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INSTRUCTION AND MAINTENANCE MANUAL

STAGE RIGGING

HILLIARD HIGH SCHOOL

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LOADING A PIPE BATTEN AND ITS COUNTERWEIGHT CARRIAGE

1. Begin with the counterweight system in balance.
2. Lower the batten to low trim point, which should be approximately 4'6" above the stage floor, at which time the carriage should be against its top bumper stop and within convenient reach from top loading bridge if the cable reeving arrangement and the rigging design reflect best practice.
3. Close rope lock.
4. Depending what is to be attached to batten (lights, drapery, track, painted scenery, scrim, sky, etc.) check that clearance exists so the items to be attached will fly clear of adjacent battens with their respective equipment.
5. Check horizontal trim of batten to be loaded and make required adjustments with the trim chains, which are provided in the counterweight system. In doing this, apply sufficient weight at each running line batten connection for removing across stage catenaries in the running lines. The longer lines especially have a tendency to raise the batten because of their greater across stage length.
6. Proceed to attach the intended equipment to the batten using care that all connections (ties, snaps, clamps) are secure.
7. If full length drapery is the item as attached in 6 above, arrange the "floor pile up" to allow it being lifted off the top of the "pile". Also arrange the "pile"(s) quite well directly under the batten to avoid excessively drifting the batten from its normal travel path.
8. There should now be two people at the loading bridge and one at the locking rail. All should have experience or be properly supervised.
9. Estimate the quantity of weight required and arrange their close proximity access.
10. Proceed at bridge to load weights on the carriage while properly arranging the spreader plates and lock collars. Keep alert for audible directions from person at rail.
11. As the counterweights are loaded onto the arbor where a curtain or similar drop is involved, which is piled on the floor periodically open the rope lock to allow the curtain or drop to raise off the floor. This will allow the arbor to descent, thus bringing the empty portion of the arbor into the reach of the men at the loading bridge. After each movement, be sure to close the rope lock. Continue this procedure until the curtain or drop is in balance.

12. If light fixtures or track (no drapery) are the newly attached batten load, there is no progressive increase in load regardless of batten elevation and the carriage can be "balanced out" at the one loading bridge elevation. Here again the person at rail directs the operation and "feels" the imbalance approaching zero point by pulling on the operating rope keeping the rope lock closed.
13. After a balanced condition is established, the top spreader plate should be kept to position on the carriage tie rods using the lock collars.
14. During strike, the same precautionary procedures (except in reverse) apply as listed above but with more hazardous potential since the full-out carriages are already located and their potential likely to be overlooked by the floor crew often over anxious for load-out and get-away.
15. Another procedure to be avoided in the handling of an out-of-balance counterweight system is the use of bull lines over the batten to attempt controlling a carriage heavy condition. The crew members on the floor here have no advantage beyond their own strength and weight coupled with two hazardous options of (a) either releasing their grip or (b) being pulled into the loft if the load considerably exceeds the estimated magnitude.
16. If bull lines are to be used, they should be applied to the top or bottom of the carriage and work through a rope falls, grip hoist, come-along, or capstan with the head beams or locking rail as anchor point. Proper bull line equipment at the locking rail area is usually the preferred choice above all other by experienced flymen but requires substantial counterweight rigging and the necessary accessory equipment including heavy duty locking rail fabrication and anchoring.
17. Still another method for controlling a reasonable imbalance is the "twining" of the two manila hauling lines. For minimal imbalance only several wraps need be used and hand held while for somewhat greater imbalance the tourniquet method can be applied. The latter of the two utilizes a wood batten section some 3 feet long for applying the twist but has the disadvantage during the "windup" of fouling the hauling lines of adjacent sets plus the hazard of easily assuming a vertical attitude at which time it "spins out" leaving the imbalance free to be overtaken by gravity.

FUNCTION AND OPERATION OF THE FLOOR BLOCK

1. The floor block assembly engages the T-bar guides and is held in suspension by the manila hand line. The basic design intent is to use the weight of the floor block to maintain tension on the manila line for ease of operation. Under normal conditions the manila line will shrink and stretch according to humidity conditions. The floor blocks will accommodate the varying length by dropping when the manila stretches. When the manila shrinks, the floor block will tend to bind in the T-bar guides and can be freed by application of foot pressure to the toe kick tab while simultaneously pulling on the operating line at the portion between the floor block and the bottom arbor block. Should shrinkage or stretch occur beyond the limits of the floor block travel, the manila should be re-tied accordingly. It is recommended that the floor block be raised to mid-point of vertical travel.

RETRIMMING OF PIPE BATTENS

1. Because of constructional and elastic stretch in steel cable, the running lines of a counterweight system being of unequal lengths require the batten trim be given occasional attention. Constructional stretch in steel cable can approach a one percent factor related to original length when new. Elastic stretch, however, is not permanent unless imposed loads exceed approximately sixty percent of the catalog breaking strength of the cable.
2. The trimming adjustment is quite simply accomplished by lengthening or shortening the working length of the batten trim chains.
3. These chains - approximately 38" long - are each attached to ends of the running lines and typically wrap the batten with one and one-half turns with the end then connected by shackle or snap to the standing part.
4. The actual adjusting procedure consists of relocating the shackle or snap connection to selected links in the standing part as required to shorten or lengthen the working length of the chain, which respectively raises or lowers the batten.
5. A storey pole for measuring the distance from the batten to floor is a more convenient method than a tape or rule for successively checking the across stage points at running line locations.
6. If batten is loaded or otherwise too heavy for size of available crew to conveniently handle, use a Havens grip with small tackle, ratchet, or grip hoist for relieving load on chain during connection being relocated.

ADJUSTMENT OF ROPE LOCKS

- A. Rope locks are all steel construction equipped with Corbin plunger key operated tumbler type lock at right side of unit rendering the system entirely inoperable. The plunger design allows locking without use of key but requires key to open.
- B. Note - no oval or other shape link is used to required to surround the manila which creates noise and vibration during the running of the system.
- C. The internal toggle action of the brake provides an overthrow into a staying position requiring no keeper type assistance and hence the elimination of the awkward link.
 - 1. Two (2) threaded adjustment machine screws are located at rear of each individual rope lock housing together with a jam nut for holding the adjustment.
 - 2. The adjustability feature of a rope lock is provided to allow a mechanical means for increasing and decreasing the space or chamber through, which the hauling line in endless loop configuration passes as it connects to the top and bottom of the counterweight carriage.
 - 3. Turning the adjusting screws "in" reduces the space required through which the movable brake shoe need move prior to contacting the hauling line thereby being capable of exerting greater holding pressure on the line since the travel distance of the movable shoe remains constant related to the throw and cam action of the handle.
 - 4. This "in" adjustment, therefore, will compensate for the hauling line assuming reduced size (girth) as can result from stretch and wear.
 - 5. Turning the adjusting screws "out" enlarges the space or chamber and thereby produces the opposite effect described in 3 above.
 - 6. This "out" adjustment, therefore, will compensate for new replacement hauling line, which has increased size (girth) than the worn and stretched line it replaced.
 - 7. It is important that both screws be adjusted equally. This can be determined by measuring the amount of thread projecting from the rear of the lock.
- D. During adjustment process, continue operating the lever full open to full close as the screws are being turned, which will indicate the pressure being applied to the lines as well as indicate the manual force required to move the lever to its staying position.

1. Regardless of the vintage of the hauling line, the proper setting of the adjustment screws is determined by the amount of manual force required to push the operating handle to its full close or upright position.
 2. This manual force can be described as the maximum which can be applied without requiring more than one attempt using one hand and with the elbow of pushing arm firmly against torso thereby allowing body strength to supplement and fortify the strength of arm and hand.
 3. When this point of adjustment as described in 8 above is reached, tighten jam nut to hold adjustment screw setting.
- E. With proper adjustment, the capacity of this rope brake, using 3/4" manila. is 800 pounds.

GENERAL INFORMATION AND INSTRUCTIONS

FOR ADJUSTING AND OPERATING

AUTOMATIC SAFETY ROPE BRAKES

1. These instructions assume the rigging equipment is properly installed and aligned, and the manila line properly reeved and deaded off each end, and all designed to withstand the dynamic and impact loads to be imposed. Hand line should have all stretch removed by floating floor block.
2. Attention is directed that the following relates to the automatic safety features and entirely aside from the auxiliary hand lever which is covered by another portion of the instruction.
3. Begin the adjusting procedure with the counterweight system in balance and with the auxiliary hand lever in open position (toward operator) - also the Corbin plunger lock should be open (out) and the foot treadle allowed to remain in up position.
4. With 3/8" hex wrench, back out the 1/2" socket set screw at back of unit located approximately 4" from top. This set screw cannot be turned out of threads - simply back out until stop limit is reached. Note: jamb nut on this screw must be released for using Allen wrench procedure.
5. Brake should now be wide open and allow manila hand line to run through freely in either direction as system is operated.
6. While running the system slowly in either one direction or alternately in both directions (system in balance), slowly turn "in" the Allen screw until the brake action holds the manila against further operation in either direction.
7. Give the Allen screw approximately one-half additional turn in same direction as 6 above.
8. Tighten jamb nut to hold adjustment of Allen screw.
9. Test system by exerting pulling force alternately on the manila "up" and "down" lines. It should be impossible to put the system in motion.
10. If test 9 above allows system to be put in motion, loosen jamb nut and turn Allen screw half turn "in" and proceed as above until unable to impact motion by pulling force on either the "up" or "down" lines.
11. Depress foot lever full down. It should now be possible to run the system in either direction beginning with one of the two lines.

12. Run system (still in balance) with foot lever depressed and with system in motion let up on foot treadle. System should stop abruptly.
13. Repeat 11 and 12 above once or twice.
14. The equipment is now adjusted for automatic operation for a holding capacity of 800 pounds.
15. To test the brakes ability of preventing a "run-away" of the system merely by depressing the foot lever when an out-of-balance condition exists, two tests can and should be performed:
 - a. Test when out-of-balance is within the range capable of being overcome by the strength of the operator pulling on the appropriate line. This can be established at an approximate imbalance of fifty (50) to seventy-five (75) pounds.
 - b. Test when out-of-balance is not within the range capable of being overcome by the strength of the operator pulling on the appropriate line. This can be established at an approximate imbalance of 250 pounds or more.
16. For testing 15 a. above, load the arbor (or the batten) within fifty (50) to seventy-five (75) pounds to establish this amount of imbalance.
17. Depress foot treadle - system should remain static.
18. With foot treadle remaining depressed, pull on operating line with sufficient force to overcome the imbalance condition and the brake should automatically open. The operator now has this imbalance under his control and can operate the system (foot treadle remaining depressed) but only with considerable effort because of the mass involved.
19. For testing 15 b. above, load the arbor (or the batten) with approximately 250 pounds to establish this amount of imbalance.
20. Depress foot treadle - system should remain static.
21. With the foot treadle remaining depressed, pull on operating line with all force possible toward overcoming the imbalance and brake will continue holding the system static since operator is incapable of overcoming the 250 pounds imbalance.

This test (21) if by chance performed by a person of unusual strength or by more than one person pulling in unison it might conceivably result in overcoming the imbalance - in which event the procedure of 18 above develops.

Should such over-powerful person or persons be involved in this test - simply increase the imbalance test load by another 100 pounds or more and repeat 21 above.

With a system not being capable of being placed in motion, or if some 75 pounds of awkward imbalance exists, the obvious requirement of adjusting the arbor weights becomes apparent, consequently the possibility of a heavy run-away is avoided related to the procedure of opening a common rope lock with the risk of then being confronted with a run-away system and resulting major hazards.

22. As the operating line becomes worn or of reduced diameter because of stretch during the course of extended use, the Allen screw adjustment procedure will allow further and continued adjustment of the gripping shoes as may be required.

Hand Lever at Right Side of Unit

1. This auxiliary hand lever is not in any way linked to the foot treadle or to the automatic equipment of this unit.
2. The two (2) main functions of this hand lever are:
 - a. Slowing snubbing a batten in or out as sometimes required for various effects during a Production.
 - b. During set-up or strike when a recognized and anticipated imbalance is practically unavoidable such as hanging or removing a heavy curtain with the changing weight involved related to the amount flown and that remaining on the floor.

For either of the above or similar circumstances, the automatic features can be locked out by use of the panic button accessory to be dispensed by the crew chief at his discretion after he is made aware of the intent to circumvent the automatic safety feature. This panic button accessory is described in a following portion of the instruction.

3. The holding capacity through the auxiliary hand lever brake is 500 pounds.
4. To adjust the rope grip of the auxiliary hand lever to compensate for wear, stretch, and reduced rope diameter, use end wrench or small crescent for increasing or decreasing the handle throw and shoe travel. A longer throw increases the shoe grip and shorter throw reduces the grip.
5. This is the clevice type linkage at approximately mid-point on the right side of the unit.

Panic Button Accessory

1. This is a "snap-in-place" accessory to remain in the custody of the crew chief, technical director, or other designated person of authority and responsibility for dispensing at his discretion thereby allowing the automatic safety features of one or more selected units to be disengaged and all control transferred to the auxiliary hand lever.
2. Only when a system is in balance will a unit accept this accessory.
3. This accessory, when in place and shifted to its safety lock-out position, nevertheless provides panic button means for instantly allowing the automatic safety features being re-engaged by a hand push requiring only a fraction of a second. The requirement might develop during set-up or strike through inadvertence or human error in shifting equipment from one system to another.
4. After the occasion has passed when the safety lock-out is no longer desirable for special operation as listed above, this accessory should be removed for keeping by the person in authority to be dispensed again as he determines.
5. The positioning of this panic button accessory into the unit and the subsequent removal is by simple snap action requiring approximately five (5) seconds maximum.

Total Lock-Out Against Operation

1. The Corbin plunger key operated tumbler type lock at right side of unit allows rendering the system entirely inoperable.

The plunger design allows locking without use of key but requires key to open.

2. With the general unrestricted accessibility to the locking rail location on most stages in Educational Theatres, this feature prevents those unauthorized whether by curiosity or otherwise from operating the equipment.

GREASING AND ADJUSTMENT OF SHEAVE BEARINGS

1. It is unlikely any lubrication attention will be required for at least a twenty (20) year period from date of original installation. The grease used at time of manufacture and assembly is the type formulated to be applied in sealed for life bearings with a dropping point of approximately 300 degrees Fahrenheit while maintaining migration and channeling characteristics required for anti-friction bearings with minimal or zero running clearance.
2. After this time period, several blocks chosen at random should be disassembled and the sheave bearings examined for determining if a relubrication program is warranted. Mechanics ordinary hand wrenches are all that is required here.
3. If a relubricating program appears warranted, it will be necessary to remove all loads from lines and disassemble the blocks for gaining accessibility to the sheave bearings since no zerk or other pressure fittings in rifle drilled shafts are provided.
4. In the relubrication program, the bearings should be thoroughly washed in an agitating solvent and allowed to dry by evaporation before adding new grease. Do not use compressed air in the drying operation.
5. When adding grease, apply not more than one-third of the possible maximum, which could be packed into the bearing cavities and voids. Use hand pressure gun with small nozzle for directing small amounts of grease between rollers in single sheave bearings. For head and multigroove sheave bearings, simply apply grease with fingers - but sparingly as mentioned.
6. The grease used should have similar formulation to that described in 1 above.
7. The bearings provided in all single sheaves are double row Timken solid cone design, which retain their precision running clearance without depending on the unpredictable flexure (oil canning) of the side plates forming the block housing or on the "cut and try" nut adjustment of center shaft lash-up.

When reassembling the single blocks, there should be sufficient tension placed on the center shaft to slightly exceed the elastic limit of the shaft for avoiding cyclic stressing. This rigid lash-up also provides a diaphragm effect at the center point of load concentration related to the overall block assembly thereby much better resisting operational deformation under heavy or oblique loading conditions.

When reassembling the head blocks and top arbor blocks, it is however necessary to depend on the tension of the center shaft lash-up since the Timken bearings in these applications have no solid cones or Timken precision spacer.

Fortunately, the side plates here are more rigid and the cable force is more directly applied as related to the drifting and breasting of various battens as described in another section.

In this reassembly procedure, the nut on the center shaft is to be successively tightened and loosened through several sequences while the sheave is being turned and "wobbled" until a compromise adjustment is reached, which is "thought" about right.

This type bearing application cannot, however, provide or compensate for holding the cones stationary and prevent their rotation on the shaft as compared with solid cone bearings or those with precision spacers where the pressure of the side plates in compression hold the cone or cones against rotation and longitudinal action. The results of these actions are Brinelling and abrasive wear.

CARE OF CURTAINS

Mainly good judgement and good housekeeping practices should be applied here which are beyond the scope of this listing.

A few specific do's and don'ts, however, are tabulated below as are especially pertinent to stage drapery.

1. Fold drapery carefully before placing in carts or bags as compared to "stuffing" in these containers.
2. Fold with top area readily accessible in anticipation of again attaching to rigging without rearranging and extra handling.
3. Do not pack drapery with unplated ferrous hooks, snaps, or chains as this type hardware in contact with flameproofed drapery materials soon causes irremovable stains on fabric with which it comes in contact because of accelerated oxidation of these parts.
4. Do not allow drapery to be handled on dusty or soiled floor. First, sweep and dust mop floor or cover with clean Vis Queen type plastic.
5. Do not pin spangles, bunting, or other decorations to drapery.
6. Do not nail, tack, or staple edges of drapery to flats and the like for overcoming holidays with masking problems.
7. Do not "throw" drapery across adjacent battens or railings for achieving "tripping effect" - rather, remove and store such drapery.
8. Store drapery in area having dry atmosphere as most flameproofing chemicals are hygroscopic and moisture will precipitate a white salt compound on the surface.
9. When hanging drapery to fixed overhead battens or tracks, don't expect one corner to withstand lifting strain as the section is being "dragged" up (or down if removing) as A-trestle. Use netting sling and rope falls.
10. Clearly mark all stored drapery items including dimensions for easy identification.

STORING OF CURTAINS IN BAGS

1. Lay curtain on floor with face side up and stretch top webbing taut. If curtain is sewn in fullness, arrange plaiting at bottom edge to approximately correspond with spacing of plaits at top edge so seams run in 90 degree relationship to top and bottom edge.
2. Two persons should perform this operation and the folding should proceed with one person located near top corner and one near bottom corner.
3. These people should typically kneel at top and bottom edge of curtain facing each other and approximately at mid-point of first width. Kneeling position is not on the curtain but closely adjacent.
4. For orientation purposes, visualize the curtain laying up and down stage on the floor with the top of the curtain downstage and the two persons kneeling at the first width left stage side.
5. The downstage person (whose back is toward auditorium) places right hand on corner of curtain and upstage person (facing auditorium) places left hand on corner of curtain. Each hold corner tight to floor against shifting.
6. Downstage person with left hand grasps the top edge of the curtain at the first seam and upstage person with right hand grasps bottom edge at the first seam.
7. Each - in unison - with an overhand motion lift the seam grasped area some few inches above the floor and lay the seam area at the off-stage side edge of the curtain, each still holding their corner against the floor. At this juncture, both hands of each person are at the same point at their respective corners.
8. In this overhand operation, each pulls the curtain taut against the other for allowing a relatively straight edge of form for coinciding with the side edge of the curtain.
9. During this overhand motion the entire curtain - especially at the top (downstage) is pulled across the floor toward left stage but the left stage edge remains stationary.
10. The bottom of the curtain (upstage), without fullness being sewn in, will now need be slightly rearranged for again allowing fullness to be coincident with the top plaiting and for the seams to again be in the 90 degree relationship as described in 1 above.
11. The downstage person now places right hand at the on-stage fold-over point of the width just folded and the upstage person places left hand at corresponding point.

Both persons remain at approximately their respective positions except downstage person moves to left and upstage person moves to right each approximately two (2) feet.

12. Operation 6 above is now repeated with each grasping their respective top and bottom curtain edges at the second seams.
13. Follow through repeating 7, 8, 9, and 10 until entire curtain is folded.
14. In the folding over operation, practice will reveal the value of team work between the two people plus the advantages to be gained by utilizing the billowing of the curtain for achieving straight edges of the folded-over portions.
15. The folded or stacked curtains - now approximately one-half width wide and full height - can conveniently be folded or rolled for allowing bag to be worked around for enclosing the curtain without actually lifting the curtain.
16. With large heavy curtains, considerable strength is required for the simultaneous vertical and horizontal "pulling" during the fold-over portion of the operation. This can be relieved by "bunching" the unfolded portion more near the folding position but always keeping the "upcoming" seam parallel with the already folded portion of the curtain.
17. The handling and folding of borders is done in same manner described above.
18. Comment is made that the person handling the bottom edge of a plaited curtain or border requires considerably more dexterity than the person at top edge. This results from the fullness being not sewn into position here and the excess material needs be laid into the folded stacking with extra attention.

CLEANING AND FLAMEPROOFING CURTAINS

1. The dry cleaning of stage curtains should be avoided for the longest possible period of time.

Except for specific stains caused by accident such as food or drink spill, it is advisable to never clean stage drapery for simply "freshening up" because of dust and other precipitated soil as one does with home drapery.

If specific stains do occur as listed above, remove the width or widths so effected, have them dry cleaned and then relocated to the off-stage edge of edges of the drapery sections. These sections may or may not require reflareproofing depending on the chemical compound used originally.

2. To avoid the necessity for an overall dry cleaning of various stage curtains and drapery sets, the best procedure is obviously careful handling coupled with periodic brushing and/or vacuuming which is best done with drapery hanging.
3. If brushing, use vertical brush strokes with a soft bristle duster type brush - not a broom unless a very soft bristle push broom with cut-off handle.
4. Always brush with down strokes beginning at top. For velour sewn with nap in upward direction, do not use brush but wand type vacuum using upward strokes.
5. If it should be decided to resort to a dry cleaning procedure for an entire curtain or drapery set, it will likely be necessary to reduce the larger units into smaller parts by taking apart at various seams.
6. All chain weighting and top hooks are to be removed. The maximum size of the reduced curtain portions will need be coordinated with the capacity of the mechanical facilities available at the dry cleaning establishment.
7. The requirement for reflareproofing will also need be determined - perhaps by a pilot run of a small portion of the drapery being dry cleaned then given a flame test.
8. The test for determining the necessity regarding reflareproofing is the simple match or alcohol torch test as used by the fire authorities. This involves removing a small cutting about 2" x 4" from a hem or off-stage edge and while holding vertically apply flame at the bottom edge.

If this cutting burns and supports combustion the material will require reflareproofing. If the curtain after being kept in contact with the flame for approximately ten seconds does not itself flame or support combustion when the match or torch is removed, then the drapery will not require reflareproofing.

9. An advisable procedure, however, is to request one of the fire authorities in the area to conduct the above test for official assurance especially if a borderline result develops from the testing procedure.
10. Reflameproofing is possible by one of two methods:
 - a. The flameproofing chemical can be added to the dry cleaning solvent if the equipment at the dry cleaning establishment and the experienced knowledge of the staff is such as to provide the feature.
 - b. The flameproofing chemical can be sprayed on the fabric after rehangng following the dry cleaning and re-sewing of the curtain components.
 - c. Drapery not being considered for not undergoing dry cleaning but requiring reflameproofing can be so treated by the spray process if directions on the manufacturers label are followed closely.
11. The cost factor relating to the handling, taking apart at seams, dry cleaning, re-sewing, and possible reflameproofing does however almost assuredly result in this procedure being one which cannot be economically justified.

This is further compounded by the fact that in the dry cleaning operation various finishing and stabilizing ingredients used in weaving the original fabric are removed and the curtains take on a "rag like" appearance.

REHANGING CURTAINS

1. Assume batten of counterweight system is approximately 4'6" above floor and system is in balance with carriage against top stop.
2. Borders tie to pipe battens usually with typical bow knot and proceed as follows.
3. Fold width-wise to find exact center of border (unless colored tie line is at this point) and tie this line to exact center point (stage center line) of batten. Face side of border to be downstage.
4. If border has been sewn in fullness - or is flat and is to hang flat - proceed from this point both right and left of center point - tying as you go while stretching the webbing taut.
5. If border is sewn flat and is to hang in fullness, find center point and tie on as above. Next tie right and left stage ends of border to respective ends of batten.
6. Continue tying mid-points of remaining untied portions of border to corresponding mid-points of bare batten until entire border is tied to position.
7. Shake out deformed flutes, kinked hems, and other irregularities and hand shape for proper appearance.
8. If border is flat as in 4 above - and is to have small batten in bottom hem - this should obviously be inserted with final attention being given to adjusting any irregularities to allow sharp edge and no bulged areas in surface.
9. The procedure for tie-on curtains or legs is the same as above excepting additional fabric (height) is involved which must be more carefully distributed on floor in manner to prevent it coming underfoot as the operation proceeds. After flying to play position, the bottom parallel trim with floor should be checked and adjusted at the ties if required.
10. For traveler curtains which typically utilize either snaps or S-hooks, and with carriers at ends of track, the procedure is simply attach these to the chain trimmers in master and single carriers (beginning with master carrier) plus deading off the off-stage edges to an eye typically provided in the end sheave assembly of the track. It is advisable to count grommets in curtain and carriers in track - and if they do not correspond then add or remove carriers as required.
11. Ordinarily the connecting point to the chain trimmers will be in the same link counting downward from the carrier eye supporting the trimmer.

12. The trimming results of 11 above should be checked by flying the curtain to play position and measuring or "eye balling" the horizontal trim with the floor. See 16 below for flying.
13. Generally some adjusting is required at the trimmers to bring the bottom edge into straight relationship with the floor. This is best done from an A-trestle on a dolly or rolling man lift. One person at top at track elevation for making adjustments, one on floor determining where and giving directions to top person as to how much to raise or lower individual trimmer connections, and another moving the ladder or lift across the stage.
14. Several across stage trips are generally required to accomplish a perfect trim-out.
15. For this trimming operation the curtain should be closed and good practice is to have the person directing the work seated in the first row of seats with house dark and with the stage well lighted behind the curtain.
16. For taking out (flying) the drapery now attached to batten, load carriage at bridge or use bull one-line procedure as described under another section.

TRACK SYSTEM MAINTENANCE

1. Traveler tracks as the 1/2" diameter cable center operating line stretches during the first year or two of service, it will be necessary to remove this excess at one of the master carriers.
2. In making this adjustment, keep curtain trimmed with floor and with floor block attached to floor and sheave in block raised to maximum height in adjustment slot.
3. Before pulling excess cable through master anchor point, loosen clamps on opposite master for allowing feed-through.
4. After stretch is removed, tighten clamps both master carriers, cut off excess line as pulled through, and know and tape cut end. It is good practice to coil approximately 8" of line at one of the master clamps for future convenience.
5. Quick release floor blocks should always be disconnected from their floor plates before flying - otherwise some damage to the track or floor block may result.

RELOCATING TRACKS TO OTHER BATTENS

1. Depending on the distance a track is to be shifted upstage or downstage, consideration should be first be given to the drapery, lighting, and other items which are hanging between the track to be relocated and the batten to which it is to be attached. We will call these sets A with track as existing and B the set to which track is to be transferred.
2. Also to be considered is the height of the loft (elevation of single blocks) related to the items on the counterweight systems between A and B so as to appraise the angle which will be assumed by the running lines during the breasting operation.
3. The above conditions relate to the possibility of the running lines on sets A and B fouling the items between as sets A and B are drifted and breasted together. The angling cables on A and B can damage or dislodge lighting fixtures and deface or soil drapery, scrims, picture screen, etc.
4. After determination has been made that no overhead fouling is to result, and both sets are in a balanced condition, the batten with track on set A and batten on set B are brought in to their low limit of approximately 4'6" above the stage floor. It is assumed further there is a loading bridge properly positioned with the carriages full up against bumper stops. The rope locks on both sets should be left in open position.
5. The carriage for set A is now to be deaded-off either at the head beams or with or more stopper hitches on the hauling line at locking rail. The weight of the track should be estimated and if in the vicinity of 400 pounds, the top method of deadening-off to the head beam is preferred as being more safe than the stopper hitch approach. This, however, depends somewhat on the capability of the crew, especially the floor person at the locking rail and his knot tying ability rather than this strength.
6. The two battens A and B are now to be breasted typically using snatch chain on approximately eight (8) to ten (10) foot spacing throughout batten length. The breasting should hold the two (2) battens at a horizontal spacing of approximately six (6) inches but dependent upon the length of the snatch chains to be used.
7. The backbone of the track on batten A is now snatched to the batten on set B with attention directed to keeping chains taut and of approximately equal working length. Chains used here are additional to those not yet disturbed on batten A. Chain spacing should be on approximately ten (10) foot spacing throughout track length.

8. Snatch chains on batten A (holding track backbone to counterweight batten) should now be removed. For this operation, depending on weight of track, (and which may still have curtain attached) one of three procedures is possible.

See precaution listed in item 9 following.

- a. If light weight then only the manpower of the floor crew may be necessary for actual shift - depending also on the size of the crew.
 - b. If heavy weight, use Havens grip and ratchet puller, small falls, or grip hoist to relieve chain tension on batten A for allowing releasing chain snaps.
 - c. Begin loading carriage on batten B until strain on snatch chains of batten A is relieved.
9. In removing the breasting snap chains for allowing battens A and B to pendulum to their normal position, use care that this action is controlled for avoiding personal injury and/or damage to various items and scenery on the stage within the path of pendulum travel and overtravel. See 12 as listed below.
 10. Proceed to balance out carriage of set B by adding weights.
 11. Proceed to balance out carriage of set A by unloading weights and then removing dead-off connection or connections as applied in 5 above.
 12. If the breasting distance exceeds some eight (8) to ten (10) feet (but depending upon the size of crew) keeper lines can be used as auxiliary to the snap chains. These, by having slip knots, can be used to control the pendulum swing and need not be at closer spacing than some twenty (20) feet across batten length.
 13. The horizontal trim of track on B should be checked and the snatch chains adjusted as may be required.
 14. If the curtain had remained attached to the track during the shift, this horizontal trim should also be checked with curtain in play position.
 15. Variations to the above procedure are possible such as using bull lines to hold carriage A at top of travel and to pull down carriage B after the transfer. Another procedure involves preloading the carriage which is to receive the load and take necessary precautions for controlling the imbalance with stopper hitches or dead-offs.

16. The above variations may be a desirable procedure in instances where no loading bridge facilities exist.
17. If the imbalance developed during the transfer does not exceed 1,000 pounds and if heavy duty rigging equipment, including steel rope locks, are incorporated in the installation with well designed clamping and anchoring attachments throughout, carriage A need not be deadened-off but simply held by the rope lock action on the hauling line. Carriage A can be unloaded at either the loading bridge or snubbed to a lower elevation if no bridge exists and be unloaded at this point for balancing the empty batten.

OPERATION OF FIRE CURTAIN AND AUTOMATIC RELEASE SYSTEM

1. This fire curtain is operated manually through a hand winch equipped with a hydraulic operation to slow its final descent. The winch is held static by a band brake through which the fire line is reeved.
2. To operate the winch manually insert the winch handle into the pin socket on the input shaft. Apply pressure to the crank handle then slowly relieve the band brake by lifting up on the brake arm. Take care as the full load of the curtain will be on the winch gear train. Slowly back the curtain down to the closed position allowing the band brake to be re-engaged of the operator ties. To raise the curtain follow the same procedure.
3. For emergency operation as manually initiated, it is necessary to break the glass and pull tie ring down in one of the two fire boxes located on each side of the stage near the smoke pockets.
4. For emergency operation as automatically initiated by a fire, no manual attention is required. In one of the fire boxes is a solenoid which is connected to four (4) rate of rise heat detectors located at various points on the proscenium wall. The solenoid is also connected to a flow switch located in the sprinkler system. If the solenoid receives a signal from the rate of rise detectors on the flow switch in the sprinkler system it will open causing the release of the fire line and the curtain will fall.
5. The solenoid is powered by 24 Volt D.C. current which is provided by a transformer located in a box at stage left. The transformer is run on 110 A.C. current. Two (2) storage batteries have been provided to act as a back up in the event of a power outage. This will prevent the curtain from falling if the power is cut off and additionally it will allow the fire sensing devices to remain active.
6. The fire line has been also provided with fusible links which will separate at 180 degrees F. This will also cause the curtain to fall.

7. To reconnect the fire line equipment after a manually initiated emergency descent, meaning the fire line has not parted. Open the fire box with key provided, push & pull down ring up, then slip the loop at the end of the fire line around the tripping mechanism making sure that the line sets in the detent that is located slightly over center on the mechanism. There is a weight in the fire line to remove stretch and give tension, by pulling on the line additional length may be obtained.
8. To reconnect the fire line equipment after an automatically initiated emergency descent, meaning the solenoid has opened from a signal. Replace blown fuse in fire box. (A spare is provided). This will reactivate the solenoid, then follow procedures described in item No. 7.
9. To reconnect fire line after an automatic descent, meaning the fire line has parted by separating of fusible link:
 - a. Replace the fusible link
 - b. Connect the link into the fire line so the line will again be continuous full length between the fire boxes and of the same overall length end to end.
 - c. Reconnect the fire line to the release box as described in No. 7.