Dec. 6, 1927. 1,651,985

E. F. ALLEN

ACTUATING APPARATUS FOR THEATER CURTAINS

Filed April 14, 1924 3 Sheets-Sheet 1

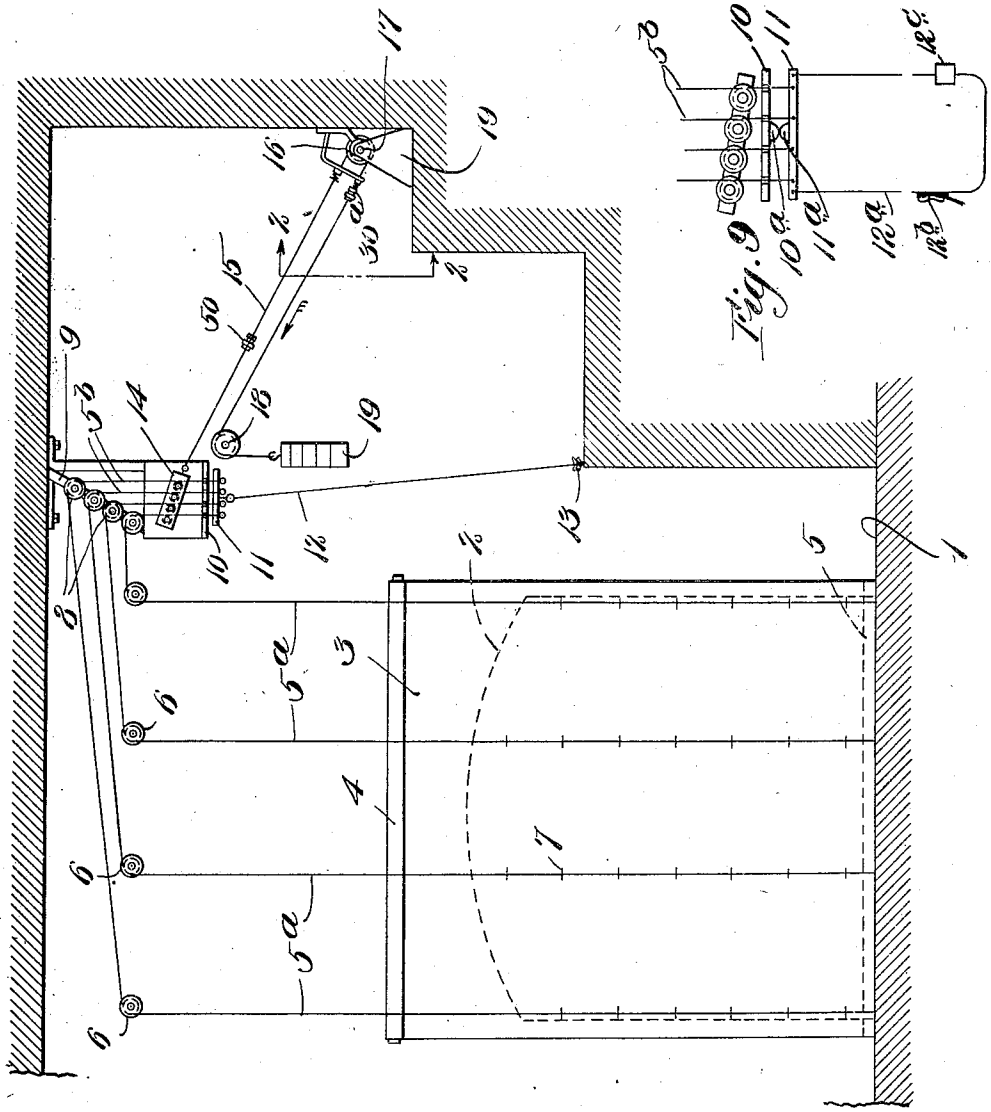


Fig. 1.

Fig. 9

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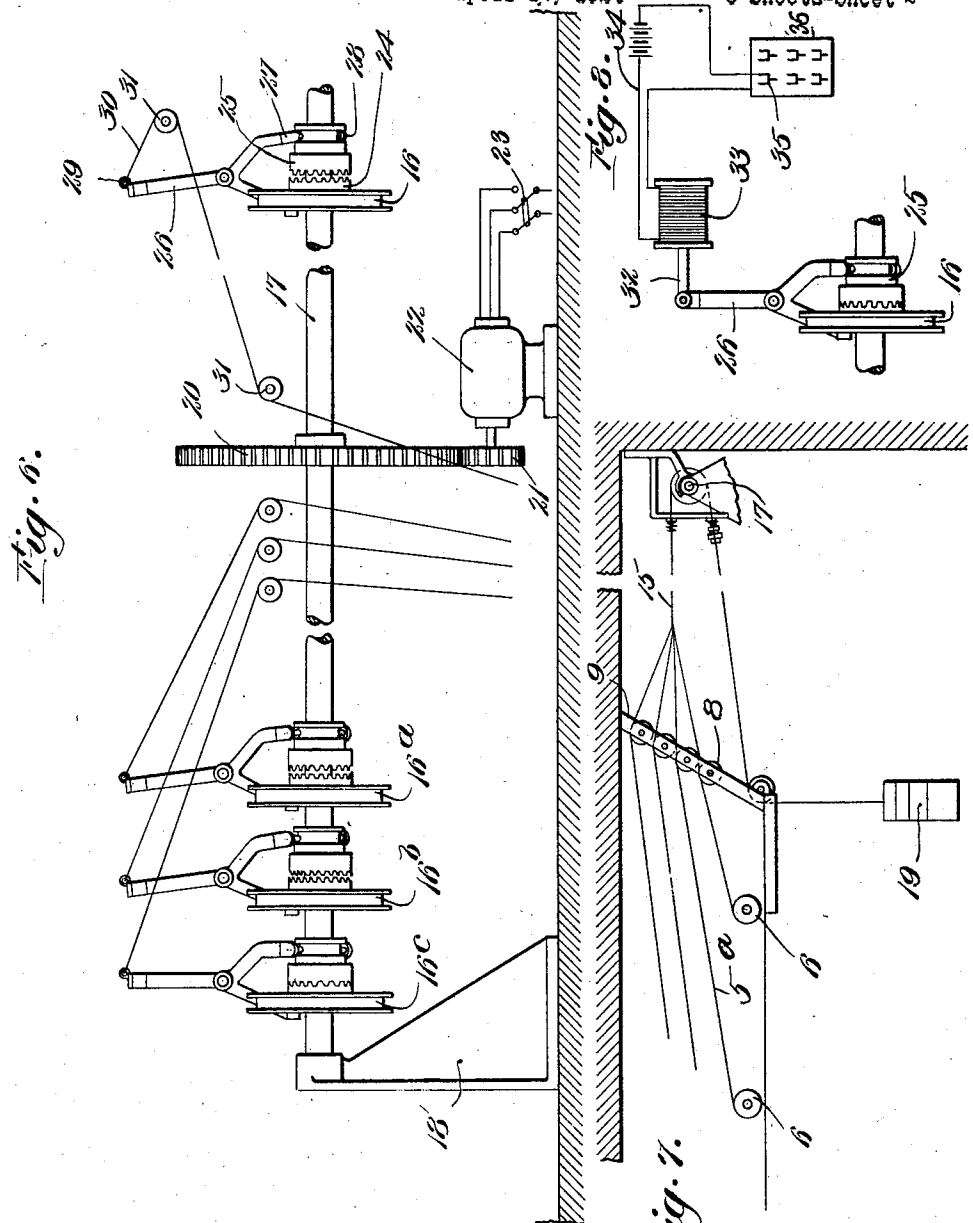


Fig. 6.

Fig. 8.

Fig. 7.

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Fig. 2.

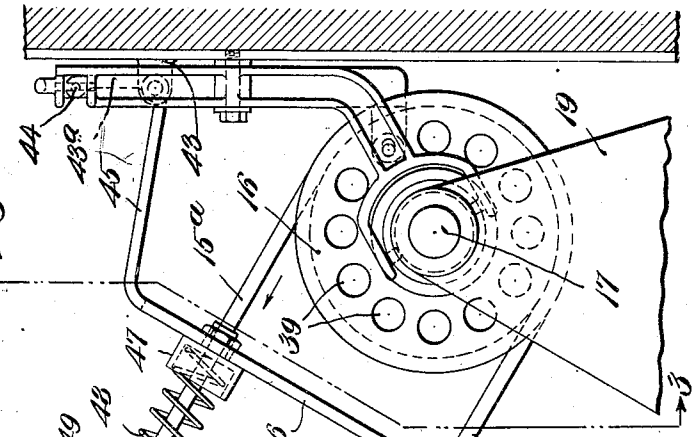


Fig. 4.

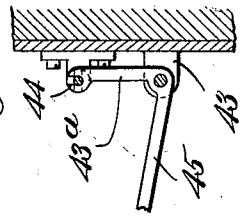


Fig. 5.

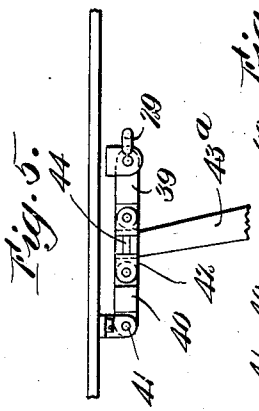
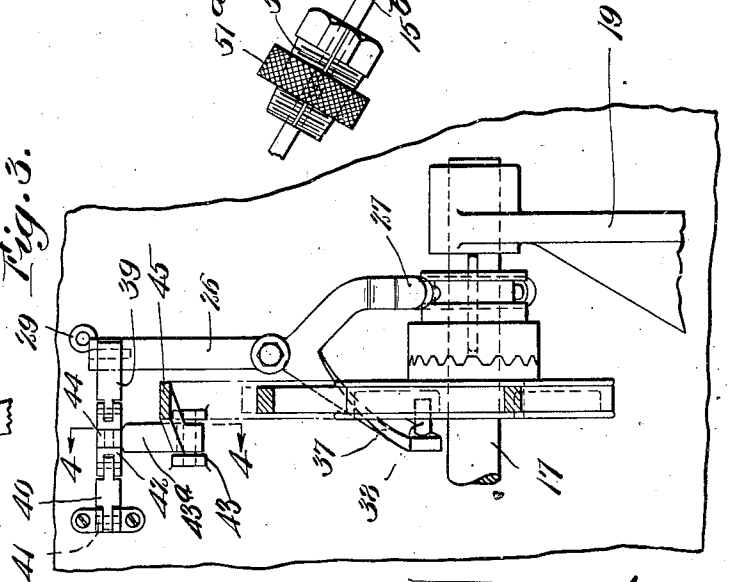


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ACTUATING APPARATUS FOR THEATER CURTAINS.

Application filed April 14, 1924. Serial No. 706,421.

This invention pertains to actuating apparatus for theater curtains, and the like, and relates more particularly to power driven mechanism for raising and lowering theater curtains, drops, fire screens, etc.

Principal objects of the invention are to provide power driven apparatus by means of which one or more curtains or drops may be raised or lowered rapidly and evenly; to provide automatic means for stopping such power driven apparatus when the curtain or drop has reached the permissive limit of movement; to provide means for positively locking the curtain or drop when raised; to provide means capable of manipulating a plurality of curtains or drops either separately or simultaneously; and to provide such apparatus with controlling means capable of actuation at a point remote from the driving mechanism.

In the accompanying drawings preferred embodiments of the invention are illustrated by way of example, and in such drawings,—

Fig. 1 is an elevation, partly diagrammatic, looking from the theater stage toward the proscenium arch and showing the curtain dropped and the lifting mechanism in position to initiate raising of the curtain;

Fig. 2 is a fragmentary elevational view to larger scale of a part of the device of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary section substantially on the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary plan view of the parts shown in Fig. 4;

Fig. 6 is a side elevation, to somewhat smaller scale, of the drive mechanism shown in Fig. 2 but omitting some of the parts;

Fig. 7 is a fragmentary view similar to Fig. 1 but illustrating a modified arrangement;

Fig. 8 is a diagrammatic view illustrating a modified form of control apparatus; and

Fig. 9 is a diagrammatic view illustrating a modification permitting the curtain to be tilted.

Referring to the drawings, the numeral 1 indicates the level of the stage floor, while the numeral 2 indicates the proscenium arch which is indicated in dotted lines. The curtain 3 is carried by a suitable support 4 and is provided with a rail or bar 5 at its lower edge. Lifting cables 5^a attached at their lower ends to the bar 5 extend upwardly in substantially parallel runs to guide pulleys 6 arranged at the level of or above the usual fly gallery. The cables 5^a preferably pass through loops or rings 7 upon the curtain in order to insure the proper folding of the latter as it rises. While the curtain here illustrated is of that type which is gathered into folds as it rises, the invention is not in any manner restricted to use with this type of curtain, and the cables 5^a may be attached to the curtain either at the top or bottom in accordance with the type of curtain employed.

From the pulleys 6 the several cables pass laterally to pulleys 8 carried by a suitable supporting bracket 9. From these pulleys the several cables pass downwardly in substantially vertical runs 5^b through perforations or openings in a guide member 10 and are secured at their lower ends to a bar 11. The upper end of a cable 12 is secured to the middle of the bar 11 while its lower end is carried to a convenient point where it may be secured to a cleat 13 or other desirable fastening means, while this mode of securing the bar 11 is preferable, as it permits adjustment of the bar for taking up slack in the cables 5^a, it is contemplated that the bar 11 may be a fixed member if desired.

The numeral 14 indicates a pulley block having a series of pulleys which engage the runs 5^b respectively of the cables 5^a. An actuating cable 15 is secured to the end of the pulley block 14 and after passing over a drive pulley 16 mounted upon a shaft 17 extends upwardly and over a guide pulley 18 and has a counter-balance weight 19 secured to its extremity. This counter-balance weight is sufficiently heavy substantially to balance the weight of the curtain, thus permitting the latter to be moved up and down with little effort.

The curtain controlling apparatus thus far described is shown as applied to a single curtain, but it is contemplated that similar arrangements and apparatus will be provided for each of the curtains or drops which it is desired to control by the improved mechanism. For this purpose the shaft 17 is of a length sufficient to support the necessary number of drive pulleys, several such pulleys being indicated in Fig. 6 where they are designated by the numerals 16, 16^a, 16^b, and 16^c, respectively. As the control mechanism for each of these pulleys is similar, it is necessary to describe but one of such mechanisms in detail.

Referring particularly to Figs. 2–6 inclusive, the shaft 17 is shown as mounted to turn in bearings carried by spaced brackets 18′ and 19′. This shaft is furnished with a driving pinion 20 which meshes with a pinion 21 carried by the shaft of a reversible electric motor 22. This motor is mounted upon a suitable support and is controlled by a switch 23 arranged at any convenient point. By manipulation of this switch, the motor shaft may be caused to rotate in either direction, thus turning the shaft 17 in either direction at the will of the operator.

The pulley 16 is furnished with one element 24 of a driving clutch, the other element 25 of which is splined to the shaft 17 to turn therewith, being free to slide axially thereon. Normally the clutch elements are disengaged so that the shaft 17 may turn without turning the pulley.

The clutch elements are caused to engage by means of a controlling arm 26 pivoted to a suitable support and provided with a forked extremity 27 which engages a circumferential groove 28 in the axially movable clutch element 25. The opposite end of the arm 26 is furnished with an eye 29 to which one end of a flexible connection 30 is secured. This flexible connection, which may be a cord, chain or cable, passes over guide pulleys 31 and thence to a control station at any convenient point, it being understood that the cords 30 corresponding to each of the pulleys 16, 16^a, etc. preferably lead to the same control station.

In Fig. 8 a modified arrangement of means for actuating the clutch engaging arm is shown. In this modified arrangement the cord or cable 30 is replaced by an iron bar 32 constituting the core of a solenoid 33. This solenoid is connected by means of a conductor 34 to a suitable source of electrical energy and may be controlled by a switch 35 mounted upon a switch board 36. Other switches upon the same board may control the other clutch actuating devices, and if desired the motor controlling switch 23 may also be mounted upon the same board.

The clutch controlling arm 26 is furnished with a bracket member 37 carrying a pin 38 adapted to engage any one of a series of openings 39 in the web or face of the pulley 16, the arrangement being such that when the clutch is disengaged the pin enters one of said openings, thus locking the pulley against rotation.

A toggle link 39 is pivotally connected to the upper end of the clutch actuating arm 26. A second toggle link 40 is pivotally secured to a fixed bracket 41, and the ends of the links 39 and 40 are connected by a third link 42.

A bracket 43 provides a fulcrum for a two-armed lever, one arm 43^a of which is pivotally connected by means of a pin 44 to the link 42. The other arm 45 of this lever extends outwardly and then downwardly, the downwardly inclined portion being indicated at 46.

The controlling cable 15 extends from the pulley 16 to the block 14 and to the guide pulley 18 in two substantially parallel, oppositely moving runs 15^a and 15^b, (Fig. 2) respectively. The arm member 46 lies substantially in the plane of the pulley 16 and is furnished with apertures for the passage of the runs 15^a and 15^b, respectively, of the cable. Spring positioning cups 47 and 47^a are secured to the arm member 46 in concentric relation to these respective openings and springs 48 and 48^a are secured within the respective cups. These springs encircle the cable and are preferably furnished with annular washers 49 and 49^a, respectively at their outer ends.

The cable runs 15^a and 15^b are furnished with adjustable stops 50 and 50^a, respectively. These stops preferably comprise split screw-threaded sleeves having nuts 51 and 51^a, respectively, for clamping them to the cable.

In Fig. 1 the parts are shown as positioned with the curtain fully dropped and as thus disposed the stops 50 and 50^a are located substantially as indicated in the figure. To raise the curtain, the operator closes switch 23 to cause the motor 22 to drive shaft 17 in the proper direction, this being a clockwise direction, as shown in Fig. 1. He then manipulates the cord 30 or the switch 35 corresponding to the particular curtain or drop which is to be raised so as to cause the corresponding clutch 25 to engage its pulley and lock the latter to the shaft.

The movement of the clutch actuating arm 26 to engage the clutch parts simultaneously disengages the locking pin from the pulley and the cable 15 immediately begins to move in the direction indicated by the arrow in Fig. 1, thus permitting the counterweight 19 to descend and at the same time pulling the block 14 laterally to the right, as viewed in said figure. This movement of the pulley block 14 draws the runs 5^b of the several curtain cables laterally to form bights which thus effectively diminish the lengths of the said cables, causing the curtain to rise.

As the curtain approaches the upper limit of its movement the stop 50 comes into engagement with the collar or washer 49 thus compressing the spring 48 and finally causing the arm 46 to swing downwardly. This moves the arm 43^a to the left as viewed in Fig. 4, breaking the toggle connections 39, 40, and 42 and swinging the actuating arm 26 to the left as viewed in Fig. 3. This throws the clutch out of engagement, stops

the cable, and at the same time moves the pin 38 into engagement with the pulley so that the parts are locked and the curtain is held in elevated position.

In lowering the curtain, substantially the same operation takes place with the exception that the shaft 17 is first caused to turn in the opposite direction. As the curtain descends, the stop 50^a gradually approaches the washer 49^a and after compressing the spring 48^a again actuates the arm 47 to throw the clutch out of engagement.

The modified arrangement illustrated in Fig. 7 is employed when there is sufficient space laterally of the curtain to permit the shaft 17 to be placed substantially at the level of the fly gallery.

In this arrangement the upper ends of the several cables 5^a, after passing over the pulleys 8 are all united directly to the end of the actuating cable 15, the latter then passing over the drive pulley 16 and the guide pulley 18 and having the counter-weight 19 secured to its end. The operation of this driver is substantially the same as that above described except that the cables 5^a are pulled longitudinally instead of being drawn into lateral bights.

The arrangement illustrated in Fig. 9 is intended as a modification of that shown in Fig. 1, and permits the curtain to be tilted laterally. For this purpose the guide plate 10 and the bar 11 are furnished with rocker members 10^a and 11^a, respectively, which normally engage each other. The cord 12 is replaced by a cord 12^a secured at its ends to the opposite ends of the bar and falling in a closed loop to the desired point of manipulation. Suitable retaining means such for example as a clamp 12^b or cleat 12^c or both may be provided for holding the cord 12^a in adjusted position with the bar 11 tilted to take up unequal slack in the cables 5^a or to rock the curtain laterally if desired.

While a specific arrangement of connections has herein been shown as desirable for the purpose intended, it is to be understood that various changes both in proportion of parts and in relative arrangement thereof may be made without departing from the spirit of the invention.

I claim:

1. Actuating apparatus for theater curtains and the like comprising a power driven rotary shaft, a pulley normally free to turn thereon, a clutch for connecting the pulley to the shaft, manually controlled means for operating the clutch to cause the pulley to turn with the shaft, connections between the pulley and curtain for raising and lowering the latter, and means acting after a predetermined movement of the curtain for operating the clutch to disconnect the pulley and shaft, said last named means having a resilient connection with said clutch whereby to avoid shocks and noise in operating the device.

2. Actuating apparatus for theater curtains and the like comprising a rotary shaft, a pulley normally free to turn thereon, a clutch for connecting the pulley to the shaft, a cable operable by the pulley for raising and lowering the curtain, and means carried by the cable and operative after a predetermined movement of the latter for actuating the clutch to disconnect the pulley from the shaft, said last named means having a resilient connection with said clutch, whereby to avoid shocks and noise in operation.

3. Actuating apparatus for theater curtains and the like comprising a power driven rotary shaft, a pulley normally free to turn on the shaft, a clutch for connecting the pulley to the shaft, an arm for operating the clutch, manually operable means for moving said arm to engage the clutch, a cable operable by the pulley for raising and lowering the curtain, a stop carried by the cable, and means resiliently engageable by the stop after a predetermined movement of the cable for moving the clutch arm to disengaging position, the resilient connection avoiding shocks and noise in operation.

4. Actuating apparatus for theater curtains and the like comprising a rotary shaft, a pulley normally free to turn thereon, a clutch for connecting the pulley to the shaft, the clutch having an actuating arm, a lever connected to said arm for moving it to clutch disengaging position, said lever having an aperture therein, a cable engaging the pulley and movable thereby to lift and lower the curtain, a stop fixed to the cable and operable after a predetermined movement of the cable to move the lever whereby to disengage the clutch, and a spring surrounding the cable between the stop and said lever for the purposes described.

5. Actuating apparatus for theater curtains and the like comprising a rotary shaft, a pulley normally free to turn thereon, a clutch for connecting the pulley to the shaft, a cable engaging the pulley to transmit motion from the latter to the curtain, manually operable means to engage the clutch to drive the pulley, and means to disengage the clutch comprising a lever having an aperture for the passage of the cable, a stop moving with the cable for moving the lever after a predetermined movement of the curtain, and resilient means interposed between the stop and lever.

6. Actuating apparatus for theater curtains and the like comprising a rotary shaft, a pulley normally free to turn on the shaft, a clutch for connecting the pulley to the shaft, a cable passing over the pulley to be moved thereby to transmit movement to the

curtain, manually operable means for engaging the clutch to drive the pulley, and means to disengage the clutch comprising a lever having apertures for oppositely moving runs of the cable, a coil spring concentric with each aperture encircling the respective runs of cable, and stops secured to the cable engageable with the respective springs after a predetermined movement of the cable in either direction to move the lever and thereby disengage the clutch.

7. Actuating apparatus for theater curtains and the like comprising a rotary shaft, a pulley normally free to turn thereon, a clutch for connecting the pulley to the shaft, an arm for controlling the clutch, a flexible connection secured to the arm for manually moving the clutch to engaging position, a cable passing about the pulley for transmitting movement to the curtain, and means for automatically disengaging the clutch comprising a two-armed lever, toggle means connecting one arm of the lever with the clutch actuating arm, the other arm of the lever having apertures for the passage of the oppositely moving runs of the cable, cushioning elements concentric with said apertures, and stops fixed to the respective runs of cable engageable respectively with the respective cushioning elements after a predetermined movement of the cable in either direction to move the lever and thereby disengage the clutch.

8. Actuating apparatus for theater curtains and the like comprising a flexible cable attached to the curtain for raising and lowering it, power actuated means for decreasing the effective length of the cable to raise the curtain, and means independent of said power actuated means for tilting the curtain laterally.

Signed by me at Cambridge, Mass., this 11th day of April, 1924.

EARLE F. ALLEN.