Fox Hall - *Part 3*, Hall Floor Lift

By Jim Melchor and Tom Newbern

News Flash - Wood is subject to warping, rotting, and insect damage. This statement will come as no surprise to most people, and many might not even care. However, it can be of major concern to owners of buildings containing wood, especially structural members of wood. Restorers of early buildings are, more often than not, faced with dealing with the problems resulting from these wood issues.

Fox Hall, dating to the early eighteenth century, is no exception and has not been immune. It is a brick house with internal wood framing. The tails of the first-floor joists are resting in masonry joist-bearing pockets. The brick in this early house is fairly porous and subject to wicking of moisture. The joist tails, over nearly 300 years, have experienced quite a bit of dampness as a result. This dampness has, indeed, caused rot and warping, and it has invited termites and powder-post beetles. The damage thus induced has caused the first-floor framing to move and settle in places. Fortunately, major damage has not occurred requiring replacement of original structural elements. At Fox Hall, the damage has basically been confined to the joist tails, not an uncommon problem, but one that must still be addressed to prevent major settlement and failure of the wood framing.

Beginning in the twentieth century, Fox Hall has been treated periodically to eliminate insect infestation; therefore, bugs are no longer a problem. However, wood damage already caused had (and has) to be addressed.

In the middle of nineteenth century, an attempt was made to stabilize a section of flooring beneath the hall, adjacent to the central-passage wall (Fig. 1, Nineteenth-century support T-beam). This likely addressed an immediate concern of a "springy" floor, but it did not solve the problem.

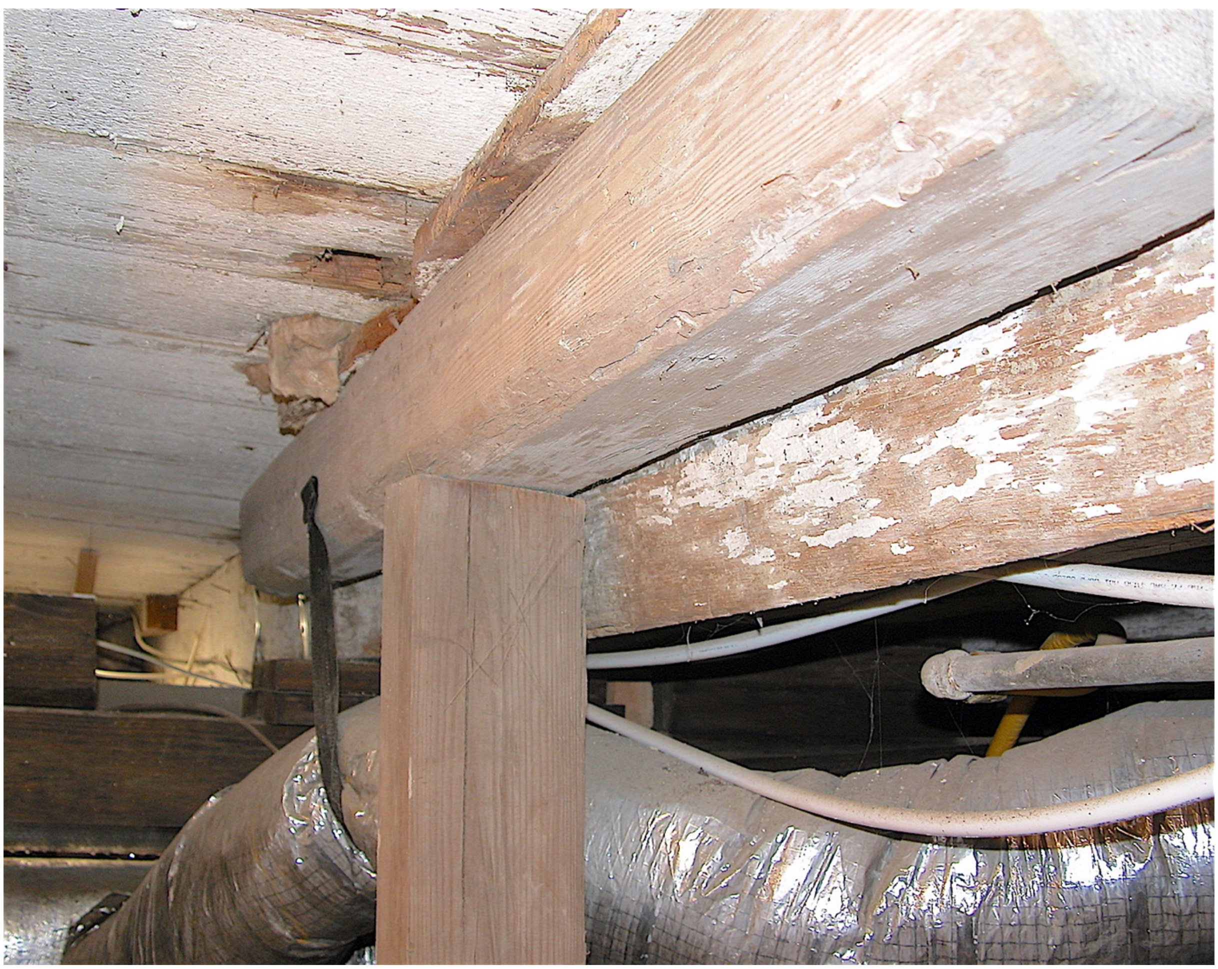

Figure 1

By early in the twentieth century, the condition of the framing under the house, due to damaged joist tails, had become serious enough that corrective action had to be taken. Creosoted support beams and posts were installed along both the front and back basement walls and down most of the centerline of the house (Figs. 2 & 3, Support beams and posts along front wall) (Fig. 4, Support beams and posts along the back wall) (Fig. 5, Centerline support beam and post). The support system along the walls was intended to transfer the framing load from the masonry joist-bearing pockets, to the system, farther in on the joists, bypassing the damaged joist tails.

Figure 2

Figure 3

Figure 4

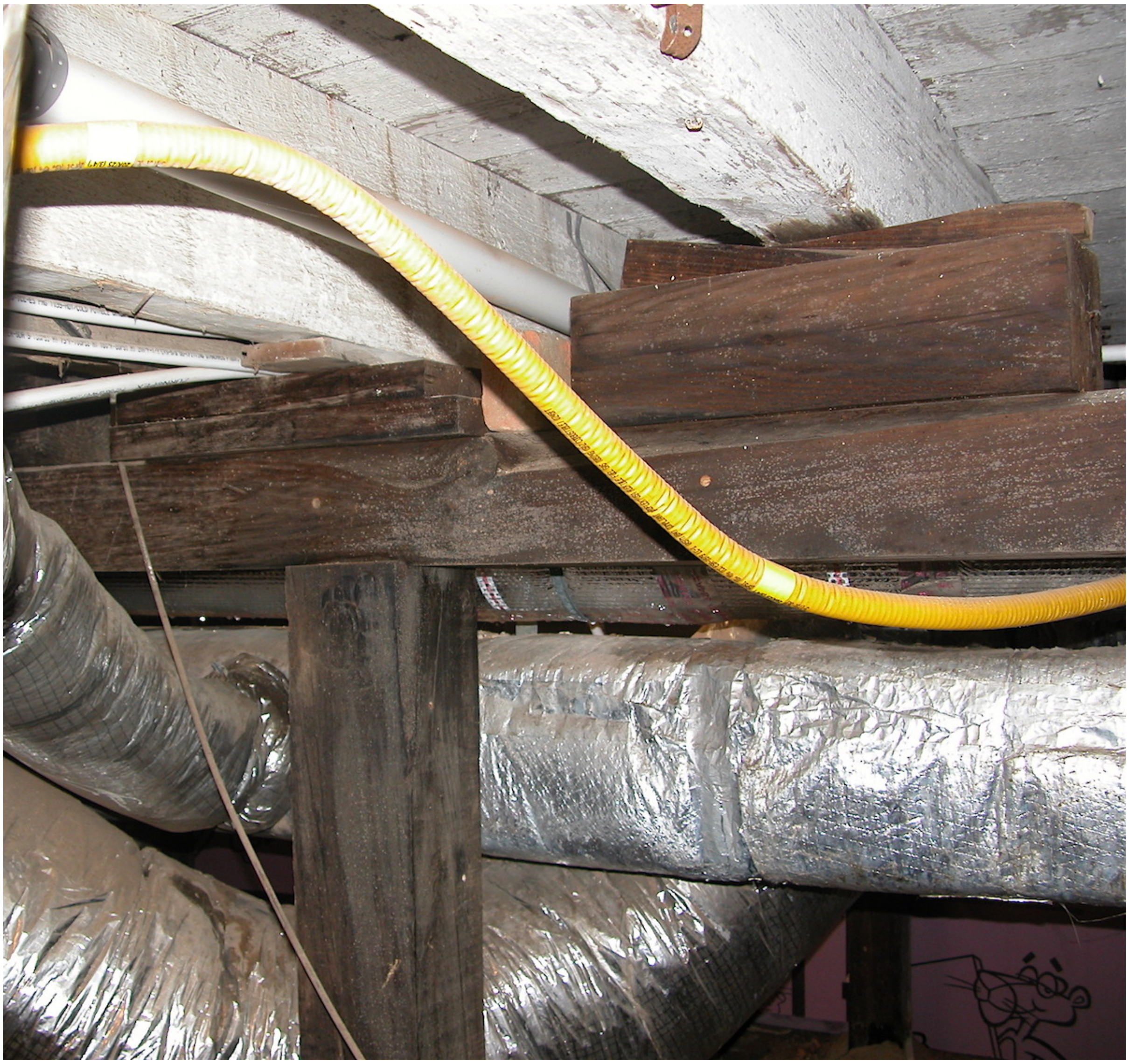

Figure 5

In Fig. 5, note the block and wedges on the centerline support for tightening the support against the floor joist. Here is the only place in the early twentieth-century support system that a means was incorporated to adjust/correct for continuing movement of the framing.

Overall, these early twentieth-century structural repairs to the framing have worked fairly well for a hundred years or so, especially the centerline and back-wall sections. However, there were design deficiencies in this support structure that have necessitated corrective action in the restoration project.

The main deficiency was that there were no provisions in the wall sections for tightening them against the joists to adjust for future movement/settlement. Another major issue with the wall system on the front of the house was where the two beam sections overlapped. Instead of placing a post at this intersection to support the beams, the beams were cantilevered, one over the other. As the supported house framing at this intersection settled further, the support beams warped downward (Fig. 6, Warped support beams).

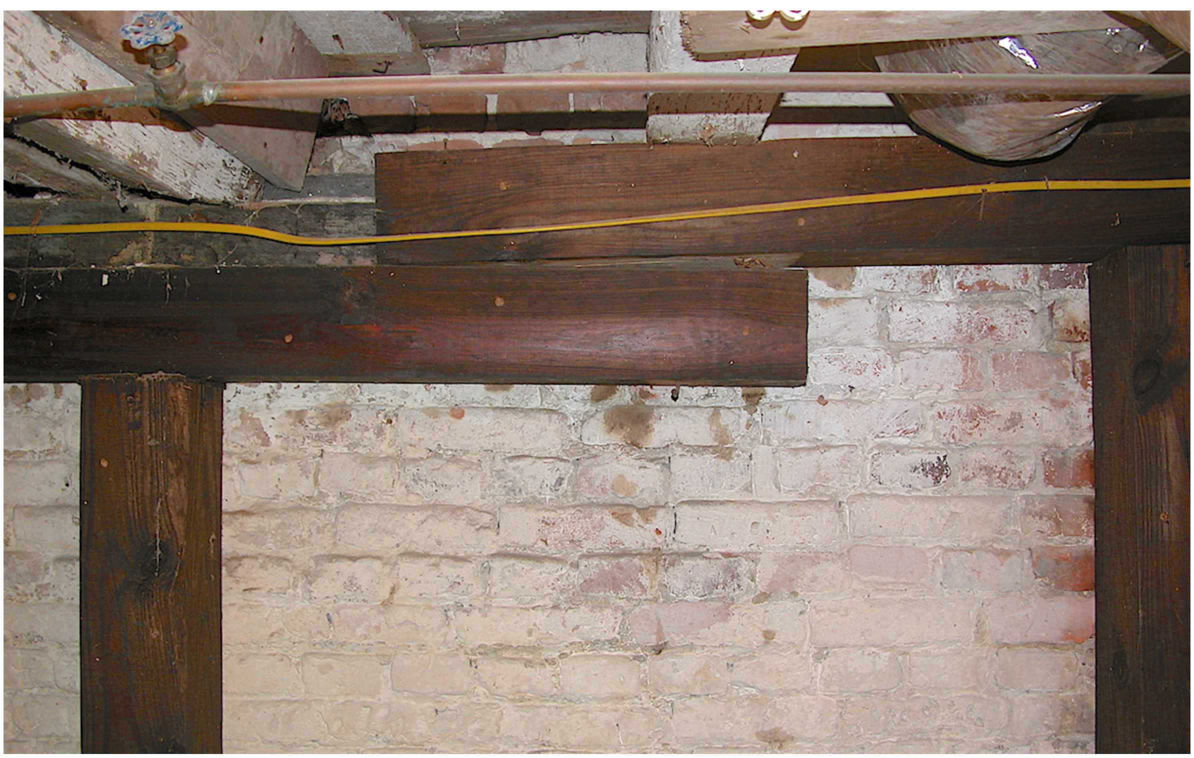

Figure 6

Both the mid-nineteenth-century and early twentieth-century remedies failed to recognize and address a serious problem in the change-order framing joist (See Part 1 of this series, change-order discussion). Figure 7 shows the double joist added in the change order. (Fig. 7, Change-order joist).

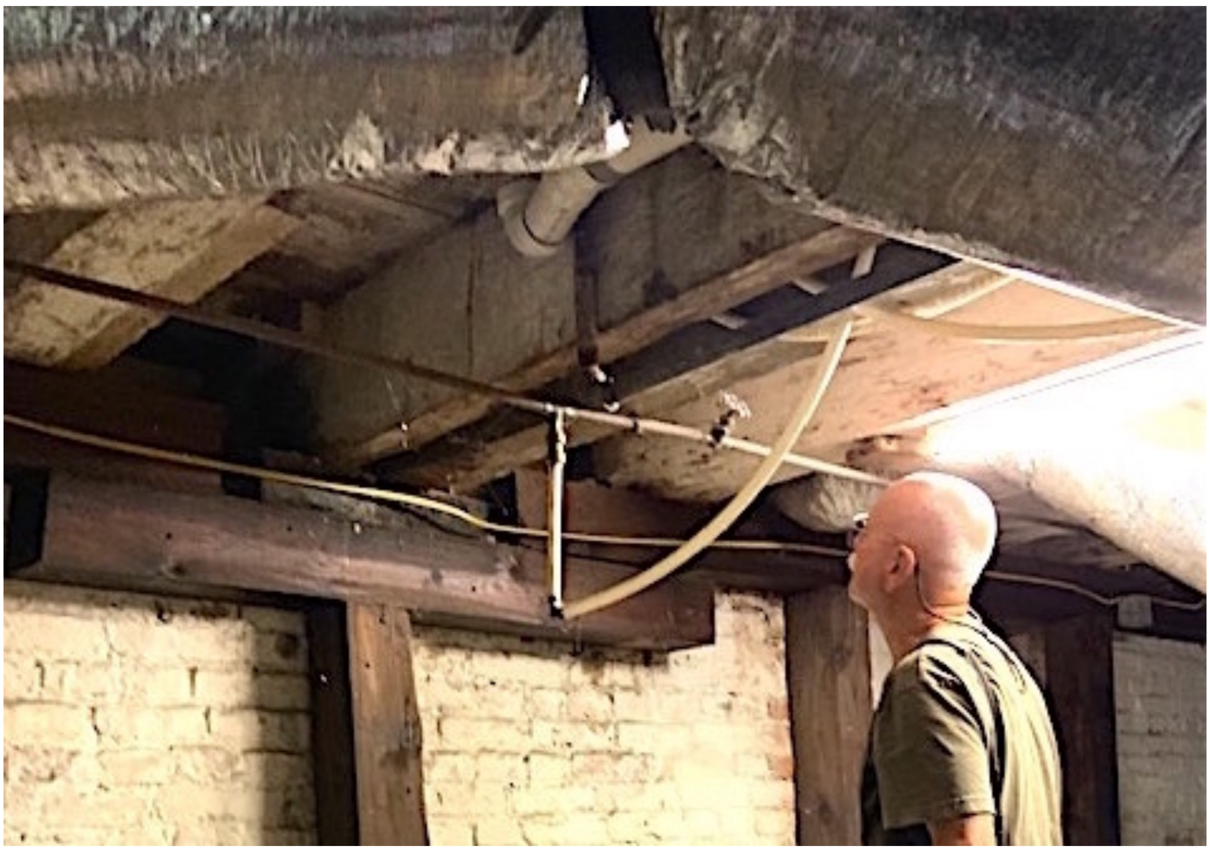

Figure 7

Apparently, the two timbers in this double joist were not fully seasoned prior to instillation. The last couple feet of the timber on the right warped, rotating several inches to the right. This resulted in the flooring above it in the hall to settle approximately one and three-quarters inches over the years (Fig. 8, Floor settlement in hall).

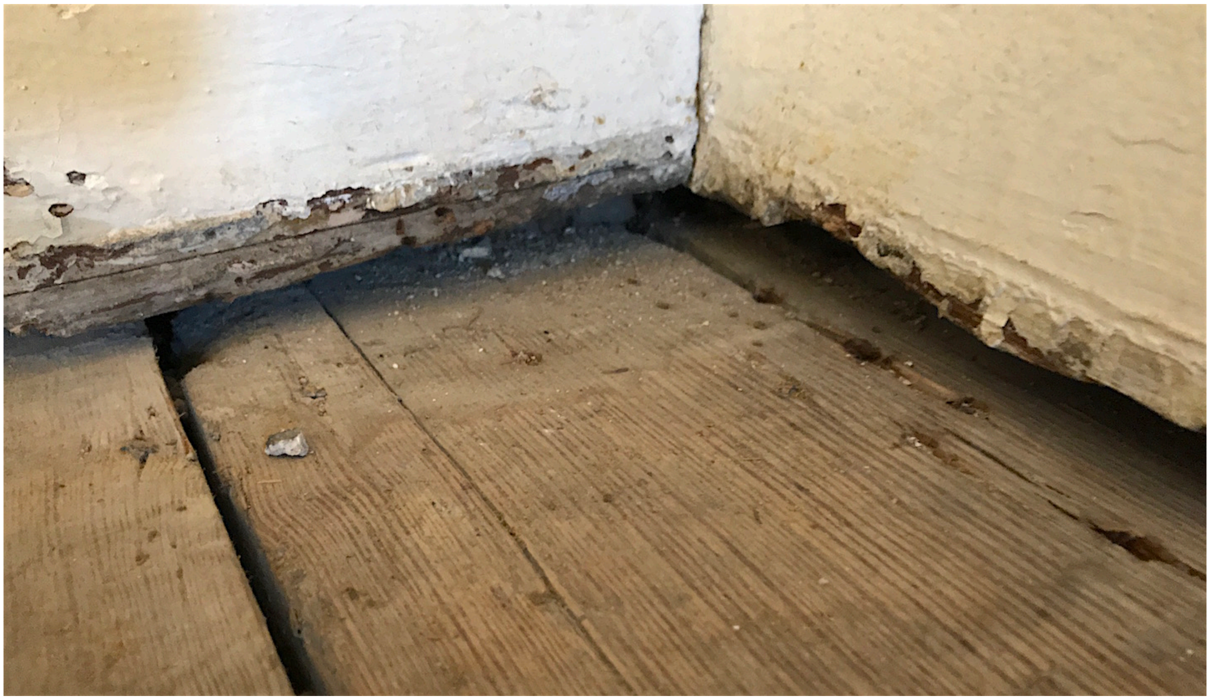

Figure 8

This problem was recognized sometime in the twentieth century, and there was an unsuccessful attempt to fix it. This "solution" was to nail a piece of wood roughly two inches by eight inches by three-feet long to the side of the warped joist. This scabbed-on piece of wood had to be removed prior to the floor lift (Fig. 9, Scabbed-on piece of wood).

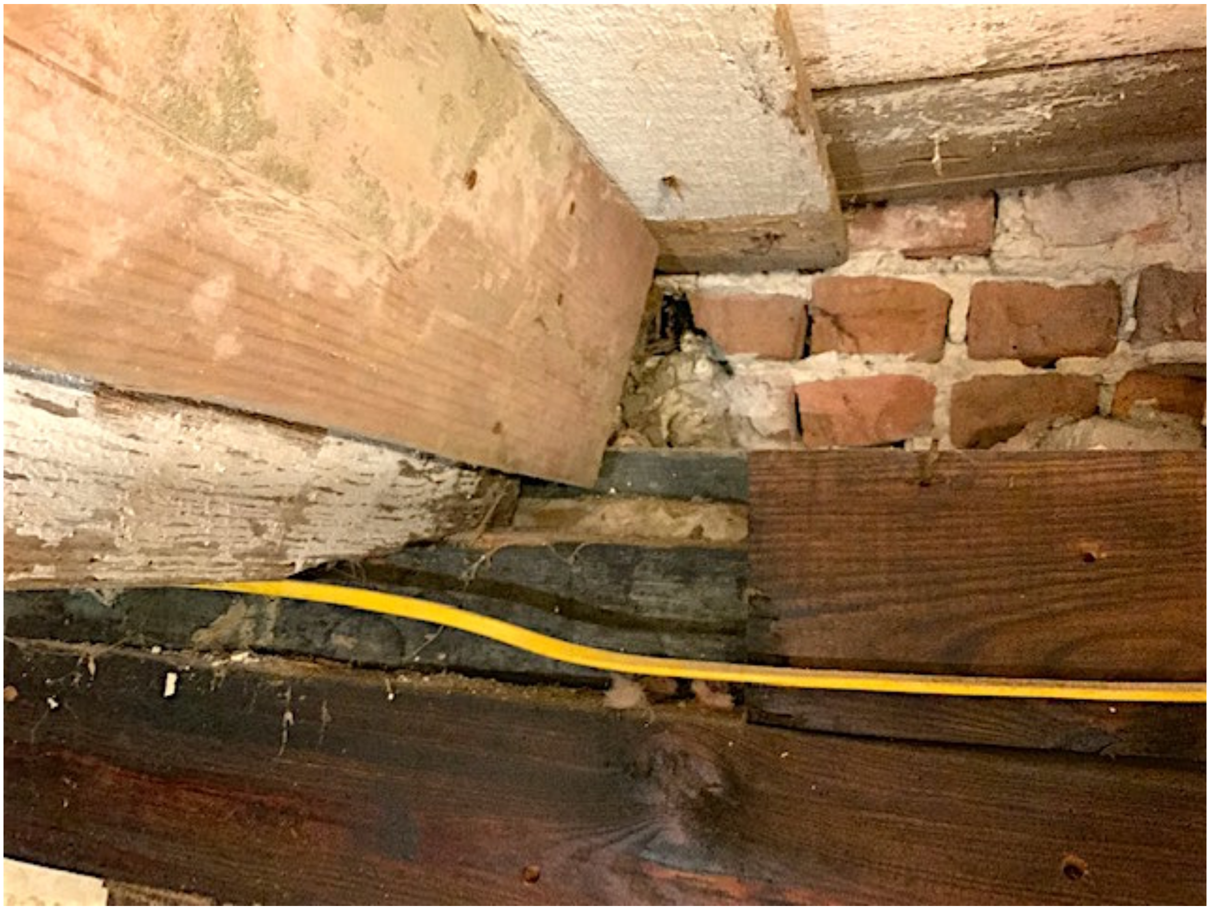

Figure 9

Once this piece of wood was removed, a hole was drilled through the double joist and a galvanized, three-quarter inch steel bolt with large washers was inserted and tensioned to reduce further warping of the right element of the double joist.

The lifting efforts in this restoration project were focused along the double joist under the hall and central-passage wall and at the intersection of the early twentieth-century support beams on the front of the house. The remainder of the early twentieth-century support system is working sufficiently, at least for now.

The floor in the hall was checked with a level to determine what sections underneath needed to be lifted. Prior to any lifting, the mid-nineteenth-century T-beam support had to be removed (See Fig. 1). This was done by slowly and carefully lifting the support beam and removing the post, then slowly lowering the jack to make sure removing this T-beam did not cause any catastrophic failures. Fortunately, it did not.

All lifting was done with 12-ton hydraulic jacks. The lifted elements were then secured in place with steel column jacks. These column jacks were chosen because they could be easily adjusted in the future as conditions dictated.

A 13-foot long, salt-treated timber, six-inches square, was, with considerable difficulty, threaded in along the side of the double joist. It was then lifted with the hydraulic jacks until the settled floor along the double joist was level in the hall (Figs. 10 & 11, Heavy lifts).

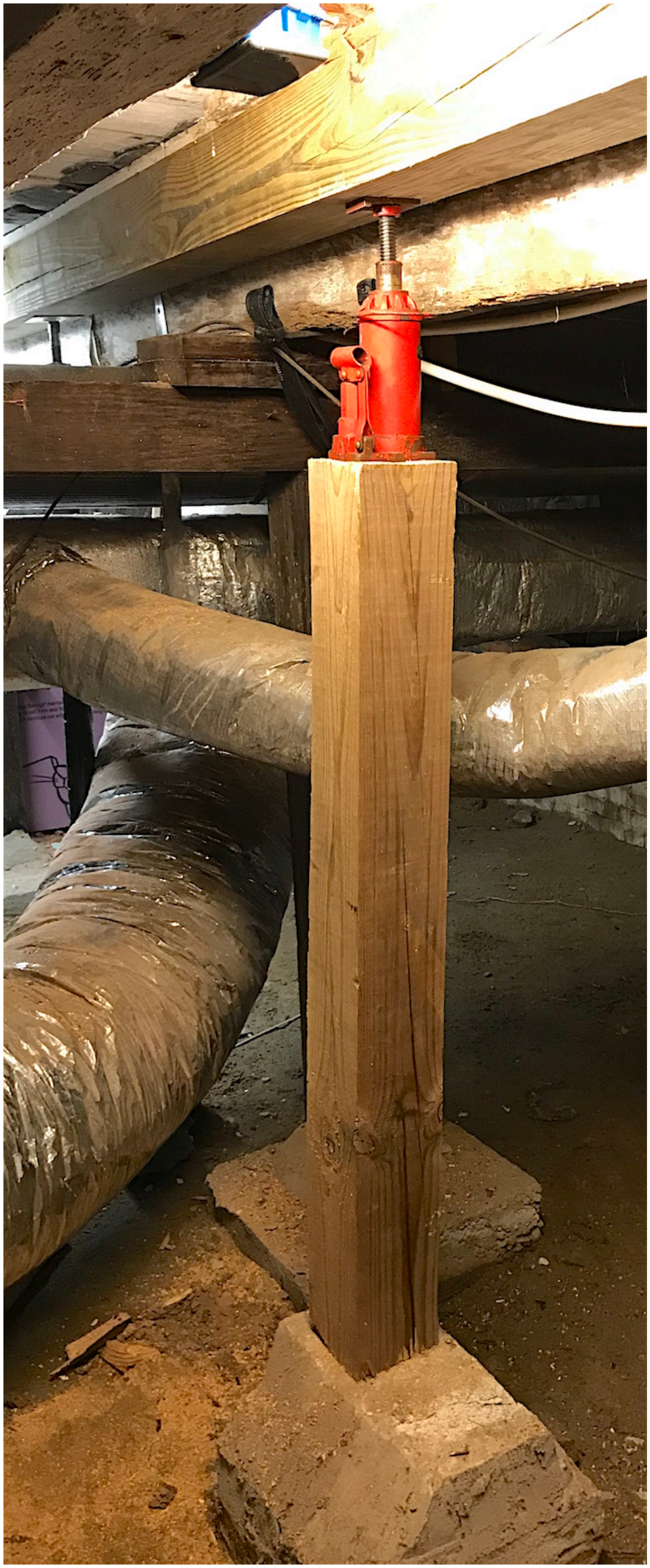

Figure 10

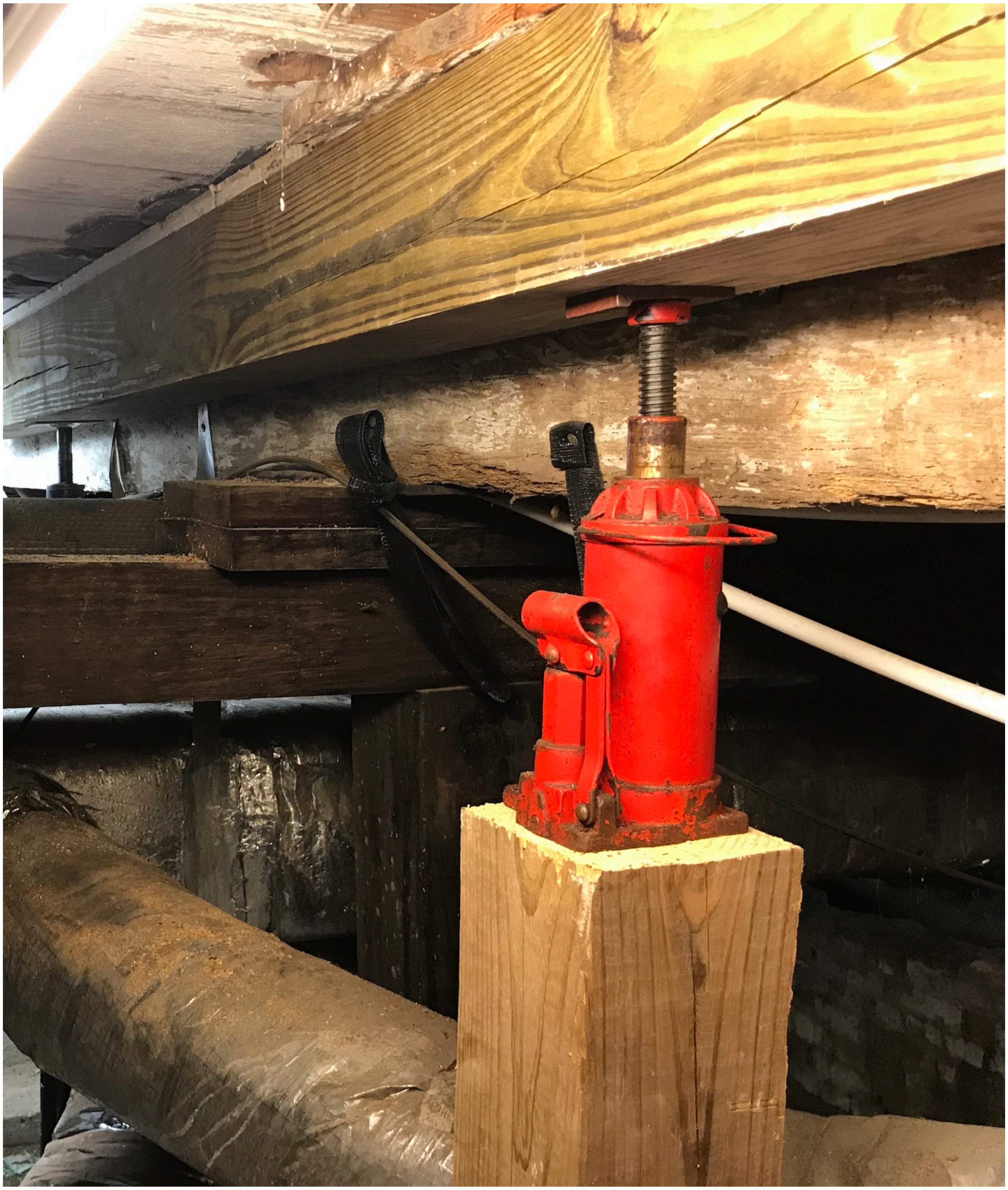

Figure 11

Note the small slate shims between the timber and the above floor. Slate is used as it will not compress.

Once the hall floor was level along the hall-passage wall, the lifting timber was secured in place with column jacks on each end and in the middle (Figs. 12, 13, & 14, Column jacks securing lifting timber).

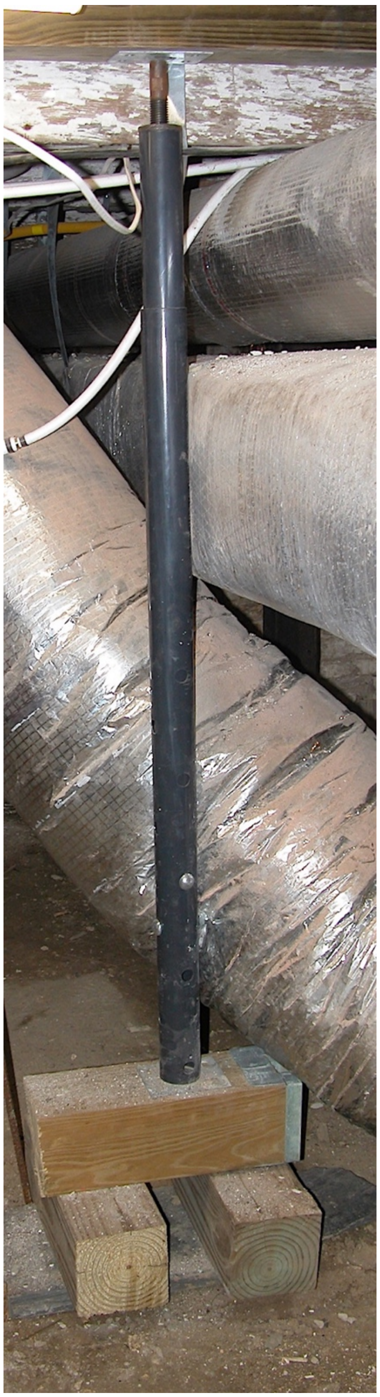

Figure 12

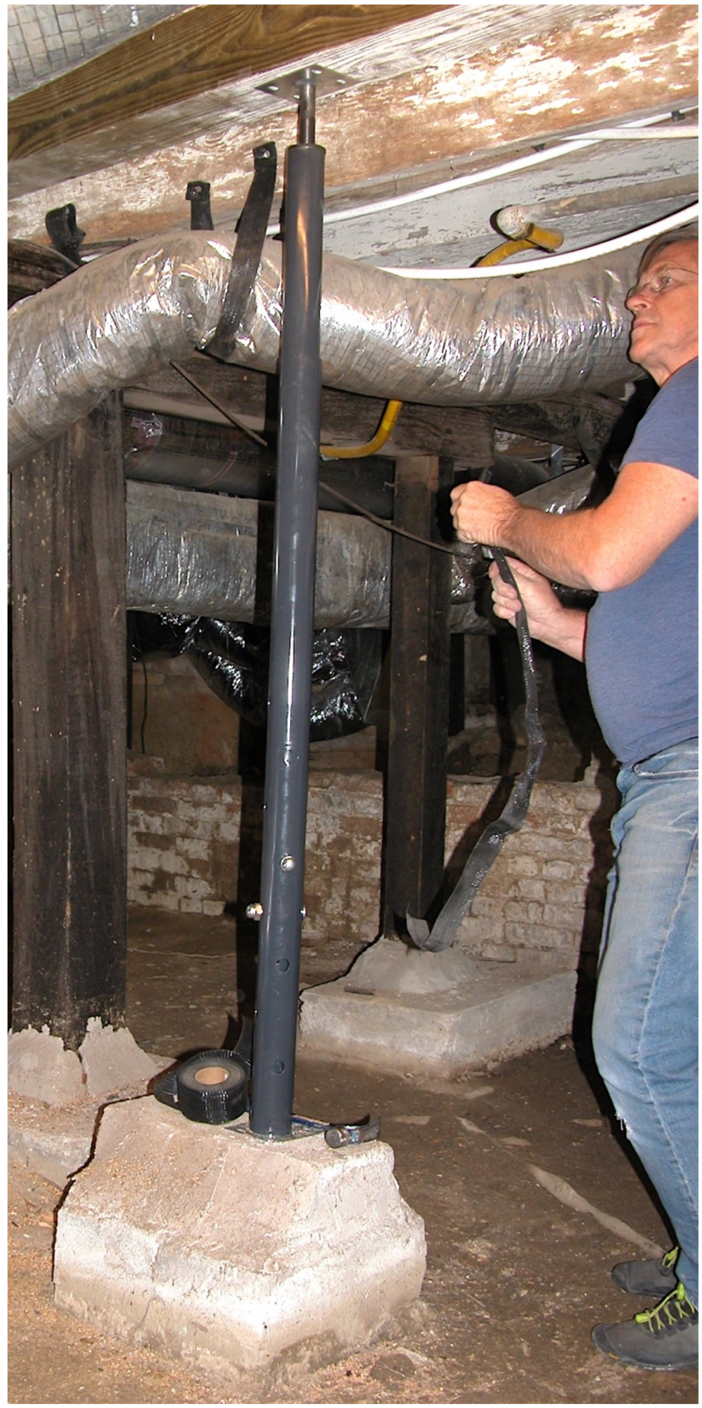

Figure 13

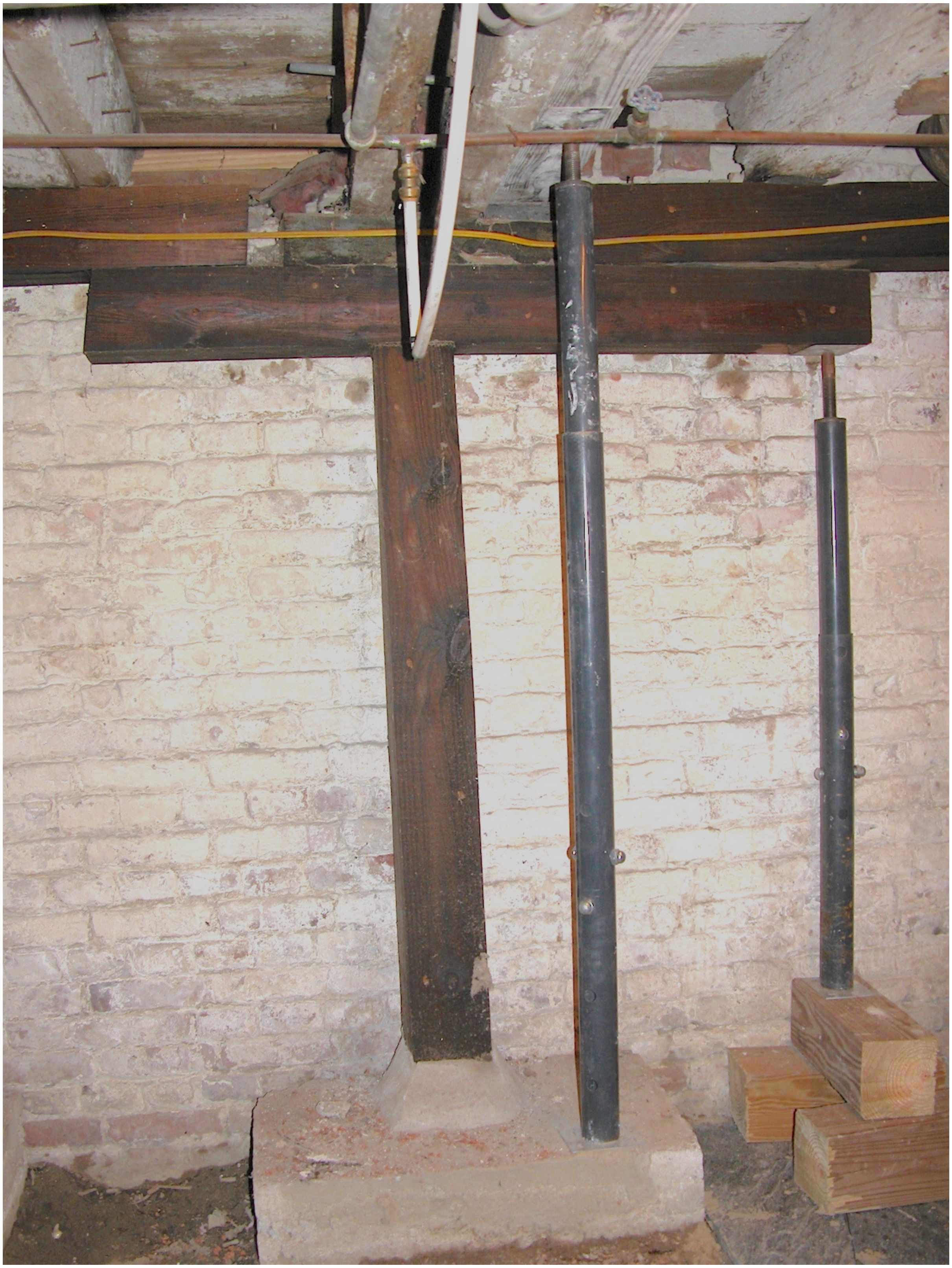

Figure 14

Lifting of the warped cantilevered beams of the early twentieth-century support system and the original floor joist above them was accomplished with a hydraulic jack and then secured with a column jack (See Figs. 6 & 14). In Fig. 14, note the small slate shim, high right, between the support beam and the original joist.

A problem was encountered in this last lifting effort. A single heavy lift of the cantilevered beams together with the original joist did not straighten the warped beams sufficiently to raise the hall floor high enough to level it. To solve this problem, this lift was done in two stages. First, the original joist was lifted and a slate shim was inserted. Second, the cantilevered beams were then lifted together with the shimmed original joist. This did the trick in the final floor leveling (See Fig. 14).

In Fig. 12 and Fig. 14, note that the salt-treated cribbing timber is six-inches square. The cribbing in each location is sitting on a large piece of slate serving as a footing.

Interestingly, once the salt-treated lifting timber was in place, the entire lifting and securing job took less time than it has taken to tell about it.