FLIPPIN' BOATS*

By John Justice

Is it finally time to replace that leaky bottom with one of the no-soak variety? Maybe you have a suitable place to do the work—and are willing to take on such a project—but there isn't room (in your workshop or your budget) for an overhead beam or gantries.

That was my situation. Most basically I wanted something that could invert a Chris-Craft U-22 inside my 20- x 30-foot workshop. However, I came up with a number of other requirements as well:

MY REQUIREMENTS SPECIFICATION

1. That "something" must be constructed easily. I am much more interested in working on boats than boat-turning machines.
2. Once constructed and used, it be removed easily from the work area. My indoor room is limited.
3. It can't cost more than I am willing to spend on something that won't pull me on water skis.
4. It doesn't require a large rollover crew; crews cost beer, which I would rather drink myself.
5. It doesn't leave the hull suspended in the air. I hate it when that happens.
6. It doesn't require welding; see 4, above; substitute "welders" for "large rollover crew."
7. It won't become a storage problem or an eyesore in my back yard.
8. It is safe both for the boat and the rollover crew.
9. **I'll give bonus points if it can be easily moved to friends' workshops.

BILL BAKER'S DESIGN SPECIFICATION

Given those requirements, my friend Bill Baker (a wonderful resource for all sorts of things) put his mind to work for a while, then suggested I build a "Horizontal Turning Cage."

"A *what*?"

"A Horizontal Turning Cage," he replied with that kind of shrug that implies he's talking to someone just above the I.Q. level for *Moron*. "It's all very simple: ya' get a couple of big wheels, some formers, maybe some bearings, put 'em together, and you're all set."

After somewhat more discussion, I discovered that this consisted of two vertical plywood wheels—one surrounding the foredeck and one surrounding the stern—that are joined into a single unit by horizontal planks: "formers," in his words. Each wheel would consist of two halves joined to facilitate installation and removal. The complete boat-and-cage assembly would be placed on bearings and rolled in place.

Bingo!

Actually, it wasn't *nearly* as difficult as it appeared to be. Figure 1 shows the Horizontal Turning Cage I came up with to transform Baker's vision into workable reality. Since its completion, it has satisfied all eight of my requirements—including bonus points—having been disassembled a number of times for storage, transported to other sites, and used to turn numerous boats that subsequently received new bottoms. Not bad for what started out as a simple set of practical requirements

SOME ASSEMBLY REQUIRED

PARTS LIST COMPILED AFTERWARD

Drywall screws, box	1 ea.
¼- x 3-inch bolts/nuts/washers	bunch of ea
12-foot sections, 2x4	3 ea
Sheets, ¾-inch CDX plywood,	8 ea (See Figure A)

THE WHEELS

I placed two pieces of ¾-inch, 4- x 8-foot CDX plywood sheets side-by side to form an 8- x 8-foot square. Next, I placed two more 4- x 8-foot pieces on top of the square, *positioning these slightly on a diagonal.* (See Figure B) This diagonal positioning formed overlaps that I would, later, use to bolt

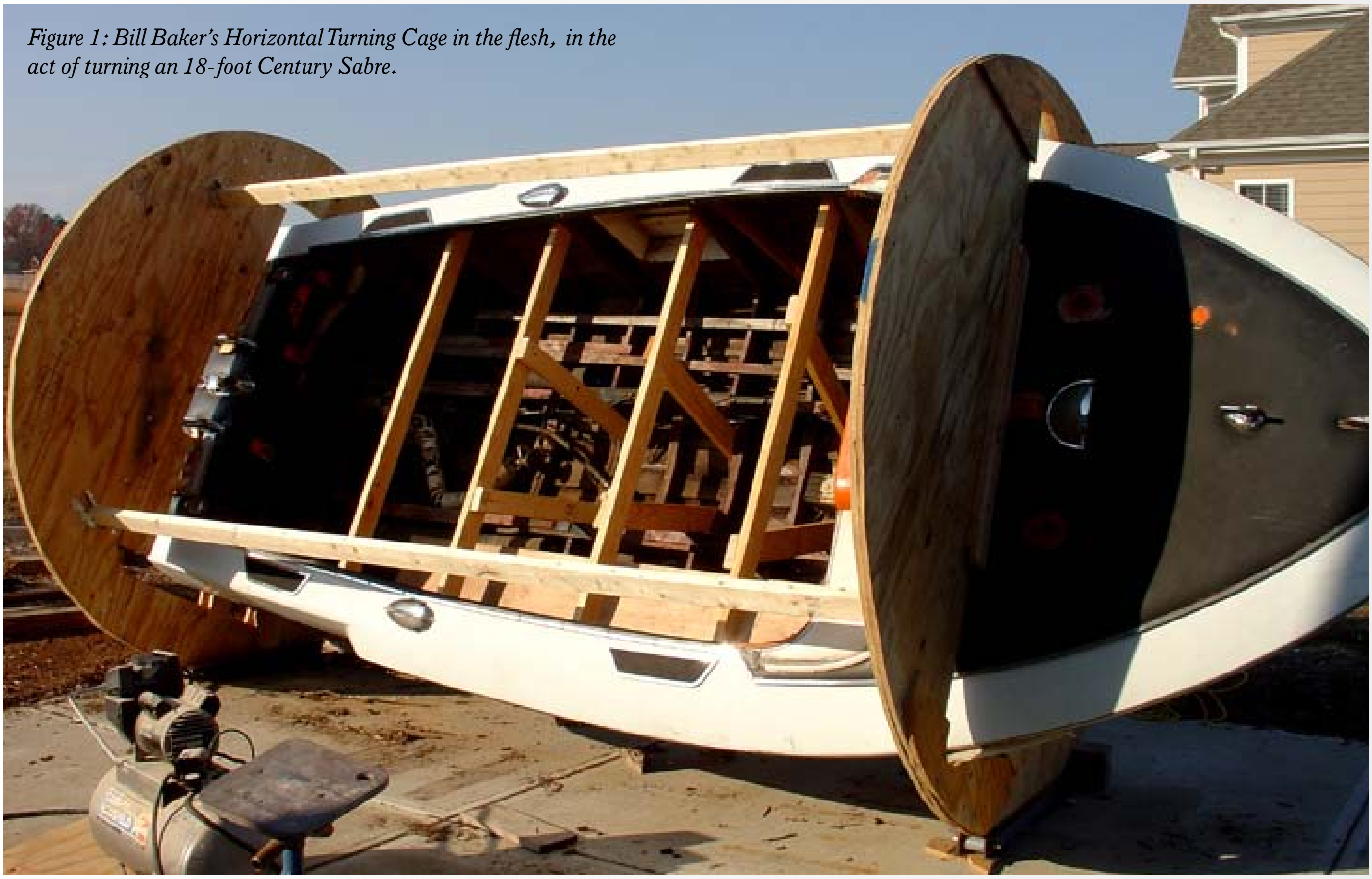

Figure 1: Bill Baker's Horizontal Turning Cage in the flesh, in the act of turning an 18-foot Century Sabre.

Figure 2: U-22 upside-down in Cage. Note width of shop; it is left as an exercise for the reader to determine another way to turn a U-22 in this space without first taking it outside.

the upper and lower halves together. This done, I marked an 8-foot circle on the square, then screwed the pieces together with drywalls screws, placing the screws 3-inches inside the circle—except in the overlap area. Finally, I cut out the circle. (See Figures C, D, and E); note that the two halves are not yet screwed together (See Figure F). Now, it was time to draw lines for the opening for the hull (Figures G, H), leaving plenty of room to fit to an estimated cross section at the point where the wheel would go. When I was sure of my estimates, I cut the opening. (See figures I and J),then built the second wheel in the same manner

I did save the cut out pieces—scraps—as I planned too use them for fitting the wheel to the hull and to reinforcing the overlap areas.

Finally, I screwed the wheel halves together. Each complete wheel was 1 ½-inch thick, except the overlap areas, which was 2 ¼ inches thick.

THE BEARINGS

I used four 30-inch sections of 2- by 3-inch channel iron, a collection of short pipe sections from ½-inch ID to 2-inch OD, and four pieces of ½-inch, threaded rod four inches long. Four ½-inch bolts that are four inches long can be substituted for the pieces of threaded rod. These bolts or rods are the center of the concentric pipe "bearings" (see below) and serve to bolt the bearings to the channel iron, as well.

If your workshop is large enough you *could* roll The Cage with the hull inside it across the floor, but in my case I needed to roll it in place. A bearing assembly on the floor under each plywood wheel allowed this to happen. (See Figure 3). I made each bearing assembly from two, parallel, 30-inch sections of 2- x 3-inch channel iron, installing a roller at each end of the assembly—27 inches apart. My rollers were three inches wide, made from progressively larger diameter pipes over a ½-inch rod, with lots of grease inside each pipe. The rollers ended up as two-inches in diameter. This may be a case where bigger might have be better. I used what was readily available.

USER GUIDE: INSTALLING THE WHEELS

It took a lot of careful preparation, but I began with the hull well braced, leveled, and blocked securely. I positioned the keel about 18-inches off the floor—just about what I thought would center the boat in the wheel. Next, I positioned one half of a wheel beneath the hull, slid the matching half into place above, and bolted them together, using a scrap of the plywood to reinforce the joint. It is critical that the hull and the wheels do not shift during the rollover. The wheels and the hull must become a solid assembly that doesn't shift position, so I took pains to do everything *carefully*.

With the completed wheels in place, I secured each to the hull by bolting plywood scraps between the wheel and the hull, padding as necessary to protect the boat. NOTE *no screws from the wheel pierced the hull.* The padded plywood scraps rest *snugly against* the hull *but are bolted only to the wheel.*

Just as it is critical that the wheels fit snugly to the hull, it is also important that the wheels remain equidistant from each other, forming a strong, cage-like structure. I did this by connecting the wheels using 2 x 4s of the same length as horizontal

Figure A

Figure B

Figure C

Figure D

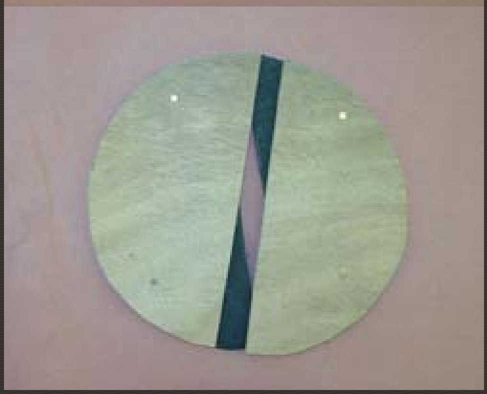

Figure E

Figure 3: A bearing unit: key to rolling the Horizontal Turning Cage in place.

Figure 4: These last-minute additions to the wheel allowed the use of a floor jack to overcome the inertia and bearing friction built into the Horizontal Turning Cage. Editor's note: we of the Brass Bell *staff sincerely believe that this inertia and friction were part of the Author's initial design and included for safety.*

formers, placing them well away from the edge of the wheels, while constantly squaring the wheels to each other and the hull. I used galvanized stud hangers screwed both to the wheel to place the formers, but you could also nail everything directly. Three formers ensured that the wheels are equidistant; you could use more. Figure 2 is an aft view of my U-22 encapsulated in the cage turned bottom-up.

THE ROLLOVER (FIRST EXPERIENCE)

First, I placed the bearing assemblies under the wheels, then lowered the cage assembly so that the wheels fit into the bearings and squarely on the rollers. At this point, I was ready to turn for the first time.

The first 45 degrees was easy to roll by hand. After that, things changed considerably. In fact, I had to use considerable force to move the boat at all. To continue, I installed 'cogs' (see Figure 4) that allowed use of a floor jack to do the heavy lifting. This extra force required turned out to be a really good thing—for example the dreaded dramatic 'over-center' weight shift never even *began*. Throughout the operation, we were able to control everything much better than I had even hoped. I used a couple of 6- x 6-inch blocks to scotch the wheels when I needed to stop the rotation. In fact, I placed 6- x 6–inch blocks on each side of the bearings, just in case the hull and wheel assembly came out of the bearings. Of course, it didn't, but why engineer something if you can't *over-engineer* every once in a while?

Once the hull was upside down, we removed the plywood wheels, leveled the hull, and replaced the old, leaky bottom. We stored the wheels where they are out of the way; they fit easily under the hull.

HAPPY ENDING

There you have it: *another* method for inverting our boats. It may not be the best answer for everyone. It doesn't work for boats that are wider than about 7½-feet, and it isn't as fast as rolling with a sling (sometimes, that's a definite blessing!). Nevertheless, it might be just the thing for your situation. It worked for me, and I intend to use it to when it is time invert the hull again. If you find ways to improve on this technique then please share them via Boat Buzz.

**Important Note: Shop practices, such as flipping boats can be very dangerous. The method illustrated in this story worked for the author using extreme caution and proper safety precautions. It is the responsibility of each Chris-Craft Antique Boat Club member and/or reader of* The Brass Bell *to devise a method that works safely. The Chris-Craft Antique Boat Club,* The Brass Bell*, and its contributors cannot review shop practices, workmanship, or safety procedures, and therefore cannot be held liable for any shop practices or accidents that may occur.*

Figure F

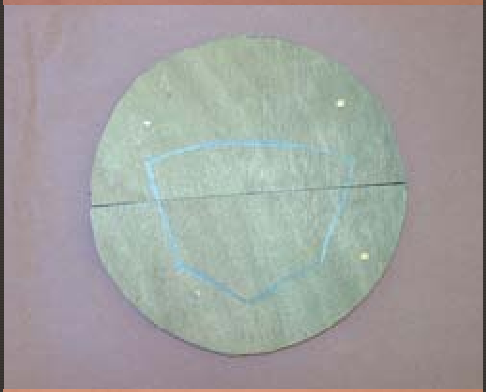

Figure G

Figure H

Figure I

Figure J

WHAT I LEARNED FROM A RECENT FLIP.

Author John Justice sends the results of a recent flip that restored his U-22 to a right-side-up orientation—and suggests a few improvements for the next rollover cage.

BEARING ASSEMBLIES

The bearing assemblies were made from on-hand material. As built, the they need to be shimmed about ¾ of an inch on each end because the wheels aren't perfectly round. I'll bet our readers can suggest improvements. I also think bearings that are higher off the floor and thus farther apart would be an improvement. They should be easier to roll and more forgiving of imperfections on the edge of the wheels.

THE CAGE ASSEMBLY

Keeping the wheels and hull assembly rigid is essential. The three formers that worked fairly well when doing the initial flip didn't hold things steady enough for the return flip. Adding cross braces tightened things up sufficiently. Only one side of the wheel is needed to roll the wheel 180 degrees. Use braces on the side that won't have to go through the bearings.

THE WHEELS THEMSELVES

The edge of the wheels should be smooth and round. An uneven edge will cause extra effort in rolling, which may force the wheels to roll out of the bearing assemblies rather than inside the bearing. Lesson: make the wheels as nearly round as you can, and put a large scotch block on each end of the bearing assemblies just in case the whole assembly tries to roll across the floor.

PLACEMENT OF THE HULL IN THE CAGE

Try to get the hull's center of gravity close to the center of the wheels. The return flip was much easier than the initial inversion. Apparently the initial flip was working against gravity, thus requiring significant force. No 'cogs' or floor jack were required to right the hull. Placement of the hull in the wheels is much more important than originally thought.

Extra braces added on one side to keep the turning cage better aligned.