This invention relates to curtain-operating apparatus, and more especially it relates to apparatus for opening and closing a pair of curtains, portieres, drapes or the like, that are supported at the top and are movable toward and away from each other.

The invention is of especial utility for operating the curtains of theatres or the like, wherein the curtains in extended or closed position overlap at the center of the proscenium, and in the opening or withdrawing operation they gather only at their remote end portions, which portions may be concealed from the audience.

The chief objects of the invention are to provide an improved supporting frame for the apparatus; to provide improved track-travelers that operatively engage the operating cord when the latter is moving in one direction only; and to obviate the use of extraneous means, such as cams and the like, for causing the travelers operatively to engage the cord, or to become disengaged therefrom. Further objects include reduced initial cost and lower maintenance costs. Other objects will be manifest.

Of the accompanying drawings,

Figure 1 is a side elevation of curtain-operating apparatus embodying the invention, in its preferred form, and a pair of curtains operated thereby, the latter being in closed or drawn position;

Figure 2 is a view similar to Figure 1 showing the curtains in partly opened position;

Figure 3 is a bottom plan view of the apparatus shown in Figure 1, the curtains being removed for clearness of illustration;

Figure 4 is a vertical longitudinal section through the curtain-operating apparatus, at the middle portion thereof, on the line 4—4 of Figure 3 and Figure 6;

Figure 5 is a vertical longitudinal section of the apparatus, at one end thereof, showing one series of curtain-supporting travelers moving to curtain-opening position;

Figure 6 is a section on the line 6—6 of Figures 1 and 4;

Figure 7 is a section on the line 7—7 of Figure 9;

Figure 8 is a section on the line 8—8 of Figure 5; and

Figure 9 is a vertical longitudinal section of the apparatus, similar to Figure 5, but viewed from the opposite side of the apparatus and at the opposite end thereof, showing the other series of travelers moving to curtain opening position.

Referring to the drawings, 10 is an overhead metallic frame that is tubular in form, generally rectangular in cross-section, and formed throughout with a centrally-disposed longitudinal slot 11 in its bottom wall, the latter being formed, at each side of said slot, with respective flat-bottom grooves 12, 13 constituting runways for respective series of wheeled travelers T, T'. The latter support the two sections A and B of a curtain, said sections overlapping somewhat at the middle of the apparatus as is most clearly shown in Figures 1 and 4.

The curtain sections are opened and/or drawn together by means of an operating line or cable 16 that is trained about a grooved pulley 18 that is journaled upon a vertical axis in one end of the frame 10 (the right end as viewed in Figures 1, 2, 3, and 5), the cable extending in two parallel reaches the length of the frame, directly over the runways 12 therein. At the opposite end of the frame the cable extends over respective grooved pulleys 17, 17 that are journaled on a horizontal axis, the free ends of the cable extending downwardly to any suitable cable-operating mechanism (not shown).

The travelers T include two master travelers T', T' that are disposed over the adjacent or inner ends of the respective curtain sections A and B. As is most clearly shown in Figures 4 and 5, each of said master travelers comprises a relatively long metal plate 19 that has its upper and lower marginal portions bent in the same direction at right angles thereto to constitute marginal flanges. Suitably journaled on the plate 19, near each end thereof, are respective wheels or rollers 20, 20 that are positioned in a frame groove 12, the arrangement being such that the plate 19 extends through the frame-slot 11, the upper flange of the plate lies along the cable 15 below the same, and the lower flange of the plate is disposed in spaced relation to the bottom of the frame. A generally C-shaped clip 21 lies against the inner face of the plate 19 centrally thereof and extends through suitable slots in the respective flanges of said plate, the upper end of clip 21 being hooked over cable 15 and there being a set screw 22 extending through the bottom portion of said clip and bearing against the under side of the lower plate-flange. By setting up screw 22 the clip 21 is caused to clamp the cable 15 to the upper flange of plate 19 whereby movement of the cable in either direction also moves the master traveler. The curtain sections are attached to the master travelers by respective
S-hooks 23 that engage in grommets in the upper margin of the curtain and in respective loops or eyes 24 depending from the lower flanges of plates 19.

As is most clearly shown in Figure 4, the rollers 20 in the master traveler associated with curtain section A are disposed in a different frame-groove 12 than are the rollers of the traveler associated with curtain-section B, and since the plates 19 and clips 21 are relatively thin, there is ample room in the slot 11 for one master traveler to pass the other. The arrangement of the apparatus, assuming the curtain to be in closed position as shown in Figures 1 and 4, the curtain-sections A and B at the middle of the apparatus is accomplished without the use of separate track and frame structures for each curtain section. Respective stop plates 25 are adjustably mounted by means of screws 26 interiorly of the frame 10 in position to obstruct the runway grooves 12, and thereby to provide positive stops for the respective master travelers in the closed or drawn position of the curtain.

The outer end remote ends of the curtain-sections are supported by S-hooks 23 that engage respective loops or eyes 27 that are fixedly attached to the bearing blocks that carry pulleys 16, 17 at each end of the frame 10. Between the eyes 27 and the eyes 24 of the master travelers the curtain sections are suspended from the respective series of travelers T, which travelers are so constructed as automatically to operatively engage the cable 15 when the latter is moved in the direction to open the curtain, and automatically to release their engagement with said cable after they have reached the limit of their travel. Since the respective series of travelers engage respective reaches of the cable 15, and said reaches move in opposite directions during operation of the cable, the travelers require to be in reversed relationship according to their series, but all travelers T may be identical.

Each traveler T comprises a plate 23 carrying a laterally projecting stub shaft 30 upon which is journaled a roller 31 that is disposed in a frame-groove 12, the said plate extending through slot 11 of the frame 10 and being supported by said roller. The lower margin of the plate 29, below the frame, is bent laterally to form flange 32 that carries a depending loop or eye 24, an S-hook 23 being suspended in the latter attachment as a means of swivelled on the stub shaft 30 is a device for releasably connecting the traveler T to the cable 15, said device comprising a pair of legs 33 that straddle roller 31 and at their juncture are integrally formed with a cable-engaging structure consisting of an annular thimble 34 through which the cable 15 passes, and a horizontal lip 35 spaced somewhat from the thimble 34, and in contact with the under side of cable 15. The thimble 34 is somewhat larger than the cable so that the latter passes freely there-through, and has a rolled or flared margin on the side nearest lip 35. The thimble 34 and lip 35 are so arranged that the lip trails the thimble during the opening of the curtain, that is, when the traveler is moving toward the end of the frame 10.

Struck out from the upper margin of plate 29 is a lug 36 which limits the pivotal movement of the cable-engaging structure in one direction, the cable 15 limiting its pivotal movement in the opposite direction. The lateral margin of plate 29 that is remote from the end of the frame 10 is locally bent to form a flange 37, and when the travelers T are in laterally abutting relation the said flange 37 on each traveler will abut a leg 33 of the cable-engaging structure of the adjacent traveler to hold said structure in upright position, in which position the axis of the cable is horizontal. Suitable fixed abutments 38, 39 at the respective ends of frame 10 serve the same purpose as flanges 37 in engaging and tilting the cable-engaging structures of the travelers at the outer ends of each series of travelers. In the operation of the apparatus, assuming the curtain to be in closed position as shown in Figures 1 and 4, the curtain-sections A, B will be in overlapping position and the travelers T will be uniformly distributed lengthwise of the frame 10. Opening or withdrawing of the curtain is accomplished by operating the cable 15 in the proper direction so that its respective reaches move in the direction, indicated by the arrows in Figures 4 and 9, it being understood that said reaches move in opposite directions. This movement of the cable so tilts the cable-engaging structures of travelers T at one end of the apparatus, as it rotates the cable to the cable that lips 35 of said structures are drawn upwardly against the cable with sufficient force frictionally to grip the cable and slightly flex it as shown, with the result that there is no farther relative movement between the cable and travelers T and said travelers move along with the cable in properly spaced relation. Master travelers T' being normally fix to the cable also travel with it, and pass each other on their respective trackways as the curtain-sections move apart. With the cable firmly gripped by all of the travelers, it will be apparent that the curtain sections will move apart without any substantial gathering between travelers.

As each traveler T at the outer end of each series of travelers approaches the end of frame 10, its cable-engaging structure engages the abutment 38 thereof whereby said cable-engaging structure is forced into upright position, with the result that its lip 35 releases its grip on the cable and the latter is permitted to move freely through the thimble 34 of said structure. With the most remote traveler T motionless, the curtain begins to gather as the adjacent traveler approaches the motionless one. The said adjacent traveler ceases moving after a leg 33 of its cable-engaging structure strikes flange 37 of the motionless traveler T, the curtain-sections are forced into upright position and thus releases the cable. This operation is repeated until the curtain is fully open and the master traveler T' abuts the nearest traveler T.

When the direction of movement of the cable 15 is reversed to draw the curtain-sections together in overlapped relation, the pull on the cable draws the master travelers T' toward the middle of the frame 10, said master travelers carrying the curtain sections with them, the cable sliding freely through the thimbles of the travelers T. As successive portions of the curtain-sections become taut they pull successive travelers T along with them, the cable-engaging structures of the travelers being inoperative at this time because the direction of movement of the travelers, and because the latter and the cable are moving at the same speed.

The invention provides an improved curtain-operating apparatus that is superior in construction and operation, and which achieves the several advantages set out in the foregoing statements of objects.

Modification may be resorted to without de-
parting from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. In curtain-operating apparatus the combination of a horizontal tubular frame formed with a longitudinal slot in its bottom wall and trackways on each side of said slot, respective series of travelers on said trackways having portions extending downwardly through said slot, each series being adapted to support individual curtain sections, and an operating cable in the frame for moving each series of travelers concurrently in opposite directions.

2. In curtain-operating apparatus the combination of a horizontal tubular frame formed with a longitudinal slot in its bottom wall and trackways on each side of said slot, respective series of travelers on said trackways having portions extending downwardly through said slot, each series being adapted to support individual curtain sections, an operating cable in the frame for moving each series of travelers concurrently in opposite directions, and an abutment in each runway for preventing further closing movement of the travelers when the curtain-sections are in determinate overlapped relation.

3. In curtain-operating apparatus the combination of a trackway, travelers on said trackway adapted to support a curtain, an operating cable for moving said travelers, and means on each of said travelers for operatively engaging the said cable when the latter moves in one direction only.

4. In curtain-operating apparatus the combination of a trackway, travelers on said trackway adapted to support a curtain, an operating cable for moving said travelers, and means on each of said travelers for operatively engaging the said cable when the latter moves only in the direction to open the curtain.

5. In curtain-operating apparatus the combination of a trackway, travelers on said trackway adapted to support a curtain, an operating cable for moving said travelers, and movable means on each of said travelers for operatively engaging the said cable when the latter moves in one direction only, said movable means being operable to engage the cable by the movement of the cable.

6. In curtain-operating apparatus the combination of a trackway, travelers on said trackway adapted to support a curtain, an operating cable for moving said travelers, means on each of said travelers and movable relatively thereof for operatively engaging the cable when the latter moves in one direction only, said means being operated by movement of the cable, and means for releasing said cable-engaging means while the cable is moving.

7. In curtain-operating apparatus the combination of a trackway, an abutment at one end thereof, travelers on said trackway adapted to support a curtain, an operating cable for moving the travelers, and means on each of said travelers for operatively engaging the said cable when the latter moves toward said abutment, said means on the leading traveler releasing the cable upon striking the abutment, and succeeding travelers releasing the cable as they move into engagement with the next preceding stopped traveler.

8. In curtain-operating apparatus the combination of a trackway, travelers on said trackway adapted to support a curtain, an operating cable for moving said travelers, and means on each of said travelers for connecting said travelers to said operating cable when the latter moves in one direction only, said means comprising tiltable structures engaged by the cable and adapted frictionally to grip the cable when tilted in one direction by movement of the cable.

9. A combination as defined in claim 8 including means for tilting the tiltable structures in the opposite direction to cause them to release the cable.

10. In curtain-operating apparatus the combination of a trackway, travelers on said trackway adapted to support a curtain, an operating cable for moving said travelers, tiltable means on each traveler for frictionally engaging the said cable when the latter moves toward the end of the trackway, an abutment at the end of the trackway for tilting back the tiltable means on the leading traveler to cause it to release the cable when contacted by said leading traveler, and an abutment on each traveler for tilting back the tiltable means on its adjacent succeeding traveler in like manner.

11. In curtain-operating apparatus the combination of a trackway, travelers on said trackway adapted to support a curtain, a cable for moving said travelers, and cable-engaging structures on each of said travelers, each of said structures comprising pivotally mounted arms, a thimble carried thereby embracing the cable, and a horizontal lip disposed at one side of said thimble adapted to engage the cable when said arms are tilted.

12. A combination as defined in claim 11 including means on the traveler for limiting the tilting of the arms in one direction to thereby enable the cable-engaging structure to engage the cable only when the latter moves in one direction.

13. A combination as defined in claim 11 including abutments on each traveler for causing the cable-engaging structures to release the cable when the travelers abut each other.

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