

❁ BELLE OF LOUISVILLE ❁

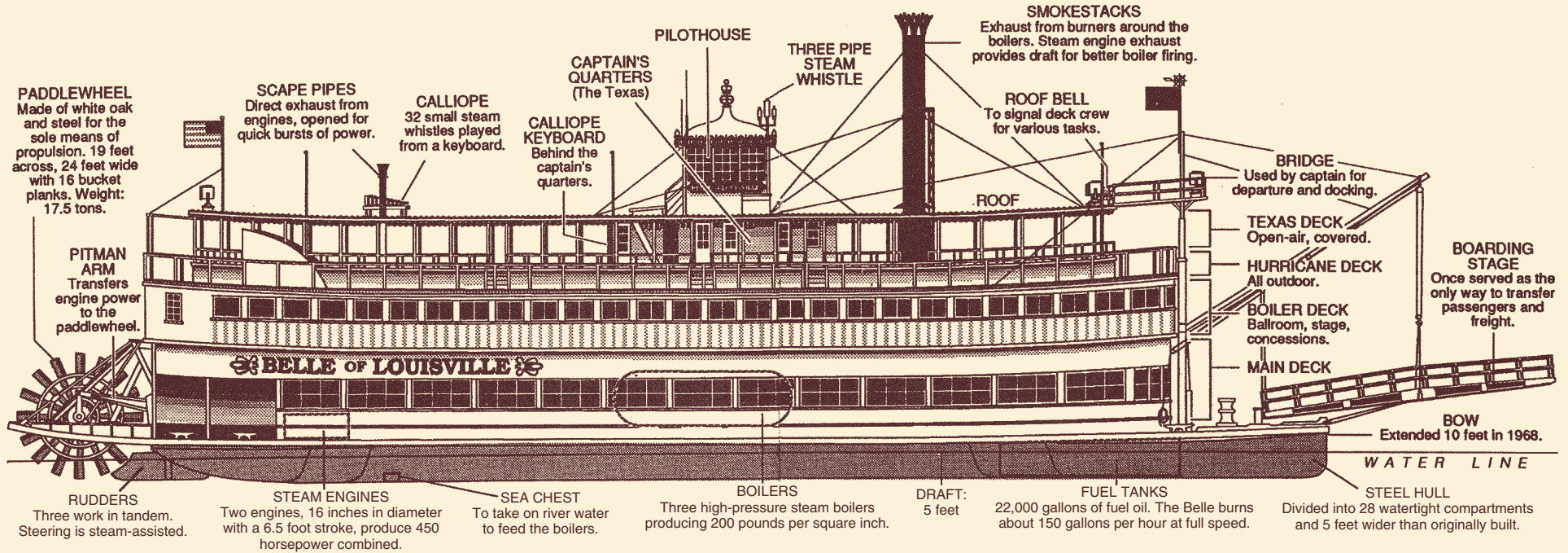


**Historic Mechanical
Engineering Landmark**

Louisville, Kentucky

23 April 2010





THE STEAMBOAT - BELLE OF LOUISVILLE

The *Belle of Louisville* represents a significant historical treasure to the field of mechanical engineering. This still active steamboat contributes greatly to a heritage, which could otherwise be lost, of the days when this country was young and expanding within its own frontiers. The fact that she has been in-service for 95 years is the result of her builder's willingness to embrace new technologies in 1914 and 1915.

THE HISTORY AND HERITAGE PROGRAM OF ASME

The History and Heritage Landmarks Program of ASME (the American Society of Mechanical Engineers) began in 1971. To implement and achieve its goals, ASME formed a History and Heritage Committee initially composed of mechanical engineers, historians of technology and the curator of mechanical engineering at the Smithsonian Institution, Washington, D.C. The History and Heritage Committee provides a public service by examining, noting, recording and acknowledging mechanical engineering achievements of particular significance. This Committee is part of ASME's Center for Public Awareness. For further information, please contact Public Awareness at ASME, Three Park Avenue, New York, NY 10016-5990, 1-212-591-7020 and <http://www.asme.org/history>.

Since the History and Heritage Program began in 1971, nearly 250 landmarks have been designated as historic mechanical engineering landmarks, heritage collections or heritage sites. Each represents a progressive step in the evolution of mechanical engineering and its significance to society in general. Site designations note an event or development of clear historic importance to mechanical engineers. Collections mark the contributions of a number of objects with special significance to the historical development of mechanical engineering.

The Landmarks Program illuminates our technological heritage and encourages the preservation of the physical remains of historically important works. It provides an annotated roster for engineers, students, educators, historians and travelers. It helps establish persistent reminders of where we have been and where we are going along the divergent paths of discovery.

ASME helps the global engineering community develop solutions to real world challenges. Founded in 1880 as the American Society of Mechanical Engineers, ASME is a not-for-profit professional organization that enables collaboration, knowledge sharing and skill development across all engineering disciplines, while promoting the vital role of the engineer in society. ASME codes and standards, publications, conferences, continuing education and professional development programs provide a foundation for advancing technical knowledge and a safer world.

HISTORIC MECHANICAL ENGINEERING LANDMARK

STEAMBOAT *BELLE OF LOUISVILLE*

1914

THE *BELLE OF LOUISVILLE* IS THE OLDEST OPERATING "WESTERN RIVERS" STEAMBOAT. BUILT AS THE *IDLEWILD* BY JAMES REES & SONS OF PITTSBURGH, IT HAS THE SHALLOW-DRAFT FLAT-BOTTOM HULL BRACED BY HOG-CHAIN TRUSSES, MULTIPLE FIRE-TUBE BOILERS, PADDLEWHEEL PROPULSION, AND SUPERSTRUCTURE CONFIGURATION THAT WERE CHARACTERISTIC OF HUNDREDS OF STEAMBOATS THAT PLIED AMERICA'S RIVERS DURING THE 19TH AND 20TH CENTURIES.

THE TWO-CYLINDER 450-HP ENGINE TURNS A 19-FOOT-DIAMETER, 24-FOOT-WIDE STERN PADDLEWHEEL. DATING FROM ABOUT 1890, THE ENGINE WAS TRANSFERRED FROM AN UNKNOWN BOAT TO THE *IDLEWILD*, A COMMON PRACTICE AT THE TIME. A TYPICAL WESTERN RIVERS NON-CONDENSING ENGINE, IT FEATURES A LONG STROKE AND POPPET VALVES WITH ADJUSTABLE CUTOFF.



THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS 2010



There's no finer way to tell that you are in the presence of a lady than to hear the cheerful song from her calliope. You can search high and low for a more beloved symbol of Louisville, but you'll never find one. She's a proud steamboat steeped in history and fueled by our own imaginations. Welcome to our own beloved river queen, the Belle of Louisville.

The Belle's calliope being played by E. J. Quinby.

INTRODUCTION

In 1811, four years after Robert Fulton built the *Clermont*, the world's first successful steamboat, Nicholas Roosevelt built the *New Orleans* at Pittsburgh, Pennsylvania. Proceeding down the Ohio and Mississippi Rivers to her namesake city, she attracted much publicity and attention along the way. As the cotton gin signified the beginning of the Industrial Revolution, the advent of this steamboat or steam propulsion on the western rivers, initiated a revolution which changed the pattern of commerce on the rivers of North America. This new pattern of commerce opened new areas for prosperity and trade growth. In short, steamboats provided convenient, inexpensive transportation which greatly facilitated the opening of the continent to settlement.



New Orleans replica in 1911.

HISTORY

The *New Orleans*, and the boats which were built on her pattern, were powered versions of canal boats. Their long, narrow, deep hulls were better suited to deep eastern rivers than the shallow Mississippi, but were needed to support heavy steam machinery. Another type of boat was required, but several design problems faced steamboat development before they could claim success on western rivers.

To navigate on the shallow rivers of the West, steamboat hulls and machinery had to become as light in weight as possible. Machinery weight problems were solved first. For example, a lightweight, high-pressure engine was employed to propel a small boat, named *Comet*, in 1813. The powerplant was further refined in 1816 by Henry Shreve, who placed the boilers on deck and designed a new type of engine to distribute machinery weights over a large area of hull. Shreve's new engine design used a double-acting, horizontal, high-pressure engine to drive the paddlewheel. The second design problem was overcome over time. Lightweight hull construction gradually replaced earlier robust "canal boat" construction and a broad, shallow-draft hull form using a truss rod system or "hog-chain" rather than heavy wooden beams, was developed.

To succeed in business, these lightly built boats had to carry a large amount of freight and many passengers. In answer to this requirement guards were built out from each side of the hull to extend the deck area. Sponsons were also used to aid in support of the paddle boxes. Superstructures were extended two decks above the main deck, which was commonly the boiler deck, to support passenger cabins.

By 1834 all of the essential elements of the Western Rivers steamboat were present. Broad, shallow-draft boats with boiler and engines on deck, side or sternwheels for propulsion, and cabins built on lightweight decks above the freight and machinery laden main deck soon appeared on every tributary of the Mississippi. The ease and economy of this service caused the value of goods reaching New Orleans to double every ten years from 1820 to 1860.

SAFETY AS A CONCERN

After the explosion on *Sultana* in 1865, a cardinal concern in the development of Western River steamboats was safety. Early boats were particularly susceptible to boiler explosions, fires, and sinkings caused by hitting hidden snags. Extraordinary dangers included being damaged in floods, tornadoes, and ice packs. All this brought the estimated lifetime of a steamboat in the 1840's and 1850's to less than five years. This life expectancy changed very slowly.

Government intervention forced builders and operators of steamboats to become more conscious of safety considerations in a way that commercial motivations simply could not. In 1838, Congress responded to the need for increased safety aboard steamboats when it passed an act requiring the inspection of all steamboats. In 1851, six steamboat disasters took more than 700 lives and caused Congress to tighten these safety regulations. The Steamboat Inspection Act of 1852 set standards for both boats and operators and created a system of Federal inspection to oversee them.

Hazards to navigation did not deter business and new boats were built to replace those lost to the various accidents. A substantial salvage business grew up in consequence, and parts produced for one steamboat, especially the engine, might be reused on a succession of later boats.

As time progressed, steamboat designs diversified to meet the needs of the various trades and expanding routes. Features which were an advantage to a particular trade or route were accentuated in the vessels built for it. For example, passenger vessels required high speed and "high-class" accommodations, while ferries called for wide stable hulls. Package freighters needed dependable engines and robust construction since they carried heavy cargo on deck. For some services speed was of paramount importance, even surpassing safety concerns. Those faster boats required fine lines, powerful engines, and multiple boilers to supply plenty of steam.

Tributary rivers with little depth, such as the Missouri and the upper regions of other rivers, required boats with exceptionally shallow draft. To operate in such shallow water, steamboats sacrificed all unnecessary weight and settled for minimal superstructures. The *Bertrand*, which sank in 1865 on the Missouri River, drew only 18 inches when light.



Idlewild during construction at Rees yard.



Safety First on the Idlewild pilothouse.

The era of the steamboat began to decline immediately after World War II. The diesel engine, with its size, weight and economy advantages became the standard for river transport propulsion. The better channel maintenance along the rivers has also allowed use of propellers.

CONSTRUCTION AND CAREER OF THE BELLE OF LOUISVILLE

The West Memphis Packet Company ordered a new steamboat from the yard of James Rees and Sons in Pittsburgh, Pennsylvania in 1914. This new steamboat was to serve as a day packet, excursion boat, and ferry.

The builder, James Rees and Sons Company, was founded by James Rees in 1845 and incorporated in 1895. They were designers, contractors and builders of iron and steel hull freight and passenger steamers, tugboats, dredgeboats, towboats and barges for inland waters.



Idlewild going through ice.

They specialized in light draft river steamers of every description, being the pioneers of the “knockdown” galvanized steel hull watertight compartment, and composite steamers for foreign trades. They used either high pressure or compound condensing engines of any type or design desired by the customer.

The new steamboat was christened *Idlewild* on October 18, 1914, as she was launched from the Rees yard on the banks of the Allegheny River. She was completed early in 1915 allowing her to depart for her first homeport, Memphis, on January 8, 1915.

Solidly built with a steel hull and iron superstructure, instead of wood, the *Idlewild* was less susceptible to destruction by ice. This rugged construction is one reason she has survived for so long.

Drawing only 5 feet of water, she was able to travel virtually every navigable waterway. With the motto “Safety First” proudly emblazoned under her name on the pilothouse, *Idlewild* primarily served as a ferry between Memphis and Hopefield Point, Arkansas. She could only carry a small

number of vehicles on her restricted foredeck and alongside her boilers. However, on excursion trips the Steamboat Inspection Service allowed her to carry up to 1,600 passengers.

The company changed the schedule to allow *Idlewild* to substitute for the well known *Kate Adams*. The ferry business at Memphis ended when a bridge joined the shores she served and *Idlewild* was sold on November 7, 1925 to the Tri-State Ferry Company of Cairo, Illinois. They used her for ferry service between Cairo and Bird’s Point, Missouri. Tri-State then sent their new boat to St. Louis the next season for work on the upper Mississippi and Illinois rivers.

As a day packet her decks were laden with bales of cotton, barrels and crates of farm, household, and construction goods, lumber, and sacks of grain. However, in the 1920’s, when all-weather road surfaces paved the way for an infant trucking industry the demand for packet boats declined sharply.

By 1928, this ferry route and the packet trade had dried up, and the excursion business was not enough so *Idlewild* was sold to the New St. Louis and Calhoun Packet Company of Hardin, Illinois. The new owners ran *Idlewild* mainly on the Ohio carrying excursion parties and occasionally produce. In 1931, she was chartered to the Rose Island Company where she spent that season running trips from Louisville to Fontaine Ferry Amusement Park and Rose Island, about 14 miles upriver from Louisville.

The early 1930’s brought hard times to the river. Versatility was required to survive, and *Idlewild’s* owners turned to barge towing contracts to supplant the rare excursion cruise business. The Second World War brought more towing contracts moving oil to various locations along the Mississippi and Ohio Rivers.

In April 1947 *Idlewild* was sold to J. Herod Gorsage of Peoria, Illinois. He renamed her *Avalon* in February, 1948 to grant the death-bed wish of his good friend, Captain Ben Winters, who had worked on a previous steamboat bearing that name. Mr. Gorsage sent *Avalon* tramping for excursion business west to Omaha, Nebraska, south to New Orleans, north to Stillwater, Minnesota, and Joliet, Illinois, and east to Charleston, West Virginia, and Knoxville, Tennessee.

Mr. Gorsage sold *Avalon* in 1950 to E. A. Meyer of Cincinnati, who ran her under an operating company, Steamer Avalon, Inc. This company operated *Avalon* on the same sort of strenuous



The Avalon docked at Pittsburgh in 1958.

tramping excursion trips as had Mr. Gorsage, and they made several improvements to make the boat more attractive and comfortable to passengers. These included a 33 by 96 foot maple dance floor and enclosing the main and boiler decks to allow a longer operating season. The stacks were shortened about ten feet and the pilothouse dome was removed to allow passage beneath low bridges up the head waters of rivers in 17 states.

Further modifications allowed *Avalon* to operate as the last tramp excursion boat in the 1950's. In 1953 the Texas deck was shortened 30 feet to eliminate unneeded topside weight. The boilers were switched from coal to fuel oil in the same year. Sponsons were added to the hull to offset the added weight from enclosing the topsides by increasing the buoyancy and stability.

Ultimately, financial difficulties forced the Steamer Avalon, Inc. company to turn the boat over to a printing company which was the major creditor and the boat was laid up for the winter. Her first mate at that time was Captain Clarke "Doc" Hawley. He hired an engine room hand "from his own pocket" to drain the pipes and boilers. This action probably saved the machinery from serious damage during the winter freeze. The company filed bankruptcy proceedings in February 1962 and *Avalon* was sold at auction, May 24, 1962.

The purchaser was Judge Marlow Cook, for Jefferson County Fiscal Court, who bought her over the objections of some taxpayers. Jefferson County now owned an expensive steamboat in need of work. However, with financial help from the City of Louisville, *Avalon* was put back into service.

April 30, 1963 marked the beginning of a new tradition as the *Belle of Louisville* faced off against the *Delta Queen* in the now renowned Kentucky Derby Festival. During this first of many races the *Belle* lost as "Goodbye Little Girl Goodbye" played on her calliope. In the years since the coveted trophy of golden elkhorns has been evenly awarded between the two vessels, with the tremendous hoopla which surrounds the event.

Today, as the *Belle of Louisville*, a National Historic Landmark is now owned by the Louisville Metro Government and in 2005 was assigned to be operated by the Metro's Waterfront Development Agency. The steamboat plays an important part in the cultural and historical heritage of the City of Louisville and the entire region, where she is regarded with a particular affection.



Auction sale notice for Avalon.



Construction on the Idlewild.

TECHNICAL EQUIPMENT AND DESCRIPTION

The *Belle of Louisville* is a steel, steam powered, sternwheel-propelled day packet and excursion boat. The superstructure is built of wood and the hull is supported by a hogging truss system in the traditional manner of western rivers steamboats. The *Belle of Louisville's* sternwheel is propelled by a pair of single cylinder, non-condensing, reciprocating steam engines.

HULL

The boat's hull was originally built from steel plates, double riveted to steel frames. She measured 157.5 feet long, 36 feet at the beam, and 5 feet depth of hold. The hull was fitted with a bluff, full bow, a flat bottom with no external keel, and a tucked-up run to the stern with rounded indentations to clear the three rudders. The *Belle* was modified in 1953 to reduce her draft by adding bilge sponsons along most of her length. In 1968 an additional 10 feet



Lowering the gangplank on Avalon.

A double, steam-powered capstan is set in the middle of the foredeck. The single mast, which is mounted along the centerline, supports a boom and landing stage (gangway). Two large sliding doors, to port and starboard, provide access to the interior. A ticket booth stands inside between the doors, opposite the main stairway to the boiler deck.

BOILERS

The boiler room occupies the forward half of the main deck, behind partitions to port and starboard of the boilers. The three boilers are connected by a single mud drum below and a single steam drum above. Each cylindrical boiler is manually fired from the front with No. 4 fuel oil, atomized by a compressed air blower when starting cold, or by a steam jet when hot. The fire passes beneath the water to the back of the boiler and returns through flues to the front. Exhaust gasses then pass through uptakes above the firebox, and exit the boat through two smokestacks. Steam produced by the boilers is extracted from the steam drum and passes through the main steam line overhead to the engine room. The entire assembly is covered by a sheet steel jacket over the refractory material covering the boilers.

The current boilers are at least the fifth set fitted to the *Belle*. She was first fitted with three return-flue boilers, forty-four inches in diameter and twenty-four feet long. They were rated for 157 psi. The second set of boilers, were replaced in 1938, in Paducah, Kentucky with three similar boilers from the famous overnight packet *Gordon C. Greene* in 1954. They were rated for 200 psi. A fourth set replaced these in 1965.

These were not of a traditional river pattern but were instead a pair of fintube boilers intended to increase her speed for the annual races with the *Delta Queen*. Ultimately these boilers did not significantly add to her speed (she lost again). They were not powerful enough and deteriorated rapidly. The fintube boilers were replaced in 1968 with the

of length was added forward to fair out the bow and smooth the transition with the bilge sponsons. Internally, The *Belle* is divided into 28 watertight compartments by the two side keelsons and several athwartships bulkheads.

Like most western rivers steamboats, the *Belle's* hull is supported by a truss system, which in effect makes the hull one large girder. Two rows of vertical I-beams rise from the side keelsons (parallel to the center keelson) that are tied to the hull and to each other by truss rods. These allow the buoyancy of the entire hull to support the weight of heavy fittings, such as the engines and boilers.

SUPERSTRUCTURE

The superstructure consists of three decks: the main deck, on which the propulsion machinery is located; the boiler deck above the boilers; and the Texas deck with pilothouse atop. Originally the *Idlewild* was built with an open main deck except for the aft engine room. The removable bull rails between stanchions were replaced with steel panels and glass in 1953. Stanchions and framing for the boiler deck are built of steel. Stanchions, decks and bulkheads of the upper decks are built of wood with steel truss-rod reinforcement.

The main deck has an open foredeck which extends aft to the curved front of the superstructure. A



Lowering new boilers into position on the Belle of Louisville.

boilers still in use. The current boilers are very similar to the original boilers installed in 1914 and include many fittings from retired steamboats. They are rated for pressures of up to 200 psi by their latest inspection permit.

Three types of instruments indicate the level of water in the boilers. The oldest method, now obsolete, was a vertical row of three small spigots, called test cocks, set into the back of each boiler. The water level was found by opening each one briefly to see whether steam or water comes out. The second, a Vanduzen gauge, a clock-face gauge, activated by a float inside the center boiler. The third type of water level indicator is a sight glass through which the water level can be viewed. The redundancy of water level indicators assures that the water will not be allowed to drop low enough to damage the boilers.

The passageways outboard of the boilers are lined with storage and shop compartments. It is believed wooden compartments were added in the 1930's when the *Belle* began making extensive excursion trips. These were replaced with the current steel construction in 1954. The last two side compartments aft extend beyond the rear of the boilers. Passengers can walk from the bow aft to the engine room by way of either the port or starboard passageways. From the engine room they can ascend to the deck above on the stairways at the stern bulkhead.

ENGINE ROOM

The engine room occupies the entire width of the stern. It contains the engine, rudder linkage, auxiliary machinery, and engine controls. The engines are mounted to port and starboard on large structural members called cylinder timbers. The cylinder timbers support the cylinders and crossheads at their forward ends and the paddlewheel shaft at the after end.

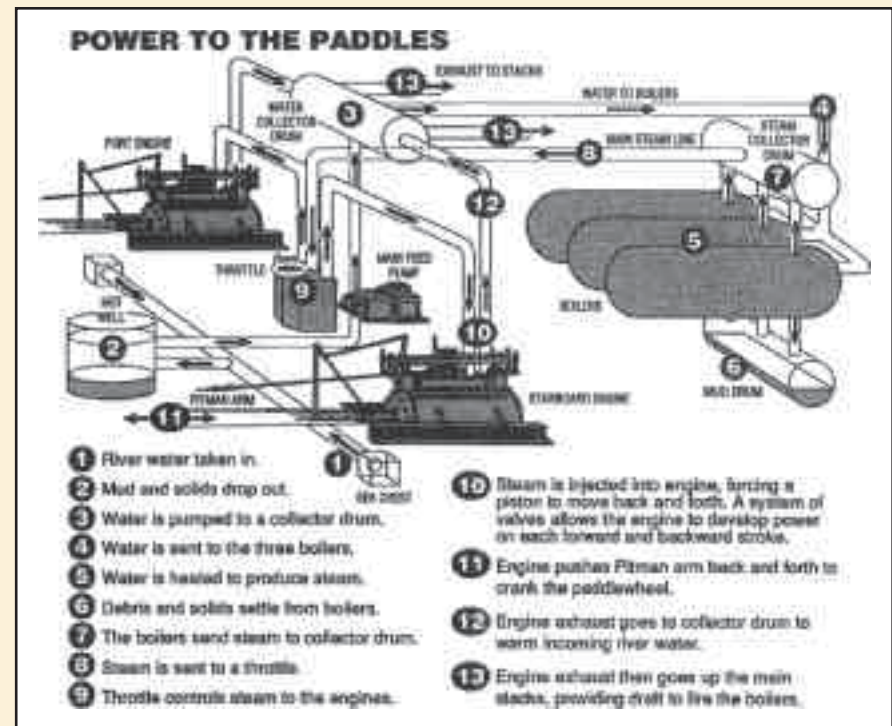
The engines were transferred from another steamer to *Idlewild* when she was built. The name of the steamboat or steamboats that used the engines prior to the *Belle* is unknown, but the engines were often reused on new boats and these engines could have powered several boats prior to the *Belle*.



Brass engine nameplate from James Rees & Sons.

The date when they were built can be established by reference to the head brasses from the cylinder which spell the city of manufacture, "Pittsburg." The spelling which omitted the "H" was used officially between 1890 and 1911. Those twenty years are believed to be the time when these engines were built.

The engines are high-pressure, poppet-valve engines equipped with Rees-patent adjustable or variable cut-off and inside cam motion. The cam turns inside a frame as the pitman arm turns the paddlewheel, and converts the motion to linear to-and-fro motion.



Port side engine.



The "Doctor" pump currently in storage.

This motion operates the valve gear which admits steam to the cylinders. The pistons push a heavy crosshead along a slide attached atop the cylinder timbers. The crosshead pushes and pulls the pitman which turns the crank and thus the paddlewheel. The cylinders are 16 inches in diameter and have a stroke of 6 ½ feet. The engines develop a combined 450 Indicated Horse Power.

The paddlewheel, constructed of 17.5 tons of steel and white oak, is mounted at the stern, which propels the boat. It is 19 feet in diameter and 24 feet wide. Six flanges, each holding sixteen arms, are evenly spaced along the paddleshaft. The arms are all braced by steel circles and blocking. Each arm and flange assembly forms one segment of the entire paddlewheel. Bucket planks are attached to the end of the arms on each segment to actually push the boat.

A number of auxiliary steam engines power various pumps and generators. The *Belle* does not use any gasoline engines in regular service, though she does possess a diesel generator as a primary source for electrical power. Four double-acting, duplex pumps handle all regular pumping duties and a large overhead-beam pumping engine called a "doctor" was removed after the near sinking in favor of a 50 HP electric fire pump. The steam pumps are all located between the engine cylinders as is the single steam turbine electrical generator, which provides electrical power.

All engine room controls are located aft of the generators between the cylinders. Orders were once sent to the engine room through a system of bells, today still connected to the pilothouse, guided the engineer on duty as to what speed and direction was desired. Since 1953 a "telegraph system," consisting of a circle resembling a clock face and an indicator is now employed. There must be a chief engineer and a striker on duty in the engine room and a fireman in the boiler room when the *Belle* is under steam.

The steering is controlled from the pilothouse, by a wheel and levers which operate a steam ram. Much of the multiple rudder system is located in the engine room. Cables from the pilothouse run through the superstructure and over sheaves at each side of the engine room to the long central tiller at the rear of the boat. This central tiller arm is yoked to two other rudders for additional control in maneuvering. *Belle* is unusual among modern boats for her lack of additional rudders, called monkey rudders, behind the paddlewheel.

One item of *Belle's* original equipment was recently removed for new bilge pumps, an iron bar cage which served as the brig attached to the stern bulkhead. It had been called into service to handle aggressive drunks on excursion cruises.

BOILER DECK

The deck above the boilers is traditionally known as the boiler deck. This deck was mostly open when *Idlewild* was built, with an enclosed cabin space running down the middle. There are stairways to port and starboard aft and a single large stairway amidships between the stacks. Subsequent alterations removed the cabin from the central boiler deck and replaced the entire outer railing by the windows and solid metal. A large ballroom was formed from the enclosed space.



Idlewild Ballroom with stage set for band.



Belle Ballroom in the 1960s.

TEXAS AND SKYLIGHT DECKS

The roof over the boiler deck did not originally also serve as a deck. This surface, which is on two levels, was the hurricane roof and skylight roof when the *Idlewild* was new. Later, when *Idlewild* was employed mostly on excursions, this roof also became a deck by the addition of passenger stairways and railings.

TEXAS

The raised section of deck over the skylights on Western Rivers steamboats was used to build a small group of cabins for officers. This cabin area, called the Texas, is only about thirty feet long, and supports the pilothouse on its roof. Small staterooms serve the officers for occasional cruises away from Louisville. The keyboard for the calliope is located on the aft end of the Texas.

In the 1920's, an additional roof was built over the entire skylight deck level with the top of the Texas. This roof is not railed or open to passengers, but supports railed extensions to its forward corners to allow the captain to view the bow and sides when maneuvering in close quarters. Carbon-arc searchlights of pre-Second World War vintage are mounted at the outboard wings of the extensions. The bronze bell weighing about 400 pounds is mounted between the extensions. The steam calliope whistles are amidships on this deck, well behind the pilothouse, with steam provided from the boiler and controlled by the keyboard on the back of the Texas.

PILOTHOUSE

The pilothouse is a 12 foot x 12 foot (3.7 m x 3.7 m), glass-enclosed compartment with domed roof mounted amidships atop the Texas. The domed roof is ornamented by acorn finials on the four corners and an elaborate wrought iron ornament at the peak. The boat's original three-pipe steam whistle is mounted above the pilothouse.

The main feature of the pilothouse interior is the huge boat's wheel at the forward side, half hidden by the floor. This wheel steers the boat by means of cables which run to the stern. A rudders foot brake in the pilothouse floor uses leather pads to stop and hold the wheel at the desired rudder angle. *Belle* is the only steamboat operating on the Western Rivers using only this method of steering, which Mark Twain would have found familiar. The pilothouse interior also holds a raised bench, called the lazy bench, against the back windows. This bench was provided for the comfort of visitors on many Western Rivers boats.

The pilothouse is surrounded by sliding windows which can be moved out of the way for ventilation or clearer visibility. The front face is also fitted with chest boards which protect the person at the wheel from some of the rain and wind when the windows are open. Controls from inside aim the powerful spot lights used to pick out landmarks used for navigation.

RIG

The single mast, with topmast, is stepped amidships just forward of the superstructure. The foremast supports a heavy boom at the level of the boiler deck. The boom is used to support and position the heavy landing stage by means of the stage hoist and guys, a multiple pulley system.

Boiler exhaust travels up from the boilers on two sides and out of the boat through two tall smokestacks. When the boat was new she had simple "puddings," or doughnut shaped ornaments at the stack tops. In 1962 the puddings were replaced with fancier "feathers," which are delicately appearing steel cutouts at the stack tops. Such decorations were common.

The only other features on the upper silhouette of the *Belle* are the two 'scape pipes and eight flag staffs. The flagstaff serves double duty to help the pilot judge the centerline of the boat. The 'scape pipes are small-diameter exhaust pipes for the steam used by the engines. Western Rivers steamboats use high pressure steam which is exhausted to the atmosphere rather than reused by a condenser.

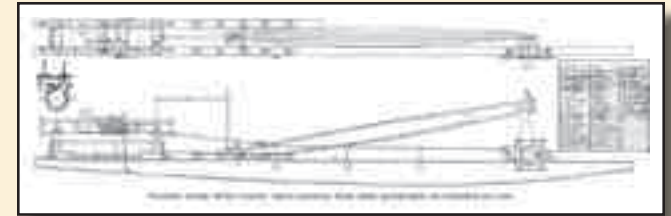
MECHANICAL SPECIFICATIONS

General Information

Original Size:	157.5ft (48 m)l x 36.0ft (11m)w x 5.0ft (1.5m)d
Present Size:	200.0ft (61 m)l x 46.0ft (14 m)w x 5.2ft (1.6 m)d (Including stage and paddlewheel)
Engines:	16in (406 mm) bore x 6.5ft (2 m) stroke, Rees-built
Boilers (construction):	{present} Battery of 3 built by Nooter Corp., St. Louis, MO, 1967
Boilers (size):	56in (1,422 mm)x 28ft (8.5 m) x 39 fire tubes (maximum 200 psi)
Gross/net tonnage:	350 ton (cargo-carrying capacity of the hull)
Displacement tonnage:	860 tons (without passengers)
Fuel:	#4 fuel oil – 22,000 gallon (98 cu. m) maximum
Passengers allowed:	999 (1,048 with crew)

Boiler Weights and Capacities

Battery (3 boilers):	51,000 pounds (23,133 kg)
Refractory:	78,700 lbs (35,698 kg) of brick work under flooring
Casings, smoke box, wind box, structurals:	43,000 lbs (19,505 kg)
Water cargo:	6,500 gallons (24.6 m ³)
Total Weight:	221,000 lbs (100,244 kg) or 110.5 tons
Heating Surface:	2425.88 sq. ft (225 m ²)
Boiling Capacity:	8 gals (30 L) per minute, 19,407 lbs (8,803 kg)/hour
Maximum Pressure:	200 psi (1,379 kPa) at 390 °F (199 °C)



Paddlewheel

Total Weight:	17.5 tons (35,000 lb) (15,876 kg)
Planks:	32 white oak bucket planks (16 sections, 2 per section) 28 planks – 24ft (7.3 m) x 12in (305 mm) x 1.25in (31.75 mm) 4 planks – 24ft (7.3 m) x 12in (305 mm) x 2.25in (57.2 mm)
Wheel Arms:	96 white oak wheel arms
Shaft, rings and bolts:	Steel shaft, 12 rings, and 192 bolts



TIMELINE

1914	Construction begun at Pittsburgh
January 9, 1915	Left Pittsburgh for Memphis, TN
February 1928	Sold to New St. Louis & Calhoun Packet Co. in Hardin, Illinois.
1932	Ran out of Louisville as an excursion steamboat. Chartered by Rose Island owners.
April 1947	Sold to J. Herod Gorsage of Peoria, Illinois
February 1948	Renamed <i>Avalon</i>
1949	Sold to Steamer Avalon, Inc., at Cincinnati.
1953 to 54	Converted from coal to oil
May 24, 1958	Emsworth Dam accident when engines failed.
1961	Last season as a tramp steamer
May 24, 1962	Sold to Jefferson County Fiscal Court for \$34,000
1968	Bow rebuilt and new boilers installed
April 10, 1972	National Register of Historic Places, Structure #72000535
June 30, 1989	Designated National Historic Landmark
August 24 1997	Partially sunk at mooring due to sabotage
October 2009	Collided w/ dry dock on a windy day and damaged paddlewheel



SUMMATION

The *Belle of Louisville* is truly an American historical treasure as well as a significant Mechanical Engineering Landmark. She is the only remaining western rivers day packet boat. She still speaks from her original whistle which is operated by a foot pedal in the Pilothouse. Pressing on the pedal opens a steam valve located above the boilers venting steam into the three chime whistle chamber. The result is a musical “chord” unique to each steamboat, due to the variations of both construction and metals used. That whistle allowed those who lived and worked on the river to identify her as readily as by her shape and coloring. She has hailed some of the greats of steamboating such as the fabled *America*, *Gordon C. Greene*, U.S. Mail *Kate Adams*, *Sprague*, *Queen City*, *Verne Swain*, *W.P. Snyder* and the steamboat team *City of Louisville* and *City of Cincinnati*.

The *Belle of Louisville* embodies the classic lines of the inland river steamboat. She has traveled the Mississippi from New Orleans, Louisiana, to St. Paul, Minnesota, and on the Missouri River to Kansas City. She has been to Chattanooga and Knoxville on the Tennessee River and to Carthage, Tennessee on the Cumberland River. As she does today, the Belle traveled the Ohio River where she has been from Pittsburgh, Pennsylvania to Cairo, Illinois. No other steamboats have traveled the inland rivers for as long and to as many places over the years.

The *Belle of Louisville* remains the last original, active survivor of a once huge fleet of steamboats that plied the inland waterways. The *Belle* stands as a tangible link to an illustrious past that helped transform this nation. She resides on Louisville’s waterfront, available for public cruises and private charters from April to October, and dockside events year round.

Her most exciting upgrade will be in 2010 when she opens her season with the addition of long anticipated air conditioning and/or heated ballroom for passenger comfort. The *Belle* is a valued treasure and icon to the City of Louisville and her versatility will now be greatly increased with this modern addition without any noticeable changes to her historic integrity as she celebrates her momentous 100th birthday in 2014.



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ACKNOWLEDGEMENTS

The Louisville Section of The American Society of Mechanical Engineers gratefully acknowledges the contributions of the following individuals:

Linda Harris, CEO of the *Belle of Louisville* for her enthusiastic support for the presentation, focus in rallying resources, and helping so many appreciate the *Belle of Louisville's* grace and historic presence.

J. Lawrence Lee, P.E. for his technical and editorial review in 1999 and 2009.

Captain Mike Fitzgerald of the *Belle of Louisville* for his support, text and photo contributions and attention to accuracy in editorial review.

The UW - La Crosse Historic Steamboat Photograph Collection – <http://digital.library.wisc.edu/1711.dl/LaCrosseSteamboat>

Jack Custer of Steamboat Masters and Associates, Inc. for furnishing photographs, timelines, review and first hand knowledge of steamboat history.

Joseph A. Nitzken, P.E. of AAF International for his editing and assembly of the brochure, and his wife, Kate S. Nitzken for her typing and assistance.

Christopher Haragan of Air Equipment Company, Chair of the Louisville Section when the *Belle* recognition effort started, who has been a major contributor and maintained involvement throughout the early process.

John G. Stice of AAF International for his leadership of the Louisville Section in pursuing and completing the Historic Mechanical Engineering Landmark Designation effort no matter which obstacles arose.

And In Memory of Lee Horlander, P.E. father and motivator of the Belle of Louisville's Historic Mechanical Engineering Landmark Designation effort from its inception to its collective finish.



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