C. G. GUTHRIE & L. W. NEILSON.

MACHINE FOR REGISTERING THE TRAJECTORIES OF CAPTIVE BALLS.

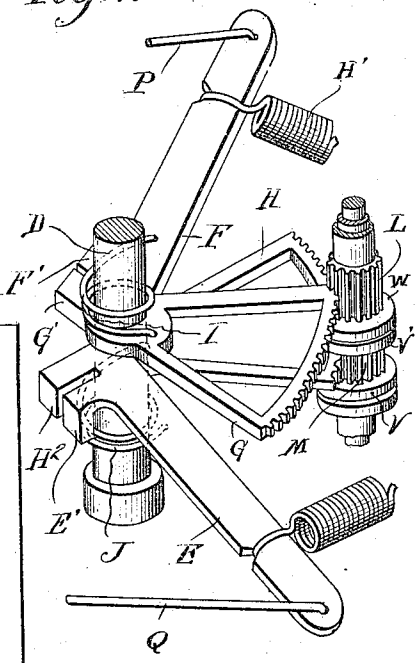
APPLICATION FILED JUNE 27, 1916.

1,240,198.

Patented Sept. 18, 1917.

2 SHEETS—SHEET 1.

Fig. 2a.



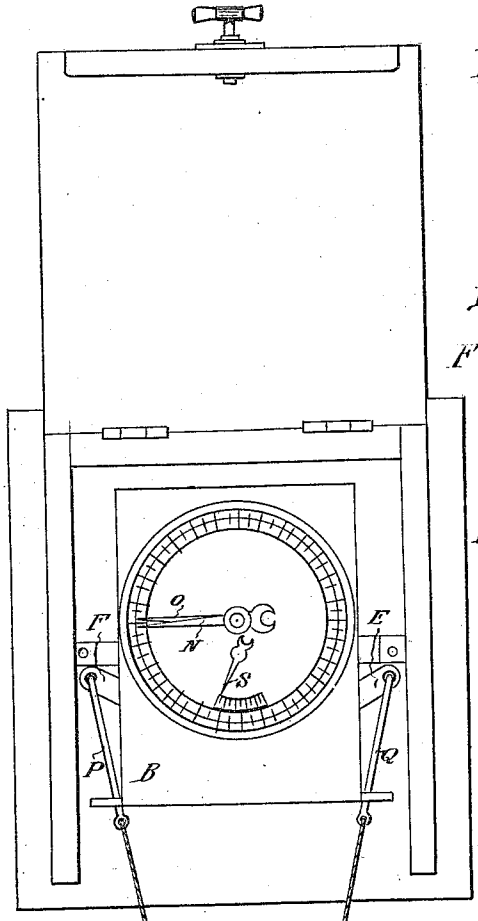
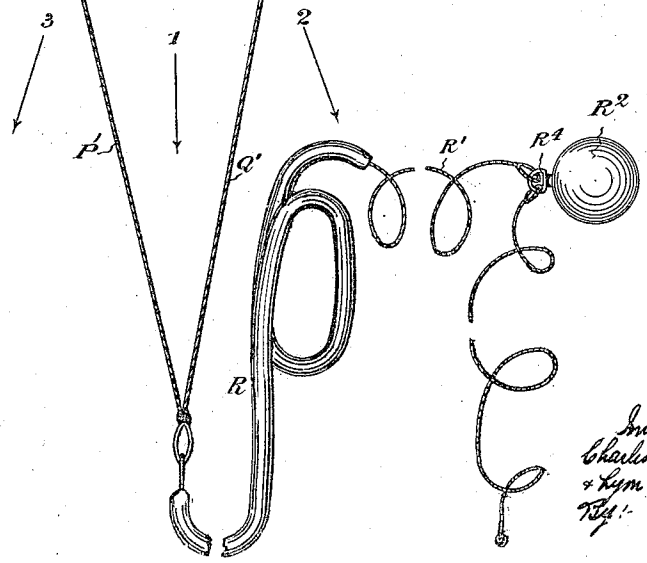


Fig. 1.



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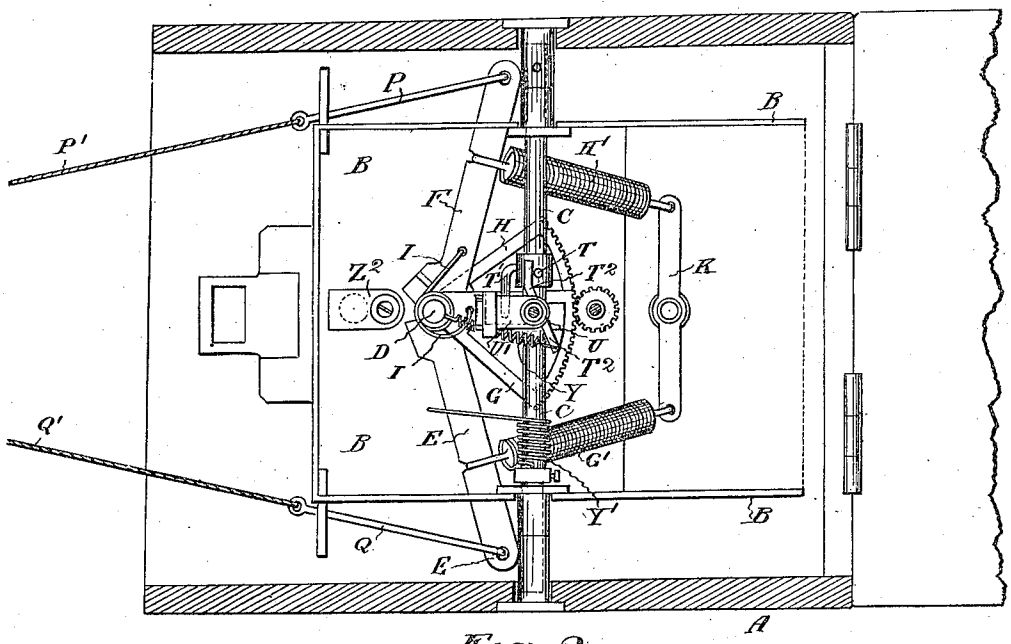


Fig 2.

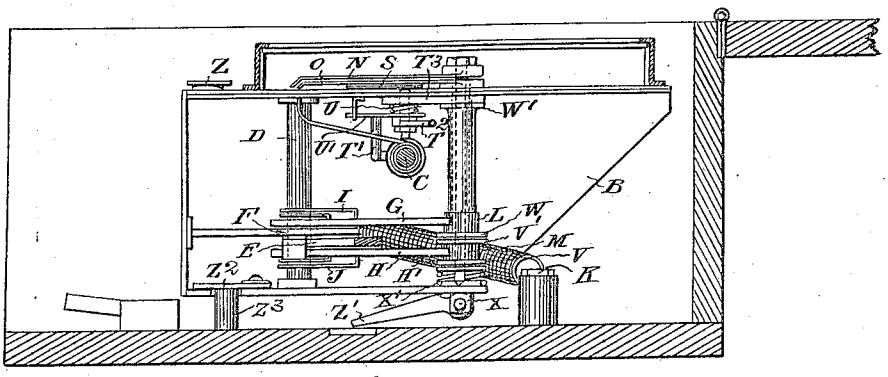


Fig. 3.

Inventors:
Charles Guthrie Guthrie.
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By: B. Singer. Atty.

UNITED STATES PATENT OFFICE.

CHARLES GUTHRIE GUTHRIE, OF GLASGOW, AND LYON WILSON NEILSON, OF HELENSBURGH, SCOTLAND.

MACHINE FOR REGISTERING THE TRAJECTORIES OF CAPTIVE BALLS.

1,240,198. Specification of Letters Patent. Patented Sept. 18, 1917.

Application filed June 27, 1916. Serial No. 106,236.

To all whom it may concern:

Be it known that we, CHARLES GUTHRIE GUTHRIE, of 10 Hamilton Crescent, Glasgow, West, Scotland, engineer, and LYON WILSON NEILSON, of Dalblair, Granville street, Helensburgh, Scotland, engineer, have invented a certain new and useful Machine for Registering the Trajectories of Captive Balls, the same being also applicable for indoor golf, of which the following is a specification.

Our invention has for its object the providing of a scientifically designed machine, by means of which any individual making a stroke with any form of golf club upon a golf-ball held in captivity by an attachment in communication with the operating gear of the machine, will have indicated correctly upon the machine the properties of length, height, "slice" or "pull" for the complete flight of the ball as efficiently as if it had been free to make its complete flight and thereby enable a golfer or player to at once observe the effect of any stroke, and immediately to correct any errors in his stance, swing, grip, and all the circumstances which affect the value of the aforesaid properties of each stroke.

In order that our invention may be properly understood and readily carried into effect, we have hereunto appended one sheet of drawings, of which—

Figure 1 is a plan of the machine made in accordance with and embodying our invention.

Fig. 2 is a part plan and part horizontal section of the machine turned at an opposite plane drawn to an enlarged scale.

Fig. 2^a is a detail perspective view of the lever mechanism directly connected to the captive ball.

Fig. 3 is a longitudinal section of the part shown in Fig. 2.

Referring to the drawings, A is the outer box. The mechanism which will be described with reference to the drawings, is contained for the most part in the inner box B. The box is adapted to oscillate in a fixed transverse shaft C. This shaft traverses the whole width of the inner box B and is carried through bearings on the upright sides of it and it projects on each side into bearings carried on the upright walls of the outer box A aforesaid, and it does not revolve, but is a fixture in those outer bearings, and forms the fulcrum about which the inner box B oscillates. A vertically fixed column D is mounted near the front of the inner box B. This column forming a fulcrum carries the levers E, F, G, H, which operate coaxially in pairs, the straight lever E operating in conjunction with the toothed quadrantal lever H and the straight lever F operating in conjunction with the toothed quadrantal lever G by means of a shoulder piece protruding from each of the straight levers E, F, near the fulcrum and acting upon each of the tail ends of the quadrantal levers G, H, the arrangement being clearly shown in Figs. 2 and 3. Coiled around the fixed column D are two helical springs I, J. One of the ends of each of these is fixed at a suitable point in the straight levers, while the other end of each is fixed at a suitable point on the toothed quadrantal levers. These springs I, J, are fixed to insure an uncoiling action, and the shoulders on the straight levers butt against the tail ends of the quadrantal levers with the consequent pressure. It will be seen that the column D forms a fulcrum carrying the levers E, F, G, H, said levers operating coaxially in pairs, the straight lever E operating in conjunction with the toothed quadrantal lever H and the straight lever F operating in conjunction with the toothed quadrantal lever G by means of a shoulder piece E^1, and F^1, respectively, protruding from each of the straight levers E and F near the fulcrum and acting upon each of the tail ends G′ and H^2 of the quadrantal levers G and H. This arrangement is clearly shown in Figs. 2, 2^a and 3. Coiled around the fixed column D are two helical springs I and J. One of the ends of each of these is fixed at a suitable point in the straight levers E, F, while the other end of each is fixed at a suitable point on the corresponding toothed quadrantal levers. At a designed point on each of the straight levers E, F, which pass through suitable guide slots cut in the sides of the inner box B at a designed distance below the main shaft C, are attached the ends of the two main helical springs G^1, H^1. The other end of each of these springs is secured to either end of a swinging cross-head K which is swung horizontally upon a pivot fixed vertically in the floor of the outer box A. These springs G^1, H^1, are fitted slightly in tension, and it will be noted that this causes a per-

sistent tendency for the inner box B to return to the position as seen in Fig. 3, should it be tilted upon the main shaft C. The toothed peripheries of the quadrantal levers G, H, engage each respectively with the teeth of the pinions L, M, H engaging M coaxial with the pointer N, and G engaging L coaxial with the pointer O, as seen more particularly in Fig. 3. To the outer ends of the aforesaid levers E, F, are attached the guide rods P, Q, which pass through suitable guide brackets projecting from each side of the inner box B as shown clearly in Figs. 1 and 2. To these guide rods are attached the cords P^1, Q^1, converging to a looped apex to which is attached a single elastic spring R of suitable length. To this elastic spring a length of cord R^1 is attached and carries the ball R^2, which is allowed to spin on a swivel eye-piece R^4. Another cord R^3 is attached as shown in Fig. 1, this being a safety cord which is carried well forward from the player and there suitably secured. On the dial of the machine is operating a short pointer S whose function is to register the elevation of the flight of the projected ball R^2. The means by which this is effected is by mounting a double wiper piece on the aforesaid main shaft C, this wiper piece having two arms T and T^1 which are stationary. Engaging with the arm T is one end of a spring pressed horizontal lever T^2. This lever is carried upon a vertical spindle T^3 which operates through on to the dial of the machine, and mounted upon T^3 is the aforesaid short pointer S. Pressing upon the lever T^2 by means of the compression spring U is a suitably shaped plate friction piece U^1, which is supported by a bracket secured to the under side of the top of the inner box B. The spindle T^3 assists in the supporting of the plate U^1. The smallest inclination given to the inner box B is communicated to the pointer S by the lever T^2 which cannot pass the rigid arm T of the wiper piece that is secured on the fixed shaft C, and in virtue of the frictional contact between the lever T^2 and the fixed plate U^1 enforced by the pressure of the spring U, the pointer S remains at any record of elevation made within the limits of the design of the machine when the inner box B, at the end of the flight, returns to the horizontal position shown in Fig. 3. The spindles carrying the pointers O, N, have been invested with a certain amount of frictional contact which is destined to fix them at any point in their revolution. This is carried into effect by a short helical spring X^1 fitted between the floor of the inner box B and the flange of the adjustable center-piece X which forms a common floating center for hollow and solid spindles on which are mounted the pointers O, N. On the pinion M are incorporated collars V, V^1, and on the pinion L is incorporated the collar W. On the hollow spindle upon which is fitted the pinion L is a collar W^1 which has frictional action upon the roof of the inner box. The collar V is in frictional contact with the flange of the floating center-piece X which is supported by the spring X^1 aforesaid and the collar V^1 is in frictional contact with the collar W through the action of the said spring X^1. The collar W^1 on the hollow spindle is in frictional contact with the roof of the inner box B through the action of the said spring X^1. By this combination, an equal frictional contact is established on the spindles carrying the hands O, N, and in virtue of the frictional contact they remain stationary at any point when the machine is operated by striking the captive ball attached to the operating levers E, F, which immediately spring back to their original position in virtue of the tensional action of the springs G^1, H^1, leaving the quadrantal lever stationary with a slightly increased uncoiling action on the springs I, J. This uncoiling action is such that it just fails to overcome the frictional resistance offered to the spindles by the friction collars incorporated on the pinions which are fixed to the spindles. To release the pointers, a slight pressure is put upon the inner box B at the point Z. This pressure operates the cushioning plate spring Z^2 fitted in the floor of the inner box, which upon its giving way slightly brings the releasing devices for all the pointers simultaneously into action. The plate Z^2 rests upon the pintle Z^3 which projects from the floor of the outer box. On the double wiper piece aforesaid, which is fitted upon the main shaft C, the arm T^1 is caused to act upon, and lift the plate U^1, and the frictional contact maintained by the spring U is immediately removed from the lever T^2 and it returns to its original position because of the tension in the spring Y, and the pointer indicating elevation is revolved back to zero on the graduated dial. Also the lever Z^1 fitted to the floating center-piece X is caused to engage its overhung end on the floor of the outer box A and this action pulls down the floating center-piece, and the frictional contact on the collars V, V^1, W, W^1 is immediately removed and the gear is returned to the zero position on the graduated dial in virtue of the uncoiling action of the springs I, J aforesaid tending to keep the tail ends of the quadrantal levers butting against the shoulder-piece on the straight levers. To assist the inner box to tilt against the mechanical moment of tension exerted by the springs G^1, H^1 about the shaft C, a helical spring Y^1 is coiled round the shaft C, one end being fitted to it as shown, while the other end being suitably elongated is made to impose its uncoiling action upon the inner side of the top of the inner box B, and

in this way assists it to tilt against the tensional moment of the springs G^1, H^1, about the shaft C. The impact given to the captive ball is as intended for the most part a straight drive as indicated by the arrow 1 but as opposed to this it may have a "sliced" or "pull" bias. In a right handed player a "slice" bias is toward the right hand of the machine looking in the direction of flight and indicated by the arrow 3, and a "pulled" bias is toward the left hand of the machine looking in the direction of the flight and indicated by the arrow 2. In a left handed player the "slice" bias is toward the left hand of the machine looking in the direction of flight, and the "pull" bias is toward the right hand of the machine looking in direction of flight. If the ball is "sliced" the cross-head K aforesaid is swung clockwise, but if the ball is "pulled" the said cross-head is swung counter-clockwise, and a relative deflection is communicated to the pointers O, N, which are distinctly differentiated by colors. In any stroke the distention of the springs G^1, H^1 is equal, and the value of the property of "length" of stroke is recorded by the pointer which indicates the smaller reading. Two equally graduated scales are provided, an inner scale for the said pointer O and an outer scale for the said pointer N, the inner scale indicating the "pull" bias, and the outer scale indicating the "slice" bias of the projected ball.

Claims:

1. In a machine for registering the properties of length, height, "slice" or "pull" of the flight of a captive golf ball had it been free to complete its flight, in combination, an inner box frame, a horizontal shaft upon which said inner box is pivotally mounted, an outer enveloping box in which said horizontal shaft is carried, a double-armed wiper-piece carried and secured on the said horizontal shaft, a curved lever, a pointer having a fulcrum which is integrally formed with said curved lever, said lever being adapted to engage with one projection on the said double wiper-piece when the said receptacle is tilted on said shaft by the momentum of the captive ball in its projected flight, and a segmentally divided scale over which the said pointer moves, and adapted to temporarily indicate the angle of inclination for the receptacle, substantially as described.

2. In a machine for registering the properties of length, height, "slice" or "pull" of the flight of a captive golf ball had it been free to complete its flight, in combination, an inner box frame, a horizontal shaft upon which said inner box is pivotally mounted, an outer enveloping box in which said horizontal shaft is carried, a double-armed wiper-piece carried and secured on the said horizontal shaft, a curved lever, a pointer having a fulcrum which is integrally formed with said curved lever, said lever being adapted to engage with one projection on the said double wiper-piece when the said receptacle is tilted on said shaft by the momentum of the captive ball in its projected flight, a segmentally divided scale over which the said pointer moves, and adapted to temporarily indicate the angle of inclination for the receptacle, a vertically arranged column fixed to the floor of the inner box, a pair of spring controlled levers mounted on said column, a column fixed to the floor of said outer box, a cross-head pivotally mounted on said column in the outer box, springs connecting said levers on said first mentioned column to said cross-head, flexible means for attaching said levers to the golf ball to be acted upon, toothed levers actuated by said first mentioned levers, and toothed pinions engaging with said toothed levers for communicating their movement, a dial, and a pair of pointers actuated by said pinions and moving over said dial for momentarily indicating the measurements made, substantially as described.

3. In a machine for registering the properties of length, height, "slice" or "pull" of the flight of a captive golf ball had it been free to complete its flight, in combination, an inner box frame, a horizontal shaft upon which said inner box is pivotally mounted, an outer enveloping box in which said horizontal shaft is carried, a double-armed wiper-piece carried and secured on the said horizontal shaft, a curved lever, a pointer having a fulcrum which is integrally formed with said curved lever, said lever being adapted to engage with one projection on the said double wiper-piece when the said receptacle is tilted on said shaft by the momentum of the captive ball in its projected flight, a segmentally divided scale over which the said pointer moves, and adapted to temporarily indicate the angle of inclination for the receptacle, a vertically arranged column fixed to the floor of the inner box, a pair of spring controlled levers mounted on said column, a column fixed to the floor of said outer box, a cross-head pivotally mounted on said column in the outer box, springs connecting said levers on said first mentioned column to said cross-head, flexible means for attaching said levers to the golf ball to be acted upon, toothed levers actuated by said first mentioned levers, and toothed pinions engaging with said toothed levers for communicating their movement, a dial, a pair of pointers actuated by said pinions and moving over said dial for momentarily indicating the measurements made, means for returning the pointers to zero on the dial, comprising a lever controlled by a helical spring, and means for causing a frictional action upon

parts of said pinions of the pointers to maintain them in the position determined by the flight of the ball, said friction causing means comprising a cushioning spring plate fitted on the floor of the inner box and a pintle projecting from the floor of the outer box against which the spring plate rests, substantially as described.

4. In a machine for registering the properties of length, height, "slice" or "pull" of the flight of a captive golf ball had it been free to complete its flight, in combination, an inner box frame, a horizontal shaft upon which said inner box is pivotally mounted, an outer enveloping box in which said horizontal shaft is carried, a double-armed wiper-piece carried and secured on the said horizontal shaft, a curved lever, a pointer having a fulcrum which is integrally formed with said curved lever, said lever being adapted to engage with one projection on the said double wiper-piece when the said receptacle is tilted on said shaft by the momentum of the captive ball in its projected flight, a segmentally divided scale over which the said pointer moves, and adapted to temporarily indicate the angle of inclination for the receptacle, a dial, said pointer moving on the dial, said lever formed integrally with said pointer to which said wiper-piece communicates motion, and means for maintaining said pointer in the position determined by the action of the captive ball and for retaining it to zero, substantially as described.

In witness whereof we affix our signatures in presence of two witnesses.

CHARLES GUTHRIE GUTHRIE.
LYON WILSON NEILSON.

Witnesses:
JOHN LIDDLE,
JOHN TRAIN LIDDLE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."