

“The [*Razzle Dazzle*] system of painting is based on... rendering the problem confronting a submarine more difficult, confusing him...and thereby adding in some degree to the safety of the vessel attacked.”

VICE ADMIRAL WILLIAM S. SIMS  
Commander of United States Naval Forces  
Operating in European Waters, 1917

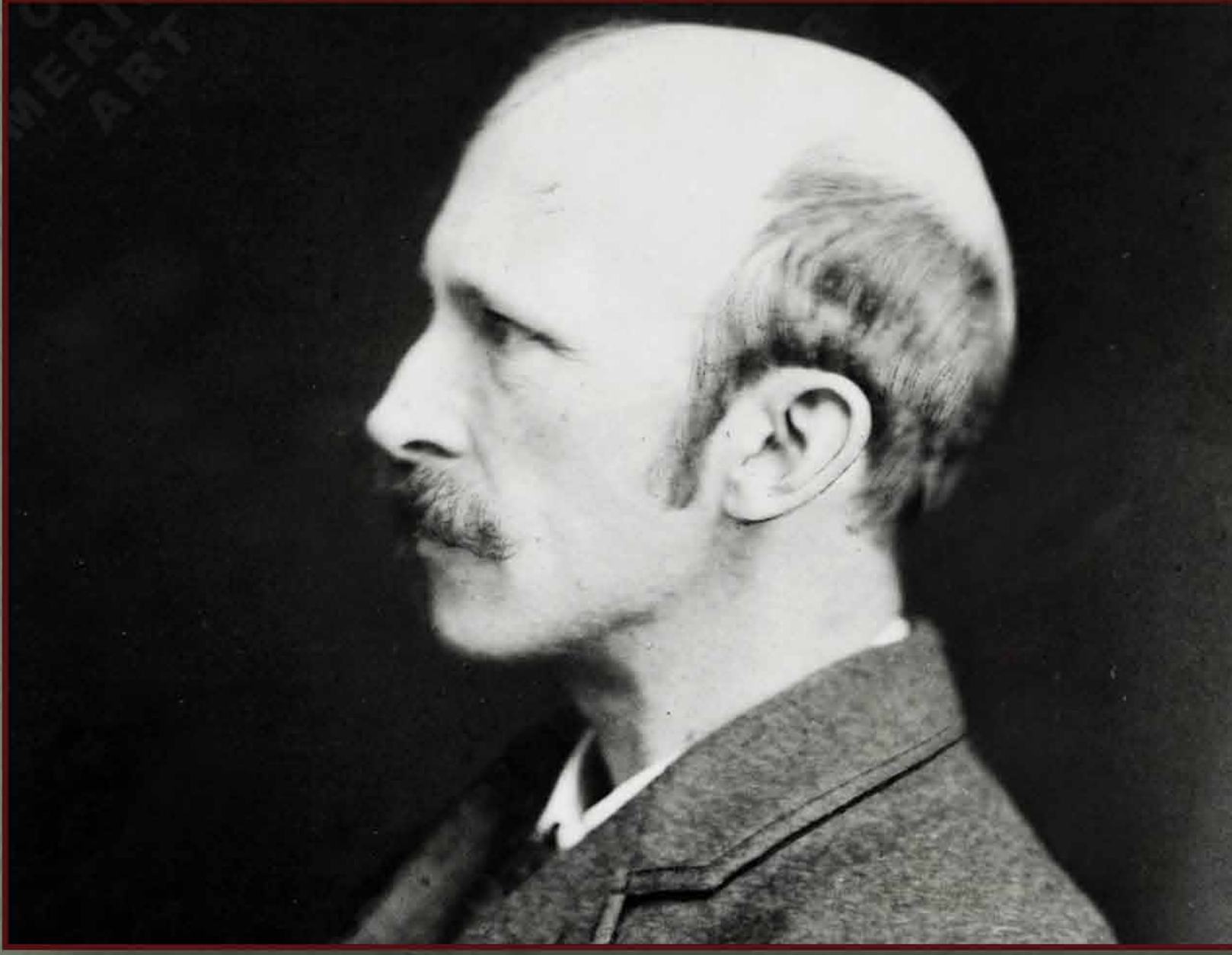


# The First Dazzlers



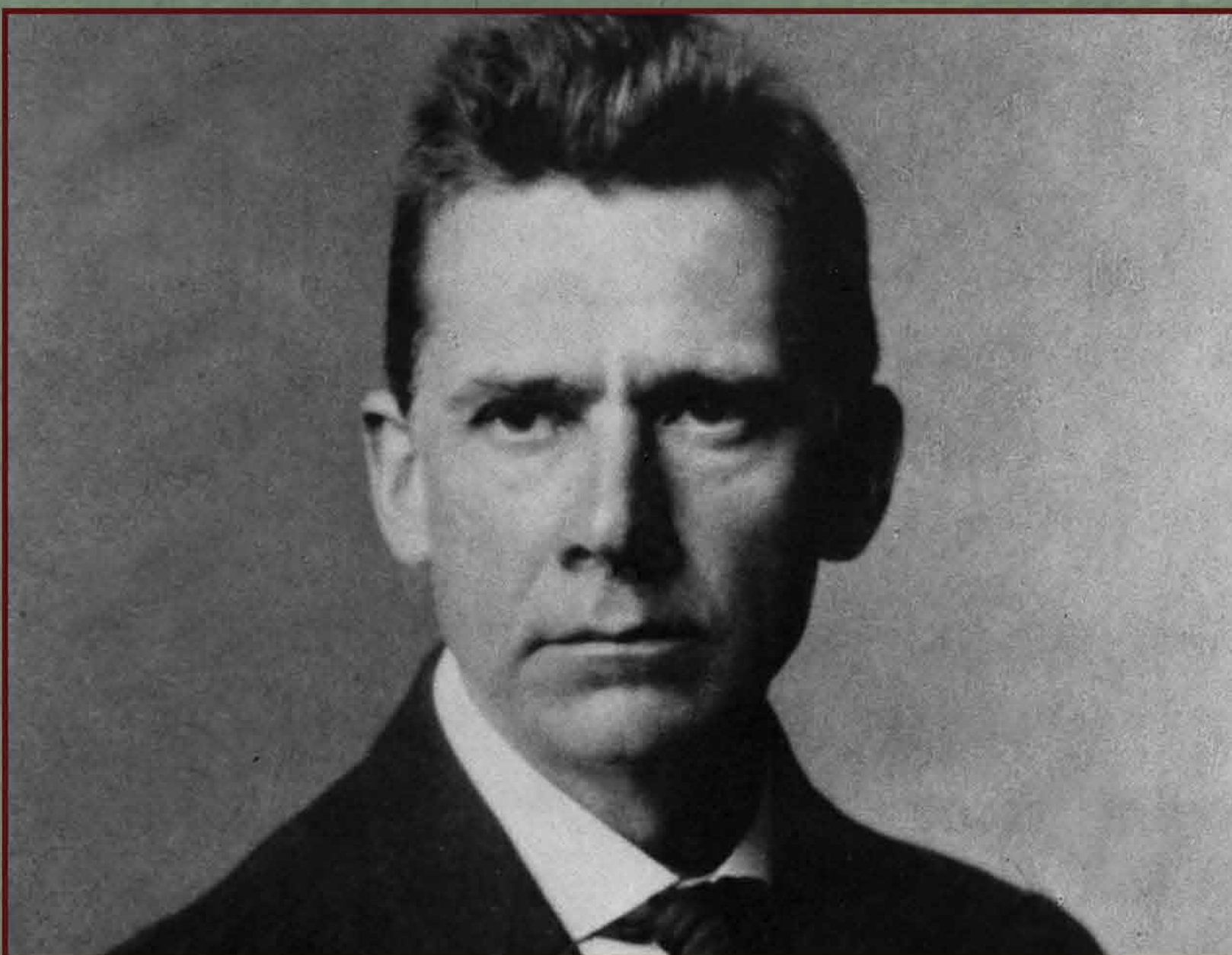


By 1917 the world war, a bloody stalemate in France, had become a deadly contest at sea. Merchant ship losses to German submarines — 1-in-4 on each trans-Atlantic passage — threatened to starve Great Britain into submission. In response, the British adopted *Dazzle*, a novel ship camouflage based on the work of Abbott Thayer, George de Forest Brush and Norman Wilkinson.



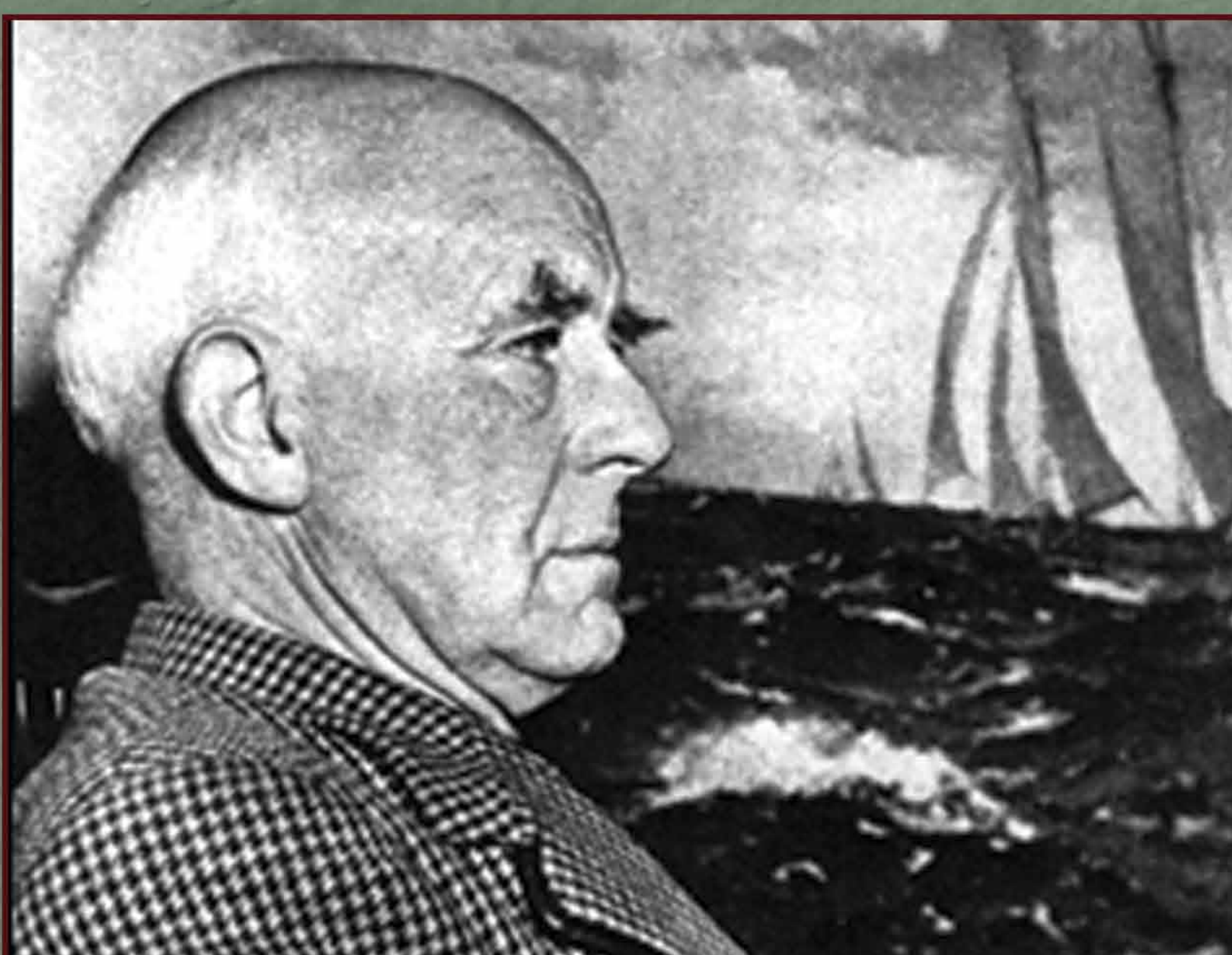
### ■ **Abbott Thayer**

Known as the “father of camouflage,” American artist and naturalist Abbott Thayer derived his ideas from the natural coloration that protects certain animals from predators. Thayer patented his ship camouflage paint scheme in 1902, but his idea would not be adopted until World War I.



### ■ **George de Forest Brush**

A neighbor of Abbott Thayer, naturalist and artist George de Forest Brush collaborated with him on camouflage schemes, and proposed the concealment of objects by reversing their light and dark areas, a technique he called *countershading*.



### ■ **Norman Wilkinson**

English artist Norman Wilkinson left the *Illustrated London News* and joined the Royal Navy Volunteer Reserve during World War I. Like Thayer and Brush, Wilkinson concluded that ships at sea could not be hidden but could be visually distorted, and proposed his own version of Dazzle camouflage to the Royal Navy in April 1917; the British Admiralty quickly accepted and implemented his design.





■ A Gray Wolf displays its naturally counter-shaded coat; the wolf's sunlit head and back are darkened by gray fur, while its shadowed chest and belly are lightened by white fur. In effect, this breaks up the animal's outline, making it appear to be part of the snow-covered landscape.

# How Razzle Dazzle Worked

Taking their inspiration from concealment coloration in the animal kingdom, early camouflage designs aimed at either concealment or distortion.

George Brush's countershading, derived from animals like the wolf, had limited success when applied to the smoke-belching steamships of World War I, but became the basis for the Navy's post-war camouflage designs, especially on aircraft.

Brightly-colored animals, such as tropical birds, inspired Thayer and Wilkinson to protect ships from predators — in this case, enemy submarines — in the same way. They theorized that high-contrast, irregular paint schemes would distort a ship's apparent size and aspect at a distance.



■ Against a background of tropical foliage, the Macaw's high-contrast coloration breaks up its shape, thereby confusing its predators.



This World War I Victory Medal, issued by the U.S. Navy in 1919, bears the "Naval Battery" operational clasp, signifying that the bearer was assigned to an artillery unit in France during the war.



“The primary object of this scheme was not so much to cause the enemy to miss a shot when actually in the firing position, but to mislead him, when the ship was first sighted, as to the correct position to take up.”

NORMAN WILKINSON

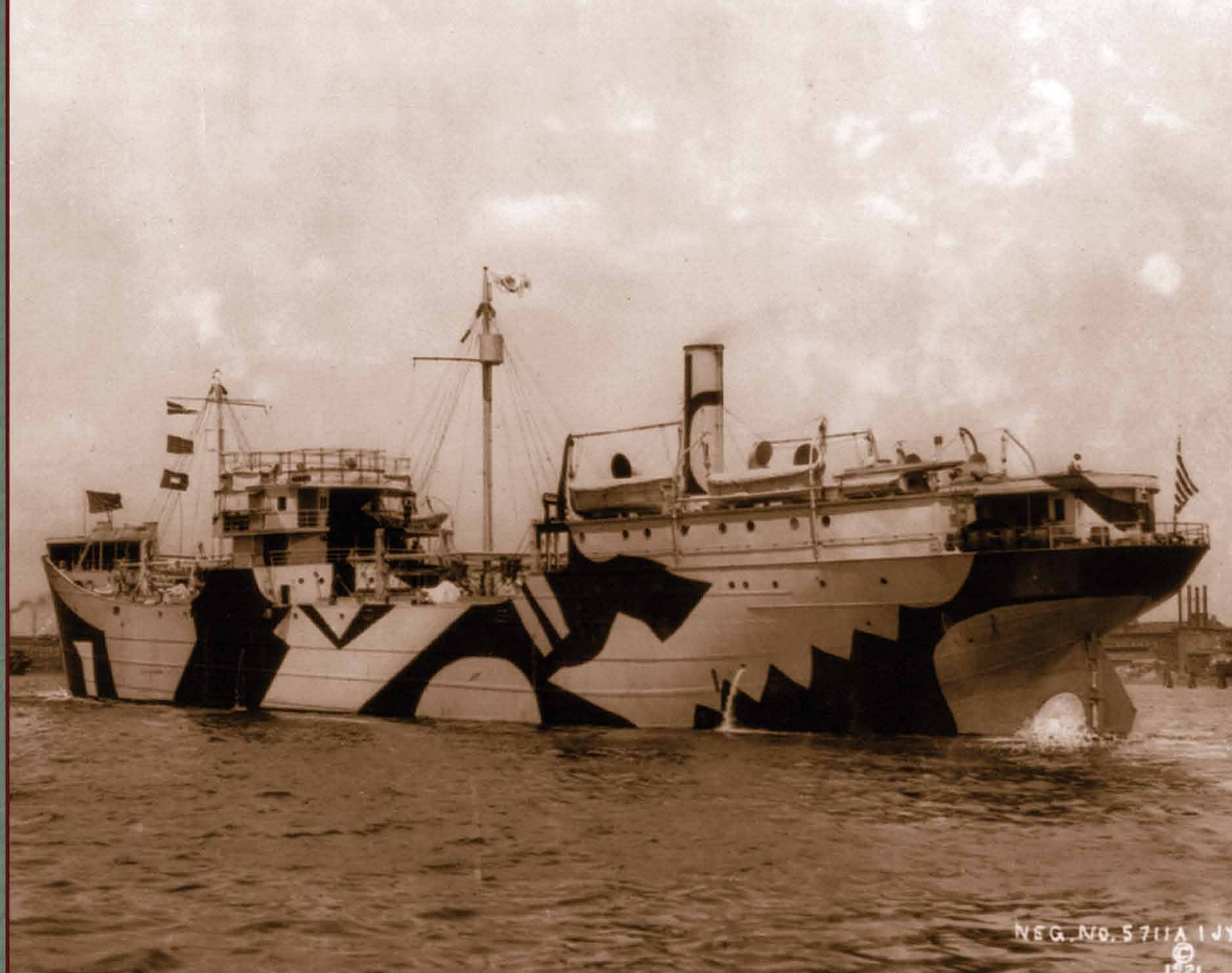
Inventor of the British Dazzle System, 1919



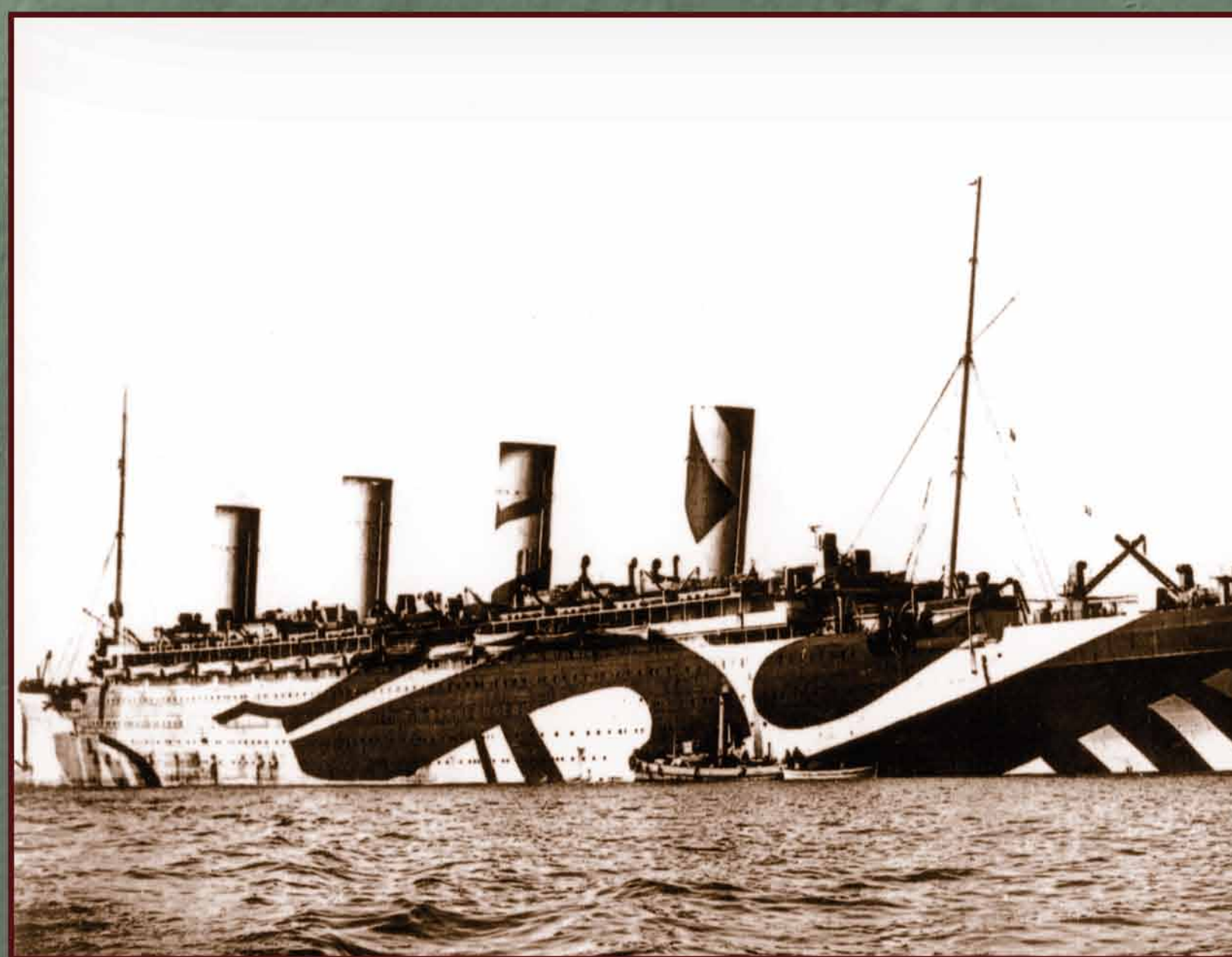
# Dazzle Becomes Razzle Dazzle

The United States Navy followed the development of Dazzle in Great Britain with great interest. In March 1918, it established its own program, which built on and expanded the British Dazzle system with new patterns of “war paint” and experimented with vivid colors and modern art designs.

The American version was dubbed “Razzle Dazzle” after the work of Abbott Thayer. Applied to thousands of ships built during the war and combined with developing anti-submarine measures, Razzle Dazzle helped reverse the tide of the U-boat war to break the stalemate in Europe.



■ An American Razzle Dazzle scheme applied to the freighter SS *Absecon*, built in 1918.



■ British Admiralty Dazzle applied to RMS *Olympic*, circa 1917.

The pocket cornet was used to play “taps” at Admiral George Dewey’s funeral in 1917. Originally British, it was present aboard HMS *Warspite* during the Battle of Jutland in 1916, before an American Sailor refurbished it.



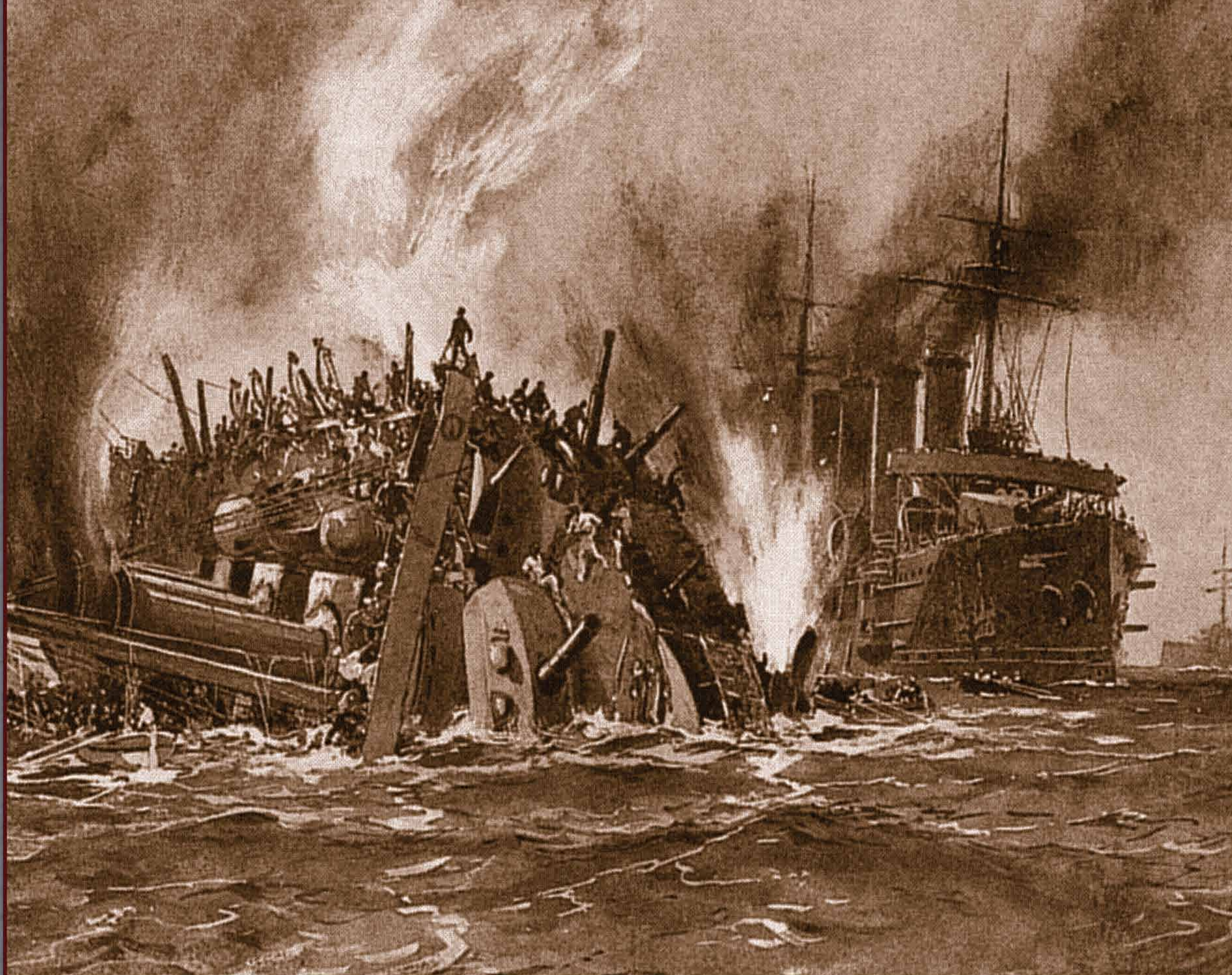


# The Unseen Menace





On the eve of World War I in 1914, submarines were still considered a novelty; no navy was prepared to oppose them. The Imperial German Navy began the war with 29 such “undersea boats,” or simply *U-boats*, but like the Allied navies, the Imperial German Navy went to war anticipating sea battles involving mainly surface ships.



■ On 22 September 1914, less than a month into the war, *U-9*— a small, obsolete German submarine — torpedoed and sank HMS *Aboukir*, HMS *Hogue*, and HMS *Cressy* in quick succession. The submarine's hour had come.

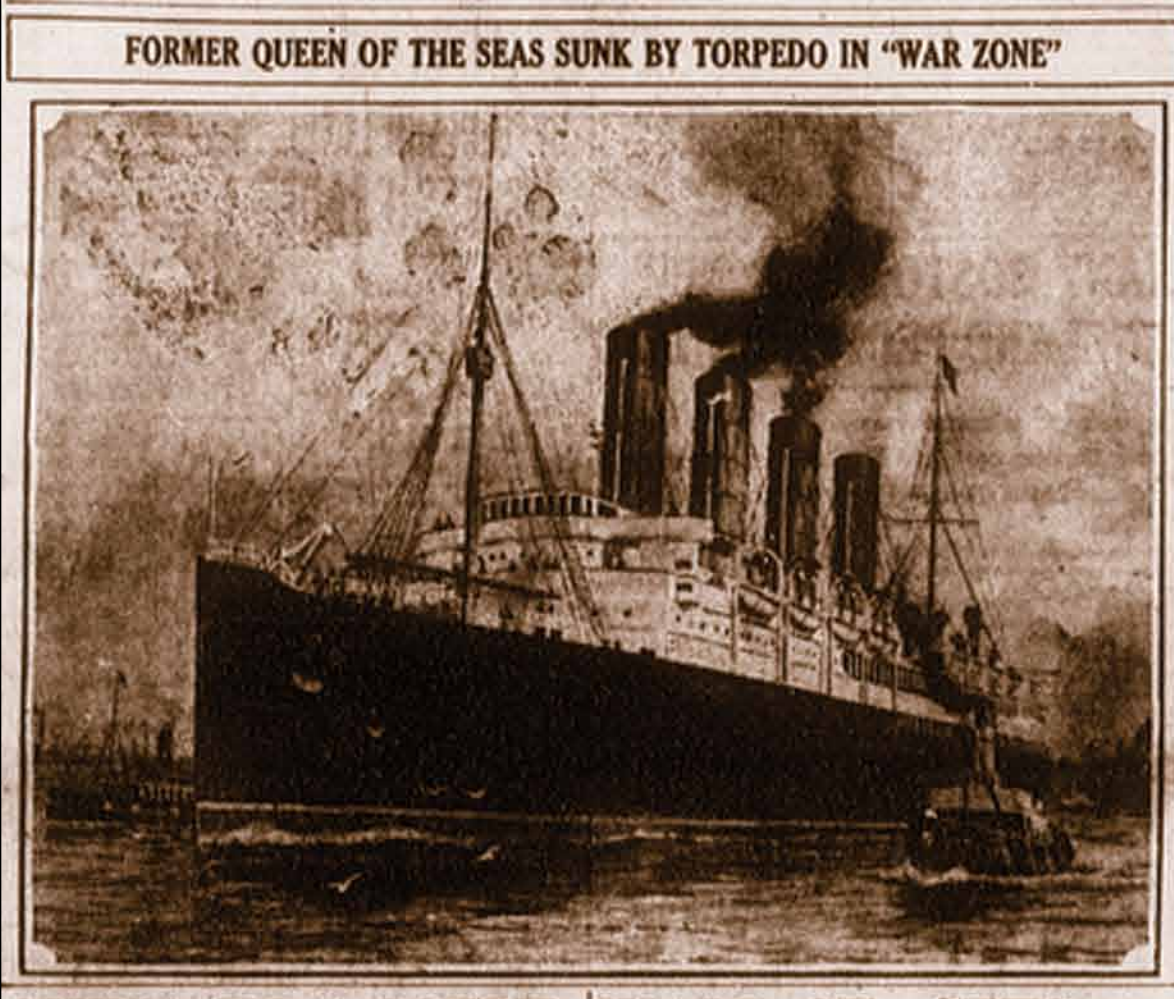
Within a month of the war's onset a U-boat sank a British battleship, and another sank three British armored cruisers in just over an hour. German naval leaders quickly grasped the value of submarine warfare, especially against merchant shipping. The Allied navies scrambled to devise defenses against this new, unseen menace.

These items were among the standard gear issued to U.S. Navy Sailors during World War I. Personal hygiene was a higher priority during World War I than in any previous war, and Sailors were equipped accordingly.





# HUNDREDS OF LIVES ARE LOST ON THE TORPEDOED LUSITANIA



**FORMER QUEEN OF THE SEAS SUNK BY TORPEDO IN "WAR ZONE"**

**GERMAN'S WARNING AND CUNARD REPLY**

The Imperial German embassy published in New York papers of April 22, nine days before the Lusitania sailed on May 1, the following advertisement, as a warning to passengers on Cunard and other English steamship lines:

"Travelers embarking on an Atlantic voyage are reminded that a state of war exists between Great Britain and Germany; that the zone of war includes the waters adjacent to the British Isles; that, in accordance with formal notice given by the Imperial German government, vessels flying the flag of Great Britain are liable to destruction in these waters, and that warships will in the war zone on ships of Great Britain do as at their own risk."—Imperial German Embassy, Washington, D. C., April 22.

The answer of the Cunard company to the advertisement was as follows:

"The Germans have been trying for some time to put English lines out of commission. We anticipate that from this time on every possible means will be used by the Germans to prevent people traveling on English lines. The fact is that the Lusitania is the safest ship afloat. She is not fast for German warships or submarines. She will reach Liverpool as per schedule, and arrive in New York on time as long as we care to run her."

Capt. W. T. Turner of the Lusitania rebuked the German warning: His statement, made as the liner was about to sail, was:

"I wonder what will be the Germans next move. It does not look as though they had frightened the people very much with their warnings from the appearance of the passenger list and the pier."

**Survivors Landed Believed to Number Not More Than 500 Out of Total List of About 2000.**

**MANY BOSTON PEOPLE ON LINER'S PASSENGER LIST**

**German Embassy Had Given Warning to Passengers—Submarine Sunk Her Prey Off Irish Coast.**

Queenstown, May 8, 1:15 A. M.—Survivors of the Cunard liner Lusitania, torpedoed by a German submarine off the Irish coast today, landed here late in the night, fear that hundreds of lives have been lost in the sinking of the steamship.

Dispatches received from Clonsilla, Kinalea and other points where passengers have been landed, also indicate that the magnitude of the disaster may be appalling. It is certain that the toll of lives will be heavy.

Many of the rescued are terribly injured or suffering from shock and exposure. Everything possible is being done to relieve their conditions, and the resources of the authorities and the Cunard company are being taxed.

Only about 30 minutes was given for the work of rescue. In that brief time, from all accounts thus far available, the officers of the liner did magnificent work. Most of them, it is believed, gave up their lives to aid the escape of the passengers.

**SUBMARINE GAVE NO WARNING**

No warning whatever was given by the German submarine responsible for the work of destruction. It was sighted by persons on the deck as it rose to discharge two torpedoes.

The passengers were for the most part at lunch at the time. So sudden was the appearance of the submarine and so quickly did it fulfill the threat made against the Lusitania shortly before it sailed, that no opportunity was given to protect the ship.

The first torpedo came shooting through the waves and hit the Lusitania on the starboard side, forward. A tremendous explosion resulted and the boat listed violently.

**SECOND TORPEDO FINISHED HER**

Almost immediately afterward the second torpedo was fired into the engine room of the liner. An even more violent explosion followed, and the ship began to settle rapidly.

**CHINA TO ACCEPT JAPAN'S DEMANDS**

Answer to Ultimatum to Be Delivered to Minister

**WALL ST. GETS BIG SHAKE-UP**

Excitement Greater Than Since War Began Following

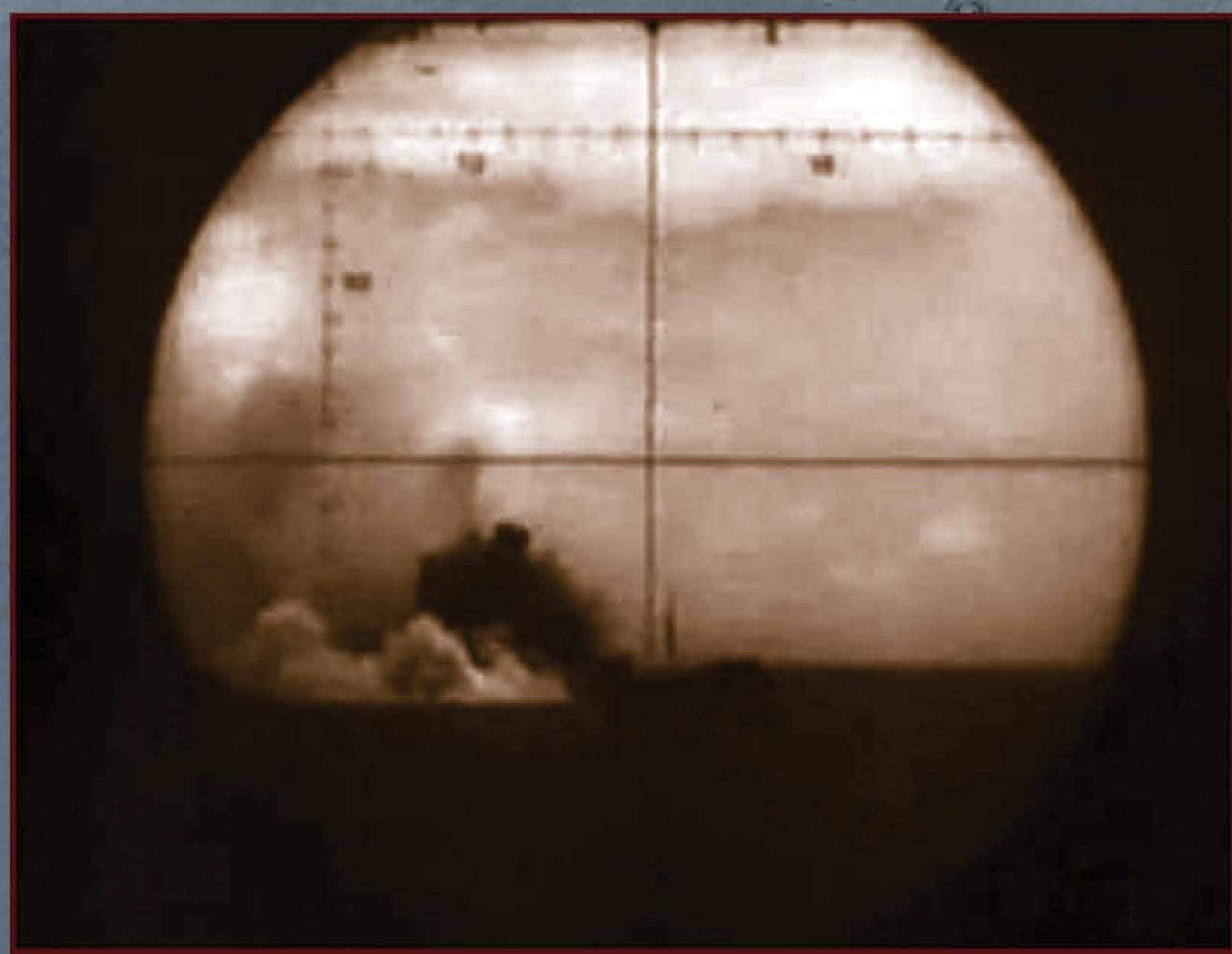
Although Germany's U-boat campaign was very successful, it claimed American lives in the process — most notably the sinking of RMS *Lusitania* in May 1915. Wishing to avoid armed conflict with the United States, Germany placed restrictions on which targets its U-boats were allowed to attack.

## Unrestricted Submarine Warfare

By the end of 1914 the first offensives ended and armies on both sides began to dig trenches. The Western Front devolved into war of attrition; the first side to exhaust its manpower and resources would lose. To add pressure, Great Britain immediately established a blockade of German ports, which stopped ships from supplying Germany.

In response, Germany ordered its U-boat fleet to aggressively target the vulnerable merchant ships that supplied Great Britain with food and war material. The British Navy was at first unprepared to meet this new kind of threat, and it looked as if the U-boats would win the war for Germany.

However Germany's greatest weapon proved to be its downfall. In 1917, believing that Great Britain's will to fight was nearly broken, Germany released its U-boats from restrictions against attacking neutral vessels; this act helped lead the United States to declare war on Germany in April 1917.



A rare photograph of a sinking Allied ship viewed through the periscope of a submerged German submarine. Remaining in this position, a U-boat was almost undetectable.

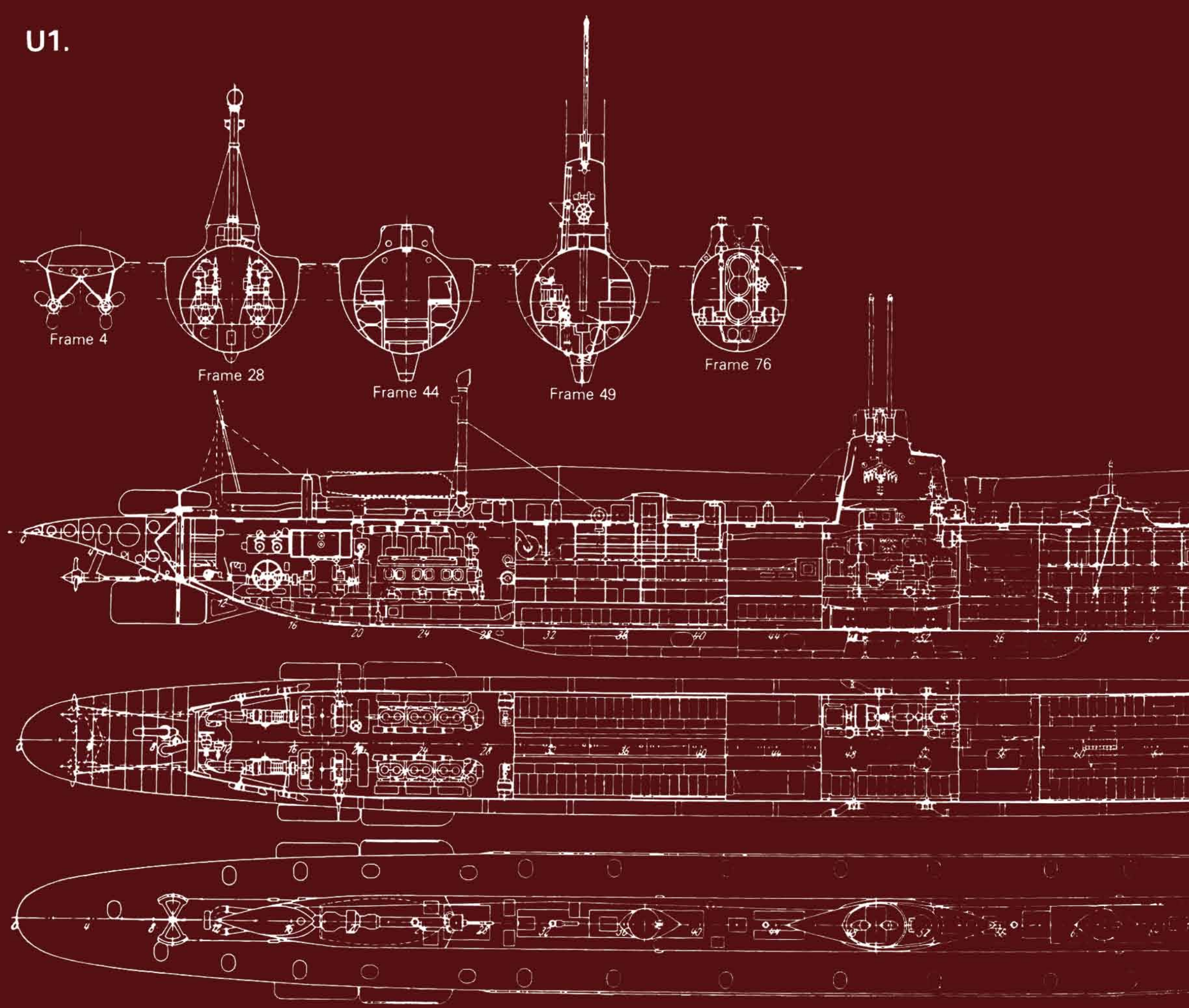


# Anatomy of a U-boat

A U-boat was essentially a water-tight hull enclosing the crew, engines and weapons, surrounded by flooding compartments that allowed it to submerge. Driven by air-breathing diesel engines when on the surface, it relied on battery-powered electric motors when submerged. As the batteries could only be charged by the diesel engines, submarines had to remain surfaced much of the time.

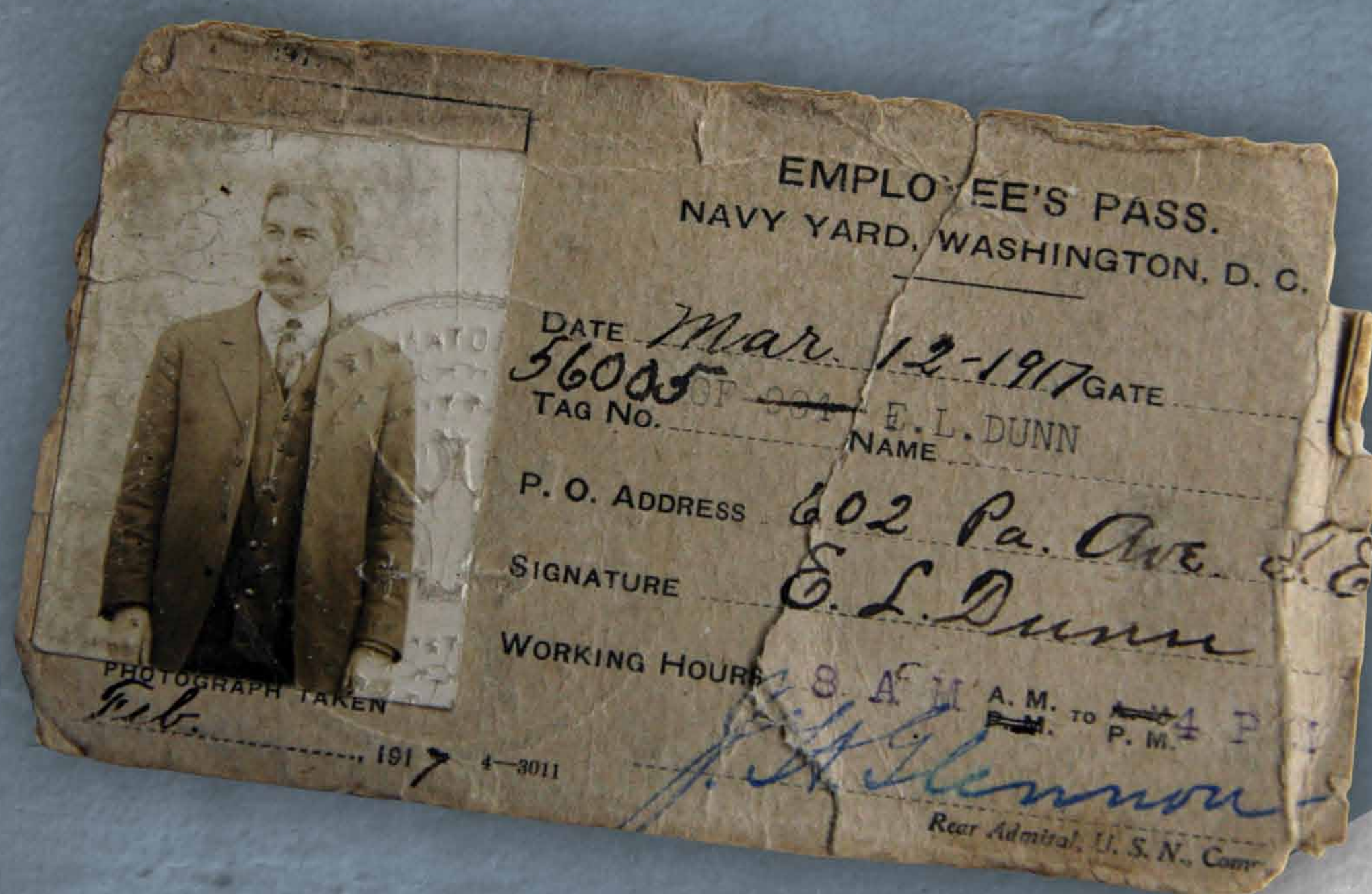
In 1914, a submerged U-boat was a terrible threat; there were no sensors that could detect them and no weapons that could harm them. It took many months to develop anti-submarine technology, such as hydrophones to detect them and depth charges to sink them. In the meantime, U-boats operated with near impunity, and Allied mariners lived in fear of meeting one anytime, anywhere.

U1.



To dive, U-boats opened valves and let seawater flood special tanks in the submarine, which reduced the buoyancy of the boat and made it sink in a controlled manner. It would surface by blowing water out of the tanks with compressed air.

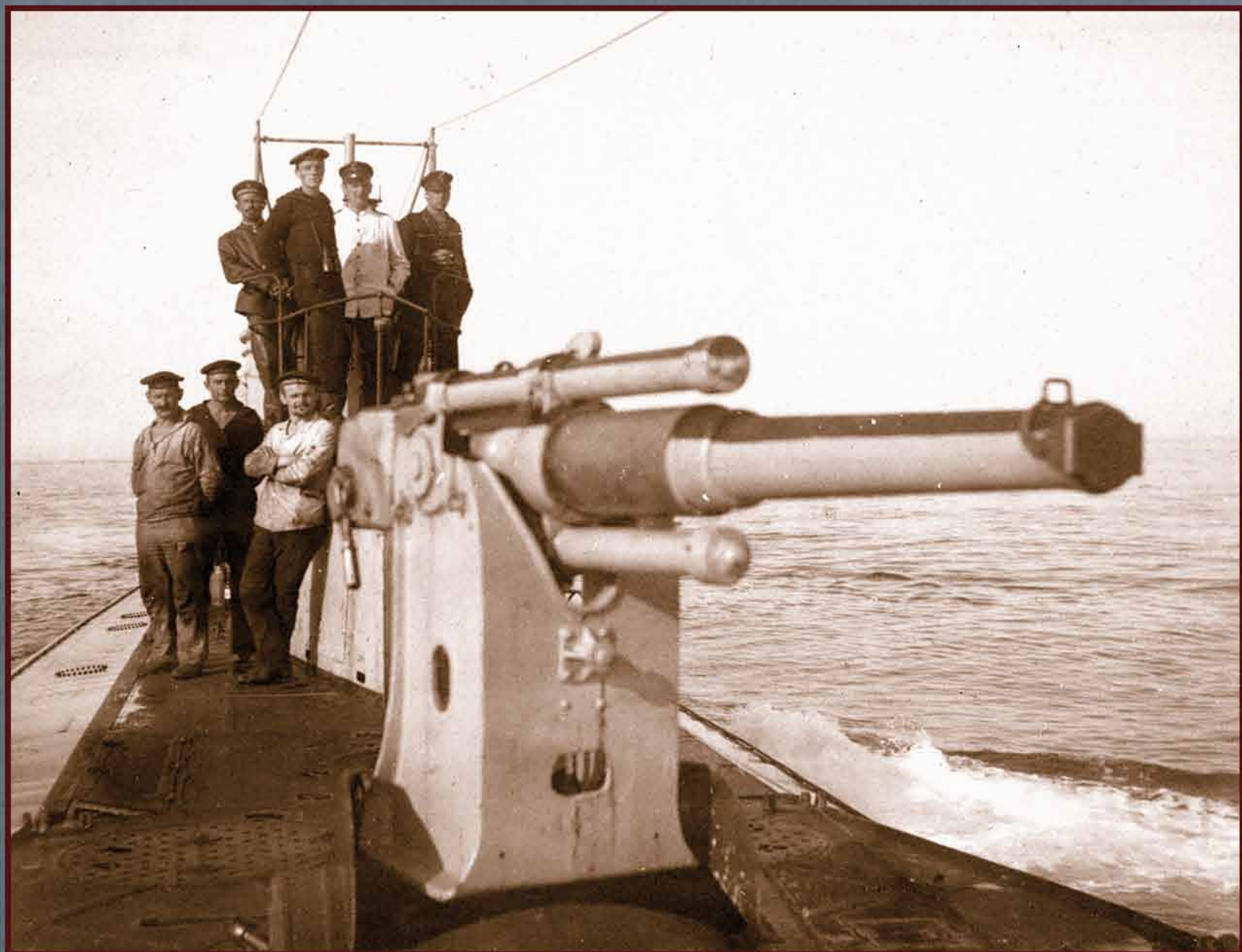
In the climate of suspicion the war brought to America, the U.S. Navy adopted photographic identification, a new security technology, to prevent enemy saboteurs and spies from infiltrating the Navy's vastly expanded civilian workforce.



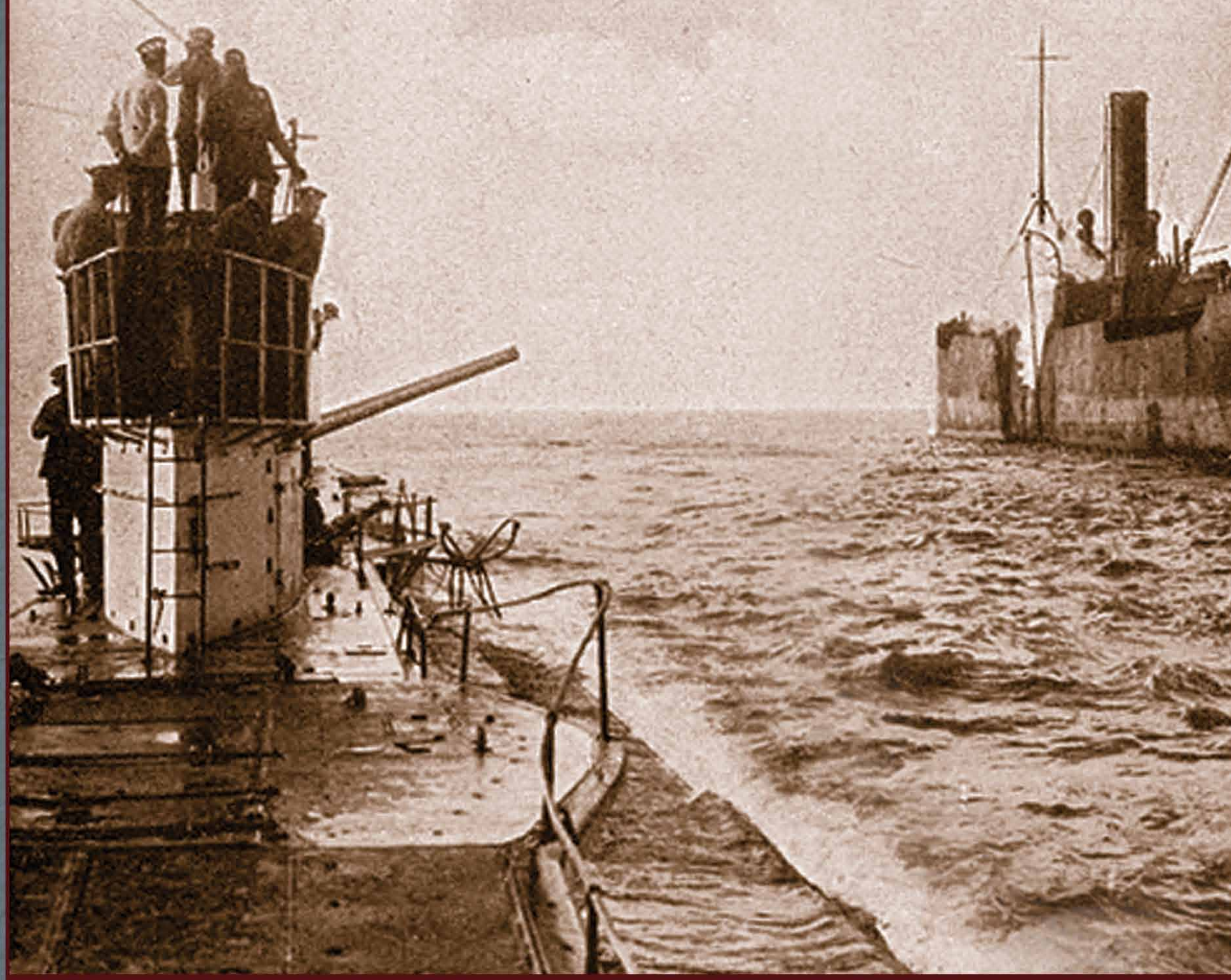


# Attacks on the Surface

Early in the war, when German U-boats first began their war on British shipping, they followed the old “cruiser rules” of a more civilized age. Each ship was stopped, searched, and safely evacuated before the ship was sunk. By necessity, these kinds of attacks were made on the surface.



■ A U-boat's deck gun required a lot of hands to fight effectively, since the only way to keep up a steady rate of fire was to pass ammunition up from below by a human chain.



■ Most U-boats mounted a 105mm breechloading deck gun for surface combat, but on the unstable platform of a submarine, its use was restricted to short ranges. However, as a U-boat's effectiveness was primarily limited by the number of torpedoes it had, commanders used the gun whenever practical, to keep the submarine at sea longer.

However, after Great Britain began arming merchant ships with artillery, German U-boats adopted the safer tactic of diving underwater and sinking merchant ships without warning. The only weapon available to a submerged U-boat was the torpedo.

Modern chemical weapons, namely artillery shells filled with a variety of poison gases, were first used on the battlefield in 1914. The U.S. Navy learned from its allies' experience, and issued Sailors protective masks.



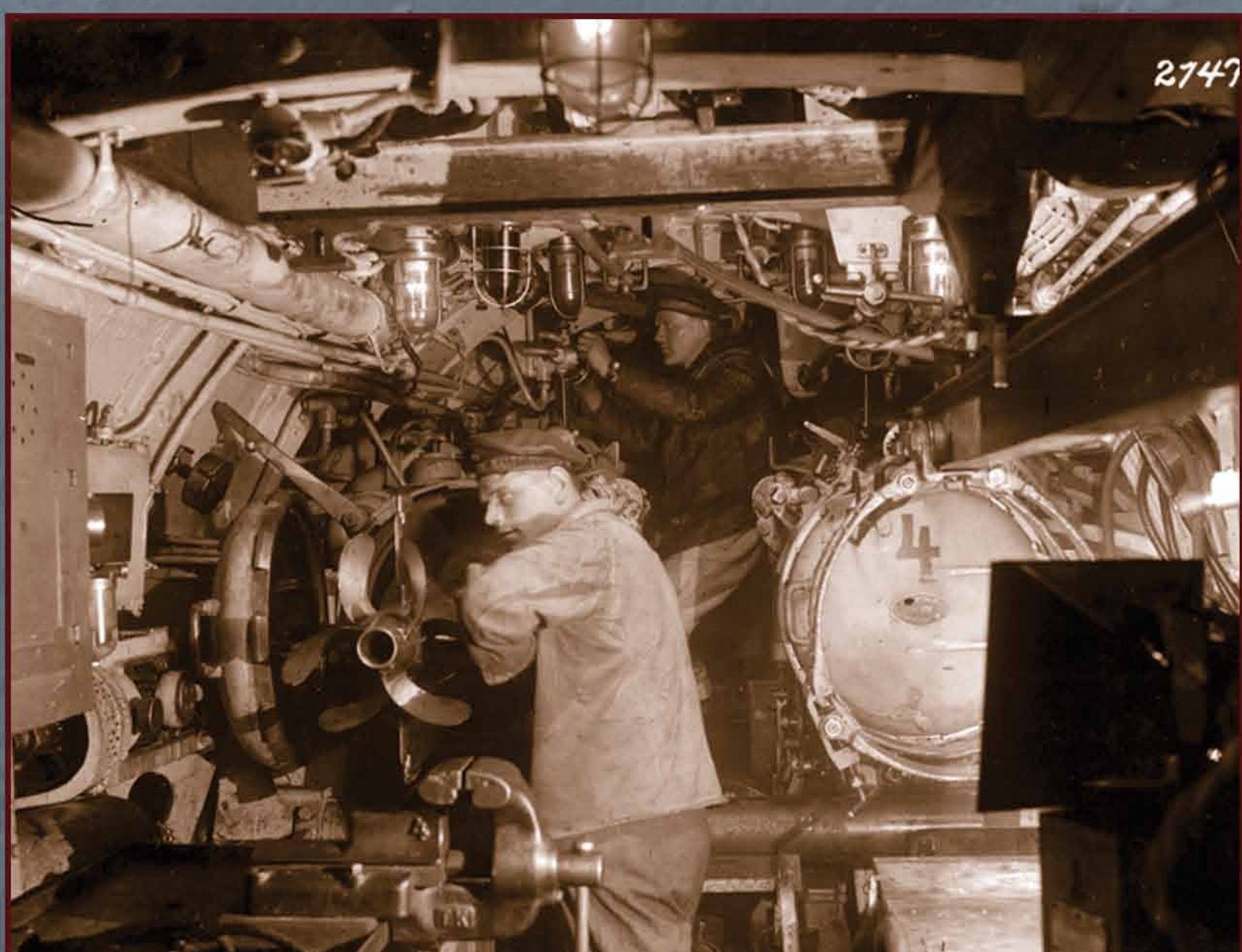


# The Torpedo

The U-boat's primary weapon was the torpedo: a self-propelled, high-explosive projectile that ran just below the surface. Its powerful warhead could hit a ship below the waterline, and a single torpedo was often enough to sink even the largest of ships.



■ A German torpedo explodes against the side of an Allied transport. The Schwarzkopf torpedo had a warhead containing 200 pounds of guncotton explosive, enough to hole any ship.



■ These German sailors load a torpedo into its firing tube with a winch. Each tube launched a single torpedo using compressed air and then had to be reloaded by hand, a slow and laborious process.



Following a wider service trend, the U.S. Navy began issuing winged insignia like this to advanced flight graduates in 1917. The Navy's modern aviator badge is nearly identical to the original pattern introduced during World War I.

The torpedo would run on course for at least 1,000 yards at about 30 knots, but its slow speed — barely faster than many warships — meant that significant lead was needed to score a hit. Without the aid of modern computers, only very skilled U-boat commanders fired at targets beyond a few hundred yards.

The short effective range of the torpedo made it difficult to obtain a firing position on a ship, which was always faster than a U-boat, especially after the submarine had to submerge to avoid discovery.

To set up a shot, the U-boat commander plotted an intercept course well ahead of time, based on the target's heading and speed. Any delay or miscalculation caused by confusing Razzle Dazzle camouflage could allow the target to escape.

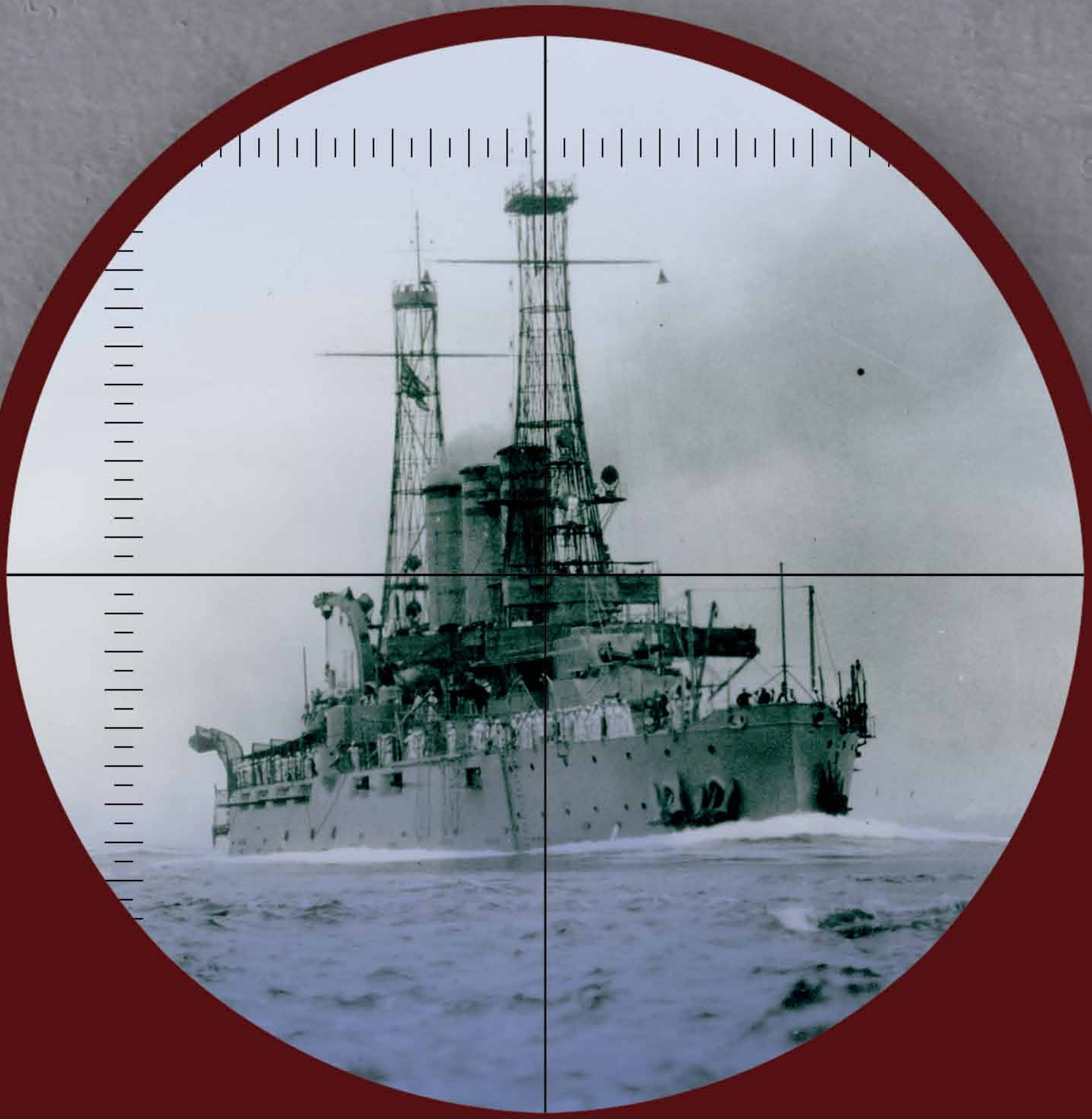


# Deceiving the Eye

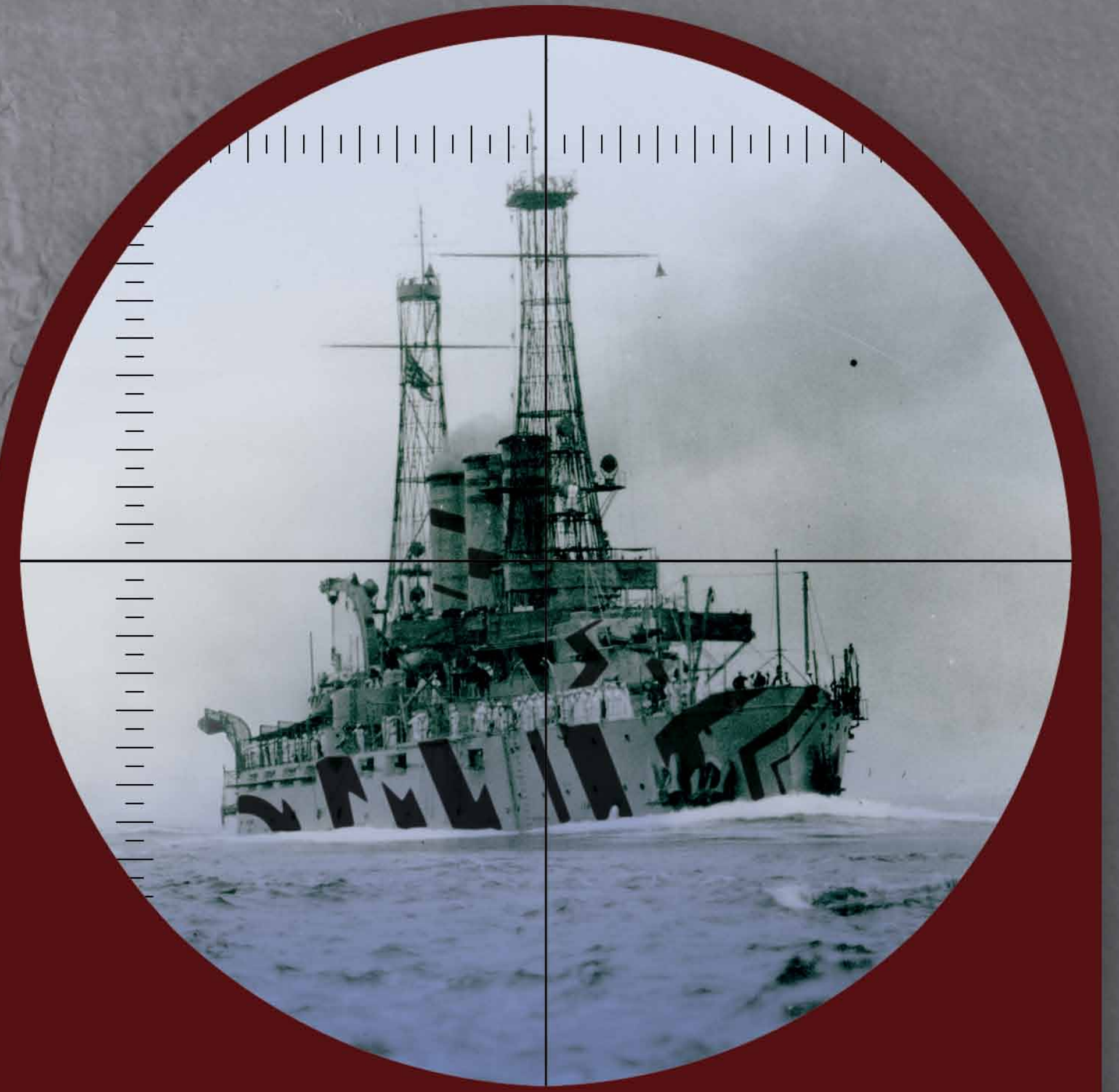




# In Plain Sight



The U-boat commander peering through his periscope at a distant ship would predict its course by determining its orientation from distinctive features such as its bow and funnels, and estimate the distance by comparing its apparent length to its actual known length. With experience, these simple methods were highly effective.



Razzle Dazzle camouflage made it difficult to determine which side of the ship the observer was seeing by distorting the apparent position of distinct parts of the ship. Until the ship came near enough for the observer to see through the camouflage, it was almost impossible to accurately judge the target's heading.

Razzle Dazzle did not attempt to hide a ship, since the smoke of a ship's coal-fired engines made that impossible. Instead, it distorted a ship's appearance so U-boat commanders would incorrectly predict where to submerge and wait for their prey.

To execute a surprise attack, a U-boat had to dive and remain almost still while a target approached. Being in the right position required good planning and an accurate assessment of the target's course. Razzle Dazzle interfered with that assessment, leaving the U-boat well out of the target's path and torpedo range.





Jones' team developed an elaborate test theater that simulated the observation of ships in miniature. To recreate sea conditions, researchers viewed models from all aspects under varied lighting, through periscope-like optics.

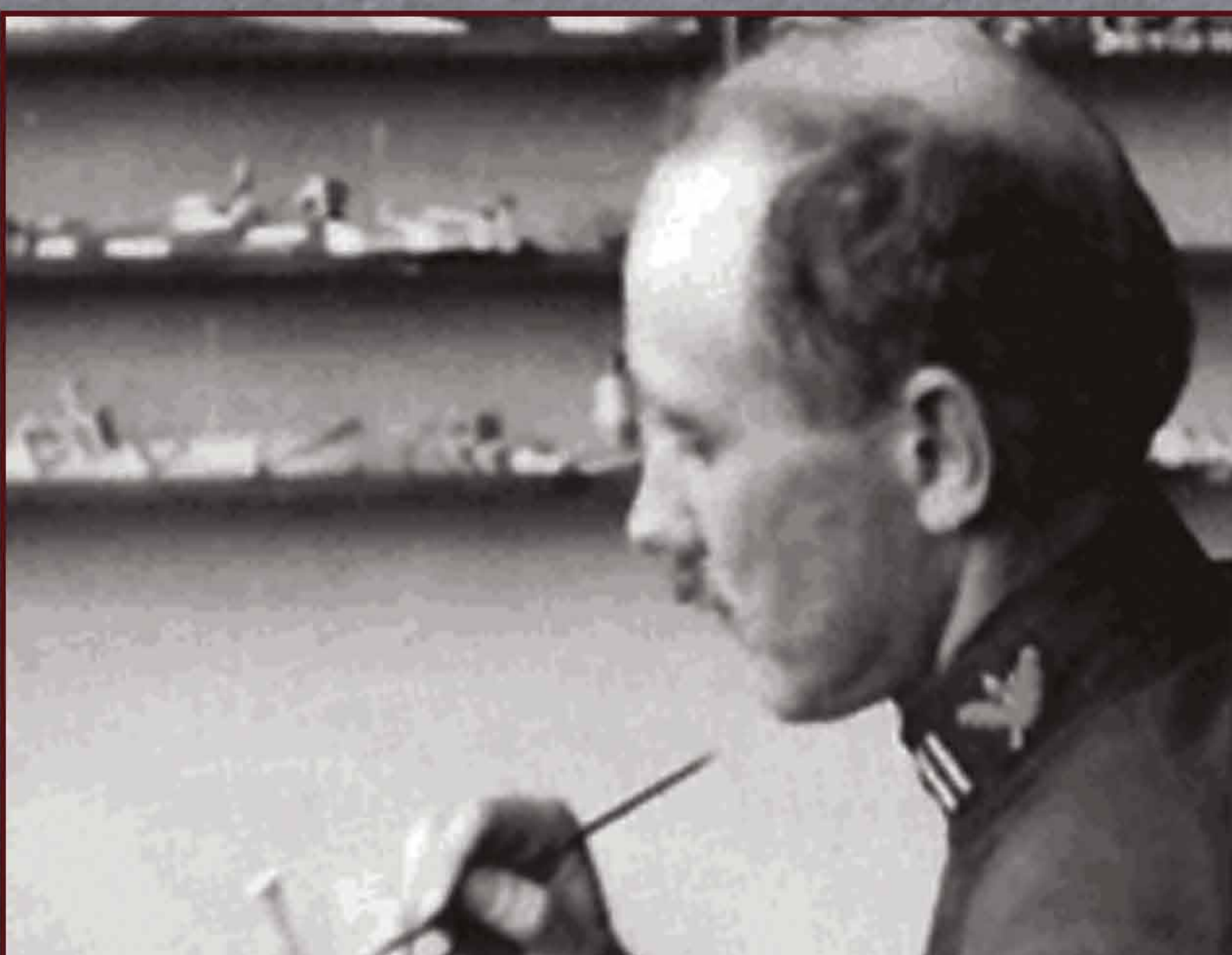
# America's Razzle Dazzlers

In March 1918, the U.S. Navy established a new department, the Camouflage Section — composed of artists and scientists, working in Design and Research Subsections, respectively — to develop and approve anti-submarine camouflage for Navy warships, and direct similar efforts in the merchant marine.



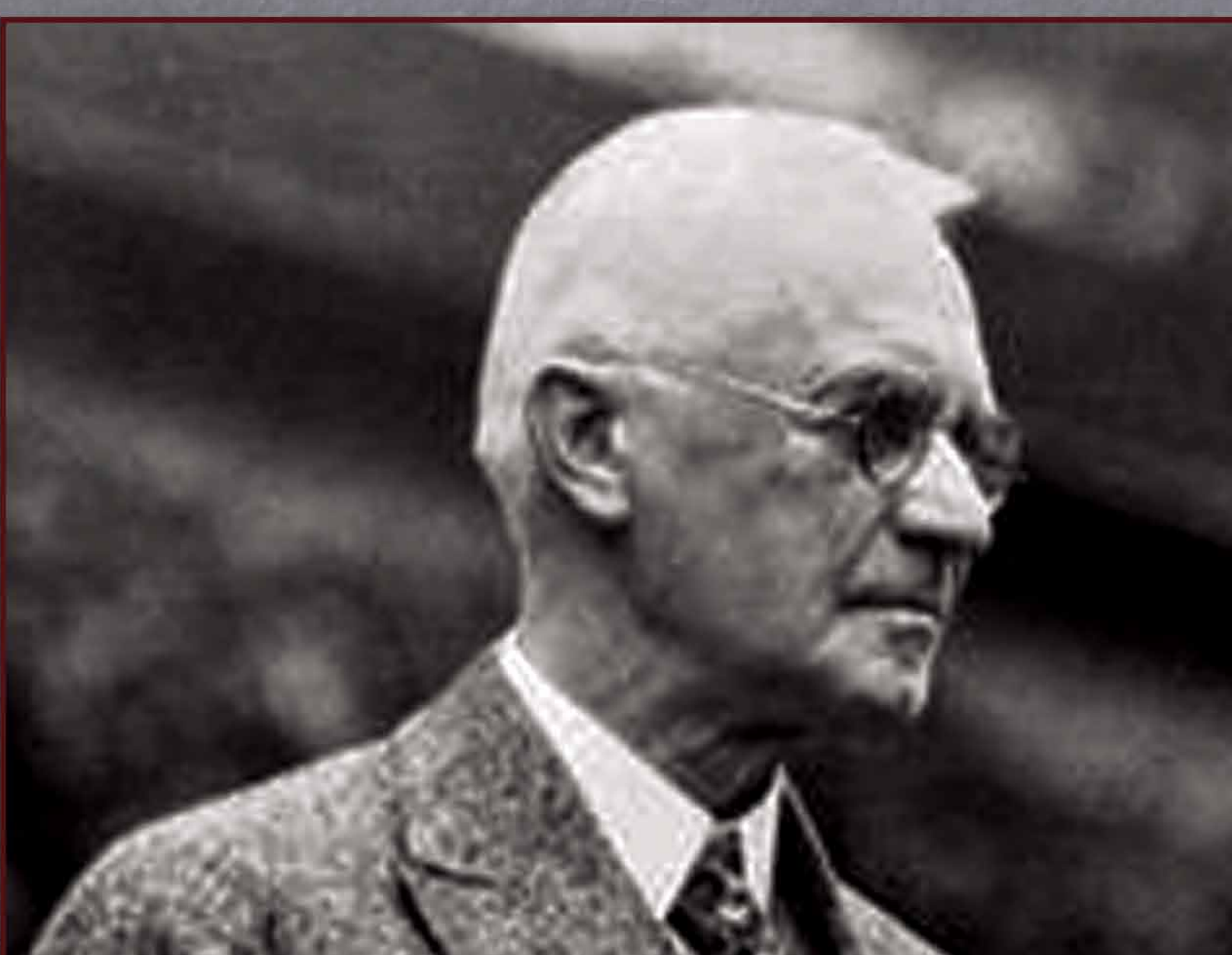
## Harold Van Buskirk

Harold Van Buskirk was an architect and member the Submarine Defense Association, a research and development company making camouflage for the merchant marine. After joining the U.S. Naval Reserve, he was appointed to head the new Camouflage Section.



## Everett Warner

Everett Warner — artist, art critic, and U.S. Naval Reserve officer — worked with Thomas Edison during World War I, before being appointed to head the Design Subsection, based in Washington, D.C.

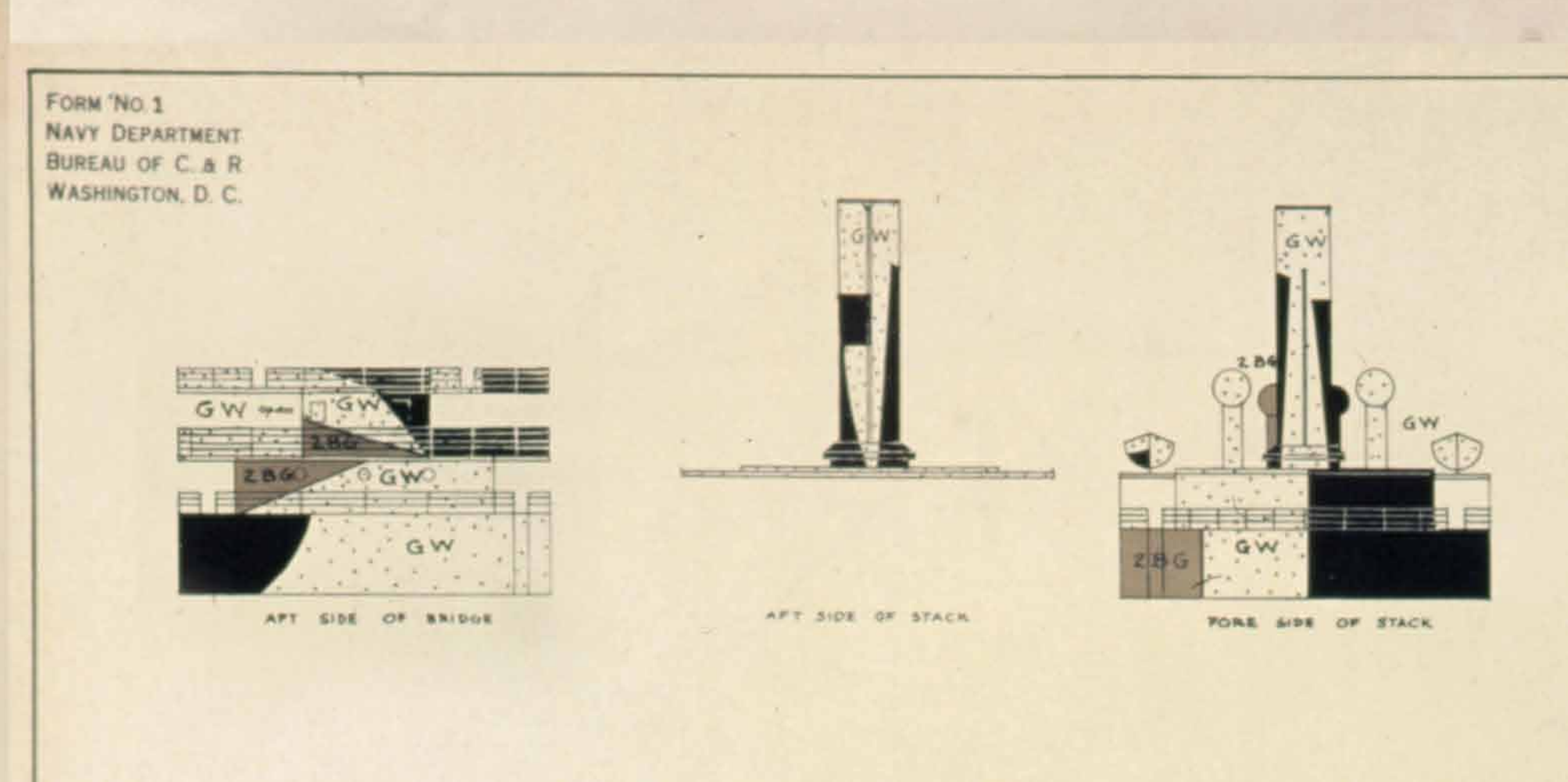
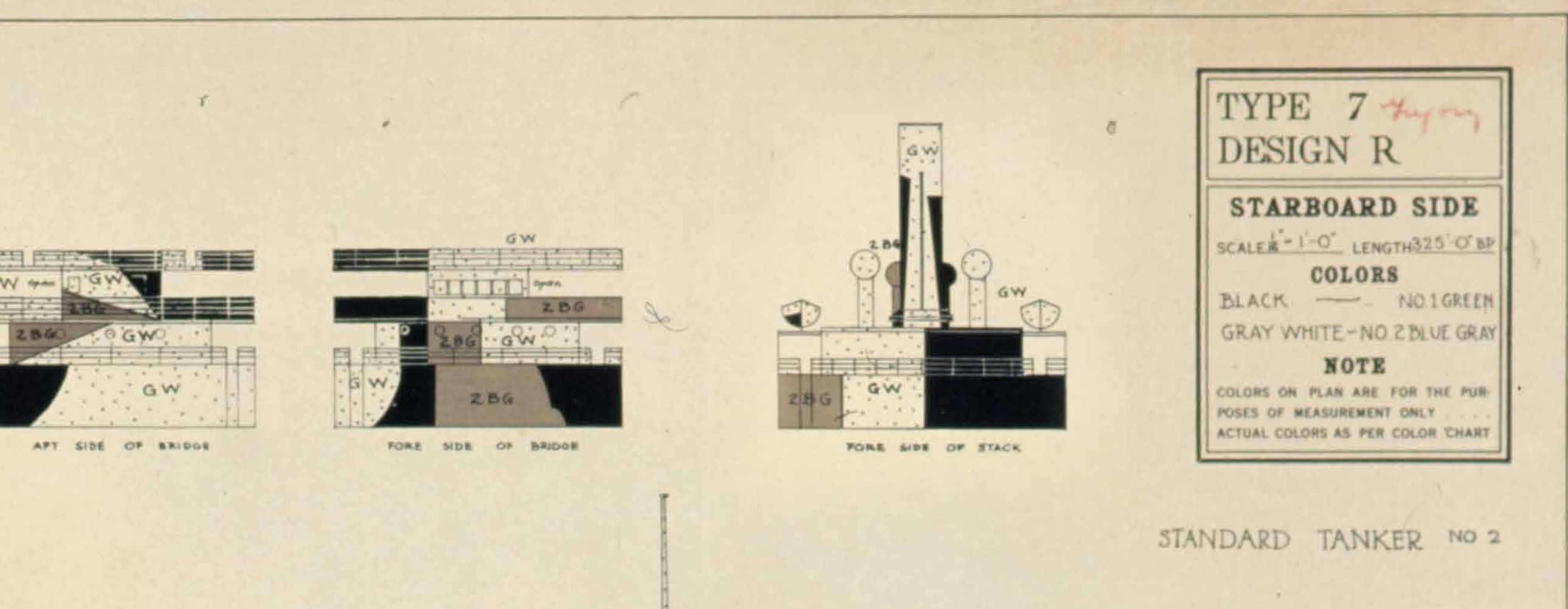
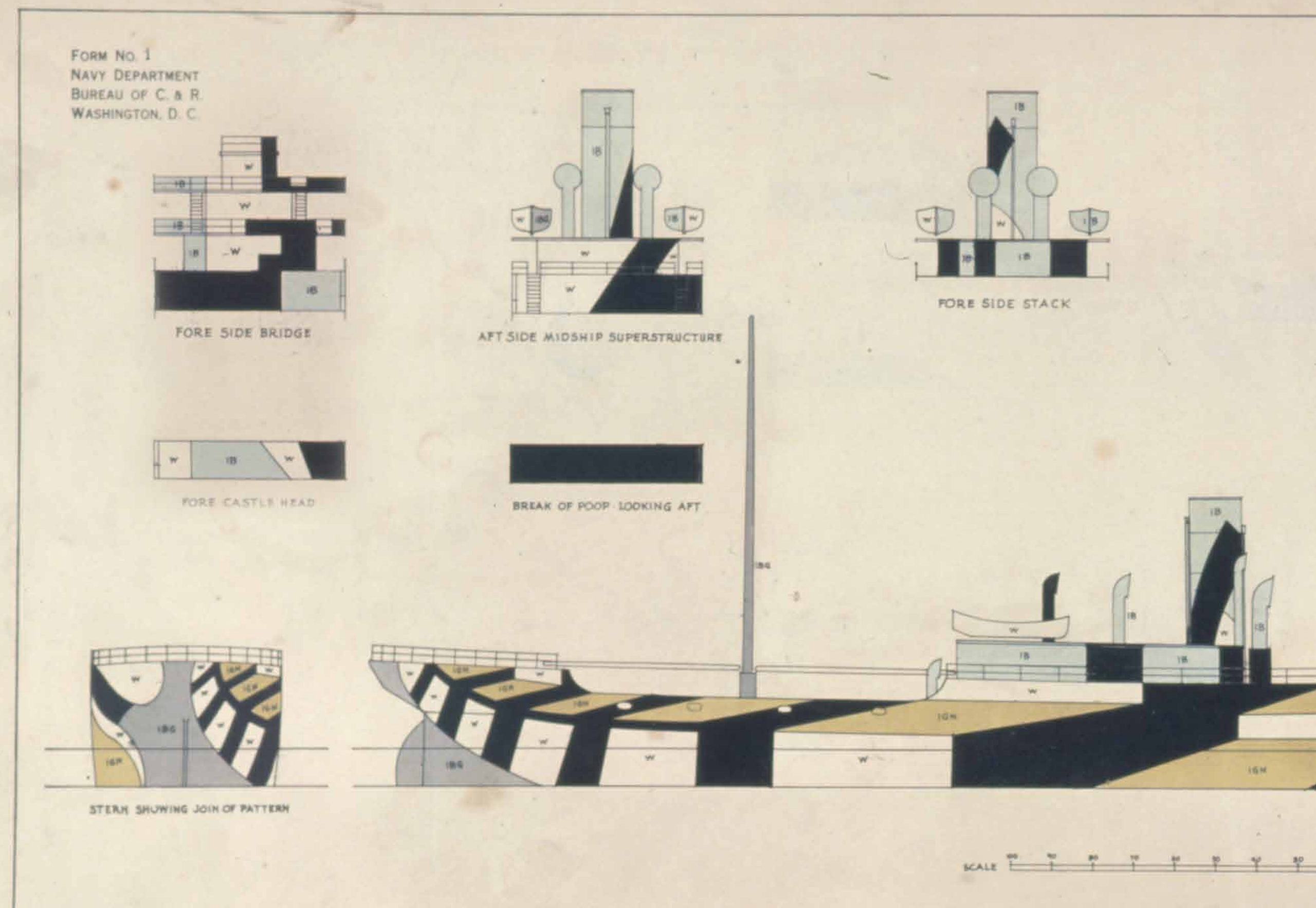
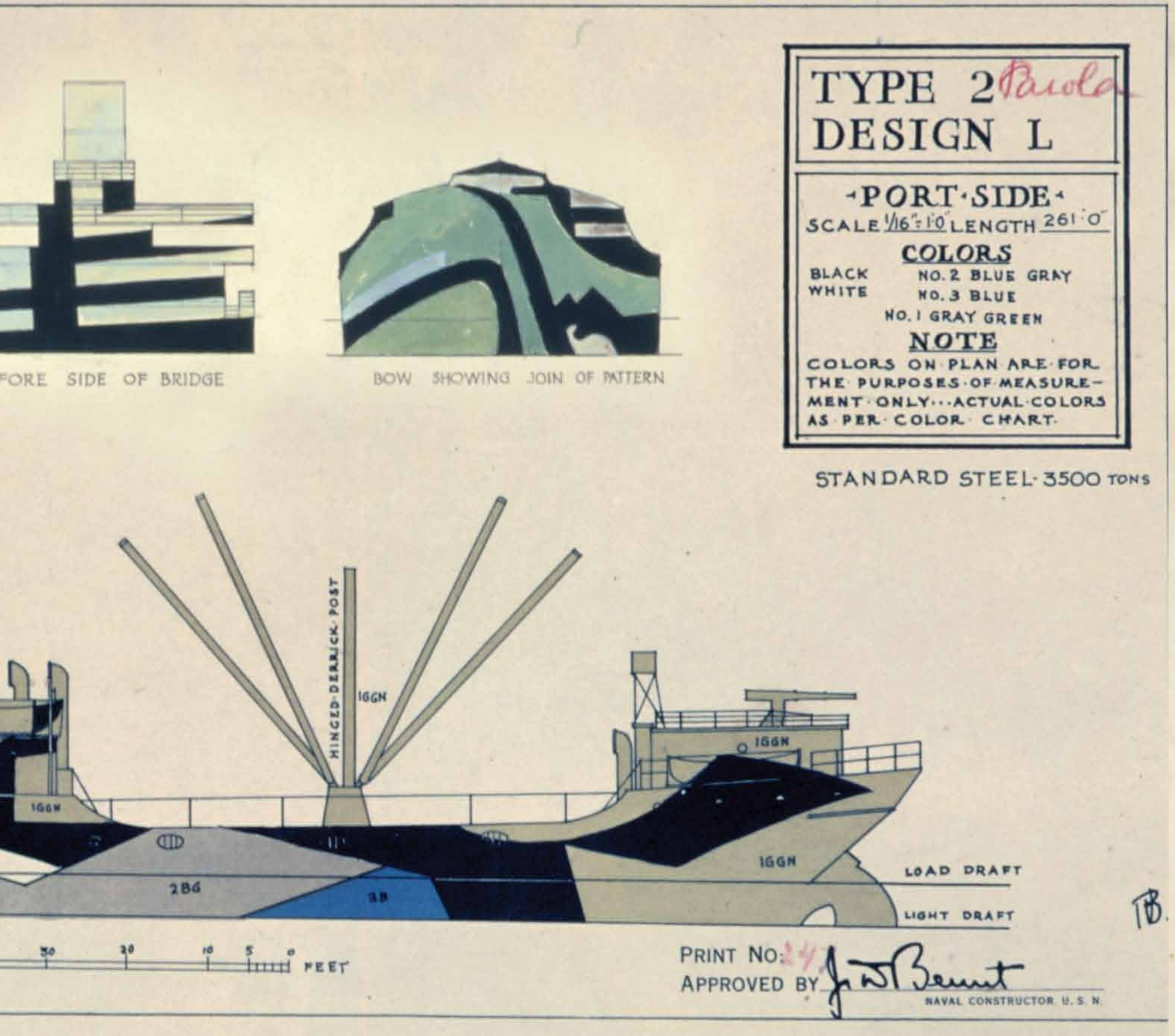
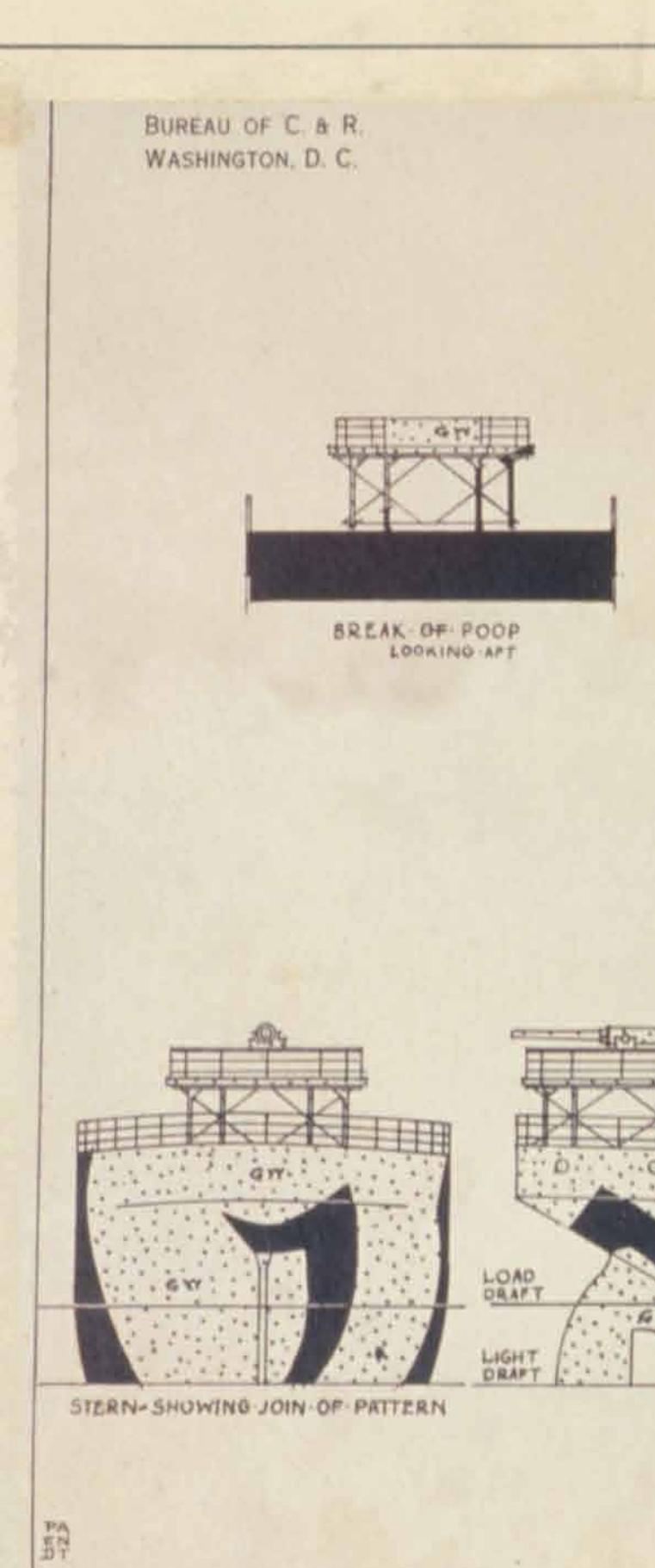
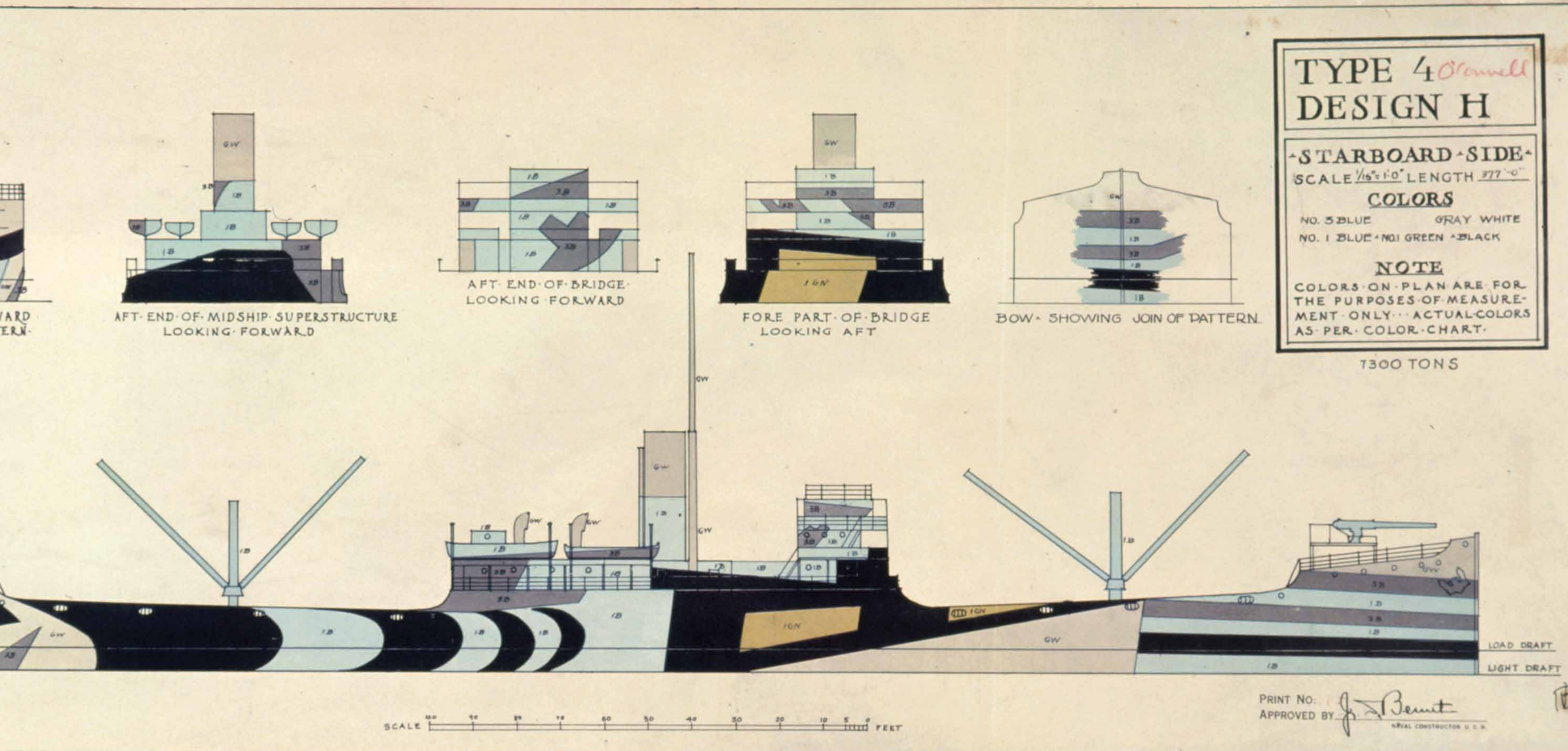
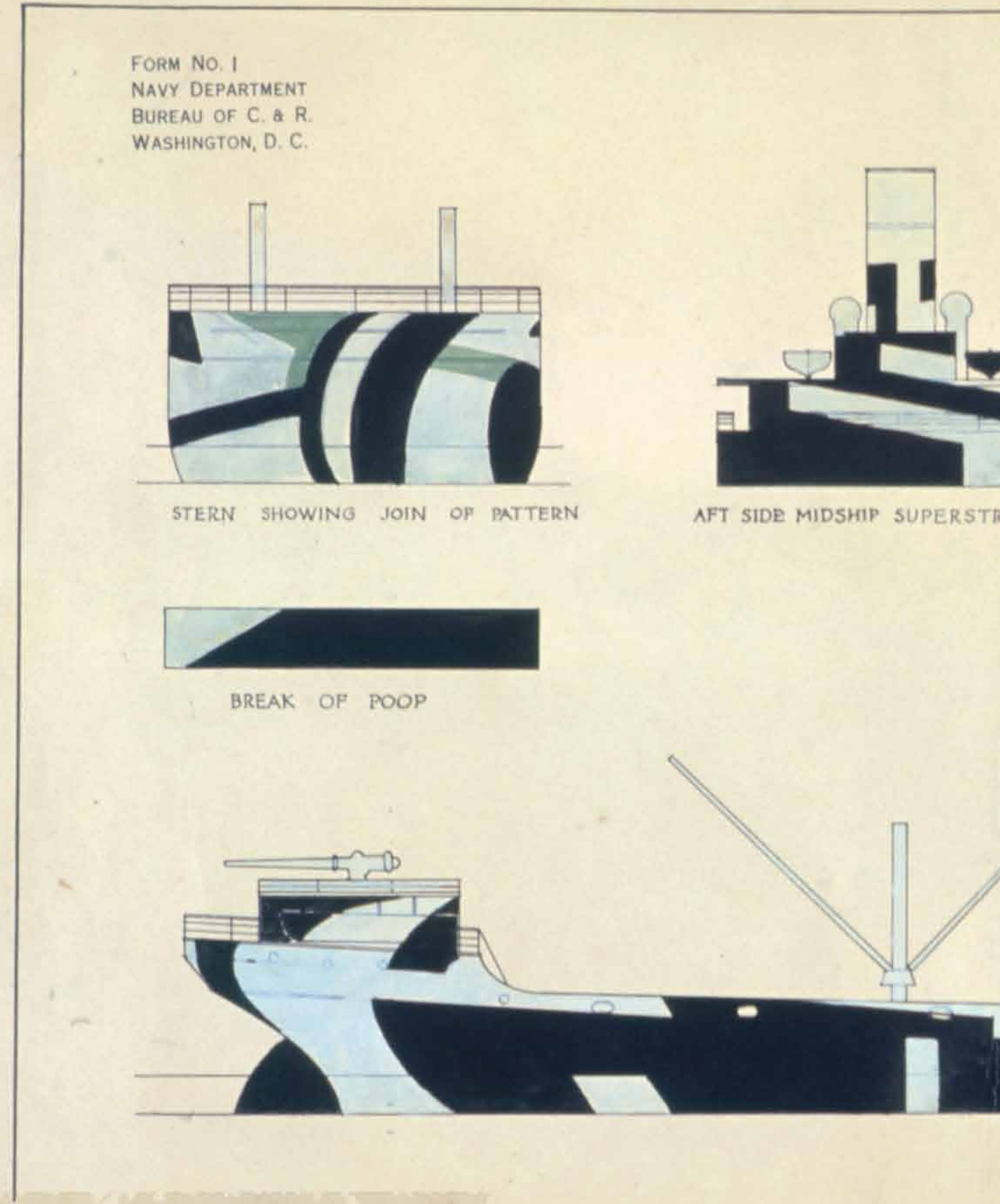
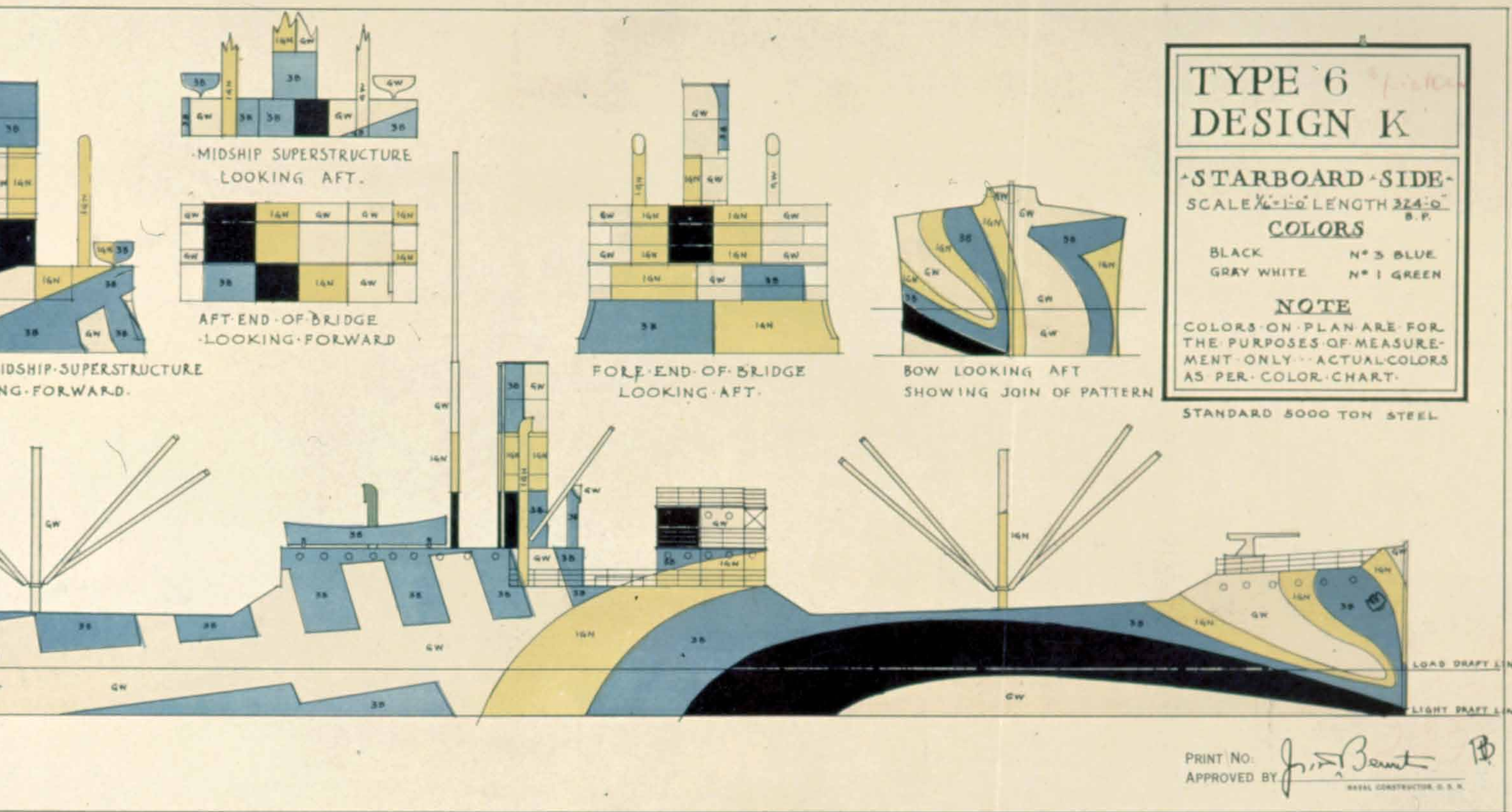


## Loyd Jones

Loyd Jones, chief physicist for the Eastman Kodak Company, was selected to lead the Research Subsection, based in Rochester, New York. There, Jones invented various methods for testing Razzle Dazzle designs in miniature.



# An Array of Schemes

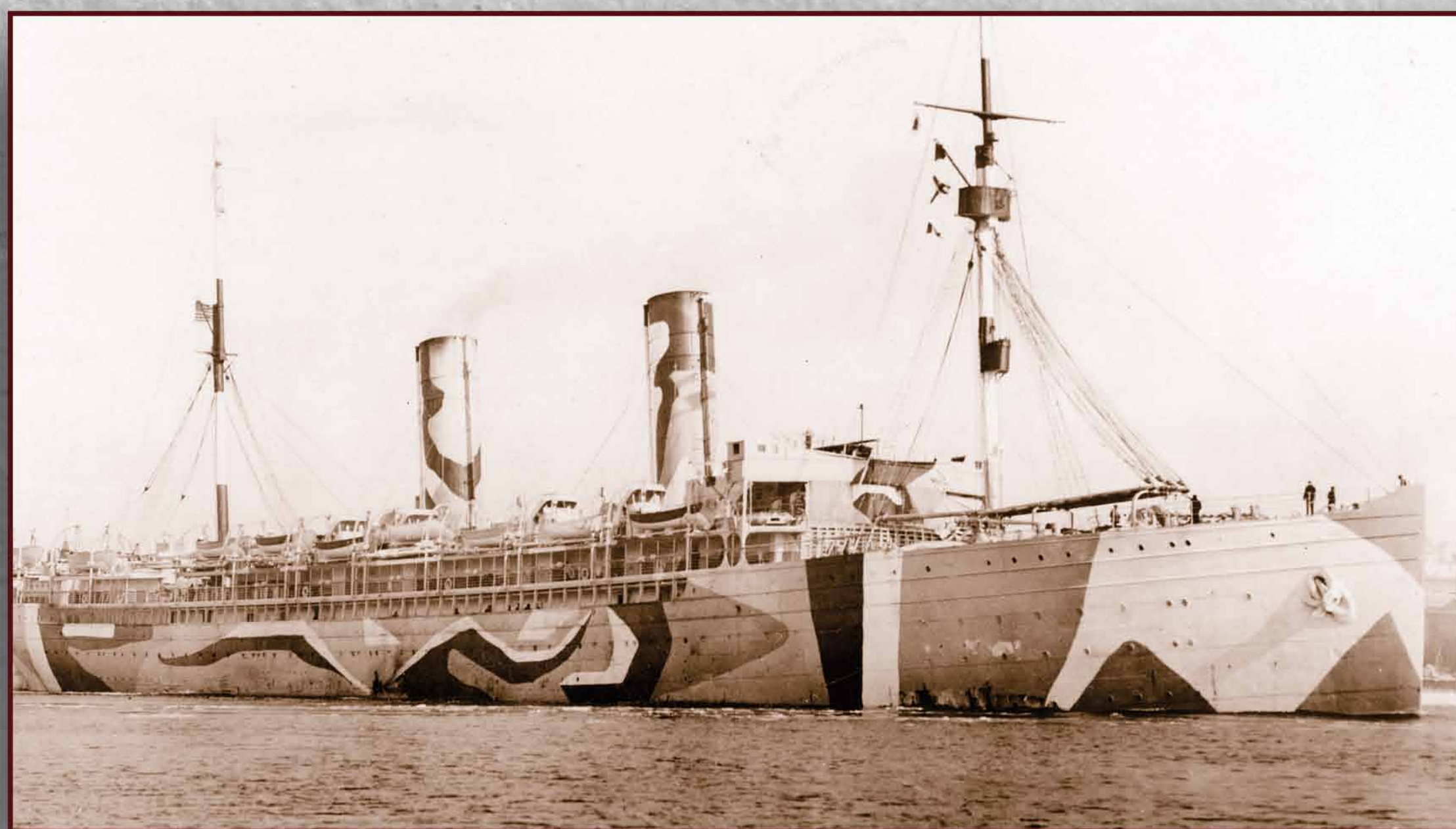




Convinced that anti-submarine camouflage could improve the survivability of ships at sea, but lacking the time to conduct definitive tests, the U.S. Navy's Camouflage Section decided to approve several different designs and let actual conditions determine which was most effective.

## Pure Razzle Dazzle

Some of the camouflage schemes relied solely on distorting the appearance of a ship to confuse enemy observers, according to the principles of Thayer and Wilkinson. These systems were most representative of the Razzle Dazzle idea.



### Warner Disruptive Dazzle System

Considered by the Navy to be the best of the disruptive schemes, this design by Everett Warner made no attempt at concealment but employed a classic Razzle Dazzle design to confuse the observer as to a ship's size and heading.



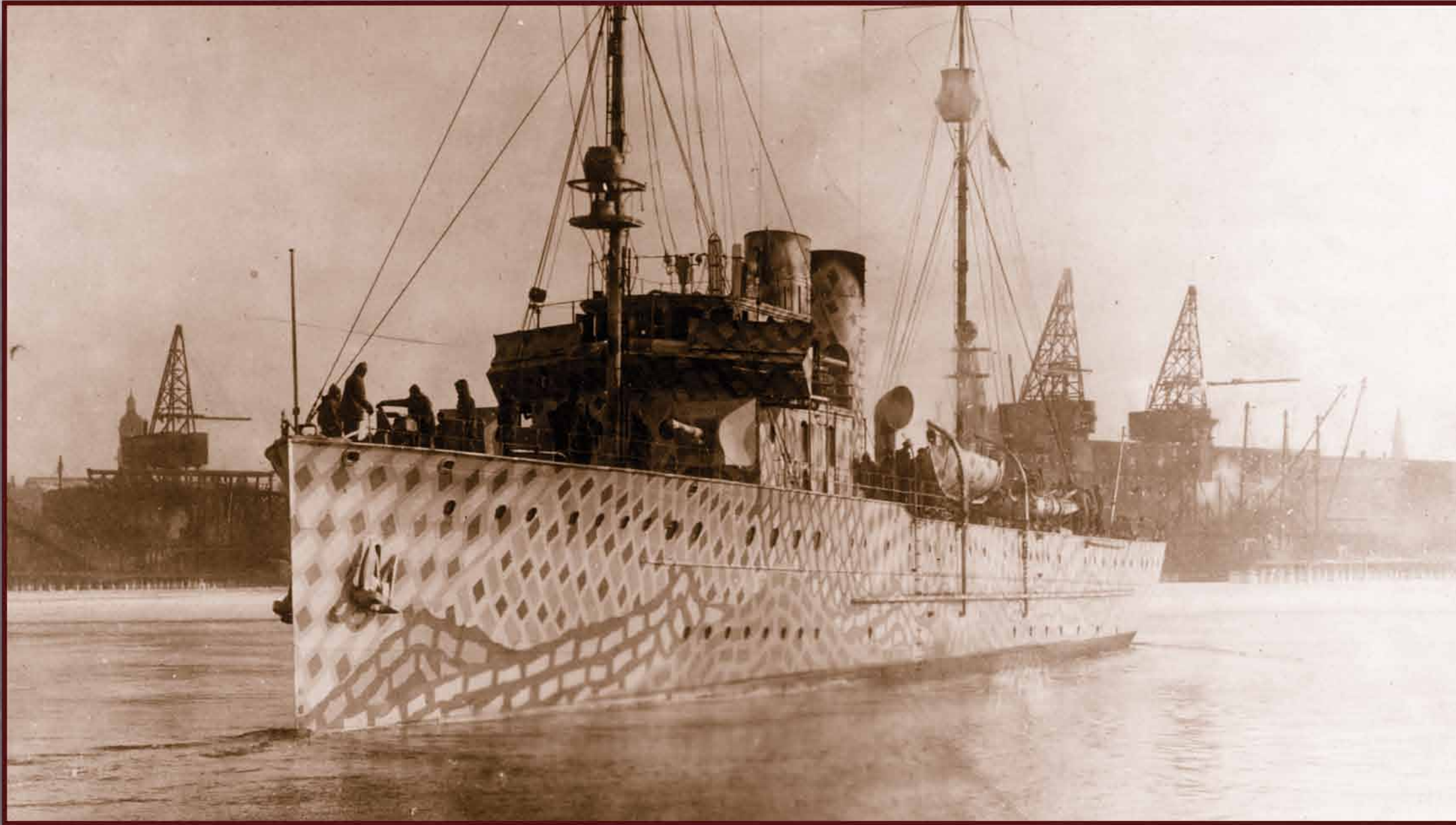
### United States Navy Dazzle Painting

This design, the most widely applied scheme for U.S. Navy destroyers and U.S. Naval Overseas Transportation Service ships, had a great variety of patterns that all aimed at distorting a ship's appearance to thwart enemy submarines' course prediction and ranging attempts.



# Low Visibility

Some of the approved designs were classified as “low visibility” schemes, attempting concealment rather than the distortion effects of true Razzle Dazzle. Authorities eventually concluded that given the technology of the time, low visibility camouflage was ineffective except at very long ranges.



## ■ Brush Counter-Shading System

Designed by George de Forest Brush, the first proponent of countershading camouflage, this scheme darkened raised surfaces that reflected the most light, and lightened shadowy recesses. This reverse coloration was intended to make a ship less apparent to distant observers.



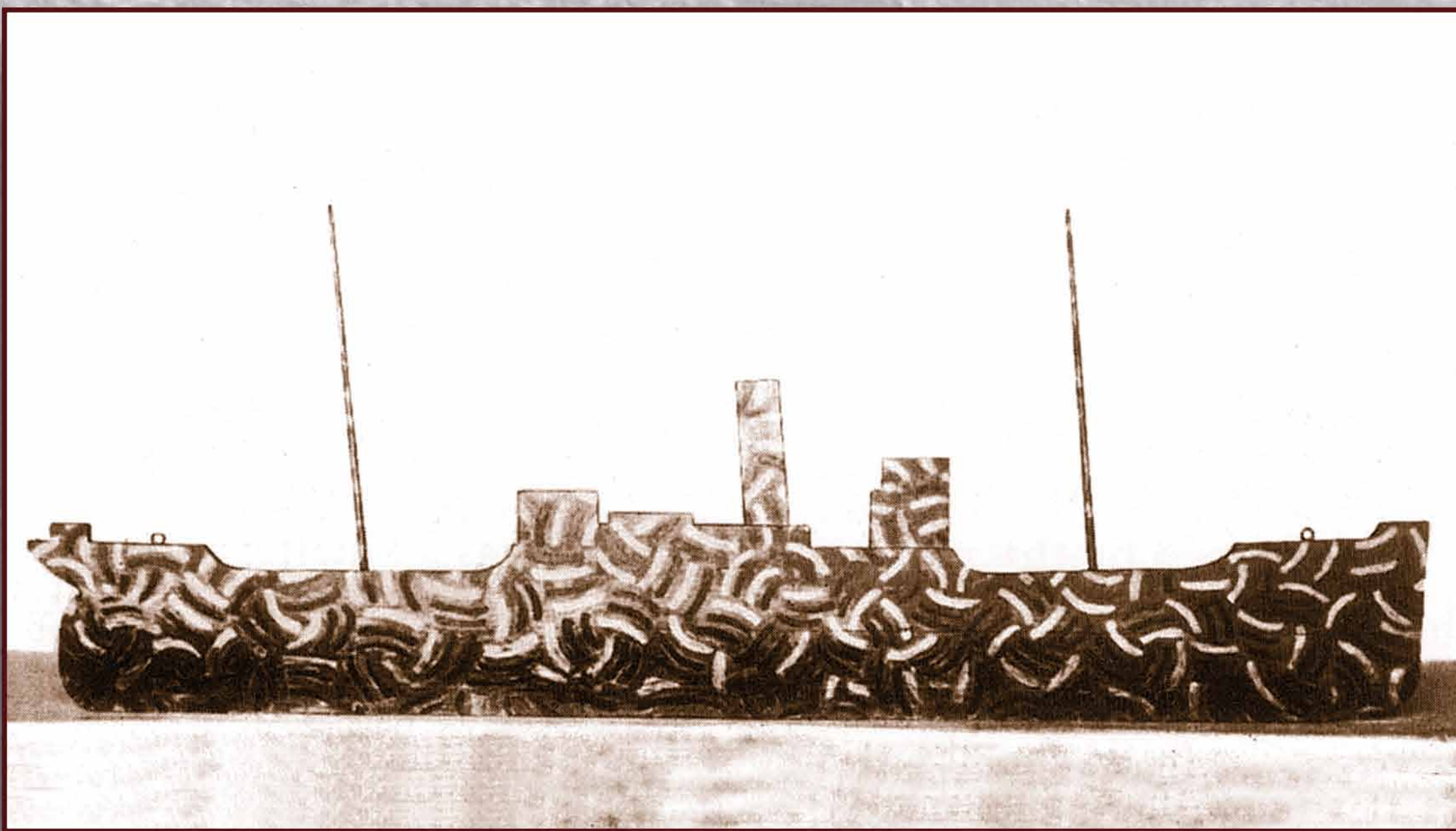
## ■ Mackay Low Visibility System

Artist William Mackay designed this scheme around the idea that a multitude of contrasting points on the surface of an ship would overwhelm an observer's optic nerves, creating the illusion that the ship was just part of its background. It was never proven whether or not this effect was achieved.



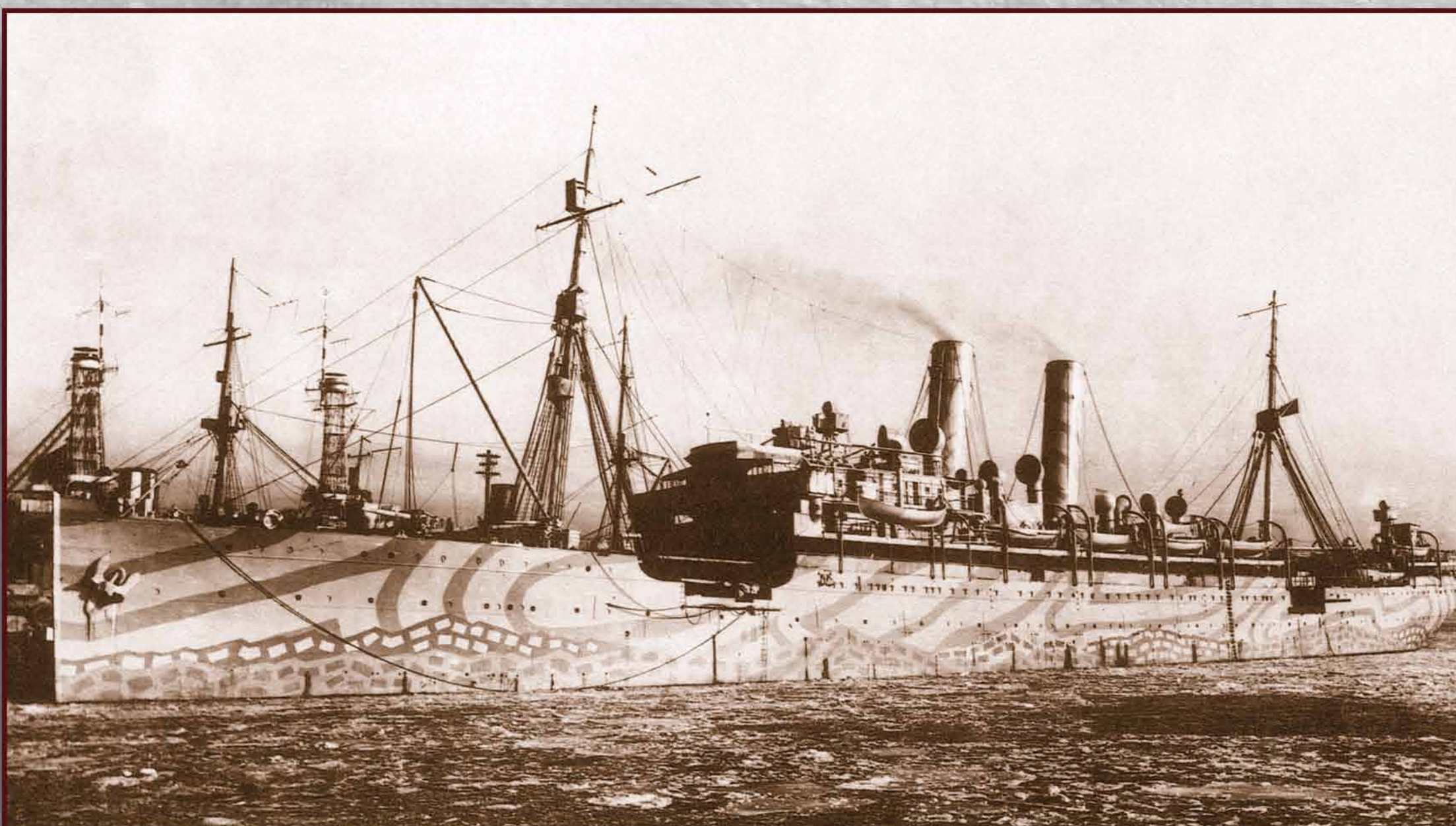
# Combining Low Visibility and Disruptive Coloration

Some of the Camouflage Section's designs attempted to combine the aims of concealment and disruptive distortion. Previously these two goals were considered to be mutually exclusive, since distortion design relied on high-contrast schemes that were easy to see.



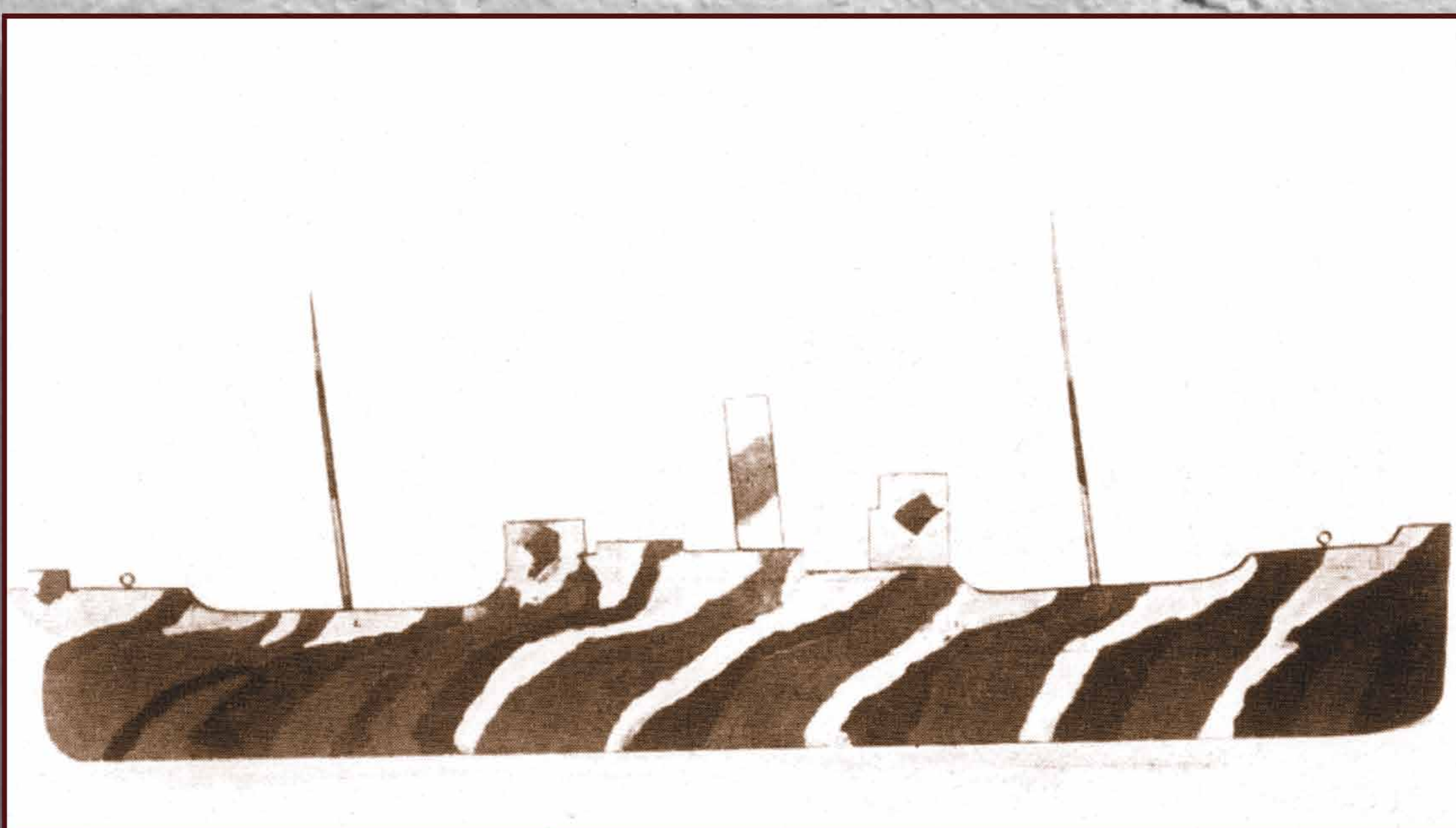
## Herzog Low Visibility/ Disruptive System

Design Subsection artist William Herzog designed this scheme to confuse observers regarding the range and course of a ship at certain distances, while concealing it at others. However, the United States Navy ultimately judged it to be ineffective.



## Mackay Disruptive/ Low Visibility System

Designed to overcome the opposing requirements of low visibility and disruptive systems, this system used high-contrast patterns that offered poor optical resolution at long range, and distorted a ship's appearance at close range.



## Toch Disruptive/Low Visibility System

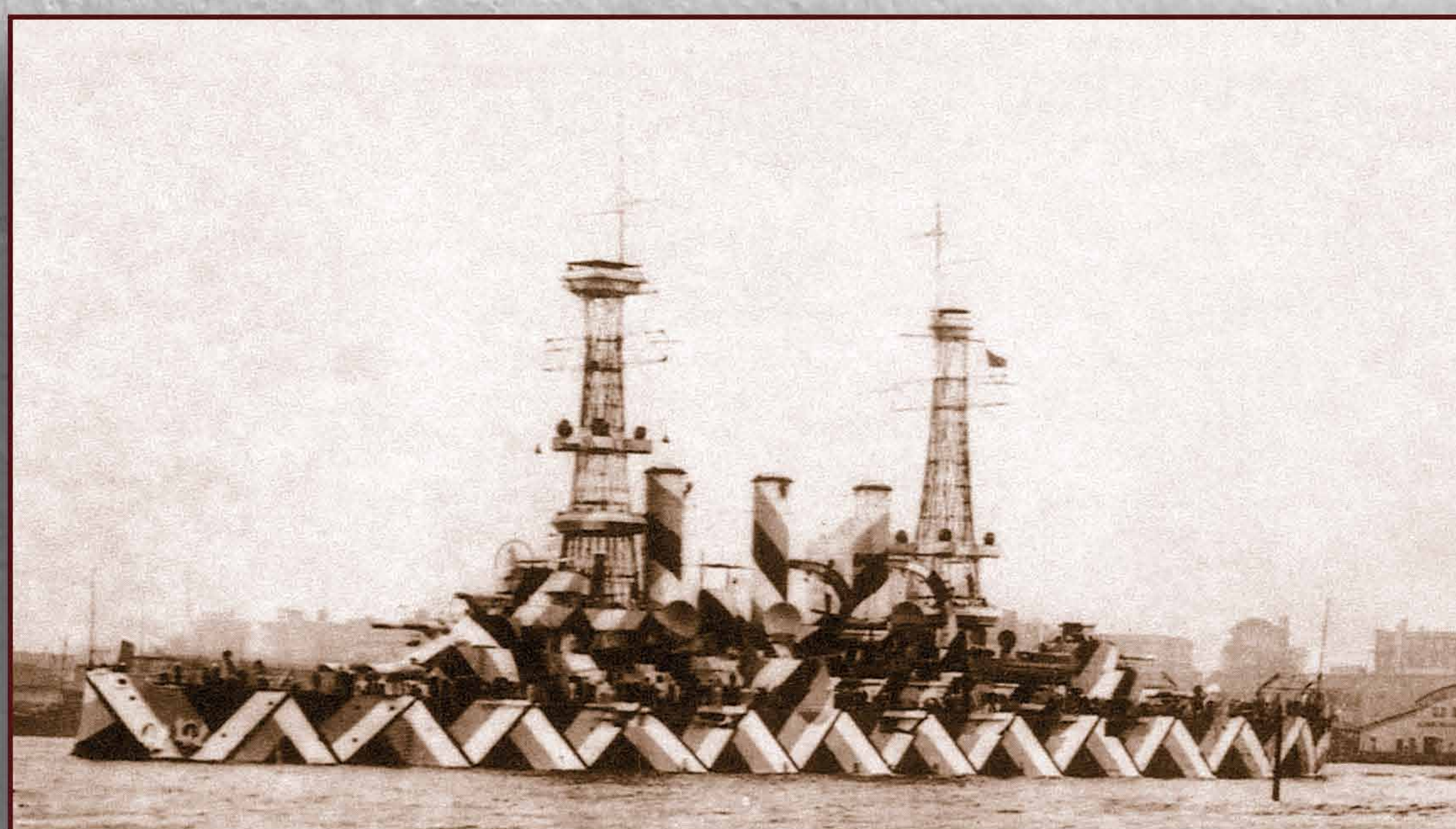
Research Subsection chemist Maximilian Toch designed this scheme using research on optics done at the Eastman Kodak laboratories. It was intended to create optical illusions to conceal ships at long range and hamper range estimation once the ship was sighted.



# Other Camouflage Techniques

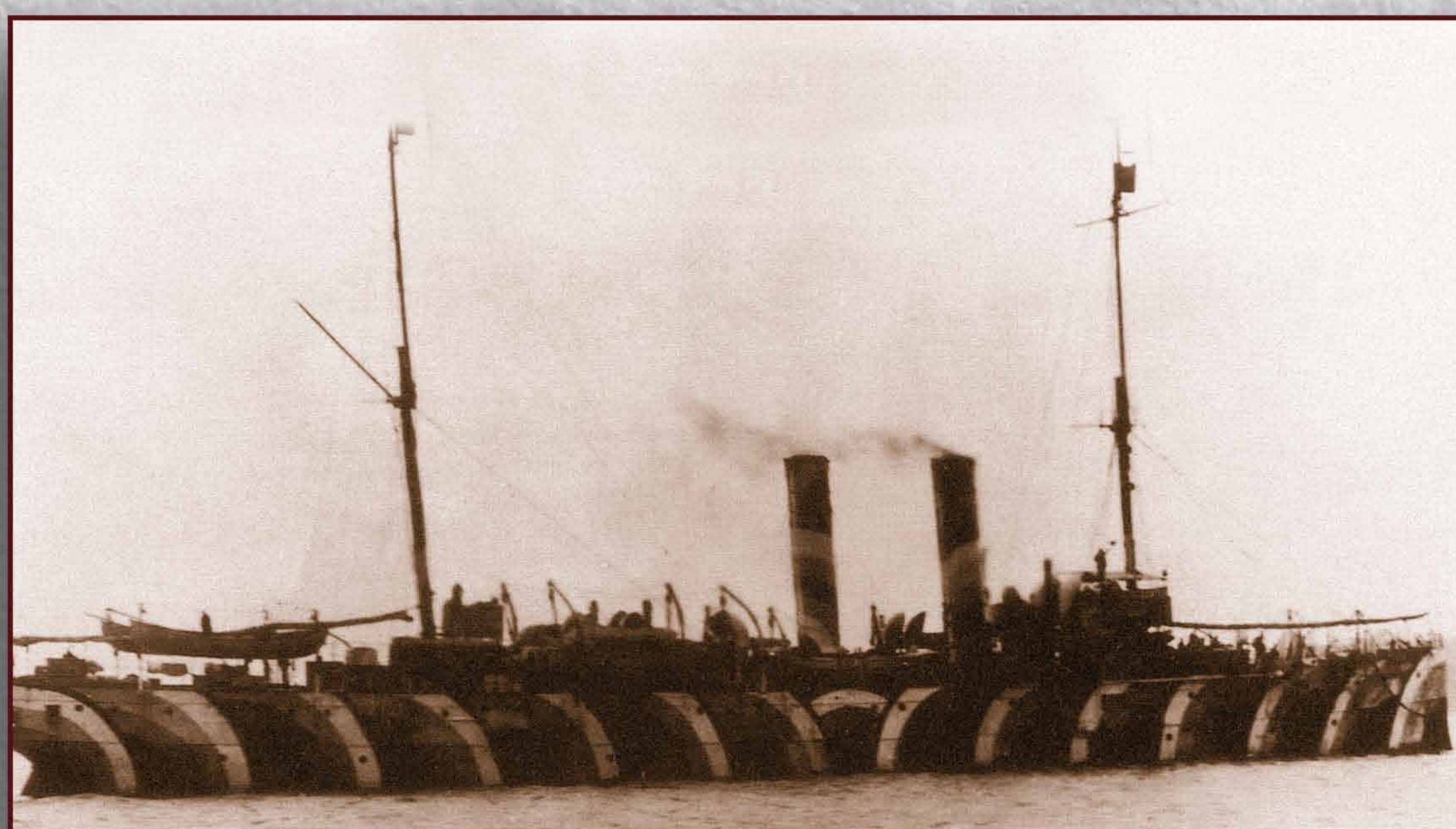
The U.S. Navy also approved several camouflage systems not intended for use against enemy submarines, but to protect the U.S. battle fleet in combat. The Navy also approved a system designed by a private company for the U.S. Shipping Board that was later applied to vessels of the merchant marine.

By the war's end, eight months after the Camouflage Section's establishment, some camouflage systems were preferred over others. Overall, Razzle Dazzle, when combined with convoys and aggressive anti-submarine measures, had made a favorable impression on the U.S. Navy.



## ■ Watson/Norfolk Disruptive Dazzle System

Designed at the Norfolk Navy Yard by "Mr. Watson, master painter," to protect U.S. Navy battleships, this scheme was intended to impede enemy gunners' range finding by breaking up a ship's vertical and horizontal lines, which were used to judge distance.



## ■ Submarine Defense Association Low Visibility/Deception System

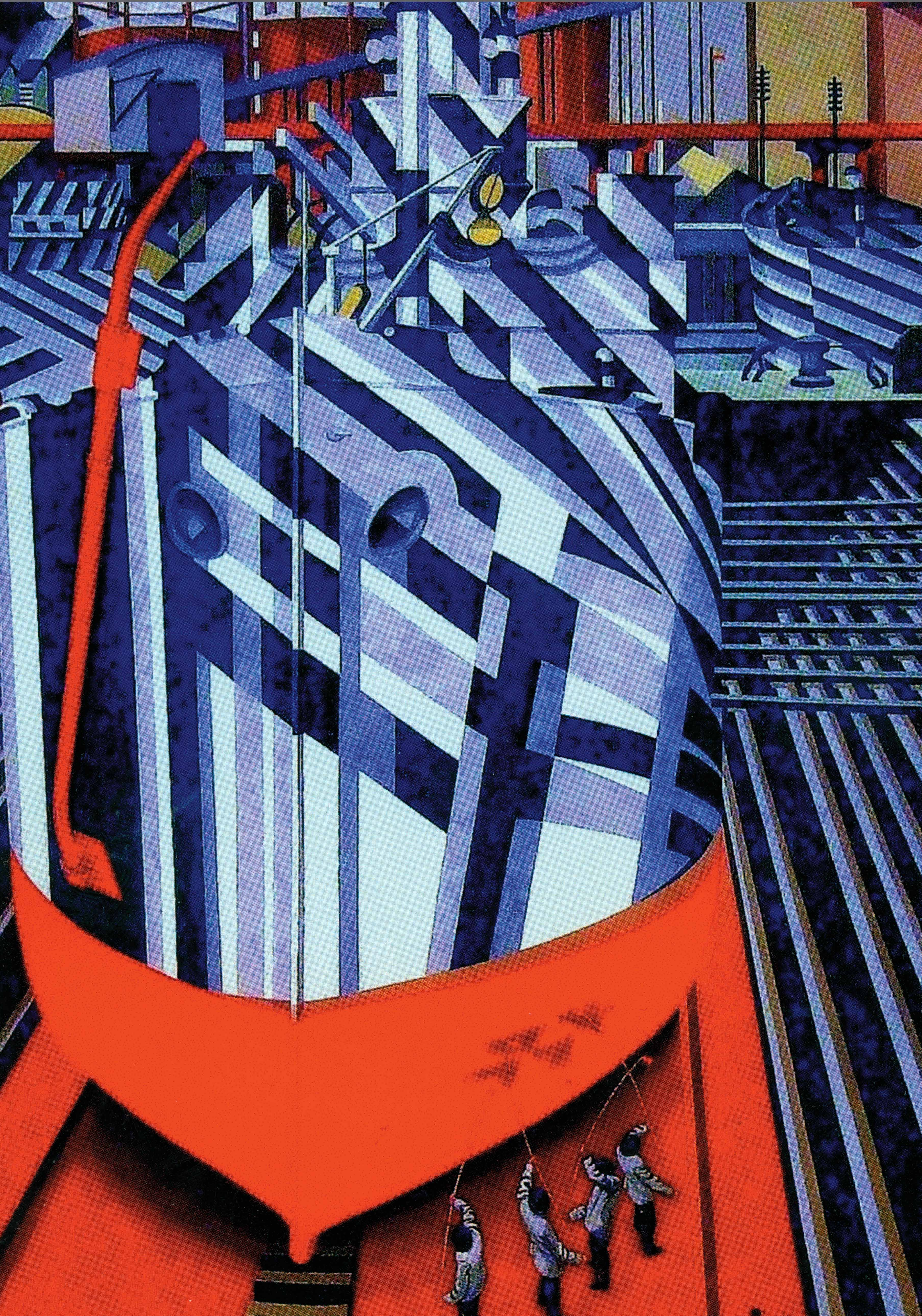
Named after the private research and development company that designed it, merchant ships that applied approved systems, such as this one, obtained lower insurance premiums. America's large shipping corporations protected their investments by funding anti-submarine research.



## ■ Fleet System

This scheme was devised for use by the battle fleet — battleships and armored cruisers — which steamed in long, orderly lines that gave away their course and made ordinary Razzle Dazzle ineffective. After the war it was discovered that German battleships' range finders were not foiled by such optical illusions.



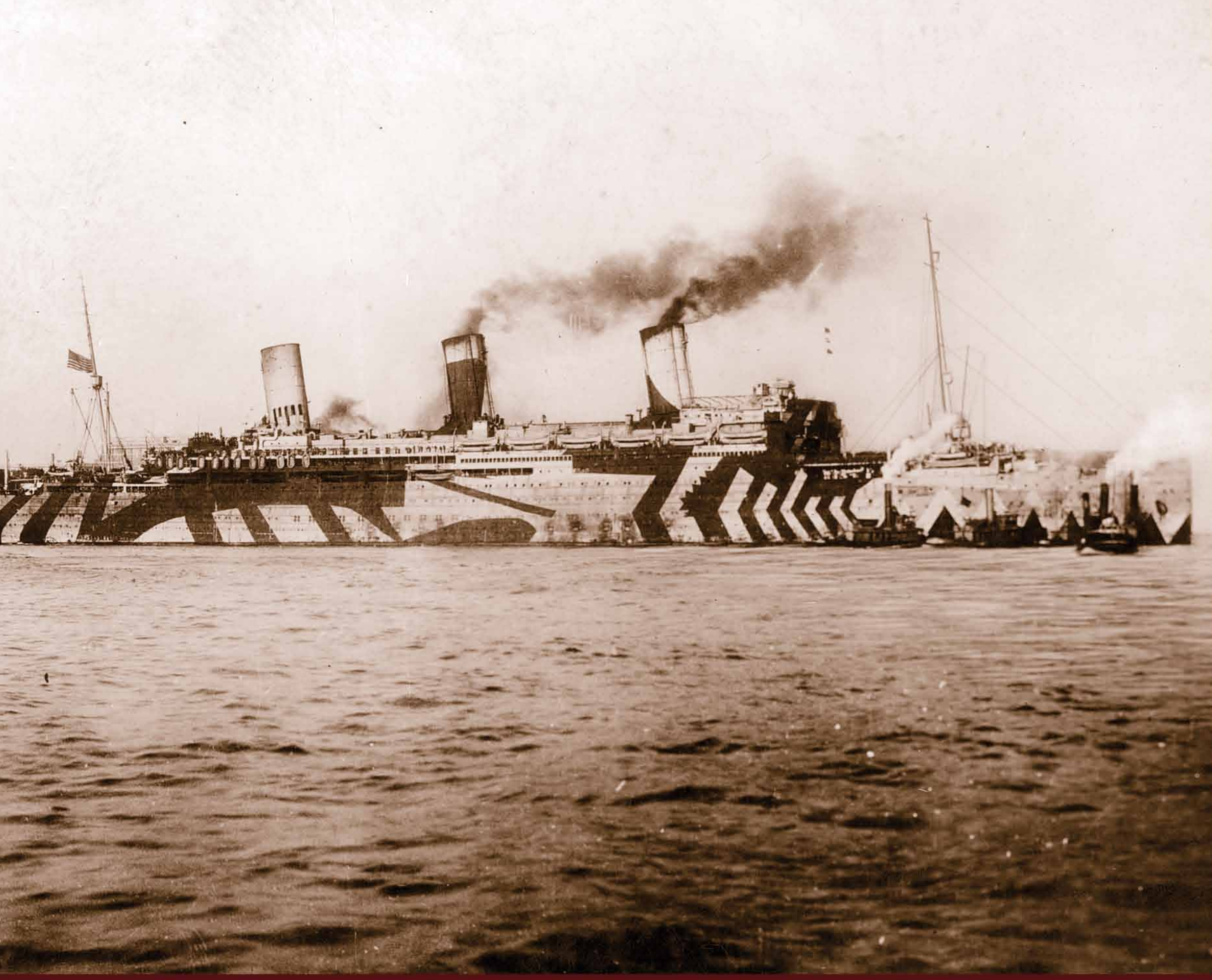




# The War of the Ways







■ Among the captured prizes was Germany's largest liner, SS *Vaterland*, seized in New York Harbor along with 26 other ships. Renamed USS *Leviathan*, the ship made 19 round trips to Europe as a troop transport.

Once repaired, confiscated ships became part of the American war effort. They were commissioned in the Naval Overseas Transportation Service, an auxiliary branch of the U.S. Navy tasked with command of supply ships. By 1918 the NOTS had carried more than six million tons of war material to Europe, enough to support an expeditionary force of two million men.

After Congress declared war on Germany on 6 April 1917, the United States urgently needed transports to supply its hard-pressed allies and move American troops to Europe. To meet the demand, the federal government interned enemy ships, commandeered American merchantmen under construction, and took charge of the nation's shipbuilding effort.

President Woodrow Wilson immediately authorized the seizure of all enemy vessels being held in U.S. ports. Unfortunately, while Wilson waited for Congress' declaration, many German crews sabotaged their ships. Still, 91 ships and 1,100 prisoners were taken.



This wool officer's service cap was intended for everyday wear, and was much more practical than the ornate, old-fashioned dress hat of its day. A white lightweight version was issued in tropical climates.



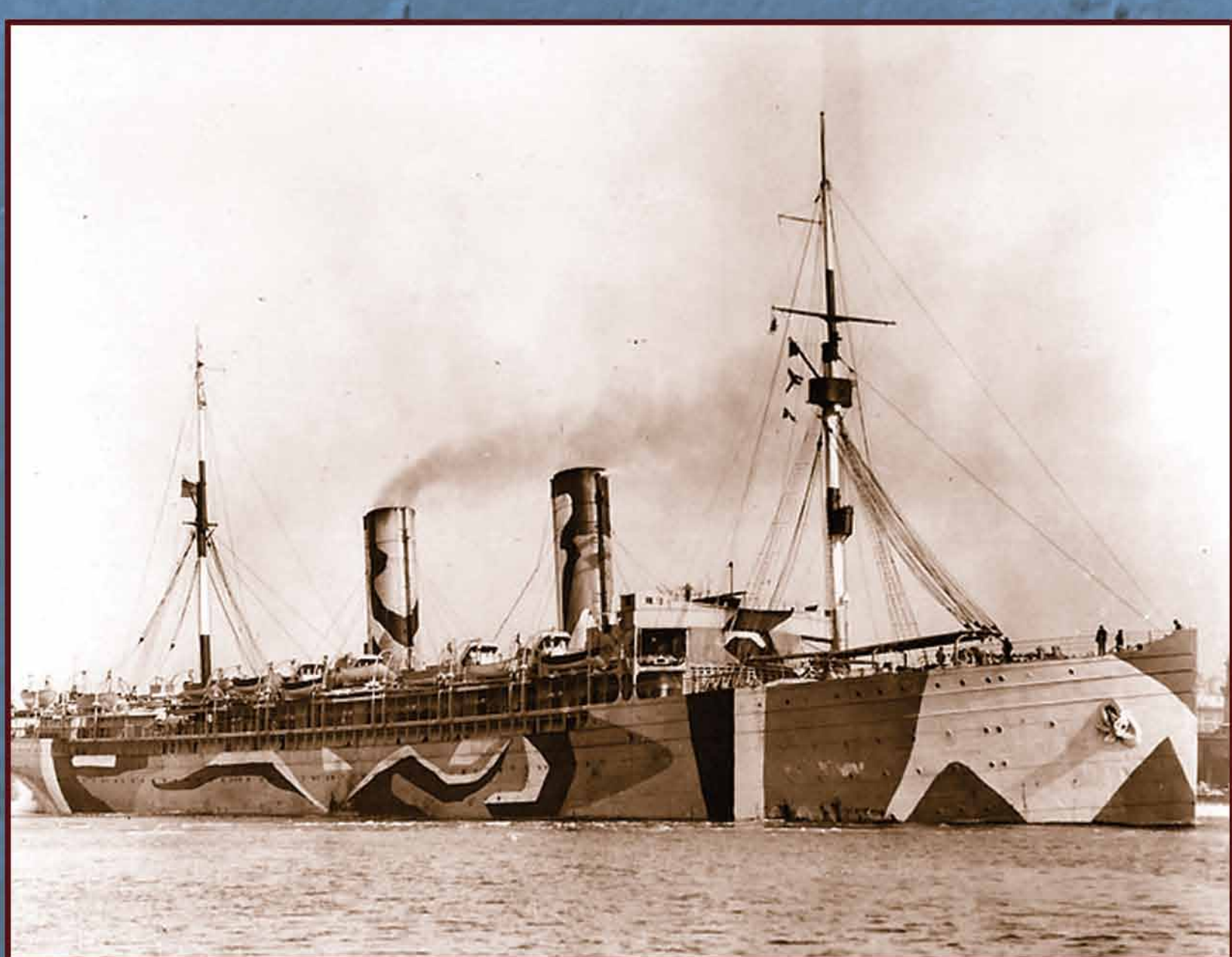
■ The German steamer *Kamilla Rickmers* was confiscated in Boston within 90 minutes of the declaration of war, along with five other vessels. Commissioned USS *Ticonderoga*, the ship served as a supply transport until she was sunk by a U-boat in November 1917, after falling out of a convoy.



Not only did the federal government seize German ships in the United States, it also took control of many privately-owned American merchantmen, to put them to use where they were needed most, without regard to business interests. Most were placed under the command of the Naval Overseas Transportation Service.



On 4 July 1918, the U.S. launched 95 vessels in 24 hours, a historic achievement. Between April 1917 and September 1918, the combined tonnage of the U.S. Merchant Marine fleet had increased from 2.75 to 9.5 million tons.



The American Line Steamship SS *St. Louis* was among the vessels commandeered by the U.S. Shipping Board/Emergency Fleet Corporation for the Navy. Renamed USS *Louisville* in April 1918 and repainted in Razzle Dazzle, she made several round trips to Europe as a troopship.

Ten days into the war, President Wilson created two new government entities, the Emergency Fleet Corporation and United States Shipping Board, to oversee the enormous task of harnessing American industry for the war effort. These agencies quickly took charge of private American shipyards and steel mills and began organizing the first mass-production of ships in history.

The war featured prominently in the newspapers before America's entry, and even more so afterward, such as in this spread from the *New York Times*' "Mid-Week Pictorial," which highlights the role played by the U.S. Navy.

MID-WEEK PICTORIAL

### Notable Achievement of Navy Under Admiral Gleaves in Transporting Safely Over Two Million Men to Europe

**NUMBER OF MEN TRANSPORTED PROMPTLY TO FRANCE**

|          |           |           |           |            |           |
|----------|-----------|-----------|-----------|------------|-----------|
| MAY 1918 | JUNE 1918 | JULY 1918 | AUG. 1918 | SEPT. 1918 | OCT. 1918 |
| 116,642  | 278,844   | 365,340   | 288,974   | 257,457    | 118,230   |

**AMERICAN TROOPS CARRIED BY SHIPS OF EACH NATION**

|                            |                     |
|----------------------------|---------------------|
| RUSSIAN SHIPS (COMMERCIAL) | 20,000 MEN - 137    |
| FRENCH SHIPS               | 45,000 MEN - 239    |
| ITALIAN SHIPS              | 32,000 MEN - 51     |
| AMERICAN SHIPS             | 2,250,000 MEN - 437 |
| BRITISH SHIPS              | 1,027,000 MEN - 94  |

**PORTS OF DEPARTURE IN AMERICA AND DEPARTATION CENTRES IN EUROPE**

| PORTS OF DEPARTURE | PORTS OF ARRIVAL (ENGLAND) |
|--------------------|----------------------------|
| QUEBEC             | GLASGOW                    |
| MONTREAL           | MANCHESTER                 |
| HALifax            | LIVERPOOL                  |
| BOSTON             | BIRMINGHAM                 |
| PHILADELPHIA       | LONDON                     |
| BALTIMORE          | BRISTOL                    |
| NEW YORK           | GLASGOW                    |
| NEW ORLEANS        | GLASGOW                    |
| SAVANNAH           | GLASGOW                    |
| MOBILE             | GLASGOW                    |
| MEMPHIS            | GLASGOW                    |
| INDIANAPOLIS       | GLASGOW                    |
| CINCINNATI         | GLASGOW                    |
| ST. LOUIS          | GLASGOW                    |
| KANSAS CITY        | GLASGOW                    |
| CHICAGO            | GLASGOW                    |
| DETROIT            | GLASGOW                    |
| CLEVELAND          | GLASGOW                    |
| COLUMBUS           | GLASGOW                    |
| INDIANAPOLIS       | GLASGOW                    |
| ST. LOUIS          | GLASGOW                    |
| KANSAS CITY        | GLASGOW                    |
| CINCINNATI         | GLASGOW                    |
| CHICAGO            | GLASGOW                    |
| DETROIT            | GLASGOW                    |
| CLEVELAND          | GLASGOW                    |
| COLUMBUS           | GLASGOW                    |

**ADMIRAL ALBERT GLEAVES**, Vice Admiral Gleaves, who has been commander of the cruiser and transport force of the Atlantic Fleet, having charge of the transportation of troops to and from Europe since the war began, has been raised to the rank of Admiral and placed in charge of the Asiatic Fleet.

At eleven o'clock, Sept. 1, Admiral Gleaves ordered his flag as full Admiral on the U. S. S. South Dakota, and assumed command of the Asiatic Fleet in accordance with the President's order of Aug. 18. He is here shown (left) holding farewell to his predecessor, Rear Admiral A. L. Halsey.

ADMIRAL GLEAVES ON THE DECK OF HIS FLAGSHIP, THE SOUTH DAKOTA, JUST AFTER TAKING COMMAND OF ASIATIC FLEET.

U. S. SOUTH DAKOTA, FLAGSHIP OF THE ASIATIC FLEET, LEAVING ANCHOR WITH THE FOUR-STARRED ADMIRAL'S FLAG AT MARLBHEAD.



“I want everyone in the yards to understand that when we succeed in building these ships, the credit will belong to the men who actually built them. I want all the men in the shipyards to feel that they are working with me, not for me.”

**Charles M. Schwab**

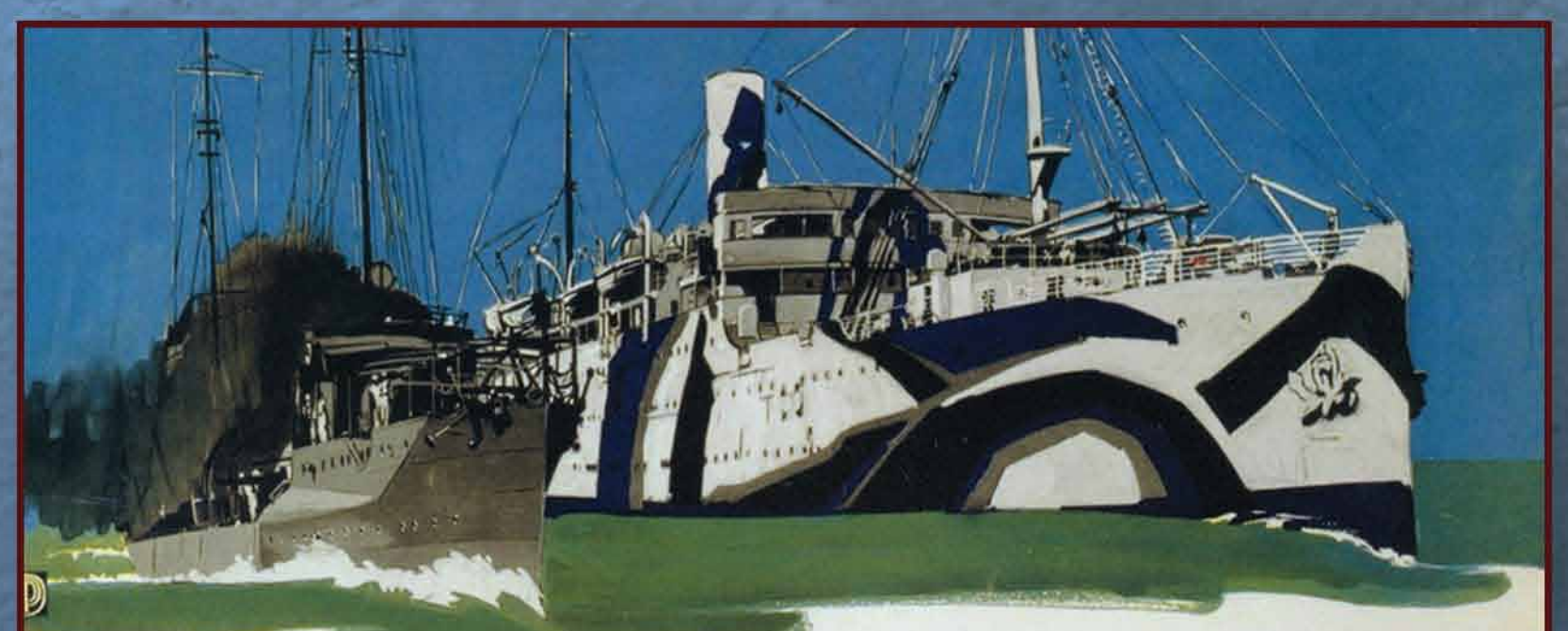
Director General of the Emergency Fleet Corporation, 1918

Directing the U.S. Shipping Board and Emergency Fleet Corporation were two of America's leading industrialists: Edward N. Hurley, and Charles M. Schwab — head of Bethlehem Shipbuilding and Steel Company, the nation's second largest steel maker. Their greatest achievements lay in applying the recent invention of mass-production to the American shipbuilding industry.



Faced with a shortage of automatic pistols, the U.S. Army requested the rush delivery of a modified civilian firearm, resulting in the M1917 Revolver. These sidearms were also carried by Sailors stationed with Navy artillery batteries in France.

Previously ships were custom-built from the keel up, using parts manufactured in the same shipyard. Charles Schwab brought together America's steel and shipbuilding industries — one making parts and other assembling them — and used new technology to simplify shipbuilding so a huge, semi-skilled workforce could build ships faster than ever before.



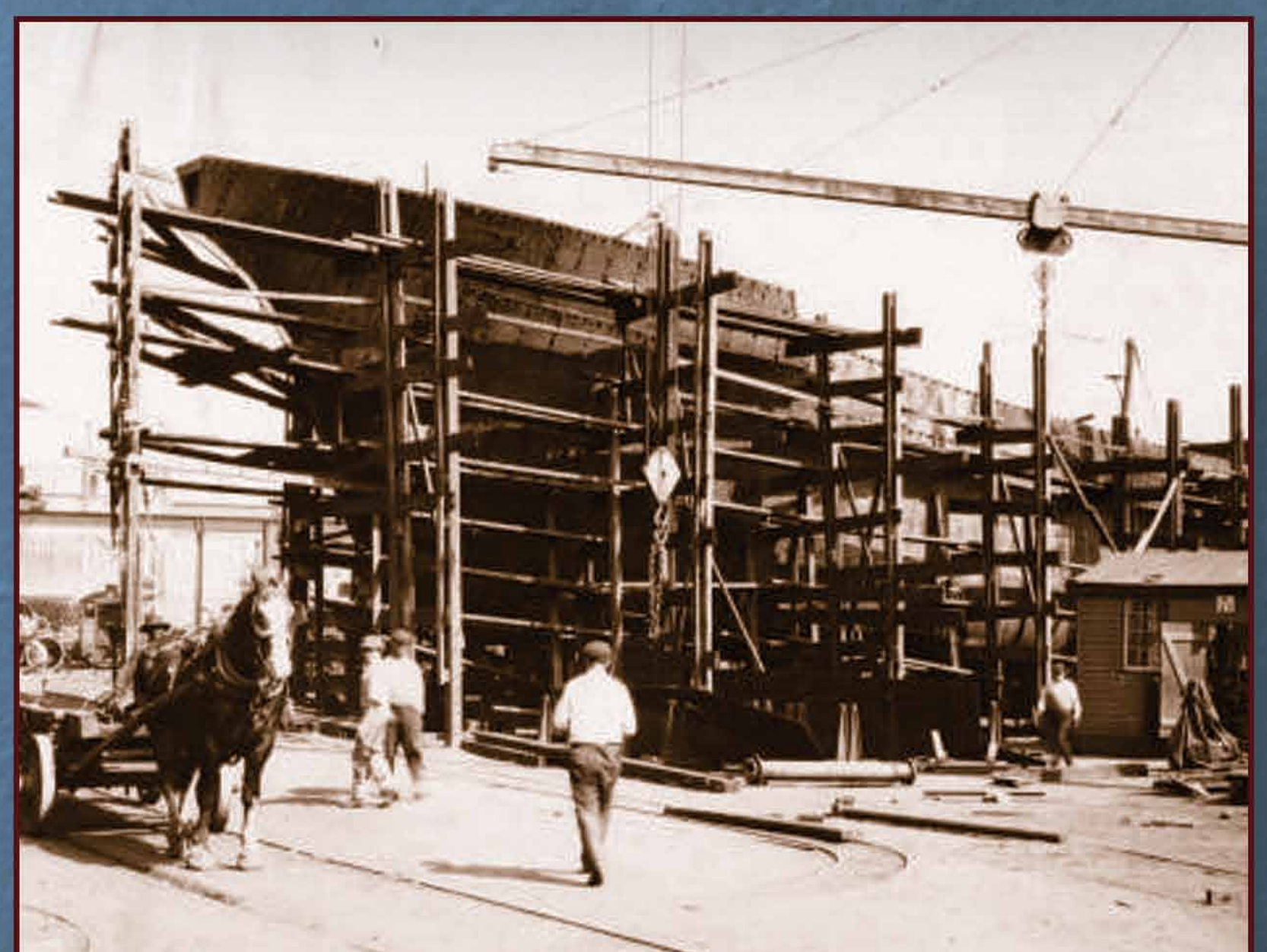
Shoot Ships to Germany and help **AMERICA WIN**—Schwab

At this Shipyard are being built ships to carry to our men “Over There”—Food, Clothing, and the

Shoot Ships to Germany and Help America Win

Illustrated by Adolph Treidler

United States Shipping Board/Emergency Fleet Corporation, 1918

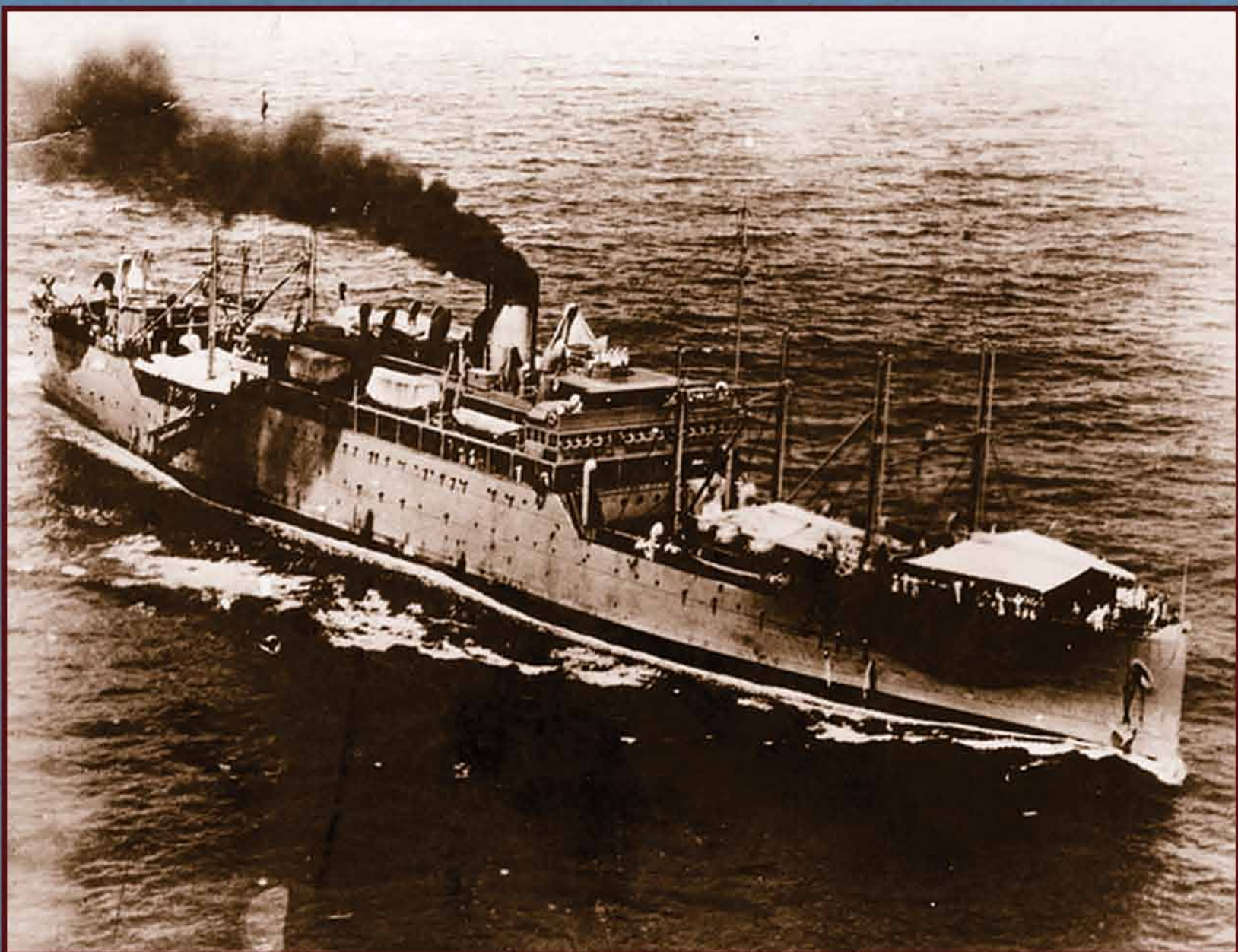


Between 1917 and 1918, the number of American shipyard workers grew from 50,000 to over 350,000, not including over 180,000 others making pre-assembled components at steel mills and plants around the country.



# Hog Island

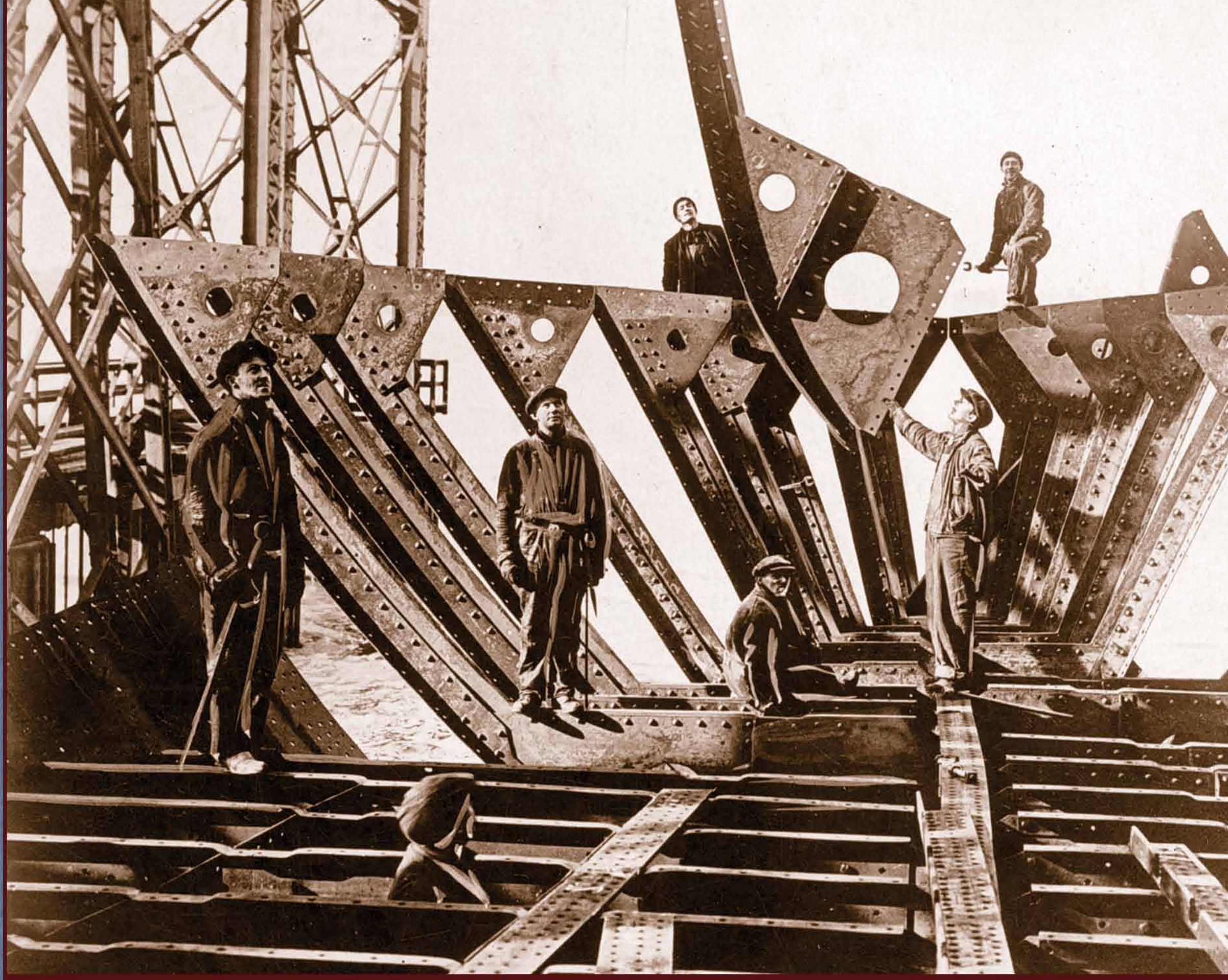
To augment America's private shipyards, the Emergency Fleet Corporation opened four shipyards: at Bristol, Rhode Island; Hog Island, Pennsylvania; Newark, New Jersey; and Wilmington, North Carolina. These yards accounted for 25 percent of American shipbuilding — a ship every four workdays — and exceeded the national shipbuilding product of every other country.



■ In two years Hog Island completed 122 ships of two standard designs, such as USS *Chaumont*, launched in March 1920. Like many "Hog Islanders," as they were called, USS *Chaumont* saw no service in World War I, but provided critical service during the early days of World War II.



■ This "War Service Ship Building" badge identified the wearer as a worker at one of the Emergency Fleet Corporation's shipyards.



■ The use of riveting and prefabricated parts allowed American shipyards to build nearly 3,000 "Liberty Ships" in only 20 months, a rate of construction not possible before the advent of modern shipbuilding technology.

Hog Island, the largest, had over 50 shipways, 250 buildings, 100 miles of railway, and 28 outfitting docks located on 846 acres. At its peak, the shipyard employed more than 34,000 workers. On Memorial Day 1919, Hog Island launched a record-setting five ships in just 48 minutes.

This uniform hat belonged to a Yeoman (F), a female reservist. To help meet personnel requirements, the U.S. Naval Reserve admitted women for the first time in March 1917, through a legal loophole. By the war's end, over 10,000 women had served in a variety of non-combat roles.







■ An American riveter poses for a photograph at a private shipyard, circa 1918.

Soon after the declaration of war on Germany, the United States had a growing fleet of transports and troopships, which would bring American supplies and troops to Europe where they were badly needed. The Emergency Fleet Corporation's zeal for shipbuilding was soon matched by the U.S. Navy's construction of anti-submarine escorts.



■ The government shipyards also carried out the nation's first large-scale job training program. Most shipyard workers hired between 1917 and 1918 learned welding, riveting, plumbing, painting or wiring on the job.

Were it not for the U.S. Shipping Board and Emergency Fleet Corporation, the vast work of applying the Camouflage Section's Razzle Dazzle designs to the thousands of hulls built in shipyards across the country would never have been completed in time to contribute to winning the war against the U-boats.

The Navy, seeing that freedom of the seas depended on defeating U-boats rather than enemy battleships, halted expansion of the battle fleet to focus on the construction of destroyers and subchasers. Armed with these, the Navy set out to protect its transports and troopships with a new idea — the convoy system.



By 1917, the Navy possessed effective countermeasures to chemical attacks, primarily the gas mask. But its effectiveness relied on Sailors' ability to use it correctly under pressure. This Navy training manual helped teach this essential survival skill.



“Things were looking bleak. In the three previous weeks the submarines had sunk 152 British merchant ships. It was manifest that this thing could not go on if the Allies were to win the war.”

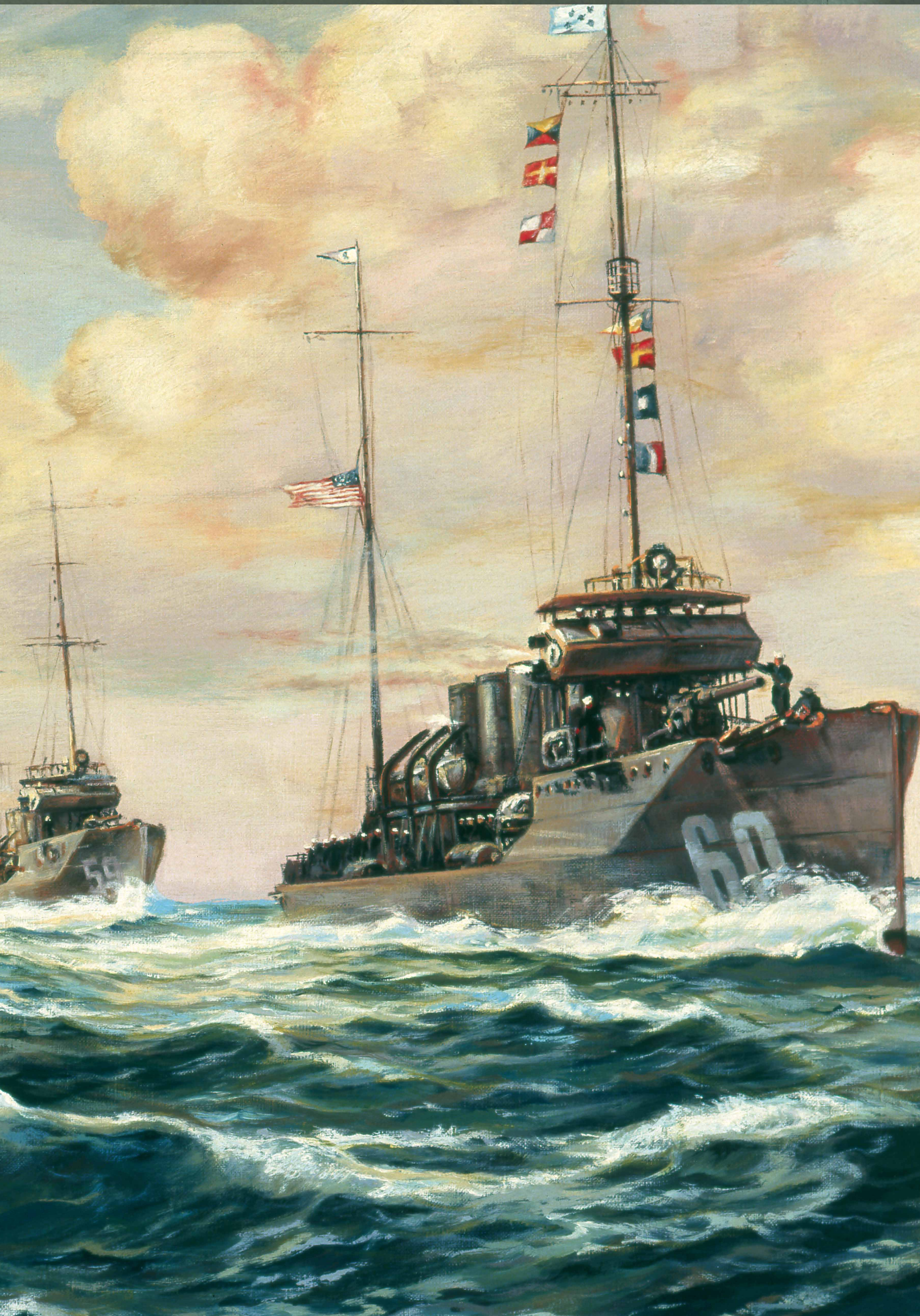
COMMANDER JOSEPH K. TAUSSIG

Commanding officer

Division 8, Destroyer Force



# America Strikes Back







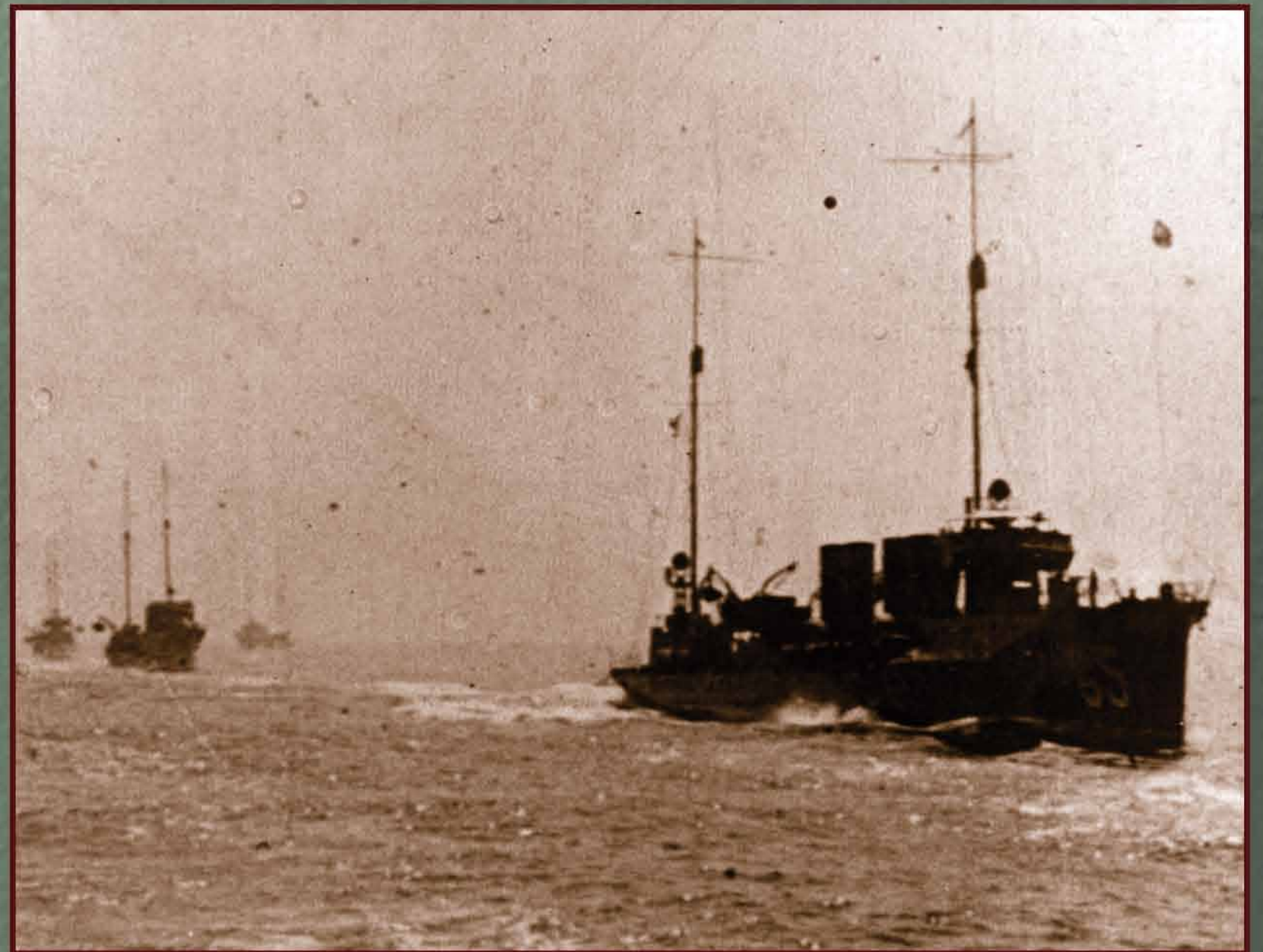
■ An American transport and destroyer, part of an Atlantic convoy, wear Razzle Dazzle in 1918.

Under Admiral Sims, the U.S. Navy expanded its presence in the British Isles. Although Sims advocated a more offensive posture, Secretary of the Navy Josephus Daniels ordered U.S. Navy warships to provide escorts for the transports and troopships that would soon be steaming in by the hundreds from across the Atlantic.

## Convoy Duty

In April 1917, the U.S. naval representative in London, Rear Admiral William S. Sims, learned Britain's true shipping losses: a staggering 20 percent, high enough to force peace negotiations by autumn. In response, Sims won joint approval of a convoy system from both the Royal Navy and United States Navy.

Upon the U.S. Navy's arrival, British Vice Admiral Lewis Bayly wanted to know one thing: how fast could these ships be ready for action in combating the submarine menace? Without hesitation the commanding officer of the American destroyer flotilla, Commander Joseph K. Taussig, responded "We are ready now, sir."



■ The first American warships arrived at Ireland on 4 May 1917, less than a month after the United States declared war on Germany.



■ Commander Joseph K. Taussig, commanding officer of the first U.S. Navy squadron to reach Great Britain after America's entry into the war.



Beginning in July 1917, the U.S. Navy implemented the convoy system on both sides of the Atlantic. Naval escorts based on America's eastern seaboard took convoys as far as Iceland before turning back. As convoys neared Ireland, U.S. Navy destroyers and aircraft based in the United Kingdom met them for the final leg.



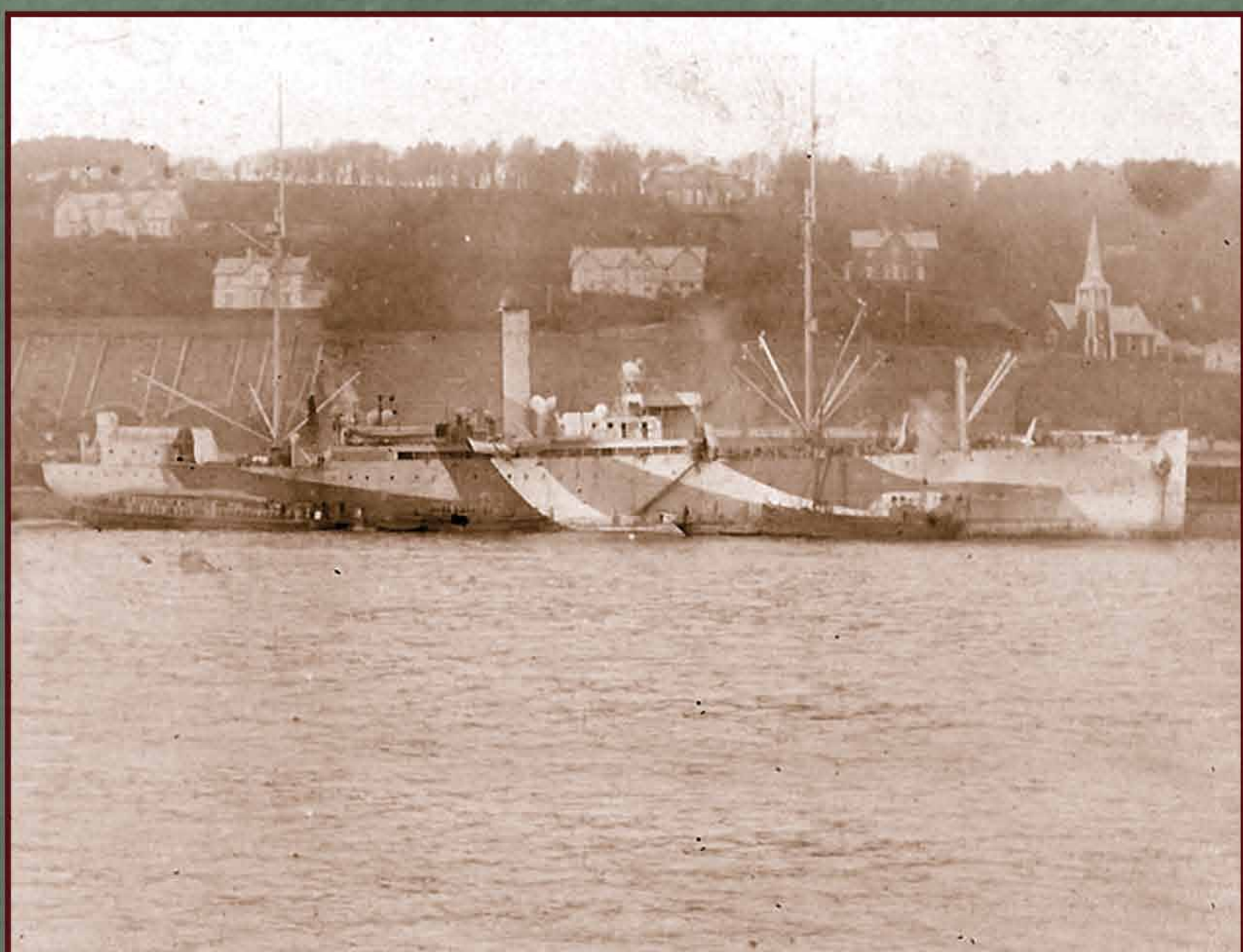
Viewed from a U.S. Navy aircraft, a convoy zigzags in formation in the North Atlantic, circa 1918.



At the Secretary of the Navy's order, the Navy first introduced Personal Identification Tags, or "dog tags," in 1917. They were only authorized for the duration of the war, however, and were not issued again until 1941.

By concentrating 20 to 30 transports, convoys emptied much of the sea of Allied ships, making them harder for U-boats to find. They provided more lookouts to spot U-boats and ensured a counterattack should a U-boat be sighted. Within months, reported losses fell from 20 percent to less than one percent.

Razzle Dazzle, defensive maneuvering called zigzagging, and smoke screens all increased the survival rate of transports in the convoys. But the convoy's best protection was its escort group, composed of destroyers and supporting aircraft, that screened the seas ahead and on each flank, discouraging U-boats from closing to torpedo range.

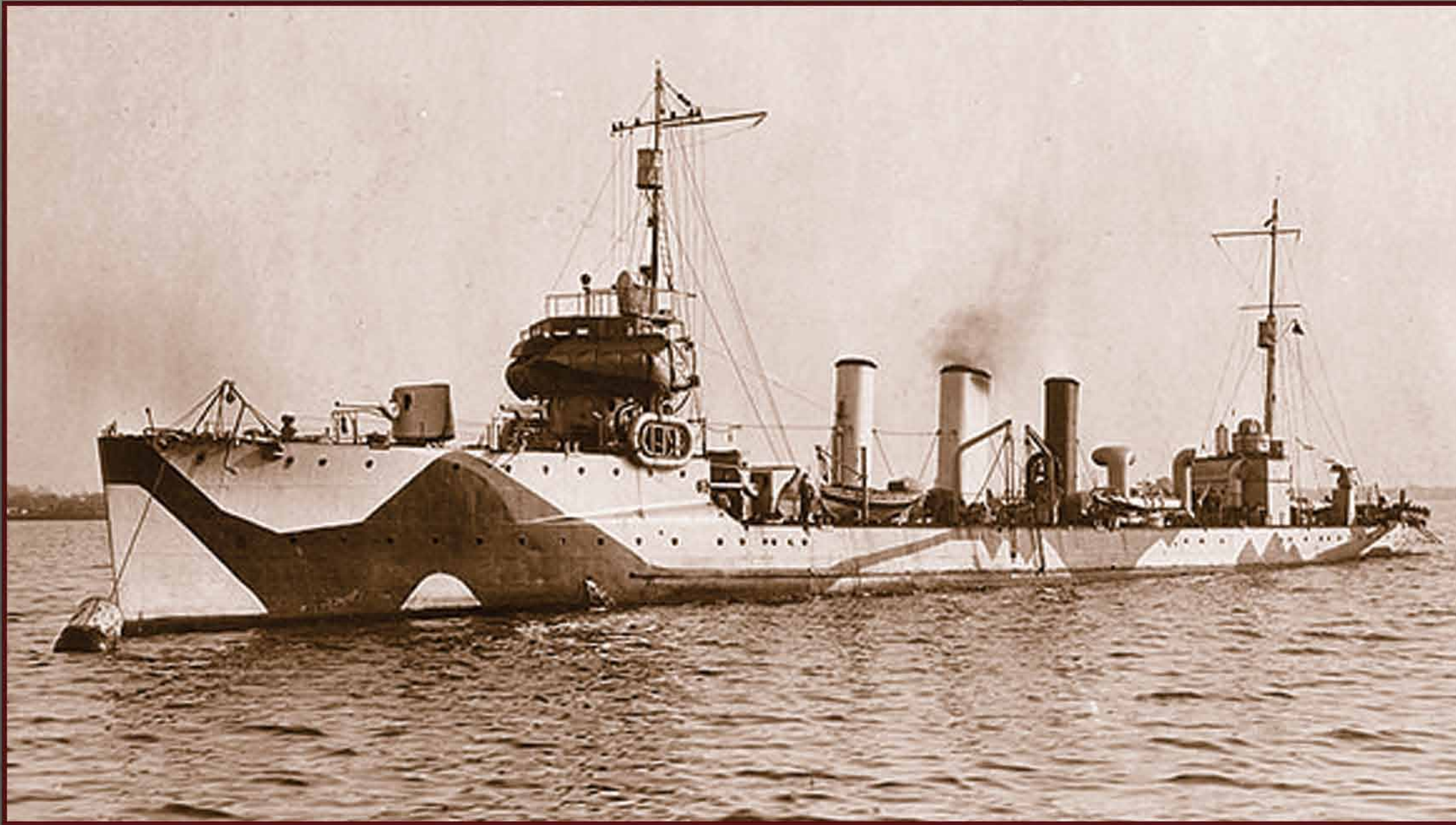


By November 1918, there were 73 U.S. Navy destroyers, 37 smaller escort ships, and numerous subchasers based in Great Britain, Ireland and France. Working around the clock, they safely brought thousands of Allied transports into British and French ports.

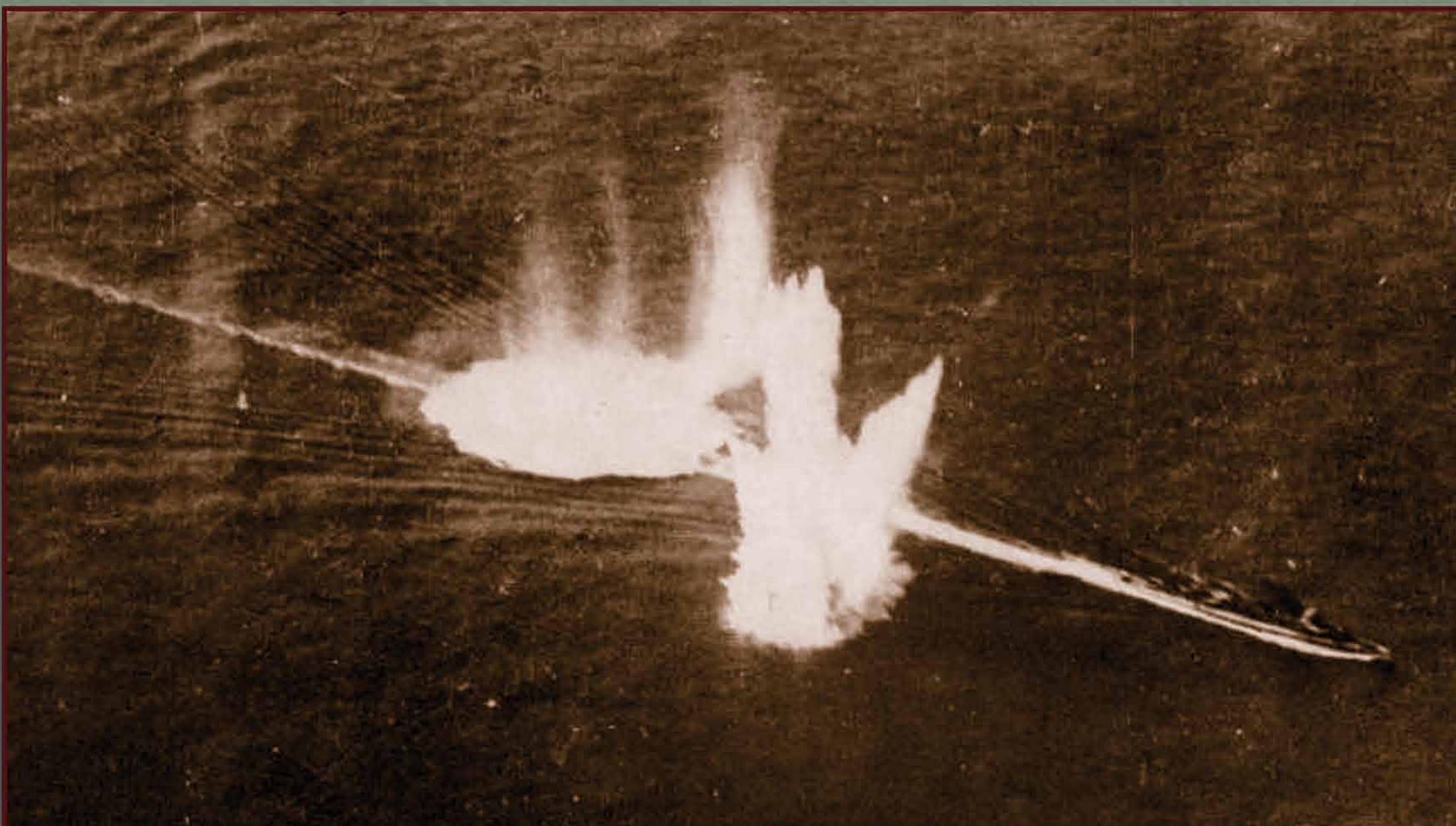


# Combating the U-boat Menace at Sea

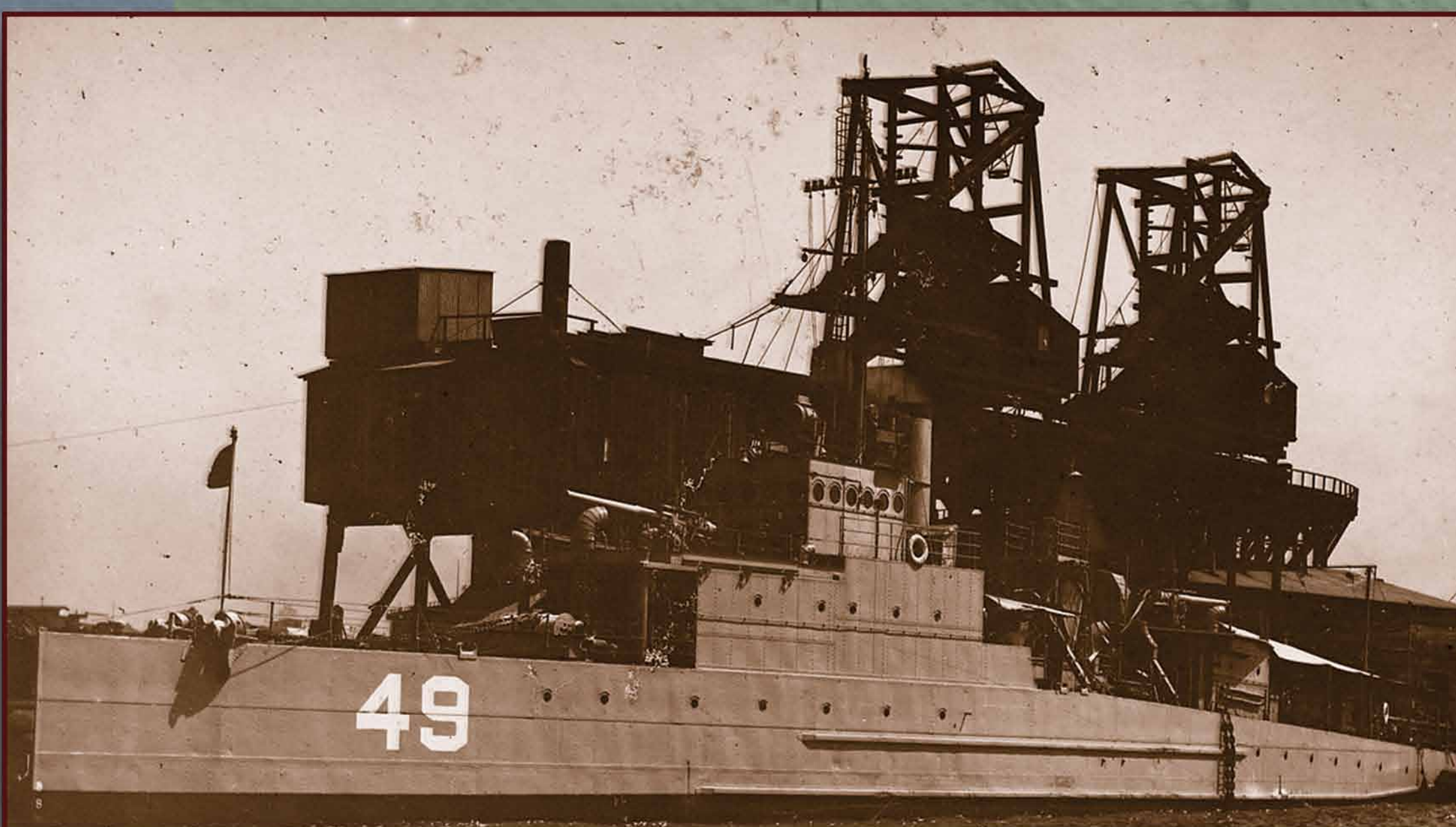
The backbone of the convoy system was its escort of U.S. Navy warships, which screened the convoy through the most dangerous parts of the trans-Atlantic passage.



Originally called “torpedo boat destroyers” because they were designed to protect the battle fleet from torpedo boats, destroyers were fast and seaworthy, and fitted with depth charges they proved to be ideal anti-submarine platforms. To augment its anti-submarine capabilities, the Navy constructed over 260 new destroyers between 1917 and 1920.



A variety of smaller anti-submarine patrol boats, nicknamed “subchasers,” operated in the coastal waters of the United States, Great Britain, and France. They escorted convoys in and out of ports, while others were assigned patrol areas where they hunted in packs, using underwater listening devices to locate U-boats. Under the patronage of Assistant Secretary of the Navy, Franklin D. Roosevelt, 440 wooden-hulled subchasers were built during the war.

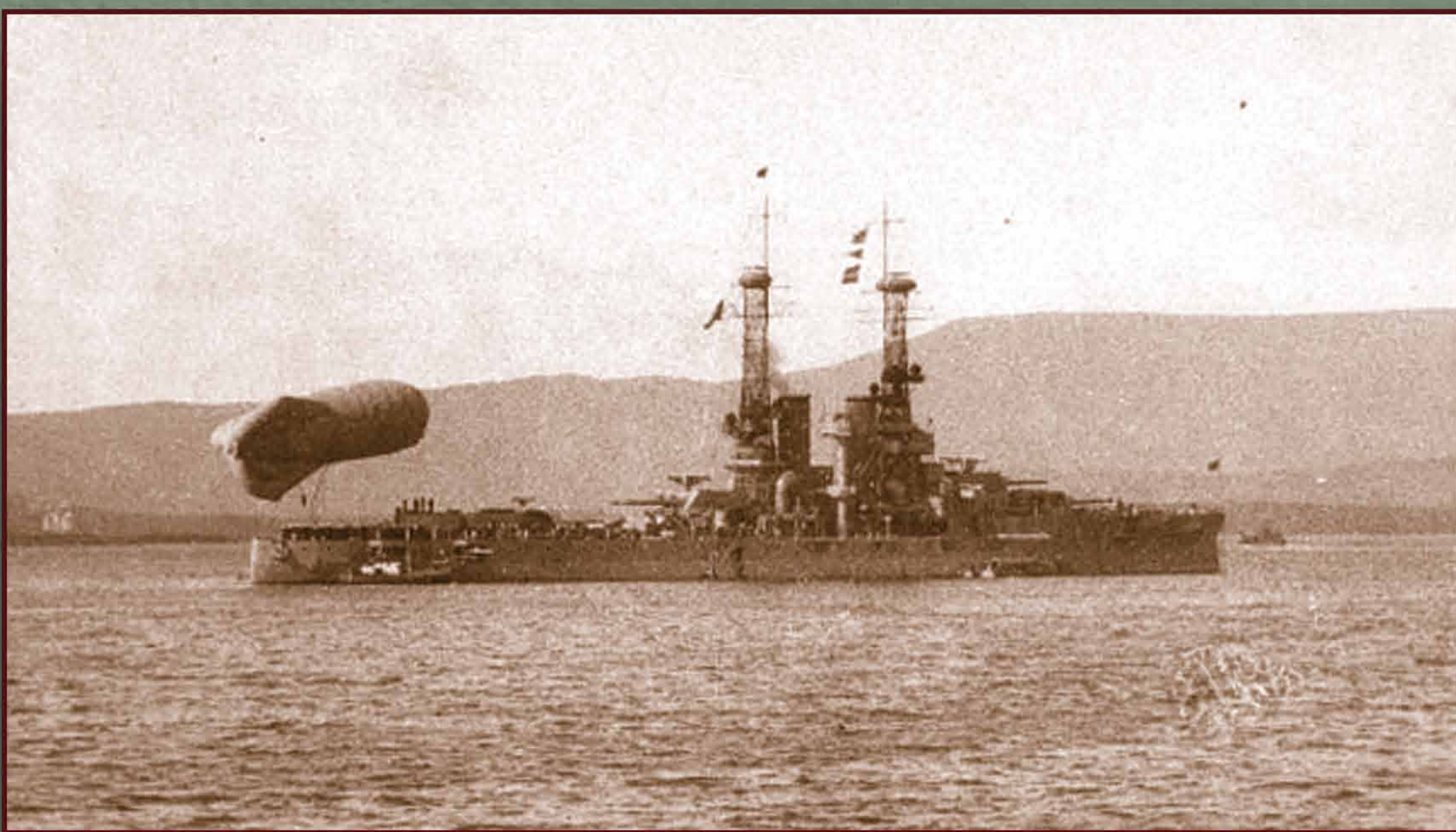


The Ford Motor Company in Detroit, Michigan, mass-produced 60 experimental, steel-hulled “Eagle Boats” — so named by an editorial in *The Washington Post*. They were designed to be larger, longer ranged, and more heavily armed than wooden subchasers. Unfortunately, structural problems prevented their deployment.



# Combating the U-boat Menace from the Air

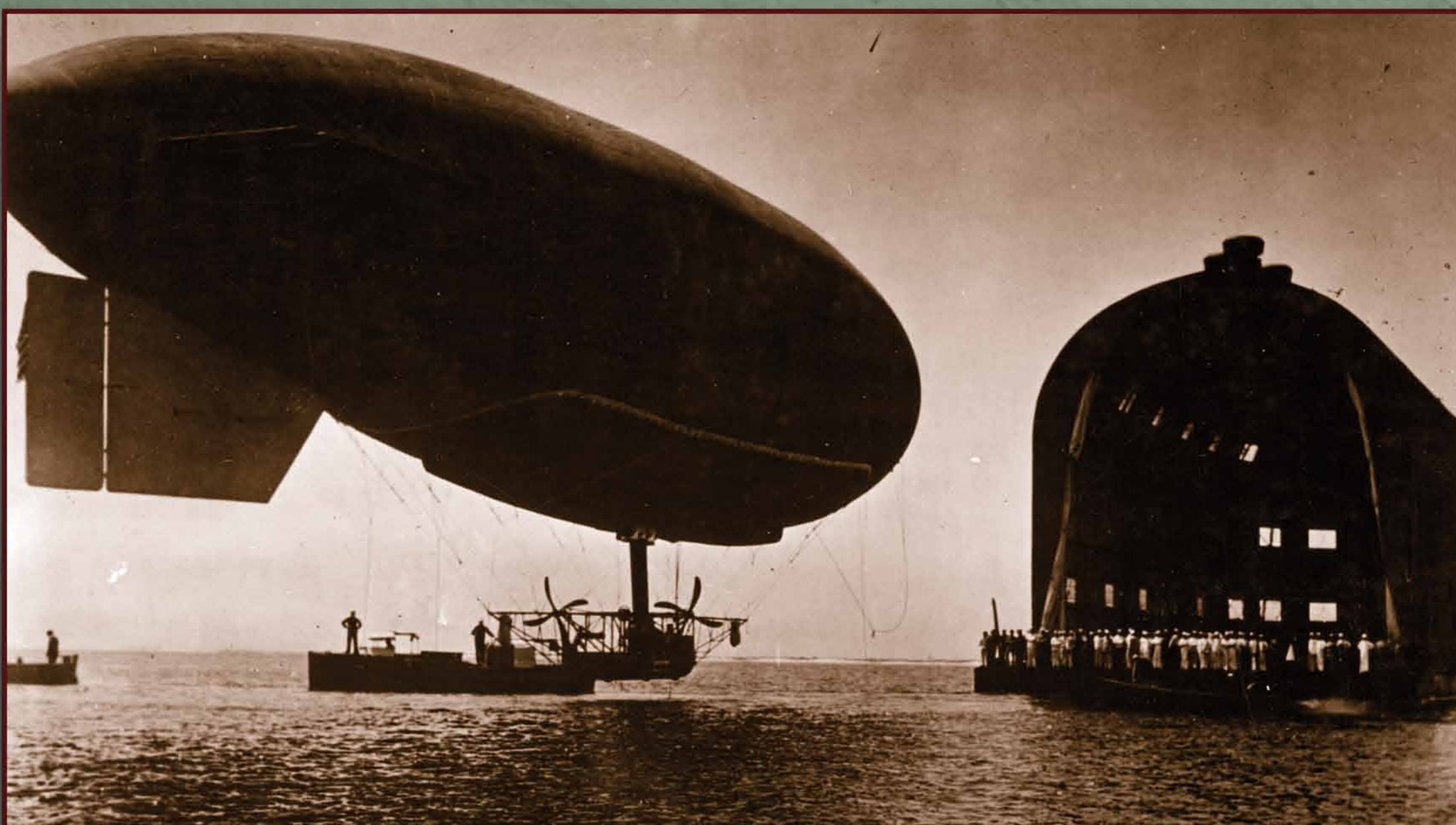
During the war, U.S. naval aviation expanded from a small observation corps to a force of 25,000 personnel, operating more than 500 aircraft from dozens of naval air stations on two continents. As the “eyes” of the anti-submarine fleet these pioneers not only made significant contributions in the war against the U-boats, they also secured a place for aviation in the post-war Navy.



Destroyers were too small to launch airplanes, but kite balloons manned by observers allowed escort vessels to deploy their own aerial assets to aid in detecting U-boats.

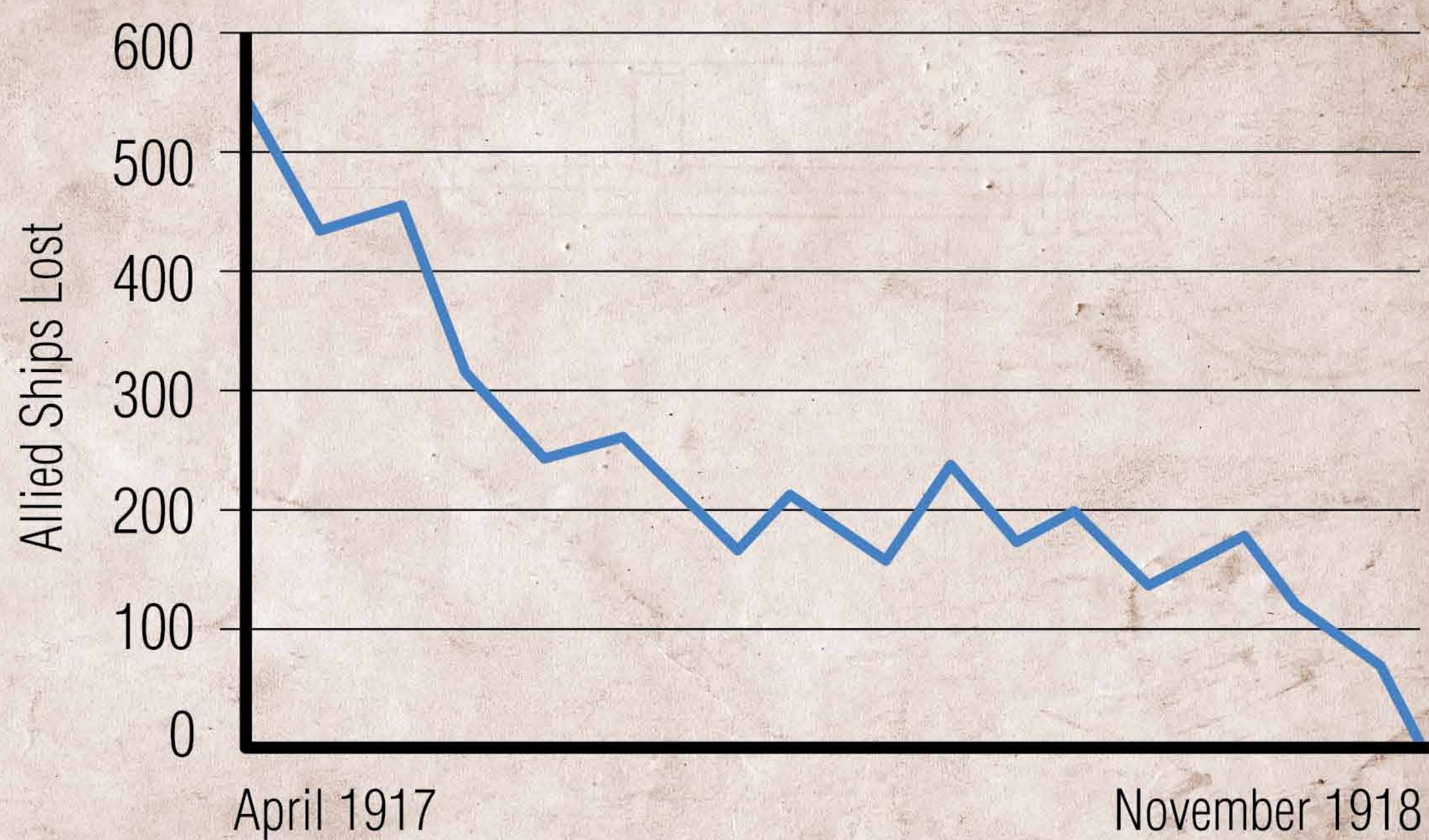


Interested in a heavier-than-air craft capable of non-stop, trans-Atlantic flight, the U.S. Navy conducted wind tunnel tests on this nine-engine flying boat model in 1918. This marvel, which would have been roughly the size of a Boeing 747, was never built.



The DN-1 dirigible, the Navy's first airship, entered service in April 1917. Airships were the most effective aerial platform for long-range escort missions. Always airborne, they could spot U-boats and alert the destroyers before the submarines got within firing range of the convoy.





■ Soon after the United States entered the war, the dire situation facing Great Britain was reversed, as Allied shipping losses fell to sustainable levels and continued to decline throughout the rest of the war.

The success of the U.S Navy's convoy system and anti-submarine warfare is revealed by the decline in Allied shipping losses after April 1917 and the increasing number of U-boats being sunk by Allied warships. By Armistice Day, the U-boats were a hollow threat.

During the 16 months that Naval Overseas Transport Service operated convoys, the U.S Navy escorted 18,653 troopships and transports, carrying more than 2 million troops and over 6 million tons of material, without losing a single ship to enemy action — a singular achievement.

The Imperial Germany Navy began the war in 1914 with 29 U-boats; by the end of the war in November 1918 it had 134 submarines. During those four years Germany built 317 submarines, but more than half were lost by accident or in action with Allied warships.



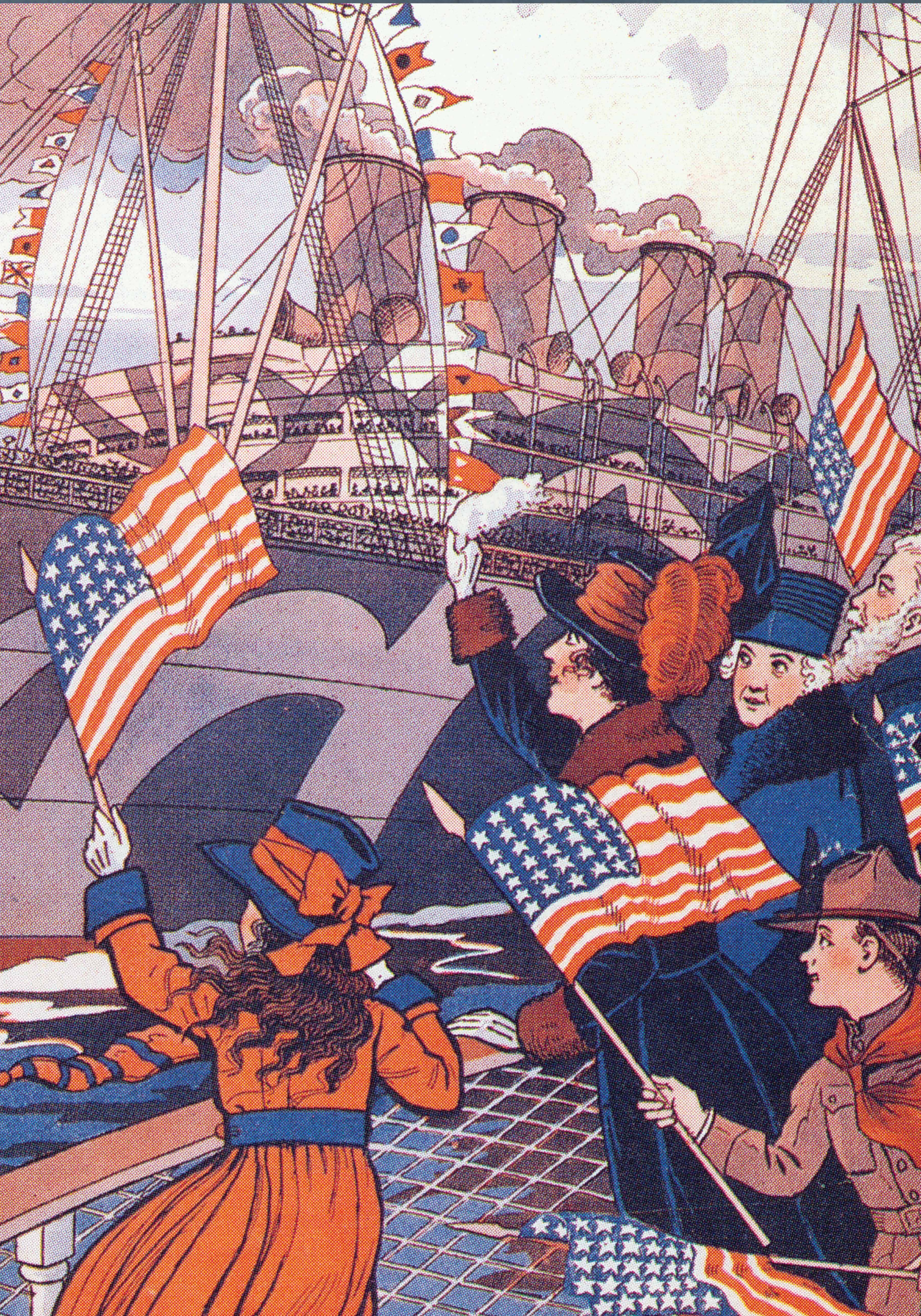
■ The destroyers USS *Fanning* and USS *Nicholson* engaged *U-58* on 17 November 1917 and forced her to surface, where the Germans surrendered and scuttled the submarine. It was the U.S. Navy's first submarine kill.



The M1917 Cutlass, which replaced the 1861 pattern, was the last sword design the Navy accepted as a weapon. Afterwards, the Navy only retained swords in ceremonial and honorary roles.



# Assessing Razzle Dazzle





At 1100 on 11 November 1918, the guns fell silent all across the Western Front as the two sides agreed to an armistice. However, it would be several months before the truce became final and all patrolling U-boats received surrender orders: for U.S. Navy Sailors, the war wasn't over yet.

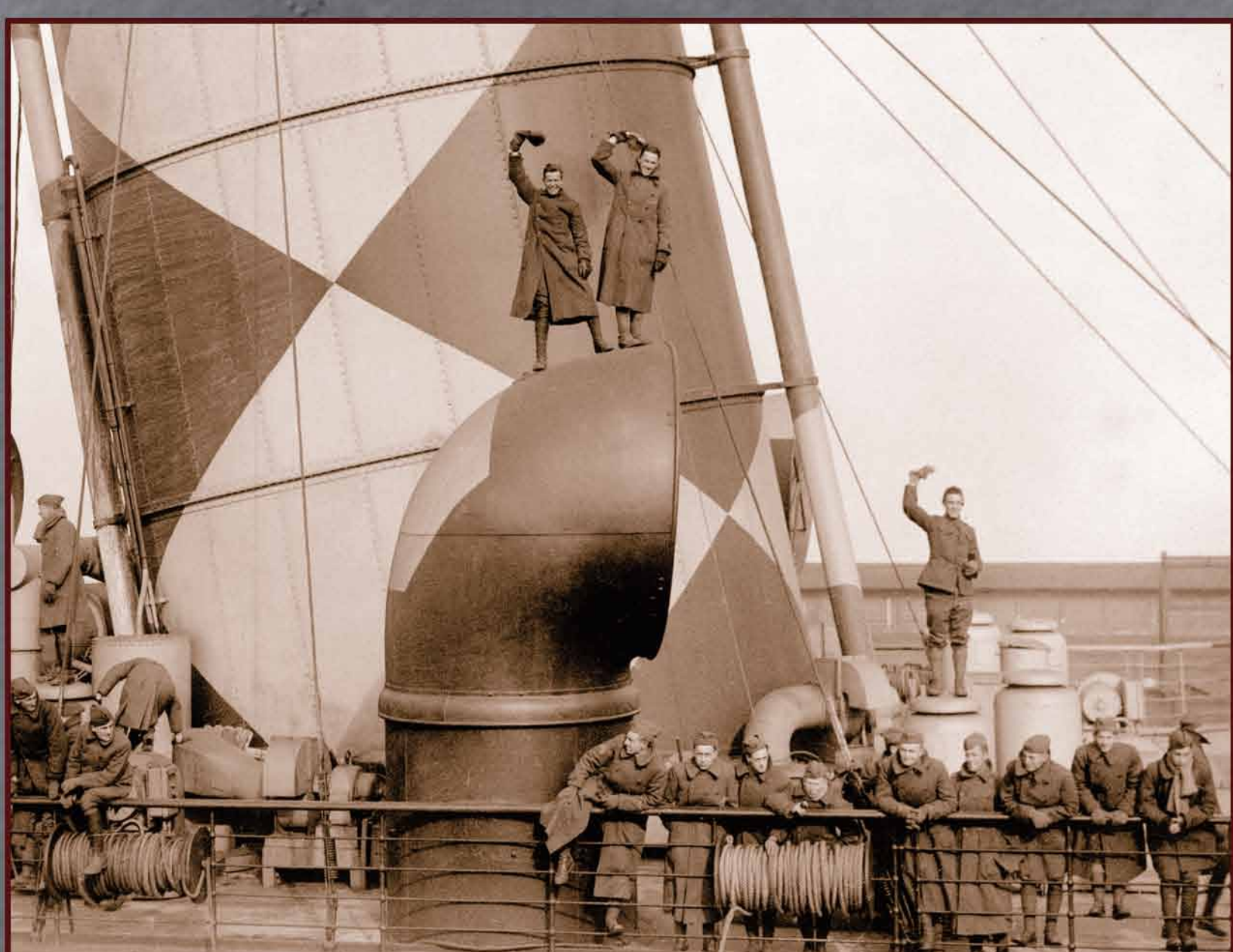


Americans pour into the streets, overjoyed to hear of the armistice on 11 November 1918. It would be celebrated year after year as "Armistice Day" until 1954, when Congress renamed it "Veterans' Day."



While the Navy was busy bringing home the troops, representatives of the victorious Allied nations met in Paris to decide the fate of Germany and the other defeated Central Powers. The conference would last through 1919.

By February of 1919, the Navy began to return to a peacetime routine, while its transports continued to bring the troops home. Freed from the constant grind of convoy duty and patrols, the Navy could finally take stock of its performance in its first war against submarines.



For the Navy, the end of the war brought a new mission: bringing home most of the 2 million Soldiers, Marines, and Airmen who had fought in France. The U.S. Navy did not relax its anti-submarine precautions until every German U-boat surrendered.



In 1913, the U.S. Navy approved a recommendation from its aviation section stating that international pilot training standards were not stringent enough to produce qualified carrier pilots. The Navy soon created its own training program to certify naval aviators.





American troops crowd the deck of a U.S. Navy warship that wears Razzle Dazzle camouflage, in 1918.

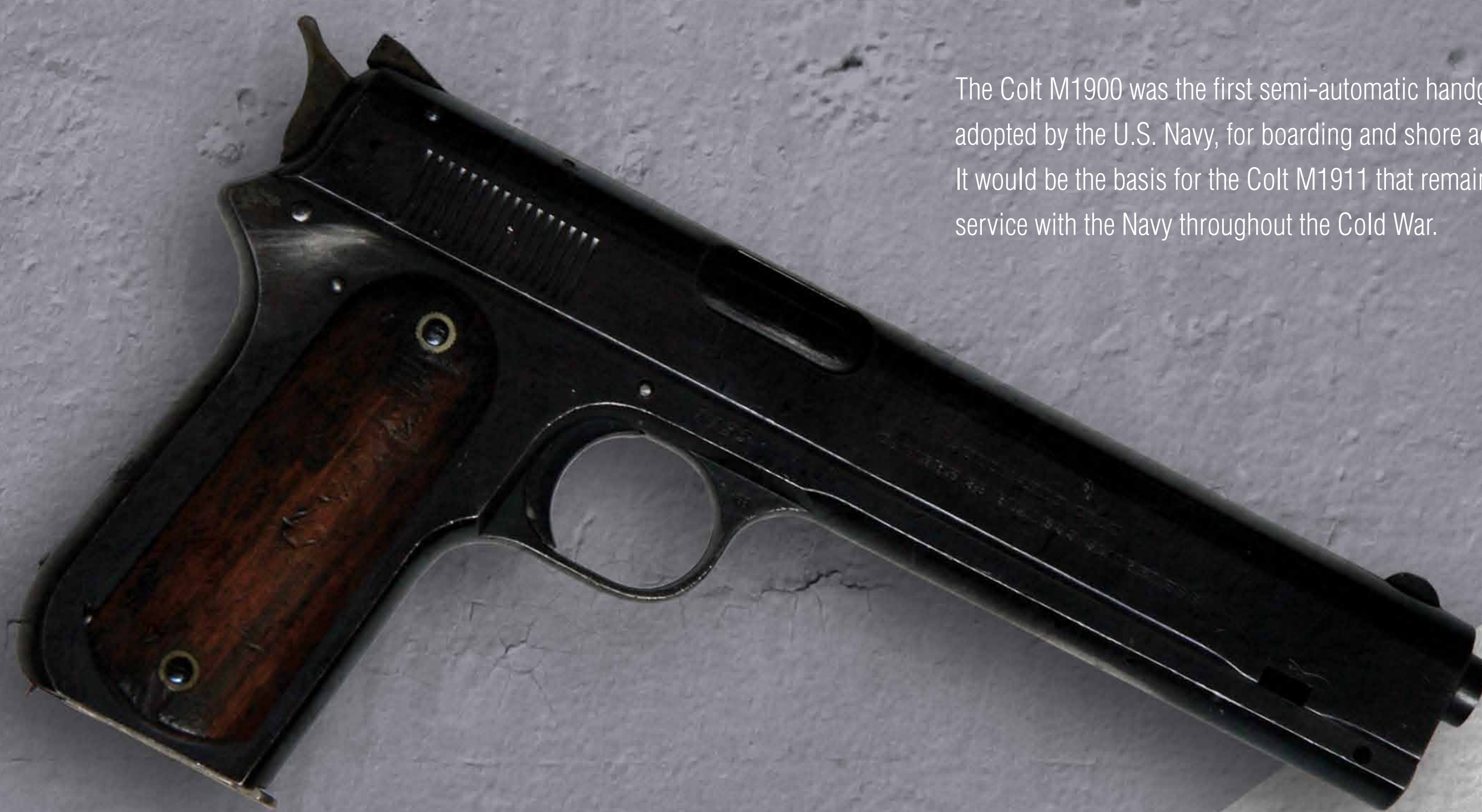
The variety of other anti-submarine measures used by the U.S. Navy — including convoys, airships, and destroyers — made it impossible to quantify camouflage's contribution to the Navy's overall success in neutralizing the U-boat threat. What remains, however, is the good opinion Razzle Dazzle earned from naval and maritime authorities during its trial by fire in 1918.

During the rapid post-war demobilization of 1919, the United States Navy was not able to conduct further tests to conclusively determine the effectiveness of Razzle Dazzle camouflage in protecting American ships from the German U-boat threat.

The only hard evidence of Razzle Dazzle's success came from the maritime insurance industry, which offered reduced premiums to merchants whose ships wore approved camouflage systems. However, the confidence of insurers in camouflage left out the bigger picture.

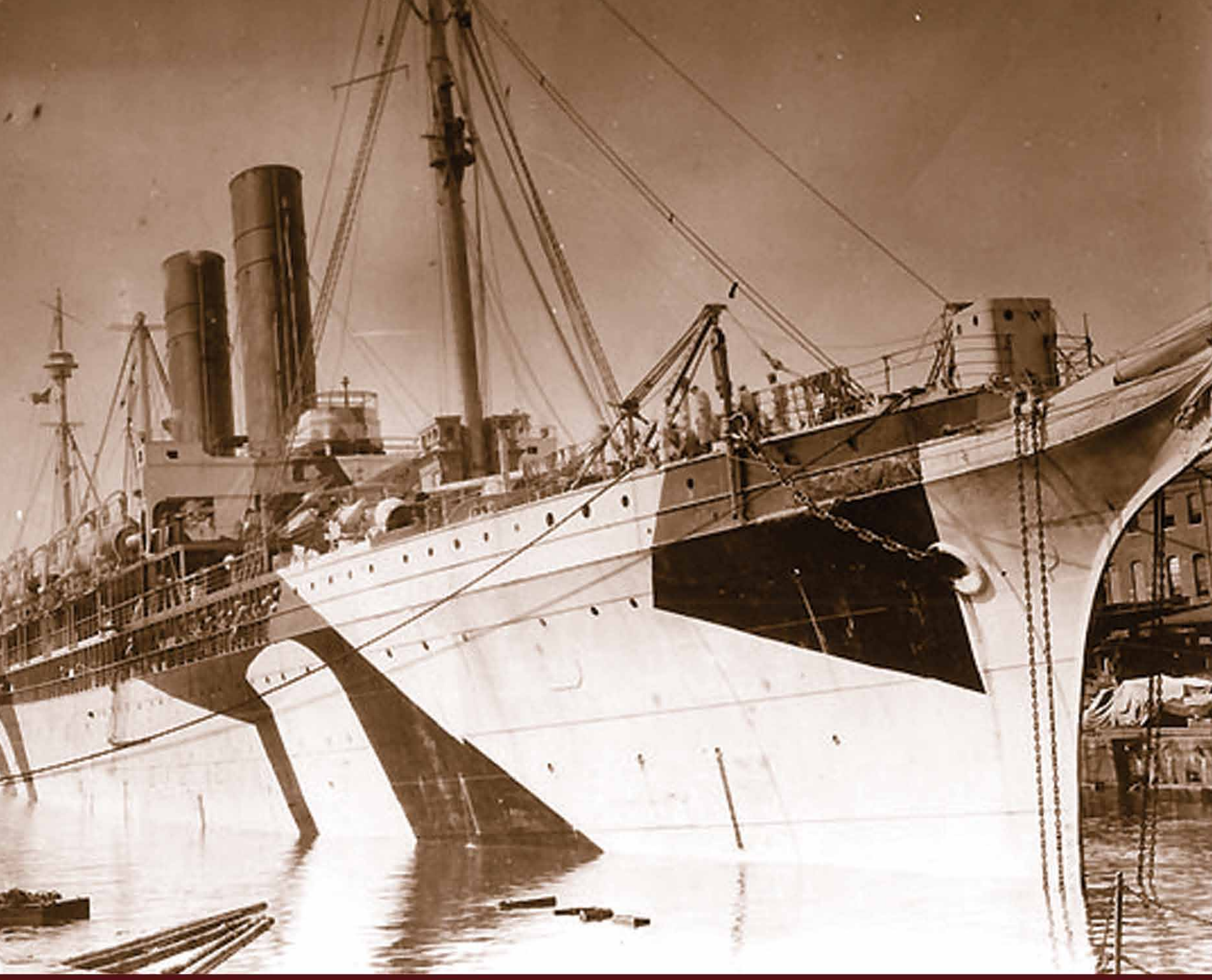


Dozens of U.S. Navy destroyers rest in mothballs at San Diego in 1922. Peacetime funding after 1918 did not allow the Navy to keep its wartime fleet in service.



The Colt M1900 was the first semi-automatic handgun adopted by the U.S. Navy, for boarding and shore actions. It would be the basis for the Colt M1911 that remained in service with the Navy throughout the Cold War.





■ USS *Plattsburg*, a liner converted into a troopship, received her coat of Razzle Dazzle camouflage in 1918.

While the exact credit due to Razzle Dazzle camouflage may never be known, it is clear that the U.S. Navy's entry into World War I turned the tide decisively: shipping losses to U-boats declined from a high of more than 875,000 tons in April 1917 to just over 100,000 tons by November 1918, a decrease of almost 90 percent.

In the end, less than one percent of merchant ships wearing Razzle Dazzle camouflage were torpedoed during the war, none while under U.S. naval escort. The U.S. Navy lost only one warship to a U-boat during its involvement in the war — a testament to its ability to adapt to its tactics and technology in the face of new challenges.



■ USS *New York* led the American battle fleet in European waters during World War I, helping the British keep the German fleet trapped in port.



This ratchet was used to alert Sailors of poison gas in the event of a chemical weapon attack. In France, Sailors kept their gas masks close at hand, ready to don them at the first alarm.

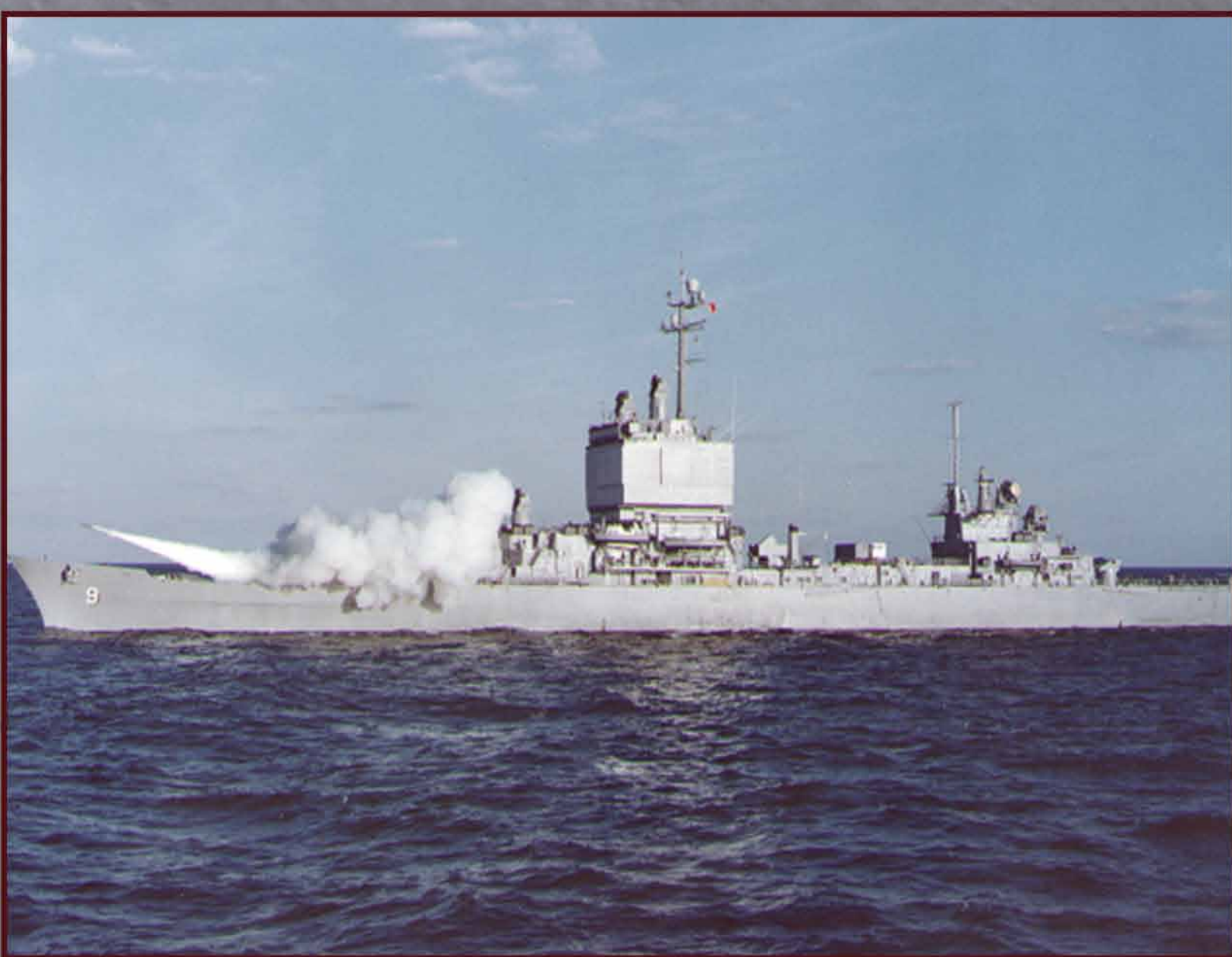


The work of America's Razzle Dazzle pioneers was not forgotten after 1918. At the beginning of World War II, many navies' ships still wore distortion camouflage inspired by Razzle Dazzle during the previous war, to protect against both submarines and surface combatants.

After World War II, distortion camouflage gave way to low visibility systems, as optics improved. During the Cold War, electronic countermeasures — systems that confused or evaded enemy sensor technology — increasingly took over the role that visual camouflage previously filled, but did not entirely replace it.



■ USS *Duluth*, launched in 1943, wears a World War II-era Razzle Dazzle scheme.



■ USS *Long Beach*, wearing the now standard "Haze Gray" camouflage, tests new guided-missile weaponry in October 1961.

A century of amazing technological developments has only proven again and again that the ideas of Thayer, Brush, and Wilkinson still have a place in military thought, and will remain applicable into the foreseeable future.

In the 21<sup>st</sup> century, advanced sensors and guided weapons permit attacks from beyond visual range, but today's warships still wear visual camouflage — indeed, one can hardly imagine an American warship today without its signature "Haze Gray" scheme.



■ Today's U.S. Navy warships use every possible advantage to defeat enemy sensors and weapons, including visual camouflage.

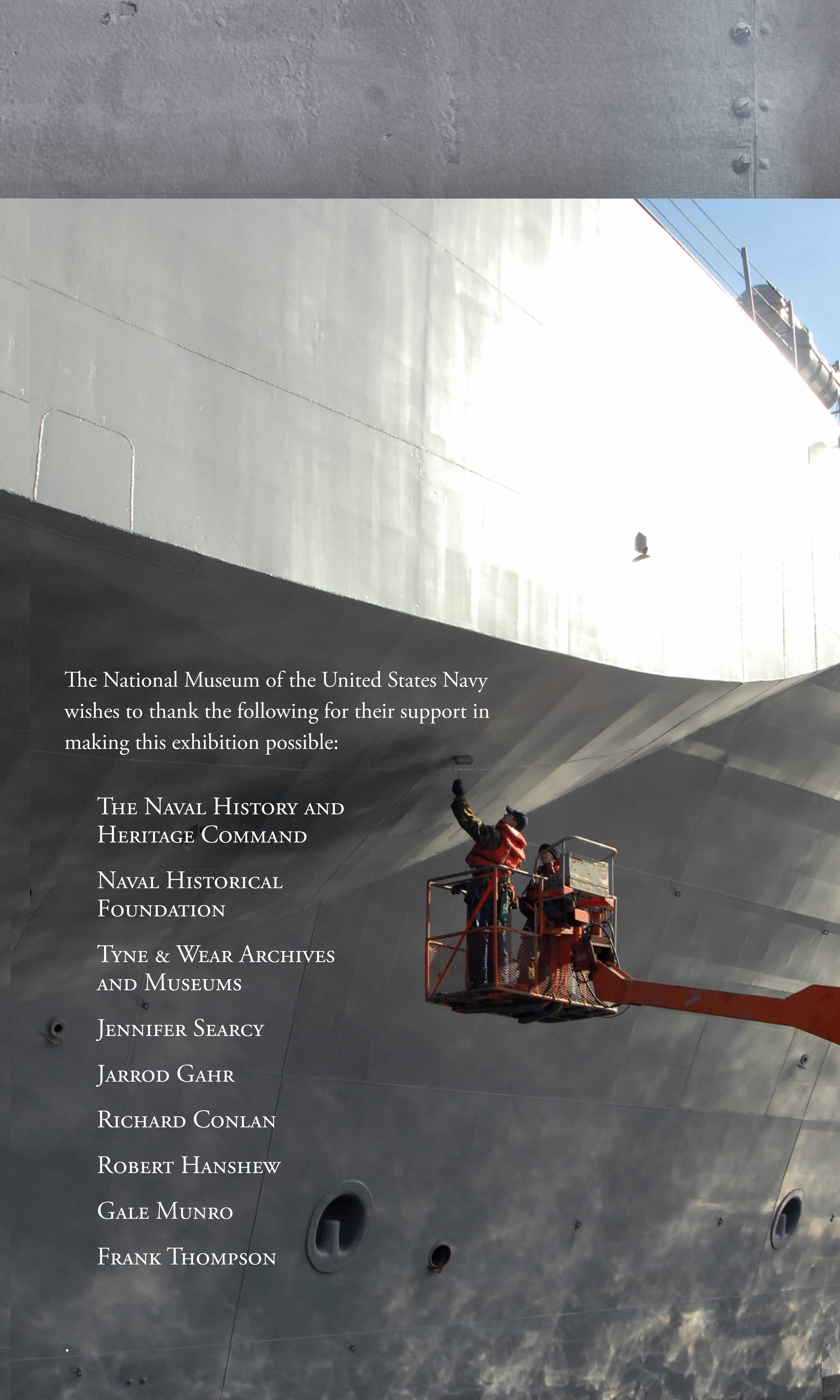




World War I was a severe test for the United States, and particularly for the U.S. Navy and Merchant Marine. At great cost, Americans restored peace to the world and asked nothing in return.

If the pioneers of camouflage have taught us one thing, it is that although technology and tactics may change, America's sea service will adapt to overcome whatever challenges it meets.





The National Museum of the United States Navy  
wishes to thank the following for their support in  
making this exhibition possible:

THE NAVAL HISTORY AND  
HERITAGE COMMAND

NAVAL HISTORICAL  
FOUNDATION

TYNE & WEAR ARCHIVES  
AND MUSEUMS

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RICHARD CONLAN

ROBERT HANSHEW

GALE MUNRO

FRANK THOMPSON