June 1, 1948. D. LEMING 2,442,365

CHRONOGRAPH SCREEN CHANGER

Filed Dec. 7, 1942 4 Sheets-Sheet 1

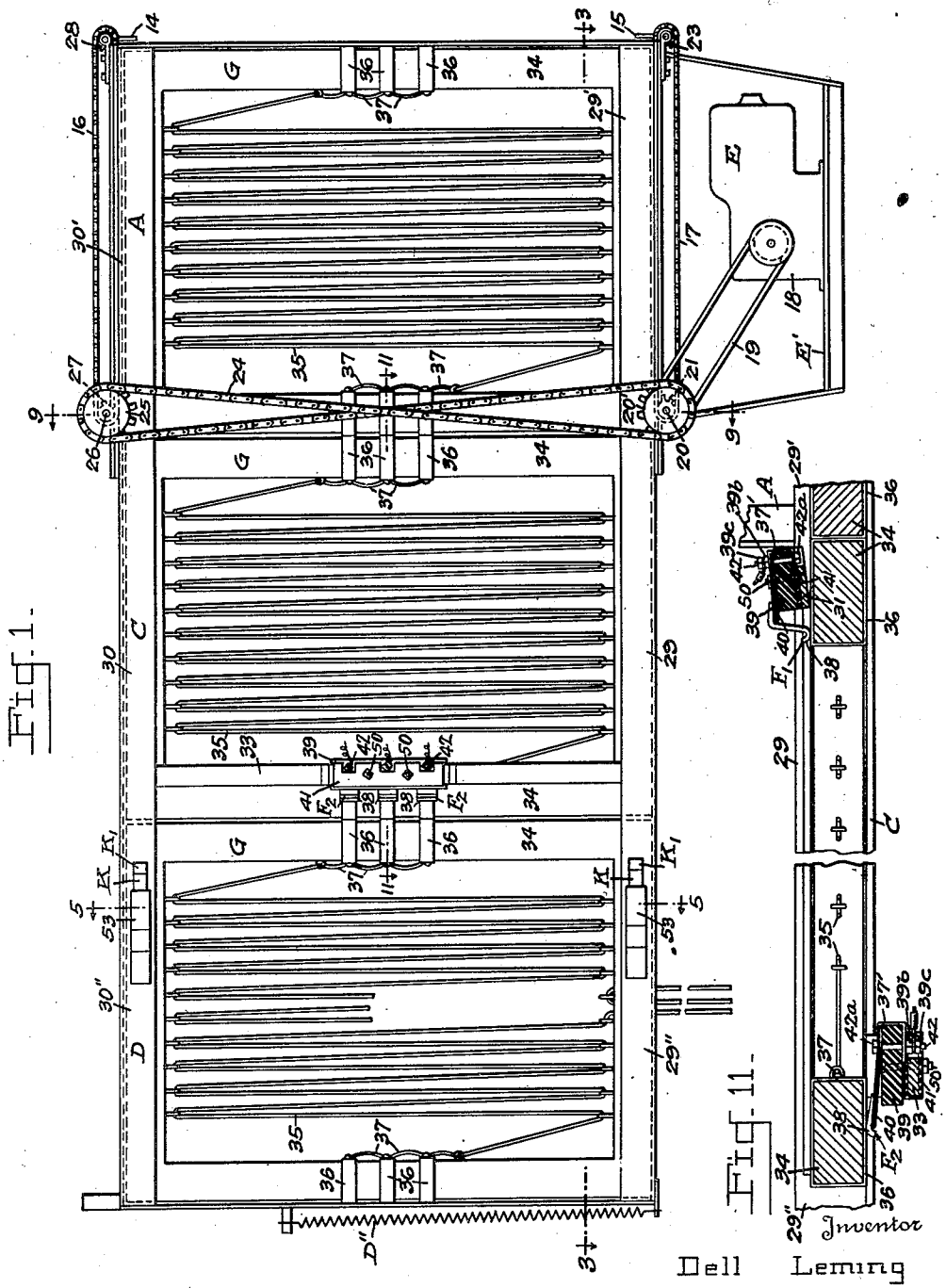


Fig. 1.

Fig. 11.

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CHRONOGRAPH SCREEN CHANGER

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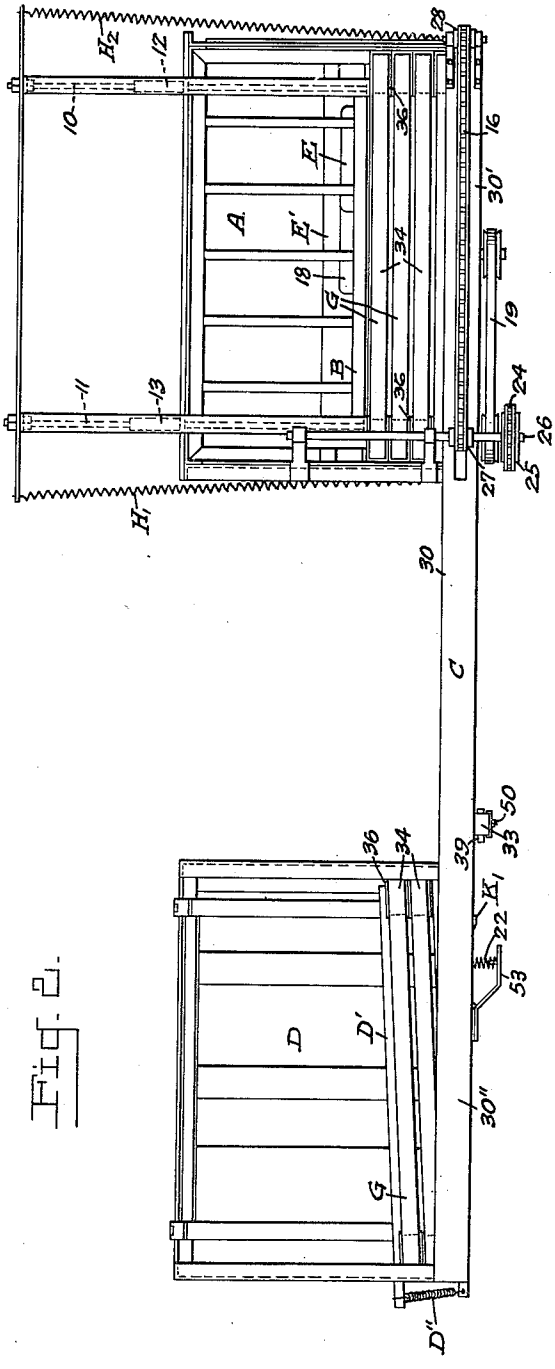


Fig. 5.

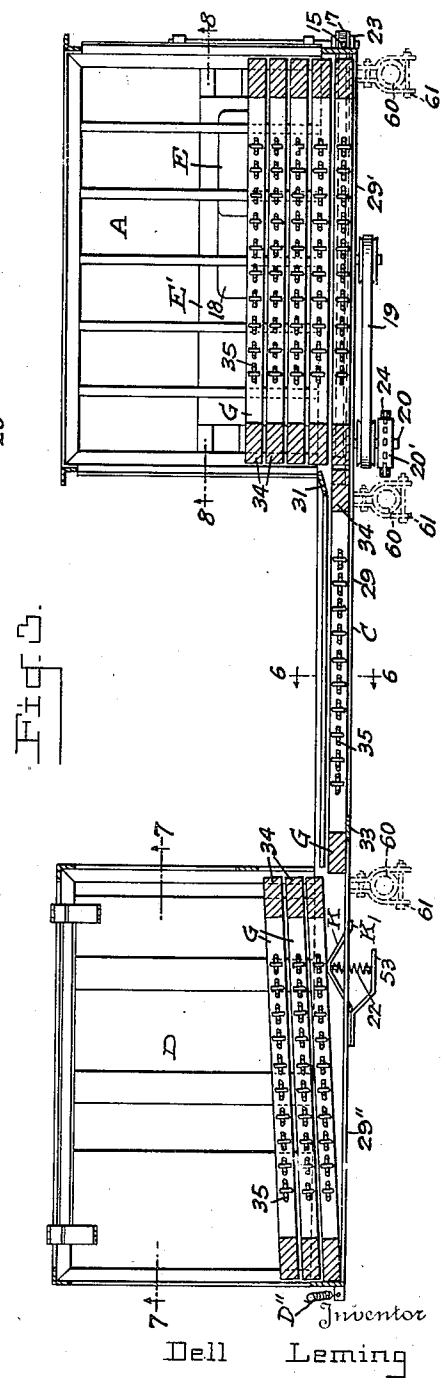


Fig. 6.

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Fig. 6.

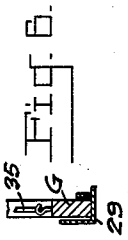


Fig. 8.

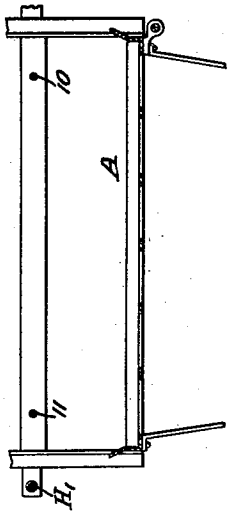


Fig. 5.

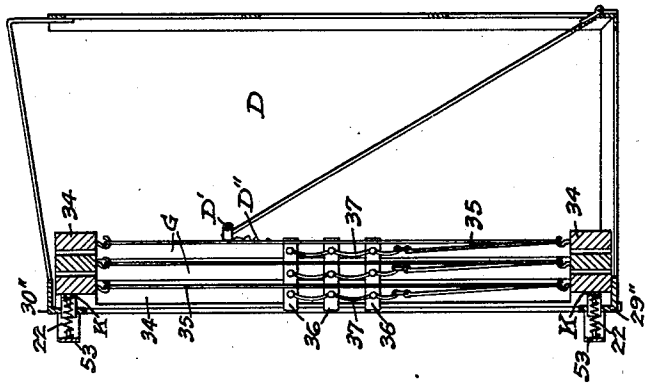


Fig. 7.



Fig. 4.

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Dell Leming

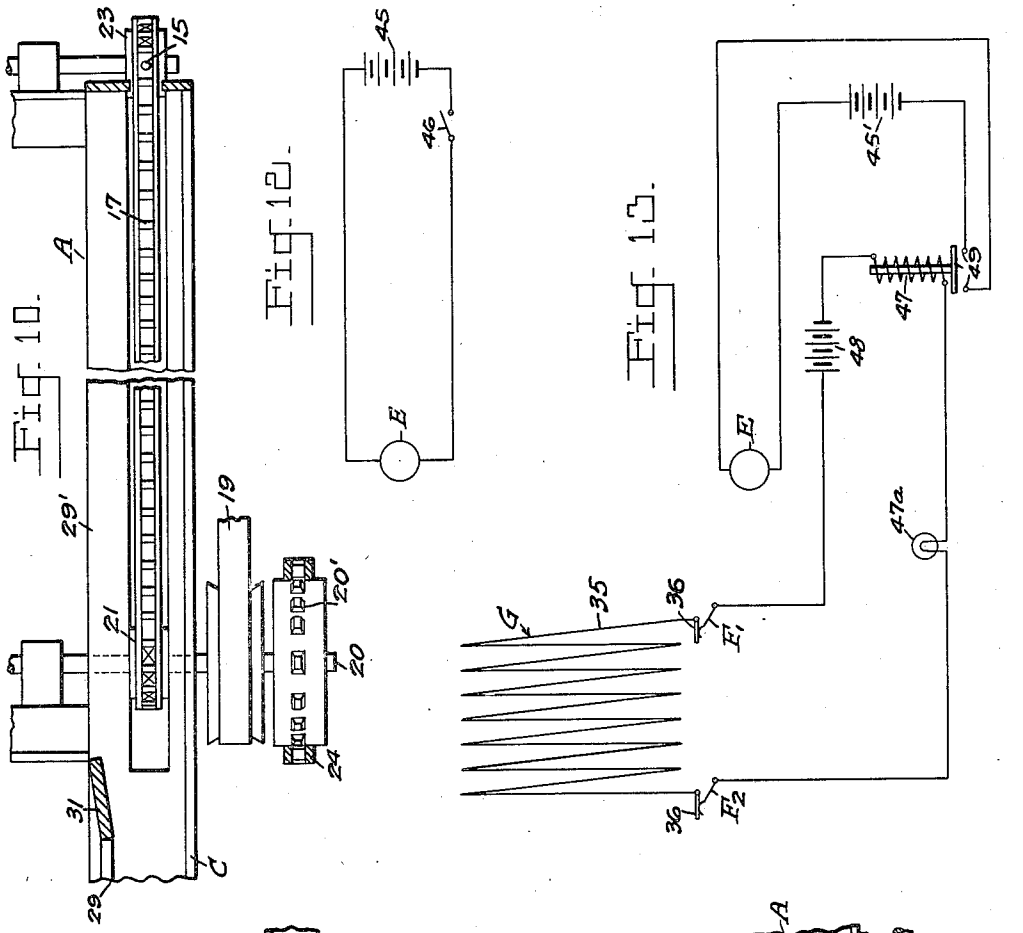
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CHRONOGRAPH SCREEN CHANGER

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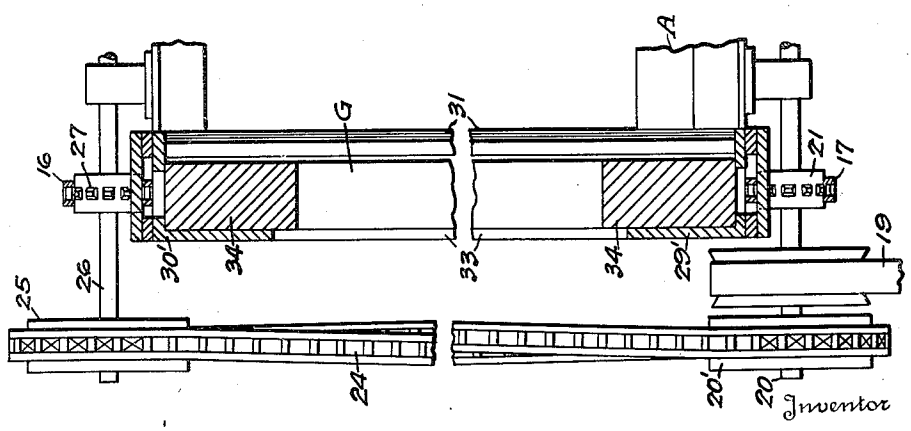


Fig. 9.

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Patented June 1, 1948 2,442,365

UNITED STATES PATENT OFFICE

2,442,365

CHRONOGRAPH SCREEN CHANGER

Dell Leming, Madison, Ind.

Application December 7, 1942, Serial No. 468,125

5 Claims. (Cl. 273—105.6)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to means for positioning a body.

An object of this invention is to provide apparatus for changing targets particularly those targets of the frangible type adapted for use with the Le Boulenge chronograph.

Another object of this invention is to provide apparatus for motivating a body from a remote point.

The specific nature of the invention as well as other objects and advantages thereof will clearly appear from a description of a preferred embodiment as shown in the accompanying drawings in which:

Figure 1 is a front elevation of a prefered embodiment of my screen or target changer.

Figure 2 is a plan view of the screen or target changer shown in Figure 1.

Figure 3 is a sectional view on the line 3—3 of Figure 1 and also discloses the supporting means in dotted line.

Figure 4 is a side elevation taken from the right hand side of the screen changer in Figure 1.

Figure 5 is a sectional view on line 5—5 of Figure 1.

Figure 6 is a sectional view on line 6—6 of Figure 3.

Figure 7 is a view on line 7—7 of Figure 3.

Figure 8 is a section on line 8—8 of Figure 3.

Figure 9 is a view taken substantially on line 9—9 of Figure 1.

Figure 10 is a fragmentary view similar to the right hand part of Fig. 3 but with the screens removed.

Figure 11 is a fragmentary section taken substantially on line 11—11 of Fig. 1.

Fig. 12 is an electrical control circuit for energizing the screen driving motor; switch 46 being at a point remote from the motor and preferably behind the gun which is fired.

Figure 13 is an electrical control circuit for automatically energizing the screen driving motor each time a screen 35 is pierced by a shell.

The screen changer embodies the following essential parts: a feeder rack A, a feeder mechanism B (Fig. 4), front central or display section C, discharge rack D, motor E, and sets of spring wiper contacts F_1, F_2 (Fig. 11). These parts are assembled in relation to one another whereby upon operation of motor E a target or screen G is moved from the feeder rack A into a set-up or

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target position in the front section C and the target or screen G which formerly occupied the front section is displaced into the discharge rack D.

Initially, the targets or screens G are manually placed in the feeder rack A in face to face relationship with the feeder B (which is urged forwardly by springs H_1, H_2) pressing the screens G forward. The feeder B includes parallel horizontal fore-and-aft extending rods 10, 11 slidably mounted and supported in sleeves 12, 13 which are welded to rear uprights of the feeder rack A.

Individual (spring-pressed) targets or screens G are propelled out of the feeder rack A by means of engaging pawls 14, 15 respectively (Figs. 1 and 4) on horizontal reach upper and lower endless chains 16, 17 extending across the front or mouth of the feeder rack. They are synchronously driven by the motor E through the reduction gear 18, friction belt 19, and rotatably mounted countershaft 20 near one side of the rack; chain 17 being driven directly from sprocket wheel 21 on shaft 20 and extending over auxiliary supporting idler sprocket wheel 23 adjacent the opposite side of the rack; and chain 16 is driven from shaft 20 by means of a sprocket wheel 20' on shaft 20, crossed driving chain 24, to sprocket wheel 25 on a shaft 26 at the top of the structure of feed rack A and sprocket wheel 27 on shaft 26, this chain extending over idler sprocket 28. When pushed from the mouth of the feeder rack, targets or screens G are guided into U-shaped horizontal upper and lower channel members or guides 29, 30 of the front section C, from L angle irons or guide members 29', 30', respectively (which are extensions of the members 29, 30), by a vertical angularly disposed fender and contact bar or plate 31 extending the full height of the screens G. This bar marks the entrance to the central front section C. It carries a set F_1 of three spaced resilient electrical insulated contact brushes 38 (Fig. 11) mounted thereon for contacting correspondingly situated metallic electrical contact bands 36 fixed on the insulating frames of the screens G. The structure of only one of the contact brushes on member 31 is disclosed and it is understood that the other two contact brushes in the set are of the same construction.

It is noted that the pawls 14, 15, due to their orbital movement, become disengaged from that screen G actually engaged when it is propelled to target position. After the target or screen G is pierced by a projectile the motor E is energized and a second target G is propelled from its feeder

rack A to target position; but when this second screen G moves to target position the first mentioned screen is displaced thereby over into alignment with the opening of discharge rack D. The trailing end of the forwardmost screen in the opening or mouth of discharge rack D is pressed to the rear by spring-biased presser fingers or cams K, K (Figs. 1 and 3) inclined across the path of entering screens whereby the leading edge of a succeeding screen G will cam the preceding screens further to the rear into the discharge rack D against the action of a spring-biased pivotally mounted arm D' having fore-and-aft movement in the rack. Arm D' is biased by spring D''. The fingers K, K are hingedly mounted on the angle iron guide extensions 29'', 30'' from front section C and are biased to the rear through slots in the members 29'' and 30'' by compression springs 22 which abut against fixedly mounted and projecting seats 53. A projection K_1 on each of the fingers K engages a portion of the extensions 29'', 30'', respectively, so as to limit the rearward movement of the corresponding finger K. At the same time that the cams K press the trailing side of the screen to the rear, the spring D'' draws the far end of the bar D' forward and holds the far side of the screen forward and erect.

A second contact bar 33 extending the full height of screens G and located at the far side of the front section C from bar 31, together with bar 31 and channel guide members 29, 30, define a window through which a projectile or other piercing object is adapted to pass. The bar 33 has a set of insulated contact brushes F_2 thereon as will be described.

The particular screens G disclosed herein are adapted to be used in a Le Boulenge chronograph similar to the one disclosed in the Du Pont Patent 1,357,281 issued November 2, 1920; the screens G in this application have as their counterpart the frangible screens *r* or *s* in the Du Pont patent. Screens G comprise essentially a wooden rectangular frame 34 having at least one frangible wire conductor 35 threaded zigzaggedly in and forming a tortuous grid over substantially the whole area within the frame. A set of three spaced horizontal metallic bands 36 are centrally disposed on and encircling respective opposite vertical legs of the frame and are joined electrically to respective adjacent ends of the common conductor 35 by means of short joining conductors 37. The metallic bands 36 are adapted to cooperate with the corresponding sets F_1, F_2 of the spring biased electrical brushes on the contact bars 31, 33 simultaneously when the screens G are in target position, as in Figure 11.

An electrical strip or element 37' having a contact brush 38 mounted thereon has one end bent in the form of a U so as to snugly receive a portion of an insulating block 39, with a flat steel spring 40 sandwiched therebetween. The insulating block 39 carries three of the electrical strip elements 37' in spaced insulating relation, bolt and nut connection 50 fastening them together and to the central portions of the bar 31 or 33, from which they are insulated with interposed insulating material 41. Brass bolts 42 passing through the insulating block 39 have their heads 42*a* engaging corresponding strips 37' and one or more in each brush group together with nuts 39*b*, 39*c* serves as a binding post for conductors to one or more Le Boulenge chronographs and possibly to an auxiliary circuit, such as to relay 47 in Fig. 13. It is noted that contact is made by brush group F_2 with the front side of screen G at contact bar 33 and contact is made by brush group F_1 with the rear side of screen G at contact bar 31.

Contact bar 31 is straight and it is disposed at a convergent angle to the channel guide members 29, 30 in the direction of movement of the targets. The switch contact elements 38 are projected inward toward the path of the targets so as to make contact with the contacts 36 of the targets at the rear; contact bar 33 is recessed as shown in Figs. 4 and 11 and the insulating block 39 is mounted in that recess in such a manner that the brushes 38 there project slightly into the path of the targets to engage the contacts 36 at the front side.

Motor E and its reduction gear 18 are supported on a platform E' which is rigidly fastened to frame members comprising a part of the feeder rack A.

The various frame elements which make up this automatic screen changer are adapted to be assembled in metal one to the other preferably by electrical welding but it is apparent that other materials and means for joining those elements are readily suggested to a mechanic. This construction permits a unitary screen changer which may be moved about and elevated to one of a plurality of positions (convenient to the height of a gun, or its trajectory, etc.) by conventional means or by guide means similar to that shown dotted in Fig. 3. The screen changer proper may be elevated on stationary tubular guide posts 60 and then clamped thereto by the integrally formed combination guide and clamp 61.

After one method, indicated in Fig. 12, the motor E for propelling screens G is energized through a source of current 45 by actuating a switch 46 which may be located behind the gun being fired. In the preferred embodiment shown in the remaining views, the driving motor E may be started automatically as soon as frangible conductor 35 of screen G is pierced by a projectile in accordance with the following expedient: an auxiliary electromagnetic relay 47 and its energizing source 48 are connected in series with the grid conductor 35 whereby normally closed contacts 49 on the relay 47 are opened when the screen G is in position and frangible element 35 is unbroken. As soon as frangible element 35 is broken, contacts 49 close the circuit including source 45' to the motor E and the motor E continues to operate until a new screen G is placed in target position whereupon the motor E becomes deenergized. Series connected lamp 47*a* which may also partake of a current responsive element in the Le Boulenge chronograph serves to remotely indicate the centered position of a screen G in the center section C.

In the drawings I have shown springs H_1, D'' for biasing the feeder rack mechanism B and discharge rack arm D', respectively, but it is understood that other means may be employed to press correspondingly situated screens G into the mouths of the feeder rack and discharge rack, for instance the members B and D' may be caused to operate by gravitational means by providing suitably supported weights to those members.

The contact bands 36 completely encircle the side members of the target frames on which they are mounted, each group being equally spaced from the horizontal upper and lower cross members of the frames, and the bands of one group are respectively alined with corresponding bands in the group on the opposite side members of the

frames. The ends of the grid wire 35 are connected to respective adjacent groups of bands 36 so that a series circuit may be formed through the grid by any two brushes F_1 and F_2 at opposite sides of the front section C, as is well understood in these devices. In consequence of the arrangement of the contact bands and the nature of the circuit, either face of the target may be presented at the front of the apparatus, and the target may be inverted, without affecting its signal function or manner of coaction with the screen changer. That is to say the screens do not have a front side and back side, or top or bottom.

I claim:

1. In a target apparatus a target support constructed to receive slidably a flat target device, a target feeder rack in delivering relation to said support, a discharge rack in receiving relation to said support, means to move a target from said first named rack to a target position on said support including an electric motor, an electrical source in circuit with the motor, and means to open and close said circuit including an electrical self-closing servo switch, a second circuit including means to open the servo switch when the second circuit is closed, said second circuit being open at said support and target engaging means operative at said target position to close the last named circuit.

2. The structure of claim 1, said open circuit including terminal target engaging wiper brushes at said support positioned to engage respective contacts of a conductive target when in target position to complete said second circuit.

3. The structure of claim 1 in which said target comprises a projectile severable conductor across the target area and having terminal contacts at respective edges of the target extending on both faces at the same distance from top and bottom, said open circuit including terminal brushes positioned to engage said contacts at respective edges of the target when in target position.

4. In a screen changer, a feeder rack adapted to receive screens in face to face relationship and having a forward vertical end mouth, spring biased means to feed a screen translatively in a direction perpendicular to its plane from a rear part of the rack to said mouth, a display front section in a plane with said mouth of the feeder rack, means to propel a screen edgewise from said mouth into the front section, a discharge rack arranged to receive screens in face to face relationship and having a front end aligned with said front section, a screen guide extending from the front section across the front of the discharge rack, yielding means mounted on the discharge rack to hold the advanced edge only of a screen forwardly in the discharge rack at a point distant from said front section and a cam member mounted on the said guide member closely adjacent the front section arranged, constructed and adapted to press the trailing edge only of a screen rearwardly into the discharge rack and to hold the said edge spaced rearwardly from the guide.

5. In an apparatus for automatically replacing frangible screen when broken, a feeder rack constructed to receive a plurality of planiform screens, means to advance screens therein to a delivery position in the feeder rack, a front section constructed to receive screens one at a time from said feeder rack and to hold the same in a given set-up position therein said single screen being displaceable edgewise beyond the set-up position, a screen guide extending from the feeder rack at said delivery position to the front section in line with the set up position, a screen propelling device constructed to engage a screen at said delivery position and propel the same edgewise along said guide to the front section, operating means for the propelling device, a frangible planiform screen in said feed rack and adapted to be moved therefrom into the front section at said set up position and beyond, and means including a part at said front section and a part on said screen constructed to form a control connection with the said operating means, said connection being responsive to rupture of the screen to initiate operation of said operating means, said connection also being responsive to registry of a non-ruptured screen at said set-up position to stop said operating means.

DELL LEMING.

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