S.S. *Tahoe*

The Queen of the Lake

By Alan Zulberti

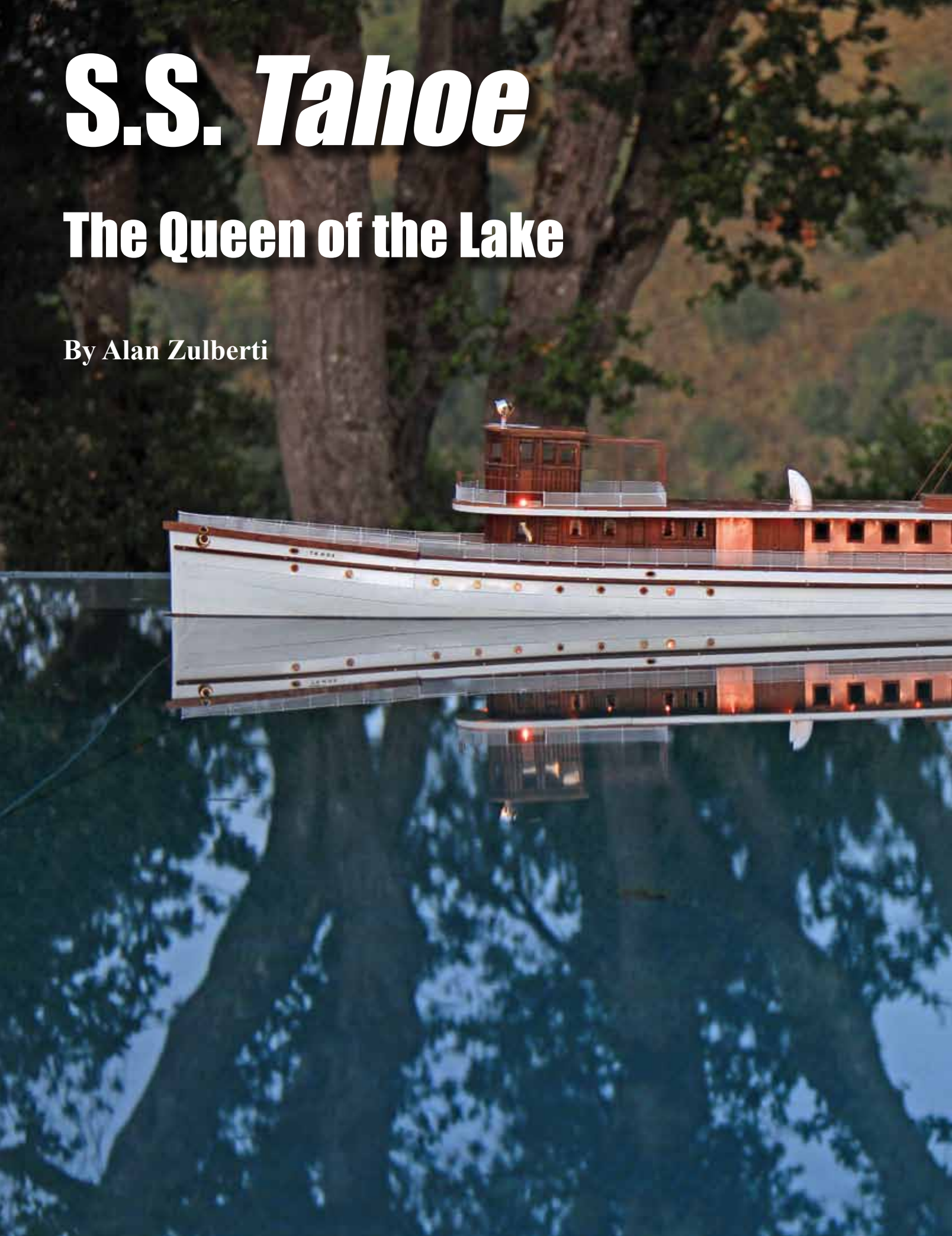

Photo 1. "The Queen of the Lake" – Here she lays with her very long graceful lines accentuated by the reflecting mirror glass water just before nightfall and with all eighty-five of her electric lights turned up bright. Picture by Tom Barrat, a friend and an unbelievably prodigious photographer!

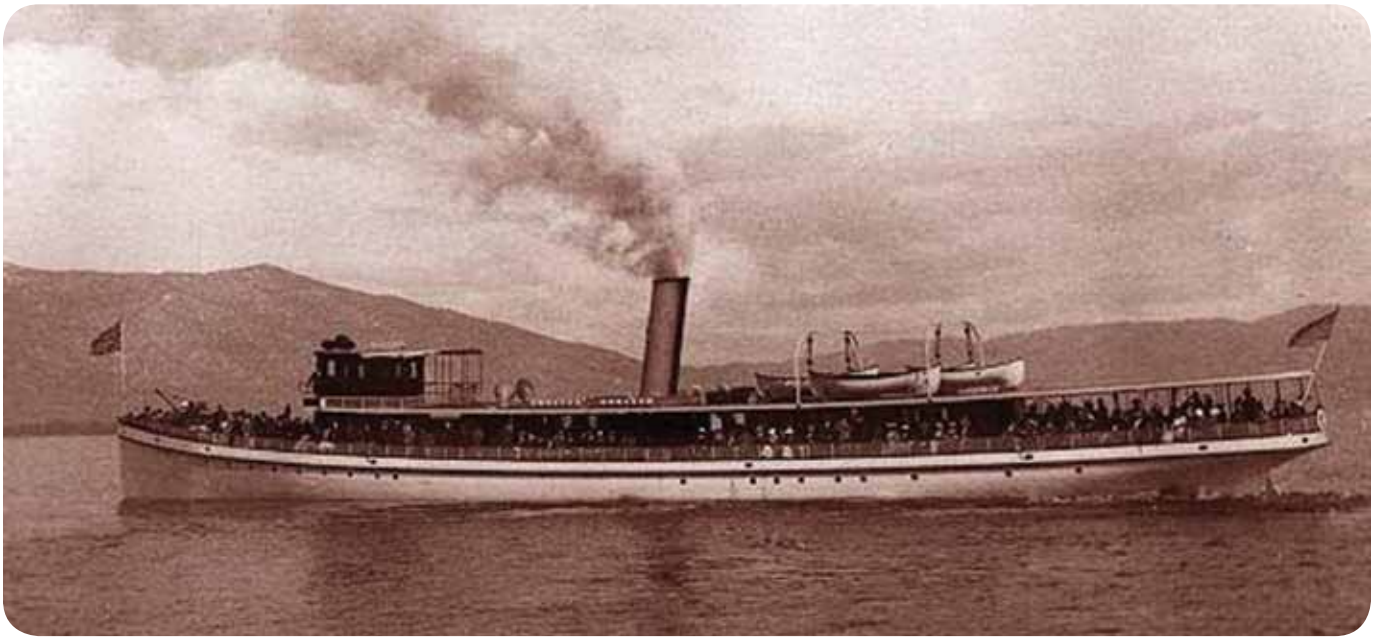

Photo 2. *Tahoe* cruising the lake.

History

The steamer S.S. *Tahoe* was commissioned by Duane L. Bliss who made his fortune providing cribbing lumber for the silver mines in Nevada during the latter part of the 1800's. When the mines began to play out towards the late 1880s, Duane Bliss started looking towards promoting tourism at beautiful Lake Tahoe as a new business venture. In order to accomplish this goal he needed to develop three new and separate businesses. A small gauge railroad was needed to transport passengers from the Truckee RR Station about twenty miles away to the shores of Lake Tahoe, then deliver those passengers by boat to various points around the lake and provide some of them with a very opulent place to stay. Over the ensuing years he commissioned to have the *Tahoe* built, along with the railroad and a tavern. The railroad was built along the riverbed of the Truckee River all the way out onto a long pier at the Tahoe City shoreline, and it was completed in 1901. Passengers could then easily transfer from the train onto the *Tahoe* docked at the pier to complete their travels. Duane Bliss also purchased a forty acre parcel just South of Tahoe City and built Tahoe Tavern to accommodate tourists arriving from San Francisco.

The building of *Tahoe* was commissioned to the Union Iron Works of San Francisco in 1894 (Union Iron Works Boat #42). Upon completion, the ship was then disassembled and transported in sections by rail to Carson City Nevada, then by horse and ox drawn wagons to the shores of Lake Tahoe at Glenbrook. The 169ft long steel hulled *Tahoe* was then reassembled and launched at precisely 1200 on June 24, 1896. She slid into the clear blue waters of Lake Tahoe with a great amount of fanfare. Her long sleek lines must have been quite a sight to see in 1896, a symbol of futuristic beauty. She was powered by a locomotive style boiler with twin steam engines producing a combined 1200HP driving twin three bladed screws at 353RPM towards a designed speed of 18.5 knots.

Her superstructure comprised of forward and aft steam heated passenger cabins outfitted in an elegance befitting the "Gay '90s" along with below deck crew quarters in the aft section and a forward dining hall which could accommodate thirty people. She was trimmed in teak and mahogany interior appointments, with polished brass fittings, leather upholstery, hand-woven carpeting, and marble lavatory fixtures with hot and cold running

A series of dives on the wreck of the *Tahoe* were completed in the summer of 2002 by New Millennium Dive Expeditions (**Figure 1 and Photos 3 & 4**). The treacherous expedition featured the deepest scuba dive ever in Lake Tahoe and was the deepest high altitude dive ever attempted. For more information and several dramatic images of the old steamer visit their web site www.nmde.org.

water. She also had 65 electric lights and a forward smoking lounge for the gentlemen.

Each summer morning the *Tahoe* made a complete 73 mile circuit of the lake stopping at all the major landings depositing her daily passengers, mail and freight that had arrived by train earlier that morning, then returned to Tahoe City by late afternoon (**Photo 2**). It was a full day of activity for her seven man crew. However, by 1926 a roadway for automobiles was completed around the lake and the *Tahoe's* passenger traffic began to wane. With the onset of the depression in the early 30's and the loss of the mail contract in 1934, her glorious attributes and passenger service came to an end.

The once proud steamship lay at dockside with her condition deteriorating over the years until 1940 when William S. Bliss, grandson of the D. L. Bliss, bought the vessel back from the company he had sold it to in the mid 1920s, and ordered it to be scuttled as a memorial to the bygone era of steam traffic on the lake. On the night of August 29, 1940 the *Tahoe* was towed south towards her original launching point off Glenbrook where she went down in the early morning hours in approximately 330ft of water as per the sonar picture below where she currently rests.

Building of the model

What inspired me to build an operational model of the Steamer *Tahoe* was her very eloquent history, the beautiful Heron model steam engines manufacture by Nick Monahan and the sheer level of challenge and complexity of building such a beautiful ship. She lays low in the water with exceedingly long graceful lines and a magnificent semicircular stern. It is for this reason alone she was referred to as the "Queen of the Lake." She also had a very narrow beam and was built for speed.

This is a model which required a considerable amount of math to calculate her displacement, weight and length given the absence of any creditable construction plans available. There is a "General Arrangement Plan" readily available, however, it lacks a considerable amount of necessary detail and only provides one mid-ship bulkhead cross section of her hull. Ideally the model's hull would have been seven feet in length with a 9-1/2in beam; however, I would have needed to buy a new larger, and longer, truck with which to haul her around in. Fortunately the displacement calculations were sufficient to limit the hulls length to just 6ft.

The next challenge was deciding what kind of material to use in the fabrication of the hull. Constructing her hull of wood struck me as just being too easy, and it wouldn't look like her original riveted steel hull when completed. Now 0.035in copper roofing/flashing material had possibilities. Scale wise this is equivalent to one inch steel plate, which is rather thick. However, copper doesn't rust, it can be riveted and soldered, but could it be done? I experimented a little bit and decided, yes it could be done, but would I live long enough to complete it? In the end it took three years to build the ship with well over 5,000 rivets in her hull, each individually drilled and riveted using 0.025in x 3/8th inch brass nails. With that many rivets, even if one percent of them leaked, there could be more than fifty leaks. There were a few! Can you find Captain Joe Pomin, the *Tahoe's* first Captain, in the picture below supervising the assembly of the hull?

A wooden framework needed to be fabricated in order to provide the basic shape of the hull and mounting bulkheads (**Photo 5**), keel and stringers for all of her superstructure, decking, hardware, interior lighting, radio servos and electronics. Once the framework was completed, the copper flashing was

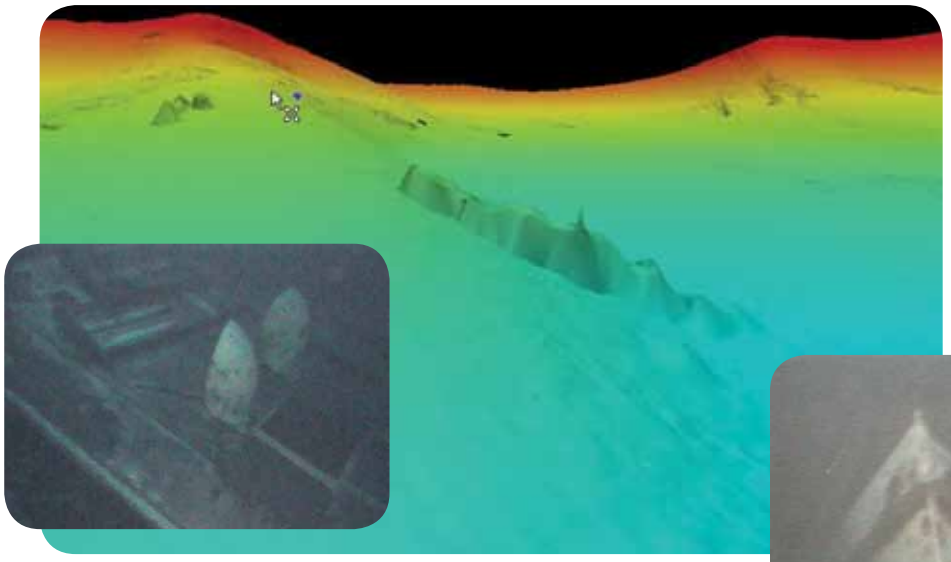

Figure 1 and Photos 3 & 4. The figure is an enhanced sonar image of the *Tahoe's* position on the bottom. The photos are actual pictures taken of the wreck.

Photo 5. Wooden frame assembled and ready to begin sheathing with copper plate.

Photo 6. Riveting the copper plates in progress — only 3,000 left to do!

sheared into 1in strips and 3/8in-wide brass stripping was riveted in place to provide the necessary backing material to hold the copper strips together.

Forming her stern represented the ultimate challenge because copper roofing material does not form very easily no matter how much heating, hammering, stretching or willful abuse is inflicted upon the metal. As an example, the little copper cap piece which fits the underside of her stern took two days of crafting (**Photo 7**).

Occasionally compromise is an inevitable reality as pictured in **Photo 8**. Twin eyebrows needed to be incorporated into the underside of the hull in order to provide an exist for the drive shafts because the copper material was too stiff to fabricate and provide an even flowing transition from the hulls underside all the way to the stern. This is, of course, is not visible when she sits in the water, but I know it's there. In the second picture to the right it is easily seen here the amount of shaping necessary to fabricate the cap for the underside of the stern as well as the 3/8in brass back plate utilized to hold the copper stripping in place.

Photo 9 shows how the hull is assembled using the 3/8in brass stripping and soldering of the siding joints from the inside, with heat being applied to the outside of the hull. The hull also houses a foam block attached to a 100ft long 200lbs test line beneath the deck hatch cover float which is there in the event the *Tahoe's* hull springs an unplanned leak. The other end of the line is anchored to the keel for retrieval from the waters depth below?

The *Tahoe's* Architect, H.P. Freer and Mechanical Designer, Knut Dahl were both very cleaver fellows as indicated in the design of the hull, drive shafting and rudder system (**Photo 10**). (There are times when it's ashame to have to paint something!)

Photo 7. Twin eyebrows needed to be incorporated into the underside of the hull in order to provide an exist for the drive shafts because the copper material was too stiff to fabricate and provide an even flowing transition from the hulls underside all the way to the stern.

Photo 8. Forming the stern was a challenge because of the stiffness of the copper sheet.

When I first started pouring over the ships plans it was noticed the centerline distance between the engines crank shafts and the diameters of the twin propellers created a 6in overlap

between the propellers. Sometime later I was able to locate the below deck plan view of the engines and drive shafting, which clearly resolved the question. Since the *Tahoe* was designed for speed, her beam was just seventeen feet wide for a ship 169ft long. To help compensate for this, Freer and Knut splayed the ship's drive shafts outboard about five degrees each. This provided clearance between the props and help reduce the ships turning radius while underway. The rudder was also hinged about one third aft in order to reduce the amount of effort need to turn her helm and to place the rudder into the prop wash in order to help push the stern outboard of the turn. This is a very cleaver and effective solution in order to help minimizes the radius of turn which was still considerable. The irony, however, is a turn to port required advancing the throttle on the port engine, exactly the reverse of normal. This is due to the minimal spacing between propellers which provides little, or no, mechanical advantage when entering a turn. The model behaves in exactly the same manner. The drive shafts are 17in long, and along with the bearings and stuffing boxes, they had to be custom made.

Photo 9. The hull is assembled using the 3/8in brass stripping and soldering of the siding joints from the inside, with heat being applied to the outside of the hull.

In the end the *Tahoe* is 6ft long and weights 34lbs. This is not something one can easily carry around under their arm. The *Tahoe* travels and rolls around in a custom made powder coated aluminum chariot with a tow bar, baby stroller wheels, suspension system, steerable nose gear and a parking brake (**Photo 11**). It also has a two man launching bar with straps to lift the *Tahoe* up from her walnut display stand cradle and into the water. There is also a dust cover for storage.

The Power Pant

The *Tahoe's* power plant is a phenomenal piece of engineering

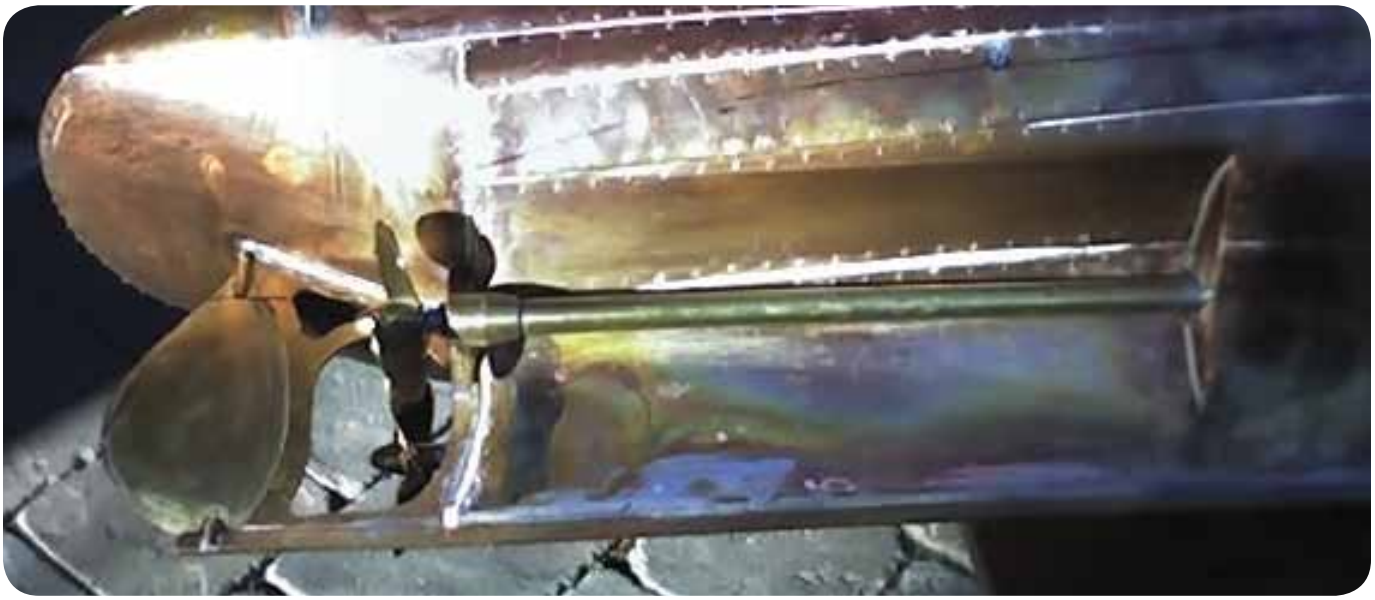

Photo 10. Architects Freer and Knut splayed the ship's drive shafts outboard about five degrees each. This provided clearance between the props and help reduce the ships turning radius while underway. The rudder was also hinged about one third aft in order to reduce the amount of effort need to turn her helm and to place the rudder into the prop wash in order to help push the stern outboard of the turn. A very cleaver arrangement.

which required the talents of three people, Nick Monahan who built the engines and did the plumbing, Brian Marten of Marten Howes and Baylis, Marine Steam Model Supplies in England who built the custom modified and exceedingly efficient nickel-silver boiler and a few of my efforts as well (**Photo 12**).

The twin Heron model steam engines are a magnificent piece of mechanical artwork. These engines turn between 3,000 and 4,000 RPM, and on the *Tahoe's* maiden launch, she sliced through the water at a scale speed of 36 knots, nearly double that of the original ship. The speed of a 20th century destroyer if you will!

Photo 11. The *Tahoe* travels and rolls around in a custom made powder coated aluminum chariot with a tow bar, baby stroller wheels, suspension system, steerable nose gear and a parking brake

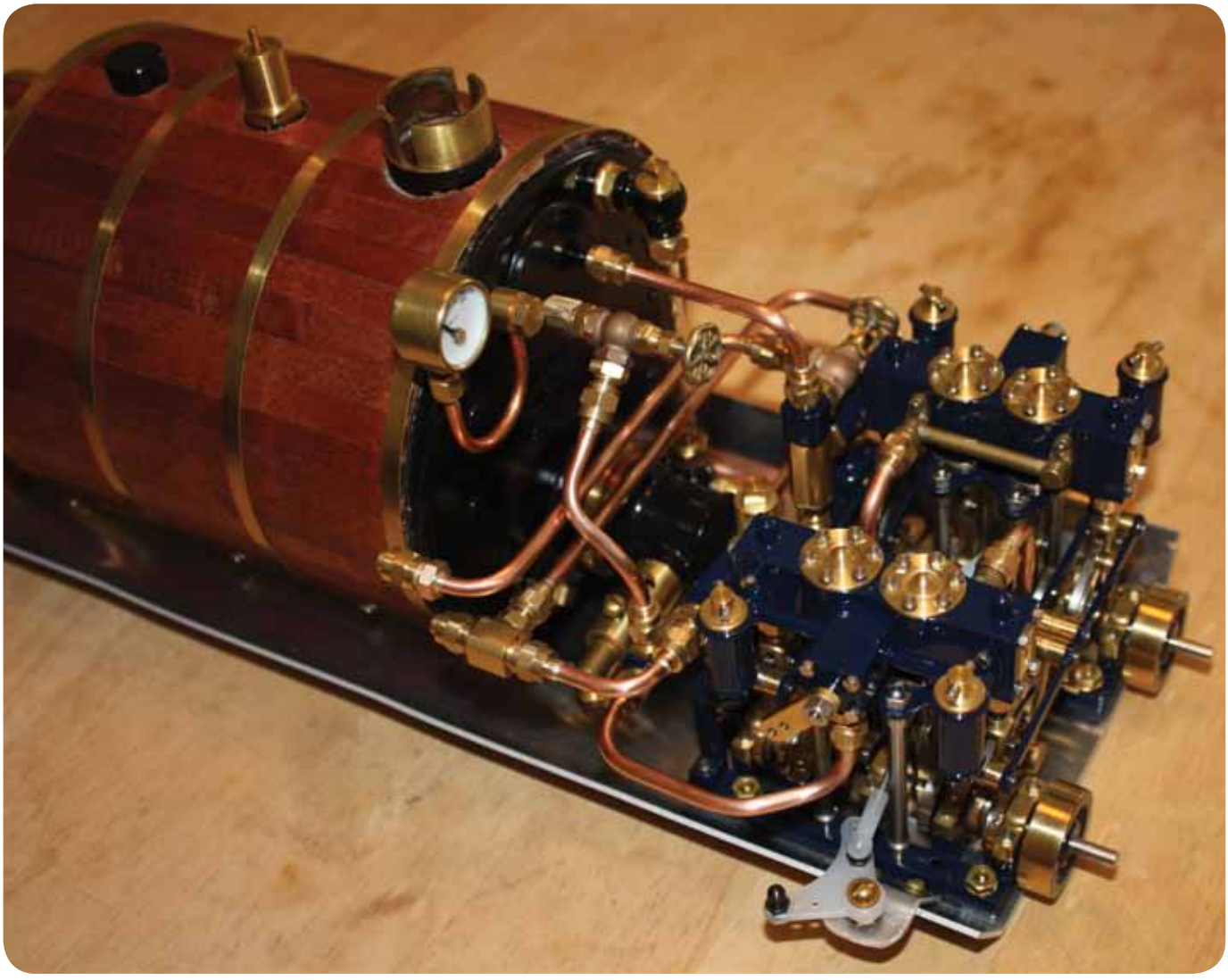

Photo 12. Close-up of the amazing custom-built steam engine that powers the model.

The entire steam plant is seventeen inches long and mounted on an aluminum tray that serves as the mounting base for the twin engines, boiler, oil separator and fuel tank. Given the narrowness of the *Tahoe's* hull it required a considerable amount of ingenuity and planning to get everything to fit within the allowable space (**Photo 13**). In fact, it is the width of the twin engines which dictated the 9-1/2in beam of the hull. The engines are mounted so close together the forward/reversing push/pull rods pass though and in between the piston connecting rods as seen here.

The design of the boiler is an engineering feat in itself. Nickel-silver is very strong, considerably lighter and more heat efficient than a standard copper boiler. The design of the boiler also incorporates a "superheater" burner tube along the top length of the boiler where the steam heat outlet tubing snakes through several times before exiting the aft end of the boiler towards the engine throttle bodies. Water being pumped into the boiler from the two engine driven pumps is also pre-heated within the supper heater before passing into the boiler. This all allows the boiler to operate as high as 75psi and efficiently drive both steam engines.

The fuel used to power the boiler is standard Boy Scout camping fuel which is a designer mixture of butane and propane. There is also servo controlled fuel line emergency shut-off valve so the boiler can be shut down remotely. Lastly, there is an oil separator tank which allows the steam exhaust to exit the vessel leaving behind a condensed mixture of oil and water so as not to contaminate the lake's water.

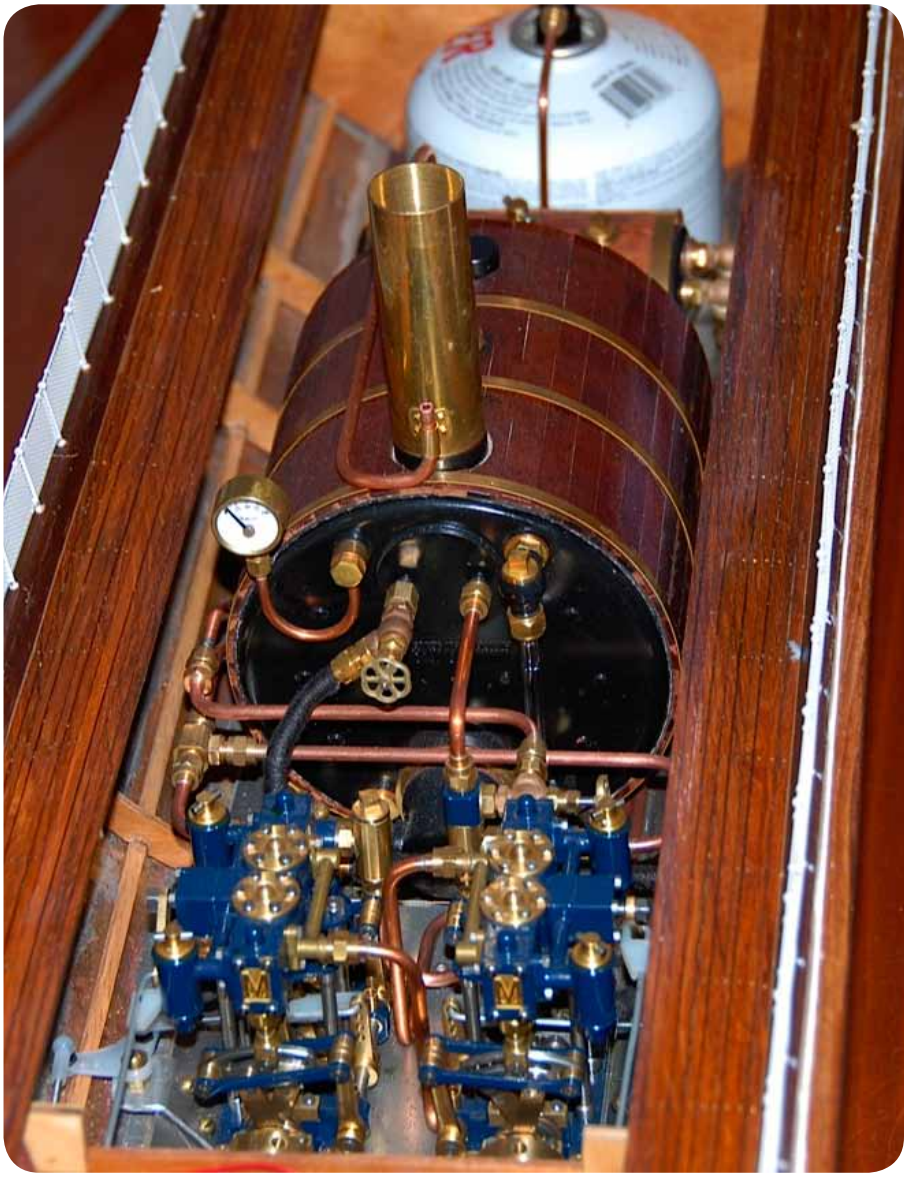

Photo 13. It required a considerable amount of ingenuity and planning to get everything to fit within the allowable space.

Electrical & Radio System

The *Tahoe's* electrical system is not overly complex, and it powers the 5-volt radio system and all the 12-volt accessories including a sound system, eighty-five electric interior and exterior lights, running lights and a search light, The interior, exterior and search lights are individually switched on and off remotely via the 28 channel Robbe F14 Twin Stick radio control system.

One challenge of this design is building a model's electrical system when two, or more, voltages are required. Finding an easy to install DC to DC Converter is not easy. The amount of amperage draw adds to this complexity when models such as the *Tahoe* have six servos, four to operate the steam engines, the rudder and the emergency fuel shutoff valve. A previous model I built, PT-588, has twelve servos and speed controls and required two DC to DC Converters. I have listed a good source below from Jameco.com.

Sound systems add a tremendous amount of character to a model, yet very few of them

include sound systems in their design. If a duck doesn't quack, Pavarotti didn't have a voice, or all humans were deaf there would be a total absence of personality in the world! I have installed many sound systems from Dallee Electronic like the one in the *Tahoe*. It provides authentic steam chugs in sync with the rotation of the drive shaft, an actual steam whistle sound and ships bell, and the normal blow down sounds from a steam boiler. These sound boards are small, light weight and come with very clear installation instructions. Sound brings life to a model. The sound system is on the left side of the **Photo 14**.

Photo 14. A look into the electrical and RC equipment bay.

Engineering

I have never really considered myself to be an Engineer. However being a former military pilot flying a very complex aircraft, possessing an intimate understanding of electrical, mechanical and hydraulic systems became a the basic attributes necessary for the long term survival and health preservation of the flight crew, including myself! Building model boats has further tested this basic premise in order to avoid the embarrassment of becoming the unwilling Captain of a model submarine! The engineering involved in building model boats can be quite a challenge and requires considerable research. You end up learning a lot of things you didn't know, and don't work, and only just a few things that do work. There is also some degree of truth in the old saying, "Third time's a charm." Having said all this, I also tend to be a little bit stubborn, and if somebody tells me it can't be done, stand aside and I'll make an earnest attempt to prove them otherwise, riveted copper hulls included!

Photo 15. Close-up of the finished bridge.

Of course, the two major engineering challenges in building the *Tahoe* were the construction of her hull and the building of the steam plant. However, anything is possible. It just depends upon how much time, energy and money one is willing to contribute towards

achieving the impossible! The end results will certainly turn a few heads though.

Accomplishments

Members of the San Francisco Model Yacht Club, along with members of the public, were quite generous in awarding the S.S. *Tahoe* First Place in Commercial and Best in Show at last February's Frostbite Regatta and The Bill Hayes Engineering Award for 2010 **(Photo 17**).

Now the *Tahoe* and I have only two remaining goals, to enjoy each other's company and to meet with the eight-six year old Great Grandson of Duane Bliss who originally commissioned to have the *Tahoe* built. I am led to believe Bill Bliss, who lives in Glenbrook, CA where the *Tahoe* was originally launched, wants to see the model and to show me all of the memorabilia and ships fittings his father had removed from the *Tahoe* just prior to her being scuttled in August of 1940. I'm very much looking forward to this visit sometime soon.

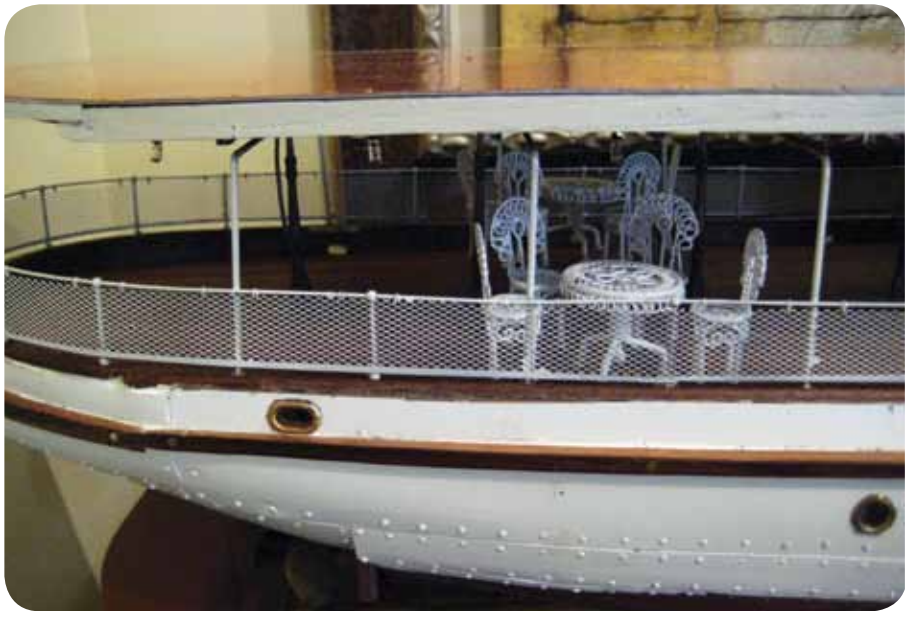

Photo 16. Close-up of the stern showing some of the deck furnishings details. The finished hull with visible rivets is also clearly visible.

Photo 17. SFMYC Commodore Robert Heacock giving the Bill Hynes Memorial Engineering Award to the author for the *Tahoe*.

Note: Photos 11, 13, 14, and 18 provided by John Linneman, a friend and master photographer.

Equipment Sources

- Drive shafts and Raboesch Props: ..... http://www.shipsnthings.com/indexS.htm
- Boiler:..... http://www.model-steam-boats.co.uk/
- Sound System: http://www.dallee.com/Boat%20Sounds.html
- Radio System: ..... http://www.harbormodels.com/
- DC to DC Converter:..... http://www.jameco.com

Photo 18. It only seemed fitting to have launched the S.S. *Tahoe* on her maiden voyage upon the clear blue waters of Lake Tahoe on June 9th, 2010, nearly 104 years after the original ship slid into the water just off Glenbrook. Picture by John Linneman, a friend and master photographer.