

A. WILLIAMS.  
 APPARATUS FOR RAISING AND LOWERING STAGE SCENERY AND THE LIKE.  
 APPLICATION FILED SEPT. 15, 1908.

915,523.

Patented Mar. 16, 1909.

3 SHEETS—SHEET 1.

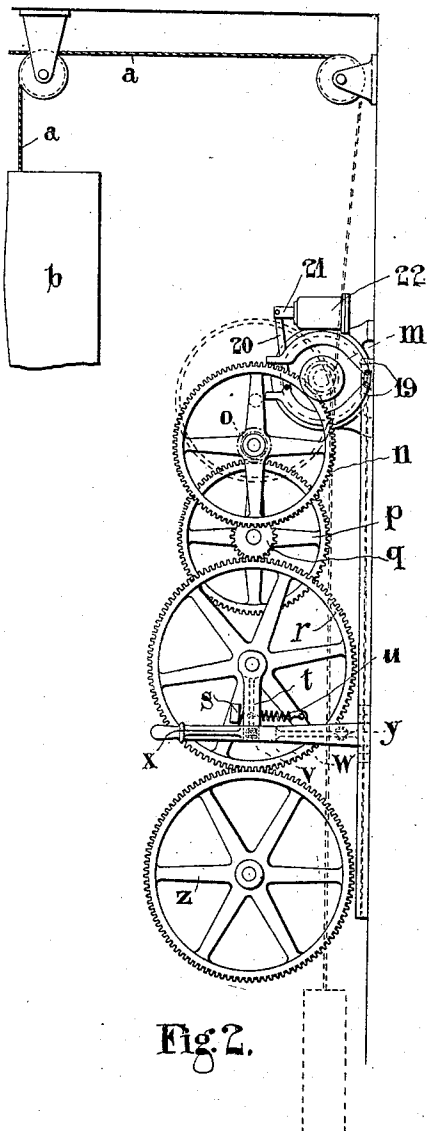


Fig. 2.

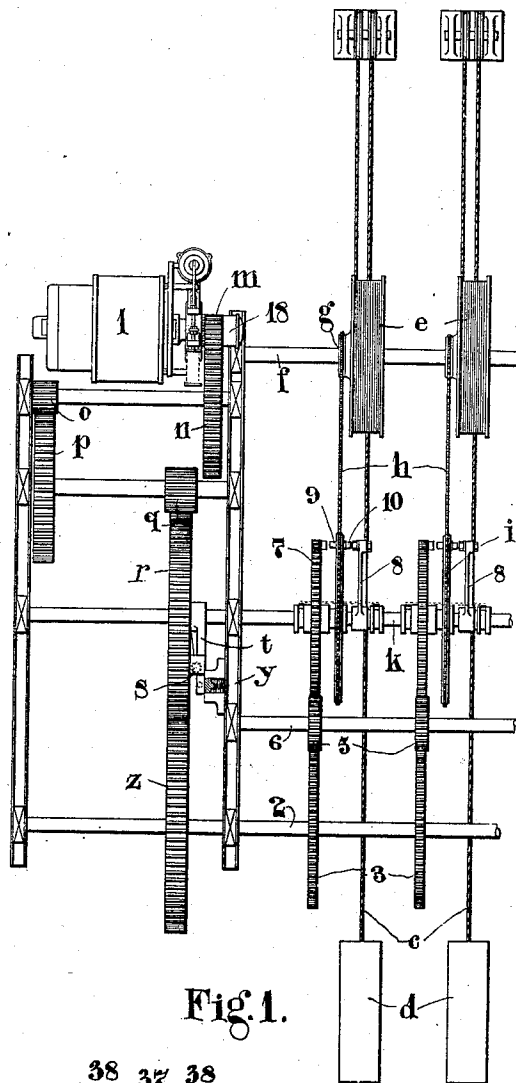


Fig. 1.

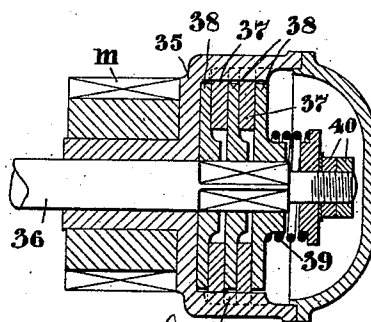


Fig. 12. INVENTOR.  
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 BY Spear, Middleton, Donaldson & Spear  
 ATTYS.

ATTEST.  
 Bent McStahl.  
 Edward N. Sartou

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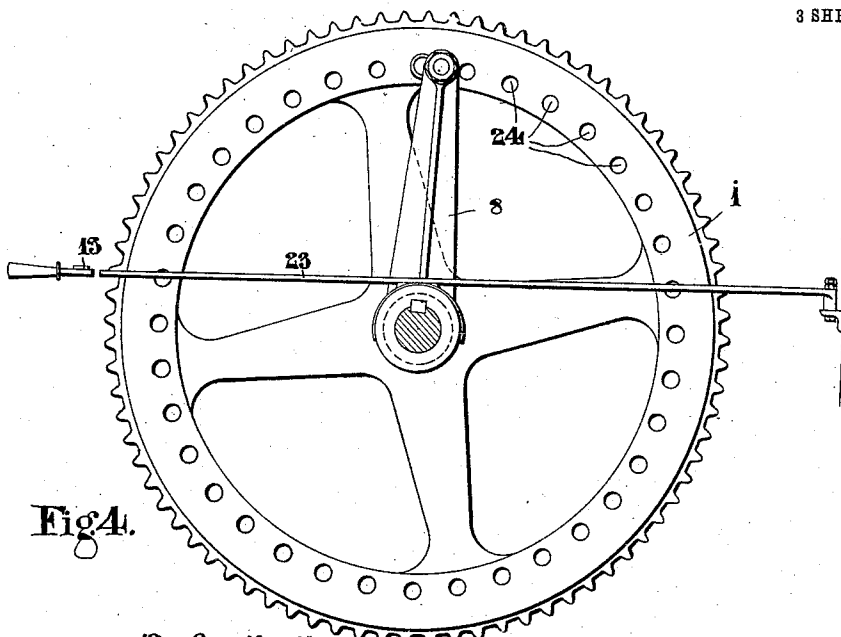
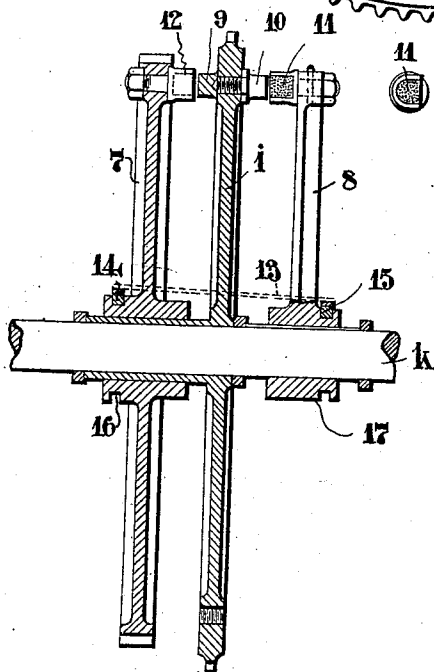


Fig. 4.



ATTEST **Fig. 3.**  
*Bentley & Hall.*  
*Edward N. Sartor.*

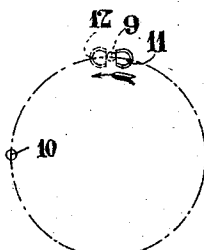


Fig. 5.

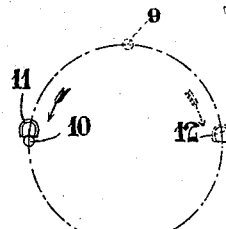


Fig. 6.

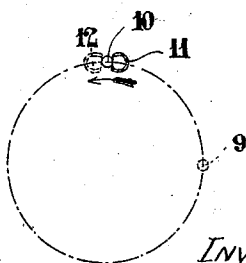


Fig. 7.

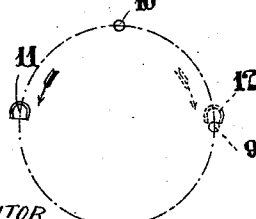


Fig. 8.

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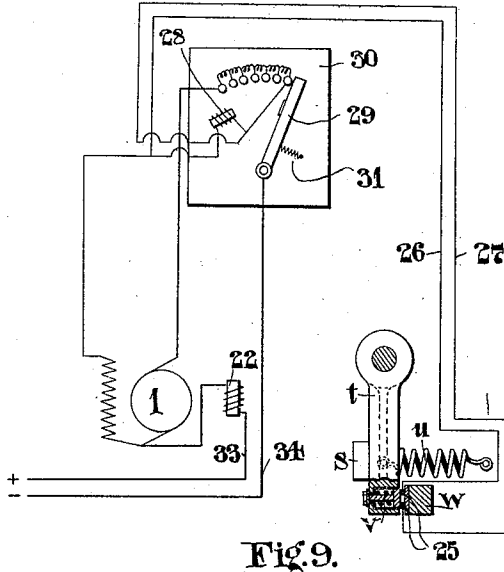


Fig. 9.

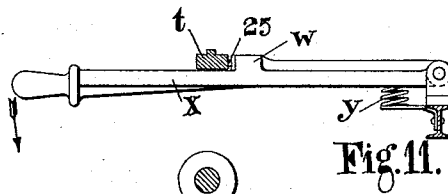


Fig. 11.

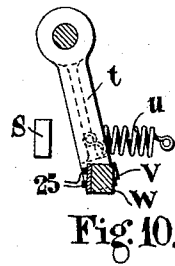


Fig. 10.

ATTEST.  
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INVENTOR.  
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 BY *Spencer Middleton Donaldson*  
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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR RAISING AND LOWERING STAGE SCENERY AND THE LIKE.

No. 915,523.

Specification of Letters Patent.

Patented March 16, 1909.

Application filed September 15, 1908. Serial No. 453,144.

*To all whom it may concern:*

Be it known that I, ALAN WILLIAMS, a subject of the King of Great Britain and Ireland, and residing at 16 Messaline avenue, Acton, London, in the county of Middlesex, England, have invented certain new and useful Improvements in Apparatus for Raising and Lowering Stage Scenery and the Like, of which the following is a specification.

This invention relates to apparatus for raising and lowering stage scenery and the like.

Each curtain or piece of scenery is usually suspended upon two or more cables or lines which are led over pulleys at the side of the stage and connected to counterbalance weights so that the curtain or piece of scenery can be very easily raised or lowered by hand. In a large theater the number of lines involves a considerable amount of men to operate them especially as the change of scenery has sometimes to be effected very rapidly.

The object of the present invention is to enable all the curtains or pieces of scenery for each act or scene, or a considerable number of them, to be raised and lowered simultaneously by means of one or more motors under the control preferably of one man.

Another object of the invention is to enable an operator to select in advance the particular curtains or the like which are to be raised or lowered for any particular act or scene and also to predetermine the extent of movement of the same so that when the motor is started by the operator in charge of it the correct curtains or the like will be moved and then arrested in their correct positions.

It is preferred to effect the above objects in such a manner that the lines are free to be operated by hand at any time if necessary.

The invention consists in passing the lines from the curtains or the like and from the balance weights over a series of drums all of which are independent of one another, and in then driving each drum from an operating disk or the like which is adapted to be put into driving connection with either of two driving disks or arms which are rotated from a motor, or motors in opposite directions.

The invention also consists in adapting the driving connections between the driving disks and the operating disks to be adjusted or altered in such a manner that the amount

of movement imparted to each curtain or the like may be predetermined in order that once the motor is started by the operator in charge of the same the curtains or the like will all move to their correct positions without involving any further control on the part of the operator referred to, the mechanism being so arranged that the curtains or the like return to their initial position.

The accompanying drawings illustrate one form of apparatus according to the invention.

Figure 1 is an elevation showing the motor and the gearing required for two curtains, the gearing for any other number however being identical. Fig. 2 is a side elevation corresponding to Fig. 1. Fig. 3 is a front sectional elevation, and Fig. 4 is a side elevation showing one of the operating disks with its corresponding driving disks and driving arm in detail. Figs. 5 to 8 are diagrams illustrating the relative positions of the driving lugs and driven lugs respectively during the lowering and raising of a curtain which necessitates three quarters of a revolution of the operating disks to effect the desired lowering or raising operation. Fig. 9 is a diagram of electrical connections and also illustrating one position of the contact arm, Fig. 10 being a view showing the contact arm in another position. Fig. 11 is a detailed plan showing a main controlling lever. Fig. 12 is a detail section of a slipping clutch which is used on the motor.

In carrying out the invention according to one mode the usual wire or other ropes *a a*, or chains, from each curtain *b*, or the like, and the rope *c*, supporting the balance weight *d*, of the same are passed over a drum *e*, preferably provided with a grooved periphery. All the drums, *e*, for the various curtains or pieces of scenery, or all those for any particular group of the same, are mounted loosely upon a common shaft *f*, although they may be independently carried if desired. Each drum is fitted with a sprocket pinion *g*, connected by a chain *h*, to a sprocket wheel or operating disk *i*, freely mounted upon a common driving shaft *k*, arranged parallel to the axis of the drums *e*. This shaft *k*, hereinafter referred to as the main driving shaft may be driven by suitable gearing from an electric or other motor *l*.

In the example illustrated the motor *l*, drives the shaft *k*, through spur gearing *m*, *n*, *o*, *p*, *q*, *r*, the last wheel being keyed upon the shaft *k*. Pivoted on the shaft *k*, is an arm *t*, connected by a spring *u*, to the wheel *r*, and so arranged that when the spring *u*, is extended, the arm *t*, touches the lug *s*, on the spur wheel, *r*. The arm *t*, is adapted to engage a stop *w*, on a lever *x*, which is adapted to be pivoted against the action of the spring *y*, in the direction of the arrow shown in Fig. 11, to allow the arm *t* to pass the stop *w* ready for the next operation, for a purpose hereinafter referred to, and the arm *t*, is also provided with a spring buffer *v*, adapted to make an electrical contact for a purpose hereinafter referred to.

The wheel *r*, meshes with a wheel *z*, mounted upon a shaft 2 upon which is secured a wheel 3 meshing with an intermediate pinion 5 upon an intermediate shaft 6. The latter shaft is provided with a series of intermediate pinions 5 adapted to mesh with all the driving disks or wheels 7 which are intended to drive the operating disks *i*, in a direction corresponding to that required for raising the curtains or the like as hereinafter explained. Alternately the wheels 3 may be dispensed with and the shaft 2 may drive the shaft 6 through one pair of gears of adequate strength all the pinions 5 thus becoming driving pinions and being keyed on the shaft 6.

Upon the shaft *k*, and adjacent to each operating disk *i*, is a driving arm 8. Each operating disk *i*, is provided with a return lug 9 which may be cast upon the disk and it is also provided with a lug or pin 10 upon the opposite side, the latter being adapted to be screwed into a screw-threaded hole in the operating disk as indicated in detail in Fig. 3. The disk *i* is provided with a series of threaded holes 24, so that the position of the removable pin or lug 10, may be determined according to the depth to which the particular curtain is to be lowered. Each driving arm 8 is provided with a driving lug 11, preferably recessed and provided with a soft packing in the recess as indicated in Fig. 4, and each driving disk 7 is similarly provided with a driving lug 12, also provided if desired with soft packing. The two driving lugs 11 and 12 are adapted to be brought alternately into engagement with the lugs 10 and 9 respectively according to the direction in which the operating disk *i*, is to be rotated. This is effected by means of striking levers 23 (Figs. 3 and 4) connected by a bar 13 and provided with lugs 14 and 15 respectively engaging in grooved collars 16 and 17.

When the striking lever 23 is in a central position neither of the lugs 11 and 12 engages the lugs 10 and 9 so that the operating disk *i* is left quite free upon the shaft *k*, and if desired the curtain may be raised and

lowered by hand or will remain in the position in which it is left.

The motor *l*, is provided with a slipping clutch 18 of any known form. For instance the clutch may comprise an outer casing 35 (Fig. 12) to which is feathered the pinion *m* the casing 35 being loosely mounted upon the motor spindle 36. A number of rings 37 are slidably feathered to the inside of the casing 35, the rings being slotted to embrace 75 feathers 41. A number of disks 38 are alternately arranged with regard to the rings 37, these disks being loosely mounted on the square end of the motor spindle 36. The rings and disks are pressed together by 80 means of a spring 39 adjusted by means of lock nuts 40 so that the friction between the disks and rings may be regulated as desired according to the maximum torque of the motor which is to be transmitted, the arrangement being such that when this torque 85 is exceeded the clutch slips. The clutch 18 is therefore so arranged that when the arm *t*, is in contact with the lug *s*, and the stop *w*, at the end of each operation, so that the curtains have been raised or lowered to definite 90 positions, the motor *l*, is free to over-run the clutch 18, it being preferred to arrange a suitable electric circuit of which the spring buffer *v*, hereinbefore referred to, forms a 95 part, so that when this contact has been made the no-voltage coil or other device connected with the motor starting switch is operated and the motor automatically stops. For instance in the diagram Fig. 9 the 100 spring buffer *v*, on the arm *t*, is shown bridging two contacts 25, on the stop *w*, thus completing a shunt circuit 26, 27 and cutting out the no-voltage coil 28. The contact arm 29 of the starting switch 30 having been thus 105 released has been drawn back by its spring 31 thereby opening the circuit 33, 34, containing the motor and solenoid 22 of the magnetic brake. The magnetic brake may comprise bands 19 adapted to be drawn 110 apart by a link 20 pivoted to the core 21 of an electro magnet 22, and drawn together by a spring.

Figs. 5-8 diagrammatically illustrate the mode in which the removable lug 10 may be 115 set in the operating disk *i*, according to the movement required for the respective curtain or piece of scenery. In these figures the lug 10 is shown in such a position upon the operating disk *i*, that the latter will be 120 rotated through three quarters of a revolution only for each complete revolution of the shaft *k*. For a complete raising or falling motion of a curtain the apparatus is preferably arranged so that the operating disk *i*, 125 makes one complete revolution.

In Fig. 5 the lugs 10 and 11 are shown in the positions assumed when the curtain is in its raised position and about to be lowered. The lug 11 then moves around 130

through one quarter of a revolution in a direction indicated by the arrow without affecting the lug 10. When it reaches the latter as shown in Fig. 6 it commences to rotate the disk *i*, and lowers the curtain corresponding to the particular disk *i*, upon which the lug 10 is mounted. Fig. 7 shows the position of the lug 10 when the curtain has completed its downward movement.

It will be noticed in Figs. 5-7 that the lug 9 is in all positions 90° behind the lug 10.

When the curtain has to be again raised the lug 11 is disengaged from the lug 10 and the lug 12 is brought into the path of the lug 9. The lug 12 then rotates in the direction indicated by the dotted arrow in Fig. 8 but it does not affect the disk *i* until it, the lug 12, has moved through 90° and engaged with the lug 9, in which position it is indicated in Fig. 8. Then in its continued revolution it drives the lug 9 and consequently the disk *i*, until the two have assumed the position indicated in Fig. 5 corresponding to the raised position of the curtain. It will thus be understood that by suitably arranging the lugs 10 in the respective operating disks *i* the lowering and return of each curtain may be set or regulated as desired.

In order to set a particular scene, the striking levers 23 of those lines which are to be used in that scene are thrown over to the lowering position and the striking levers for the previous scene are thrown over to the raising position and the lever *x* is pivoted against the action of the spring *y* so as to allow the arm *t* to pass the stop *w* as hereinbefore described. The motor is then started and rotates till the scene is changed when it automatically stops. The striking levers and the lever *x* can then be re-set for the next scene and so on.

The striking levers and operating disks may be arranged in any suitable position under the control of one man, for instance, they may be accessible from a gallery provided upon the wall of the stage.

The starting switch can be in any suitable position for example near the usual lighting switch board, the operator in the gallery signaling to the switch-board operator when all the striking levers have been set so that the actual changing of the scene can be quickly and correctly carried out at the time required by the switchboard operator without requiring any judgment or skill on his part.

It is to be understood that any equivalent driving mechanism may be employed instead of the chain drive hereinbefore referred to and also that any other suitable means may be substituted for the series of holes and removable pins for determining the amount of movement to be imparted to each scene. For instance the operating disk may be clutched in any suitable manner to the driving disks and adjustable means may be

used to automatically disconnect or de-clutch the operating disks from the driving disks after the predetermined movement.

Similarly the invention is not confined to the use of an electric motor as any other suitable motor may be used although an electric motor is preferred.

Having now particularly described my invention what I claim as new and desire to secure by Letters Patent is:—

1. Apparatus for raising and lowering stage scenery, comprising a plurality of winding drums, an operating disk for driving each of said drums, two rotatory driving members for each operating disk adapted to rotate in opposite directions, means for operatively connecting either of said members to the aforesaid operating disk and a motor and gearing for driving the driving members in opposite directions, substantially as and for the purpose herein set forth.

2. Apparatus for raising and lowering stage scenery, comprising a plurality of winding drums, a sprocket pinion on each drum, an operating disk having sprocket teeth, a chain connecting each disk with its respective sprocket pinion, two rotary driving members for each disk adapted to rotate in opposite directions, means for operatively connecting either of said members to the aforesaid disk, and a motor and gearing for driving the said members in opposite directions, substantially as and for the purpose hereinbefore set forth.

3. Apparatus for raising and lowering stage scenery, comprising a plurality of winding drums, an operating disk for driving each of said drums, two rotatory driving members for each operating disk adapted to rotate in opposite directions, means for operatively connecting either of said members to the aforesaid operating disk, a motor, gearing between the latter and the aforesaid driving members, a definite stop for arresting said gearing at the end of each operation, and a slipping clutch between the gearing and the motor, substantially as and for the purpose hereinbefore set forth.

4. Apparatus for raising and lowering stage scenery, comprising a plurality of winding drums, an operating disk for each drum, two rotary driving members for each disk, means for effecting a driving connection between one driving member and the disk and adjustable means for effecting a driving connection between the other driving member and the disk, substantially as and for the purpose hereinbefore set forth.

5. Apparatus for raising and lowering stage scenery, comprising a plurality of winding drums, an operating disk for each drum, two rotatory driving members for each operating disk, means for rotating said members in opposite directions, a lug on each side of such operating disk, corresponding driv-

ing lugs on the respective rotary driving members, and means for axially moving the said members relatively to the operating disk for the purpose of bringing the lugs into operative engagement, substantially as and for the purpose hereinbefore set forth.

6. Apparatus for raising and lowering stage scenery, comprising a plurality of winding drums, an operating disk for each drum, two rotary driving members for each operating disk, means for rotating said disks in opposite directions, a lug fixed on one side of the operating disk, another lug adapted to be secured in any one of a plurality of positions in the other side of said disk, corresponding driving lugs on the aforesaid driving members, and means for axially moving the latter members relatively to the operating disk, substantially as and for the purpose hereinbefore set forth.

7. Apparatus for raising and lowering stage scenery, comprising a plurality of winding drums, a plurality of freely mounted operating disks, driving means between said disks and drums, one set of rotary driving members feathered upon a common shaft, another set of driving members freely mounted on said shaft, means for moving either set into operative engagement with the operating disks, a motor, a spur wheel driven by the same and keyed to the aforesaid shaft for the purpose of rotating it in one direction, and spur gearing intermediate of the aforesaid spur wheel and the aforesaid freely mounted driving members for rotating them in the opposite direction, substantially as and for the purpose hereinbefore set forth.

8. Apparatus for raising and lowering stage scenery, comprising a plurality of winding drums, a plurality of freely mounted operating disks, driving means between said disks and drums, one set of rotary driving members feathered upon a common shaft, another set of driving members freely mounted on said shaft, means for moving either set into operative engagement with the operating disks, an electric motor, a spur

wheel driven by the same and keyed to the aforesaid shaft for the purpose of rotating it in one direction, and spur gearing intermediate of the aforesaid spur wheel and the aforesaid freely mounted driving members for rotating them in the opposite direction, a starter for the aforesaid motor, an electric circuit for controlling the starter, a definite stop having contacts arranged in said circuit and means carried by a moving part of the apparatus for bridging said contacts for the purpose of stopping the motor at the end of each raising and lowering operation.

9. Apparatus for raising and lowering stage scenery, comprising a plurality of winding drums, a plurality of freely mounted operating disks, driving means between said disks and drums, one set of rotary driving members feathered upon a common shaft, another set of driving members freely mounted on said shaft, means for moving either set into operative engagement with the operating disks, an electric motor, a spur wheel driven by the same and keyed to the aforesaid shaft for the purpose of rotating it in one direction and spur gearing intermediate of the aforesaid spur wheel and the aforesaid freely mounted driving members for rotating them in the opposite direction, a lug on the aforesaid spur wheel, an arm loose on the aforesaid shaft, a spring connecting the arm to the spur wheel tending to hold the arm away from the lug, a contact carried by the arm, a definite stop, a pivoted lever carrying the stop, two contacts on the stop, and a contact on the aforesaid arm adapted to bridge these contacts on the stop so as to complete an electric circuit, and a motor starter and magnetic brake adapted to be controlled by said circuit for the purpose hereinbefore set forth.

In testimony whereof, I affix my signature in presence of two witnesses.

ALAN WILLIAMS.

Witnesses:

A. MEWER,

H. LENTLECHER.