 having one input connected, in parallel with the lamp of sign 107, to the lower back contact of relay 153 by way of a delay network 167. The other input of AND gate 155 is connected to a front contact of a switching relay 156 (FIG. 3A) which is operable by the output of an AND gate 157 having one input connected through an OR gate 184 to the aforementioned lower back contact of relay 153, the other input of AND gate 157 being joined to the “set” output of a flip-flop 158 whose setting input is energizable under the control of the contacts of any of the pushbuttons 110 via an OR gate 159. These pushbutton contacts are interconnected in a chain so that only one pushbutton at a time (the first in a series if several are depressed simultaneously) is effective to energize the OR gate 159 as well as an associated flip-flop 160, the setting inputs of all the flip-flops 160 being connected to the respective pushbutton switches 119 through back contacts and armatures of a relay 161. The energizing circuit of the latter relay includes another AND gate 162 with a first input connected to the lower front contact of relay 153, in parallel with the lamp of sign 106, and a second input tied to the output of flip-flop 158 in parallel with one of the inputs of AND gate 157. A lead also extends from this flip-flop output through a delay network 163 and another armature and back contact of relay 156 to the resetting input of a flip-flop 164 having an output lead tied to another input of OR gate 184; the last-mentioned output lead also serves to energize a relay 150. Flip-flop 164 has its setting input connected to the output of an AND gate 165 with 11 inputs respectively connected to the front contacts of pushbutton switches 119 in parallel with corresponding inputs of OR gate 159. The connections between this OR gate and the pushbutton switches 119(4), 119(5), 119(6), 119(8), 119(9) and 119(10) include respective OR gates 166 with alternate inputs tied to lines A1, A2, A6, A9, A10 and A11. Flip-flops 160 have “set” outputs terminating at the lamps of respective signs 124 whose numbering is identical with that of the corresponding pushbutton numbers 119. Flip-flops 160, 158 and 164 are resettable by the delayed output of flip-flop 158 traversing network 163 in the unoperated condition of relay 156.

Lines A2, A9 and A10 (energized when “craps” is rolled) are connected to respective inputs of an OR gate 169 whose output lead extends through armatures and back contacts of relays 156 and 148 to an input of an AND gate 169 whose other input is energizable, in parallel with a corresponding input of a companion AND gate 170, from bus bar 151 via the armature and front contact of relay 147 included in the operating circuit of relay 144. The second input of AND gate 170 is tied, again over armatures and back contacts of relays 156 and 148, to the output of an OR gate 171 whose inputs are joined to lines A3 and A12, i.e. the winning lines in the first roll of a “pass” bet. The outputs of AND gates 169, 170 alternatively energize the relay 149 through an OR gate 193. Still another OR gate 172 has input connections to the three “craps” lines A3, A6, A12 (by way of OR gate 168) and to lines A1, A4, A10 and A11, a signal on any one of these lines indicating a win in the case of a “right” field bet; OR gate 172 works into an input of an AND gate 169a whose companion gate 170a has an input energizable from an OR gate 173 receiving the signals of the nonwinning lines A5, A8, A11 and A16. (For purposes of a “wrong” field bet, these connections would have to be interchanged.) The other inputs of AND gates 169a and 170a are energizable via a front contact and armature of a locking relay 147a which, in a manner analogous to that of relay 147, controls the energization of solenoids 139a, 140a associated with selector 109a – 112a and is operable by means of pushbutton 113a in a circuit including the line A. Relay 147a has its holding circuit connected to bus bar 151 through armatures and back contacts of relay 148 and a relay 149a, in series with the contacts of cancellation button 115a, these contacts being shunted by a connection to auxiliary bus bar 152; relay 149a is operated from either AND gate 169a, 170a through an OR gate 193a. The upper armature and front contact of relay 147a also serves to energize, in parallel with AND gates 169a and 170a, a relay 144a which controls the operation of a multiplier 145a in response to the setting of selector 109a – 112a. Multiplier 145a also has an input connected directly to the energizing lead of relay 144a, in parallel with the lamp of sign 116a, to receive information on the odds factor (here unity) assigned to this particular bet; this is necessary only if the multiplier is also used, as diagrammatically illustrated by additional input leads, to calculate other types of bets not further described. If all the bets handled by this multiplier have the same odds of 1:1, the multiplier degenerates to a simple analogue or digital register delivering the same signal to either of the two inputs of an associated totalizer 174 which also receives the output of multiplier 145 and of any other multiplier included in the system. It will be noted that the multiplier 145 has different odds-setting inputs connected in parallel with the lamps of signs 116, 117, 120 and 121, respectively. The signals fed to multipliers 145 and 145a over contacts of relays 144 and 144a are also delivered to register 105 which is biased to show a count of zero whenever all its inputs are de-energized. The output of register 105 goes to one input of a subtractor 175 which also receives a numerical signal from the totalizer 174, this numerical value corresponding to the information concurrently supplied by the totalizer to register 104 for the display of the instantaneous credit balance. Subtracter 175, on determining an excess of the amount stored in register 105 over that accumulated in totalizer 174, energizes the overdraft relay 148 in parallel with sign 108.

The connections between each multiplier 145, 145a and totalizer 174 consists of respective “add” channels including a win gate 176 or 176a and a loss gate 177 or
177a. The control electrodes of gates 176 and 177 are connected to the outputs of AND gates 169 and 170 by way of respective contacts and armatures of a reversing relay 178; the control electrodes of gates 176a and 177a are connected to the outputs of AND gates 169a and 170a. The illustrated circuits are so arranged, as more fully described hereinbefore, that, if a bet with the aid of selector 109 - 112 is properly registered and locked up, such bet will not be canceled in the event of an overdraw by means of selector 109a - 112a which affects only the field bet attempted to be placed by means of selector 109a - 112a.

Since the various "come" bets made with the aid of pushbuttons 119 have different odds, conductors 179 are branched off the output leads of flip-flops 160 and terminate at other inputs of multiplier 145; for the sake of simplicity, all these branch conductors have been shown combined in a cable illustrated in dotted lines. Certain of these output leads, i.e., those from the positive lines No. 6, No. 8 and No. 10 flip-flops 160, are also connected to respective inputs of an OR gate 180 (FIG. 3A) working into an input and an AND gate 181 (FIG. 3B) whose other input is energized from line \( A_{1r} \). The output of AND gate 181 leads to a contact of "hardway" switch 122 which, on being actuated in the conducting condition of this AND gate, operates an associated relay 182 which thereupon energizes a lead 183 to multiplier 145 and locks to auxiliary bus bar 152, as well as to main bus bar 151 in series with cancellation switch 115a, through an armature and back contact of reversing relay 178. Relay 182, which like relays 147 and 147a is operable only during the open phase in which line A carries current, can thus be locked only when the reversing relay 178 is released, i.e. when either the line 116 ("PASS") or the sign 120 ("COME") is lit. Lead 183 also extends to the winding of a relay 185 whose single armature, connected to the output of an OR gate 186, has a back contact tied to an input of an OR gate 187 and a front contact tied to an input of an AND gate 188 whose output is joined to the other input of OR gate 187. This input of AND gate 188 is connected in parallel with an input of a companion AND gate 189; line \( A_{1r} \) is connected directly to the second input of AND gate 188 and through an inverter 190 to the second input of AND gate 189. The output of AND gate 189 is fed to one input of an OR gate 191 whose other input is connected to line \( A_{2} \) and whose output is applied to a front contact of relay 156 for delivery, in the energized condition of that relay, to AND gate 169 via one of the armatures and back contacts of relay 148.

OR gate 186 has ten inputs emanating from respective AND gates 192 each having one input tied to the output lead of a respective flip-flop 160 and another input connected to a front contact of a respective armature of relay 161 for energization by one of the lines \( A_{2} - A_{3} \) and \( A_{4} - A_{12} \). OR gate 186 is thus operated upon the occurrence of a line signal which previously had set one of the flip-flops 160.

I shall now describe several typical betting operations, adapted to be performed with the system of FIGS. 1, 2 and 3A, 3B.

1. PASS BETS

With sign 106 lit, the player adjusts the knurled digit wheels 109, 110 on panel 100 to select an amount to be placed on the line. He then depresses pushbutton 113 which energizes relays 147 and 144, locking the selector 109 - 112 and applying its output voltages to multiplier 145 as well as to register 105 to display the amount of the bet. If the player changes his mind as to either the amount or the type of bet, he may depress the cancellation button 115 before the light 106 goes out; this releases the relays 144 and 147, thereby restoring the original condition and unblocking the selector wheels.

If the bet just described is allowed to stand until the banker closes the switch S (FIG. 2), the player’s choice is locked up as sign 107 is lit to indicate that the dice are about to be rolled, an event which the player can observe on the screen of his television set 101. Three possibilities may now occur:

a. The roll is a 7 or an 11, representing a win for the player. Let us assume, for example, that a 3 and a 4 are rolled, the banker therefore closing switches S1 and S2, to set the No. 7 flip-flop 131 which energizes the line \( A_{T} \). The line voltage (here taken as positive) then passes through OR gate 117 and through back contacts and armatures of the unoperated relays 156, 148 and AND gate 170 which is concurrently energized by the upper armature of relay 147. With relay 178 likewise unoperated, the output of AND gate 170 unblocks the win gate 176 so that the numerical value computed by multiplier 145 is fed into one of the "add" inputs of totalizer 174 to increase the credit balance exhibited by register 105. Relay 149, operating simultaneously with the unblocking of gate 176, opens the holding circuit of relay 147 which, however, is shown to be of the slow-releasing type so as to give the multiplier 145 enough time to step the totalizer 174.

b. The roll is "craps" (2, 3 or 12), representing a loss. Suppose that a double-6 has come up. The banker deactivates switches S1 and S2, to set the No. 12 flip-flop 131 with resulting energization of line \( A_{T} \), the signal is conveyed through OR gate 168 via back contacts and armatures of relays 156, 148 to AND gate 169 whose output unblocks the loss gate 177, thereby feeding the information from multiplier 145 to a "subtract" terminal of totalizer 174 whereby the balance displayed on register 106 is reduced to the extent of the stake selected by means of wheels 109 - 112. Again, relay 149 is operated to deactivate the slow-releasing relay 147.

c. The roll is a "point" (4, 5, 6, 8, 9 or 10), continuing the wager. Let us assume that a double-4 has been rolled. Actuation of switches S1, S2, by the banker energizes lead L3 as well as lead L1, thereby setting the No. 8 flip-flop 131 along with flip-flop 132 and placing voltage on lines \( A_{2} \) and \( A_{12} \). At the banker’s station (FIG. 2), the sign 134 is illuminated but this is without significance for the player at board 100 since the "hardway" relay 182 there has not been operated. The signal from line \( A_{5} \) passes ineffectually through OR gate 173 (as much as relay 174a is unoperated) and also clears the OR gate 159 to set the flip-flop 158. Since this occurs at a time when relay 153 is released again to energize OR gate 184 concurrently with sign 107, AND gate 157 conducts to reenergize the output of flip-flop 158 and operates the relay 156 which thereafter locks by way of its right-hand armature and front contact to auxiliary bus bar 152 via the outermost left-hand armature and back contact of relay 148. The pulse energizing the relay 156 is also applied to delay network 163 whose output, however, is interrupted at the end of the delay interval by the operation of that re-
lay. The circuits remain in this condition until relay 153 again attracts its armatures at the beginning of the next open phase, thereby extinguishing sign 107 and relight- 

10 sign 106; at that instant, however, voltage from the back contact of relay 153 is still applied by the delay network 167 to the AND gate 183 so that the latter is opened immediately after the switchover, i.e. as soon as this AND gate also receives a signal from line A by way of the outermost left-hand armature and front contact of the now energized relay 156. Since the operation of relay 154 establishes a connection from auxiliary bus bar 152 to main bus bar 151 via contacts of relays 148 and 149 only, actuation of the cancellation button 115 continues to be ineffectual during this open phase. Thus, relays 144, 147 and 156 continue operat- 
ing, sign 116 remains lit over contacts of unoperated relays 150 and 178, and No. 8 flip-flop 160 stays in its set condition in which it had been placed upon energi- 

15 zation of line A. Sign 124(8) has lit up in response to an output voltage from this flip-flop which is also applied to one of the inputs of the corresponding AND gate 192. Furthermore, the reoperation of relay 153 
energizes the second input of AND gate 162 whose first 
input still carries voltage from the output of flip-flop 
158; this results in the operation of relay 161 which 
locks over its uppermost armature and front contact to the 
the same holding circuit as relay 156. 

Let us suppose that the player now takes no further 
action until a decision is reached, i.e. until either a 7 or 
an 8 is rolled. In the first instance, voltage on line A2 
passes through OR gate 191 to a front contact and arm- 
ature of operated relay 156 and thence through an 
armature and back contact of relay 148 to AND gate 
169 which thereupon unblocks the loss gate 177 and 
operates the relay 149 with the results previously de-
scribed. In the second instance voltage from line A3 
passes through one of the OR gates 166 and thence via 
an armature and front contact of relay 161 to the other 
input of the No. 8 AND gate 192 which thereupon 
opens up and transmits a signal through OR gate 186, 
amplitude and back contact of relay 185, OR gate 187, 
an armature and front contact of relay 156, and an 
amplitude and back contact of relay 148 to AND gate 
170, thereby initiating the aforesaid registration of 
a win. Upon the release of relay 156 (along with 
relay 161) by the operation of decision relay 149, the 
delayed output of flip-flop 158 is applied through net-

20 work 163 to the reset terminals of this flip-flop and to 
the operated No. 8 flip-flop 160, restoring them to nor-

25 mal. Relay 154 is also released. As long as neither a 7 
or an 8 comes up, the player has some additional 
choices available to him during subsequent open 
phases, i.e.:

II. HARDWAY BETS

If the point registered on sign 124 is one of the even 
numbers other than 2 and 12, the player may increase 
his odds (and comensurably reduce his chance of win-
ning) by pressing the button 114. With one input to the 
AND gate 181 energized from the output of OR gate 
180, this step operates the relay 182 wich lights the 
"HARDWAY" sign 123 and locks over the back 
contact and armature of relay 178 to bus bar 151 by 
way of the contacts of switch 115a; when the relay 153 
25 is de-energized in the closed phase, this locking circuit 
also extends to auxiliary bus bar 152. This wager is 
therefore a cancelable bet in the sense that it may be 
revoked during any open phase by depression of button 
115a, leaving undisturbed the existing "pass" condi-

30 tion. 

Relay 182 also operates the relay 185 which reverses 
its contacts to direct the output of OR gate 186 to one 
of the inputs of each AND gate 188, 189. If, as in the 
example previously given, the point to be made is 8, 
and if the roll is a double-4, closure of switches S4 and 
S5' at the banker's station energizes the line A8, so 
that AND gate 188 conducts in response to a pulse 
from the No. AND gate 192 and registers a win 
through corresponding contacts of relays 156 and 148 
as well as AND gate 170. If the roll was not a double 
but, say, the combination 3 + 5, line A8 does not carry 
current when the No. AND gate 192 responds so that 
AND gate 189 is opened, in lieu of AND gate 188, 
through inverter 190, thereby registering a loss via 
contacts of relays 156, 148 and AND gate 169. 

Relay 182, like relays 144 and 147a, is shown to be 
slow-releasing in order to let the multiplier 145 and 
the totalizer 174 operate properly after the decision relay 
149 has attracted its armatures.

III. REVERSAL OF PASS BETS

During any open phase, the player may shift from 
"pass" to "don't pass" by pressing the "DON'T" but-
ton 114. This operation energizes the relay 178 which 
locks to bus bar 151 via cancellation button 115a while 
reversing, on the one hand, the connections to gates 
176, 177 and lighting, on the other hand, the sign 117 

40 in lieu of sign 116. The input connections to multiplier 
145 are also switched though this is without signifi-
cance where, as in the situation here assumed, the odds 
are the same (1:1) in both cases. 

The operation of relay 176 further opens the holding 
circuit of relay 182 since, with that kind of negative 
line bet, a "hardway" wager cannot be made. 

Whereas in the closed phase the holding circuit of 
relay 178 is extended over contacts of relay 153 to aux-
iliary bus bar 152 and cannot be broken except upon 
the operation of decision relay 149, the player may re-
lease the relay 178 during any open phase by depre-
cessing the cancellation button 115a. This restores the 
circuits to the previous "pass" condition so that the player 
may, at his option, alternate between betting for and 
against the recurrence of the point before the appear-
ance of a 7. 

If the player had initially actuated the "DON'T" but-
ton 114 instead of the "DO" button 113, relay 178 
would have been energized from the start so that, on 
the first roll, a 7 would have opened the loss gate 177 
whereas a "craps" would have opened the win gate 
176. Subsequently, again, the player would have had 
the choice of maintaining his "wrong" bet or changing 
it to a "right" bet by pressing the cancellation button 
115a. 

IV. COME BETS

This type of wager uses the same type of circuitry as 
the aforesaid "pass" bets and differs from it only 
in that the player selects the point to be made instead 
of leaving this choice to the accident of the next roll. 
In fact, with the arrangement shown, he may extend 
this selection to any point other than a 7, thus including 
the numbers 2, 3, 4, 11 and 12, always betting that the 
selected point may come up before a 7 is rolled. As 
with a "pass" bet, the wager is noncancelable after the
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beginning of the first closed phase. It may, however, be modified from one cycle to the other by the cancelable "hardway" bet (with depression of button 122 if the selected point is 4, 6, 8 or 10) or by reversal through actuation of the "DON'T" button 114. As before, a "wrong" bet may be converted into a "right" bet by depression of button 115 which also controls the cancellation of a "hardway" bet.

To place either a "come" bet or a "don’t come" bet, the player actuates either the "DO" button 113 or the "DON'T" button 114 as well as one of the pushbuttons 119 which, via OR gate 165, sets the flip-flop 164 provided that line A is energized and relay 156 has not been operated. It will be noted that only one pushbutton 119 will be operative in this manner, namely the first one (e.g. No. 3) if several (e.g. Nos. 3, 5 and 6) are depressed simultaneously. This pushbutton also sets the corresponding flip-flop 160 in the unoperated condition of relay 161, either directly (in the case of number 2, 3, 4, 11, 12) or through one of the OR gates 166.

Flip-flop 164 applies voltage to one input of AND gates 157 and 162 which are furnished conductive by the concurrent setting of flip-flop 158 via OR gate 159. Relay 156 then operates and prevents further effective actuation of pushbuttons 119; with one of the signs 124 to indicate the chosen point, the operation is now the same as with a "pass" bet after the first roll.

The set flip-flop 164 also operates the relay 150 which causes illumination of "COME" sign 120 or "DON'T COME" sign 121 in lieu of "PASS" sign 116 or "DON'T PASS" sign 117, respectively, depending on whether button 113 or 114 had been depressed.

Naturally, a more elaborate system according to the invention may use separate logic circuits for the "pass" and the "come" bets in lieu of the common circuit arrangement here shown. In such case the two types of bets could be placed simultaneously and the "come" bet could also be made a one-shot proposition, similar to the "hardway" bet discussed above or the "field" bet described hereinafter.

Again, as in the aforesaid case, the player may exercise at the very outset his option for betting against rather than for the come-out of a selected point before a 7 is rolled. However, the "hardway" button 133 will function only in the event of a positive or "right" bet.

It should be noted that, in the case of a "come" or "don't come" bet, the setting of flip-flop 158 by the operation of any pushbutton 119 immediately operates the relay 161 since this step takes place during the open phase, i.e. with relay 153 energized whereby voltage from the bus bar 151 is applied to the other input of AND gate 162. If the player wishes to cancel his selection before this phase is terminated, he may do so by depressing button 115 which thereupon breaks the holding circuit of relay 156, and, in the aforesaid manner, resets flip-flop 158 together with the flip-flop 118 previously set.

V. FIELD BETS

With this type of bet the player wagers that a point from a specified group will appear on the next roll. In the arrangement here shown, the "field" group consists of the numbers 2, 3, 4, 9, 10, 11, and 12, with the odds rated as even.

After having set the selector wheels 109a – 112a to register his stake, the player depresses the button 113a which, in the energized state of line A, operates the relay 147a, the latter locking over armatures and back contacts of the associated decision relay 149a and the overdraft relay 148 to bus bar 151 via cancellation switch 115a, a shunt path again extending to auxiliary bus bar 152 in the unoperated condition of relay 153 to prevent cancellation during the closed phase.

If one of the aforementioned field numbers comes up during the cycle in which the bet was made, OR gate 172 conducts and energizes the AND gate 169a to which voltage is also applied by the operated relay 147a. This results in the opening of win gate 176a and the operation of decision relay 149a which releases relay 147a.

If the point rolled is not included in the field group, i.e. if it is one of the numbers 5 – 8, OR gate 173 conducts and opens the AND gate 170a which also has voltage applied to its other input by relay 147a. In that case, loss gate 177a responds while relay 149a is likewise operated to open the holding circuit of relay 147a.

If the "field" bet coincides with a pre-existing "pass" or "come" bet and if the total displayed on register 105 is so close to the credit balance exhibited by register 104 that the operation of selector 109a – 112a overdraws the totalizer as soon as relay 147a actsuates the relay 144a, relay 148 responds to prevent the locking of relay 147a and to inhibit the registering of a win or a loss by means of gate 176 or 177 without, however, releasing the previously operated relays 147 and 154 of the pass/come section. The bets in the latter section, therefore, remain locked up and can be consummated as soon as the overdraft condition has been cured by cancellation of the field bet or suitable reduction of the amount wagered thereon.

Naturally, the system shown in FIGS. 3A and 3B could be extended to include a reversing relay, similar to relay 150, and a "DON'T" button, similar to button 114, associated with selector 109a – 112a to provide for a "wrong" field bet. Other, analogous circuits may be included to facilitate one-shot bets for different point combinations or single points.

In FIGS. 4 and 5, I have illustrated the adaptation of my invention to a game of roulette. FIG. 4 shows a conventional roulette wheel 200 whose bowl 201, however, is equipped with a set of microsensitive switches 202 underneath the wheel for the closure of contacts whenever the ball 203 lands in one of its pockets, the latter having bottom holes somewhat smaller than the ball which register with these switches and are disposed near the inner end of each pocket so that, when the wheel comes to rest, the ball actuates the switch underneath the pocket it occupies. These switches may be slightly slow-operating (or connected to slow-operating relays) so as not to close their circuits until the ball stays put. The two pairs of contacts particularly illustrated in FIG. 4 have been designated P1a and P1b, respectively associated with pocket No. 16 (red) and pocket No. 29 (black). A television camera 204 is trained upon the wheel 200 to let distant players observe its operation.

Switch contacts P2a are connected to an individual outgoing numerical line M16 and to "red" line M8, "even" line M4, and "low" line M2 by way of respective OR gates 205, 206, 207 having other inputs connected to switch contacts from similarly identified locations along the bowl 201. On the other hand, contacts P2b are connected to an individual outgoing line M29 and to "black" line M9, "odd" line M5, and "high" line M4.
through respective OR gates 208, 209, 210. A master switch P is operable by the croupier, before the ball 203 comes to rest in any pocket, to indicate the termination of betting by energizing an outgoing line M which corresponds to line A of the preceding embodiment. The master line M, the numerical lines such as M₁₆ and M₂₀ as well as the evenchance lines M₇, M₉, M₈, M₄ and M₆ all include respective flip-flops; not shown, in the manner illustrated for the various outgoing lines A etc. in FIG. 2.

At each player's station (FIG. 5), a panel 211 carries a simulated roulette layout 212 together with a variety of selector means, including selectors 213, 213', 213" for individual numbers and small groups (up to six), rotatable knobs 214, 214', 214" for the "even" chances red/black, odd/even and low/high, and pushbuttons 215, 215', 215" for the three columns. The associated stake selectors have been designated 216, 216', 216" for the individual numbers, 217, 217', 217" for the even chances and 218, 218', 218" for the columns; for simplicity's sake, each of these selectors is represented by a single digit wheel with associated display wheel even though, for larger bets, two or more decades may be used as in the system previously described.

Whereas an elaborate roulette system according to my invention may include an individual numbers and stake selector for each of the 36 to 38 numbered squares of the layout (the number of such squares depending on the presence or absence of an 0 and/or 00), the simplified arrangement shown in FIG. 5 has but one selector for any six-number group which, as particularly described for selector 213, offers a choice of six "straights" (i.e. any one of the six adjoining numbers 19 - 24), any "split" (combination of two) either longitudinally or transversely, either of two "streets" (transverse three-number combination), either of two "quarters" (four-number combination) and a "line" (six-number combination). For this purpose, the selector 213 comprises a rotatable knob 213a and a slider 213b, knob 213a having three positions for energizing a first contact 213c (left), a second contact 213d (right) or both these contacts together (center). An arm 213e rigid with knob 213a closes one of three switches 213f, 213g, 213h in its various positions to transmit respective odds factors to the associated multiplier, not shown, the odds factor being the same for the two outer positions (switch 213f or 213g closed) and lower for the middle position (switch 213g closed). Slider 213b has an arm 213h for the alternate closure of six multiplier-controlling switches 213j, 213k, 213l, 213m and 213n in corresponding positions in which, as best seen for selectors 213j' and 213k', the slider may be indexed by being dropped into a notch 225 of a track 226 after being raised from another notch in which it has been seated. A set of contacts 213p on the left and 213q on the right serve for the selective energization of different combinations of leads 219 in the six operative slider positions, the slider also having a seventh or inoperative position in which none of these leads is energized. Leads 219 at the setting of respective flip-flops 220 which are part of a circuit arrangement analogous to that shown in FIG. 3A with reference to flip-flops 160, these flip-flops being automatically reset at the end of the closed phase of each betting cycle. A set of signals 221, comparable to lamps 124 of FIG. 3A, are connected to respective output conductors N₁₉ - N₄₄ of flip-flops 220 so as to be individually lit whenever these flip-flops are set, these output conductors also extending by way of respective AND gates Q₁₉ - Q₄₄, whose other inputs are tied to numerical lines M₁₉ - M₄₄ from the banker's station, to an OR gate 225 working directly into an output of an AND gate 222 and through an inverter 223 into an input of a triple-coincidence AND gate 224. A relay 227, connected across line M, has the back contact of its single armature multiplied to other inputs of AND gates 222, 224, the third input of AND gate 224 being connected directly to line M. Two signs 228 and 229, reading "BETTING OPEN" and "NO MORE BETS," are respectively lit in the energized and the de-energized condition of relay 227 which is the counterpart of line relay 153 in FIG. 3B. When energized, the armature and front contact of relay 227 also apply working potential to a wiper of knob 213a and through it to either or both bank contacts 213c, 213d associated therewith. The outputs of AND gates 222 and 224 are connected to control electrodes of a win gate 230 and a loss gate 231.

In its lowermost position, the wipers of slider 213a engage two of the contacts 213p, 213q, respectively associated with numbers 19 and 25. Since these wipers are respectively connected to contacts 213c and 213d of knob 213a, only contact 213p will be energized in the left-hand position of this knob and will set the corresponding flip-flop 220 with resulting energization of line N₁₉ and lamp 221(19). In this position, switch 213b will be closed to transmit to the multiplier a signal which, together with that transmitted concurrently by switch 213j, establishes the odds applicable to a single number selection or "straight," generally 35:1. If knob 213a had been in its right-hand position, contact 213d would have energized the wiper engaging contact 213q so that the setting of the No. 22 flip-flop 220 would have applied voltage to lead N₂₂ with resulting illumination of sign 221(22); the same odds would have been established in that case by the joint closure of switches 213b and 213d. When knob 213c and 213d simultaneously energizes the contacts 213p and 213q associated with numbers 19 and 22 to register a "split," with a setting of the two corresponding flip-flops 220, lighting of signs 221(19) and 221(22), and application of voltage to one input each of AND gates Q19 and Q22, the odds, as determined by the joint operation of switches 213j and 213d, are then much lower, generally 17:1.

In the second-lowest position of 213j, 213k, the combination of lines N₁₉ and N₂₀ (associated with the left-hand numbers 19 and 20) and/or N₁₉ and N₂₂ (associated with the right-hand numbers 22 and 23) is registered according to the position of knob 213a; this results either in a "split" (odds 17:1) or in a "quarter" (odds 8:1), with the lighting of signs 222(19), 221(20) and/or 221(22), 221(23). The third slider position, similarly, gives a choice between numbers 20 and/or 23, the fourth position registers either of the two "splits" 20, 21 and 23, 24 or the "quarter." 20, 21, 23, 24. The flip-flops inputs of respective flip-flops 220 again giving the choice among two "straights" and a "split." Finally, the top working position offers a selection of the left-hand "street" 19 - 21, the right-hand "street" 20 - 24 or the "line" 19 - 24, with odds of 11:1 or 5:1. If any one or more of line N₁₉ - N₄₄ are energized and a corresponding line M₁₉ - M₄₄ receives a signal from
the banker's station, the associated AND gate $Q_{19} - Q_{23}$ conducts and energizes the AND gate 222 to open the win gate 230 for operation of the totalizer in an additive sense, taking into account the odds registered by the selector-actuated switches. Naturally, he selector elements 213a, 213b may be provided with mechanical or electrical locking means to prevent their untimely actuation, e.g., with the aid of solenoid-operated devices as illustrated at 138 – 140 in FIG. 3B; such solenoids or other electromechanical means may also be used to reset the sliders 213, 213b, 213c to their uppermost or inactive positions at the end of each closed phase, either automatically or in response to a special signal from the banker's station.

If none of the numbers chosen by selector 213 is spun, all the AND gates $Q_{19} - Q_{23}$ remain blocked and a true signal is applied by inverter 223 to one of the three inputs of AND gate 224. At the beginning of the next open phase, the second input of this AND gate is also energized from line M while relay 227, shown to be of the slow-operating type, still applies voltage to the third input to open the loss gate 231, thereby causing the totalizer to perform a subtracting operation.

It will be understood that the connections between leads 219 and flip-flops 220 may include circuitry for the cancellation of selections before betting is closed, as described above with reference to flip-flop 158 and relays 156, 161. Other circuitry from FIGS. 3A and 3B (e.g., an overdraft relay) may likewise be used insofar as it applies to one-shot propositions.

The operation of the even-chance selectors will now be described with reference to knob 214 controlling the switch between "red" and "black": the wiper of this knob, connected to the front contact of relay 227, is engageable with either of the two bank contacts 213R, 214B, being disengaged from both in an intermediate position. One of the two flip-flops 232R, 232B is settable by this wiper, again through the intermediary of circuitry previously described but not shown in detail in FIG. 5, to condition either of two pairs of AND gates 233, 234 or 235, 236 for conduction in the event that their other inputs are subsequently energized by voltage on one of the two lines M, M', AND gates 233 and 235 work through an OR gate 237 into the control electrode of a win gate 238; AND gates 234 and 236 similarly work through the OR gate 239 into a control electrode of a loss gate 240. Thus, gate 238 is opened when line M, receives a signal in the set condition of flip-flop 232R or when line M' receives a signal in the setting condition of flip-flop 232B, conversely, loss gate 240 is activated when energization of line M, coincides with a setting of flip-flop 232B or when line M' carries current upon the setting of flip-flop 232R.

The resetting of flip-flops 232R, 232B after each cycle is carried out by circuitry of the type previously described. If, under the house rules, the appearance of a 0 (or 00) is to leave the even chances standing, then such flip-flop will not be reset in that event; naturally, neither line M, nor line M' would then receive a signal upon the spin of a 0 (or 00).

Knob 214 may also be associated with an odds selector similar to wiper arm 213c, the odds factor here having the value of unity.

The operation of selectors 215, 215' and 215"", being analogous to that of selector 214 (as well as that of field selector 113a in FIG. 3B) except for a different combination of winning numbers, need not be described in detail. This also applies to other multiple-choice selections usually provided on a roulette layout, such as first, second, and third dozen.

VI. HORSE-RACE WAGERING
A further embodiment of the present invention is illustrated in FIGS. 6 – 10b in which a player is permitted to place wagers on the outcome of a horse race or a series of horse races from a remote panel generally designated 300. Preferably, as shown in FIG. 6, a number of such panels are located in a suitable area in the race track at which the player may sit comfortably while viewing the track from an optimum vantage position such as in a lounge or restaurant at the track. In a typical track installation a plurality of betting panels 300a – 300n are tied into a control computer 302. The player opens an account by making a payment at a teller's station 304, specially provided for this purpose.

The teller transmits the information, e.g., over telephone lines 309 and 311, to computer 302 to cause the latter to store information respectively relating to the identification and code number of the player, and the amount of money given in payment to the teller. A receipt may be issued at this time to the player containing the relevant information. The computer 302 then establishes in its memory an initial credit balance for the player. Computer 302 is tied into a track computer 303 commonly provided at parimutual tracks for the purpose of computing the odds on the horses running in each race.

Wagers can be placed on the races without the need for the player going to the betting windows to purchase his wagering tickets, thus saving him the burden of spending time waiting on lines. As shown in FIG. 7 the operating panel 300 for the horse-race wagering operation comprises a window 306 in which an initial credit balance may be displayed reflecting the data stored in computer 302 for the player. That credit balance is updated periodically depending on the outcome, to wit, the success or lack of success, of a wager made by that player on a horse race or a series of horse races. As herein shown that initial credit is displayed at window 306 by the player placing an identification card or badge (which he has obtained at teller's station 304, and which carries his identification number) into a slot 308 which is scanned or read by suitable equipment located in the panel to identify the player to the control computer 302.

For additional security the player may also be provided at teller's station 304 with a code number which may be conveniently made up of three or more digits. That code number is inserted into the panel by the proper activation of several numbered code buttons 310. The code number along with the identification number on the player's card provide a unique identification of the player to computer 302. Both the badge and the identification code must be fed into the panel to enable the player to make a wager from the panel.

The horses running in a particular race are identified by numbers 1 – 12 and a linear array of twelve select buttons 312 is arranged in the central region of the
In the event that more than twelve horses are running in a given race, the additional horses may be grouped as "field" and identified by number 12. The odds for each horse running as "field" are the same, and if the player selects the field to win, place or show by operating button No. 12, he will be successful if any horse in the field wins, places or shows. A window 314 is located to the left of buttons 312 and provides an indication of the number of the race for which betting is at that time permitted. The number appearing in window 314 is displayed before the commencement of betting on that race under the direction of track computer 303 and is changed in each panel 300 when track computer 303 transmits an appropriate signal to the central computer 302 at the proper time. The wagering period prior to the running of the race is controlled by the track computer 303 which causes an "open" light 315 to be lit at each panel 300 during the period in which a wager may be placed on the outcome of the race identified by the number appearing in window 314. At a predetermined time prior to the beginning of the race the wagering period is closed, light 315 is de-energized, and a "closed" light 317 is caused to be lit. Thereupon no wagers made from panel 300 will be accepted by computers 302 and 303. This fact is indicated at panel 300 by the lighting of a "rejected" light 319 which may be red in color. Under normal conditions the wager made at panel 300 is accepted by the track computer and an indication of this is given to the player by the energization of an accepted light 321 which may be green in color.

Once the player has made his selection of a horse by the operation of one of horse-select buttons 312, he selects the amount of the wager and the selected desired position for the selected horse, i.e. win, place or show. To this end three sets of money-select buttons 320, 322 and 324 are respectively provided in win, place and show sections 320a, 322a, and 324a. Each set of buttons 320–324 includes individual buttons for making wagers in the amount of $2, $5, $10, $50 and $100. Thus to make a wager for a horse to win, one or more of buttons 320 are operated, and for making a place wager, one or more of buttons 322 are operated. The amount of the wager made is determined by which of the buttons in the selected set is operated.

In some race tracks a player is allowed to place wagers on the final two, e.g. the eighth and ninth races, on the day's racing program at any time after the completion of the second race, as opposed to the other seven races for which wagers may be placed only after the results of the preceding race have become final.

An advance wager may be made on the panel 300 by operating a button 323 to bet on the eighth race and/or a button 325 to place a wager on the ninth race. The selection of the horse and amount of wager is then made as in an ordinary single race wager.

After the player has activated the desired horse select button 312, and the wager-amount and position-select buttons, the wager is placed by operating a transmit member 330. Once transmit member 330 is operated the wager cannot be recalled or canceled by the player. The data for the wager (i.e. the number of the selected horse, the amount wagered, and the type of wager made) are transmitted in suitable binary form along with the player's identification to control computer 302, and from there to track computer 303. The amount wagered is immediately subtracted from the player's stored credit balance in the balance storage section of computer 302, and a slip of paper on which the information for that wager is printed is issued to the player from a slot 328. Computer 303 uses the wager data to update its betting-pool data from which the odds for that race are calculated in a known manner. When the wagering period is over, the odds become final.

Upon the completion of the horse race, control computer 302 receives the payoff data for the win, place and show horses as well as combination, and the special races, such as the Daily Double, Exacta etc., from the track computer. The wagers made earlier for that race from the betting panels are all stored in computer 302 and these stored data are scanned and compared to the race results to locate all successful wagers. If the player is successful in picking the winning horse, or in selecting the second horse for place, or in making any other winning wager, the credit-balance register for that player in computer 302 is updated by an amount equal to the payoff for the successful wager multiplied by the number of units wagered, since the payoff in most tracks is calculated for a basic $2 wager. For example, if a player has wagered 100 units on the outcome of a race, the payoff figure is added five times (i.e., multiplied by five) and then added to his previous balance.

To protect the player's privacy, his current credit balance is preferably not continuously displayed in window 306. If the player should desire to learn his credit balance, so that he may know how much of his initial investment is available for future wagering, the player operates a credit balance button 336 which causes his credit-balance to be viewed at window 306. The player may also have his credit balance printed on a memo strip by a balance operation of the receipt button 338 which causes a printed slip, prepared by a printer unit housed in panel 300 and controlled by the data stored in computer 302, to be passed out of the panel through slot 328.

The computer 302 comprises means to compare the amount wagered by a player against that player's current credit balance, to sense the making of a wager of an amount greater than the player's credit balance and upon that occurrence to prevent the completion of that wager. This condition is reflected at the player's panel by an energization of an overdraft indicator 340 visible through window 306, and computer 302 will then, in a manner described below, prevent the making of that wager and cause the reject light 319 to be energized.

To increase the amount of his wager, the player may either make a number of single bets during the wager-open period by repeated operations of the horse-select, wager-amount and transmit members or operate the wager-amount-select buttons 320, 322 and 324 a desired number of times until the amount of the desired wager is accumulated and appears in a window 326. The wager is then effected, that is, the pertinent wager data are communicated to control computer 302 by the operation of transmit member 330. A player who may wish to place a single wager on a single horse to win, place and show may make such a combination wager by actuating the desired horse-select member and either of two buttons 332 (e.g. for a $6 or $15 wager) on a combination panel 334, and then operating the transmit member 330. The combination wager is transmit-
In many race tracks the player has the opportunity to place wagers on specified combinations of races in which the return to the player, if he is successful, may be considerable. The most popular of these is the so-called Daily Double in which the player, to be successful, must select the winners of both races or halves (usually the first and second races on the program) of the Daily Double. A Daily Double wager can be made only before the running of the first race of the Daily Double.

That open period is indicated to the player by the actuation of a “Daily Double open” light 344 under the control of computer 303. When the Daily Double wagering period ends at a predetermined time prior to the first half of the Daily Double, light 344 is turned off and a “Daily Double closed” light 346 is activated. To make a wager on a Daily Double the player operates one of the select buttons in each of two rows 348 and 350 located at the upper portion of panel 300. Windows 352 and 354 are respectively located to the left of horse select rows 348 and 350 and indicate the number of the race on which the wager is to be placed. The select buttons in rows 348 and 350 each carry a unique number for each horse in the race. To make a wager on the Daily Double the player first activates Daily Double button 352 in pass one the button in row 348 to select the winner in the first race of the Daily Double, and then operates a button in row 350 to select the winning horse in the second race of the Daily Double. The player then marks the amount of his wager by actuating one of two buttons 358 (the $2 or $10 button) located in a Daily Double panel 360. To complete the wager the player operates the transmit member 330 to communicate the wagering information to computer 302 and thence to track computer 303. The amount of the wager is presented to the player in window 326. To increase the amount of the wager, the player may operate a money-hold button 331 and then operate either wager-amount-select button 358 a desired number of times until the desired wager amount appears in window 326. The money-hold button 331 may be released by the operation of a release button 333, by the operation of cancellation member 343, or by the removal of the player’s identification badge from slot 308.

The player may make wagers on different combinations in the Daily Double to increase his possibility of success, as by combining one or two key horses running in the first half of the Daily Double with several horses running in the second half of the Daily Double. In the system herein disclosed this may be accomplished by operation of money hold button 331 and by a repeated selection of horses in each race by the actuation of one of buttons 348, 350, followed by the operation of the transmit member 330 for each such combination.

The operation of computer 302 with respect to a Daily Double wager in the manner in which it is recorded and updated upon a successful payoff is substantially the same as described above for a single race wager. The amount of money wagered on the Daily Double is subtracted from the player’s credit balance and a successful payoff to the player is reflected in the augmentation of the credit balance by an amount corresponding to the money wagered multiplied by the odds factor for the winning Daily Double provided to computer 302 from track computer 303. The payoff for a successful Daily Double wager is, of course, usually higher than for a single-race wager.
In some states other special wagering arrangements are provided in which the player has the opportunity to even further increase his winnings by correctly predicting the results of a combination of races, rather than just the outcome of a single race. A Twin Double may be considered as being a pair of Daily Doubles, that is the player to win the Twin Double must select the winners of four specified races designated by the track for that purpose. The Exacta requires the player to select the win and place horses in a single race in the correct order of their finish. The Quinella is similar to the Exacta but permits the player to select the first two horses in a given race in either order of finish. The Big Exacta requires the player to pick the first two horses in the correct order of finish in two specially designated races. The difficulty and thus the potential payoff of these special wagering combinations is greatest on the Big Exacta and Twin Double combinations. To increase the scope of possibilities in placing wagers on the Exacta and Quinella the player may "box" his bets by placing wagers on all permutations or combinations of two or more horses running in the race on which those wagers are permitted.

To place a Twin Double wager, a button 362 is operated and select buttons 348 and 350 in the Daily Double section of the panel are actuated to select the winners in the first half, to wit, the first two races in the Twin Double. The winning of the first half of the Twin Double provides the player with units that he can then wager on the second half of the Twin Double. In order to continue to make a desired number of wagers on the second half of the Twin Double, he must place a sufficient amount of wagers in the first half of the Twin Double. Assume that the player has decided to wager on three combinations in the first half and four combinations in the second half (e.g. the No. 5 and No. 7 horses in the third Twin Double race combined with the No. 6 and No. 8 horses in the fourth race). Since only one of the wagered combinations in the first-half combination can be successful, the player must thus wager each of the three first-half combinations four times so that he will have at least one unit or ticket to wager on each of his proposed second-half combinations. If the player is successful in the first half of the Twin Double his credit balance is not augmented since the Twin Double is not completed. Instead the number of units available for wagering on the second half of the Twin Double are computed in computer 302 and visually presented in a Twin Double units window 364. The player may then make his wagers on the second half of the Twin Double by again operating buttons 348 and 350, the appropriate wager button 358, and transmit member 330 the desired number of times. Each wagering operation is reflected by a decrease in the indication of the remaining available wagering units in window 364. If desired, the panel printer may print out the number of wagering units remaining on a slip of paper which is passed to the player from slot 328. The player may continue to wager until the reading in window 364 is zero at which time the wagering is completed. That zero count is sensed in computer 302 which then prevents the acceptance of any further wagers on the Twin Double.

Of course, if the player is unsuccessful in the first half of the Twin Double, that is if none of his first-half selected combinations is the correct one, no units appear in window 364 (its count remains at zero), and the computer 302 than inhibits all wagers on the second half of the Twin Double.

To make an Exacta wager, a button 366 is operated, two or more of buttons 312 are actuated, an "up only" button 370, a "down only" button 372, or a box button 369 is operated. That is if the player is wagering that horse No. 7 will win, and horse No. 3 will come in second, he will depress buttons No. 3 and No. 7, and then box in the "down only" direction by the operation of button 370. Ordinarily in a straight race only one of buttons 312 may be depressed at a single time, that is an operation of a horse select button releases any previously operated select button pressed prior to a cancel or transmit operation. However, button 366, when operated, overrides the button control mechanism to allow the simultaneous operation of two or more buttons 312. The Exacta wager is completed by first operating one of buttons 358 and then operating transmit member 330.

A Quinella wager is made by operating a button 368 and depressing two of buttons 312 corresponding to the first two horses picked to finish the race in either order. Button 368, like button 366, permits the simultaneous depression of two or more of buttons 312. One of buttons 358 and transmit member 330 are then operated to complete the Quinella wager.

In the Quinella (or Exacta) wager it may be desired to make wagers on the combinations (or permutations) of two, three or more selected horses. Since in a Quinella the order of finish is irrelevant, it is the combination that is desired; in an Exacta, in which the order is significant, it is the permutation that is desired. To place a plurality of Quinella (or Exacta) wagers, the player selects two, three or more horses and these numbers are then "boxed" by the programming of computer 302 in combination with appropriate circuitry in panel 300 by the operation of boxing button 369 to create wagers on all the combinations (permutations) of the selected horses. The instruction to box follows from an actuation of the Quinella (or Exacta) button 368 (366) the operation of button 369, and the selection of two, three or more select buttons 312.

Thus, for example, if the player wishes to box horses 1, 2 and 4 in an Exacta wager, the boxing system will place wagers on the 1-2, 1-4, 2-4, 2-1, 4-1, and 4-2 permutations. If it is desired to box in only one direction, that is to place an Exacta wager on either the first three or the second three of these permutations, the player, in addition to operating the Exacta button 366 and the box button 369, must also operate the "up only" button 370 or the "down only" button 372. Thus, if buttons 366, 369 and 370 were operated, the player would have Exacta wagers on only the 1-2, 1-4 and 2-4 finishing sequences.

For a Quinella wager the operation of buttons 368 and 369, and of the 1, 2 and 4 select buttons 312, causes the boxing of these horses to place wagers on the 1-2, 1-4, and 2-4 horses in either order of finish. The Big Exacta is similar to a Twin Double in that the player is required to correctly predict the first two horses in their exact order of finish in two races. Since the Big Exacta races are usually different from the race assigned to an Exacta wager, the operation of button 366 at the first race of the Big Exacta indicates to the computer 302 that a Big Exacta wager is being made, and that a successful outcome of the first race should not be credited to the player's credit balance, but
rather should be registered in winning units in window 364 indicating to the player the number of units available for wagering on the second race in the Big Exacta. As in the Twin Double, wagers made on the second race of the Big Exacta, by the operation of two or more buttons 312, may continue until the number of units in window 364 is decreased to zero at which time the computer 302 will accept no further wagers. As in a regular Exacta, the player in a Big Exacta wager may wager all or only selected up or down permutations of two or more horses, in each race, by the boxing technique outlined above.

**BETTING PANEL 300**

The Betting Panel 300 is illustrated in FIG. 8a–8c in block-diagram form. The player identifies himself to control computer 302 by inserting his badge into an optical badge reader 375, which scans the configurations of holes in that badge to store an identification word in the initial bit positions of a player-identification register 374. The badge reader 375 senses the presence or absence of the badge. Whenever the badge is removed, reader 375 resets player-identification register 374, thereby clearing its contents.

The player's identification number is completed by sequentially operating code buttons 310 to enter the remaining digits in register 374. Upon the insertion of the final code digit in register 374, the stored player-identification word is transmitted through a multiplexer 376 to computer 302. The stored player identification word is continuously available to computer 302 through a multiplexer 376.

When computer 302 has received and verified the player's identification number code, it transmits over a line 378 (FIG. 6) the player's credit balance which was fed into its memory at the time the player established his credit at teller's station 304.

That balance word is stored in a balance register 380 and is transferred to a decoder driver 382 which processes that information into a form to operate balance-credit display 306. To view his balance when desired, the player operates balance button 336 which enables a timer 384 to actuate the credit display 306 for a brief period determined by the enabling period of timer 384. Decoder driver 382 also transmits the balance credit information to a printer/decoder/converter 389. In order to obtain a printout of his balance, when desired, the player operates the balance receipt button 338 which applies an enabling signal to one input of a selector 386, another input of which receives the balance-credit data via printer/decoder/converter 389. Selector 386 in turn causes a printer 390 located in panel 300 to print out the player's current credit balance. The date is inserted daily into printer 390 and is printed with each line.

The track computer 303 transmits race-number data to control computer 302 over a line 392 (FIG. 6), and suitable corresponding data are transmitted from control computer 302 to panel 300 over a line 394 where they are stored in a race-number register 396. The race-number is transmitted each time a form of betting is opened or closed. These data, which also include betting open and betting-closed information, are transferred to a decoder driver 398 which produces therefrom signals to operate either the betting-open or betting-closed indicators 315, 344 or 317, 346, whichever is appropriate, and the race-number displays 314, or 352 and 354.

When betting is closed, a signal to that effect may be used to disable the race-number display 314, or displays 352 and 354.

As described above, the making of a wager is carried out on panel 300 during the open period by actuating suitable buttons on the panel which reflect all the pertinent information for that wager, such as horse selection, position, and the amount of the wager. For a simple race, one of the buttons 312 is operated to introduce the desired horse number into a horse-select register 399.

The operation of one of the win, place, show or combination buttons 320, 322, 324 or 332 is effective to feed a corresponding input to accumulator 401 and to a position register 402. That is, a two-dollar win button operation inserts a two-dollar amount into accumulator 401 and a win word into register 402. The combination of the information inserted in this manner into registers 399, 401 and 402 thus constitutes the significant information necessary to identify the nature of the bet. For a simple race bet such as this, a bet-identification register 400 is left unused, i.e., its contents are zero. The combined word from registers 399 through 402 is applied to the input of a selector 404 and from that selector to one input of an AND gate 406. When transmit member 330 is operated, gate 406 is enabled and the combined bet data are transmitted through multiplexer 376 to computer 302 over line 408 (FIG. 6). The player-identification word is also transmitted through multiplexer 376 to computer 302.

The accumulator 401 is also connected to a decoder and display 326 to provide a visual indication of the amount wagered. Repeated operation of one of the win, place, show or combination buttons 320, 322, 324 or 332 allows the player to accumulate a wager amount which is the sum of the amounts indicated by his repeated operation of the amount buttons. In this way, the player may designate a wager of almost any value before operating the transmit member 330.

The control computer 302 compares the amount of the bet with the player's current credit balance and if it finds that the player's balance is sufficient to cover the wager it transmits the bet data over line 412 to track computer 303. If, for example, the wager is timely placed (i.e., if betting is open), and if the selected horse is not scratched from the race, track computer 303 accepts the bet and transmits a signal over a line 414 to computer 302. If the bet is unacceptable for any reason, such as a scratched horse or the late placement of the bet, or if the selected betting pool is closed as when no show betting is permitted in the race, track computer 303 will send a reject signal to computer 302 over line 414.

The appropriate accept or reject signal is transmitted from computer 302 to panel 300 over a line 416 and is fed into a decoder driver 418. If the signal is a bet-accept signal, accept indicator 321 is operated and printer 390 is enabled through selector 386 to print out a memo containing the pertinent wager received via a decoder/converter 389 from multiplexer 376.

The accept signal is also applied to one input of an AND gate 335. If hold-money member 331 is not actuated, a reset signal from gate 335 clears registers 400–402, preparing the registers for a completely new bet. If, as explained above, hold-money member 331 is actuated, gate 335 will not transmit the reset signal to registers 400–402. The player may now select another
horse at buttons 312 and place the same type of bet by operating transmit member 330.

To reset the money-hold circuit to normal operation, the player operates release member 333. This resets money-hold actuator 331 and also transmits a clearing signal to registers 399–402. The clearing signal to register 399 is transmitted directly from release member 333. The clearing signal for registers 400–402 is transmitted through a gate 337 which is present to isolate the clearing signal of gate 335 from horse-select register 399. Operation of cancel member 343 at any time clears registers 399–402, as does the release member, except that money-hold member 331 is not affected.

If the wager is rejected for the reason that the player’s balance is insufficient to cover the amount of the wager, decoder driver 418 produces an overdraft signal which enables the overdraft indicator 340 directly and the reject indicator 319 through gate 341. A scratch signal is transmitted from computer 302 through an OR decoder driver 418 to enable the scratch indicator 342 directly and the reject indicator 319 through gate 341. Any other reject signal is transmitted from decoder driver 418 through gate 341 to actuate the reject indicator 319.

A wager on the Daily Double is made, as described above, by operating daily-double button 356, operating certain horse-select buttons 348 and 350, and then operating one of buttons 358. As shown in FIG. 8a, the operation of button 350 inserts data for the second race into horse-select register 399 and the operation of the horse-select button 348 for the first race in the Daily Double stores that data in a second horse select register 420 whose output is applied to another input of selector 404. The making of a Daily Double wager by the operation of daily-double member 356 supplies a control signal to selector 404, causing the latter not to transmit the position data to gate 406, but instead to transmit data from the first and second horse-select registers 399 and 420 to gate 406 and, upon the operation of transmit member 330, to computer 302.

When both races in the first half of the Twin Double have been run and their results made official, track computer 303 notifies control computer 302 of the results. Computer 302, in turn, scans its memory for all winning combination bets on the first half of the Twin Double. For each such winning combination it credits units to the player as described above. The credit units are available to betting panel 300 via register 410 and an AND gate 424. When twin double member 362 is activated it transmits an enabling signal to gate 424 allowing register 410 to transmit the number of units to decoder driver 426 and thence to units indicator 364. The player may then proceed to place wagers on the second half of the Twin Double in a manner similar to that for the first half of the Twin Double. That is, twin-double member 362 and horse-select buttons 348 and 350 are activated, followed by the operation of transmit member 330. Computer 302, instead of comparing the wager amount to the credit balance, compares the wager unit made on the second half of the Twin Double to the units balance. If there are sufficient units to cover the wager, computer 302 processes the wager to track computer 303 in the same manner as before. The new units balance, less the units just wagered, is made available to register 410. In this way, several successive Twin Double second-half wagers may be placed until the units balance is exhausted. Any further attempts by the player to place second-half Twin Double wagers will be rejected by computer 302 actuating the reject indicator 319 as previously described.

To place a wager in advance on races 8 or 9, at tracks permitting such advance sales, the player actuates either advance-sale-8 member 323 or advance-sale-9 member 325. Actuation of either of members 323, 325 places an identification code word in bet-identification register 400. The player proceeds to make a horse selection and to actuate the win, place, show, or combination buttons as before in the case of a simple race wager. Upon the actuation of transmit member 330 the entire contents of registers 399–402 including the advance-sale code from register 400 are transmitted to computer 302.

Similarly the player may place a wager on the Quinella by actuating Quinella member 368, or the Exacta by actuating Exacta member 366. Either operation places an appropriate code in bet-identification register 400. In the case of a Quinella or Exacta wager, the player makes more than one selection on buttons 312, thereby placing more than one horse number in horse-select register 399. For a simple Quinella bet, the player then actuates transmit member 330.

However, for an Exacta wager the player also actuates either “up only” member 370 or “down only” member 372 in order to transmit the essential information as to the predicted sequence of the finish. The actuation of members 366 and 370 or 372 loads appropriate codes into register 400 for transmission to computer 302.

As described above, the player may elect to box two or more horse selections in the case of an Exacta wager, or three or more horse selections in the case of a Quinella wager. To do so he also actuates box member 369 adding an appropriate code to bet identification register 400. He may also, in the case of the Exacta, select “up only” boxing or “down only” boxing by actuating either member 370 or member 372 as appropriate. Whichever options are selected by the player, appropriate codes are loaded into register 400 and upon the subsequent actuation of transmit member 330 the entire contents of register 399–402 are transferred to computer 302 as previously described.

A player may place wagers, at tracks and in states permitting same, on the Big Exacta. To do so member 366 is used in the same fashion that twin-double member 362 was used. That is, for the first half of a Big Exacta the player actuates member 366 and then proceeds to make Exacta selections as previously described. When the second half of the Big Exacta is opened, computer 302 loads the register 410 for the units indicator 364 as previously described for a Twin Double wager operation. Actuation of Big Exacta member 366 activates units indicator 364, informing the player of the number of wagering units he is entitled to wager. If at this time the player then proceeds to place his second-half Big Exacta wagers in the same fashion as for the Twin Double previously described except, of course, Big Exacta member 366 is operated instead of Twin Double member 362.

The operation of computer 302 may be understood by reference to the simplified program flow charts.
shown in FIGS. 9a-9b. It will be appreciated that computer 302 may be a general-purpose digital computer programmed to perform the required operations from data derived from the panels 300 and from the track computer 303, or a special purpose computer designed to perform the required functions. It is believed to be well within the skill of those skilled in the programming art to implement the complete program for whatever type of computer is selected, so that only the basic steps in that program are described herein. The program routine illustrated by the flow chart of FIG. 9a is the background-program routine, that is the program under which computer 302 operates when it is not receiving wagering data from any of the betting panels 300 or from track computer 303. Thus, computer 302 first senses at 430 if data are being received from the teller's station. If the answer is yes, these data are read at 432. If the answer is negative, the computer keeps on repeating the step until it obtains an affirmative response at which time a decision is made at decision step 434 to determine whether the teller's data include an instruction to open a new account for a player.

If the answer at step 434 is affirmative, a storage area in the memory of computer 302 is designated for the player at 436, the amount deposited is added to the player's credit balance at 438, and a memo confirming the new account is sent to the teller's station as indicated at 440 after which the cycle is repeated.

If the answer to decision step 434 is negative, the decision is then made at 442 as to whether the new data reflect a new deposit made by a player into his previously established account. Upon an affirmative response the new amount is added to that credit balance at 438, and a suitable memo is sent to the teller as described. Upon a negative response at step 442, the decision is made at step 444 as to whether the newly received data are for closing a previously established wagering account.

Upon an affirmative reply at step 444, the computer is then instructed to search its wager storage area to determine at 446 whether that player has any outstanding or "live" wagers at that time. For any such live wagers, the information for that wager and the player's credit balance are written to the teller at 448 and 450, the storage area in the control-computer memory for that player is closed at 452, and a zero credit balance for that player is established at 454, after which the program is returned to its initial idling condition at step 430.

Upon a negative response to decision step 444, a termination is then made at step 456 if the new data constitute a withdrawal by the player from his credit balance. If the response is affirmative, the player's credit balance is compared to the amount of the withdrawal at 458. If the latter exceeds the former a withdrawal-reject memo is written to the teller as indicated at 460 to prevent the completion of the withdrawal at the teller's station, and the cycle is repeated. If the player's balance is sufficient to cover the amount of the withdrawal, his balance is reduced by that amount as indicated at 462, and the player's new reduced balance is sent to the teller as indicated at 464.

Upon a negative response at decision step 456, a decision is then made at 466 as to whether the new panel data are indicative of the closing of wagering for the day. Upon an affirmative response to that step the program is terminated. A negative reply at step 466 indicates an error in the received data and the program is caused to be repeated, commencing once again at step 430.

When computer 302 receives wager data from one of the panels or data from track computer 303, the background program of FIG. 9a is temporarily halted to allow for the processing of the wager in accord with the foreground program for which the flow chart is illustrated in FIG. 9b. The first step of that program is to decide at step 468 if the data are obtained from a betting panel. Upon an affirmative response, the data are read into computer 302 at 470, and a security match is made at 472 to confirm that the player-identification code received from the panel matches with the code word stored in computer 302 for that player. If the security match is not successfully made, the wager data are rejected, and a reject signal is sent to the panel as indicated at 474.

Upon a positive outcome of the security match, the credit balance for the identified player is sent to the panel as indicated at 476, and a determination is made at 478 if the data received from the panel are wager data. If it is not, an error is indicated, the program is terminated, and the background program of FIG. 9a is re instituted.

Upon an affirmative response at decision step 478, a decision is then made at decision step 480 to determine if the wager is a Quinella wager. If the wager is a Quinella wager a decision is then made at decision step 482 to see whether the wager data contain a boxing command. If such a command is sensed the computer is instructed to perform an up-combination subroutine at 484, which will be more completely described below with reference to FIG. 10a. Upon a negative response to decision step 482 the computer is then instructed to perform the make-bet subroutine 486, which will also be described below in greater detail with respect to FIG. 9c; after which the foreground program of FIG. 9b is terminated and the background program of FIG. 9a is resumed.

For a negative response to decision step 480, a decision is made at step 488 to determine if the wager made is an Exacta wager. If it is not, indicating a non-special race, computer 302 is instructed to perform the make-bet subroutine 486. If the wager is an Exacta, a decision is made at step 490 to determine if an up-only Exacta wager is desired. If the reply at step 490 is negative, the computer is instructed to perform a down-combination subroutine 492 which is more completely described below with reference to FIG. 10b. After the completion of subroutine 492, a decision is made at step 494 to determine if a down-only Exacta is desired. If the answer to step 494 is affirmative, the foreground program terminates. If the response at step 494 is negative, indicating that an Exacta is to be in both the up and down directions is desired, computer 302 is instructed to perform up-combination subroutine 484, after which the foreground program is terminated.

If the response to decision step 468 is negative, a determination is made at step 496 to determine if the input data come from track computer 303. If they do not, an error is indicated, the program is terminated, and the background program of FIG. 9a is re instituted. Upon a positive response at decision step 496, the data from computer 303 are read at 498 and a decision is made at step 500 to determine if these data contain race-number information. If the reply at step 500 is af-
firmative the race-number information is sent to panel 300 as indicated at 502 and the program is terminated.

Upon a negative response at decision step 500, the decision is then made at step 504 to determine if the data from track computer 303 contain scratch information. Upon a positive reply the identity of the scratched horse is stored in computer 302 as indicated at 506, so that a subsequent wager made from panel 300 on a scratched horse will be rejected in a manner described below. Upon the completion of step 506 the program proceeds to perform a make-payoff subroutine 510 illustrated in greater detail in FIG. 9d, in which the credit balance of all players who had wagered on the scratched horse will be augmented by an amount corresponding to the amount wagered.

Upon a negative response at step 504, computer 302 then makes a decision at step 508 to determine if the data from track computer 303 constitute payoff information for a unit or two-dollar wager once the results of a race are official. If the response to decision step 508 is also negative, an error is indicated and the program is terminated. Upon an affirmative response at decision step 508, the computer is instructed to perform a make-payoff subroutine 510 in which the credit balances of all successful players are augmented by an amount corresponding to the amount wagered by the successful player and the winning payoff for his wager.

FIG. 9c illustrates the make-bet subroutine 486 which is initiated after a negative decision is made at either of decision steps 482 and 488 as described previously. The first step in this subroutine is to decide at step 512 whether the wager made is for the second half of a Twin Double wager. If the response is negative a similar decision is then made at step 514 to determine if the wager is for the second half of a Big Exacta wager.

For an affirmative response to either of decision steps 512 or 514 the wagering units credited to the player for a successful wager on the first half of these wagering combinations, as described above, is compared at step 516 with the amount of the wager. If the amount of the wager exceeds the number of available wagering units, an overdraft signal is sent to the player's panel as shown at 518. For a negative response at decision step 514, the amount of the wager is compared at step 520 with the player's credit balance. If the former exceeds the latter, step 518 is performed to provide an overdraft indication at the player's panel and the make-bet subroutine is terminated.

For a positive comparison at either of steps 516 or 520, depending on the nature of the wager, the make-bet subroutine then determines at step 522 whether the selected horse has been scratched from the race. If that determination is positive, a scratch signal is sent as indicated at 524 to the player's panel and the make-bet subroutine is terminated. If the player's balance is sufficient, the bet information is transmitted from control computer 302 to track computer 303 as indicated at step 525.

Computer 302 awaits a response from computer 303, as indicated at decision step 526, and continues to recyle until that answer is received. That answer is analyzed at decision step 528 to determine if the track computer has confirmed or rejected the wager. For a rejected wager, for any of the reasons described above, a reject signal is transmitted to the player's panel as indicated at step 530 and the make-bet subroutine is terminated.

If the player's wager is confirmed, the wager data are logged or inserted into memory at the wager storage area in computer 302 previously assigned to the player as indicated at 532, after which the player's account is debited or reduced by the amount of the wager as indicated at 534. The make-bet subroutine is then completed by sending an accept signal to the player's panel as shown at 536.

FIG. 9d illustrates the make-payoff subroutine 510 that is initiated, as shown in FIG. 9b, upon the official certification of a successful wager on the part of the player. The subroutine is initiated at step 538 in which the accounts of each player are searched for a current or "live" wager made on any winning horse, which includes successful place or show wagers made on horses that finish in their predicted position or better.

A determination is made at each player's stored account at decision step 540 whether a successful wager has been made. If there is no such "hit," a decision is then made at step 542 to determine whether all live wagers have been searched. If the answer to step 542 is affirmative, the indication is that no successful wagers were placed for that race, no payoffs need thus be made, and make-payoff subroutine 510 is terminated. If the decision at step 542 is that not all live wagers have been searched, step 538 is repeated until step 540 locates a successful wager.

When that occurs, the wager is examined at steps 544 and 546 to respectively determine 17 the successful wager is for the first half of a Twin-Double or Big Exacta combination. If the wager is for either of these combinations, the amount of the wager is divided by two at step 548, and the player's units balance is updated by an appropriate amount at step 550.

If the successful wager is for neither of these combinations the payoff price as computed at track computer 303 for a basic two-dollar wager is multiplied by one-half the amount of the wager at step 552, and the product derived at step 552 is added to the successful player's credit balance at step 554, that balance having been previously adjusted by subtracting the amount of the wager at the time the wager was made at step 534.

Upon the completion of steps 550 or 554, the now processed live wager is closed by being converted to a "dead" wager at step 556, after which the search for remaining live wagers is reinitiated at decision step 542.

BOXING

The program for a Quinella or an Exacta operation is illustrated schematically in FIGS. 10a and 10b. As noted above, boxing is performed whenever a player electing to wager on the Quinella (or Exacta) combinations, selects three (or two) or more horses and operates one of buttons 369, 370 or 372 on panel 300. When it is determined at decision step 482 in FIG. 9b from the nature of the wager, that a boxing operation is required, an appropriate input signal is generated to trigger to a decision step 484 which determines whether the wager is a Quinella or an Exacta. If the wager is a Quinella, computer 302 is instructed to perform an up-boxing operation according to the subroutine illustrated in FIG. 10b. Since the boxing operation for a Quinella is the same as that for an Exacta in which boxing is performed only in the up direction, the results
of that operation are a series of wagers placed on the proper Quinella combinations which are then processed in the manner of regular wagers as described above.

The flow chart of the down-only subroutine 492 is illustrated in FIG. 10a. Upon instructions to perform a down boxing operation a counter in computer 302, here designated CTR1, is set to a count of 13 as indicated at 558. The horse selections, to be boxed, are inserted in a work area 1 located in the computer memory at 560. The count in counter CTR1 is then diminished by one at 562. The count in index counter CTR1 is used to examine the corresponding slot in Work Area 1 at 564 in which the horse-select data are stored, and a decision is then made at step 566 to determine whether the initial count in counter CTR1, that is horse 12, corresponds to one of the selected horses. If the response is negative, the stored count in counter CTR1 is compared to zero at 568. If that count is greater than zero, the count in counter CTR1 is once again decreased by one at 562. The above-described steps are repeated until the reduced count in counter CTR1 corresponds to the number of the selected horse having the highest number.

At that time an instruction is given at 570 to transfer the count in counter CTR1 to a memory cell here designated as first-half. The data in Work Area 1 are then stored in a second memory portion here designated as Work Area 2, as indicated at 572, and the data from counter CTR1 are transferred to a counter CTR2, at 574. The count in the latter counter is then decreased by one at 576. The decreased count in counter CTR2 is used to examine the correspondingly numbered slot in Work Area 2 at 578. A determination is made at 580 to see whether or not that slot contains a selected horse; if that decision is negative, the count in counter CTR2 is again compared to zero at 582, and if it is found to be greater than zero, counter CTR2 is again decreased by one at 576. This process is repeated until the decision at 580 is affirmative, at which time the count in that counter is transferred at 584 to a second memory cell here designated as second-half. At this time the counts in the first-half and second-half cells reflecting the highest and next-highest numbered of the selected horses, is presented as a single wager to the make-wager subroutine 486 illustrated in FIG. 9c. This wager is the first down-only Exacta Combination wager.

At this time the comparison at 582 is repeated and the count in counter CTR2 is again incrementally decreased by one, or one or more times, until the count in that counter corresponds to the number of the next-lowest-numbered selected horse, at which time a second combination wager is performed consisting of the latter selected horse and the highest-numbered horse stored in the first-half memory cell. This procedure is then repeated until the counter in counter CTR2 reaches zero at which time the decreasing number combinations of the highest-numbered horse and all other selected horses is made, all at subroutine 486.

When counter CTR2 reaches zero, decision step 582 then causes step 562 to be repeated which again causes the count in counter CTR1 to be decreased by one until the next-lowest-numbered selected horse is located in Work Area 1. At that time steps 570–584 are repeated until all two-horse, down only combinations of that next-lowest numbered selected horse and all lower-numbered selected horses are derived and wagers made thereon at 486. This process is repeated until the count in counter CTR1 reaches zero. The down-only subroutine of FIG. 10b is then terminated when the outcome of decision step 568 is that the count in counter CTR1 is equal to zero, which indicates that all the down-only, two-horse combinations of the selected horses have been formed and wagers placed thereon.

The operation of an up-only subroutine 484 is illustrated in FIG. 10b, and is substantially similar to the down-only subroutine 492 of FIG. 10a. When an instruction to perform the latter subroutine is present, counter CTR1 is set to zero at 586 and as before, the horse select data are stored in Work Area 1 at 588. The count in counter CTR1 is increased by one at 590 and that increased count is used to index and examine the corresponding slot in Work Area 1 at 592 whereupon a decision as to whether or not that indexed slot contains a selected horse is made at 592. Upon a negative response to that decision, the count in counter CTR1 is compared to twelve at 596.

If the count in counter CTR1 is less than twelve, step 590 is repeated to again increase the count in that counter by one. This process is repeated until the count in counter CTR1 causes a slot in Work Area 1 having the lowest-numbered-horse select bit therein to be examined, resulting in an affirmative decision at step 594.

The count in counter CTR1 containing the lowest-numbered selected horse is transferred at 598 to a first-half memory cell. Thereafter, the horse-select data in Work Area 1 are transferred at 600 to Work Area 2 and the count in counter CTR1 is transferred to counter CTR2 at 602. The count in the latter counter is then increased by one at 604 and that increased count is used to examine a correspondingly numbered slot in Work Area 2 at 606. A decision is then made at step 608 to determine whether a selected horse bit is stored in that slot.

If the decision is negative, the count in counter CTR2 is compared to twelve at step 610. If the count is less than twelve, step 604 is repeated to further increment the count in counter CTR2 until the answer to decision step 608 is affirmative. That count, which represents the next-highest selected horse, is transferred to Work Area 2 at 612, and the combined wager representing a combination of the lowest-numbered and next-lowest-numbered selected horses is then made at subroutine 486. Step 610 is then repeated one or more times to continue to update counter CTR2 until all combinations of the lowest-numbered horse (the count in counter CTR1) and the other higher-numbered selected horses are derived and wagers placed thereon.

At that time the count in counter CTR2 reaches 12 whereupon the decision at step 610 causes step 590 to be repeated, thereby causing the count in counter CTR1 to be increased by one. The latter operation is then repeated until the count in counter CTR1 corresponds to the number of the next-highest selected horse, after which steps 598–612 are repeated to bring about all combinations of the next-highest-numbered selected horse and all higher-numbered selected horses. After the completion of each succeeding series of up-only, two-horse combinations, counter CTR1 is further updated by one until all up-only combinations are derived and wagers placed thereon at which time its count will be 12. When the count in counter CTR1
reaches 12, the subroutine of the up-only Exacta wager is completed.

It will thus be apparent that my invention can be applied to a variety of games of chance, with manual or automatic generation of result signals to be transmitted to remote players' stations, and that many details of circuitry of structure may be modified; thus, for example, the token-operated credit-balance register (shown at 106 in FIG. 3B and not illustrated in FIG. 5) may be set by a signal from the banker upon the payment of a corresponding cash amount or may be operated by a special key the player may buy in lieu of a token. Similarly, credit balance may be established in the horse-race betting system of FIG. 6 by inserting tokens into the panel as in the dice system. The specific wagering combinations described herein for use with the horse race system are not limiting in nature, and it will be understood that the system could be readily adapted for the processing of other wagers or combinations of wagers. While the racing wagering system has been specifically described for facilitating the making of wagers on horse racing, it could be used to equal advantage at dog tracks or jai-alai games in states permitting wagering on those events.

The system of the invention is thus highly advantageous in that it permits a player to participate in the prediction of the outcome of a fortuitous event in a far more convenient manner which greatly adds to the pleasure of that participation.

Moreover, by facilitating the making of wagers at locations such as race tracks, more people will take advantage of the opportunity to enjoy a day at the track, with the resulting increase in revenue by the track and thus by the state which receives a share of track revenues.

These and other variations, readily apparent to persons skilled in the art, are intended to be embraced within the spirit and scope of my invention as defined in the appended claims.

I claim:

1. A data-processing system for determining gains and losses from bets on a fortuitous event, comprising: a player's station remote from the site of said event; first selector means at said player's station operable by a player to indicate an amount wagered on the outcome thereof; second selector means at said player's station operable by the player to choose one of several types of wagers; register means at said player's station inaccessible to the player following operation thereof to display an initial credit balance, said register means being responsive to said first selector means for deducting the wagered amount from said balance; calculating means coupled to said second selector means for determining an odds factor from the chosen type of wager; arithmetic means coupled to said register means and to said calculating means, said arithmetic means being actutable under the control of said first selector means, upon an outcome of said event in conformity with the wager, for additively introducing into said register means said wagered amount multiplied by said odds factor to increase the existing credit balance; a control station at the site of said event; actuating means for said arithmetic means at said control station; and transmission means linking said actuating means to said arithmetic means.

2. A system as defined in claim 1 wherein said player's station is one of a plurality of such stations each provided with individual arithmetic means, said transmission means being common to the arithmetic means of all player's stations.

3. A system as defined in claim 2 wherein said arithmetic means form part of a computer common to all player's stations.

4. A system as defined in claim 1 wherein said player's station comprises a panel carrying said first and second selector means and said register means.

5. A system as defined in claim 4 wherein said calculating and arithmetic means are located at said player's station.

6. A system as defined in claim 4, further comprising a closed-circuit television channel linking said player's station with the site of said event, said television channel including an observation screen disposed adjacent said panel.

7. A system as defined in claim 4 wherein the site of the event is a race track, said calculating means comprising a track computer, said panel being provided with player-operable signaling means responsive to said first and second selector means and connected to said track computer for supplying odds-determining data thereto.

8. A system as defined in claim 7 wherein said first and second selector means are coupled to said signaling means for finalizing a selection upon the transmission of said odds-determining data to said track computer.

9. A system as defined in claim 7 wherein said player's station is one of a plurality of such stations, said track computer being common to all said player's stations.

10. A system as defined in claim 9 wherein the arithmetic means of all said player's stations form part of another computer common to all said player's stations and connected to said track computer.