MATERIALS

- Two P1000 Unistrut® channels
- Two P2950 Unistrut® trolley assemblies
- Four $3\frac{1}{2}$" phenolic resin sheaves for $\frac{1}{8}$" aircraft cable
- Four shop-fabricated brackets for the sheaves
- Four lighting instrument C-clamps
- $\frac{1}{8}$" aircraft cable and hardware

ASSEMBLY

1. Cut tracks to length.
2. Bolt C-clamp hangers to track.
3. Place trolleys in track.
4. Mount sheaves at ends of tracks.
5. Clamp tracks to system pipes and fly to working height.
6. Run top pickups from panel to the center holes on the trolleys.
7. Run the bottom pickups from the panel over the upstage sheaves and connect them to the upstage holes on the trolleys.
8. Run control lines from the downstage holes on the trolleys, under the downstage sheaves, and to the control batten.

NOTES

1. The weight of the panel shifts toward the downstage system pipe during the move. Tie off the system pipes securely and provide appropriate safeguards to keep their handlines from slipping through the rope locks.
2. The minimal batten swing this rig generates can be further reduced by tying the system pipes off downstage and upstage.

Standard traveler track manufactured for the theatre industry, such as ADC Models 170 and 280, perform their intended functions of providing for the movement of soft goods across the stage quite well. However, when heavy scenic elements must effect similar motions, these tracks may not perform satisfactorily. Common problems include excessive noise, loads exceeding the track's design, and sagging draw cables. Further, the hardware typically available for these tracks is designed for $\frac{1}{2}$" or $\frac{5}{8}$" rope operation, making the connection of $\frac{1}{8}$" or $\frac{3}{16}$" aircraft cable for winch-driven operation difficult and cumbersome. In an effort to discover an improved traveler track design, I surveyed a number of manufacturers and developed the design detailed here.

First, it is useful to identify the primary concern which led to this investigation — noise. Typical traveler track consists of a sheet metal tube, bent to allow the wheels of a carrier inside and connection of other hardware outside. This design results in a megaphone in which the primary noise, caused by the small carrier wheels, is amplified in a resonant chamber. Increasing the mass of the track, using larger wheels, and moving the wheels from the inside to the outside of the track are three ways to reduce the noise. Any of these steps alone produces good results, but since the latter two necessitate abandoning the standard track anyway, we opted to incorporate all three in designing a track to carry two heavy wall units in the Yale Repertory Theatre's 1996 production of *First Lady*.

Atlas Silk's Models 801 and 1001, the acknowledged inspiration for our design, is sold as heavy-duty (but non-rated) curtain track and proved too expensive. Our adaptation incorporates two pieces of Unistrut® P1000 that, held parallel by custom hangers as shown in Figure 1, serve as rails for our custom carrier wheels. Unistrut® is constructed of a heavier gauge steel than ADC 280, and by running the carrier wheels on top of the Unistrut®, we achieved all our design objectives. To distinguish our track Unistrut® from other pieces and to protect it over time, we purchased the P1000 with Unistrut®'s Perma-Green II, baked-on finish.

To suspend the track we constructed a set of brackets like those detailed in Figure 2 whose design incorporates not only track support, but also dresses the draw cable neatly above the scenery. Spacing of the brackets for any track is a factor of the size and weight of the load. For our first use of the track — moving a pair of 500#, 12'w x 20'h steel-framed hard-covered flats — bracket spacing of 5' worked well.

The carriers we built consist of $\frac{3}{16}$" plate bent as shown in Figure 3, fitted with two all-thread bolts from which to hang the scenery, and featuring a pair of in-line skate wheels to roll along the top of the Unistrut®. The all-thread bolts

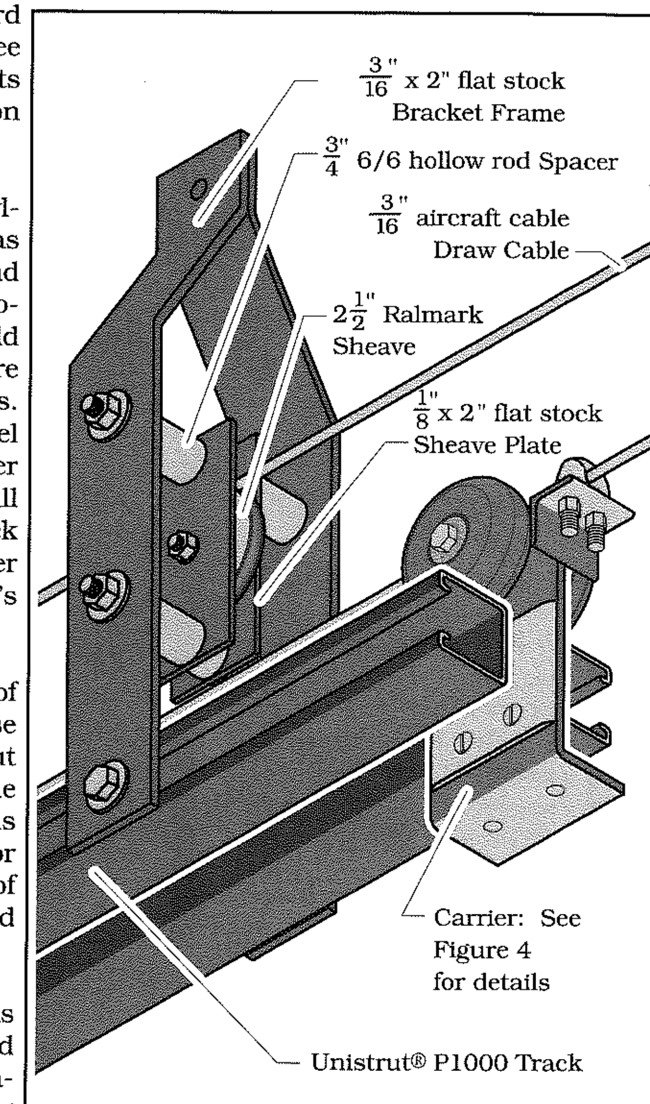

FIGURE 1: BRACKET, TRACK, & CARRIER

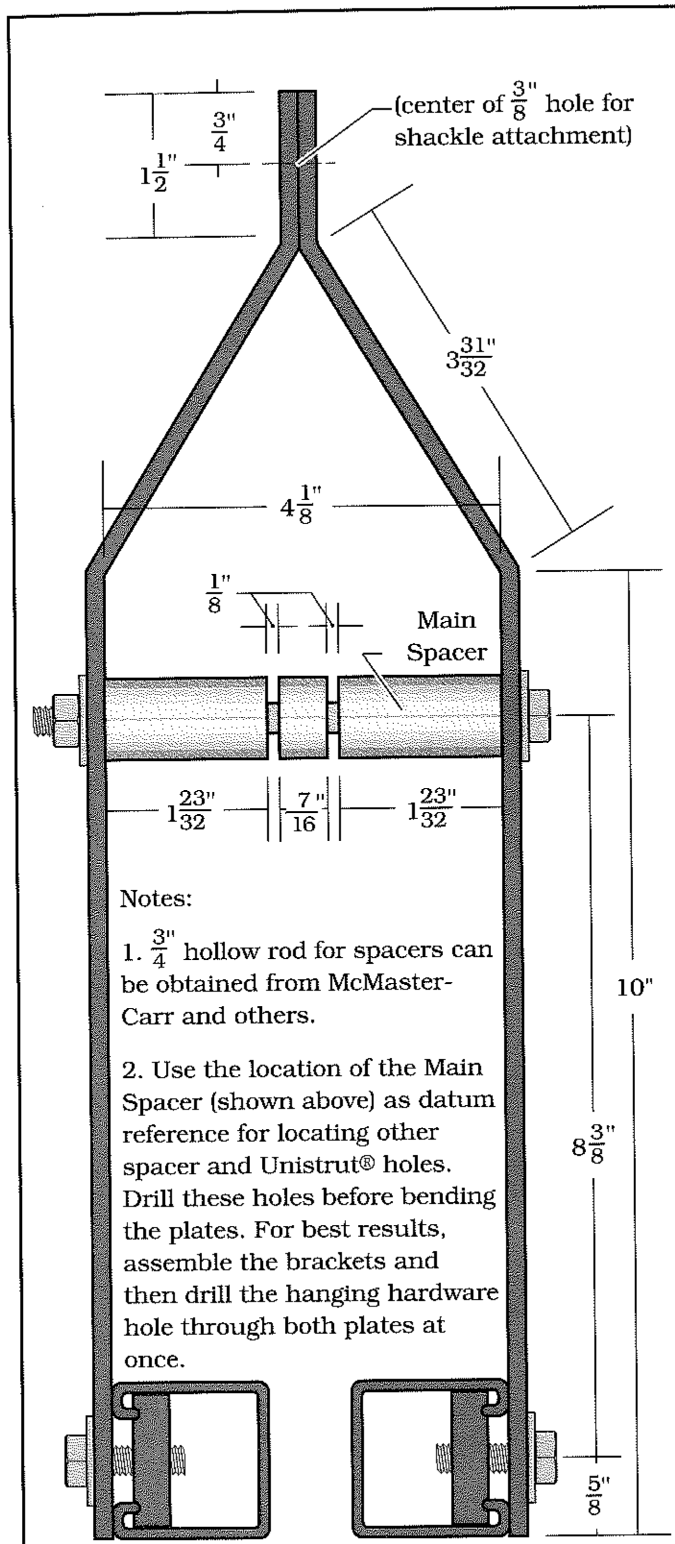

Figure 2: Notes & Common Dimensions

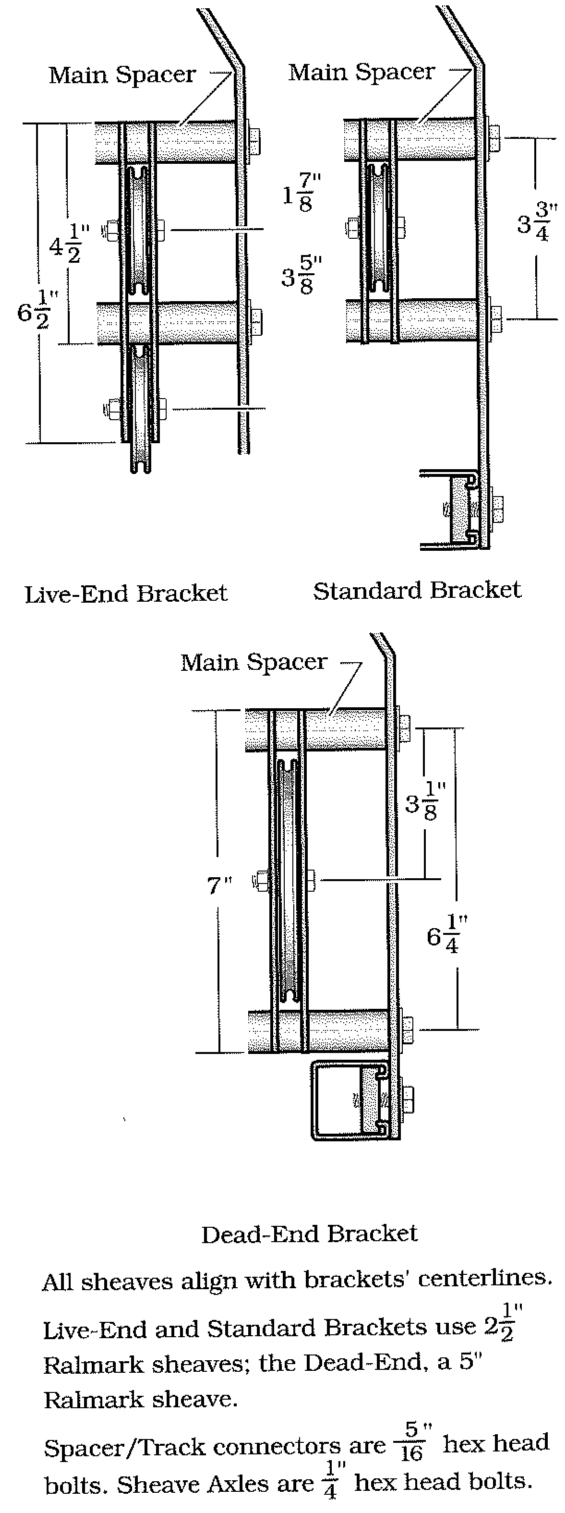

Figure 3: Bracket Details

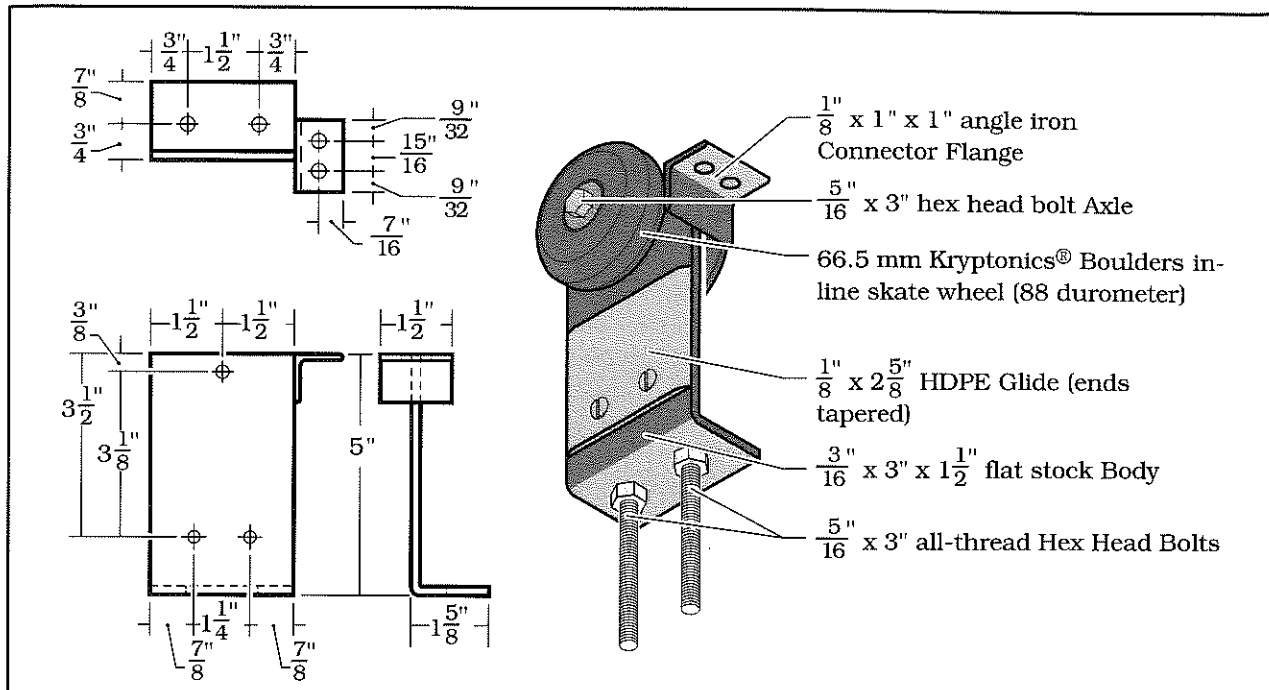

Figure 4: Carrier Details

allowed us a couple of inches of trim adjustment. We used 66.5mm Kryptonics® wheels (88 durometer) with low-grade bearings. The sides of the carrier plates are covered with HDPE to minimize both noise and the chance of the carrier snagging at a joint between sections of Unistrut®. The small angle flange added to the lead carriers on each piece of scenery allowed for attachment to the draw cable with a wire rope clip.

In its inaugural production, the track performed well. Scenery tracked smoothly and nearly silently, thus satisfying our goals for the project. Future implementations will no doubt benefit from continued consideration of the design.

I decided to build a device based on the JOMY design. Like a straight ladder, the ladder itself is comprised of two parts: vertical side pieces and horizontal rungs. The main difference between the retractable ladder and a standard one is that the rungs are attached to the vertical members with pinned rather than rigid connections. With one vertical member fixed to a wall, the pins allow the rungs and the free vertical member to hinge upward. In the retracted position, the rungs nest between the vertical members. Figure 1 illustrates the ladder in three positions: closed, partially open, and fully open.

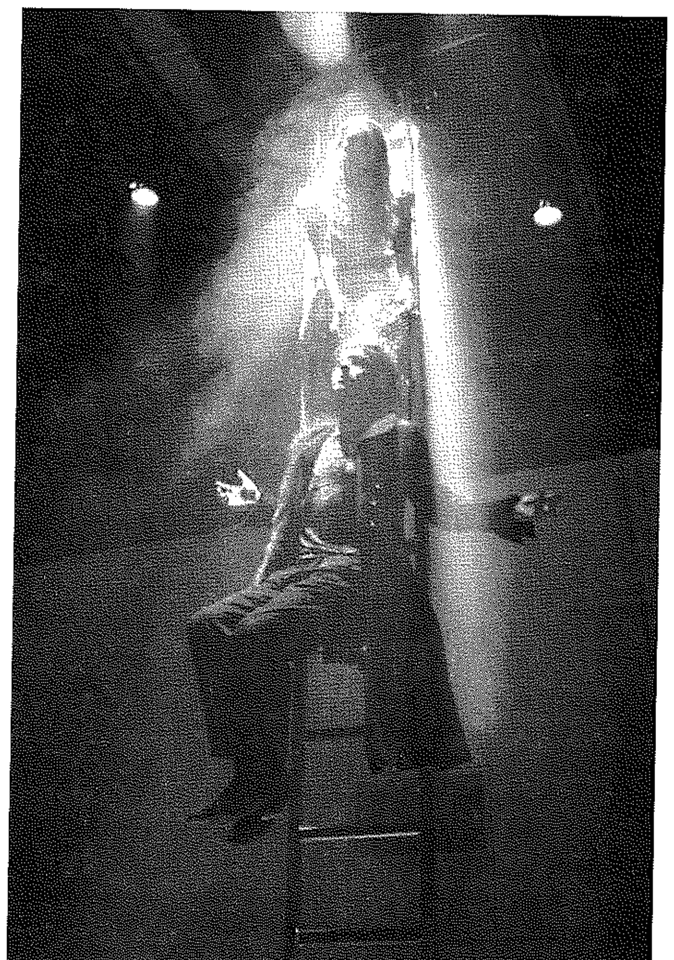

Figure 3

I designed the ladder in consideration of the materials, equipment, and skills available to me in the scene shop. This meant adopting square steel tube and load-rated hinges, versus the aluminum members and pin mechanisms utilized in the JOMY ladder design.

Fabrication proceeded as follows and took approximately 8 to 10 hours:

- Rungs and vertical members cut to size, de-burred, and cleaned.
- Hinges welded to each end of the rungs; one hinge on the top and one on the bottom being careful to avoid any heat distortion.
- Rungs jigged-up 13″ apart with the 1½″ wide rungs spaced on the 2″ verticals with a piece of ¼″ plywood.
- Hinge flaps clamped to verticals to ensure proper alignment and carefully welded.

The final step in the process was to weld the ladder to an I-beam that ran from the stage floor up to the grid. This served as structural support for the ladder as well as an aesthetic element. I then installed an 8-pound counter weight rigged above the pivoting section to allow a single person could raise and lower the pivoting section with little difficulty. Figures 2 and 3 show the installed ladder.

The ladder functioned just as anticipated. It was so inconspicuous and lowered so quietly that many audience members did not even notice that it had been deployed until the actor began her decent. All in all, a successful adaptation for use on stage of a good design. ▼

SKATE WHEEL SCENERY CARRIER

by Matthew McKinney
San Diego State University

exhibit no. 21

The scenic design for a recent production at San Diego State University required that multiple sets of heavy moving panels travel across the stage. The use of our stock traveler track to move the scenery was not a viable solution for a number of reasons: not enough track in stock, excessive noise when in use, and no money in the budget to buy the additional track needed. Designing our own scenery tracking system seemed to be a practical option. As we began to break down the basic elements of a tracking system: wheels, carriers, and the length of track they could ride upon, the technical director suggested that the skate wheels could work as scenery carriers. After some research, we discovered they are cheap, come in a variety of hardnesses for quiet movement, and are perfectly capable of accepting forceful dynamic loads, such as withstanding aggressive skating moves. We examined various types of track including one type where the wheels rode on two square tracks parallel to each other. We decided that this was too complicated and moved on to other possibilities. We wanted a track that would be simple to make from common material. We soon realized that the skate wheels could ride on two sides of the same 2″ square tube, if this tube was used at a 45 degree angle. Now it was just a matter of designing a carrier to ride along this tilted tube. A Y-shaped carrier using grade 8 bolts and steel standoffs for the wheels was the final solution (fig. 1). I devised modular end caps that could be inserted into the ends of the track and splice joints that required no fasteners (fig. 2). The tracking system could now carry multiple heavy-weight scenery panels on the same track effortlessly and with no noise. It was inexpensive and easy to build and install.

During this process I did discover some problems and some possible improvements to the system. The track we developed is much heavier than conventional traveler track, however the heavier gauge material is more rugged and dependable when moving heavier scenery. A switch to a lighter gauge steel or aluminum for the track is possible, if weight is an issue. The total width of the carrier and track is about 6¾″, over one and a half times wider than standard track. This can create space problems. These drawbacks are negligible when price and quality are taken into account. The price for 60 feet of this track with all components is $375 as compared to a commercial track at $550, a savings of 60%. The ease of use, quietness, and economic qualities of this track make it superior to traveler track.

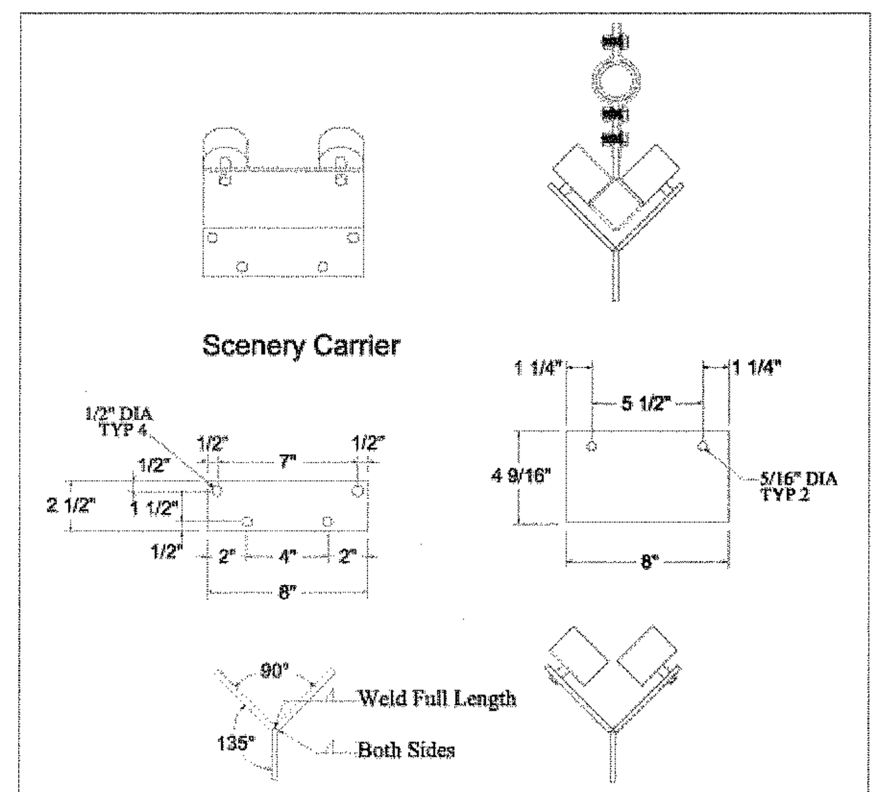

Figure 1

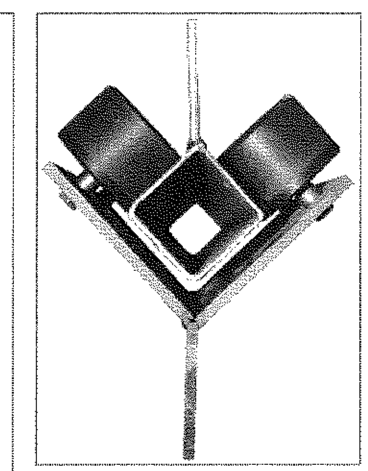

Figure 2

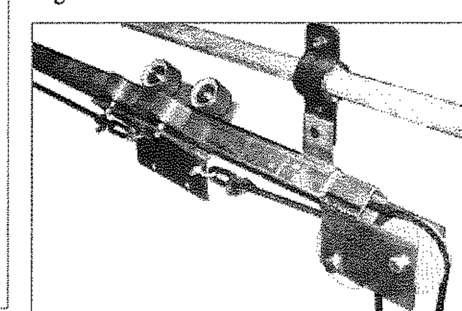

Figure 3