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# Cold Hard Steel

BY [BILL PARLATORE](#)

Heavy Metal, cold to the touch. Everything under foot feels solid, secure. A dropped platter of hors d'oeuvres shatters on impact like a fragile glass ornament, yet there's no worry about cracked gelcoat or dented teak.



Resting arms on the gunwales of a steel ship, my eyes scan the horizon, as thousands have done since the dawn of the last century. Back during a time of raw courage, when bravery was measured in buckets of cold seawater on a rolling deck, mercilessly timed between long periods of endless boredom, when hard men went to sea on ships of steel.

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Many of us began our love of boats and the sea in our youth, during the time of global and polar exploration, Jacques Cousteau and his beloved Calypso, and the war years of convoys stretching across the sea. Richard Rodgers' classic Victory at Sea, black ocean

swells rolling across the screen.



Early movies contributed their share of adventurous appeal, tramp steamers connecting exotic ports sprinkled across the Pacific, every captain a Wallace Beery bear of a man, the crew a scurvy lot of rough-and-tumble seamen. All capable hands, of course- they had to be to exist among the cutthroats and bandits-at least until the next set of sleazy dockside bars came along. Where the folklore of treasure and tattoos would abound.

Few will argue that a well-constructed steel vessel possesses immense strength. The physical properties of steel allow such boats to survive grounding, or being holed in a collision. And they are best for surviving shipboard fire.

Steel vessels are typically the most robust, the most abrasion-resistant, and are the vessel of choice if one needs to power through ice in the Bering Sea. Should a submerged container lie in wait, or the water thin out along a rocky, unfamiliar coast, there is some inherent confidence that a steel boat will be the least of the skipper's worries.

There are countless stories of steel yachts- both power and sail-surviving collisions at sea, or unexpected journeys up a beach during a storm. A tow back into deep water, followed by a haulout to inspect for damage, usually reveals scraped bottom paint...and not much else.

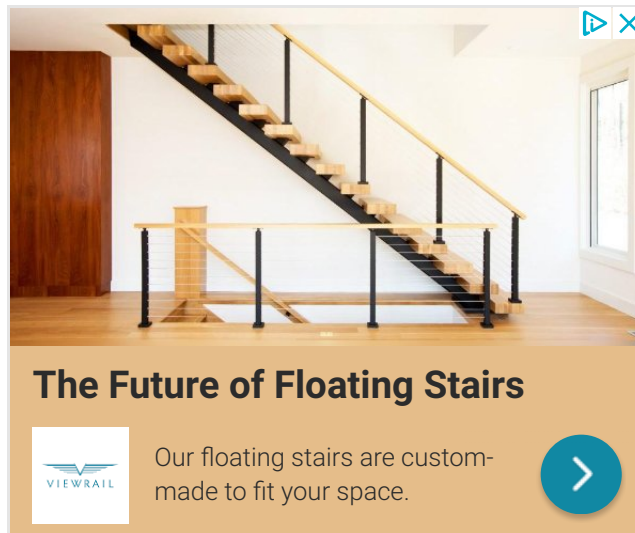
Many experienced cruisers believe owning a steel boat is like picking the biggest kid on the block for your team when choosing up sides.

With the current proliferation of competent cruising yachts, those looking for an offshore passagemaker have never had so many choices. This is particularly true with the growing availability and choices among metal boats.

Heavy metal cruisers are seemingly everywhere. And owners report they can be every bit as satisfying to own as their fiberglass sisterships.

## A Reality Check

If steel boats are so strong, especially in vessels costing as much as modern passagemakers, why haven't people flocked to them all along? Is steel really that much stronger than fiberglass, aluminum, or wood/epoxy construction?



According to Chuck Neville, a well-known designer of steel, steel/aluminum, and fiberglass cruising yachts, his specification of steel-plate thickness is driven by a yard's ability to work with the material. Being able to weld steel plate without distortion (which can lead to an ugly boat or expensive fairing), is a more important consideration for many designers than specifying plate thickness just for strength. Since it is easier for the typical boat yard to work and paint thicker plate, the results are better welds and fairer hulls, and a boat that is far stronger than otherwise required.

"A good, strong boat can be built in any material by a competent yard," Chuck told me recently. "And while it's true you'll do more damage to a fuel dock with a heavy steel boat than your average fiberglass boat," he went on, "I could design a fiberglass boat that could do just as much damage. It all boils down to designing for what you expect to hit."

Charlie Morgan, venerable designer of hundreds of sail and power boats, agrees with Chuck Neville that designing a boat to American Bureau of Ships (ABS) standards will create a strong boat, no matter what the material. Charlie recalls one steel-hulled sailboat, considered lightly built by some but to ABS standards, that successfully cruised to Cape Horn and back. Strong? Yeah, I'd say so.

Dave Gerr, another naval architect well versed in these vessels, adds that abrasion resistance and steel's fireproof qualities are other benefits of steel construction, although steel is not at the top of his list. He much prefers aluminum for metal boat construction. More on that later.



"A steel boat has much greater abrasion resistance than any other material," Dave said, "and it is fireproof. So if you plan to run up on a reef, then set your boat on fire, steel is the way to go."

Topper Hermanson, a custom boat builder in Fernandina Beach, Florida, spent 1968/1976 circumnavigating in a 26-foot wood Folkboat, a delightful little sailboat well known for its sailing and seakeeping ability.

While visiting New Zealand and Australia, Topper saw boat after steel boat, mostly

homebuilt, able to withstand repeated groundings and other abuse. He learned that Down Under sailors enjoyed their boats to the fullest, and their apparent cavalier attitude about shallow water was due to the rugged construction of their steel boats. Run out of water? Sit back and have a beer...

So impressed was he by this recurring demonstration, Topper, a trained engineer, decided his next build would be a metal one that he would build himself. Far less fragile than his wood sailboat, steel seemed ideal for Topper, who would soon have a wife and family and a higher priority on security.

Little did Topper Hermanson know that he would still be building custom metal boats 25 years later. One might say he is sold on metal.

### **Shades Of Red And Orange**



Strong, fireproof, and able to withstand grinding tidal action across a coral reef...sounds like steel is one of the best choices for hull material. So why haven't steel boats been the norm all along?

The answer to this question is simple and has been historically a big consideration when

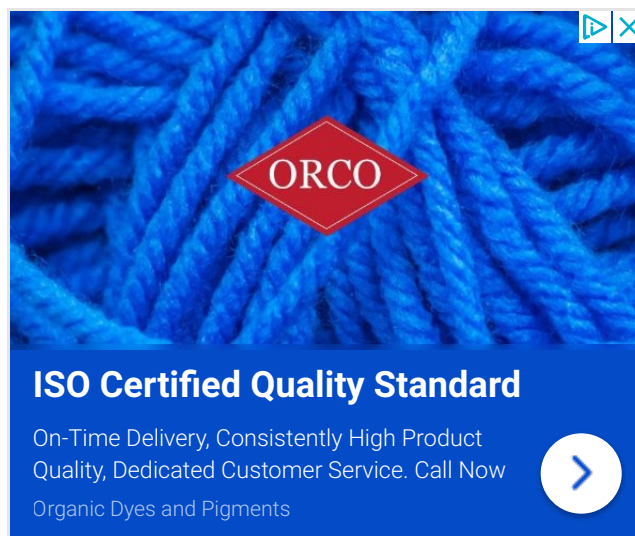
comparing steel vessels to those constructed of other materials. In a word: rust.

Travel a few miles along most waterfronts and you'll see aging boats that have seen better days. Rust weeping down the sides of tugs and other commercial workboats, deep red stains eating the boats as they sit on their moorings.

Visit any fishing community worldwide and you'll see rusting steel fishboats, although most carry on despite their affliction. Rust has long been a fact of life on steel boats, and builders used to simply make them heavier, using even thicker steel plate to accommodate a sacrificial layer of rust.

Rust is the result of steel coming into contact with oxygen, and salt accelerates the process. Left unprotected in the harsh marine environment, a steel boat, once it begins to rust, will last only as long as the pinholes and cracks hold out seawater. Most rusting hulks are destined for an eternal graveyard from which there is no return.

These two opposing factors-steel's inherent strength versus its rust potential-are at the core of any debate on steel as a boat building material. It has been so for years.



## Talking Heavy Metal

I spoke at length with Teresa and Richard Flowers of Custom Steel Boats in Merritt, North Carolina. The Flowers family has been building steel and aluminum pleasure boats since 1981, although Teresa's father, Richard Flowers, has been constructing steel tugs, ferries, and barges since 1948.

In 1994, they moved Custom Steel Boats to its present location in Merritt, just seven miles north of picturesque Oriental, a popular stop for cruisers traveling the Intracoastal Waterway.

Rodney Flowers is in charge of construction at CSB, after years of working closely with his father. Richard is still active in the business, but Rodney runs things on the floor these days.

Custom Steel Boats is a modern metal boat yard, albeit a small one, and representative of the craftsmen who create boats in metal. Despite its small size, the CSB client list is most impressive. CSB has worked with a number of designers, including Dieter Empacher, Kaufman Design, Bruce Roberts, Tom Colvin, Chuck Neville, George Buehler, Jay Benford, Bob Johnston, Eric Sponberg, Dave Gerr, Ed Fry, Charles Morgan, Woodin & Marean, and Charles Wittholz.

All told, Custom Steel Boats has built some 75 yachts in steel and aluminum since entering the pleasure boat market. And their extensive design diversity gives them some credibility in a steel discussion.





I asked the Flowerses what questions they most often hear when discussing potential projects, and why they feel steel is a good material for displacement powerboats.

### **Steel Offers Flexibility**

In custom boat building, steel has a lot going for it. For one, the process of building a unique vessel is easier to accomplish in steel than it is in fiberglass, as there is no need to create expensive tooling for hull and deck molds. This is no small consideration, as a one-off yacht project doesn't typically justify the significant time and money of extensive tooling.

A welded steel boat is actually a rigid monocoque structure-tight, strong, and able to accept any interior, or none at all. With his experience with wood boats over the years, Topper Hermanson sees no fair comparison between the rigid structure of a metal boat and the twisting and flexing of a wood boat built of thousands of individual pieces.

Steel boats also do not depend on bulkheads for structural support as in fiberglass construction, so interior layout changes are therefore easier to work into a project.

The downside of interior flexibility within a rigid hull, as Teresa Flowers was quick to point out, is that most designers don't have huge portfolios of stock plans covering

every possible arrangement, so customers wanting custom steel boats must live through the design process with designer or naval architect.



Without the expense of molds and part tooling, commercial workboat and other yards can get into the trawler market far quicker than if they were producing a fiberglass yacht. Taking a proven design, or the work of an experienced designer, and turning it into a completed steel yacht only takes about 18 months from start to finish for a world-cruising passagemaker.

It is worth repeating that the absence of precise molds allows for individual differences between boats, but that also means it is exceedingly difficult to make two identical boats from the same set of plans. As Topper Hermanson said, every steel boat is Hull #1.

This is exactly why most production boat builders are so fond of fiberglass construction, as they can produce boat after identical boat. Molds and deck tooling really pay for themselves over a production cycle.

Some other positive factors about steel: It is no small matter that steel is a familiar material worldwide, and readily available. Mild steel can be competently handled and

repaired in even the thirdest of third world countries. Not so with other materials.

The relative ease of working and welding steel speaks favorably about steel boat building. But from another perspective, this ease factor is a big reason many of us have long shunned steel boats.

The last 40 years have been witness to hundreds, if not thousands, of amateur home builders creating unsightly, one-off steel "boats" in back yards and driveways around the world. Those vessels actually completed and launched include some strikingly shoddy vessels that did nothing for the credibility and image of steel as a viable boat-building material. It is the same as how acceptance of sailing multihulls was for years tarnished by truly awful home-built examples just begging to be put out of their misery—especially those houseboat boxes made of plywood or ferrocement. Remember those? Ugh!

"The one thing I really hate about steel boats is that many were completed with very sloppy construction," Chuck Neville stated. "They look awful and give a bad name to steel. Truth is that a well-done steel boat is essentially unrecognizable from a fiberglass yacht."

### **What About Rust...And Maintenance?**

When asked about rust, Teresa Flowers told me there are two words that spell the difference between long-lived cruising yachts and those that don't make it: coatings and technique.

Coatings have come a long way since the early 1960s. Before that time, buying a steel boat was a potluck affair, as technology just did not exist to bond dissimilar metals properly or coat them adequately with durable finishes. Chipping away rust and endless paint schedules insured a solid relationship with the maintenance yard.

As a result, many older steel boats require an inordinate amount of attention to get protected and stay that way.

Steel vessels built in the 1960s and 1970s were coated with zinc primers, products still used today on many commercial and pleasure boats. The top paint coating of protection, however, produced a cosmetic appearance near a workboat finish, or required repainting somewhat frequently.

Around 1975, epoxy coating systems became better understood, and epoxy technology slowly made its way into boat yards. New epoxy coating systems proved to be a vastly superior surface coating if applied properly to a wellprepared surface.

But epoxy coating systems are just one element of the total solution. When I asked the Flowerses about rust and its maintenance, I was informed that a new steel boat, correctly fabricated from precut and preprimed steel, then properly painted with an epoxy coating system, will offer its owner no more maintenance than a similar-size vessel built in fiberglass. Period.

That's quite a statement, but one backed by two generations' experience with steel construction. Let's look at this in detail to better understand what this all means.

## **Computers Make A Difference**

Boat design, and all aspects of naval architecture, have benefited from computers and their software, especially programs written for computer-aided design (CAD) and engineering.

Charlie Morgan applauds the latest computers and CAD software that help the design and performance-prediction process. Exhaustive testing and modeling is now available to the designer to work out shapes, trim, and stability. A designer can optimize the parameters of a design without requiring months of tank testing, costing thousands of

dollars.

For a metal boat project, the computer-enlightened designer can draw frames, beams, stringers, hull and deck plates, and other parts right on the computer. Every piece used in building a boat can be identified, numbered, and included in the boat's plans.

When final design work is complete, the individual pieces can then be moved around in another program, as in some enormous puzzle, to fit as many individual parts as possible onto the fewest number of sheets of steel. Computer nesting of frames and all other steel parts is a remarkable achievement that minimizes waste.

Custom Steel Boats has had great success with DNC of Mobile, Alabama, a company that takes a designer's final plans and creates the computer files used by the steel company to precut the steel. Even the order in which parts are needed to assemble the boat is considered.

A growing number of steel companies use these files in computer-controlled cutting equipment to cut out the individual pieces on the nested sheets before shipment. The use of computer control results in very accurate, very precise tolerances, and getting all steel precut before delivery to the boat yard greatly aids construction time, alignment, and the ultimate accuracy of the project.

When the flat-bed truck arrives at the yard, its trailer is loaded with numbered, preblasted, and preprimed steel parts. One might say the boat is already under construction.

And the amount of steel waste left over from the nesting process is simply amazing. Richard Flowers recalls his last 60-footer was completed with only enough scrap to fill two 55-gallon drums, which were later shipped back to the steel company for recycling.

The development of a proper preprimer was another big step forward in metal boat

building. The coating is a weldable primer, which means its zinc-rich chemical formulation resists the intense heat from welding. Only a small amount of preprimer is burned off as steel is welded together-most of the steel remains primed and protected.

So successful is the use of weldable primer on precut steel that power washing is now the prescribed post-welding treatment to remove grit and oils.

This is quite a departure from the days of delivery trucks loaded with rusting sheets of steel-which continued to rust through the months of boat building. Metal boat yards looked more like junk yards than boat yards, with piles of rusting scrap everywhere.

Yard workers cut each piece by hand, bending and shaping it to fit the dimensions in the plans, one piece at a time.

It was a slow and timeconsuming process.

But Topper Hermanson warns that those considering purchase of a precut steel boat "kit" should not assume perfection. It takes a lot of work to get the puzzle right, and Topper knows more than one unhappy person with a precut kit where not all pieces fit as intended. If the laborintensive planning that goes into precutting work is not done right (which is why there are specialty companies like DNC of Mobile), the owner is left with a lot of steel pieces-a jigsaw puzzle without a solution.

This reiterates the need to use reputable builders and designers who know the right suppliers for the materials.

## **Coat That Barge**

After welds are power washed, and perhaps spot sandblasted to clean up any steel surface that may have weathered, the yard next sprays on high-build epoxy paint, the chief component of the surface protection.

Custom Steel Boats uses Devco or International Paint products for all its commercial boats, and boats completed to a commercial finish. Interlux and U.S. Paint systems are used for final yacht finishes.

As Teresa Flowers explained, commercial painting systems are less expensive, but form a rugged-looking, extremely durable finish that lasts a long time. For boats without much need for fairing to smooth out welds and seams, the commercial system is the way to go. (For boats that Wallace Beery would love.)

Yacht-finish paint systems are specified when the project calls for fairing the hull smooth, an expensive and laborious job that eliminates all rough surfaces and wavy lines. A flawless, mirror-like finish is the goal. ]

In both applications, three or four coats of epoxy are applied over zinc-primed steel.

I asked why we sometimes see small, weeping rust stains on new steel boats, often just weeks after a new boat is launched. Teresa told me such defects result when small areas and joints are not thoroughly sandblasted, and insufficient epoxy applied to build up the protective coating, letting oxygen reach the steel.

Inattentive or imperfect welding often leaves small dimples or pinholes along a seam or joint, which are perfect places for developing rust. Once noticed, however, the dimples can be properly cleaned and coated with epoxy paint, and oxidation halted.

I also learned that it is not necessary, beyond the requirement for a watertight hull, to weld every inch of a seam or joint, as a full-length weld may actually distort the steel due to the considerable heat generated by welding. But if the yard uses preprimed plate, which is even primed on the edges, such gaps along a seam are of no concern.

Just to be on the safe side, the Flowerses feel it's best to run a bead of caulk along these seams, to encapsulate the primed steel edges and any dimples that may exist.

It is easy to see how such attention to detail goes a long way toward making ownership of a steel boat a true love affair. This kind of construction isn't cheap, though, and buyers choosing steel because they believe it to be a cheap alternative are just asking for future trouble. Cheap construction pricing eliminates extra measures of prevention and virtually guarantees future maintenance issues.

"A properly built hull, with proper sand blasting, zinc priming, and epoxy coating," Topper Hermanson told me, "will last the owners' lifetime, and that of their children."

### **Simple By Design**

Another outstanding way to avoid future problems is to design them away. Simply put, it is better to design a boat so that its shape and structural members do not create hidden seams and blind corners.

A perfect example of this might be the bulwarks along a side deck. I've seen some older boats with intricate frames running up from the deck to underneath cap rails, and the curved upper seams are totally inaccessible. It is hard to imagine that a proper coating of primer and paint could have been applied initially, let alone the ability to manage rust as it develops over the next 40 years.

A simpler bulwark design would eliminate these hidden corners and pockets that either trap water or hide rust.

Richard Flowers told me it is critical to "eliminate rust pockets by design and actual construction. Don't give rust a chance to start."

This is a good reason for using stainless steel in areas of potential chafe, such as hawse pipes, bollards, and rubrails. Chafe means thinner paint protection, and rust won't be far behind... In addition to designing out potential



problems, Topper said that is a chief reason why he prefers to use aluminum in any area of the boat that will be altered by the owners.

"Preservation of the steel comes down to how well builders protect it from owners drilling holes in the boat for mounting equipment," Topper told me, "and especially when they don't thoroughly clean up all metal shavings."

Owners have a responsibility here as well.

## **Interior Considerations**

What about rust prevention on a steel boat's interior?

"At Custom Steel Boats," Teresa answered, "we build the interior as we do on the outside, including one good coat of epoxy (with an extra coat in the bilge), then we spray foam insulation throughout the interior, everywhere except the bilges."

Why only one coat of paint? Turns out that when several layers of paint are put over primed steel, the foam tends to adhere to the paint, not the steel it is supposed to be protecting and insulating from sound, heat, and vibration.

Foam insulation is applied in enough quantity to build up thickness to that of the longitudinal frames, on which wood stringers have already been attached for later construction of the interior. These wood strips are fastened prior to foaming so no holes will be drilled into protected steel, compromising the rust prevention effort.

Properly applied, closed cell foam covers every inch of the primed steel interior, which should last indefinitely. (Foam is not used in the bilges because any water coming into the bilge would be hidden.)

Interior primer protection will last indefinitely, or until it is drilled through, burned off,

or scraped off.

In Topper's experience, it is in the bilge that a problem will occur-if there will be one. He recommends owners keep the bilge clean and give it a fresh coat of paint every 10 years . If done religiously, there won't be a problem.

How long-lasting is a topquality, exterior paint system? Figure 10/20 years between new top coats of paint, according to the Flowerses, which is not much different than a fiberglass yacht.

It is not the hull that requires the most maintenance, says Topper Hermanson. It is around the hatches, exterior lockers, and curving sides, as around the pilothouse windows. Those are the hardest to protect, which is yet another reason he likes to build steel boats with aluminum deck structures. Hulls are easy to protect, corners and curves are not.

### **Steel Lacks Design Flexibility?**

From his experience, Dave Gerr finds three things that keep steel from being his material of choice. Steel is heavy, making it best suited for full displacement vessels. Gerr doesn't particularly like to design heavy boats, finding lighter vessels require less horsepower to reach their cruising speed.

He also thinks steel limits the shape possibilities somewhat, which, for a designer, is seen as an unwanted obstacle. And then there is the rust issue. Dave Gerr is adamant that both designer and builder must really understand whatever material is chosen to best fit it to the application.

Chuck Neville admits to the extra weight of steel, but finds it fits well with the heavy displacement, passagemaking boats he designs these days.

Neville and Gerr both state they tend to be more conservative when designing shapes in steel, avoiding elaborate curves and lines that test the ingenuity and skill of the yard. Chuck adds that such conservative designing actually fits well with designing traditionally styled boats.

But we're not talking about straight-sided barges here. "I don't like metal boats that look like steel boats," Chuck commented. "I like it when you can walk down the dock and not particularly notice that it is a steel boat.

"It may cost a little more to get the right shape, as in a flared bow, but that isn't usually cost prohibitive in the scope of the total project, either."

### **What Does It All Cost?**

How much does a steel boat cost? I'm told it is important to compare apples to apples in such a discussion, and remember that the great level of customization in a steel boat makes it somewhat difficult to compare a price with that of a production fiberglass boat.

However, the Flowerses feel strongly that a custom steel boat can be priced about the same as a similarly equipped fiberglass boat.

The perception that steel boats are cheap still frustrates quality steel builders and designers. Decades ago, books were written extolling the virtues of primitive boats built in primitive locations by inexperienced people. It remains a difficult task to erase such views, especially with respect to experienced yacht builders using modern materials and techniques.

What about the used market? Any bargains to keep an eye on? Do steel yachts retain their value when compared to fiberglass yachts?

A steel yacht built today, designed by a reputable designer and professionally built and

outfitted, will retain its value over the years. It should compare favorably, in the future, with a custom fiberglass boat of similar proportions and equipment.

But there is more to this than simple resale value, according to Topper Hermanson.

"People don't buy a steel boat to sit in a marina," Topper said. "They buy it to use it.

"Resale value is less of a concern for a steel boat owner, I imagine. In my experience, people keep them a long time."

Some shapes are better suited for steel construction, and some architects are more comfortable with the material. A number of factors determine the long-term value of a new custom yacht, but the simple fact that it is steel is less meaningful than it once was.

Design and quality of construction are more important. And ongoing maintenance must figure into any discussion of value, no matter what the material.

"Haul the boat once a year for normal maintenance," boat builder Topper Hermanson insists. "Then every 10 years, sandblast the bottom to white metal. Then start over with a proper paint regimen.

"Do this, and you'll be a happy steel boat owner, sailing around on the strongest thing we can build."

### **Summing Up Steel...For Now**

Steel boats are not new, but much of the reality surrounding them is. Today there are better design and construction techniques, better coatings, and higher levels of technology in all areas of construction.

I'm not done yet, though. I think we ought to delve into the wizardry of paints and coatings. And a look at steel boats from around the world might also be informative.

For some, a steel hull represents insurance against our fear of the unknown. And to some extent that may be true. But don't think for a second that there is anything negative about fiberglass, aluminum, or wood. Each has proven to result in seaworthy, capable boats, every bit as competent for cruising the bay...or the world.

My friend Capt. Mike Efford loves steel boats, and spends as much time as he can cruising the East Coast on his 65-foot Mi-T-Mo, a converted Army T-boat. This Maryland senior docking pilot is no stranger to steel ships, tugs, and men. He's been around them his entire life.

A big bear of a man, his hearty laugh is always companion to his advice to stop being distracted by the latest gizmos and electronics. A steel boat and compass is all he needs. The rest is just fluff.

I've seen Capt. Efford reduce a crowd to tears of laughter from his real-life tales of onboard adventures and commercial traffic shenanigans. The man's a real character, but as hard and competent as the boats and ships he runs.

Come to think of it, perhaps the salty characters and Beery movie images are still quite alive-as is the seduction and allure of cold, hard steel.



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