

April 29, 1969

J. WINN

3,441,277

RACING GAME WITH GEAR DRIVE MECHANISM

Filed Aug. 12, 1965

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Fig. 1.

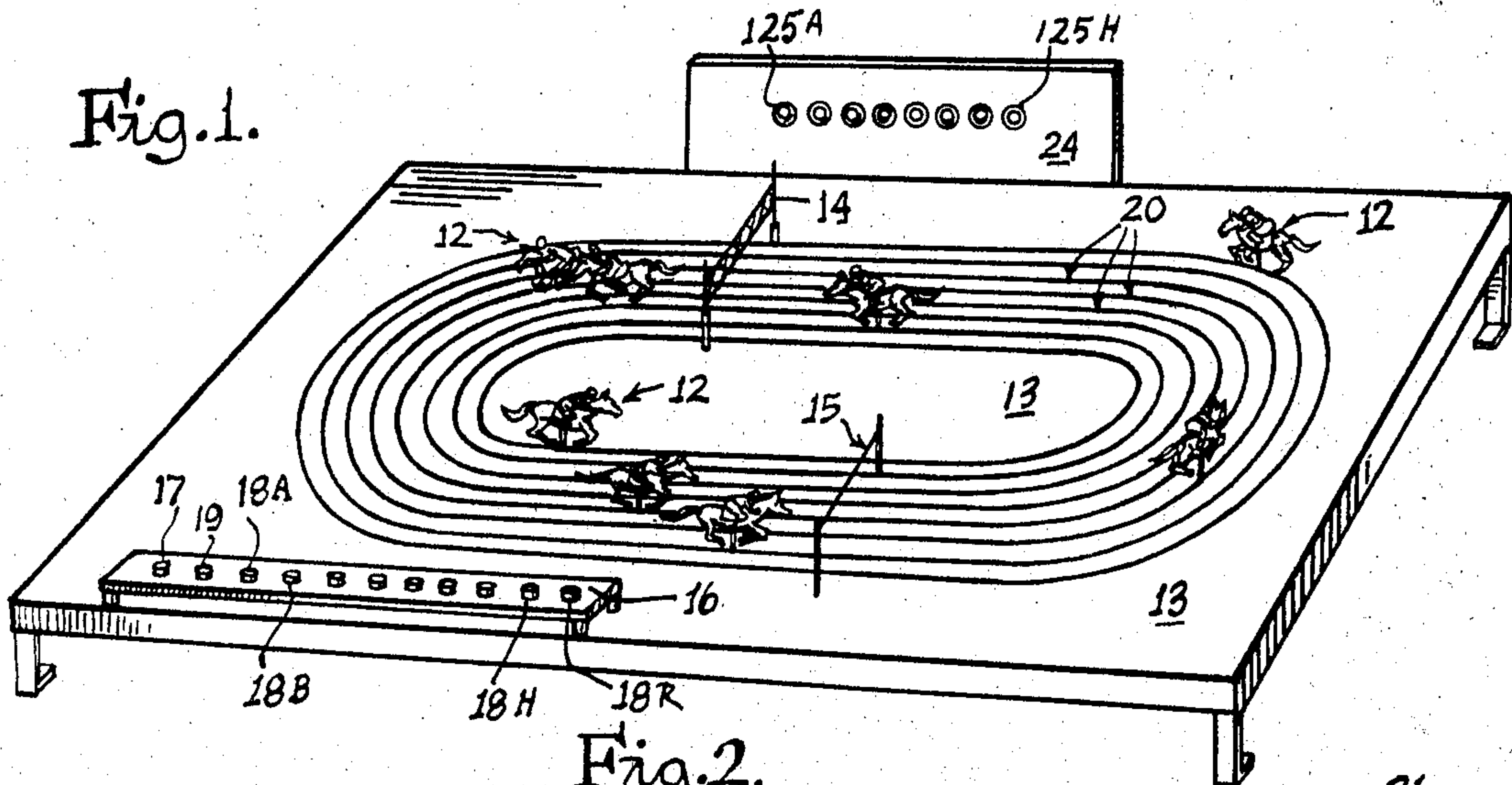


Fig. 2.

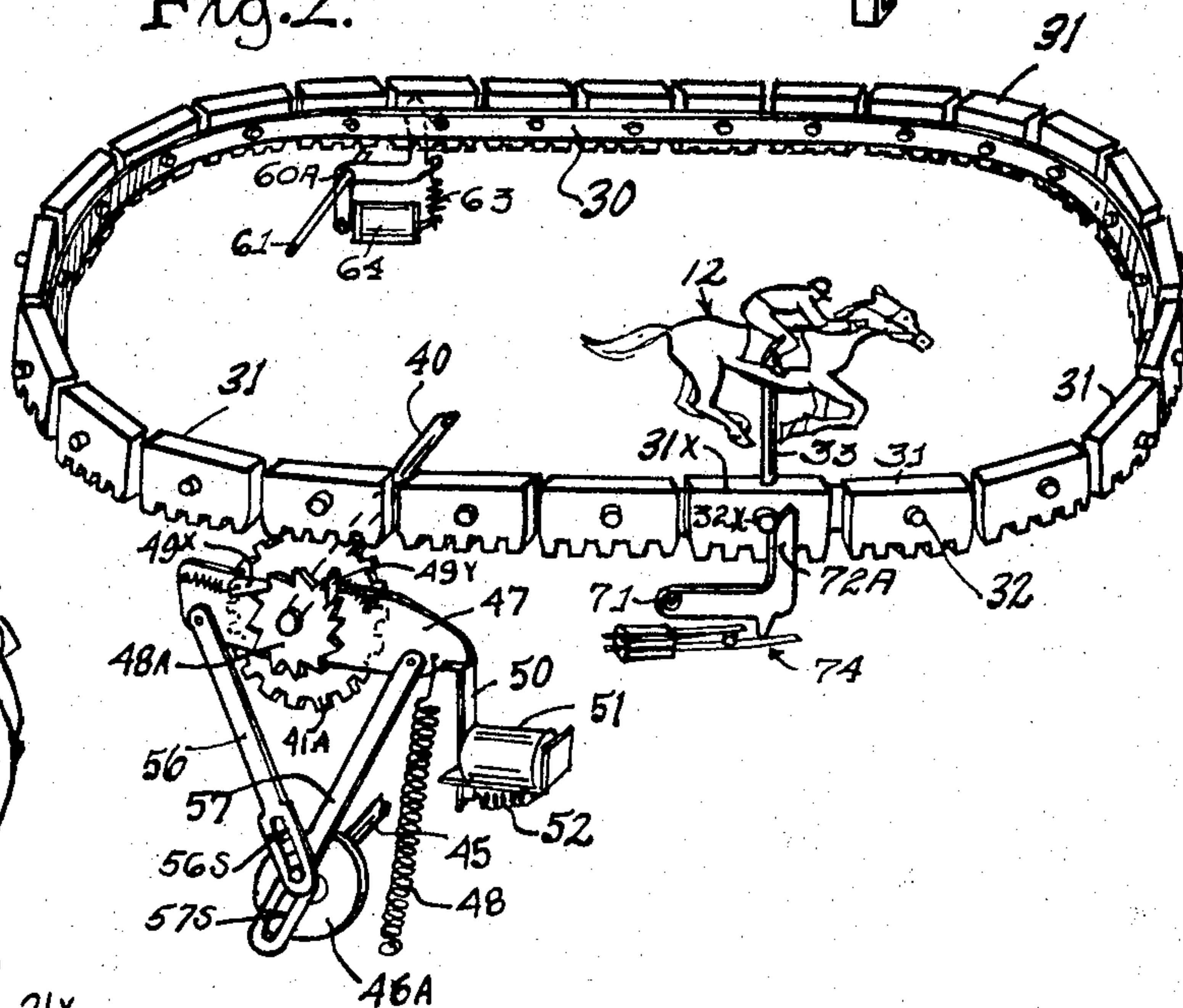
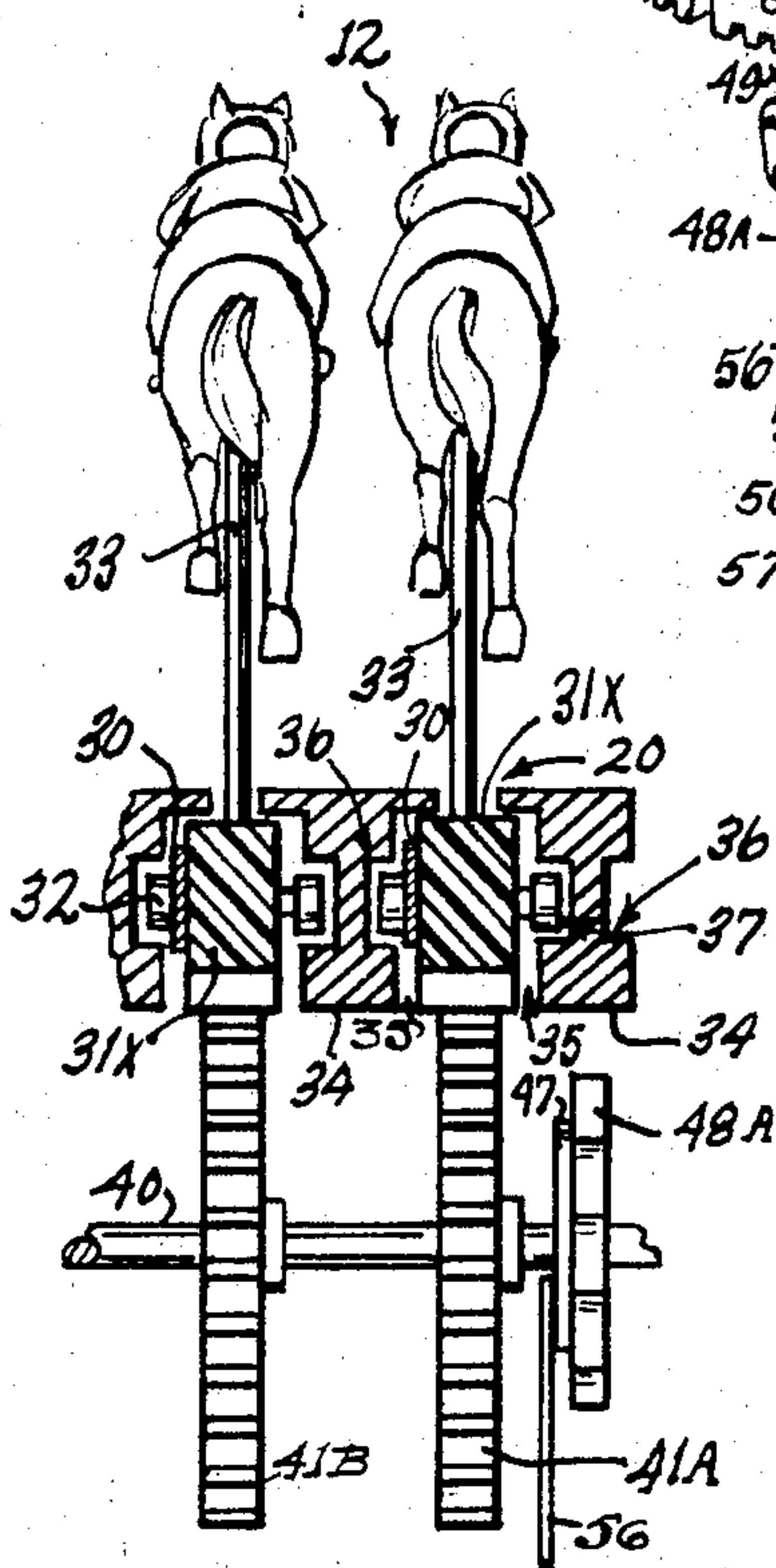


Fig. 4.



INVENTOR.
John Winn
BY *Edward J. Winn*
ATTORNEY.

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J. WINN

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Fig. 3.

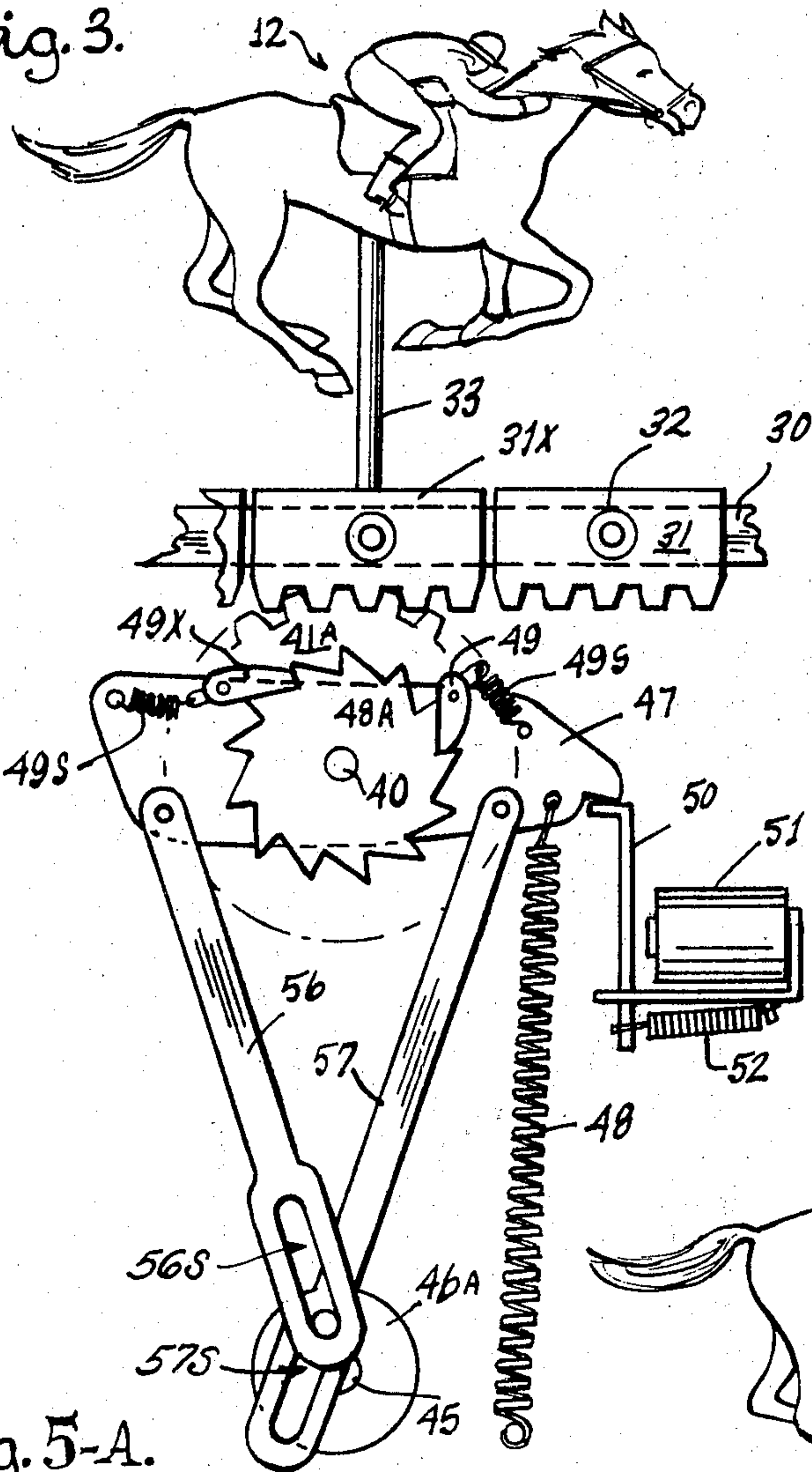


Fig. 8.

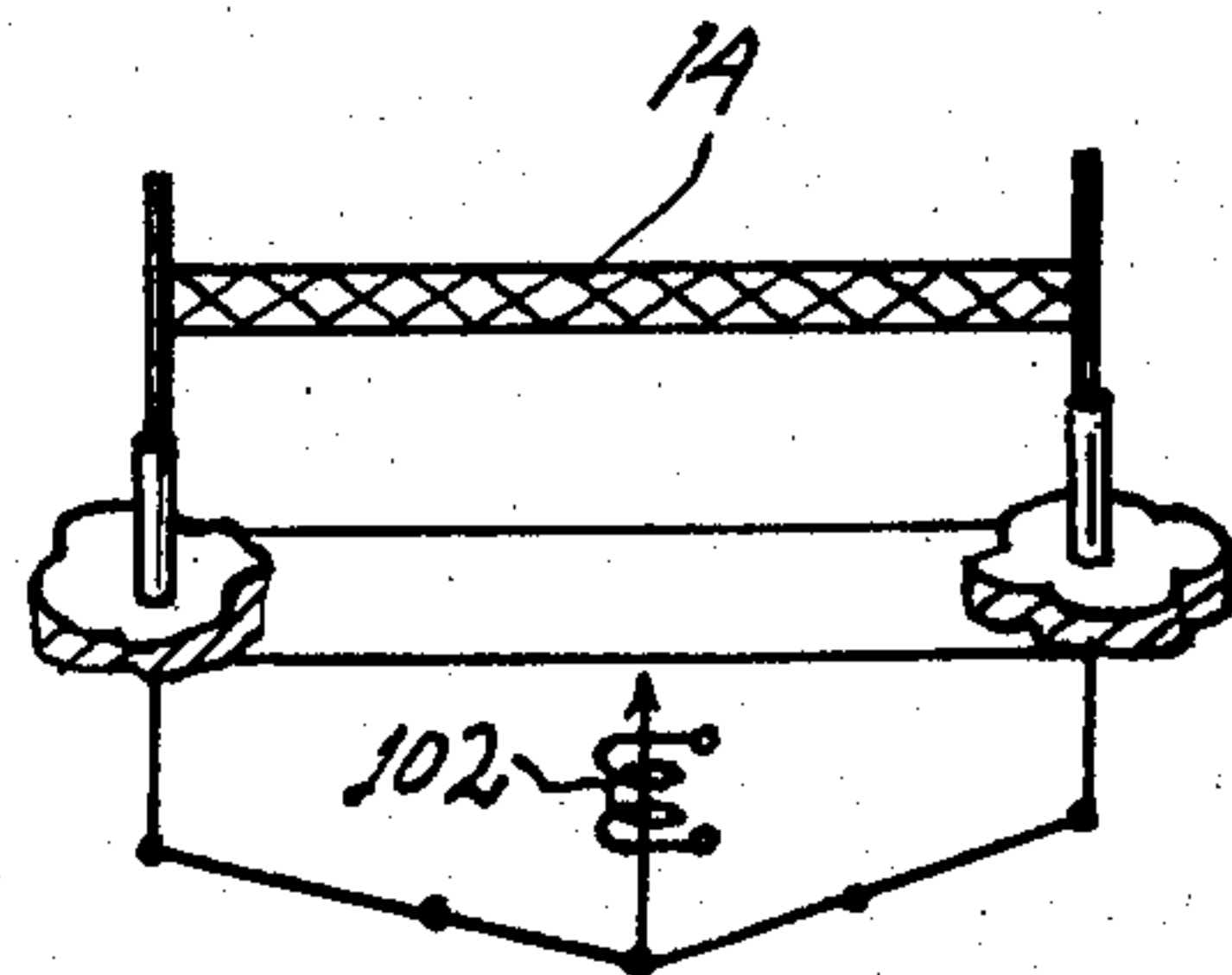


Fig. 5.

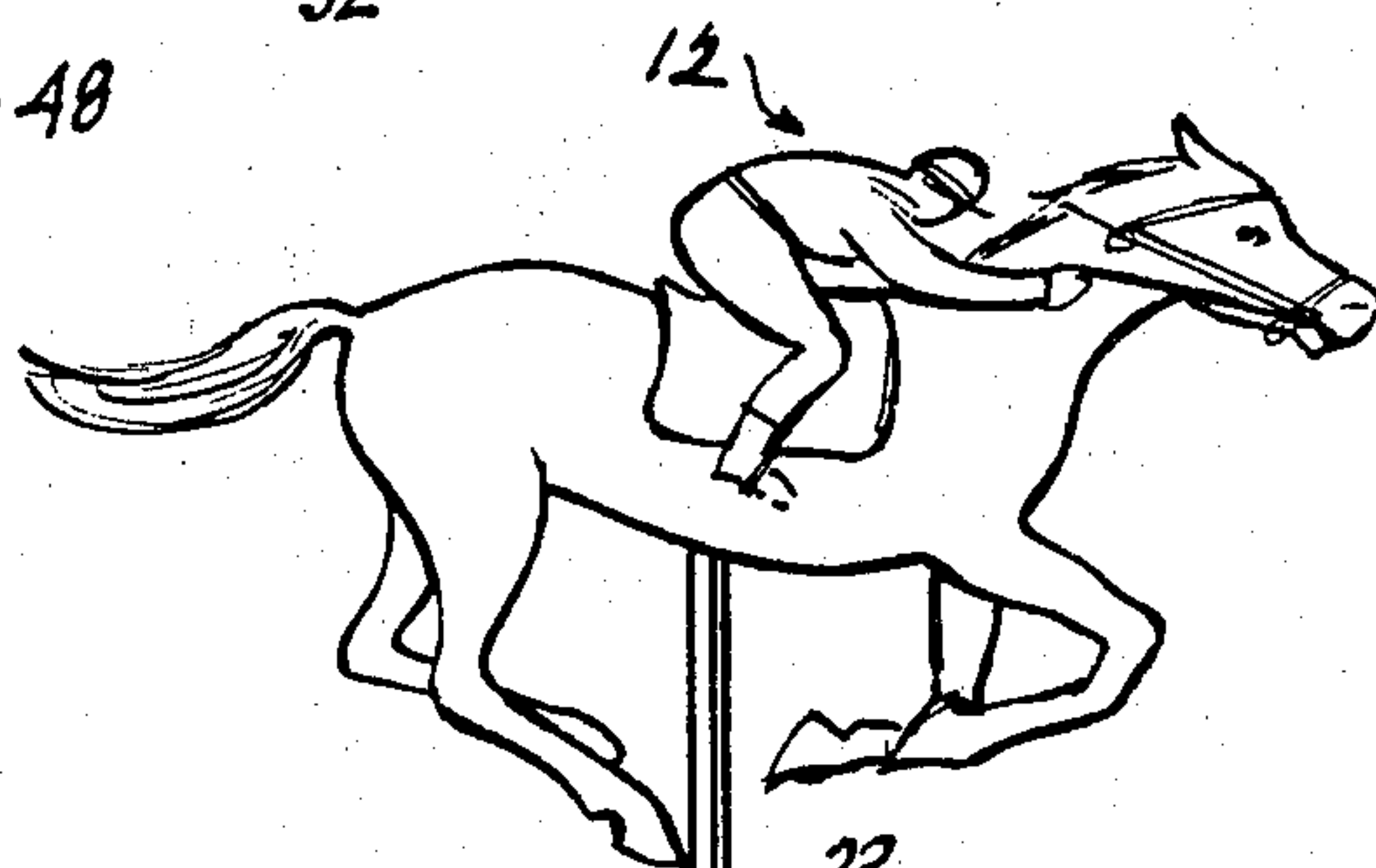
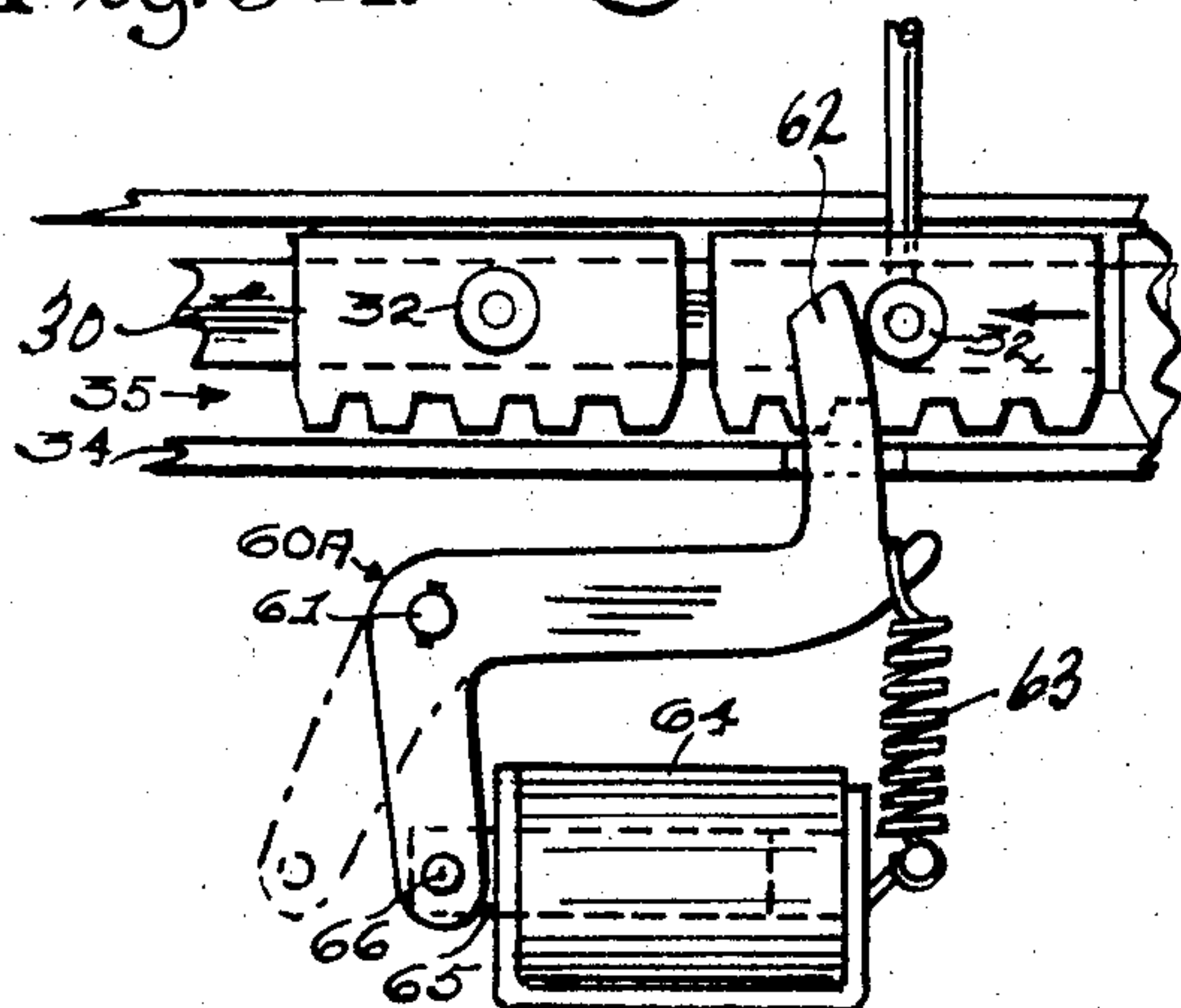
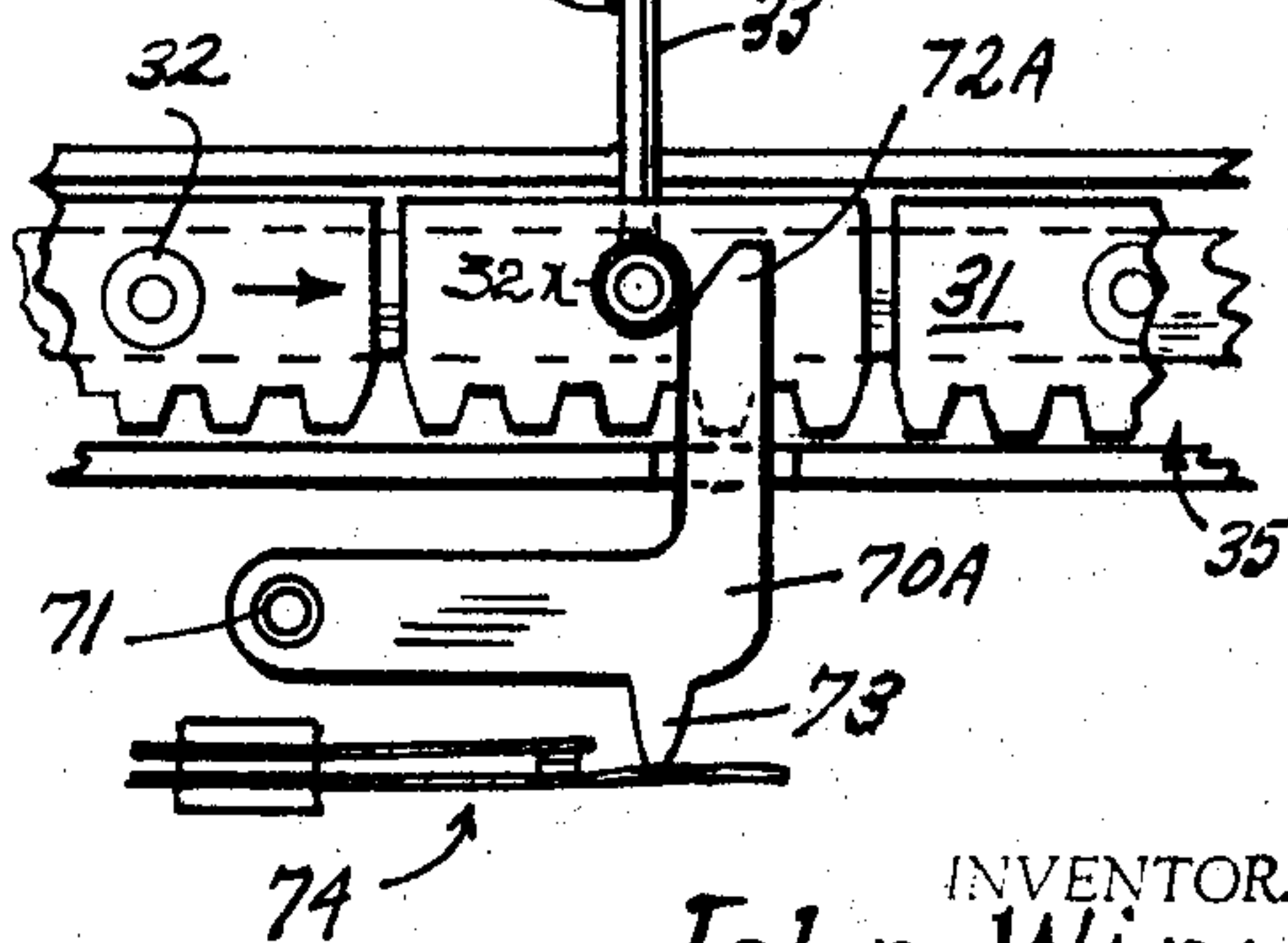


Fig. 5-A.



INVENTOR.
John Winn
BY *Robert L. Winston*
ATTORNEY.

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J. WINN

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Fig. 6.

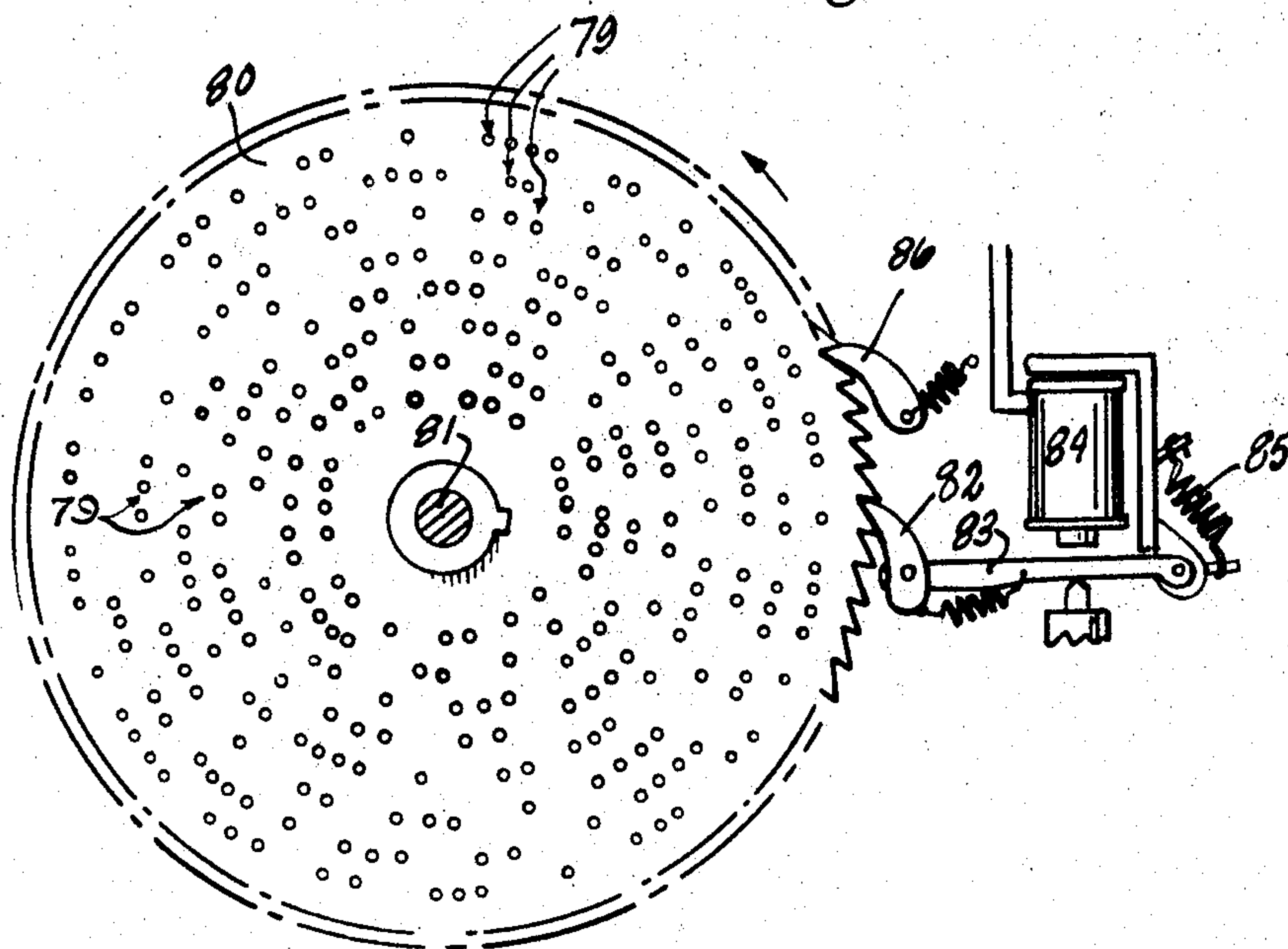
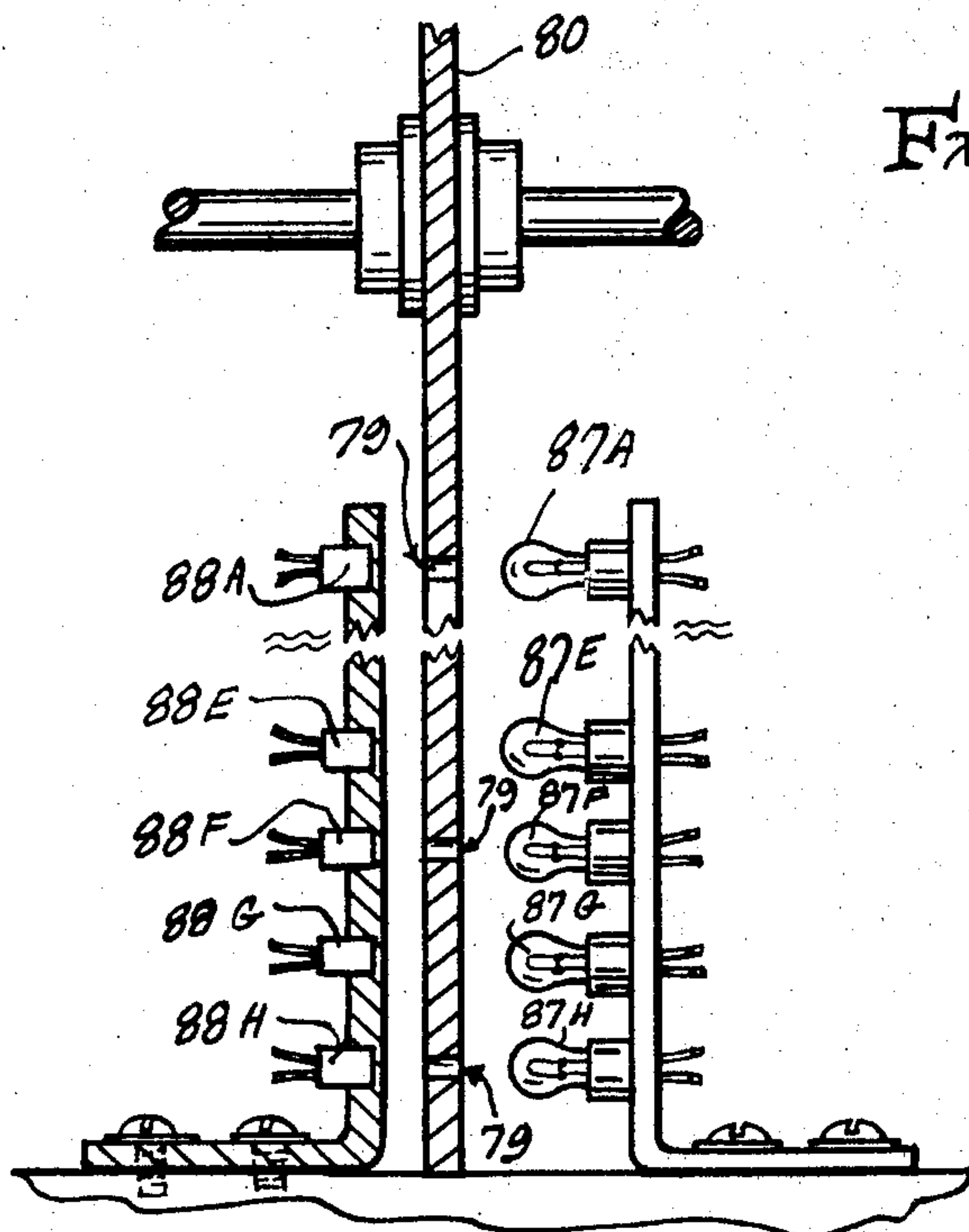


Fig. 7.



INVENTOR.

John Winn

BY

Robert Livingston
ATTORNEY.

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J. WINN

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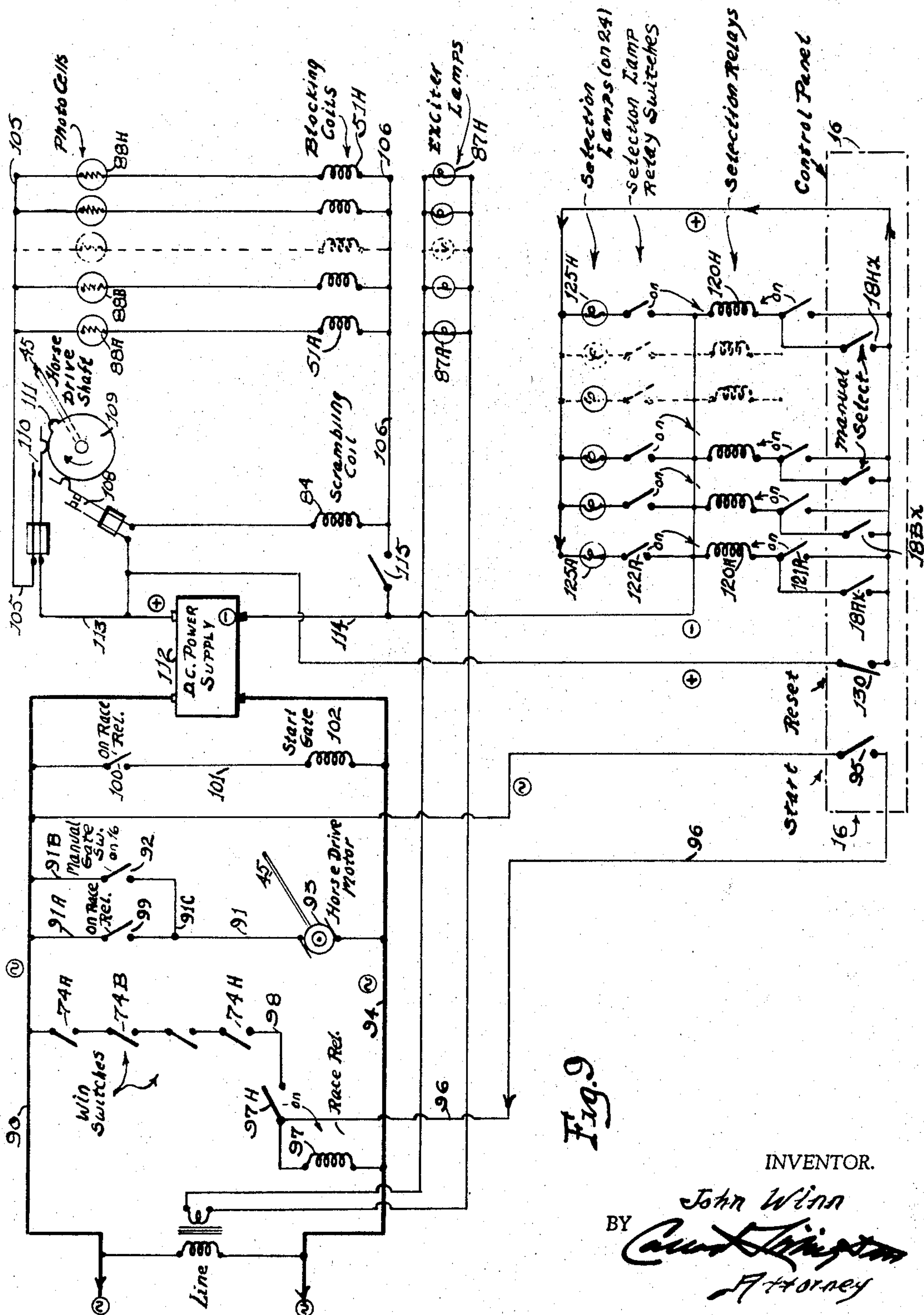


Fig. 9

INVENTOR.

John Winn
BY *Curt Livingston*
Attorney

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3,441,277

RACING GAME WITH GEAR DRIVE MECHANISM

John Winn, Las Vegas, Nev., assignor, by mesne assignments, to Westronics, Inc., Las Vegas, Nev., a corporation of Nevada

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Int. Cl. A63f 07/14

U.S. Cl. 273—86

15 Claims

ABSTRACT OF THE DISCLOSURE

In amusement games simulating a horse race or the like, the racing figures are supported for travel about a circuitous track formed by especially shaped trackways, by flexible bands to which are pivotally attached a continuing series of wide gear blocks having teeth on the underside to mesh with a driving gear turning in a vertical plane therebelow, the driving gear having a changespeed driving ratchet and appertaining electromagnetic means for altering the speed, a scrambling means being provided in the form of an apertured program disk interrupting light to photoelectric cells for irregular actuation of the ratchet control electromagnets, together with circuit means for controlling a starting gate, winner preselection circuits, selection-cancelling circuits, game cycle, etc.

This invention provides improvements in a racing game of the type in which a number of contestant devices, such as simulated automobiles, horses, greyhounds, etc., pursue a course around a track from starting to finish positions and are moved through some form of variable drive means acting automatically to scramble the rates at which the various figures travel.

Some of the salient features of the present disclosures relate to a circuitous drive means in the form of a metal band and cooperative, sequential gear blocks for driving the individual contestant objects around the course; to a novel electro-mechanical drive gear means for changing the rate of movement of individual contestants from time to time; to an electrically governed random operated scrambling circuit means for modifying a driving stroke which moves the contestant objects from time to time; and to certain control circuit means for conditioning the apparatus for a cycle of operation, selecting and signalling winners, and lining up the contestants for the start and actuating a starting gate.

Other aspects of novelty and utility relate to details of the construction and operation of the illustrative embodiment described hereinafter in view of the annexed drawings in which:

FIGURE 1 is a perspective view of a racing game in which the contestant objects are horses;

FIGURE 2 is a perspective view of one of the travelling bands and drive means for moving the racing objects;

FIGURE 3 is a fragmentary elevational detail, to enlarged scale, of parts of the travelling gear block and drive means;

FIGURE 4 is an enlarged partial cross-section and rear elevational detail of some of the racing figures and parts of the guideway structure;

FIGURE 5 is an enlarged fragmentary elevational view of parts of the finish control mechanism;

FIGURE 5-A is a view similar to FIGURE 5 but showing elevational parts of the starting line-up mechanism;

FIGURE 6 is an enlarged elevational view of the race programming device;

FIGURE 7 is a fragmentary sectional detail of further enlarged parts of the programming and scrambling means;

FIGURE 8 is a fragmentary perspective detail of the starting gate mechanism;

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FIGURE 9 is a circuit diagram.

Referring to FIGURE 1, the game mechanism includes a set of racing figures shown for illustrative purposes as a plurality of horse and jockey figures 12, each mounted for independent travel about a circuitous course on a track panel 13 which may be decoratively embellished with suitable pictorial configurations simulative of a conventional race track including a simulated starting gate 14 and a finish line 15.

Situated adjacent the track panel is a control panel 16 on which are arranged certain control instrumentalities, such as a power or cycle starting switch button 17, a gate starting or control button 19, a plurality of selection buttons 18A . . . 18H, and a cancellation or reset button 18R.

Means for supporting the individual racing figures, as seen in FIGURE 2, comprises a looped band 30, preferably of metal such as clock spring stock, but optionally of any other material having analogous qualities of flexibility and inherent stiffness capable of assuming and holding the shape depicted, there being one of these bands 30 for each racing figure and each band being provided with a series of contiguously successive driving gear blocks 31 pivotally fastened one after another to one side of the band, as at pivots 32 shown to larger scale in FIGURE 3. On each travelling band 30 one of the gear blocks 31X will additionally have attached thereto a supporting arm 33 to which the racing figure 12, whatever its character, whether a horse, automobile, jack rabbit, etc., the said arms being preferably thin to project through appertaining narrow track slots 20 on the track panel, FIGURE 4.

The several travelling bands 30 are individually supported for their circuitous travel in corresponding formed guideways 34, having the cross-sectional configuration seen in FIGURE 4 and each including a first recess or chamber portion 35 in the vertical side wall thereof and dimensioned to freely receive therein the series of gear blocks or shoes 31 loosely held in confinement therein by the opposite side wall portions 36 of the next adjacent guideway. The guideway or track sections 34 may all be identical and cooperate in adjacent pairs to shield and support the gear blocks.

The pivot pins 32 attaching each gear block (with or without a racing figure) to the travelling band project beyond the corresponding gear shoe into a continuous guide and clearance groove 37 in the appertaining guideway for engagement with certain control switch means to be described.

Means for individually driving each of the entire set of racing figures comprises, FIGURE 4, a common idler shaft 40 extending laterally beneath all of the guideways and having freely floating thereon a plurality of drive gears 41A . . . 41H, each aligned for driving engagement with the series of gear shoes 31 of the corresponding carrier band.

As seen in both FIGURES 2 and 3, a common parallel drive shaft 45 is mounted in vertical alignment beneath the idler gear shaft 40 and at each of the successive stations corresponding to one of the drive gears 41A carries a crank 46A . . . 46H corresponding to one of the racing figures.

Freely rockable on the idler shaft 40 alongside each drive gear is a variable-rate clutch means comprising a carrier plate 47 rockable on said shaft and urged by a long traction spring 48 attached thereto at a point radial to said shaft into a normal position, which movement may be blocked, however, by a dog 50 comprising part of the armature for an electromagnet 51, said armature being urged by a spring 52 to a blocking position in which the carrier plate will be prevented from moving to its normal position under urgency of the traction spring 48.

The clutch means further includes a ratchet gear 48A . . . 48H affixed to each corresponding drive gear 41A to rotate with the same, and each rocker plate 47 is provided with dog means 49X and 49Y pivoted thereon and urged by spring means 49S in a direction to engage in the ratchet teeth responsive to rocking action of the plate as a consequence of alternate action of a pair of crank arms 56 and 57 jointly driven at their lower ends from the corresponding drive crank means 46A which rotates continuously while the game is in operation, it being important to observe that the driving connection between the lower end of each crank arm and the driving crank as provided by the long slots 56S and 57S is impositive so that the drive gear for any racing figure may be moved an amount depending upon whether the corresponding rocker plate is or is not blocked by the electromagnetically-controlled dog means 50, thus making it possible to selectively move the individual racing figures from a common drive shaft and vary the progress of such figures around the course with suitable actuations of the corresponding control magnets 51, FIGURE 3, or 51A . . . 51H as will appear in view of FIGURE 9 hereafter.

The foregoing variable drive means also makes it possible to selectively stop any or all racing figures indefinitely, as for example in lining up for the start of each new race in accordance with the control means now to be described in view of FIGURE 5-A, which depicts the "Start" control means for one of the racing figures.

Beneath each travelling band 30 at a position around the race course corresponding to the simulated "Starting Line" or gate 14 (FIGURE 5-A) are a set of line-up levers 60A . . . 60H all fixed on a common shaft 61 and each having a dog portion 62 projecting into the guideway 34 for the corresponding travelling band and into the path of the pivot pin 32 on the gear shoe of the corresponding racing figure in such manner that when the dogs are elevated to stopping position, as shown in FIGURE 5-A, they will respectively block the corresponding pins and prevent the corresponding racing figures from moving farther, thus holding the entire set of figures at the starting line.

The entire complement of line-up levers is normally retracted from the aforesaid line-up or stopping position by a spring means 63, but energization of a line-up solenoid 64 will attract its plunger 65, having pivotal connection 66 with one of the line-up levers and thereby rock the dog and hence the common shaft 61 and therefore all of the line-up levers so as to thrust the dog portions 62 thereof into blocking positions relative to the corresponding drive shoe pins with the result that all of the racing figures can approach and then be stopped in a line-up at the starting line.

The arrival of any racing figure at the simulated "Finish Line" 15 is signalled by means shown in FIGURE 5 and including a plurality of "Finish Levers" 70A . . . 70H, one for each horse or other figure, each independently pivoted as at 71, and each having a dog portion 72A . . . 72H projecting into the path of the trip stud or pin 32X on the gear shoe of the corresponding figure to be rocked downwardly by said pin and thrust a projection 73 against a corresponding switch means 74, to open or close a control circuit.

Means for actuating the rocker-control electromagnets 51 of the variable-stroke band-driving crank and ratchet mechanism is shown in FIGURES 6 and 7, and comprises a program ratchet disc 80 rotatable about an axis member 81 responsive to the stepping action of a driving pawl 82 carried on an armature member 83 moved by electromagnetic means including the coil 84 and a normal spring 85, a holding dog 86 preventing retrograde slippage.

The program disc has a number of circular rows of pulse-control perforations 79 which may be distributed in each row in random fashion, there being a particular

one of these rows corresponding to each of the travelling bands and its racing figure and the disc being mounted to rotate between a set of lamps 87A . . . 87H each aligned with one of the said rows of perforations in alignment with a corresponding photosensitive cell 88A . . . 88H situated on the opposite side of the disc for excitation by light transmitted through the corresponding disc apertures from time to time responsive to the changes in angular position of the disc occasioned by the operation of the ratchet stepping means 82 in accordance with circuit means hereinafter described, for actuating the respective blocking electromagnets which will alter the progress of the racing figures from time to time in a manner to be explained.

While the novel game apparatus is wholly suited to coin-controlled operation if desired, for purposes of simplification a coin control means has been omitted and the control circuit arranged for straight manual starting and resetting, by freely-operable push button controls. Operating switches to condition the game for a "race" or a "cycle" of operation bring the horses to the starting gate, make selections for winners, and lift the starting gate.

Each race or game cycle is terminated by the arrival of some racing object or horse at the finish line to open one of the "Finish" switches 74 described in view of FIGURE 5. This event breaks the power to the main driving motor and leaves all racing contestants standing where they were at the moment the winner arrived at the finish line to open one of the "Finish" or "Win" switches.

Thus, when a new race is to be initiated the contestants or horses must be brought up to the "Starting Gate."

Referring to the circuit diagram of FIGURE 9 in which all switches are assumed to move clockwise from the positions shown to open or close a circuit, depending upon which event happens first as a result of such clockwise motion, a new race may be initiated by holding the "Gate" switch 92 closed (button 19, FIGURE 1), thereby applying power from the power side of the line 90 via conductors 91B, 91C to the main driving motor 93 returned to the drop side 94 of the power line. This operation will bring the horses up to the starting gate 14 where they will be held against further movement until said gate is lifted as a result of pushing the "Start" button to actuate the Starting Switch 95.

The new race starts on closure of the starting switch 95 (button 17, FIGURE 1) to apply power via conductor 96 to the coil 97 of the Race Relay, which closes one of its own relay switches 97H and a holding circuit via conductor 98 through a normally-closed chain circuit defined by all of the series-connected "Win" or "Finish" switches 74A . . . 74H in their normally closed condition, thus completing a power circuit from conductor 90 which will maintain the Race Relay operated until one of the said chain "Win" switches 74A . . . is opened by a winning contestant in the manner previously described in view of FIGURE 5.

As a further consequence of the aforesaid operation of the Starting Switch and holding in of the Race Relay, a holding circuit for the driving motor 93 is set up from power conductor 90 by another Race Relay Switch 99 via conductors 91A and 91, thus shunting temporary motor circuit via the manual Gate Switch 92 which is intended to energize the motor only long enough to bring the contestants up to the starting gate.

The new race begins with a lifting of the Starting Gate 14 as the result of pull-in of the Race Relay, another of whose relay switches 100 applies power from conductor 90 via conductor 101 to energize the starting gate solenoid 102, lifting the gate 14 so that the field of horses is free to move forward and make the circuit around the track under control of the variable drive means previously described, until the first of the contestants to arrive once again at the finish line can open one of the series-con-

nected "Win" switches, thereby breaking the aforesaid chain circuit 74A . . . 74H to drop out the Race Relay Coil 97 and open its holding switch 97H and the motor holding switch 99, thus stopping the movement of the horses and ending the race and operating cycle.

If it is desired to control the game by coins, instead of using the manual start button 17, the Master Start Line Switch 95 may be actuated in the known manner by coins received from any of numerous coin-testing or accepting devices (not shown) available on the market.

A variator circuit which may be part of the control circuit of FIGURE 8, and is also part of the programming means previously described in view of FIGURES 6 and 7, includes the array of photoelectric switches or cells 88A . . . 88H connecting with power from a supply conductor 105 to a corresponding one of the blocking coils or electromagnets 51A . . . 51H and the drop side 106 of said supply, such that when any said photoelectric device is excited by its corresponding lamp 87A etc., as aforesaid, the corresponding coil 51A, etc., will be energized to actuate the variable drive means in the manner previously described in view of FIGURE 3 to alter the progress of the corresponding racing figure.

The rate of movement of the several drive bands 30 and their racing objects is continually being varied under control of the aforesaid photoelectric variator means by a pulsing of the step-up coil 84 for the programming disc 80 effected by frequent closures of a step switch 108 by a cam programming disc 109 fixed on the main drive shaft 45 (FIGURE 4). The said cam disc also determines the duration of the blocking pulses applied to the blocking electromagnets 51A, etc. through the agency of an interrupter switch 110 operated by said cam disc for durations determined by its rate of rotation and the length of the cam configuration 111.

The said interrupter switch 110 when closed connects power to the photo-cell supply conductors 105, 106 from a source 112 via conductor 113 and 114 and another relay switch 115 on the Race Relay, the coil 97 of which, it will be recalled, holds in for the duration of the race.

The aforesaid photo-cell supply will preferably be a direct-current source which will also be utilized to energize the program stepping coil 84 for a more reliable pulse than would be supplied by the usual alternating current from the source connected to conductors 90, 94.

It will be evident that the distribution of the light passages in the programming disc is intentionally irregular and can be complexly scrambled in pattern and in a great number distributed variously over the area of even a small disc of the type depicted, so that a wide range of movement variation of the horses can be had over a great many operating cycles before any "repeat" pattern will appear and the pattern varying capacity of the system is accordingly more than adequate for the purposes of affording a realistic and genuine random movement of the racing objects.

The operation of the game permits several players to make a selection of choices for winning by pushing one of the selection buttons 18A . . . 18H on the panel 16 (FIGURE 1), which will result in closure of a corresponding selector switch 18AX . . . 18HX (FIGURE 9), thereby energizing a corresponding Selection Relay Coil 120A . . . 120H. For example, if button 18A is pushed, selector switch 18AX will apply power to coil 120A, the relay switch 121A of which will close a holding circuit in shunt around the manual selector switch 18AX, and another relay switch 122A will also be closed to energize a corresponding one of the display lamps 125A . . . 125H arranged on the lamp panel 24 (FIGURE 1). In case a change of selection is desired, a normally closed reset or cancellation switch 130 may be opened (by button 18R) to break the holding circuit to any selection relay, thus dropping out such relay or relays and extinguishing the appertaining display lamps on panel 24.

In addition to the advantages and features hereinabove alluded to or inherent in the disclosure, the described constructions make possible an easily fabricated and assembled and serviced apparatus.

The gear blocks can be identical and economically molded from plastic materials, and have the advantage of affording any desired width of gear face thus making it possible to mount the driving gears directly beneath the bands at conveniently spaced locations without crowding or critical alignment and assembly, it being evident that a broad width across the face of the rack of gear teeth permits meshing with a broader driving gear with considerable allowance for play and self alignment (see FIGURE 4). The pivoted attachment of each block affords easy entry of its teeth into engagement with the driving gear and easy disengagement therewith, somewhat analogously to the self-adaptive action of a sprocket chain. In addition, the sidewise projection of the heads of the pivot rods affords a driving support for both the blocks and attached band and one which is largely self-adjusting in the trackways. By attaching the blocks centrally at a single and more or less centered pivot point in the body thereof, the intervening lengths of the band are free to flex laterally so that the band as a whole can assume its looped configuration. The wide character of the gear racks affords an ample land for mounting of any desired appendage, such as the figures 12.

I claim:

1. In a race game having a plurality of racing figures each movable by a corresponding supporting and driven means about a closed circuit in relation to other like figures similarly supported and moved, improvements in the supporting and driven means comprising: a continuous series of separate gear rack bodies each attached to a continuous flexible band and individually movable relative thereto to follow in close contiguity one after another to provide a substantially continuous train of gear teeth; a drive gear cooperable with each series of gear racks; a common driving shaft for all said driving gears; and variable-stroke ratchet drive means operatively coupling each driving gear with said common shaft, each said ratchet drive means having two operating conditions in one of which the coacting figure-driving gear will be advanced by a first degree of movement responsive to a revolution of said common shaft, and in another condition of which a different degree of movement will be effected; and means selectively operable to determine which of said operating conditions shall obtain at any given time.

2. Apparatus according to claim 1 in which the band of said supporting and driven means includes an elongated, narrow, thin strip of flexible metal having its ends joined in a closing loop, said strip being supported to travel in a vertical plane; said gear racks comprising a plurality of individual gear blocks each attached to a side of said strip and each having a rack of gear teeth extending from one end to another on the bottom thereof and each pivotally attached to the same side of said strip in a series with the ends of successive blocks in such contiguity as to permit the teeth of said drive gear to continuously mesh drivingly with the teeth of two succeeding blocks traveling therepast as a result of rotation thereof, said gear being located to rotate in a vertical plane below said gear blocks.

3. Apparatus according to claim 1 wherein said variable stroke drive means comprises a rockable member; a pair of crank arms each drivingly connected at one of its ends to said rockable member but on opposite sides of the rocking axis thereof; a plurality of ratchet wheels each rotatable concentrically of said axis with one of said drive gears; ratchet dog means cooperable with said rockable member and ratchet wheel on opposite sides of said axis to step the wheel responsive to opposite rocking oscillation of the rockable member; a power shaft and separate crank means thereon rotated thereby and each operable for reciprocating a corresponding pair of said

crank arms to oscillate the appertaining rockable member; together with means including electrically controlled blocking means operable selectively to first and second positions relative to the rockable member to condition the latter for different ratchet-advancing action depending upon which of said positions is existent.

4. In a race game including contestant objects constrained to travel about a circuitous course, means for supporting and driving said objects along parallel circuitous paths comprising: a flexible one-piece and substantially flat band having pivotally attached thereto at intervals therealong a series of blocks each having gear teeth therein adapted to mesh with a driving gear; a driving gear for each said band; said blocks being spaced seriatim on each band in closely following succession permitting rocking movement to each block and permitting any two successive blocks to mesh drivingly with said driving gear such that said series of blocks will travel said band circuitously responsive to rotation of said driving gear; and means attaching a racing object for movement with said supporting and driving means.

5. The construction of claim 4 in which each said band is supported for movement as set forth in a substantially vertical plane of travel and said blocks are each attached thereto for rocking movement as set forth by means providing a rocking axis which is substantially normal to the plane of the flat band.

6. The construction of claim 5 wherein the means for supporting the bands for movement in vertical planes comprises a plurality of guide members adapted to be mounted in side-by-side relation to define a plurality of circuitous guideways with receded portions in vertical side wall parts thereof receiving said bands and the associated gear blocks and confining the same for travel circuitously as set forth.

7. Apparatus according to claim 4 further including driving mechanism for said driving gear in the form of a ratchet wheel jointly rotatable with said driving gear; a common shaft on which said gears and respective ratchet wheels rotate independently, each in driving relationship to a corresponding band and gear block assembly; a plurality of rockable members on said shaft each juxtaposed with one of said ratchet wheels to rock coaxially alongside thereof; a ratchet dog on each side of the wheel axis and spring-urged into driving engagement in the teeth thereof responsive to opposite rocking movements of said rockable member; and means for rocking said rockable member comprising a pair of crank arms each pivotally attached thereto radially of said axis on a side of the latter opposite from the other crank, a single crank wheel drivingly engaging both cranks by means of a crank pin engaging in a long slot in each crank, and spring means acting on one side of said rockable member to rock the same in one of its directions of rocking movement, whereby rotation of the crank wheel rocks the rockable member.

8. A construction as defined in claim 7 wherein there is further provided a movable stop member and means for moving the same into and from blocking position relative to one radially disposed part of the rockable member to block rocking motion on the appertaining side of the rocking axis in the same direction of movement as that imparted by said spring means, whereby the driving displacement imparted by said rockable member to the ratchet wheel for each revolution of said crank wheel is reduced.

9. Apparatus according to claim 8 further including a stopping member positioned relative to any band and guideway for movement to and from a blocking position relative to a gear block travelling therein to arrest the block.

10. Apparatus as defined in claim 8 further including electromagnet means for moving said stop member to and from blocking positions as set forth, and means for energizing said electromagnetic means at random intervals comprising a program ratchet wheel and means for automatically moving the same in small steps at intervals, said program wheel having a plurality of concentric zones each

containing a series of irregularly spaced light passages; a light source for each said zone before which said program wheel moves the passages in the appertaining zone; photoelectric means aligned with each said zone and each electrically connecting with one of the electromagnetic means for moving the stop member for the corresponding rockable ratchet-driving member, whereby to effect intermittent arrest at random intervals for each travelling band and contestant object.

11. In a racing game, a set of flat, circuitously travelling carrier bands adapted to travel racing objects and each formed into a closed loop having a substantially flat vertical side surface travelling about the circuit in a substantially vertical plane, said loops being of diminishing diametric dimension and spaced apart one within another about a common center; means supporting the bands for travel as aforesaid; a driving gear of predetermined width across the teeth for each band, said gear disposed to rotate in a vertical plane beneath the side surface of the appertaining band in parallelism with the plane of travel thereof, each band having a continuing series of gear teeth for mesh seriatim with the corresponding driving gear, said series of driven gear teeth being provided for each band by a series of short individual rack members each pivotally attached to said vertical side surface of the band to follow in closely spaced separation one after another thereabout and each independent of immediately adjoining rack members, each said rack member having a linear rack of gear teeth which are at least as broad across as the width of said driving gear disposed by travel of the appertaining band for meshing alignment with the corresponding driving gear; and means for rotating said driving gears jointly or selectively, as desired.

12. Apparatus according to claim 11 wherein said rotating means includes a source of driving power and means impositively connecting the same with each said driving gear for unidirectional advance of the latter, said connecting means including a rockable member for each driving gear and oscillable in opposite directions such that each complete oscillation thereof advances the appertaining driving gear unidirectionally, and restraint of said rockable member in one particular direction of rocking movement prevents advance of the corresponding driving gear and restraint acting upon the corresponding carrier will be transmitted through the corresponding driven gear teeth to the corresponding driving gear and corresponding rockable member and will likewise prevent rocking of said rockable member in said particular direction; together with means selectively operable to permit and prevent rocking movement of any particular said rockable member in said particular direction.

13. Apparatus according to claim 12 further provided with movable arresting means located at a predetermined point along the path of travel of said carrier bands and movable to and from control positions for impeding or permitting travel past said position; and means for moving said arresting means to and from said control positions.

14. A construction according to claim 11 wherein each rack member is pivotally attached in assembly with the appertaining carrier band by pin means passing through the band with opposite projecting supporting portions on a side of the band remote from the block and on a side of the block remote from the band and both in axial alignment to be received in aligned, spaced-apart guideways supporting the assembly for travel as aforesaid.

15. In a racing game, circuitously travelling carrier bands adapted to support and travel racing components and constructed in the form of flat elongated and relatively narrow strips substantially rigid in the plane transverse to their length, and flexible in the direction of their length, said strips each being secured in a closed loop and supported to travel with the plane of flatness thereof extending vertically about a circuit containing curvilinear changes of direction; and drive means including a driving gear for each band and a continuous series of short gear blocks each attached in fixed locations for one of the flat sides of

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the band for individual movement relative to the latter, each block being provided with a series of gear teeth adapted to mesh with the appertaining driving gear as a function of travel of the corresponding band, said series of teeth forming a continuous rack of band-travelling teeth to be driven by rotation of the appertaining driving gear; said blocks each being attached to the band, and each being of a length in relation to the radius of curvature of said curvilinear changes of direction, and each being spaced respectively from the immediately preceding and succeeding blocks in the series, in a manner to permit movement of said band freely through said curvilinear changes in direction.

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10 RICHARD C. PINKHAM, *Primary Examiner*.
THOMAS ZACK, *Assistant Examiner*.