May 20, 1958 W. L. RAICH ET AL 2,835,052

QUESTION AND ANSWER GAME

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Fig. 1

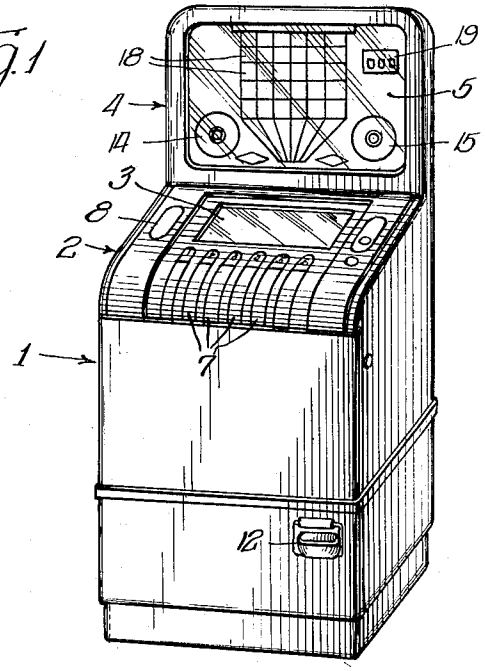
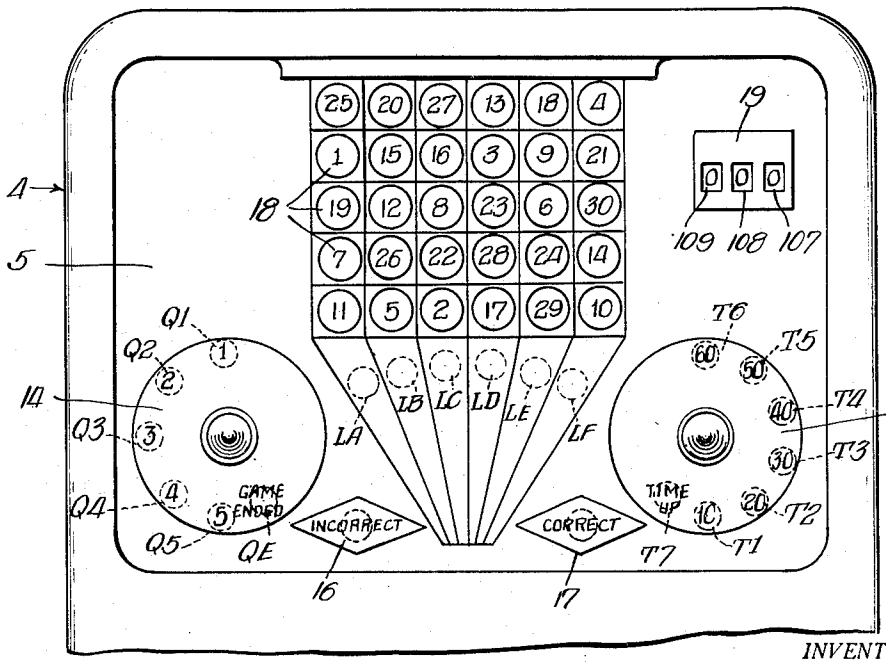


Fig. 2



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QUESTION AND ANSWER GAME

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Fig. 3

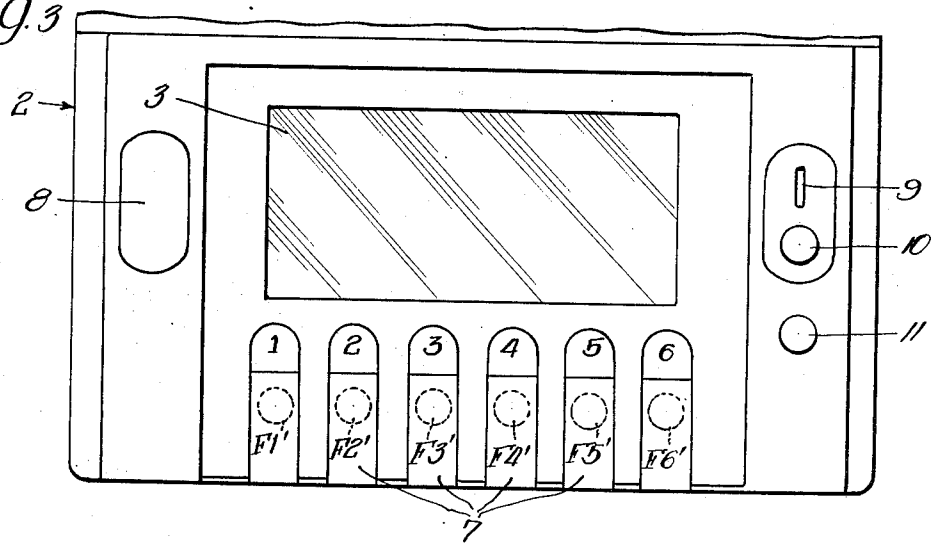
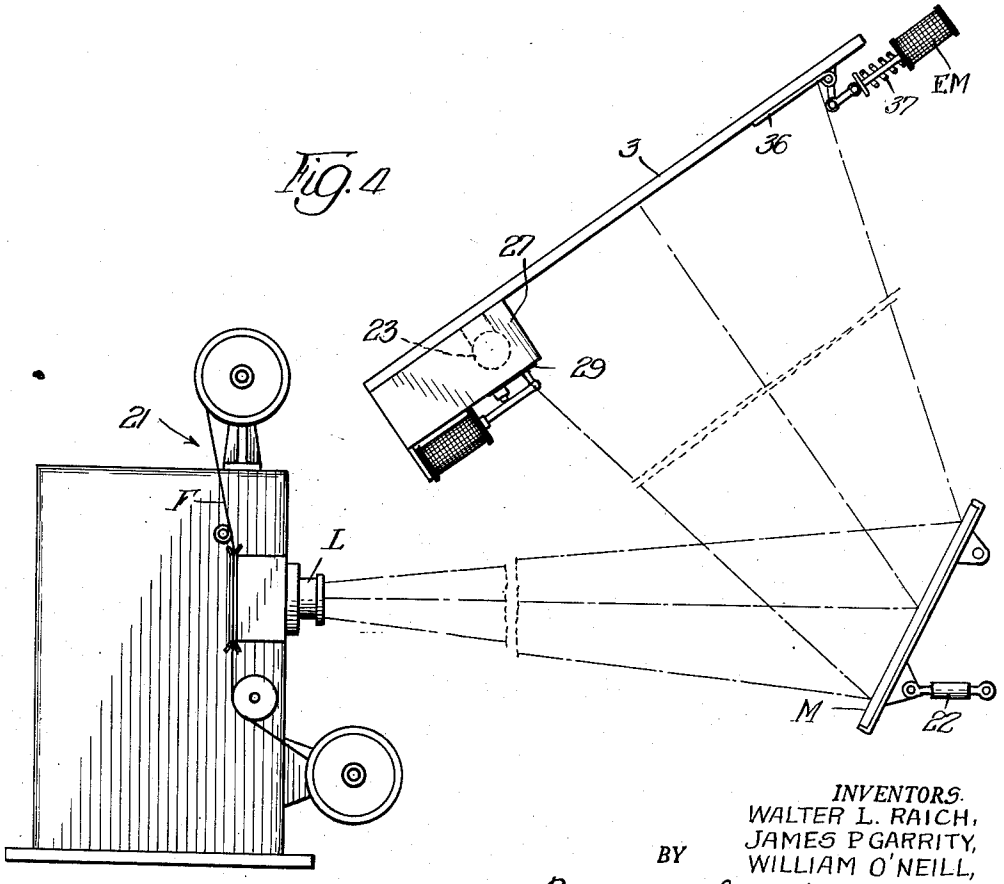


Fig. 4



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QUESTION AND ANSWER GAME

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Fig. 5

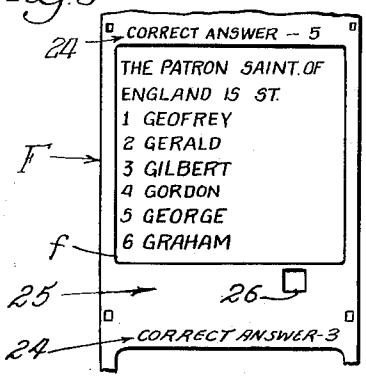


Fig. 6.

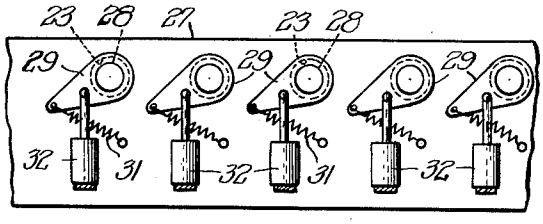
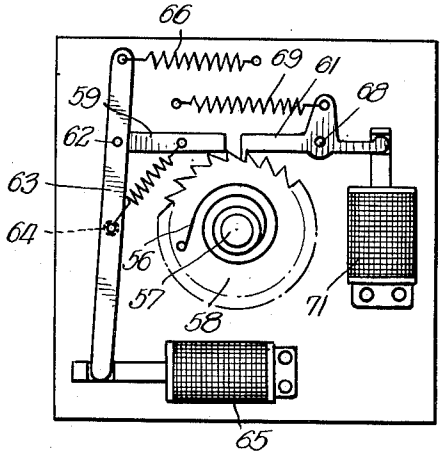


Fig. 8.



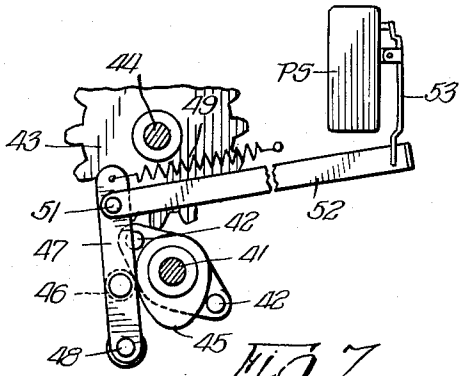


Fig. 7.

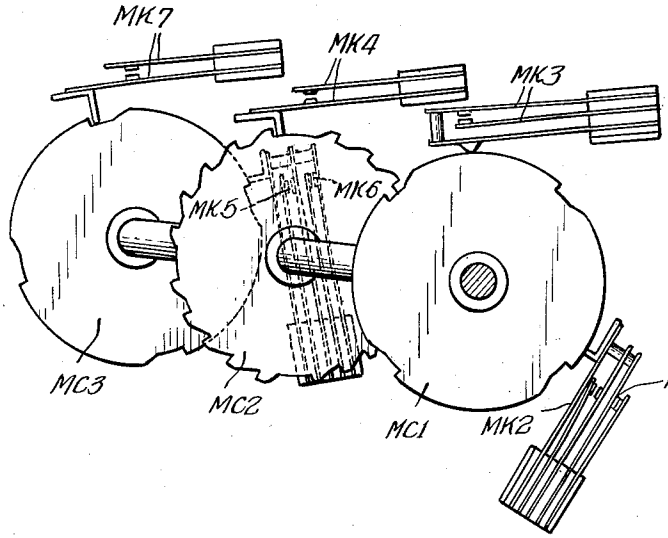


Fig. 9.

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Fig. 10.

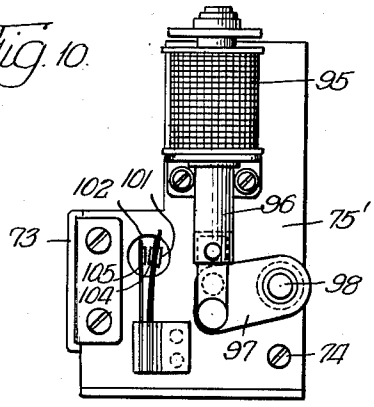


Fig. 12

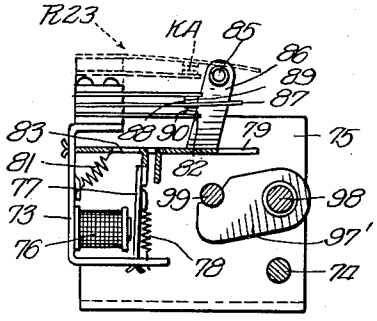


Fig. 11

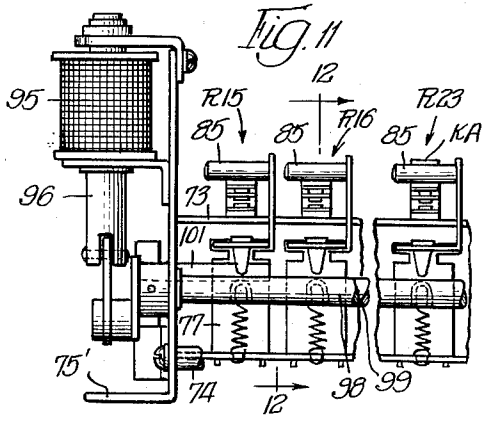


Fig. 14

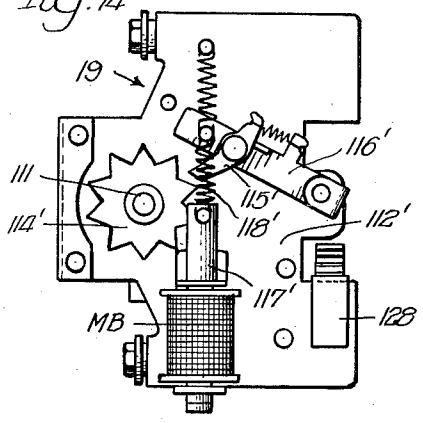


Fig. 13.

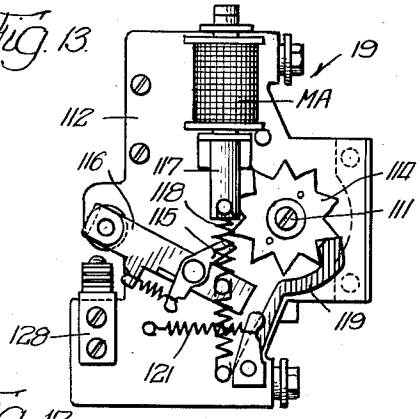


Fig. 15.

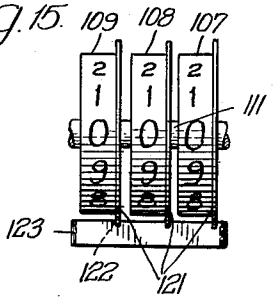
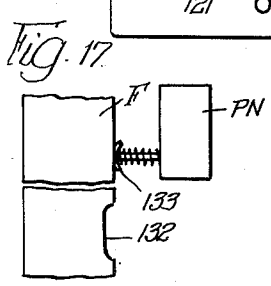
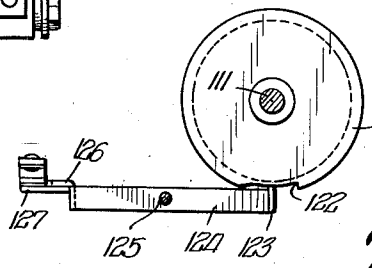


Fig. 16.

Fig. 17.





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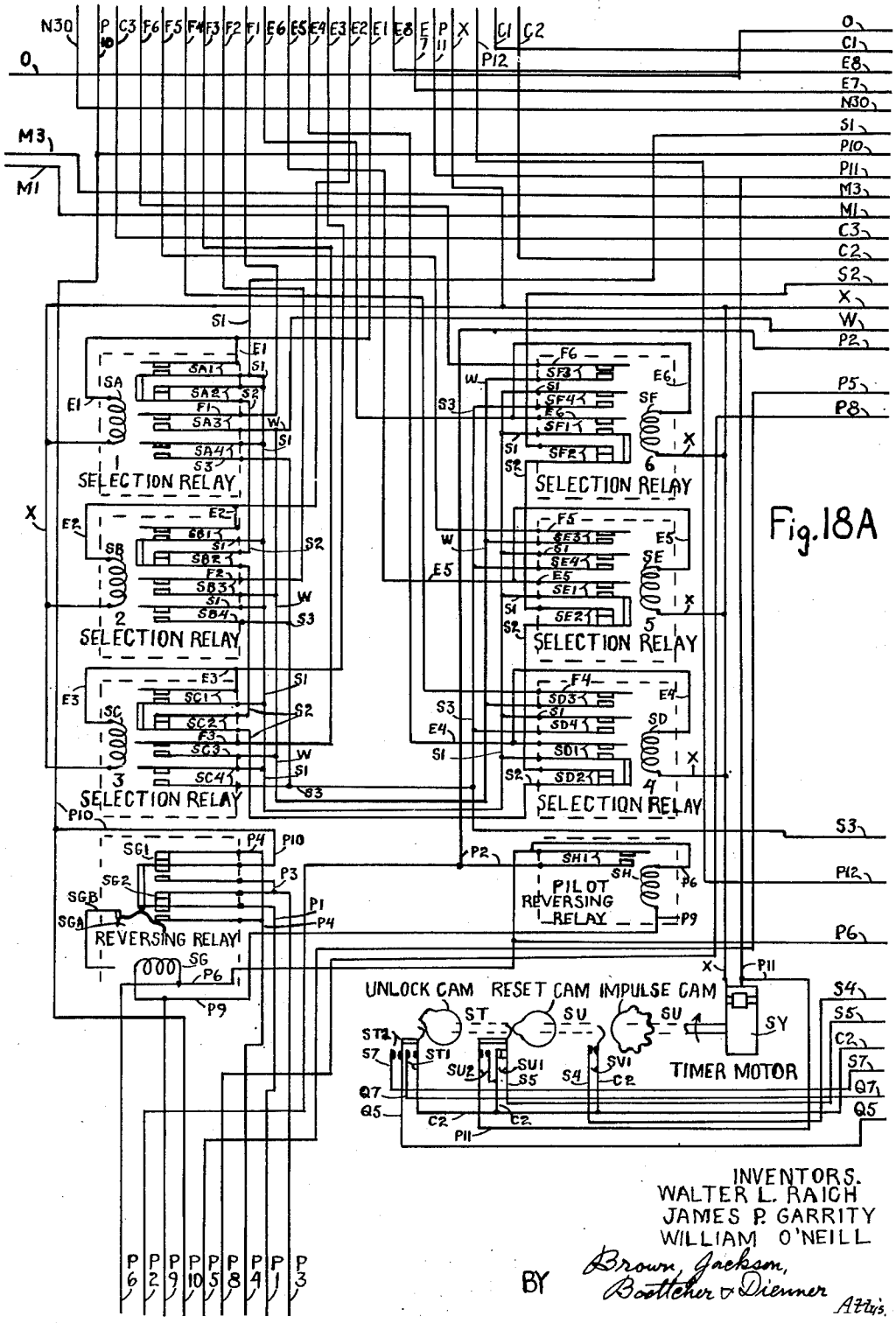


Fig. 18A

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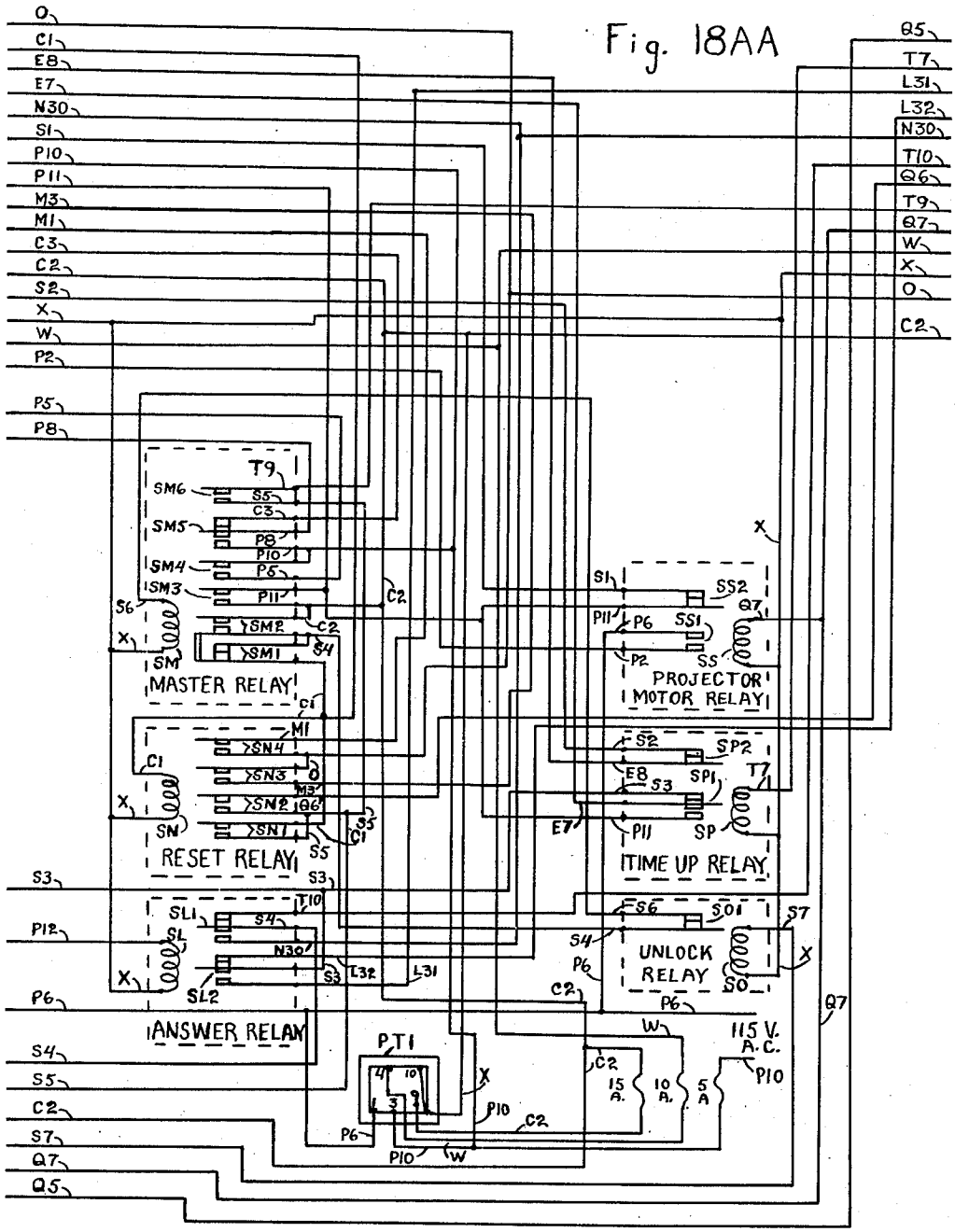
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Fig. 18AA



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QUESTION AND ANSWER GAME

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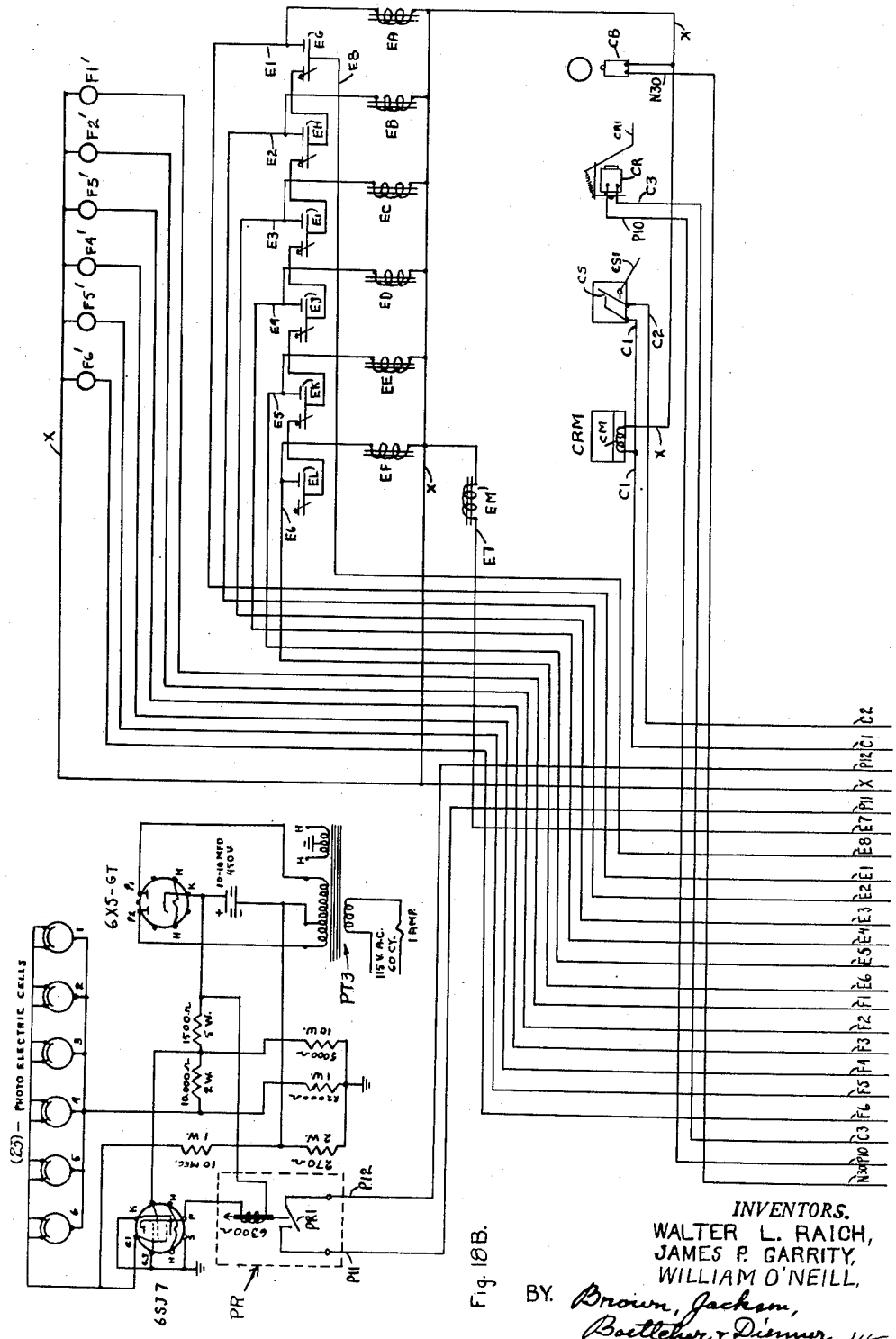


Fig. 10B.

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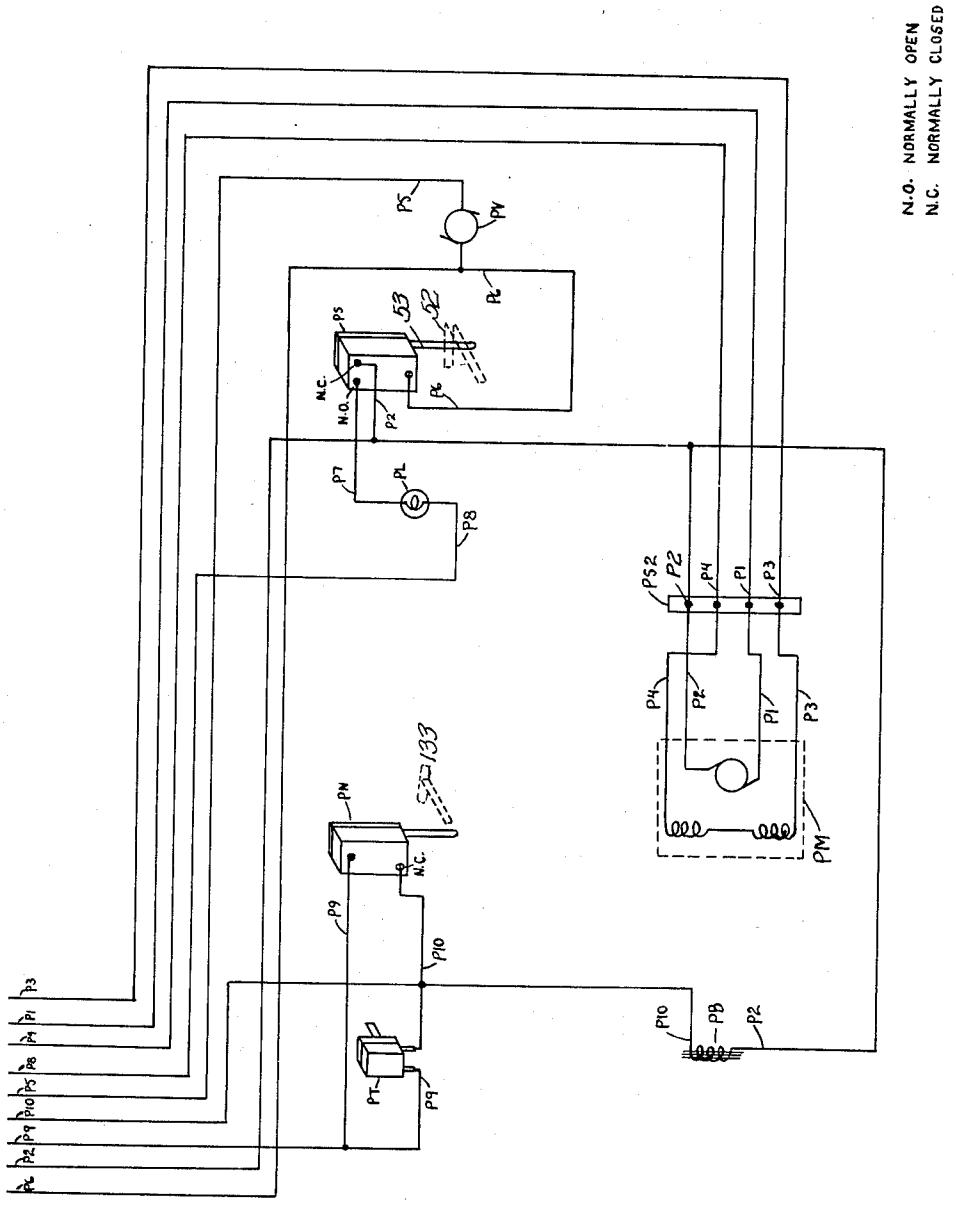


Fig. 18C.

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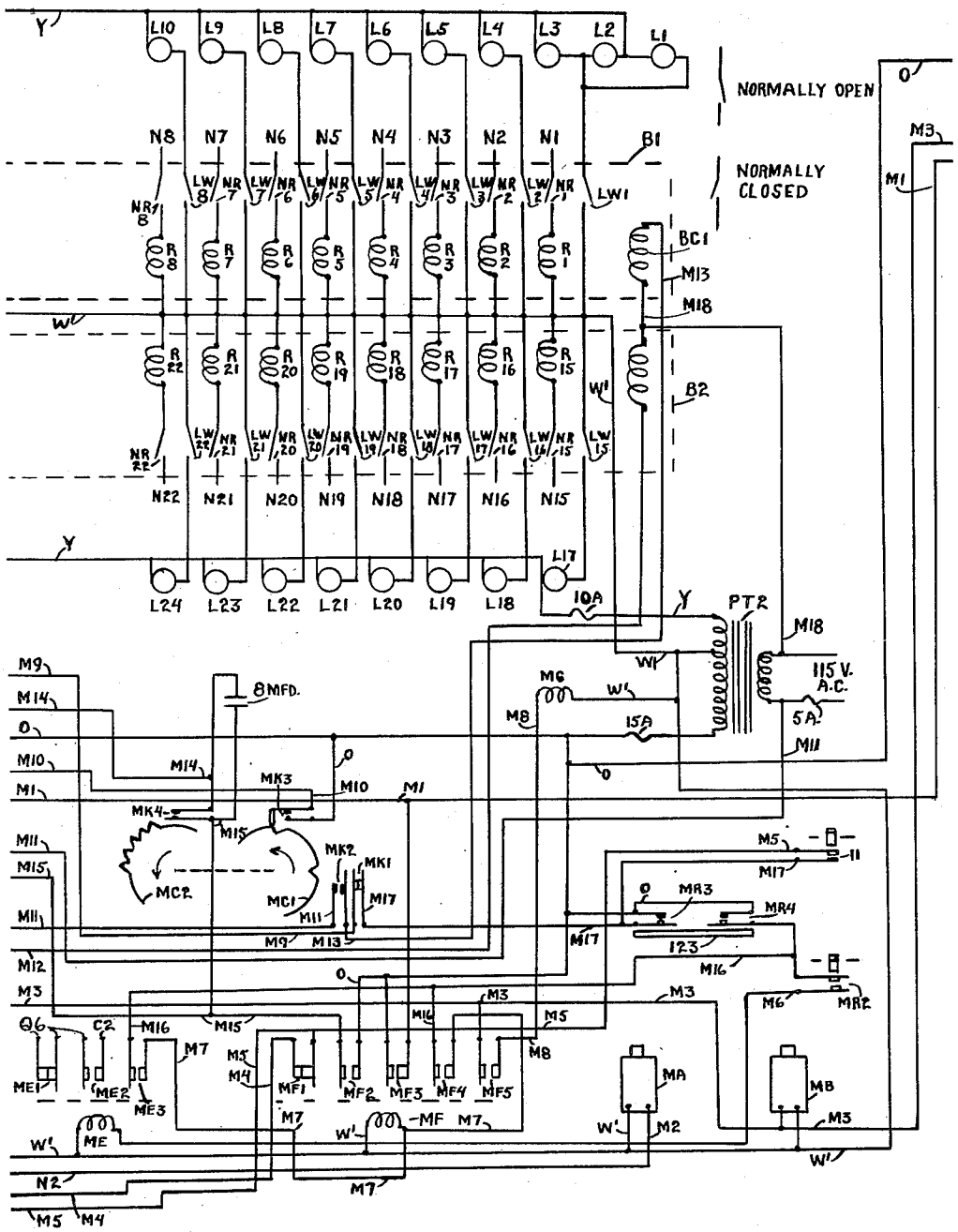


Fig. 18D

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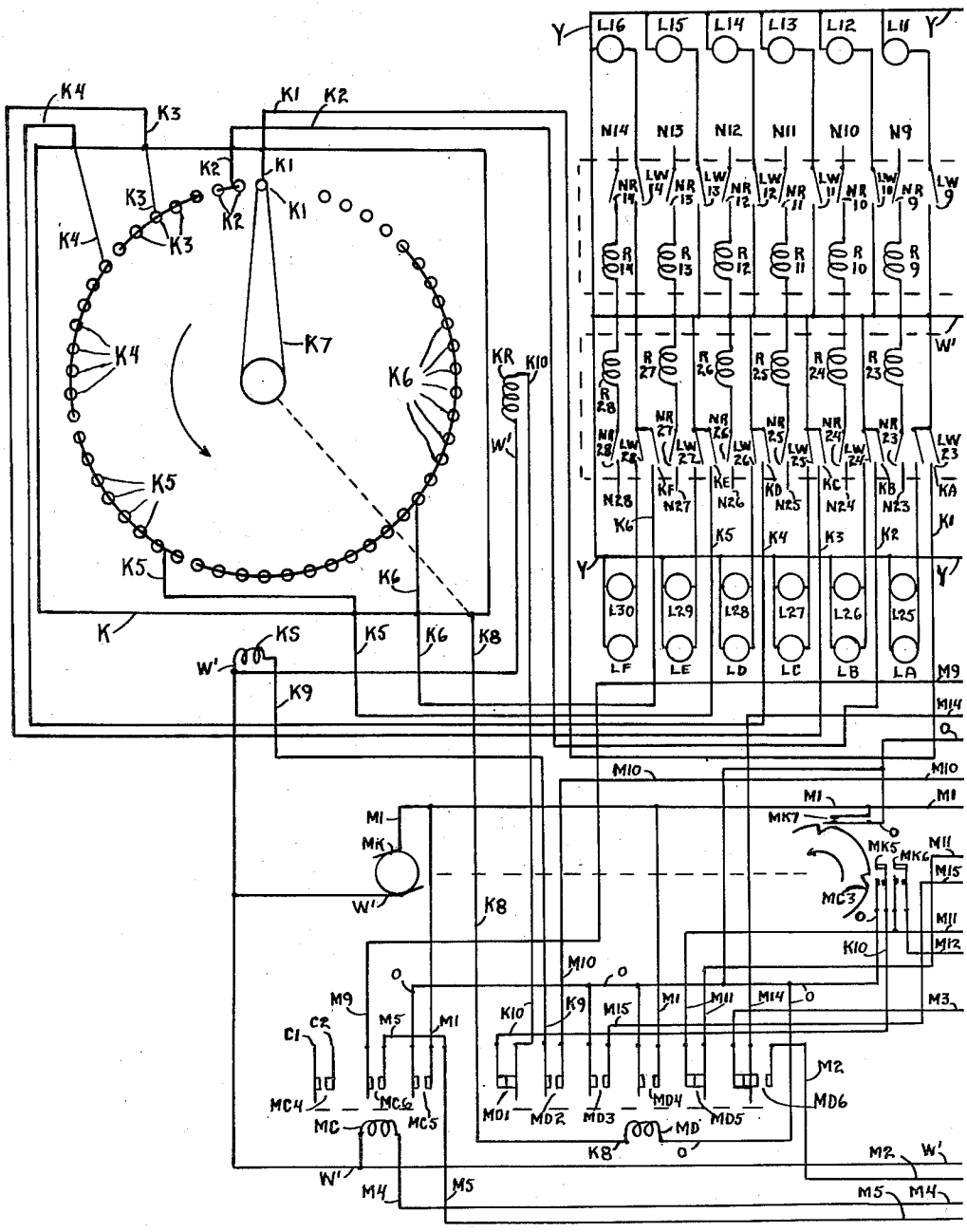


Fig. 18DD

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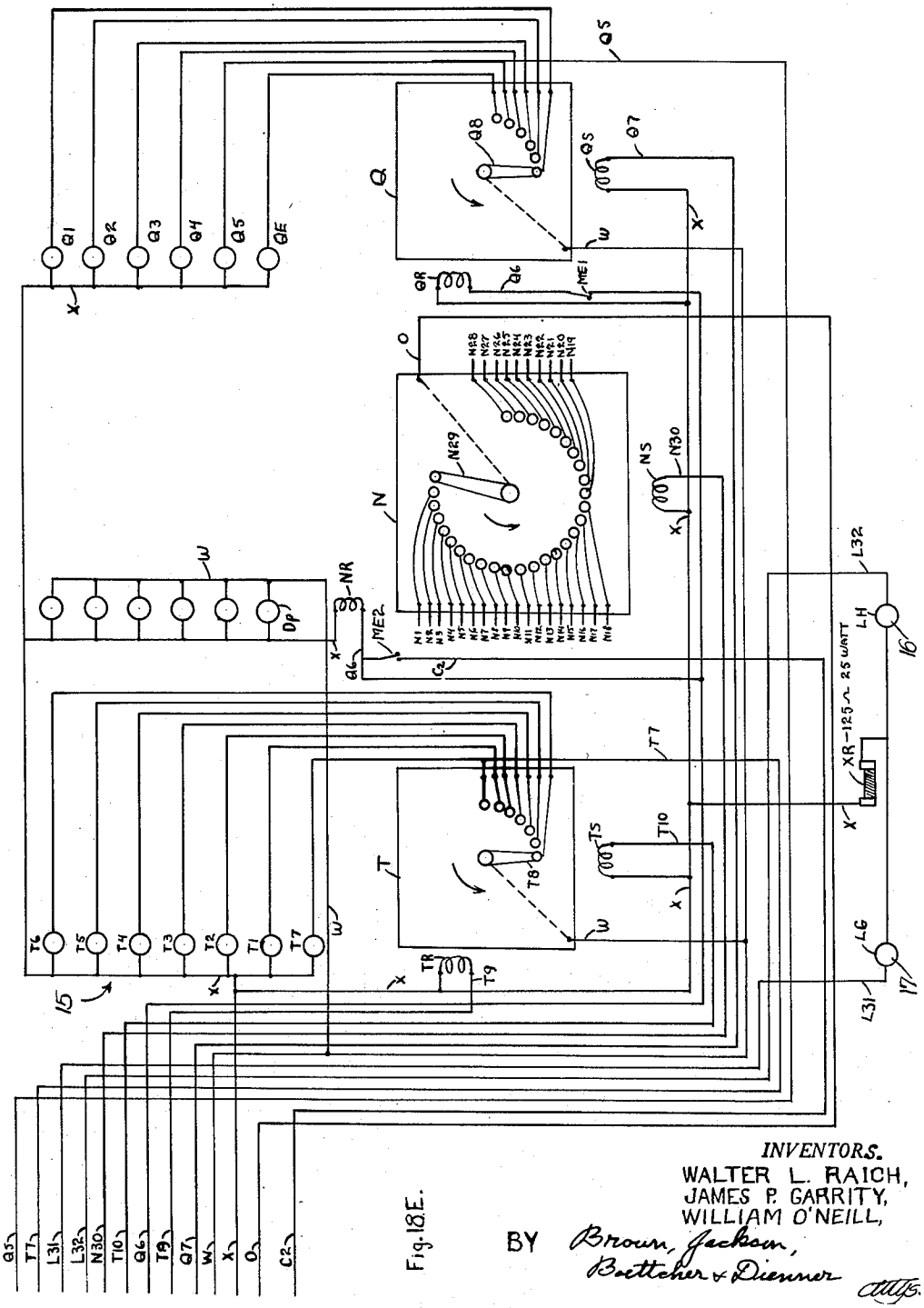


Fig. 18E.

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United States Patent Office

2,835,052

Patented May 20, 1958

2,835,052

QUESTION AND ANSWER GAME

Walter L. Raich and James P. Garrity, Chicago, and William O'Neill, Skokie, Ill.

Application December 22, 1955, Serial No. 554,826

13 Claims. (Cl. 35—9)

The present invention relates to an improved question and answer game adapted particularly for coin operated use in depots, clubs, taverns, or other places of amusement; although it can also be used in schools and educational institutions, or can be used for advertising purposes by travel agencies, manufacturing firms and the like.

The game is somewhat comparable to television and radio quiz shows, presenting successive questions to the player, who is given a limited time in which to answer each question, and who receives a score or grade, depending upon the accuracy of his answers and the length of time taken to give them. The questions may cover an endless variety of subjects pertaining to history, literature, music, sports, comics.

In the apparatus embodying our invention, each question is projected on a screen from a motion picture projector, slide strip projector, or the like. Concurrently therewith, there is also projected upon the same or an adjacent screen a plurality of possible answers, only one of which is correct. These possible answers are each identified by separate numbers or letters. Mounted adjacent to the screen are depressible keys bearing corresponding numbers or letters. For example, in the illustrative embodiment hereinafter disclosed, there are six such keys numbered 1 to 6 inclusive, corresponding to six possible answers projected upon the screen. The player selects the answer which he deems to be correct by depressing the key bearing the number of the selected answer. If the player selects the correct answer to a question or picture, the apparatus automatically gives an indication to this effect, such as by illuminating the word "Correct," and if the player selects the incorrect answers, the apparatus automatically gives an indication to that effect, such as by illuminating the word "Incorrect." Instead of the keys being numbered numerically, they might be differentiated upon the basis of odd or even, true or false, or any other desired basis.

One of the objects of the invention is to provide a block scoring system wherein numbers are illuminated in grouped relations for the purpose of showing the player's rating or ability, depending upon the accuracy of his answers and the speed or time in which he gives them.

Another object of the invention is to provide an improved scoring mechanism which will register the rating points of the player. As each line of the block scoring system is completed, the totalized number of rating points will register on the automatic scoring mechanism.

Another object of the invention is to provide a question and answer game of the coin controlled type in which a free-play is awarded to a player if he attains a predetermined number of rating points on the automatic scoring mechanism. For example, if he answers the questions in a predetermined time, he is rewarded by the ability to play another game without depositing another coin. This free-play feature may or may not be embodied in the game, as desired.

Other objects, features and advantages of the invention will appear from the following detail description of one preferred embodiment thereof. In the accompanying drawings illustrating such embodiment:

Figure 1 is a front perspective view of the housing enclosing our improved question and answer game apparatus;

Figure 2 is an elevational view of the back panel of said housing, illustrating the block scoring arrangement, the automatic scoring mechanism, the question designating register, the time keeping register, etc.;

Figure 3 is an elevational view of the inclined front panel of the housing in which is located the question and answer screen and across the bottom edge of which is located the bank of answer designating keys adapted to be manually operated;

Figure 4 is a diagrammatic view of the motion picture projector which projects the questions and answers on the screen, and also of the optical system by which the light beams are reflected to the viewing screen and to the photoelectric cells;

Figure 5 is an enlarged fragmentary view of one of the question and answer frames in the motion picture film, as viewed from the back or obverse side of the film;

Figure 6 is a fragmentary elevational view showing the bank of photoelectric cells with their individually operated shutters;

Figure 7 is a fragmentary diagrammatic view showing the automatic start and stop switch mechanism which controls the projector motor circuit pursuant to predetermined motion of the motion picture film;

Figure 8 is a diagrammatic view of the advancing mechanism and of the resetting or restoring mechanism which are embodied in each of the rotary switches employed in the system;

Figure 9 is a diagrammatic perspective view of one set of motor driven cams, and the switch contacts responsive thereto, used in the system;

Figure 10 is an end elevational view of one of the bank relay assemblies, showing the resetting mechanism;

Figure 11 is a fragmentary side elevational view of one of the bank relay assemblies;

Figure 12 is a transverse section through one of the bank relay assemblies, corresponding to a section taken approximately on the plane of the line 12—12 of Figure 11;

Figure 13 is a side elevational view showing one side or end of the point registering mechanism;

Figure 14 is a similar view showing the other side or end of said point registering mechanism;

Figure 15 is a front elevational view of the counting wheels of said point registering mechanism, showing the automatic switch operating registration bar and frame responsive to the position of these wheels;

Figure 16 is a transverse section through the point registering mechanism, showing a side view of the automatic switch operating frame responsive to the position of the wheels;

Figure 17 is a diagrammatic view of the projector reversing switch; and

Figures 18A, 18AA, 18B, 18C, 18D, 18DD and 18E are connected parts of a complete circuit diagram of the system, wherein Figure 18A is to be placed centrally; with Figure 18AA located to the right of Figure 18A, with Figure 18B located above Figure 18A; with Figure 18C located below Figure 18A; with Figure 18D located to the left of Figure 18A; with Figure 18DD located to the left of Figure 18D and with Figure 18E located to the right of Figure 18AA.

Referring to Figures 1, 2 and 3, the coin controlled embodiment of the game is shown enclosed in a housing 1 having a rectangular base portion adapted to rest on

the floor. At about waist or chest height, the housing 1 is formed with an upwardly and rearwardly sloping portion 2, and mounted in this sloping portion is a translucent screen 3, composed, for example, of frosted glass. The questions and answers are adapted to be projected against the under side of this screen 3 from a projector located within the housing 1, as will be later described. Projecting vertically from the rear edge of the sloping portion 2 is an upwardly extending rear panel portion 4 in which is mounted a glass pane 5.

Immediately below the translucent screen 3 is a horizontal row of six keys numbered 1 to 6 inclusive, a selected one of which is adapted to be depressed by the player corresponding to the number of the answer which the player deems to be the correct answer to the question then being projected on the screen 3. These manually actuated keys, designated 7, are preferably composed of translucent plastic, and mounted behind each key is a light which is adapted to be illuminated when that key is depressed. Mounted on the left hand side of the screen 3 in the sloping portion 2 is an instruction plate 8 containing instructions as to how to play the game, and mounted on the right hand side of the screen is the coin receiving slot 9, the coin reject button 10 and the replay button 11. The coin slot 9 receives the coin which sets the game into operation; the coin reject button 10 is used to reject bent coins which do not drop through to the coin mechanism; and the coin reject cup 12 receives the rejected coins. The replay button 11 is adapted to be operated to obtain the free play of another game, when the player has totalized one or more points entitling him to one or more free plays.

Referring to the upright indicating panel 4, shown in Figure 2, there is mounted behind the glass pane 5 the following apparatus: (*a*) the question designating dial 14, which shows the number of the question then being projected on the screen 3; (*b*) the time indicating dial 15 which denotes the allotted time or the time remaining in which to answer the question; (*c*) the "Incorrect" answer indicating light 16 which indicates that the player has made an incorrect answer to the question; (*d*) the "Correct" answer indicating light 17 which indicates that the player has made the correct answer to the question; (*e*) the bank or group of automatic scoring lights 18 which indicate scoring values commensurate with the accuracy of the answer given and the time taken to give the answer; and (*f*) the totalizing register 19 which indicates the total number of points made by the player over the series of questions constituting a complete game.

Referring to Figure 4, it will be seen that mounted in the front portion of the housing 1, below the screen 3, is a projector 21, which is preferably a 16 mm. motion picture projector, but it will be understood that a 35 mm. projector or a slide strip projector might be employed instead. The main elements of the projector are of conventional construction, comprising, as shown in Figure 18C, a projector lamp PL, a reversible projector motor PM, a fan motor PV, a lens L, and the usual arrangement of upper and lower reel shafts, film feeding sprocket wheel, sprocket shoe, film idler roller, aperture, aperture gate, etc. The lens L projects each frame *f* of the motion picture film F against an inclined mirror M which is adjustably mounted on the back wall of the housing 1, an adjusting screw 22 being provided for adjusting the angle of inclination of the mirror. The mirror reflects all of the light images projected from each frame of the film F in a direction upwardly and forwardly therefrom, whereby the question and answer portion of each frame impinges on the translucent screen 3, and whereby another light transmitting portion of each frame impinges on one of a bank of six photoelectric cells 23 arranged in a horizontal row below the screen 3.

Referring to Figure 5, which shows the back or obverse side of the film, each succeeding frame of the motion picture film F contains a separate question, and immediately below the question are six probable answers supposedly responsive to that particular question, each of the answers being designated #1 to #6 inclusive, corresponding to the numbering of the six manually operable keys 7 at the front of the machine. Only one of these six answers is correct. Because each frame of the film contains a separate question with its supposed answers, it will be seen that a film of even moderate length may contain hundreds or thousands of questions, each with its attendant group of supposed answers. In the preferred embodiment of the invention, but still as an optional feature, we imprint immediately above or below each question and its group of supposed answers a notation 24 designating the correct answer to that particular question, such as the notation "Correct Answer—5." After the player has made his selection of answers, this notation will be projected on the screen. Also, located at the top or bottom of each frame in the film is a horizontal opaque strip 25 in which a transparent "window" area 26 is located at a particular one of six different locations across the width of the opaque strip 25. This transparent area 26 will be located at a particular one of these six different locations, depending upon the numbered identification of the correct answer in that particular frame. For example, in the frame illustrated in Figure 5, answer #5 is the correct answer, and, accordingly, the transparent area or window 26 in this particular frame of the film is located in the #5 position across the width of the opaque strip 25, in which position this transparent area will permit a light beam from the projector to impinge on the photoelectric cell occupying #5 position in the series.

Each of the six photoelectric cells 23 is enclosed in a separate light-tight cell or housing 27 having a front window 28 therein in front of which swings a pivoted shutter 29 normally held in closed position by a spring 31. Separate solenoids 32 are operatively linked to each of the six shutters 29. Each of these six solenoids is made electrically responsive to the depressing of a particular one of the six manually operable keys 7 located at the front of the machine. Thus, if the player concludes that answer #5 is the correct answer to the question appearing in Figure 5 and depresses key #5, this will energize the solenoid 32 and swing the shutter 29 of the fifth photoelectric cell 23, and since the transparent area 26 in the film is then projecting a light beam on the target window of this fifth photoelectric cell, such cell will become energized, indicating that a correct answer has been given to the question, thereby resulting in energization of the automatic scoring apparatus.

The film may or may not be provided with the "Correct Answer" notation indicated at 24, this feature being optional. In machines employing this feature, we provide a hinged shutter 36 (Figure 4) extending horizontally across one end portion of the screen 3 on the under side thereof, this shutter normally occupying a position where it blocks off from the screen the projection of the "Correct Answer" notation 24. The shutter is normally held in this blocking or intercepting position by suitable spring means 37, and is adapted to be swung down to unblocking position by the energization of a solenoid EM, in which unblocking position it permits the projection of the "Correct Answer" notation 24 upon the screen 3.

We shall first briefly describe the mechanical construction of certain motor operated cam switches, rotary switches, solenoid switches, bank relay reset mechanism, etc. used in the game, and shall then describe the electrical circuits interconnecting such apparatus.

Referring now to Figure 7, this diagrammatically illustrates one form of conventional switch mechanism which automatically interrupts the circuit of the projector motor PM after the motor has advanced the film F a predetermined distance. In the preferred embodiment herein disclosed, this predetermined distance is two frames of the film. By thus projecting each alternate frame while the

film is being advanced in one direction, the reversing mechanism can be arranged so that when the projector motor is reversed to run the film in the other direction those alternate frames which were skipped in the running of the film in the first direction will be projected in the running of the film in the second direction, thereby minimizing the possibility of players remembering the answers to previous questions, particularly near either end of the film. The shaft 41 is driven by the projector motor PM through suitable speed reducing mechanism, and carries advancing rollers or dogs 42 which impart advancing motion to a sprocket advancing gear 43 mounted on a shaft 44 which drives a film advancing sprocket wheel. The two dogs 42 advance the film two frames. Also mounted on the shaft 41 with the dogs 42 is a heart-shaped cam 45 which tracks against a roller 46 journaled on an arm 47. This arm is pivoted at 48 and is biased by a spring 49 in a direction to hold the roller 46 pressed against the cam 45. Pivotally connected at 51 to the arm 47 is a link 52 which transmits motion to the lever 53 of a two position switch PS. The operating relation is such that the micro-switch opens the circuit of the projector motor PM when one of the dogs 42 has advanced an alternate frame *f* into projecting position in the aperture of the projector.

Figure 8 illustrates a typical or conventional arrangement of advancing and release mechanism employed in each of the four rotary switches K, N, Q and T used in the system. Each of these rotary switches is of the spring return type, utilizing a return spring 56 wound around switch shaft 57 to return the switch to home or zero position. Mounted on the shaft 57 is a ratchet wheel 58 with which an advancing pawl 59 and a holding pawl 61 cooperate. The advancing pawl 59 is pivoted at 62 to an advancing lever 63 which is pivotally mounted at 64. The lower end of this lever is pivotally connected to the core of an advancing solenoid 65, and the upper end of the lever is connected to a tension spring 66 which normally holds the advancing pawl 59 in the position illustrated, resting on the tips of the ratchet teeth. The holding pawl 61 is pivoted at 68 and is normally held in engagement with the ratchet wheel teeth by the spring 69, being pivotally connected to the core of a solenoid 71 which is adapted to release said holding pawl. In each of the aforementioned rotary switches the shaft 57 drives a rotary switch arm with a step-by-step motion.

Figure 9 diagrammatically illustrates three motor driven cams MC1, MC2 and MC3 connected to be driven by a motor MK (Figure 18D). Responding to cam MC1 are contacts MK1, MK2 and MK3; responding to cam MC2 are contacts MK4; and responding to cam MC3 are contacts MK5, MK6 and MK7.

Figures 10, 11 and 12 illustrate one of the two banks of relays used in the system. Each bank consists of 14 relays, bank B1 comprising relays R1 to R14 inclusive, and bank B2 comprising relays R15 to R28 inclusive, as shown in Figure 18D. The two banks B1 and B2 are identical except that the last six relays R23 to R28 inclusive of bank B2 are provided with an extra pair of contacts, designated KA to KE inclusive. Each bank of relays comprises a long supporting frame comprising a longitudinally extending channel frame member 73 and a longitudinally extending tie rod 74 which have their ends secured to L-shaped frame members, 75, 75'. Each relay comprises an electromagnet 76 secured to the web of the frame channel 74 and extending forwardly therefrom. Responding to each electromagnet is a vertically extending armature 77 which has its lower end pivoted to the lower flange of the channel frame member 75, this armature being normally biased in an outward direction by a tension spring 78. Each armature 77 controls an individual latch plate 79 which extends horizontally above the electromagnet 76 and above the upper end of the armature 77. The rear end of each latch plate 79 is pivotally mounted in the web portion of the frame channel 74 for vertical swinging movement of the outer end of the latch plate, the latter being normally biased in this direction by a tension spring 81. The upper end of the armature plate 77 is provided with an upwardly extending tongue 82 which normally bears against a solid under surface of the latch plate 79 for holding this latch plate elevated substantially in the horizontal position shown. When the armature 77 is attracted by the energization of its respective electromagnet 76 the tongue 82 moves back until it registers with an aperture 83 formed in the latch plate 79. Thereupon, the latch plate 79 snaps downwardly under the action of the spring 81, latching the armature 77 in attracted position with the tongue 82 held in the aperture 83. The downward movement of latch plate 79 actuates contacts individual to that relay through the downward movement of an insulated transverse pin 85 carried by an arm 86 extending upwardly from the latch plate 79. The insulated pin 85 moves down into engagement with the projecting end of contact blade 87, thereby separating contacts 88, 89 and engaging contacts 88, 90. In the case of the relays R23 to R28, the contact actuating pin 85 in its normal raised position also holds contacts 92, 93 separated, these contacts engaging when the contact actuating pin 85 moves downwardly in response to the energization of its respective relay. Any and all relays R1 to R28 remain latched in the above described position immediately following energization, until the relay resetting mechanism associated with that bank of relays is energized.

This relay resetting mechanism comprises a solenoid 95 mounted on end frame member 75', the core 96 of which solenoid is link connected with a crank arm 97 mounted on a rotatable resetting shaft 98. This resetting shaft 98 extends throughout the length of the bank of relays, and is journaled at its ends in the end frame members 75, 75'. Secured to the far end and also to an intermediate point of the resetting shaft 98 are crank arms 97'. Welded or otherwise secured to the swinging ends of crank arms 97, 97', 97' is a resetting rod 99. When the solenoid 95 is energized the resulting rotation of resetting shaft 98 swings the resetting rod 99 upwardly against the under sides of any latch plates 79 which have been tripped by the energization of their respective relay coils 76, thereby swinging said latch plates 79 back up to normal positions, in which they are retained by their associated armature plates 77 swinging outwardly to their deenergized positions.

Mounted on the armature plate 77 of the first relay R1 of first bank B1, and mounted on the armature plate 77 of the first relay R15 of second bank B2, is a laterally extending arm 101 which projects out through an aperture 102 in the end support 75'. When the aforesaid first relays of either of said banks is energized, this arm 101 is moved laterally thereby closing a pair of spring mounted contacts 104, 105 supported on the end supporting member 75'. These contacts 104, 105 can be connected in series with the resetting solenoid 95 so that the bank of relays will reset only when one of the relays in that bank (relay R1 in bank B1, and relay R15 in bank B2) has been tripped, at which time contacts 104, 105 will be in closed position.

Figures 13 to 16 inclusive illustrate the point registering or totalizing unit 19, which displays three numeral wheels 107, 108, 109 in the totalizing window in the back panel 4 of the machine. These three numeral wheels 107–109 are mounted on a shaft 111 carried between spaced end plates 112, 112' of the totalizing unit. Referring to Figure 13, there is mounted on shaft 111 on the outer side of end plate 112 an advancing star wheel 114 which is advanced by stepping pawl 115 pivotally mounted on lever 116. An advancing solenoid MA operates through a core 117 and spring 118 to actuate lever 116 and pawl 115. An overthrow preventing pawl 119 is biased by spring 121 to engage resiliently between the teeth of star wheel 114 to prevent overthrow of said

wheel in either an advancing or retracting direction. This star wheel **114** is connected through shaft **111** with the units counting wheel **107**. The tens wheel **108** and hundreds wheel **109** are loosely mounted on the shaft **111**, and conventional carry-over mechanism carries over from the units wheel **107** to the tens wheel **108**, and from the tens wheel **108** to the hundreds wheel **109**.

Connected to the opposite end of shaft **111** on the outer side of the other end plate **112'** is a retracting star wheel **114'**, which is stepped by a stepping pawl **115'** pivotally mounted on lever **116'**. A retracting solenoid MB operates through a core **117'** and spring **118'** to actuate lever **116'** and pawl **115'**, for retracting totals which have been set up on the numeral wheels **107—109**. Stop mechanism limits the retractive movement of the units wheel **107** to zero position.

Mounted on each numeral wheel is a side flange **121** having a notch **122** therein (Figure 16), which is presented in a lowermost position when the numeral wheel is in a zero position. Extending across the bottom peripheries of the three numeral wheels **107–109** to engage the side flanges **121** of all three wheels is a registration bar **123** having side arm portions **124** pivoted on a transverse pin **125** extending between the side plates **112, 112'**. The rear ends of the side arm portions **124** are joined by a transverse rear angle bar having a rearwardly projecting insulating tongue **127**. Mounted on brackets **128** carried by the side plates **112, 112'** are two sets of contacts MR3 and MR4 (Figure 18D) which extend transversely of the unit directly above the insulating tongue **127**. When all three numeral wheels are in zero positions, the registration bar **123** is registering in all three notches **122**, and the sets of contacts MR3 and MR4 are open. When any one of the numeral wheels is advanced into a number indicating position, the registration bar **123** is depressed, and the sets of contacts MR3 and MR4 are moved to closed circuit positions.

In Figure 17 we have illustrated diagrammatically a conventional form of switch PN for reversing the projector motor PM when the film F approaches either of its ends. Cut in one edge of the film adjacent each of its ends are notches **132**. Resiliently bearing against this edge of the film is a spring pressed finger or plunger **133** which is adapted to snap into each of the notches **132** at the end of the film for actuating the reversing switch PN.

Referring now to circuit diagrams **18A—18E**, these figures are adapted to be assembled with Figure 18AA located to the right of Figure 18A; with Figure 18B located above Figure 18A; with Figure 18C located below Figure 18A; with Figure 18D located to the left of Figure 18A; with Figure 18DD located to the left of Figure 18D; and with Figure 18E located to the right of Figure 18AA. Three of the aforementioned rotary switches, designated T, N and Q are shown in Figure 18E, and a fourth rotary switch, designated K is illustrated in Figure 18DD. The aforementioned motor driven switch comprising the three switch cams MC1, MC2 and MC3 driven by motor MK, appears in Figures 18D, 18DD. A somewhat similar motor driven timer switch SY appears in Figure 18A, this timer motor SY driving three cams ST, SU and SV, each of which controls switch contacts.

The system is supplied with electrical energy by three power transformers PT1, PT2, PT3, transformer PT1 being shown in Figure 18AA, transformer PT2 being shown in 18D and transformer PT3 being shown in Figure 18B. Transformer PT1, shown in Figure 18AA, has its primary winding energized through the 115 volt supply circuit conductors P6 and P10, which supply conductors also extend to different parts of the system for supplying certain apparatus to be energized. Transformer PT1 has two connected secondary windings which supply voltages to two supply conductors W and C2, these two supply conductors having a common return conductor X. Supply circuit conductors W and C2 are protected by suitable fuses.

Transformer PT2, shown in Figure 18D, has its primary winding energized by the 115 volt supply circuit conductors M11 and M18, which are also extended to different portions of the system illustrated in Figures 18D and 18DD. Transformer PT2 has two connected secondary windings which supply voltages to supply conductors *y* and *o*, these two supply conductors having a common return *w'*.

Transformer PT3, shown in Figure 18B, has a filament heating secondary winding H, H, and has two additional secondary windings supplying cathode and plate voltages to the tubes of the photoelectric cell circuit.

We shall now briefly describe the functions of each of the four rotary switches T, N, Q and K. Rotary switch T (Figure 18E) automatically controls the time indicating dial **15** in the back panel **4**, which dial indicates the time required to answer each question. This dial comprises a semi-circular arrangement of lights T1 to T6 (Figure 18E) disposed behind the dial numerals 10 to 60 denoting six ten second intervals, or 60 seconds, which constitutes the maximum alloted time in which to answer each question. A seventh light T7 is disposed behind the dial legend "Time Up" to indicate the termination of the allotted time for answering the question. The switch arm T8 of rotary switch T wipes over successive contact points establishing circuits in the direction from light T6 to T1, and finally to light T7, for the purpose of indicating the diminishing time interval remaining in which to answer the question. The switch arm T8 is stepped from one contact point to the next in the counterclockwise direction indicated by the successive energizations of the stepping or advancing solenoids TS (similar to advancing solenoid **65** of Figure 8). The switch arm T8 is reset back to the normal position illustrated by the energization of reset solenoid TR (similar to resetting solenoid **71** of Figure 8), these advancing and resetting solenoids operating through mechanism similar to that previously described in connection with Figure 8.

Referring now to rotary switch N in Figure 18E, the function of this switch is to trip the bank relays R1 and R28 inclusive, shown in Figures 18D and 18DD. The rotary switch N comprises a series of twenty-eight contacts leading to terminals N1 to N28 inclusive, and sweeping over these twenty-eight contacts is the rotary switch arm N29. The twenty-eight terminals of the rotary switch N are connected to the twenty-eight relay contacts NR1 to NR28 inclusive of the two banks of relays R1 to R28 of Figures 18D and 18DD. These bank relays R1 to R28 control the lighting of lights L1 to L30 inclusive, which constitute the block scoring arrangement **18** disposed in the indicating panel **4**. These lights L1 to L30 are controlled by the normally open contacts LW1 to LW28 responding to each of the relays R1 to R28. The rotary switch arm N29 is adapted to be advanced in the counterclockwise direction indicated by successive energizations of the advancing or stepping solenoid NS, and is adapted to be reset to home or normal position by the energization of the resetting solenoid NR (Figure 8).

Referring now to the rotary switch Q (Figure 18E), the function of this switch is to operate the question designating dial **14** in the back indicating panel **4**. This switch has six contacts connecting with lights Q1 to Q5 inclusive and with light QE respectively. The lights Q1 to Q5 are located behind the numerals 1 to 5 inclusive of the question designating dial **14**, the illumination of either one of these five lights indicating the number of the question which is then being projected on the screen **3**. In the illustrated arrangement, five separate questions are projected in each complete game, but obviously a greater or lesser number may be employed. The sixth light QE is located behind the legend "Game Ended," appearing after the numeral 5 on the question designating dial **14**. Thus, the rotary switch Q serves to indicate to the player the number of the particular question which he is to answer or which he has just answered. The rotary

switch arm Q8 is given successive advancing movements by the successive energizations of the stepping or advancing solenoid QS, and this rotary switch arm is restored to the normal position illustrated by the energization of the resetting solenoid QR.

Referring now to rotary switch K, shown in Figure 18DD, the function of this rotary switch is to control the number of rating points or the free plays to be registered. This switch has a first isolated contact K1, a set of two connected contacts K2', a set of five connected contacts K3', a set of eight connected contacts K4', a second set of eight connected contacts K5', and a final set of twenty-four connected contacts K6'. The switch arm K7 normally stands in engagement with the first contact K1'. The aforesaid contacts, K1' to K6' inclusive are connected through conductors K1 to K6 to be energized through contacts mounted on the last six bank relays R23, R24, R25, R26, R27 and R28. For example, the closing of contacts KA of bank relay R23 energizes switch contact K1' through conductor K1; the closing of contacts KB of relay R24 energizes the switch contacts K2' through conductor K2; the closing of contacts KC of relay R25 energizes switch contacts K3' through conductor K3; the closing of contacts KD of relay R25 energizes the switch contacts K4' through conductor K4; the closing of contacts Ke of relay R27 energizes switch contacts K5' through conductor K5; and the closing of contacts KF of relay R28 energizes the switch contacts K6' through conductor K6. Hence, it will be seen that it is only the energization of the last six bank relays R23 to R28 inclusive that energizes the stationary contacts K1' to K6' inclusive of rotary switch K. The switch arm K7 is adapted to be stepped progressively in the counterclockwise direction indicated by the successive energizations of the stepping or advancing solenoid KS, and this rotary switch arm is adapted to be returned to normal position by the energization of the resetting solenoid KR (Figure 8).

With regard to the arrangement of the lights L1 to L30 inclusive in the bank scoring arrangement 18 mounted in indicating panel 4, it will be seen that lights L1 to L24 responding to relays R1 to R22 are variously arranged at random in the columns and rows of the scoring bank 18. However, light L25 responding to relay R23 is located in the first vertical column; light L26 responding to relay R24 is located in the second vertical column; light L27 responding to relay R25 is located in the third vertical column; light L28 responding to relay R26 is located in the fourth vertical column; light L29 responding to relay R27 is located in the fifth vertical column; and light L30 responding to relay R28 is located in the sixth vertical column. Referring particularly to Figures 18D and 18DD, it will be seen that lights LA, LB, LC, LD, LE and LF are connected respectively in shunt of lights L25, L26, L27, L28, L29 and L30, and it will also be seen from Figure 2 that the latter lights LA to LF inclusive are located in the radial segments located at the bottoms of the vertical columns in which lights L25 to L30 inclusive are located, each of these corresponding pairs of lights in each column and segment being illuminated together.

It will be seen from the foregoing that the successive stepping of the switch arm N29 of the rotary scoring switch N will successively complete circuits through connections N1 to N28 that will successively energize or trip the two banks of relays R1 to R28. The tripping of the first relay R1 simultaneously illuminates the first three lights L1, L2 and L3, which are connected together for simultaneous illumination. Thereafter, the tripping of relay R2 illuminates light L4, the tripping of relay R3 illuminates light L5, and so on up to the tripping of relay R28 which illuminates lights L30 and LF. By the time that the rotary switch arm N29 gets around to energizing the relay R23 all of the lights in the bank 18 have been illuminated, with the exception of lights L25 to L30 inclusive. The energization of relay R23 illuminates light L25, completing the illumination of the first vertical column of lights in the bank; the energization of relay R24 illuminates light L26, completing the illumination of the second column of lights in the bank, and so on until the energization of relay R28 illuminates light L30, completing the illumination of the sixth and last column of lights in the bank. This represents a perfect score for answering correctly all five questions in the game.

When any of the last six relays R23 to R28 is energized, a circuit is completed from one of the rotary switch contacts K1' to K6' through rotary switch arm K7 and conductor K8 to the energizing winding of relay MD, the other terminal of which has connection to common supply conductor O. For example, when relay R23 is energized, this immediately energizes relay MD, closing contacts MD4 and starting scoring motor MK through a circuit established from supply conductor O through contacts MD4 and conductor M1. The energization of motor MK will immediately start driving motor cams MC1, MC2 and MC3. Cam MC2 will operate pulsing contacts MK4 to transmit five pulses to the advancing solenoid MA of free-play totalizing unit 19 (Figures 13–16), over a circuit including conductor M14, right hand pair of contacts MD6 and conductor M2 to advancing solenoid MA. After the transmission of the fifth impulse to advancing solenoid MA, the motor cam MC1 will operate through contacts MK3 to complete a circuit through conductor M10, relay contacts MD2 and conductor K9 to the stepping solenoid KS of rotary switch K, thereby stepping this rotary switch one position. It will be seen from the description thus far that for every five points of free-plays registered, the rotary switch K will be stepped one position, as will be hereinafter described more in detail.

The game is set for play by dropping an appropriate coin into the coin receiving slot 9, which directs the coin down into engagement with the coin tripping arm CS1 (Figure 18B) of the coin micro-switch, the tripping arm CS1 serving to close the normally open contacts CS of the micro-switch. This completes a circuit from supply conductor C2 (energized by transformer PT1) to conductor C1, which immediately energizes the advancing coil CM of coin recording meter CRM, through the common return conductor *x*. This coin recording meter CRM makes a one step advancement when energized, to register each coin deposited in the machine. Conductor C1 continues to the energizing coil of reset relay SN (Figure 18AA) and thence to common return *x*, resulting in the energization of reset relay SN. Conductor C1 also continues to normally closed contacts SM1 on master relay SM (Figure 18AA), the circuit thence continuing from these contacts through conductor S4 to normally closed contacts SO1 of the unlock relay SO. From contacts SO1 the circuit continues through conductor S6 to the energizing coil of master relay SM, the circuit being completed through return conductor *x* leading back to transformer PT1. The master relay SM will, therefore, energize, and will remain energized through normally open contacts SM2, which complete a holding circuit from supply conductor C2 to the energizing winding of master relay SM through conductor S4, contacts SO1 and conductor S6. The energization of reset relay SN closes normally open contacts SN1 of this relay, which complete a circuit from conductor C1 to conductor S5, which continues through normally open contacts SM6 of master relay SM to conductor T9. Conductor T9 continues through release solenoid TR of rotary time switch T to common return *x*, the energization of which release solenoid TR will reset contact arm T8 of rotary switch T back to its starting position. Also, the closing of normally open contacts SN2 on the energization of reset relay SN will complete a circuit from conductor C1 through contacts SN1 and SN2 to conductor Q6 which will energize release

solenoid QR, so as to result in the switch arm Q8 of rotary switch Q being returned to starting position. The energization of conductor Q6 will also energize release solenoid NR on rotary switch N, with the result that the contact arm N29 of this rotary switch will also be returned to starting position.

The energization of reset relay SN also closes normally open contacts SN3, which complete a circuit from supply conductor O through conductor M3 which leads to one side of replay solenoid MB (Figure 18D) and the other side of which connects to conductor *w'* thereby stepping relay counter 19 back one count. As previously described, conductors *o* and *w'* are energized by transformer PT2 in Figure 18D. The closing of normally open contacts SN4 of reset relay SN will also complete a circuit from supply conductor O through conductor M1 to start motor MK, the circuit being completed through transformer conductor *w'* (Figure 18D). When motor MK is started, the normally open contacts MK7 responding to motor cam MC3 will close and complete a holding circuit from conductor O to conductor M1, thereby keeping the motor MK energized for one-quarter of a revolution, these contacts MK7 opening up as soon as the cam follower drops into the next cut-out on cam MC3 at the end of one-quarter of a revolution. During this one-quarter of a revolution the contacts MK5 responding to cam MC3 will close and will complete a circuit from supply conductor O through conductor K10 and through normally closed contacts MD1 of relay MD. From contacts MD1 this circuit continues to the release solenoid KR on rotary switch K, the energization of which results in the releasing of the contact arm K7, for spring return of this contact arm back to its normal position in engagement with contacts K1'. Also, during this one-quarter of a revolution of the motor cams MC1, MC2 and MC3, the bank relays B1 and B2 will be reset to their starting positions, this being accomplished through the energization of conductors M13 and M12. Conductors M13 and M12 are energized from conductor M11 leading from one side of the supply circuit of transformer PT2. Conductor M11 continues through normally closed contacts MD5 of relay MD to contacts MK6 responding to motor cam MC3. The closing of contacts MK6 resulting from rotation of cam MC3 continues the circuit from M11 through M12 which leads to bank reset solenoid BC2. Conductor M11 also continues to contacts MK2 which respond to motor cam MC1. The closing of these contacts completes the circuit from M11 through M13 to the bank reset solenoid BC1. A common return M18 leads from the other terminals of the bank reset solenoids BC1 and BC2 (95 in Figures 10 and 11) back to the other side of supply circuit of transformer PT2. Contacts MK6 and MK2 are normally open but will impulse once during each quarter revolution of their respective cams MC3 and MC1. Contacts MK6 and MK2 are so placed in position with regard to their respective cams MC3 and MC1 that contacts MK6 will impulse before MK2, whereby bank relays B2 will be reset to start position before bank relays B1, to avoid the resetting motion of switch arm N29 from energizing relays R14 to R1 in such resetting motion.

The normally closed contacts SM1 on master relay SM break the circuit from conductor C1 to conductor S4 upon energization of relay SM. Also, contacts SM3 of master relay SM connect supply conductor C2 to conductor P11 which extends to normally open switch contacts PR1 of correct answer relay PR in the photoelectric cell amplifier circuit (Figure 18B). Conductor P11 also branches to normally closed contacts SS2 on projector motor relay SS and to normally open contacts SP1 on time-up relay SP, so that both of these sets of contacts energize from conductor C2 upon the closing of master relay contacts SM3. Referring to normally open contacts SM4 of master relay SM, one side of these contacts is normally energized over conductor P10 which connects to one side of the supply line of power transformer PT1. The closing of contacts SM4 connects conductor P10 to conductor P5, which connects this side of the 115 volt supply line to ventilating motor PV (Figure 18C), the other terminal of this motor being connected to the other side of said supply line through conductor P6.

Referring to the set of three contacts SM5 on master relay SM, the normally open pair of these contacts normally maintains conductor P8 out of contact with supply line conductor P10. When master relay SM is energized, conductor P8 is energized from supply line conductor P10 through the lower pair of contacts SM5, conductor P8 connecting to projector lamp PL. The upper normally closed pair of contacts SM5 separate when master relay SM is energized, and break the 115 volt supply circuit through conductor C3 to relay coil CR. This relay coil CR is normally in series with projector lamp PL through relay contacts SM5. When relay SM is in normal position the circuit is completed at micro-switch PS. This circuit of relay coil CR is optional. The purpose of relay CR is to release the arm CR1 to reject any additional coins when the master relay SM is energized. The closing of normally open contacts SM3 upon the energization of master relay SM also energizes the timer motor SY from supply conductor C2 over a branch of conductor P11. When the circuit to master relay SM is opened, the contacts SU2 which respond to reset cam SU maintain the timer motor SY energized over conductors C2 and P11 until the cam SU reaches normal position and opens contacts SU2. It will be seen that the primary coin responsive reset circuits have now been energized; and that projector lamp PL has a circuit through normally open contacts on micro-switch PS to conductor P6. As previously described in connection with Figure 7, these normally open contacts on micro-switch PS are closed by a lever 53 and connecting link 52 responsive to the operation of the projector motor PM.

The function of the amplifier arrangement, shown in Figure 18B, is to supply enough current under control of the photoelectric cells 23 to control the correct answer relay PR, such relay constituting part of the amplifier circuit. When the player has pressed the correct answer key 7, so as to swing the shutter 29 of the photoelectric cell 23 which is receiving the light beam through transparent area 26 in the film F, the resultant energization of the exposed photoelectric cell will create a current which is amplified by the amplifier tubes for causing operation of the correct answer relay PR. This energization of correct answer relay PR will close contacts PR1 to complete a circuit from conductor P11 to conductor P12 and thence to energizing coil of answer relay SL, as will be later described. On the other hand, when the player presses an incorrect answer key 7, the shutter 29 of a photoelectric cell 23 which is not receiving the light beam through transparent area 25 is opened, with the result that no photoelectric cell is energized. Under these conditions, correct answer relay PR will remain in its normal non-energized condition, with contacts PR1 remaining in normally open position.

Now that an appropriate coin has been inserted in the coin slot 9, with the result that the reset circuits have been energized and the projector lamp PL has been energized, all as above described, the first question of the game will be projected on the screen 3, together with six possible answers. Let us assume that the question and the six possible answers are as follows:

The patron Saint of England is—

1. Geofrey
2. Gerald
3. Gilbert
4. Gordon
5. George
6. Graham

When this frame of the film is projected on screen 3, the beam of light from transparent area 26 in the film will be reflected from mirror M against the shutter of photoelectric cell #5, since answer #5, namely "George," is the correct answer. The six numbered keys 7 which the player must choose from, as being the correct answer, are arranged to actuate open-and-close micro-switches EG, EH, EI, EJ, EK and EL (Figure 18B). These micro-switches are connected through conductors E1, E2, E3, E4, E5 and E6 with shutter operating solenoids EA, EB, EC, ED, EE and EF (corresponding to solenoids 32 in Figure 6). The micro-switches EG to EL are energized seriatim from conductor E8. Conductor E8 extends to normally closed contacts SP2 on time-up relay SP, which connects to conductor S2. Conductor S2 extends to normally closed contacts SF2 on selection relay #6 (SF), thence to normally closed contacts SE2 on selection relay #5 (SE), thence to normally closed contacts SD2 on selection relay #4 (SD), thence to normally closed contacts SC2 on selection relay #3 (SC), thence to normally closed contacts SB2 on selection relay #2 (SB), and thence to normally closed contacts SA2 on selection relay #1 (SA), which latter contacts connect to conductor S1. Conductor S1 comprises an upwardly extending branch which extends to normally closed contacts SS2 on projector motor relay SS, completing the series circuit through conductor P11 and contacts SM3 of energized master relay SM to supply conductor C2. The other terminals of each of the shutter operating solenoids EA to EF are connected to a common return conductor X.

Immediately upon the energization of master relay SM, and the closing of relay contacts SM3, the resulting energization of conductor P11 starts the timer motor SY to operating. The resulting rotation of impulse cam SV operates through the pulsing contacts SV1 to transmit impulses from supply conductor C2 over conductor S4 to normally closed contacts SL1 on answer relay SL. When the answer relay SL is de-energized, these impulses are transmitted from contacts SL1 over conductor T10 to the stepping solenoid TS for stepping the switch arm T8 of time switch T. The switch arm T8 normally holds light T6 illuminated, but as a result of the impulses will successively energize at predetermined intervals, such as of 10 second duration, the successive time indicating lights T5, T4, T3, T2 and T1, and will finally illuminate light T7 to indicate "Time Up" for the question, unless, in the meantime, the answer relay SL has been energized from correct answer relay PR, in which event the impulses will be directed to rotary switch N, as will be later described.

Assuming that the player has selected #1 key to press (which is an incorrect answer), while the rotary time switch T is pulsing off the time intervals, the resulting closure of micro-switch EG will energize conductor E1 from conductor E8. Energization of conductor E1 will operate through its lower branch to energize the shutter operating solenoid EA to expose photoelectric cell #1. Since no light beam is being reflected to this cell #1 from the transparent area 26 in the film, but instead is being reflected to cell #5, the amplifier tubes will have no signal to amplify and the correct answer relay PR will remain unenergized, with its contacts PR1 remaining open. The other branch of conductor E1 extending from micro-switch EG extends to energizing winding SA of selection relay #1, the opposite terminal of which winding connects to common return conductor *x*. This selection relay #1 will immediately energize, and will remain energized through contacts SA1 connecting conductor E1 to conductor S1. The upper branch of conductor S1 extends to normally closed contacts SS2 of projector motor relay SS; from whence the circuit continues through branch conductor P11 to contacts SU2 of reset cam SU, which contacts are now closed, and thence to supply conductor C2. With the energization of selection relay #1, the normally closed contacts SA2 of this relay will open and interrupt the circuit to the remaining micro-switches EH to EL inclusive, such interrupted circuit being over conductors S2 and E8 and contacts SP2. Also, contacts SA3 of selection relay #1 will complete a circuit from supply conductor W to conductor F1 which energizes key light F1' located under the #1 plastic key. The other terminals of the bank of key lights F1' to F6' are connected to common return conductor X. Normally open contacts SA4 on selection relay #1 move to closed circuit position upon the energization of this relay and energize the correct answer showing shutter 36. This occurs from conductor S1 through contacts SA4 to conductor S3 extending to normally closed contact SP1 on time-up relay SP and then through conductor E7 to the solenoid E*m* which swings the "Correct Answer" shutter 36 to open position. The provision of the "Correct Answer" shutter 36 is an optional feature, as desired. Inasmuch as the answer which was given was incorrect, the "Incorrect" indicating light 16 will be energized, this occurring through conductor L32 and through the upper normally closed pair of contacts SL2 of answer relay SL and thence to conductor S3, which latter conductor is energized at this time to actuate the correct answer showing shutter 36, as above described.

When the arm T8 of rotary time switch T is advanced into engagement with the last contact for energizing "Time Up" light T7, this energized condition will also be transmitted over lower branch conductor T7' to the energizing coil of time-up relay SP, resulting in the energization of this relay. The correct answer shutter 36 will return to closed position by the de-energization of solenoid EM through the opening of normally closed contact SP1 of time-up relay SP. Also, upon the energization of time-up relay SP, the opening of contacts SP2 will open the circuit over conductor S2. At this point, the contact ST1 responding to unlock cam ST will complete a circuit from supply conductor C2 through conductor Q7 to energize the coil of projector motor relay SS. Conductor Q7 also extends to the stepping solenoid QS of the question designating rotary switch Q, for advancing the contact arm Q8 of this rotary switch into engagement with the second contact for illuminating question indicating light #2 of the question designating dial 14. When the projector motor relay SS is energized by way of unlock cam contacts ST1 over conductor Q7, the normally closed contacts SS2 of relay SS will open the circuit S1 leading to all of the selection relays #1 to #6, designated SA, SB, SC, SD, SE and SF, resulting in the de-energization of the selection relay then standing energized. At the same time, normally open contacts SS1 on projector motor relay SS will complete a circuit from supply conductor P6 to conductor P2 to start the projector motor PM (Figure 18C). Concurrently therewith, it will also energize the brake solenoid PB on the projector motor for releasing the brake.

The projector motor PM will remain energized until link 52 and arm 53 open normally closed contact N. C. on the micro-switch PS, thereby setting up the next question on the screen. Let us assume for the moment that questions #1, #2, #3 and #4 have been gone through and that question #5 is projected onto the screen 3. The question designating switch arm Q8 will be on the fifth contact for energizing light Q5. This will energize the downwardly extending branch of conductor Q5' which extends to contact ST2 on unlock cam ST (Figure 18A). From these contacts ST2 the circuit will continue over conductor S7 through the energizing winding of unlock relay SO and thence to common return conductor *x*, with resulting energization of unlock relay SO. When unlock relay SO is energized, its normally closed contacts SO1 will open, and thereby interrupt the circuit from conductor S4 through conductor S6 to the coil of master relay SM, resulting in the de-energization of this latter relay. The contact ST1 responding to unlock cam ST will complete

a circuit from supply conductor C2 to conductor Q7, which will energize stepping solenoid QS on question designating switch Q through one implse. This will step rotary switch arm Q8 to the last contact, which will illuminate light QE of dial 14 to indicate that the game is ended. These circuits are identical with the six selection relays SA, SB, SC, SD, SE and SF when an incorrect answer is selected, i. e. these circuit conditions prevail irrespective of which selection relay SA to SF is energized, so long as it corresponds to an incorrect answer.

Going back to the situation wherein the first question is still on the screen 3, assume now that the player has selected the correct answer to the question, this being answer #5. The impulses transmitted from contacts SV1 on impulse cam SV will now be transferred through contacts SL1 on asnwer relay SL from the stepping solenoid TS of time switch T to the stepping solenoid NS of scoring switch N, as will now be explained. The act of the player in pressing key #5 closes the micro-switch EK, with resulting energization of conductor E5. The resulting energization of shutter actuating solenoid EE will open the shutter 29 to photoelectric cell #5. The beam of light through transparent area 26 in the film will strike exposed photoelectric cell #5, thereby energizing this cell, which will operate through the amplifier tubes to energize the correct answer relay PR. The consequent closing of contacts PR1 will complete the circuit from conductor P11 to conductor P12, which energizes the winding of answer relay SL. In establishing this circuit, conductor P11 is energized from supply conductor C2 through contacts SM3 of master relay SM. When the answer relay SL is energized, its contacts SL1 open circuit between conductors S4 and T10 and close circuit between conductors S4 and N30. Conductor S4 receives impulses from contacts SV1 responding to impulse cam SV, and thereupon transmits these impulses over conductor N30 to cause successive energization of the stepping solenoid NS of rotary switch N. Assuming now that the player has depressed key #5 and has closed micro-switch EK before the time pulsing contacts SV1 made contact, the stepping solenoid NS will step rotary switch arm N29 over six contacts, corresponding to circuit connections N1, N2, N3, N4, N5 and N6.

It will be seen from the description thus far that the answer relay SL directs the pulses created by the pulsing contacts SV1 either to the rotary timing switch T or to the rotary scoring switch N. That is to say, the answer relay SL determines whether all six pulses from pulsing contacts SV1 shall go to the rotary timing switch T or to the rotary scoring switch N, or determines what proportion of these six pulses shall go to switch T and to switch N. Summarizing the operation of this answer relay SL briefly, when the player depresses a key 7 which is not the correct answer, the correct answer relay PR associated with the photoelectric cells 23 is not energized and hence the contacts PR1 of this relay are not closed. Thus, no circuit is established over conductor P12 to the answer relay SL, and, accordingly, the contacts SL1 remain in their normal positions, under which conditions the six pulses transmitted from pulsing contacts SV1 over conductor S4 are directed out over conductor T10 to the stepping solenoid TS for stepping the rotary time switch T. At this same time, the contacts SL2 of answer relay SL will maintain a circuit from conductor S3 through conductor L32 to the "Incorrect" light 16. On the other hand, when the correct answer is given, the correct answer relay PR is energized, with resulting closure of its contacts PR1 and the establishment of a circuit from conductor P11 to conductor P12. The energization of conductor P12 energizes the winding of answer relay SL, and, accordingly, the contacts SL1 and SL2 of this relay are transposed to their other positions. The transposing of contacts SL1 disconnects conductor S4 from conductor T10 and connects it to conductor N30, this latter conductor N30 leading to the stepping coil NS of rotary scoring switch N. Hence, those pulses which are transmitted from pulsing contacts SV1 after the energization of answer relay SL are transmitted to the stepping solenoid NS for advancing rotary switch N. It will thus be seen that if the player knows the answer to the first question on sight and presses the correct answer key instantly, before the pulsing contacts SV1 transmit their first pulse, then all six pulses thereafter transmitted from these contacts SV1 are directed by relay SL over conductor N30 to advance rotary switch N through six steps, ending up at the position marked N6. Similarly, if the player, perchance a prodigy, should instantly know the answers to all five questions, and should press the proper answer keys for each question before the pulsing contacts SV1 transmit the first pulse in each series of six pulses, then all pulses for all five questions will be transmitted to the rotary scoring switch N, or a total of thirty pulses will be transmitted to the switch N, this constituting the product of five questions multiplied by six pulses per question. The stepping of the rotary scoring switch N to position N28, as a result of these thirty pulses, energizes the last bank relay R28, as previously described, and constitutes a perfect scoring record. Conversely, if the player should require, let us say, two seconds to answer any particular question, then approximately two pulses of the series of six will be transmitted over conductor T10 for advancing the timing switch T two steps, and only the remaining four pulses will be transmitted over conductor N30 for advancing the scoring switch N four steps, resulting in a lower score. Similarly, if the player should require, let us say, five seconds to answer the question, then these five pulses are transmitted to timing switch T and only the one remaining pulse will be transmitted over conductor N30 for advancing the scoring switch N only one step, resulting in a much lower score.

Let us now refer back to the condition of the system and the sequence of events which follow after the player has answered question #1 correctly. The contacts ST1 of unlock cam ST will at this juncture complete a circuit from supply conductor C2 through conductor Q7 to thereby energize the projector motor relay SS. Selection relay #5 has previously had its energizing coil SE energized by way of branch conductor E5 leading from micro-switch EK responding to the pressing of answer key #5. The above-described energization of conductor Q7 through the closing of contacts ST1 operates to energize the coil of projector motor relay SS, as a result of which the contacts SS2 of this latter relay open the circuit through conductor S1 to the previously energized selection relay SE, thereby de-energizing said relay. The energization of projector motor relay SS also closes the normally open contacts SS1 so as to complete a circuit from supply conductor P6 through conductor P2 to start the projector motor PM so as to set up the next question on the screen 3. The number of steps that the rotary switch N is impulsed depends upon the time that the player required to select the correct answer. If the time interval was such that the rotary switch T was stepped to the third contact corresponding to light T4, whereupon the correct answer was selected, the remaining impulses from contacts SV1 responding to impulse cam SV will be transferred in answer relay SL from conductor S4 to conductor N30. This answer relay SL is energized over conductor P12 upon the correct answer being given. As previously described, the energization of this answer relay SL operates through contacts SL1 to transfer the connection of conductor S4 from conductor T10 to conductor N30, this latter conductor N30 connecting to stepping solenoid NS of rotary switch N. Hence, the last three pulses transmitted from impulse contacts SV1 will energize the stepping solenoid NS three times, thereby moving rotary switch arm N29 to the third contact corresponding to connection N3. Another branch of conductor N30 leads to bell CB for conducting each of the impulses which step rotary switch N over this branch path

to said bell CB, for the purpose of sounding this bell with each stepping impulse transmitted to rotary switch N. The energization of answer relay SL will also close the lower pair of contacts SL2 for establishing a circuit from S3 to conductor L31. Conductor L31 extends to "Correct Answer" light 17, indicating that the player has selected the correct answer.

Method of scoring

The rotary switch arm N29 of rotary stepping switch N, in passing over the successive contacts N1 to N28 inclusive, successively completes circuits from conductor O to normally closed relay contacts NR1 to NR28 of the relay banks B1 and B2. When the relay coils R1 to R28 are energized by the successive energization of connections N1 to N28, the successive relay armatures 77 release their respective latch plates 79, as illustrated in Figure 12. The contacts NR1 to NR28 will open and contacts LW1 to LW28 will energize the score indicating lights L1 to L30 used in the in-line block scoring arrangement 18 illustrated in Figure 2. The lights L1 to L30 are illuminated from supply conductors W' and Y through the normally open relay contacts LW1 to LW38, supply conductors W' and Y extending from transformer PT2. Supply conductors O and W' from transformer PT2 complete the relay, solenoid and motor circuits of Figures 18D and 18DD. Let us assume that during the course of one game the player has illuminated lights L1 to L25 inclusive. This will mean that light LA will also be illuminated, as it is connected to normally open contacts LW23 and is connected in parallel with light L25. This indicating light LA is at the bottom of the first left hand column of lights in the block scoring arrangement 18. Concurrently with the closing of contacts LW23 of relay R23, contacts KA of this same relay will now complete a circuit from supply conductor W' through conductor K1 to contact K1' on rotary switch K. Since the normal position of the switch arm K7 is in engagement with contact K1', the circuit will be continued through switch arm K7 and conductor K8 to the energizing coil of relay MD, the opposite side of which coil connects to supply conductor O. When energized, this relay MD in cooperation with the totalizing register unit 19 registers the number of rating points or free plays for each of the vertical lines A to F in Figure 2. With the energization of relay MD, contacts MD1 now open the circuit through conductor K10 to the reset solenoid KR of rotary switch K. This is to prevent resetting the switch arm K7 to starting position while the rating points or free plays are registering. Also, normally closed contacts MD5 open the circuits to the bank reset solenoids BC1 and BC2 (95 of Figures 10–11) to prevent resetting the relays R1 to R28, this being accomplished by opening the circuit M11 leading to contacts MK6 and MK2, which control the de-energization of the bank reset solenoids BC1 and BC2. Furthermore, contacts MD4 close upon the energization of free play registering relay MD for completing a holding circuit for keeping the motor MK energized by way of conductors O and M1, the motor MK remaining energized until the circuit to relay MD is opened. Normally open contacts MD3 of relay MD also close upon energization of relay MD and complete a circuit from supply conductor O through conductor M15 to the impulse contacts MK4 responding to motor cam MC2. Immediately upon energization of relay MD and the starting of motor MK through relay contacts MD4, the motor driven cam MC2 will cause the pulsing contacts MK4 to transmit five pulses through conductor M14 to contacts MD6 of free play registering relay MD. The right hand pair of these contacts MD6 now establishes a circuit from conductor M14 to conductor M2, and hence these five pulses are transmitted over conductor M2 to the advancing solenoid MA of registering unit 19, impulsing this solenoid five times. After the pulsing contacts MK4 have transmitted five impulses, the contacts MK3 which respond to motor cam MC1 will complete a circuit from supply conductor O to conductor M10. The circuit through conductor M10 continues through relay contacts MD2 and through conductor K9 to the stepping solenoid KS of rotary switch K, resulting in the switch arm K7 of this switch being advanced to the next contact K2'. As the switch arm K7 breaks engagement with contact K1', the circuit to relay MD will open, assuming that contacts K2' are not energized.

Assuming now that the player's score was sufficiently high to trip relay R24, a circuit will be completed through relay contacts KB and conductor K2 to rotary switch contacts K2'. Since rotary switch arm K7 is now in engagement with switch contacts K2', the circuit will continue through rotary switch arm K7 and conductor K8 to the winding of relay MD, thereby reenergizing said relay. Fifteen free plays or points will register, as it requires three impulses of the stepping solenoid KS to move rotary switch arm K7 from contact K1' to the first contact of the group K3'. Five impulses are transmitted from pulsing contacts MK4 for each impulse transmitted to stepping solenoid KS from contacts MK3, and hence in the three impulses of the stepping solenoid KS required for moving the switch arm from contact K1' to the first of contacts K3', fifteen free plays will register. The movement of switch arm K7 from contacts K2' to contacts K3' will again open the circuit to relay MD. When the player's score went on to trip relay R24, a circuit to the indicating lights L26 and LB was closed through contacts LW24.

Assuming now that the player's score was sufficiently high to trip relay R25, a circuit will be completed from conductor W' through contacts KC and conductor K3 to rotary switch contact points K3', thereby bringing the total number of free plays or rating points to register on totalizing unit 19 up to 40. Concurrently therewith, the circuit to lights L27 and LC will be closed through contacts LW25.

Assuming that the player's score was sufficiently high to trip relay R26, a circuit will be completed through contacts KD and conductor K4 to rotary switch contacts K4', thereby bringing the totalized number of free plays or rating points up to 80. Concurrently therewith, the lights L28 and LD will be illuminated through the closing of contacts LW26.

Assuming that the player's score was sufficiently high to trip relay R27, a circuit will be completed through contacts KE and conductor K5 to rotary switch contact points K5', thereby bringing the totalized number of free plays or rating points up to 120. Concurrently therewith, the light L29 and LE will be illuminated by the closing of contacts LW27.

Assuming that the player's score was sufficiently high to energize relay R28, a circuit will be completed through contacts KF and conductor K6 to rotary switch contacts K6', thereby bringing the totalized number of free plays or rating points up to 240. Concurrently therewith, the lights L30 and LF will be illuminated by the closing of contacts LW28.

The rotary switch arm K7 is spring returned to starting or home position when the reset solenoid KR is energized over conductor K10. Conductor K10 is energized from contacts MK5 responding to cam MC3, this conductor K10 continuing through normally closed relay contacts MD1.

When any free plays or rating points are registered on the free play register 19 shown in Figures 13–16, the registration bar 123 is rocked out of notches 122 (Figure 16), thereby closing contacts MR3 and MR4. For starting a free play game without depositing a coin, the player will push free play button 11 (Figures 3 and 18D) located on the inclined front panel of the machine. The closing of contacts MR3 by registration frame 123 places supply conductor O in connection with one side

of push-button contacts 11 through conductor M17. When push-button contacts 11 are closed, the circuit through M17 is continued through conductor M5 to normally closed contacts MF1 of relay MF, from whence the circuit continues through conductor M4 to the energizing coil of relay MC for energizing this relay. This relay MC comprises a pair of normally open contacts MC4 which are connected to establish a shunt across conductors C1 and C2 at the coin micro-switch CS (Figure 18B). Thus, the energization of relay MC establishes a shunt across the contacts of the coin micro-switch CS, with the result that reset relay SN and master relay SM are both energized, the same as occurs from the deposit of a coin. Accordingly, it will be seen that relay MC functions, in cooperation with free play push button 11, to start another game, if free plays stand registered on totalizer 19. As previously described, master relay SM is energized from conductor C1 through master relay contacts SM1, conductor S4, unlock relay contacts SO1 and conductor S6 leading to the energizing coil of master relay SM.

The energization of relay MC also closes normally open relay contacts MC5 to close an energizing circuit from supply conductor O to motor MK through conductor M1. Contacts MC6 of relay MC complete a holding circuit for holding relay MC energized through contacts MK1 responding to motor cam MC1. When the motor cam MC1 makes one-quarter of a revolution, the contacts MK1 will open the relay holding circuit, this holding circuit extending from conductor M17 through contacts MK1 to conductor M9, then through relay contacts MC6 and conductor M5 to normally closed relay contacts MF1 and thence through conductor M4 to the winding of relay MC. During this quarter revolution of motor MK, contacts MK5 reset the rotary switch K through conductor K10, and contacts MK2 and MK6 reset the bank relay resetting solenoids BC1 and BC2 through conductors M13 and M12. An 8 mfd. condenser is shunted across contacts MK4 of motor cam MC2 so as to reduce the arcing between contacts MK4.

When a number of free plays or rating points have been registered, and it is necessary to reset the free play register unit 19 to zero position, a push-button MR2 (Figure 18D) is pressed into circuit closing position, this push-button being preferably located on the back board of the game cabinet. When the contacts of push-button MR2 are closed, a circuit is completed from supply line O through contacts MR4 and push-button contacts MR2 to conductor M6 which leads to the energizing coil of relay ME, resulting in the energization of this relay. Contacts ME1 of relay ME are interposed in that portion of conductor Q6 which leads to the release solenoid QR of rotary switch Q (Figure 18E), whereby the energization of relay ME opens the circuit to reset solenoid QR so that the rotary stepping switch Q will not be reset during this operation. Normally open contacts ME2 of relay ME are connected between supply conductor C2 and that portion of conductor Q6 which connects to one end of the resetting solenoid NR of rotary switch N (Figure 18E). Thus, the energization of relay ME and the closing of contacts ME2 resets rotary switch N to normal position. Contacts ME3 of relay ME close a circuit to the coil of relay MF through conductors M16 and M7, M16 being energized from supply circuit O through contacts MR4. With the energization of relay MF, contacts MF1 open the circuit to relay MC through conductor M4, thereby de-energizing relay MC. This function of contacts MF1 of opening the energizing circuit of relay MC is provided for the purpose of making the free play push-button 11 inoperative at this time. Contacts MF4 of relay MF establish a holding circuit for holding relay MF energized, this holding circuit being from conductor M16 (which is connected to supply conductor O through contacts MR4), thence through contacts MF4 and through branch conductor M7 to the energizing coil of relay MF. Hence, it will be seen that relay MF will remain energized until the above circuit is opened at contacts MR4. Contacts MF5 of relay MF complete a circuit through conductors M3 and M8 to a register meter MG, which has its other terminal connected to supply conductor W'. This register meter MG registers the number of free plays taken off of free play register unit 19. Contacts MF3 of relay MF complete a circuit to motor MK from conductor O to conductor M1. The motor MK will now be energized and will stay energized until the circuit to relay MF is open again. Contacts MF2 of relay MF complete a circuit from conductor O through conductor M15 to the pulsing contacts MK4 which respond to motor cam MC2. Pulsing contacts MK4 will transmit pulses through conductor M14, contacts MD6 and conductor M3 to the retracting solenoid MB of point registering totalizer 19 for stepping this retracting solenoid. At the same time, the free play register meter MG will step once for each impulse transmitted from contacts MK4 through conductor M14, through normally closed contacts MD6, through conductor M3, through contacts MF5 and thence through conductor M8 to free play register meter MG. This operation will continue until the totalizing unit 19 will be in start position and read zero, as illustrated in Figure 2. When the totalizing unit 19 reaches zero position, the registration bar 123 will be released and contacts MR3 and MR4 will be restored to normally open position, thereby opening the circuit to relay MF and de-energizing this relay.

The projector motor PM is reversed at the ends of the film by the action of the micro-switch PN (Figures 17 and 18C). When this switch PN is closed, it completes a circuit from supply conductor P10 over conductor P9 to the energizing coils of reversing play SG and of pilot reversing relay SH (Figure 18A), thereby energizing both of these relays. The energization of pilot reversing relay SH closes its contacts SH1 which energizes conductor P2 from supply conductor P6, thereby completing the circuit to one side of armature of projector motor PM. The energization of reversing relay SG results in the armature arm SGB of this relay kicking the cam SGA one step, as a result of which contacts SG1 and SG2 move to their other positions, closing the lower pairs of their contacts respectively. This connects conductors P1 and P4, and also connects conductors P3 and P10, thereby reversing the motor PM. The motor connections P1, P2, P3 and P4 are shown at the soldering post PS2 in Figure 18C. In the reverse operation of the projector motor, the alternate frames *f* of the film F which were skipped in the first direction of run of the film are projected during the reverse direction. A manually operated reversing switch PT is connected in shunt of automatic reversing switch PN, and enables the projector motor PM to be manually reversed at any point in the length of the film.

We shall now briefly summarize the functions and operations performed by the several relays of the system:

The master relay SM controls the transmission of electrical energy to the entire game. This relay will only energize from the operation of the coin switch CS.

The reset relay SN serves to start the game and to energize the master relay SM, thereby making the game operative.

The answer relay SL is energized by the correct answer relay PR. When a correct answer is given and this answer relay SL is energized by the correct answer relay PR, the answer relay SL directs the pulses from the impulse contacts SV1 to the score counting rotary switch N, and it also illuminates the "Correct" light 17. When this answer relay SL is not energized by the correct answer relay PR, or during the time counting interval before it is so energized, it is directing the pulses from impulse contacts SV1 to the time counting rotary switch T.

Selection relays 1 to 6 inclusive serve to light the lights

F1' to F6' under the translucent keys 7. After one of these keys has been manually actuated the energization of the selection relay corresponding thereto renders the other keys inoperative. Also, upon de-energization the selection relay de-energizes the shutter solenoid EA to EF through time-up relay SP and rotary switch T.

Projector motor relay SS energizes the circuit to the projector motor PM, and also breaks the locking circuit S1 to all of the selection relays.

Time-up relay SP is energized by time counting rotary switch T through conductor T7' when the rotary switch reaches its end position. The energization of time-up relay SP serves to open circuit the other key switches EG—EL after one of these switches has been depressed. This relay also energizes solenoid EM that swings the correct answer shutter **36** down to the correct answer viewing position.

Unlock relay SO breaks the circuit to the winding of master relay SM upon completion of the projection of the fifth question and the termination of its answering period, thereby terminating that game.

Reversing relay SG responds to automatic film reversing switch PN for reversing the field connections of projector motor PM when one of the film cut-outs **132** is presented to reversing switch PN. Reversing relay SG also responds to the manually actuated reversing switch PT, which is connected in parallel to automatic reversing switch PN.

Pilot reversing relay SH is connected to the manually actuated reversing switch PT and the automatically actuated reversing switch PN for starting the projector motor PM in the opposite direction when switch PT or PN is operated.

Relay MC has as its function to start another game if the player has free plays registered. This relay is responsive to free play push-button switch **11** located on the inclined front panel of the housing.

Relay MD functions to register free plays.

Relay ME responds to free play cancelling push-button switch MR2 and controls energization of relay MF. It also breaks the resetting circuit to solenoid QR of question designating rotary switch Q.

Relay MF functions to cancel any remaining stored number of free plays. It is responsive to the closing of push-button switch MR2.

While we have illustrated and described what we regard to be the preferred embodiment of our invention, nevertheless it will be understood that such is merely exemplary and that numerous modifications and rearrangements may be made therein without departing from the essence of the invention.

We claim:

1. In a question and answer game, the combination of screen means, means for projecting on said screen means a plurality of different questions each having associated therewith a plurality of different answers, only one of which is correct, each of said answers bearing designating indicia, a plurality of manually operable keys each bearing indicia corresponding to the designating indicia of said answers, thereby enabling the player to signify what he regards to be the correct answer by depressing the key of corresponding indicia, time means for measuring the time interval taken to answer the question, and scoring mechanism responsive to the key depressed and to said time means for scoring the ability of the player, said scoring mechanism comprising a series of lights, means for lighting different lights depending upon the scores made in answering different questions, and totalizing means for totalizing said scores for a plurality of questions.

2. In a question and answer game, the combination of screen means, means for projecting on said screen means a plurality of different questions each having associated therewith a plurality of different answers, only one of which is correct, each of said answers bearing designating indicia, a plurality of manually operable keys bearing indicia corresponding to the designating indicia of said answers, thereby enabling the player to signify what he regards to be the correct answer by depressing the key of corresponding indicia, time means for measuring the time interval taken to answer the question, scoring mechanism responsive to the key depressed and to said time means for scoring the ability of the player, and free-play mechanism responsive to said scoring mechanism for giving a free play of another game when the player scores a predetermined minimum.

3. In a question and answer game, the combination of screen means, means for projecting on said screen means a plurality of different questions each having associated therewith a plurality of different answers, only one of which is correct, each of said answers bearing designating indicia, a plurality of manually operable keys each bearing indicia corresponding to the designating indicia of said answers, thereby enabling the player to signify what he regards to be the correct answer by depressing the key of corresponding indicia, time means for measuring the time interval taken to answer the question, means for determining the accuracy of the answer selected, scoring mechanism responsive to said latter means and to said time means for scoring the ability of the player, said scoring mechanism comprising columns and rows of lights, and means for lighting different lights in said columns and rows depending upon the scores made in answering different questions.

4. In a question and answer game, the combination of screen means, means for projecting on said screen means a plurality of different questions each having associated therewith a plurality of different answers, only one of which is correct, each of said answers bearing designating indicia, a plurality of manually operable keys each bearing indicia corresponding to the designating indicia of said answers, thereby enabling the player to signify what he regards to be the correct answer by depressing the key of corresponding indicia, time means for measuring the time interval taken to answer the question, means for determining the accuracy of the answer selected, scoring mechanism responsive to said latter means and to said time means for scoring the ability of the player, said scoring mechanism comprising columns and rows of lights in block arrangement, means for lighting different lights in said block arrangement depending upon the scores made in answering different questions, and a totalizing counter for totalizing the scores over a plurality of questions.

5. In a question and answer game, the combination of screen means, means for projecting on said screen means a plurality of different questions each having associated therewith a plurality of different answers, only one of which is correct, each of said answers bearing designating indicia corresponding to the designating indicia of said answers, a plurality of manually operable keys each bearing indicia corresponding to the designating indicia of said answers, thereby enabling the player to signify what he regards to be the correct answer by depressing the key of corresponding indicia, time means for measuring the time interval taken to answer the question, means for determining the accuracy of the answer selected, scoring mechanism responsive to said latter means and to said time means for scoring the ability of the player, said scoring mechanism comprising columns and rows of lights in block arrangement, means for lighting different lights in said block arrangement depending upon the scores made in answering different questions, a totalizing counter for totalizing the scores over a plurality of questions, and free-play mechanism responsive to said scoring mechanism for giving free play of one or more additional games when the player scores a predetermined minimum.

6. In a question and answer game, the combination of screen means, means for projecting on said screen means a plurality of different questions each having associated therewith a plurality of different answers, only one of

which is correct, each of said answers bearing designating indicia, a plurality of manually operable keys each bearing indicia corresponding to the designating indicia of said answers, thereby enabling the player to signify what he regards to be the correct answer by depressing the key of corresponding indicia, time means for measuring the time interval taken to answer the question, means for determining the accuracy of the answer selected, a first rotary switch responsive to said latter means, relays responsive to said first rotary switch, a second rotary switch having contacts energized by said relays, and a totalizing counter controlled by said second rotary switch.

7. In a question and answer game, the combination of screen means, means for projecting on said screen means a plurality of different questions each having associated therewith a plurality of different answers, only one of which is correct, each of said answers bearing designating indicia, a plurality of manually operable keys each bearing indicia corresponding to the designating indicia of said answers, thereby enabling the player to signify what he regards to be the correct answer by depressing the key of corresponding indicia, pulse creating means operative following the projection of a question and its supposed answers upon said screen means for transmitting a predetermined series of timed electrical pulses, timing means for measuring the time interval taken to answer the questions, a rotary scoring switch for scoring points for correct answers, answer responsive means for directing said pulses either to said timing means or to said rotary scoring switch depending upon the inaccuracy or accuracy of the given answers, latching relays adapted to be successively energized by said rotary scoring switch, and totalizing counter means responsive to said latching relays.

8. In a question and answer game, the combination of screen means, means for projecting on said screen means a plurality of different questions each having associated therewith a plurality of different answers, only one of which is correct, each of said answers bearing designating indicia, a plurality of manually operable keys each bearing indicia corresponding to the designating indicia of said answers, thereby enabling the player to signify what he regards to be the correct answer by depressing the key of corresponding indicia, time means for measuring the time interval taken to answer the question, means for determining the accuracy of the answer selected, scoring means responsive to said latter means and to said time means for scoring the ability of the player, said scoring mechanism comprising a first pulse creating means, a first rotary switch, means for directing pulses from said pulse creating means to said first rotary switch when a correct answer is given, a series of latching relays adapted to be energized in sequence by said first rotary switch, lights to be illuminated by said latching relays, a second rotary switch, means responsive to the energization of the latter relays in the series for advancing said second rotary switch, a second pulse creating means, a totalizing counter adapted to receive pulses from said second pulse creating means, means controlled by said second rotary switch for determining the number of pulses which said totalizing counter receives from said second pulse creating means, free-play mechanism responsive to said scoring mechanism for giving the number of free plays totalized on said totalizing counter, and means for restoring said rotary switches, latching relays and totalizing counter to normal positions.

9. In a question and answer game, the combination of screen means, a plurality of photoelectric cells located adjacent to said screen means, a film projector, a film adapted to be projected thereby upon said screen means, said film having a plurality of frames each provided with a question and a plurality of supposed answers, only one of which is correct, each of said answers bearing designating indicia, each frame having associated therewith a translucent window occupying one of a series of numbered positions relatively to said frame, the numbered position occupied thereby corresponding to the designating of the correct answer in that frame, said translucent window transmitting a correct answer designating light beam toward a particular one of said photoelectric cells, individual shutters normally blocking off said photoelectric cells from light beam response, a plurality of manually operable keys each bearing indicia corresponding to the designating indicia of said answers and each being operable to actuate a particular one of said shutters, time means for measuring the time interval taken to answer each question, scoring mechanism responsive to said photoelectric cells and to said time means for scoring the ability of the player, totalizing means for totalizing the scores for a plurality of questions, and free-play mechanism responsive to said scoring mechanism for giving free-play of one or more additional games when the player scores a predetermined minimum.

10. In a question and answer game, the combination of screen means, means for projecting on said screen means a plurality of different questions each having associated therewith a plurality of different answers, only one of which is correct, each of said answers bearing designating indicia, a plurality of manually operable keys each bearing indicia corresponding to the designating indicia of said answers, thereby enabling the player to signify what he regards to be the correct answer by depressing the key of corresponding indicia, time means for measuring the time interval taken to answer the question, means for determining the accuracy of the answer selected, rotary switch means responsive to said latter means and to said time means, a series of latching relays adapted to be energized in sequence by said rotary switch means, secondary rotary switch means adapted to be advanced by the energization of those latching relays in the high score end of the series of relays, pulse creating means, a rating point or free-play totalizer adapted to be advanced by pulses from said pulse creating means, and a relay adapted to be energized by said secondary rotary switch means for directing the pulses from said pulse creating means to said totalizer.

11. In a question and answer game, the combination of screen means, means for projecting on said screen means a plurality of different questions each having associated therewith a plurality of different answers, only one of which is correct, each of said answers bearing designating indicia, a plurality of manually operable keys each bearing indicia corresponding to the designating indicia of said answers, thereby enabling the player to signify what he regards to be the correct answer by depressing the key of corresponding indicia, time means for measuring the time interval taken to answer the question, means for determining the accuracy of the answer selected, rotary switch means responsive to said latter means and to said time means, a series of latching relays adapted to be energized in sequence by said rotary switch means, secondary rotary switch means having a stepping switch arm and stationary contacts engaged thereby establishing different intervals of engagement with said switch arm, said stationary contacts being adapted to be energized by the latching relays in the high score end of the series of latching relays, pulse creating means, a free-play totalizer adapted to be advanced by pulses from said pulse creating means, a free-play registering relay responsive to the energization of said stationary contacts of said secondary rotary switch means for directing pulses from said pulse creating means to said totalizer, a manually operated free-play cancellation switch, and a free-play cancellation relay responsive to said latter switch for restoring said totalizer to zero position.

12. In a question and answer game, the combination of a screen, means for projecting on said screen a plurality of different questions each having associated therewith a plurality of different answers, only one of which is correct, each of said answers bearing designating indicia, a plurality of manually operable keys each bearing indicia

corresponding to the designating indicia of said answers, thereby enabling the player to signify what he regards to be the correct answer by depressing the key of corresponding indicia, coin controlled means for setting the game into operation, a reset relay responsive to said coin controlled means, a master relay responsive to said reset relay, a plurality of selecting relays each individually responsive to a particular one of said manually operable keys, time means for measuring the time interval taken to answer the question, means for determinging the accuracy of the answer selected, scoring mechanism responsive to said latter means and to said time means for scoring the ability of the player, and free-play mechanism responsive to said scoring mechanism for giving a free play of another game when the player scores a predetermined minimum.

13. In a question and answer game, the combination of coin controlled means for setting the game into operation, a screen, a film having a plurality of frames each bearing a question together with a plurality of supposed answers each having different designating indicia, a projector responsive to said coin controlled means for projecting the frames of said film upon said screen, a plurality of manually operable keys each bearing indicia corresponding to the designating indicia of said answers, thereby enabling the player to signify what he regards to be the correct answer by depressing the key of corresponding indicia, time means for measuring the time interval taken to answer the question, means for determining the accuracy of the answer selected, a first rotary switch responsive to said latter means and to said time means for scoring the ability of the player, a series of latching relays adapted to be energized in sequence by

said first rotary switch means, a second rotary switch means having stationary contacts adapted to be energized by the latching relays in the high scoring end of the series, said second rotary switch means comprising a rotating switch arm adapted to have stepping motion into contact with said stationary contact means, a free-play registering relay connected to said rotating switch arm to be responsive to the energization thereof, a free-play totalizer, pulse creating means, said free-play registering relay being operative to direct pulses from said pulse creating means to said free-play totalizer, said totalizer comprising a plurality of numeral wheels each having a zero position, automatic switch mechanism adapted to be closed when either of said numeral wheels is moved out of its zero position, a free-play push-button made operative by said automatic switch mechanism to cause a free-play operation of the game, a free-play cancellation push-button made operative by said automatic switch mechanism for restoring said free-play totalizer to zero position, motor driven timing cam means, timing contacts responsive thereto, resetting mechanism responsive to said timing contacts for resetting said latching relays, and mechanism for automatically reversing said projector when the film approaches either of its ends.

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