Oct. 20, 1936. R. E. WELLS 2,058,280

RATIO CALCULATOR

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Fig. 1.

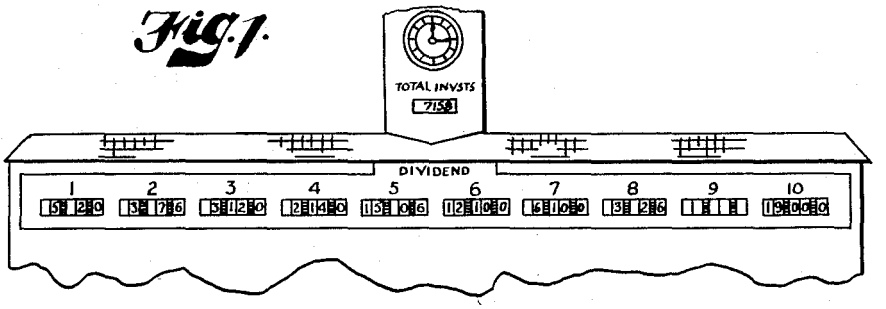


Fig. 3.

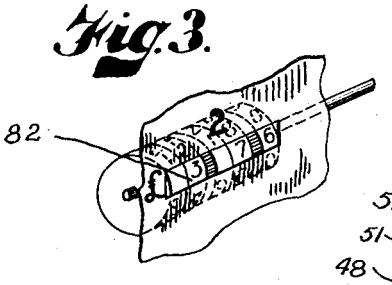
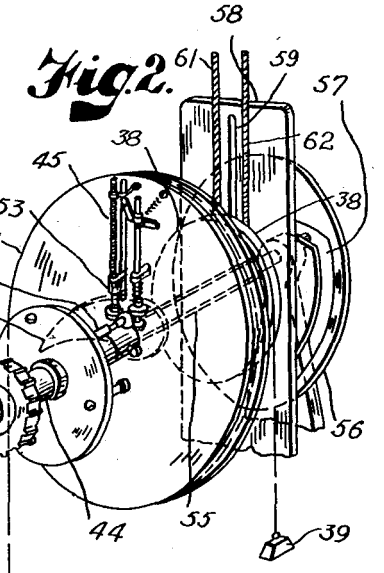


Fig. 2.



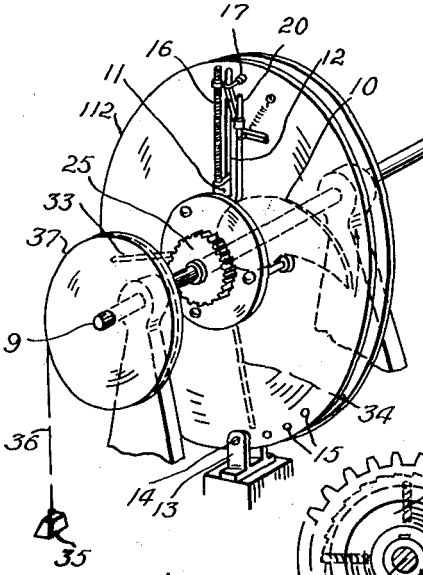


Fig. 8.

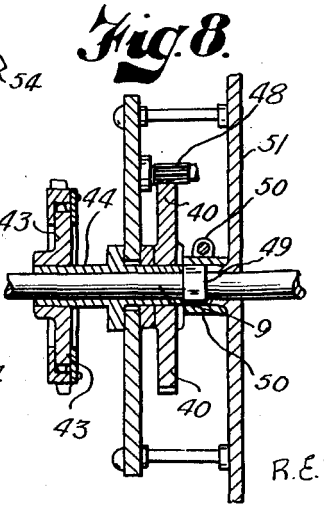
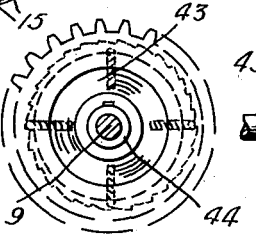


Fig. 9.



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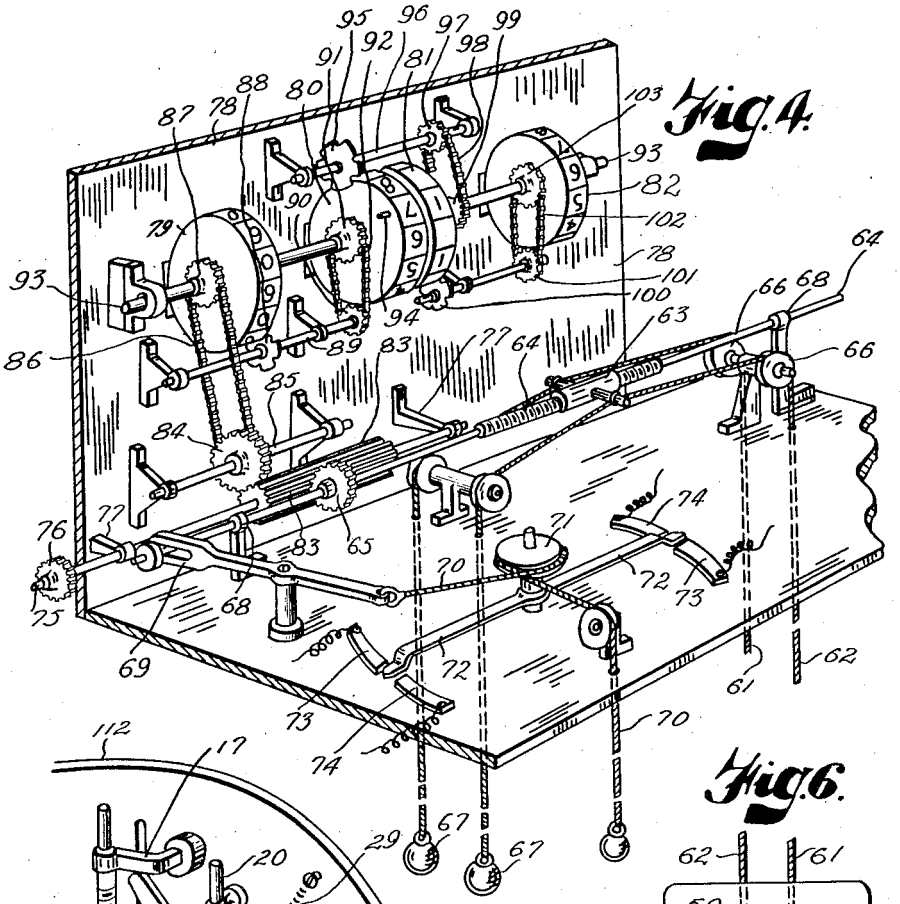

Fig. 4.

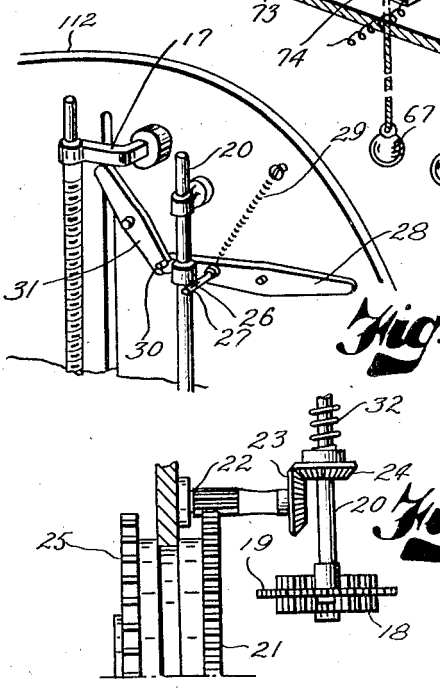

Fig. 5.

Fig. 7.

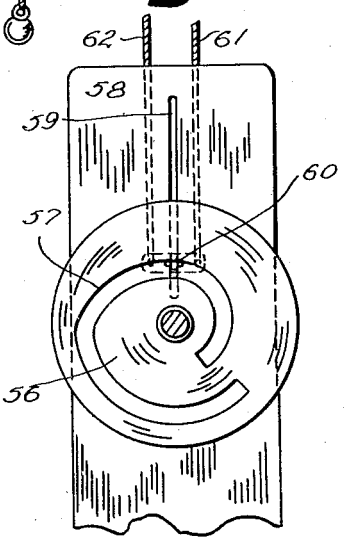

Fig. 6.

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Fig. 12.

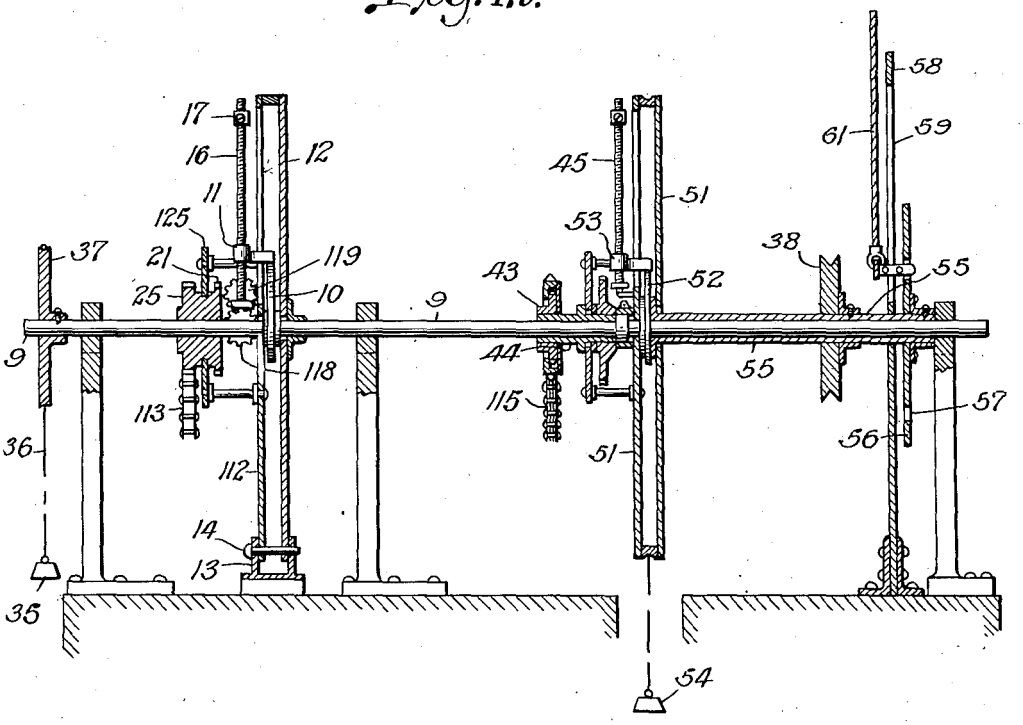

Fig. 10.

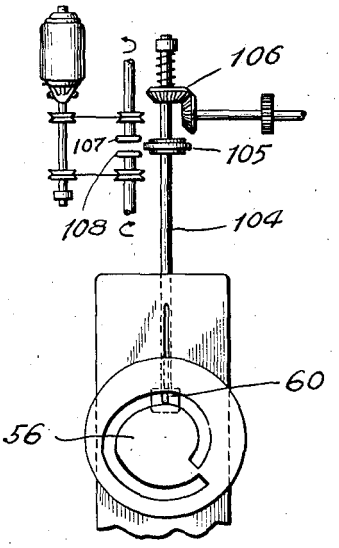

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Fig. 13.

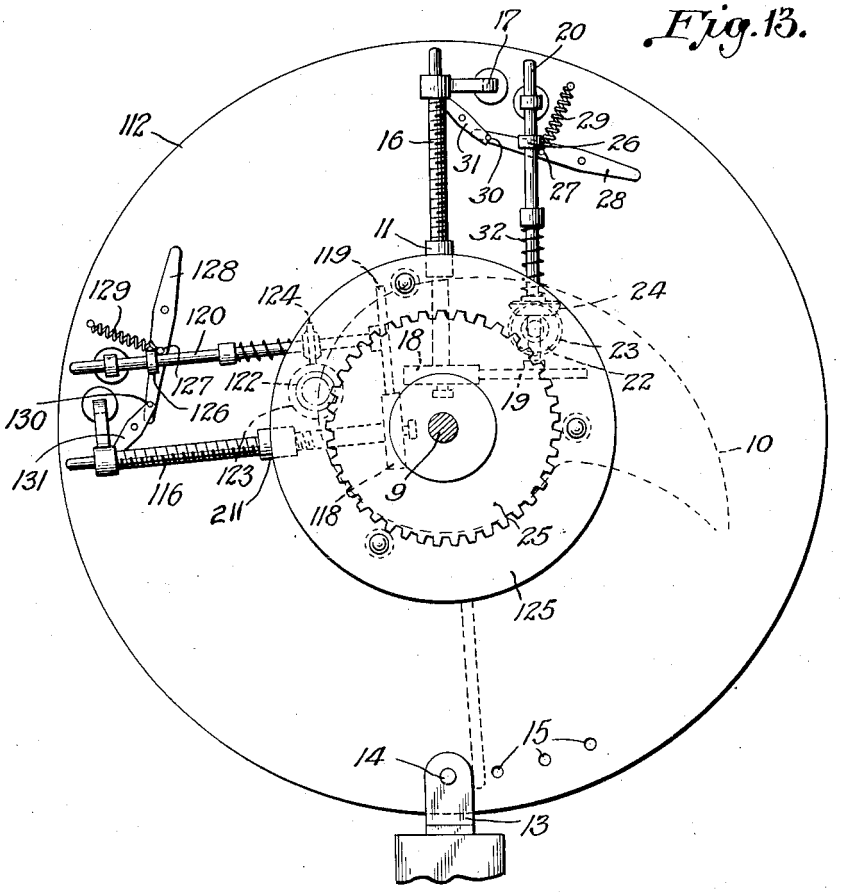
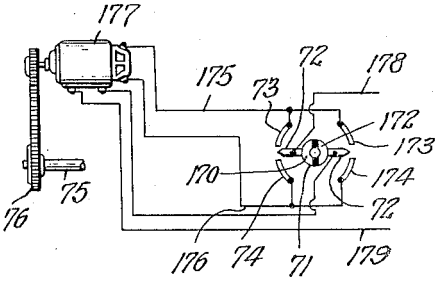


Fig. 11.



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Patented Oct. 20, 1936 2,058,280

UNITED STATES PATENT OFFICE

2,058,280

RATIO CALCULATOR

Roy Ernest Wells, Roseville, near Sydney,
New South Wales, Australia

Application May 16, 1932, Serial No. 611,726
In Australia June 22, 1931

2 Claims. (Cl. 235—61)

This invention relates to improvements in means for progressively computing and visually indicating dividend values such as would be payable in respect of each of a plurality of horses or other racing units, in connection with a race totalizator or odds-computing machine or for progressively computing the ratio between any two varying numbers or quantities.

The present invention is applicable to any of the well known totalizators wherein movement may be obtained from the usual ticket selling machines or the like provided on such machines.

The invention comprises logarithmic cam mechanism adapted to be operated by the usual mechanism provided upon a race totalizator for computing the total number of investments made during a particular race, and a plurality of logarithmic cam mechanisms each adapted to control mechanism for visually indicating the price payable for an investment upon a particular horse in the race and adapted to be operated by or from the usual mechanism provided upon the totalizator for computing the total number of investments placed upon the respective horses.

The invention is provided with a main shaft which is mounted in suitable bearings and has keyed thereto a cam shaped member plotted to a logarithmic curve. This member which is termed the total investment cam is adapted to engage a stop which is slidable along a groove in a support or frame capable of adjustment relatively to the shaft.

Preferably the stop is adapted to be moved slowly along a slot in the support in a radial direction away from the shaft by means of a worm or other gearing operated from the well known mechanism provided on a totalizator for computing the total number of investments that have been made on a particular race.

The total investment cam and its stop are kept in engagement by torque applied to the shaft by any preferred means, such as a weight disposed upon the end of a cord which has been wrapped round a grooved pulley mounted upon the shaft.

Means are provided whereby the stop mechanism may be disengaged when it is desired to return the stop to zero, or when the stop passes beyond contact with the cam.

In addition to the above mechanism, price indicating mechanism is provided one of which is necessary in respect of each horse or unit taking place in the race. Each price indicating mechanism is provided with a support or frame for a sliding stop adapted to be moved along a slot by means of worm or other gearing from the ticket selling mechanism usually provided in a totalizator, of the kind referred to and whereby the total investments made upon the particular horse are registered.

The support or frame for the respective price indicating mechanism is adapted to be connected to the main shaft by a suitable clutch so that any one of such mechanisms may be thrown out of action when desired; for instance when a horse is scratched. Provision is also made for freeing the stop mechanism when it is to be returned to zero.

In the case of the individual price indicating mechanisms the respective stops are engaged by a cam also plotted to a logarithmic curve, henceforth referred to as the individual horse cam. Each individual horse cam is loosely mounted upon the main shaft and has connected therewith logarithmic conversion gearing adapted to convert logarithmic dividend values into ordinary values.

The individual "horse" cams are so arranged that they rotate in the opposite direction to the total investment cam when actuated by their respective control mechanisms, but are forced round in the same direction as the total investment cam, by means of their stops which rotate round the main shaft in unison with the total investment cam. Hence the degree of movement of the respective individual horse cams from their respective starting positions is the logarithmic dividend in respect of each individual horse at any instant.

The logarithmic dividend is converted to ordinary value by conversion gearing which may comprise a disc cam and mechanism utilizing a reciprocating movement capable of being imparted to the dividend display drums of the totalizator.

In order that the invention will be more readily understood reference will now be made to the accompanying drawings wherein:—

Figure 1 is a front elevation of the upper portion of a known totalizator structure wherein provision is made for displaying the cash dividend obtained in accordance with the invention.

Figure 2 is a schematic view showing the mechanism whereby movement derived from the total investment mechanism of a known totalizator and the respective total "horse" computing means thereof, is transmitted to the dividend display apparatus of the said totalizator.

Figure 3 is an enlargement in perspective of one of the dividend display apertures seen in Figure 1, showing in broken lines the dividend display

drums which however do not form part of the present invention.

Figure 4 is a schematic view of the apparatus whereby the resultant movement imparted by the mechanism shown in Figure 6 is conveyed to the dividend display drums seen in Figure 1.

Figure 5 is an enlarged perspective view of the means provided for releasing the stop mechanism associated with the respective logarithmic cams.

Figure 6 shows in elevation the disc cam employed for converting the logarithmic dividend into a reciprocating movement capable of being imparted to the dividend display drums seen in Figures 1 and 3.

Figure 7 is an enlarged elevation of the inner portion of the mechanism controlling movement of the stop engaged by the total investment cam.

Figure 8 is an enlarged sectional elevation of a portion of the drive mechanism employed to actuate the stops **53**.

Figure 9 is an elevation of the free wheel sprocket seen in Figure 8.

Figure 10 illustrates diagrammatically an alternative method to that shown in Figure 6 whereby the resultant movement imparted by the mechanism seen in Figure 1 may be transmitted to the dividend display drums.

Figure 11 is a diagram of the motor circuit.

Figure 12 is a longitudinal section of the apparatus shown by Fig. 2.

Figure 13 is an end view of Fig. 2.

The invention will now be described as applied to one of the horses in a race.

The main shaft **9** which is mounted in suitable bearings in the known totalizator frame or in a suitable frame adjacent thereto has keyed to it a cam shaped member **10** termed the "total investment cam" plotted to a logarithmic curve. This cam **10** is adapted to engage a stop **11** which is slidable along a slot **12** in a support in the form of a pair of discs **112** loosely mounted upon the shaft **9** and adjustable with relation thereto as by means of a bracket **13** and a removable pin **14**, which latter is adapted to engage one of the respective holes **15** in the discs **112**. The object of the above adjusting means is to allow of a part rotation of the discs **112**, cam member **10** and the shaft **9**, to provide for percentage reductions called for by Government tax, running expenses and the like.

If necessary, three stops **11** and associated mechanism may be provided for each cam **10**, said stops being operable respectively in slots **12**, **33**, **34**, disposed radially around the shaft **9**; in which case the respective mechanisms are geared together in order to operate the stops **11** in a predetermined ratio so that they will be engaged successively by the cam **10**.

The stop **11** of Figs. 2 and 13 is adapted to be moved along the slot **12** in a radial direction away from the shaft **9** by means of a screwed rod **16** upon which the stop **11** is mounted. The screwed rod **16** is carried in bearings **17** mounted upon one of the discs **112**. One of the bearings **17** is shown more clearly in Figure 5.

On the lower end of the screwed rod **16** is a spur wheel **18** (see Figure 7), which meshes with a thin spur wheel **19** disposed upon the lower end of an operating rod **20** which is given rotary movement from a spur wheel **21** and a pinion **22** by means of bevel wheels **23** and **24**. The pinion **22** is mounted upon a spindle which projects from the disc **125**. The spur wheel **21** is loose on the shaft **9** and has coupled thereto a sprocket wheel **25** which is connected by a chain **113** with the well known total investment mechanism of the totalizator. The bevel wheel **24** is adapted to be brought out of engagement with the bevel wheel **23** when it is desired to prevent further movement of the stop **11** along the slot **12** or in cases where it is desired to return the stop **11** to the zero or starting position in the slot **12**. To this end a collar **26** is provided on the rod **20** and rests upon a pin **27** on a lever **28** pivoted to the disc **112**.

A spring **29** tends to raise the inner end of the lever **28** and the pin **27** carried thereby. The operating rod **20** would be also raised by the spring **29** were it not for the fact that the lever **28** is held down by the engagement of a pin **30** thereon, by a pivoted lever **31** also carried upon the disc **112**. The upper end of the second lever **31** is adapted to be engaged by the stop **11** which partly tilts the lever **31** and disengages the pin **30**. The rod **20** is now free to rise and disengage the bevel wheel **24** from the bevel wheel **23** with which it is normally engaged by the spring **32**, preventing further movement of the particular stop **11**.

The total investment cam **10** and its stop or stops **11** are kept in engagement by torque applied to the shaft **9** by means of the weight **35**, a cord **36** and a pulley **37**, around the periphery of which the cord is passed.

By this means the cam **10** follows the movement of the stop or stops **11** and in turn causes a partial rotation of the shaft **9** and the parts mounted thereon.

In order to obtain the geared ratio between the respective stops **11**, the first of the screwed rods **16** is driven from the spurwheel **21**, which is disposed behind the disc **125**, by the pinion **22** as described above. The second screwed rod **116** is rotated at one tenth of the speed of the screwed rod **16** by the following gearing. A pinion **122**, which meshes with the spur wheel **21**, carries a worm **123** which turns a worm wheel **124** secured to the spindle **120** of the mechanism of the second stop **211**. This spindle **120** carried a thin spur wheel **119** corresponding to the wheel **19** on the spindle **20**. The wheel **119** engages a pinion **118** secured to the said screwed rod **116** and ensures its rotation at the desired reduced speed.

Consequently as the cam **10** leaves the stop **11** it has already engaged the stop **211** which continues to function until it reaches the upper end of the screwed rod **116** when the cam leaves it and functions with a third stop, if provided, the third stop being connected in a similar manner to that described with reference to stops **11** and **211** to move at one hundredth of the speed of the stop **11**.

Each of the stop mechanisms is provided with disconnecting mechanism to release their respective gear wheels **19** and **119** from their companions **18** and **118** respectively. The release mechanism for the second stop **211** is indicated by the numerals **126**, **127**, **128**, **129**, **130**, and **131** corresponding to **26**, **27**, **28**, **29**, **30** and **31** with respect to the stop **11**.

If the several stops are operated in the ratio of ten to one with respect to each other the second one will rotate $\frac{1}{10}$th the rate of the first, and the third $\frac{1}{10}$th the rate of the second, in which case the angular spacing between the slots wherein the stops are mounted in disc **112** would be in accordance with the angular relation between the logarithmic position of ten, one hundred, and one thousand, respectively on a logarithmic scale plotted to the same scale as that used in forming the cam. Thus the second stop would be

moved to contact with the cam when the first stop has reached the point representing one hundred investments and has been thrown clear of the cam by the means shown in Figure 5.

The second stop will then control the movement of the cam to a point representing one thousand investments and the third stop if provided will have worked out to the position to engage the cam and control its movement to ten thousand.

A sleeve 44 loose on the shaft 9 is rotated from that portion of a totalizator of the kind referred to and provided to compute the total investments upon a particular horse by means such as a ratchet clutch-free wheel sprocket 43 and chain 115, see Figs. 2, 8 and 9.

The sleeve 44 upon which the inner portion of the ratchet sprocket wheel 43 is mounted is loose upon the shaft 9 and carries a spur wheel 40 adapted to drive the stop mechanism through the medium of a pinion 48 (see Figs. 2 and 8) of the individual horse cam 52 and associated mechanism disposed upon a disc 51 and similar to that described with reference to the disc 112. The disc 51 is loose upon the shaft 9 but is adapted to be clamped to a collar 49 by a band 50, the collar 49 being fixed to the shaft 9. The cam 52 which is mounted fast upon a sleeve 55 on the shaft 9, is maintained in contact with the stop 53 by means of the torque applied to the disc 38 fastened to 55 by a weight 39. A counter balance weight 54 is suspended from the periphery of disc 51 to balance the effect produced by the weight 39 on shaft 9.

The sleeve 55 also has secured thereto a disc 56 having a cam track 57 (see Figure 6) also plotted to a logarithmic curve. A guide plate 58 which is fixed with relation to the sleeve 55 and shaft 9 and through which they pass, is provided with a slot 59 in which a cam follower 60 is adapted to be moved by 57 with which it is engaged.

The stop 60 is connected by cords 61 and 62 with a sleeve 63 (Figure 4) screwed upon a rod 64 carrying a spur wheel 65. It will be observed on referring to Figure 4 that the cords 61 and 62 pass over pulleys 66 and terminate with the weights 67 which keep the cords in tension.

The rod 64 is slidably mounted in bearings 68 and engages a forked lever 69 one end of which has a weighted cord 70 tending to exert a pull upon the rod 64. The cord 70 is passed round a pulley 71 on the shaft of which a switch arm 72 is mounted. The switch arm 72 carries two contact sections 170 and 172 and is adapted to be moved into engagement with one or other of the pairs of contacts 73, 174 or 74, 173 according to the position of the switch arm 72 as effected by the movement of the cam stops 11 and 53, Figure 2, whereby the cam 56 and stop 60 are controlled.

The contacts 73, 173 are connected by wire 175 and the contacts 74, 174 are connected by wire 176, the wires 175 and 176 being connected to a motor 177, in well known manner. The positive and negative wires 178 and 179 are connected to the respective ends of the switch arm 72 the two ends being separated by suitable insulation. It will be seen from the diagram that as the arm 72 is moved from one side to the other the direction of current supplied to the motor 177 is reversed. The electric motor is geared to a shaft 75 by a spur wheel 76 and the shaft 75 is mounted in bearing brackets 77 at the back of a panel 78 provided to display the cash dividend values by means of the cash dividend drums 79, 80, 81 and 82. A relay switch system may be employed whereby a low voltage current may be used to actuate solenoids controlling a high voltage motor switch.

As previously pointed out, the electric motor 177 is geared at 76 to the shaft 75. The motor is controlled by the switch arm 72, which engages contact 73 or 74 when said arm is moved to right or left by means of the screw-rod 64 according to the direction of movement imparted to the cam stop 60 by the cam 57. The electrical connection joining the respective pairs of contacts 73 and 74 to the motor are so arranged as to cause the motor to be set in operation immediately either pair of said contacts is bridged by the switch arm 72; and the motor will continue to rotate until the switch arm has been returned to its neutral position. In performing this operation the rotation of the motor is transmitted to the display drums 79—82, through the shaft 75, elongated pinion 83, spur wheel 84, sprocket chain and gear 86—87 to the shaft 93, on which are mounted the display drums. Movement of the display drums in either direction is thereby directly governed by rotation of the electric motor, which is rotated in one direction or the other, according to movement of switch arm 72 resulting from the raising or lowering of the stop 60 by the cam 57.

The shaft 75 carries an elongated pinion 83 which meshes with the pinion 65 and also with a spur wheel 84 mounted upon a shaft 85. At the rear of the spur wheel 84 a sprocket wheel, not shown, is mounted. This sprocket wheel is connected by a chain 86 with a sprocket wheel 87 on the pence drum 79, which in turn drives the units shillings drum 80 by means of star wheel 88, shaft 89, sprockets 90 and 91 and chain 92.

The units shillings drum 80 which is also loose upon the drum shaft 93, drives the "tens" shillings drum 81 by means of pin 94, star wheel 95, shaft 96, sprocket wheel 97, chain 98 sprocket wheel 99 on the drum 81. The "tens" shillings drum 81 in turn drives the pounds drum 82 by star wheel 100, sprocket 101, chain 102 and sprocket 103. Similarly a "tens" pounds drum may be driven by the pounds drum. Any other well known means may be used for operating the relative movement of the individual drums.

Figure 10 serves to indicate diagrammatically alternative means whereby the movement imparted to stop 60 by the disc cam 56 can be transmitted to dividend indicating apparatus similar to that illustrated by Figure 4. The stop 60 in this case is mounted on a screwed spindle 104 which has fast on it a friction wheel 105 and a pinion 106 slidably keyed thereto. The wheel 105 is adapted to engage two constantly rotating discs 107 and 108 situated adjacent to the wheel 105 and rotating in opposite directions.

When the stop 60 is moved by the disc cam 56 or by weights 67 the spindle 104 is raised or lowered accordingly, thus bringing the wheel 105 into frictional engagement with one or other of the discs 107 and 108, and thereby causing the pinion 106 to be rotated in one or the other direction. Any appropriate means may be adopted for utilizing rotation of the pinion 106 to operate the display mechanism through the gear 84.

Briefly the invention operates as follows:—

When the shaft 9 turns as previously explained the disc 51 also turns and owing to the contact made between the stop 53 and the cam 52, the latter also turns carrying with it the sleeve 55

in a logarithmic movement which may be used to indicate the odds on a particular horse or which may be converted by the cam disc 56 and associated mechanism into reciprocating movement utilizable for indicating the odds upon a particular horse.

It will be observed that when the shaft 9 moves, the disc 51 is moved in an anti-clockwise direction and the stop 53 tends to move the cam 52 and its sleeve 55. However, when the particular free wheel sprocket 43 is rotated from the particular horse investments mechanism it rotates the sleeve 44 and the wheel 40 which is geared with the stop mechanism 45 and moves the latter causing a movement of the cam in the opposite direction to that imparted to it by the shaft 9.

For instance if the cam 10 moves the shaft in an anti-clockwise direction through 50° the disc 51 moves 50° in an anti-clockwise direction. Then if a bet is made upon a horse represented by the disc 51 the stop 53 will be advanced outwardly to allow the cam 52 to move the sleeve 55 say 40° in a clockwise direction. The resultant movement of cam 52 from its original position will be 10°, which movement would represent the logarithmic dividend. The present invention has been devised to utilize the resultant movement of cam 52 caused by combined movements of disc 51 and stop 53 at any one instant, for indicating the odds on a particular horse at that moment.

The apparatus may be zeroized for instance by returning the stops 11 and 53 to their original positions. This may be effected by suitable means such as springs.

It will be appreciated that as many price indicating mechanisms as are required may be mounted upon the main shaft 9 but if such arrangement is not convenient the main shaft 9 may be formed in several portions geared to operate in unison. In use when an investor wishes to know the price he is likely to receive upon any particular horse, all that is necessary is to inspect the respective price indicating drums 79 to 82 or the like upon which the price payable is displayed, no calculation or other investigation being necessary.

It is to be appreciated that various modifications may be made within the scope of the appended claims without departing from the spirit of the invention.

I claim:

1. A ratio calculator for computing dividend values in respect of racehorses, comprising a horizontally supported shaft; a logarithmic cam mounted on said shaft, and mean to transmit movement from known mechanism for registering the total number of investments on a race to said logarithmic cam, a second logarithmic cam affixed to means mounted loosely on said shaft and to which movement of the first mentioned cam is imparted, said second cam being operated independently of the shaft, by means which transmit movement from known mechanism for registering the total number of investments on a particular horse, means for displaying the ratio determined by said logarithmic mechanism, and means operated by said second cam and including a follower for transmitting to the display means the resultant logarithmic movement of the second logarithmic cam.

2. A ratio calculator for computing dividend values in respect of racehorses, comprising a horizontally supported rotary shaft, a first logarithmic cam fast on said shaft, a disc loosely mounted on said shaft and provided with means whereby the disc is held adjustably on the shaft and against rotation thereon, said disc having therein a radial slot, a movable stop guided in the slot of said disc and in engagement with said cam, rotary mechanism on said shaft for moving the stop outwardly in the slot, and means for transmitting rotary movement from known mechanism for registering the total number of investments on a race to said rotary mechanism to move the stop, a sleeve mounted loosely on said shaft, and a second logarithmic cam fast on said sleeve, a second disc fast on said shaft, adjacent to said second cam and having a radial slot, a stop for the second cam disposed in the slot in said second disc, mechanism loosely mounted on the shaft for moving the stop for the second cam, and means for transmitting movement from known mechanism for registering the total number of investments on a particular horse to said loosely mounted mechanism, means for translating into uniform movement the resultant movement imparted to the sleeve of the second logarithmic cam, means for displaying the ratio determined by said logarithmic cams, and means for transmitting to said display means the said resultant movement.

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