MARTIN OTTAWAY

ENGINEERING IN THE WORLD WAR II SHIPBUILDING PROGRAM

Presented by
Harry J. Ottaway
Henk van Hemmen

December 9, 1992

ABSTRACT

This paper, the second of three historical presentations to mark the New York Metropolitan Section's Fiftieth Anniversary, will provide a view of shipbuilding and the merchant marine from the Great Depression, through World War II, and into the modern post-war era. Reflecting on their experiences during modern times, the authors assess the impact of war-built ships on modern ship design and marine engineering.

The first part of the paper deals with Harry Ottaway's perspective as an American engineer, and the second part of the paper deals with Henk Van Hemmen's perspective as a European engineer.

INTRODUCTION:

Much has been said over the years about the decline of the American Merchant Marine over the Post War years, and there has been more than enough finger pointing with regard to fixing the blame. However, with all the finger pointing, there has been precious little done to attempt to remedy the situation.

The purpose of this paper is not necessarily to provide solutions for the problems of the U.S. Merchant Marine, but rather to revisit the Industry in the hopes that by recalling some of the miracles wrought over the years, we may re-kindle some desire in the entire industry possibly to become a bit more competitive.

PART I: THE AMERICAN PERSPECTIVE:

THE U.S MERCHANT MARINE PRIOR TO WW II:

In order to put the overall picture or sequence of events in some kind of perspective, one must return in time to the U.S. stock market crash of 1929 and the era of the Great Depression in the early and middle thirties.

Not only the United States but the entire world was in economic doldrums. After the election of Franklin Delano Roosevelt to the presidency in 1932, a number of programs were initiated in this country for the purpose of "digging" our way out. Amongst others, these programs included the Civilian Conservation Corps., the Works Projects Administration, and the National Recovery Act (this program was later found unconstitutional, and was struck down by the U.S. Supreme Court). The Merchant

Marine Act was enacted by the Congress in 1936, which was a tool for putting people back to work in addition to revitalizing our Merchant Fleet.

The Merchant Marine Act provided for, amongst other things, government subsidies for both the construction (CDS), and operation (ODS), of a fleet of U.S. built and operated dry cargo and liquid carriers. At the time, this program had relatively modest goals, but as a matter of fact, actually provided the basis for a shipbuilding program which literally came to the rescue of the free world and delivered it from the bonds of the Axis powers.

The vessels built under the Merchant Marine Act were initially put on the drawing boards of Naval Architects in 1937 and 1938, and the vessels began to "trickle" down the building ways in 1939. As a matter of fact, this writer served as the "engine cadet" in 1946 on the "MORMACPORT", which was originally built in 1940, at Federal Shipbuilding & Dry Dock Corp. in Kearney, NJ, as the "SEAFOX", and was built under a Construction Differential Subsidy (CDS) as part of the Merchant Marine Act of 1936. One can readily see that prior to our involvement in the war (December 1941), we were well on our way with development of what was at that time a "modern" shipbuilding industry. Bear in mind also, that Europe had been embroiled in the turmoil of war since September of 1939, and the Far East since the Japanese invasion of China in 1937.

In any event, cargo vessels characterized generally as C1, C2, C3 and C4 and tanker vessels generally represented as T1, T2, and T3 were designed and construction was slowly commenced in the late 1930's. It is indeed interesting to note that the "AMERICA", a passenger vessel operated by "United States Lines" which served valiantly as a "troop transport" during World War II, was also a product of the Merchant Marine Act of 1936.

The thinking, however, that went into the design of these vessels was based upon the knowledge of the world, and the trade routes and volumes of cargo movements as they existed in the middle 1930's.

THE U.S. MERCHANT MARINE DURING WW II:

When the United States' involvement in the War actually commenced in December of 1941, the gears of our shipbuilding program were shifted into "high" and between December of 1941 and August of 1945, the United States literally built thousands of vessels. The original standard designs of the '30's were even supplemented by simpler designs, which included the notable "Liberty Ships" (EC2) and the "Victory Ships" (VC2). The U.S.A. built 2710 vessels alone, of the EC2 design, during the War years. It is interesting to note that the EC2 vessels were built with the thought in mind that the completion of one (1) successful trip with war cargo or troops would justify their construction.

We shall not go into all of the details of the shipbuilding program, but suffice it to say that at the close of the War the United States was, for all intents and purposes, the only Industrial Power in the world, and also the only country which had a viable merchant fleet.

THE U.S. MERCHANT MARINE AFTER WW II:

At the completion of the war, the United States had a merchant fleet which was designed in the '30's and served admirably during the War, but was now faced with transporting the wherewithal required to rebuild war-torn Europe and the Far East, and to literally feed the world during the rebuilding process.

As regards tanker operations, consider for a moment the size of the T2 tankers. In general, most of the T3 tankers which were larger than the T2's were taken over by the U.S. Navy for use as "fleet oilers." There were hundreds of T2 tankers at a deadweight (lifting capacity) of some 16,000 long tons available for commercial use after the war. Knowledgeable business people and mercantile traders seriously asked the question, "What on earth will we do with all of these monster tankers?"

There recently was an article in a news paper where a Saudi Arabian tanker company had placed orders with several shipbuilders for some fifteen (15) vessels, deliveries to take place between 1993 and 1995. The fifteen (15) vessels will have an aggregate deadweight of some 4,500,000 tons. This is the equivalent tonnage of about 280 - T2 tankers.

In the immediate aftermath of the war, a large portion of the surplus fleet was de-activated, prepared for lay-up and placed in designated reserve areas throughout the country. Many of the vessels were purchased from the government (MARAD) by traditional ship owners and managers for the purpose of re-establishing pre-war trade routes. Ship owners also acted as managers for MARAD and operated war-built vessels for the purpose of carrying aid cargos. Since the ship building program came to a halt almost immediately upon the surrender of Japan in August of 1945, war-built tonnage remained the prime source for ocean transportation. A good portion of the war-built tonnage was also turned over to foreign governments as part of aid programs, which will be addressed later in this paper.

During the period 1945 through say, the early 1970's (the conclusion of the Vietnam War), vessels built during World War II continued to go in and come out of lay-up fleets with uncommon regularity. The following occasions quickly come to mind:

1. Lack of fuel in Northern Europe in the late '40's through the middle to late '50's necessitated enormous shipments of coal from the East Coast, particularly through the Hampton Roads area.

2. Korean War - 1950-1953.

3. Marshall Plan necessitating huge shipments of industrial machinery and equipment for the purpose of re-establishing the commercial viability of Europe.

4. The Suez Canal crisis.

5. The Cuban crisis.

6. Vietnam War

7. Oil embargoes.

Where ocean transportation was necessary, on each occasion the reserve fleets comprised primarily of war built tonnage were called upon to "pick up the slack" and on every call for duty the vessels responded quite nicely.

In addition, there were all sorts of sale programs and trade-in programs sponsored by the Government and administrated by MARAD designed for the purpose of making use of the surplus tonnage until it wore out.

Let us now consider what was happening during this period in the "real" commercial world; i.e., post-war thinking. Consider the "monster" (16,000 DWT) T2 tankers. As early as 1948 these tankers had already been recognized as being too small to handle the burgeoning oil trade which was brought on in part by the industrial growth in the U.S., necessitated by and for the rebuilding of Europe and the Far East, and in part by the increase in oil consumption actually taking place in Europe and the Far East as a result of the rebuilding.

While now in the post World War II years, and with less incentive, both economical and technological, to advance the merchant fleet, the United States still played a significant role in ship development.

Tanker vessels of 30,000 DWT and 17,600 Shaft Horsepower ("SHP") were built and launched at Welding Shipyards Inc., Norfolk, Virginia in 1948 and 1949. They were the BULKOCEANIC, BULKOIL, BULKPETROL, BULKSTAR AND BULKTRADER.

As the foreign yards, both in Europe and in the Far East, progressed in capability, the sizes increased to 50,000 DWT and more in the early and middle '60's. The size grew at such a rate as to outgrow the knowledge and expertise of the ship design profession. Typical examples were some of the first 50,000/60,000 DWT tankers built in the early to mid 60's. These tankers were built with conventional lignum vitae stern tube bearings. After a multitude of bearing renewals allegedly on account of heavy weather or groundings (underwriters were paying for the experimentation of shipowners and naval architects), it was ultimately determined that the physical size and weight of the propeller shafts were simply too much for a standard wood bearing. The owner then refitted all of the vessels with white metal sealed oil bearings. All future construction of this size vessel and larger were and are now built with lubricated oil stern tube bearings.

The size of tankers, particularly those built outside of the U.S.A., continued to increase by leaps and bounds. In the U.S.A., we built in 1962 the "MANHATTAN", a twin screw tanker of 43,000 SHP and having a total lifting capacity of about 108,000 long tons. This vessel was built in the Bethlehem Steel Shipyard, Inc. at Quincy, Mass. In the early and mid-'70's, tankers (VLCC's) were built in the Seatrain Shipbuilding, Inc., yard in Brooklyn with lifting capacities of about 225,000 long tons, and main propulsion machinery of some 50,000 SHP.

However, in overseas shipyards, the increases in lifting capacities and propulsion horsepower were even more dramatic. The increase in size was not only phenomenal, but in the overseas shipyards the quantity of tonnage produced far and away exceeded the capacity of U.S. shipyards.

Suffice it to say that it was only in the 1960's and early '70's that the U.S. shipping industry began to seriously consider the complete obsolescence of war-built liquid carriers.

Nevertheless while non-U.S. builders started to take the lead in tankers in the early sixties the United States started to lead new developments in dry cargo vessels.

Again, at the conclusion of World War II, the vast majority of dry cargo tonnage available for commercial use consisted of war-built vessels spawned from the shipyards that erupted during the period 1937-1945.

Much of the cargoes that left the U.S.A. bound for Europe, the Middle East, the Far East, the Asian under-belly, the Caribbean, etc., were in the form of bulk cargoes and either for fuel, or for feeding (coal or grain). The vessels available for this trade were Liberties, Victories and the "C" type vessels, all of which were "break-bulk" ships which are vessels with at least one (1) and in many cases two (2) "'tween decks". T2 tankers were also used to carry bulk grain when insufficient dry cargo vessels were available and, hence, the advent of "evacuators" for discharging purposes.

Outside of a few "colliers" used in the Great Lakes iron ore trade and in the coastwise coal trade, bulk carriers as we know them today were non-existent in the immediate Post-War era.

C2 CARGO VESSEL

Again, the war-built tonnage provided yeoman's service. Means were devised to fit out the "'tween-deck" vessels with what was then known as "grain fittings". They were comprised of temporary wooden centerline bulkheads, shifting boards and feeders in way of the main deck hatch openings. All of this "fit out" was designed to prevent the bulk grain cargo from shifting while the vessel was rolling at sea. Shifting cargo could result, at best, in a permanent list and, at the worst, in a capsizing. These temporary fittings were, of course, expensive and had to be removed if return cargoes were available or if the next cargo was not a grain cargo or sometimes even when the next cargo was grain but of a different density/stowage factor. In addition to the high cost, a grain fit-out also involved several days of delay to the vessel. The fit-out time could be as much as five (5) days depending upon the aptitude and ability of the "grain-fitting" gang. In short, it did not take a mental giant to understand why this war-built tonnage did not measure up as "bulk carriers".

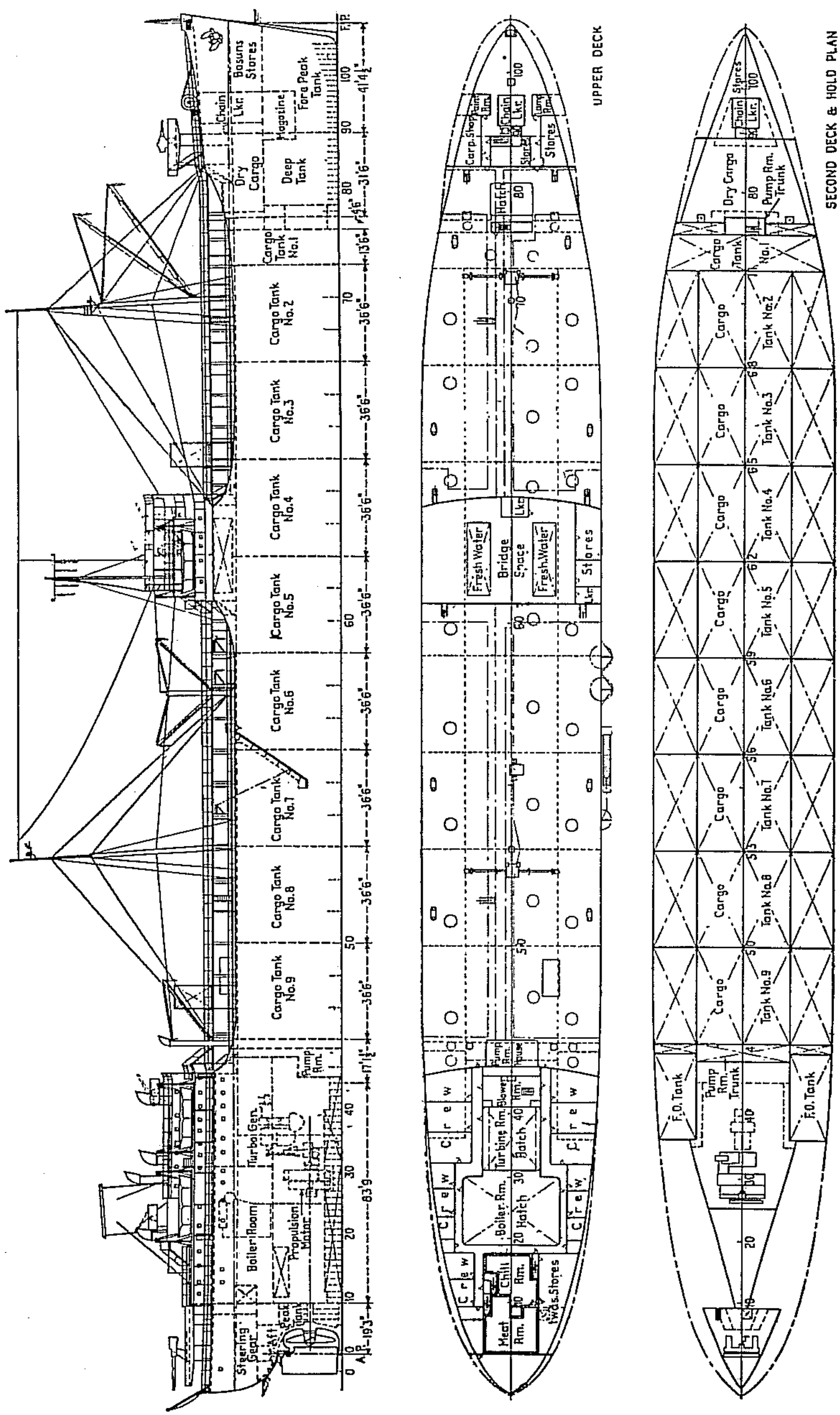
Ship Owners very quickly got a grasp on this market, and some war built tonnage was more permanently arranged for bulk cargoes.

A good example of such an adaptation was the "MARINE COURIER", which was a Liberty ship converted into a bulkcarrier.

During the '50's and '60's the tanker market generally set the standard for the dry cargo market or, at least, had much to say with regard to the ups and downs of dry cargo time charter and spot fixture rates. When the tanker market was down, for whatever reason, the grain trade was flooded with T2 tankers more than willing to take cargoes at lower rates. T2 tankers, because of the compartmentation, did not have to install "grain fittings". In such cases dry cargo operators, dependent on this trade, had two (2) choices -- i.e., lower their rates competitively or lay up their vessels. The choice depended in part on the viability of the Owner. If the Owner did not have sufficient financial strength during these periods of market depression, he was often left with no alternative but to dispose of the vessel on the sale and purchase market. Thus one can readily see that the tanker market also dictated, in great degree, to the problematicalness of the Sale and Purchase market.

A good indication of the wide variances of trades to which war-built vessels, of necessity, had to be put is their usage as scrap iron and steel carriers. The carriage of scrap was extremely detrimental to the longevity of ships and served only to speed the early demise of a good portion of war-built tonnage.

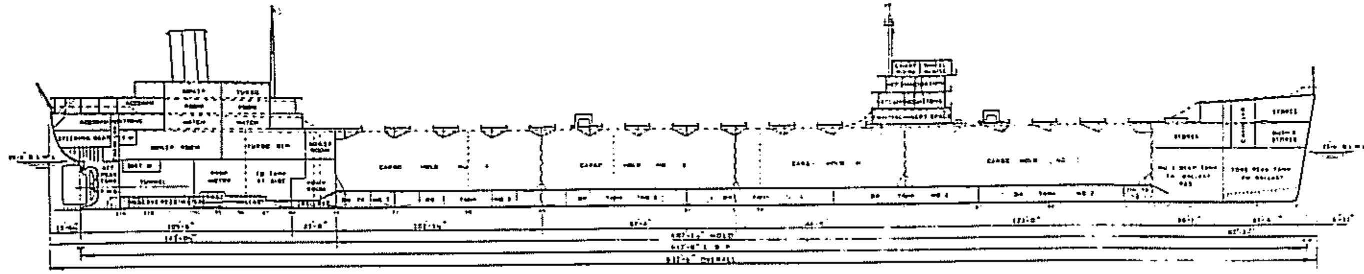
The concept of the "bulk carrier" trade, as we know it today, did not begin to come upon the scene until the early to mid-'60's. The bulk carriers were fitted with double bottom tanks, side tanks and shoulder tanks for ballasting. Oftentimes the tank tops were strengthened for "heavy cargoes", making them not only more suitable for cargoes of higher densities but also reducing the detrimental effect of scrap loadings. Modern bulk carriers, in general, do not require special fittings for the carriage of grain



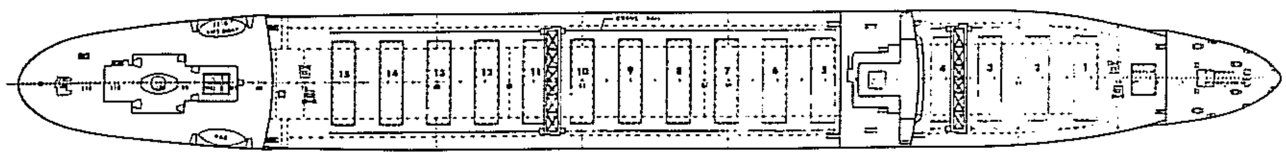
General arrangement of the "James Island," a typical T2-SE-A1 turbo-electric tanker designed by the Sun Shipbuilding and Dry Dock Company, Chester, Pa., in collaboration with the U.S. Maritime Commission. A total of 481 vessels of this class were built during the war in four U.S. shipyards

(Drawings by courtesy of "Marine Engineering and Shipping Review," New York

T2 TANKER



INBOARD PROFILE



WEATHER DECK PLAN

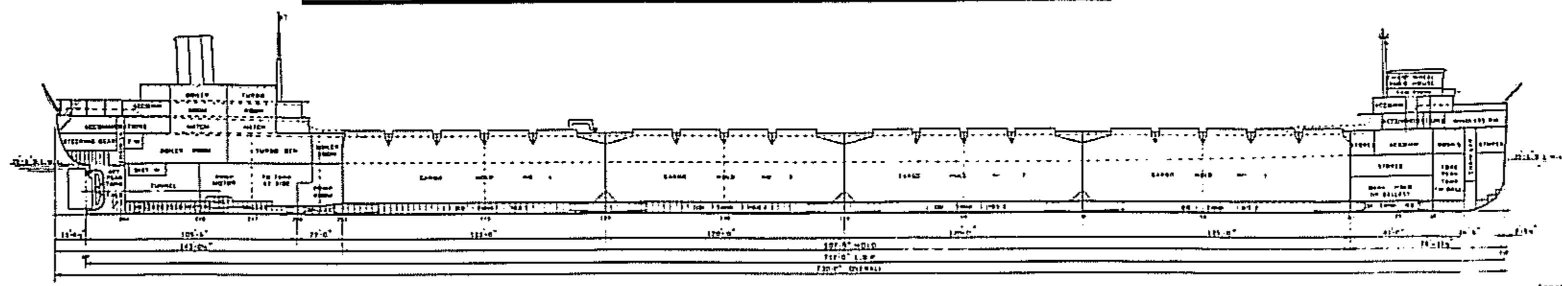
16,000 D.W.T. LENGTHENED T2 : 632'-6" x 68' x 39'-3"

PRINCIPAL CHARACTERISTICS

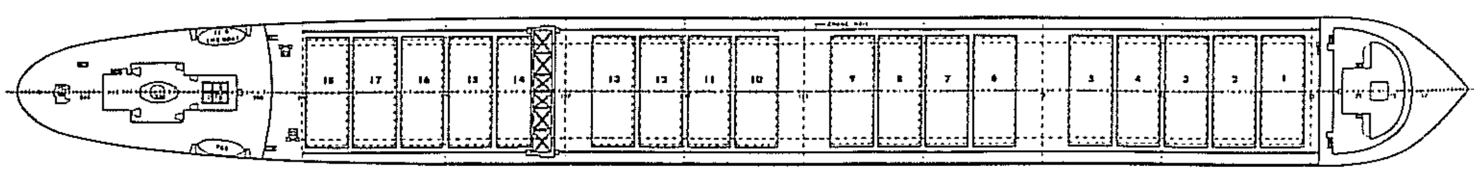
Length, Overall	632'-6"
Length, Between Perpendiculars	617'-0"
Beam, Molded	68'-0"
Depth, Molded at Side	39'-3"
Draft	25'-6"
Total Displacement	22,850 L.T.F.W.
Light Ship Weight	6,850 L.T.
Total Deadweight	16,000 L.T.F.W.

(Additional Particulars on Page A-16)

1/64" = 1'-0"



INBOARD PROFILE



WEATHER DECK PLAN

24,000 D.W.T. JUMBOIZED T2 : 730' x 75' x 39'-3"

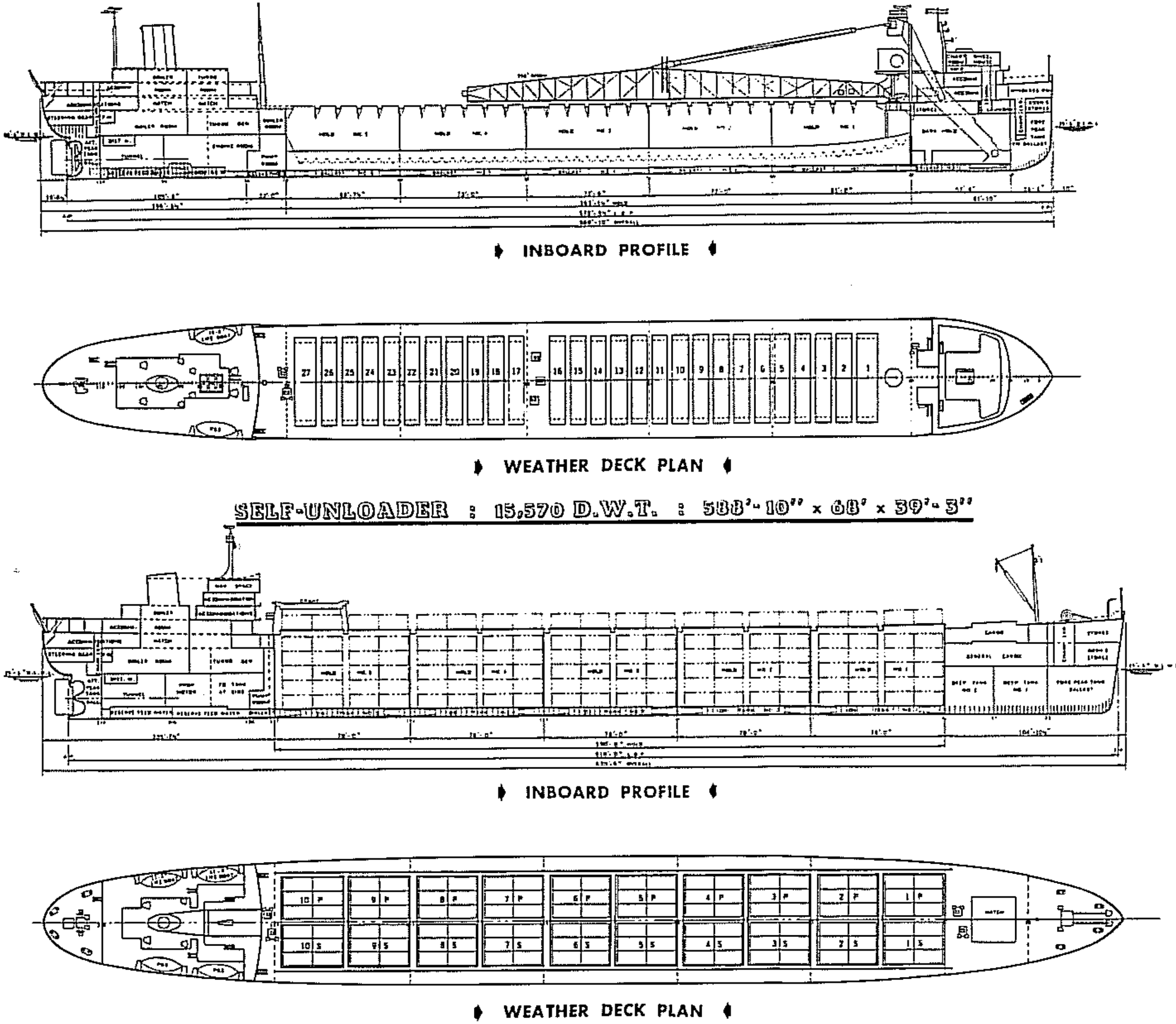
PRINCIPAL CHARACTERISTICS

Length, Overall	730'-0"
Length, Between Perpendiculars	712'-0"
Beam, Molded	75'-0"
Depth, Molded at Side	39'-3"
Draft	25'-6"
Total Displacement	31,700 L.T.F.W.
Light Ship Weight	7,700 L.T.
Total Deadweight	24,000 L.T.F.W.

(Additional Particulars on Page A-16)

BULK CARRIER CONVERSIONS

T2 TANKER CONVERSIONS



INBOARD PROFILE

WEATHER DECK PLAN

SELF-UNLOADER : 15,570 D.W.T. : 588'-10" x 68' x 39'-3"

INBOARD PROFILE

WEATHER DECK PLAN

CONTAINERSHIP : 16,250 D.W.T. : 630'-6" x 75' x 47'-3"

PRINCIPAL CHARACTERISTICS

Length, Overall	588'-10"
Length, Between Perpendiculars	572'-3½"
Beam, Molded	68'-0"
Depth, Molded at Side	39'-3"
Draft	25'-6"
Total Displacement	22,150 L.T.F.W.
Light Ship Weight	6,580 L.T.
Total Deadweight	15,570 L.T.

(Additional Particulars on Page A-16)

1/64" = 1'-0"

PRINCIPAL CHARACTERISTICS

Length, Overall		630'-6"
Length, Between Perpendiculars		610'-0"
Beam, Molded		75'-0"
Depth, Molded at Side		47'-3"
Draft	25'-6" F.W.	26'-10" S.W.
Total Displacement	24,250 L.T.F.W.	24,250 L.T.S.W.
Light Ship Weight	8,000 L.T.	8,000 L.T.
Total Deadweight	16,250 L.T.F.W.	16,250 L.T.S.W.
Total No. 17' Containers	Abt. 700	35' Cont. - Abt. 350

(Additional Particulars on Page A-16)

SELF-UNLOADER & CONTAINER-SHIP CONVERSIONS

T2 TANKER CONVERSIONS

cargoes. Bulk carriers in reality began to be built for special trades, and more often than not their construction was financed through long term charter commitments, which certainly cannot be said for the war-built fleet.

Currently bulk carriers of 350-400,000 DWT are being built, again with long term commitments and specialized or particular trades becoming part of the design, building and funding strategies.

Pilferage of cargo both at home and abroad, on the "break bulk" liner type war-built vessels, was also a prime factor in leading to their premature and untimely extinction or sale to smaller "tramp" operators.

This filching or mis-appropriation of cargo reached rather large proportions which then led to or brought on the advent of "container" vessels. Initially and again the war-built tonnage was the forerunner. Sea-Land, who pioneered container usage in this country, began by converting several war-built C2's. These conversions also took place in the early to mid-sixties. The idea of carrying cargo in sealed containers, by industry standards, very quickly caught on. These ships originally carried a relatively modest amount of TEU's. By the early '70's vessels were being built specifically as container carriers and currently are being built to carry as many as 4,500 TEU's.

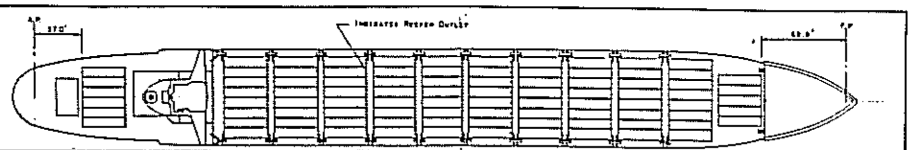
When talking about general concepts, one cannot exclude the impact made by Roll-on Roll-off's coming on the scene. Car carriers have been a boon to automobile manufacturers, but again the war-built tonnage led the way. Initially the Volkswagen "Beetles" were brought to this country for purchase in the 'tween decks of war-built tonnage. They were loaded and discharged using conventional "burtoning" cargo gear which consisted of two (2) booms, one of which was positioned over the pier and the other more or less over the center of the cargo hold. Both "purchase" wires were married to the lifting hook. Small car carriers began to emerge in the late '50's but soon the concept of driving conventional truck trailers and also trailers especially designed to carry standard containers up to 40' in length, came on the scene. Large car carriers designed specifically to carry automobiles also appeared and again pushed the war-built tonnage into hasty antiquity.

Now then, what can we make out of all of this historic rhetoric? It seems abundantly clear that the war-built tonnage admirably performed three (3) Herculean tasks. They were:

1. They helped begin the restoration of U.S. economic health towards the end of the great depression of the late '20's and '30's.

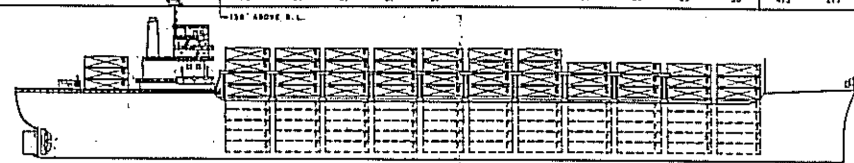
2. They provided the vast majority of the water transportation that transported troops and war materials to the entire world during the war years and the conflicts, wars and emergencies that occurred during the

S-60



CONTAINER DATA

HATCH NUMBER	#12	#11	#10	#9	#8	#7	#6	#5	#4	#3	#2	#1	TOTALS 35 FT.	TOTALS 35/40 FT.	TOTAL
CONT. ON COVER (35 FT)	2	0	2	8	7	8	2	21	2	16	2	10	78	--	78
CONT. ON COVER (35/40 FT)	4	16	14	8	14	8	22	8	22	8	22	5	--	151	151
CONT. ON COVER (REEFER)	12	16	16	16	16	16	8	0	0	0	0	0	40	60	100
CONT. IN CELLS	0	31	35	35	35	35	25	35	35	35	29	15	355	--	355
TOTAL CONT. / HATCH	18	63	67	67	67	67	57	67	59	59	53	30	473	211	684



SHIP DATA	LONG BEACH	OAKLAND	PANAMA
DISPLACEMENT (S.W.)	32,200	32,200	32,200
GROSS, REGISTERED	17,184	17,184	17,184
GROSS, PANAMA CANAL	17,863	17,863	17,863
NET, REGISTERED	13,070	13,070	13,070
NET, PANAMA CANAL	12,812	12,812	12,812
LIGHTSHIP WEIGHT (WITH BALLAST)	15,103	14,989	15,066
OFFICIAL NUMBER	248,240	248,076	248,241
BUILT	1945 KAISER	1945 KAISER	1945 KAISER
CONVERTED	INGALLS 3/66	INGALLS 5/66	INGALLS 7/66
FORMER NAMES	MARINE FLASHER	MARINE TIGER	MARINE JUMPER
OWNER	R.L.C.	R.L.C.	R.L.C.
PORT OF REGISTRY	WILMINGTON, DEL.	WILMINGTON, DEL.	WILMINGTON, DEL.

CLASS DATA ABS, ✠ A1 Ⓔ, ✠ AMS

LENGTH OVERALL	684.9'
LENGTH BET. PERPENDICULARS	658.0'
BEAM MOLDED	78.0'
DEPTH MOLDED	47.0'
SCANTLING DRAFT	30.0'
HORSEPOWER	9900
TYPE ENGINE	Geared Turbine
SPEED (SERVICE)	15 Knots
SHIP POWER	(2) 400 KW DC
REEFER POWER	(LONG BEACH) (3) 387 KW AC D/G; (OAKLAND/PANAMA) (1) 750 KW AC T/G, (1) 387 KW AC D/G
NUMBER IN CREW	36

SCALE 10 0 30

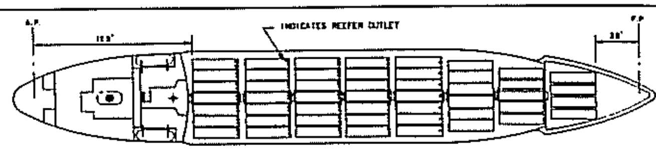
GENERAL ARRANGEMENT

LONG BEACH CLASS

Drawn: R.C.B.S. Date: FEB 69 | Rev SEPT 84 | S-60

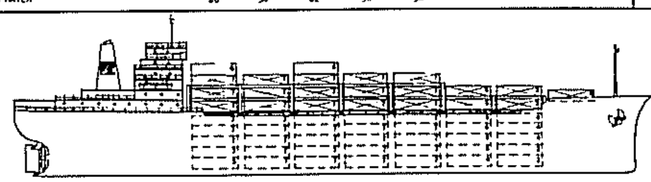
SEA-LAND C4-JC CONTAINER SHIP

S-170



CONTAINER DATA

HATCH NUMBER	#8	#7	#6	#5	#4	#3	#2	#1	TOTALS
CONTAINERS ON COVER	13	7	13	7	16	12	10	4	58
CONTAINERS ON COVER (REEFER)	16	16	16	16	7	--	--	--	63
CONTAINERS IN CELLS	31	33	33	33	33	28	16	--	217
TOTAL CONTAINERS / HATCH	60	56	62	56	56	40	26	4	360



SHIP DATA	BALTIMORE
DISPLACEMENT	19,690
GROSS, REGISTERED	10,947.73
GROSS, PANAMA CANAL	11,096.80
NET, REGISTERED	7,036.00
NET, PANAMA CANAL	8,004.80
LIGHT SHIP WEIGHT (WITH PERM. BALLAST)	10,250.00
OFFICIAL NUMBER	246103
BUILT	SUN - CHESTER, PA. 1944
CONVERTED	WILLAMETTE - 3/70
FORMER NAMES	ESSO ROANOKE, MARINE CARDINAL
OWNER	MONTEREY
PORT OF REGISTRY	WILMINGTON

CLASS DATA ABS, ✠ A1 Ⓔ, ✠ AMS

LENGTH OVERALL	497.4'
LENGTH BET. PERPENDICULARS	471.1'
BEAM MOLDED	71.5'
DEPTH MOLDED	43.5'
SCANTLING DRAFT	30.5'
HORSEPOWER	7,240
TYPE ENGINE	TURBO ELECTRIC
SPEED (SERVICE)	15 KNOTS
SHIP POWER	(2) 400 KW AC
REEFER POWER	MAIN MOTOR GEN.
CONVERTED FROM	T2-SE-A1 & C4-S-A3
NUMBER IN CREW	35

SCALE 10 0 30

GENERAL ARRANGEMENT

BALTIMORE CLASS

Drawn: R.C.B.S. Date: MAR 70 | Rev SEPT 84 | S-170

SEA-LAND T2/C4-X CONTAINER SHIP

years following up to and including the Viet Nam war/conflict (one never knows exactly how to refer to this era).

3. War-built tonnage again jumped into the breech and provided the wherewithal to transport the materials required to rebuild and feed the world in the immediate years after World War II.

And finally, but to a lesser extent, War-built tonnage served as the experimental test beds for specialized vessels such as container vessels, and bulkcarriers.

IMPACT OF THE U.S. WW II FLEET ON THE WORLD:

The above only hits the highlights of some of the history surrounding vessels designed before World War II and built during the terrible years of conflict that followed. Suffice it to say that the free world, as we know it, probably would not have survived without these valiant vessels.

On the other hand, I don't think anyone in, say, 1945, in his wildest dreams, had any conception of the rapid growth in both population and economic viability that was about to take place on a worldwide basis.

The war-built tonnage was all that was available. It was pressed into service and required to perform tasks totally beyond those for which these vessels were designed.

They were in and out of lay-up fleets, bought and sold by opportunistic ship owners who played the ups and downs of the markets, performing tasks which wreaked havoc to their hulls and internal structures.

In retrospect the maritime industry, can take a great deal of pride in not only how the fleet was designed but also with the quality of workmanship and the staggering rapidity with which they were produced. On top of all this they not only served the war machine put together by the Allies during World War II but then further continued to perform monumental tasks during the post war period, many of which far exceeded the intent of the original designers.

Finally, it is interesting to note that there are individuals who are devoting some time, and presumably money, to the thought that maybe the United States can again become a productive instrument in the commercial shipbuilding world.

In the Oct. 30, 1992 issue of "TRADEWINDS", it is reported that Ole Skaarup has spearheaded a new company by the name of U.S. Shipbuilding Consortium, Inc. (USSC). The project intends to form a group "aimed at building internationally competitive ships in the United States". The article goes on further to advise the public that the former Federal Maritime Commissioner, Robert Quartel, will act as the company's full-time president.

When one considers what we started with in the thirties ('30's), and what we ended up with at the conclusion of World War II, then the project Mr. Skaarup has in mind is not all that far-fetched. What I am saying, in a left-handed way, is that I'm old enough to fully comprehend, and yet young enough to still believe, that there is nothing that the American people can't do, given the proper incentives and a chance to roll up their collective sleeves.

PART II: THE EUROPEAN PERSPECTIVE:

THE STATE OF THE ART IN EUROPE IN 1945:

At the onset of World War II, European Maritime colleges were just getting away a little bit from the riveted "Lancaster" and "Scotch" boiler, the hotwell, lead armored electrical cable, open knife switches on marble plate switchboards, and the like.

Although I graduated after the second world war had already finished, as a junior engineer I found myself confronted with an immense amount of marine engineering developments, the substance of which could not be found in the textbooks in Europe at that time.

All this technology was brought into a community where marine academic training had stopped for almost 5 years, promotion had stalled, and governments in exile had made war time promises to the seafarers which they could not and would not fulfill after the war.

All of which resulted in a fair amount of bitterness among marine engineers who had given their best under Allied command trying to stay afloat and survive during 5 to 6 years of war.

To make up for the ships lost, shipping companies supplemented their fleets with war time U.S. built ships.

The ravaged European shipping companies acquired in substantial numbers war time built vessels like Liberties, Victories, C3 and many others.

Under the guidance of the U.S. Maritime Administration, under the umbrella of the Marshall Plan and other agreements, the European Shipping Boards could inject their merchant marines with U.S. war time built vessels and soon, after a short transition period, the original grey hulls plowed the peaceful seas very proudly, painted in European company house colors.

What did this do to the European maritime industry?

Most shipping companies had to operate fairly old, conservatively engineered and built vessels in conjunction with these U.S. built vessels.

While the Liberties as relatively conservative vessels fitted in easily with the older vessels, it were the Victories, C-3 and C-4 vessels and the T-2 tankers which truly shook the European shipping companies up.

THE IMPACT OF THE U.S. BUILT VESSELS:

With due respect to the Liberty vessels and a warm heart to those grand ladies who saved the civilized world from going under, and which kept the wolves off the door as long as it took to develop the more sophisticated vessels, I would like to focus particularly on the victory vessels, the AP-2 and AP-3 types, with respectively 6,000 and 8,500 SHP steam turbine plants, the C-3 and C-4 vessels, the T-2 tankers and so on.

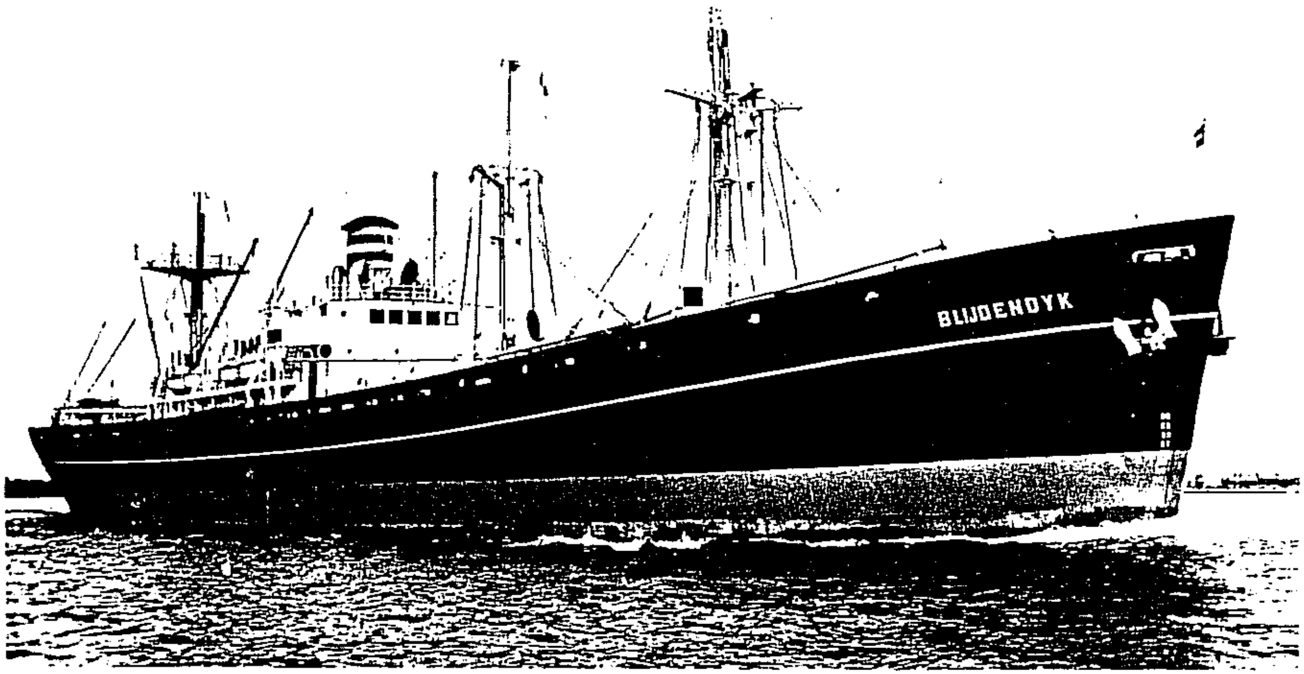
They demonstrate best what this nation achieved in an incredibly short period of time.

A U.S. Maritime Commission report issued in 1949, which will be specified later on, shows that the first AP-2 and AP-3 vessels were delivered in 1944.

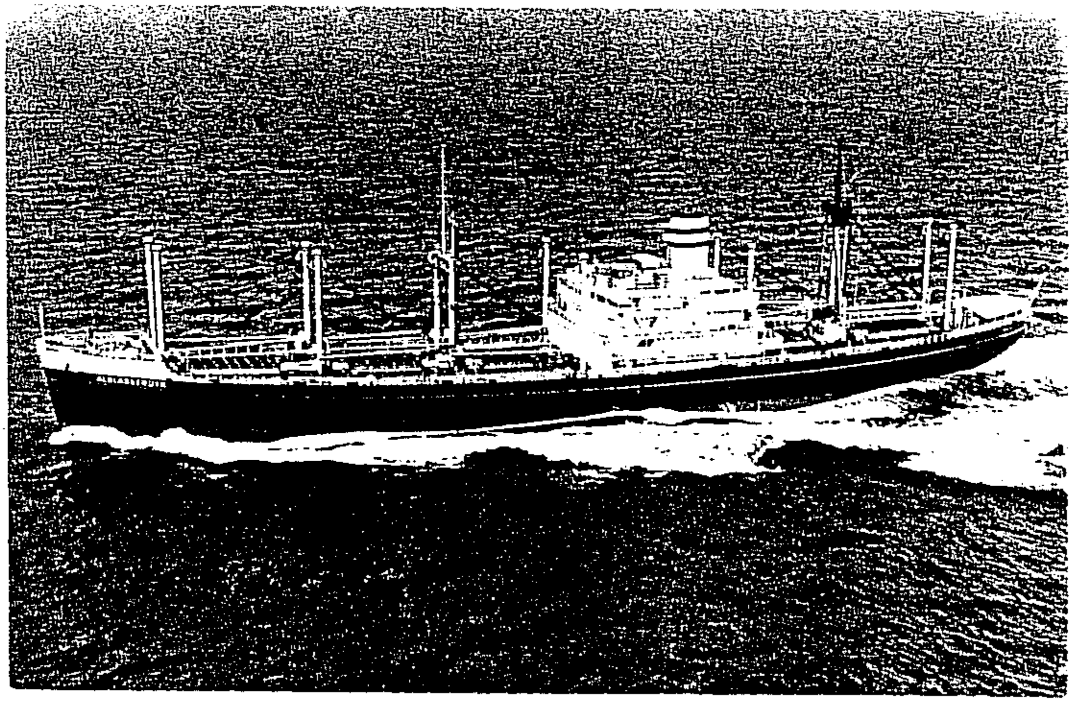
The European shipping community was in total awe when these vessels sailed into their ports. In all fairness, credit should be given to the European marine engineers who had to meet them when first taking delivery on the U.S. West coast and who had to make some swift adjustments.

There was nothing wrong with their educational level, the knowledge of the basics of thermodynamics, physics and chemistry. However, there was a lot of catching up to be done in the sense of practical modern engineering.

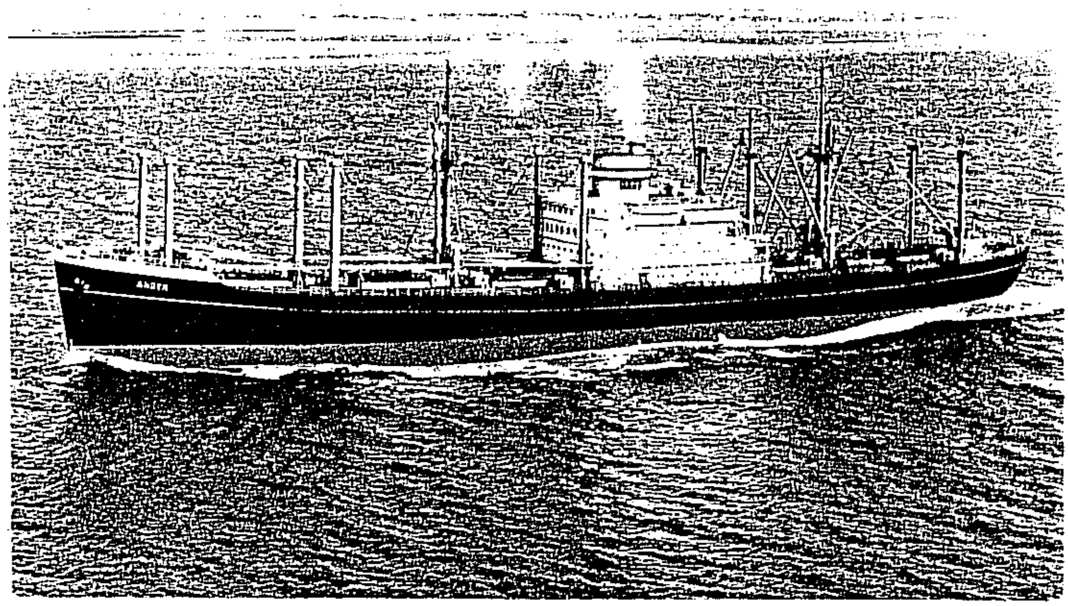
Naturally, the younger engineers who were not too deeply buried in the conventional propulsion plants showed the most flexibility and the system was developed whereby a seasoned chief engineer would sail together with much younger lower ranking engineers.



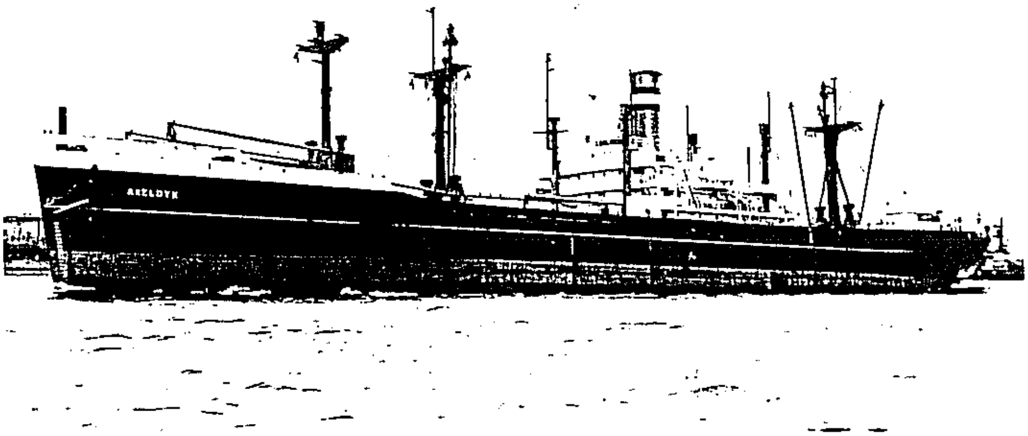
SS "BLIJDENDYK" (LIBERTY)



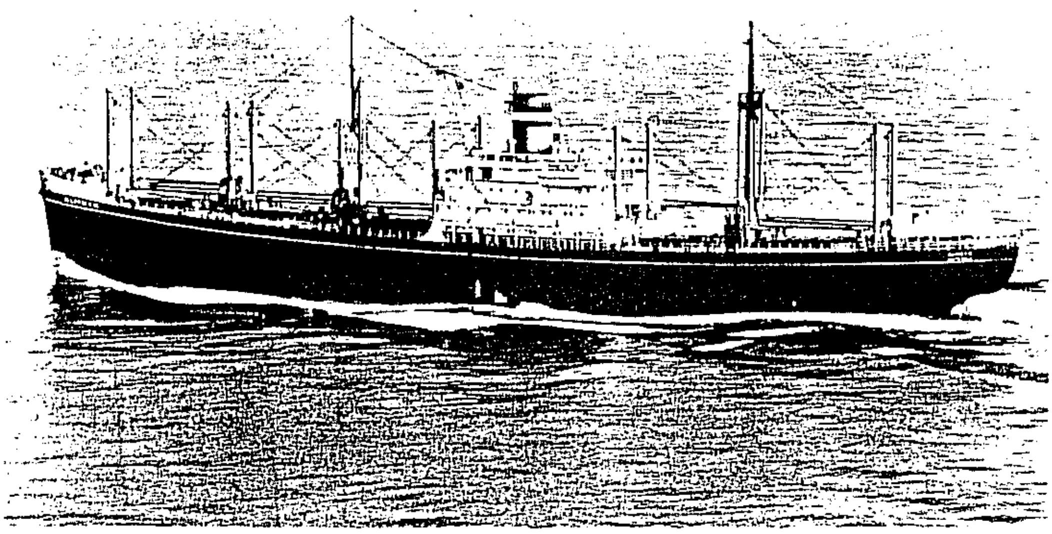
SS "ALBLASSERDYK" (C3)



SS "ANDYK" (POSTWAR C3)



SS "AXELDYK" (VICTORY)



SS "ALMDYK" (CONVERTED BABY FLATTOPPER)

I would like to give credit to those engineers in the merchant marine who adapted quickly, and no criticism is intended when I explain a few anecdotes which may sound critical, further on in this paper.

Once some of the war administration supplied vessels were distributed among the shipowners, and put in operation under civilian operations, the shipping companies started to buy Victory and C-3 vessels directly out of the layup fleets on the U.S. West and Gulf coasts.

A remarkable observation I would like to make is that each country had its preference for a certain type of vessel. There were very few Liberty ships under the Dutch flag contrary to, as a for instance, the Greek shipowners who bought Liberty ships in great numbers. The reason was the Dutch Merchant Marine mainly consisted of shipping companies engaged in the regular liner service, as opposed to the Greek shipowners who were actively serving the tramp market.

The speed and the general arrangement of the AP-2, AP-3 and C3 vessels lent themselves particularly for the regular liner service.

How well they fitted in the post war trade is probably best demonstrated by the fact that they required very little shipyard adjustments once they arrived in The Netherlands. Gun turrets and shrapnel protections were removed, and deep tanks were provided with heating coils to carry vegetable oil cargoes.

The foreship bottom was reinforced by fitting intercostals, something particularly necessary for the North Atlantic winter trade, and symptomatic for Victory vessels.

The Dutch shipowners were confronted with the Dutch shipping laws they had to comply with, similar to the problems U.S. shipowners encounter when reflagging foreign vessels.

Rules and regulations which were sensible in 1940 when the war broke out did not always fit the new boiler designs developed by the United States. This audience ought to be proud of the fact that this industry was way ahead of the book.

I remember that a feed water economizer in itself caused some sleepless nights with the Dutch steamboat inspectors because they did not clearly fit into a category of the law.

So much in love was everybody with these ships that foreign shipping companies even bought baby flattoppers (auxiliary aircraft carriers converted from standard C3 designs) and made very proud and good looking freighters of them. This was mostly done in U.S. shipyards. Like I said before, the standard European textbooks did not provide much specific information because not only technology had stopped in Europe, but also, the technical presses were not quite ready for it.

However, the U.S. provided drawings, instruction manuals, operational handbooks and spare parts books were perfect. One could not possible go wrong if one only learned to think in imperial standard instead of the metric standard of measuring.

I would like you to understand that it took some courage for the non-U.S. shipping world to catch up and deal with these novelties and rest assured they eventually all loved them.

The average marine engineer up to that time had lived in the comfortable world of direct current electricity and with the exception of an isolated turbo-electric driven vessel, the European marine engineer had not bothered to look beyond this.

The "Dobrowolsky" system changed the electrical world.

Studded boiler furnace tubes were looked on like something from outer space.

Chrome-ore castable refractory was something that all of a sudden became a very fancy way of building and repairing boiler furnaces. Everybody loved it.

There was the "Copes" feedwater regulator and the "Leslie" reducing valve, forever doing away with the hand-controlled auxiliary feed valves, and dispensing of the weight-loaded reducing valves generating annoying fluctuating steam pressures as the vessel rolled and pitched.

Integrated boiler controls. Pneumatics that made hand control obsolete.

Reefer compressors that refused to break down, because they were designed and built to take abuse.

Turbo generators that ran forever and required little or no maintenance, also because the mass produced gears were of very high quality.

Ships that could sail home operating the steam pumps only in case of a complete electrical breakdown.

And not to forget the electrical welding which changed the industry forever. Completely welding vessels was another aspect shipbuilders and ship repairers in Europe were forced to become intensely involved in.

Some knowledgeable overseas shipowners came to realize that it would be hard to improve on the design of these vessels, their machinery and equipment.

LESLIE PRESSURE REDUCING VALVES

TRADE MARK

CLASSES L-3, LE-3 AND LL-3 FOR STEAM

TABLE OF PRESSURE RANGES—Minimum Differential between Inlet and Outlet Pressure 15 PSI

Class	Size Inches	Inlet Steam Pressure PSI	Maximum Inlet Temp. °F.	Reduced Pressure Range Minimum PSI	Maximum PSI
L-3* LE-3**	½-2 (screwed)	25-300	550	10 (5% Inlet Pressures over 200 PSI)	285
LL-3**	½-4 (flanged)	25-300	550	2 (2% Inlet Pressures over 100 PSI)	35

*Internal Control Port—see cut. **External Control Pipe—see "For Low Reduced Pressure" below.*

FEATURES

ACCURACY OF REGULATION — Comparable to Instrument Control. See page 14.

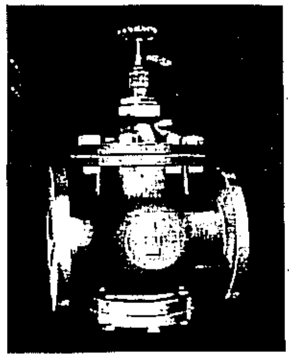
SPRING RANGE—from minimum to maximum reduced pressure range without change of spring or diaphragm.

SINGLE SEATED—closing with inlet pressure for positive dead-end shut-off.

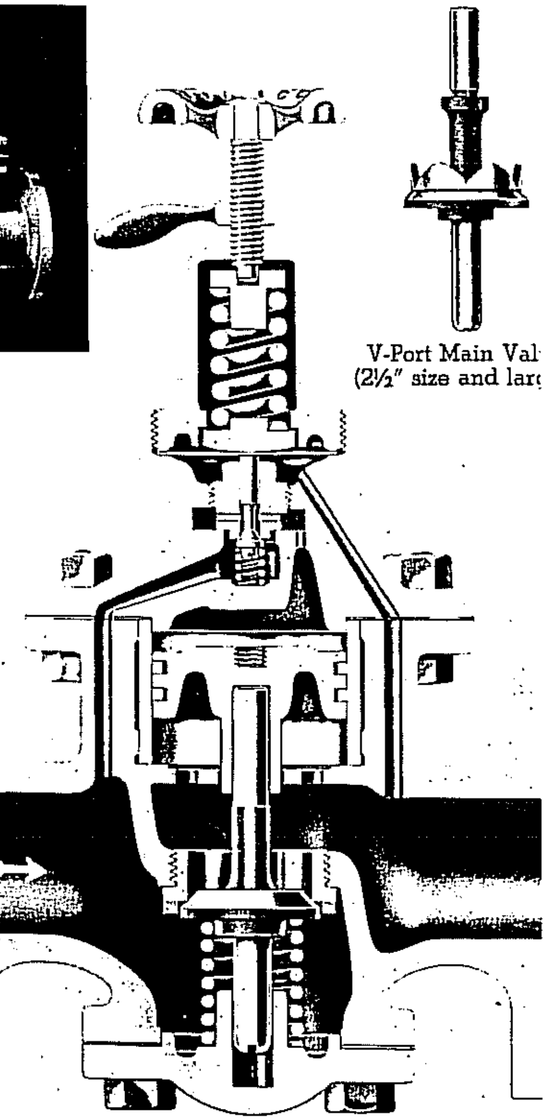
RESPONSIVE—instant corrective reaction to any flow change.

INTERCHANGEABILITY OF REPLACEMENT PARTS—making complete overhaul possible without removal of main body from pipe line.

GRADUAL OPENING V-PORT MAIN VALVE—in sizes 2½" and larger (illustrated) permits close throttling control under low flow conditions.



V-Port Main Val
(2½" size and lar



Class L-3, Pressure Reducing Valve

CONSTRUCTION

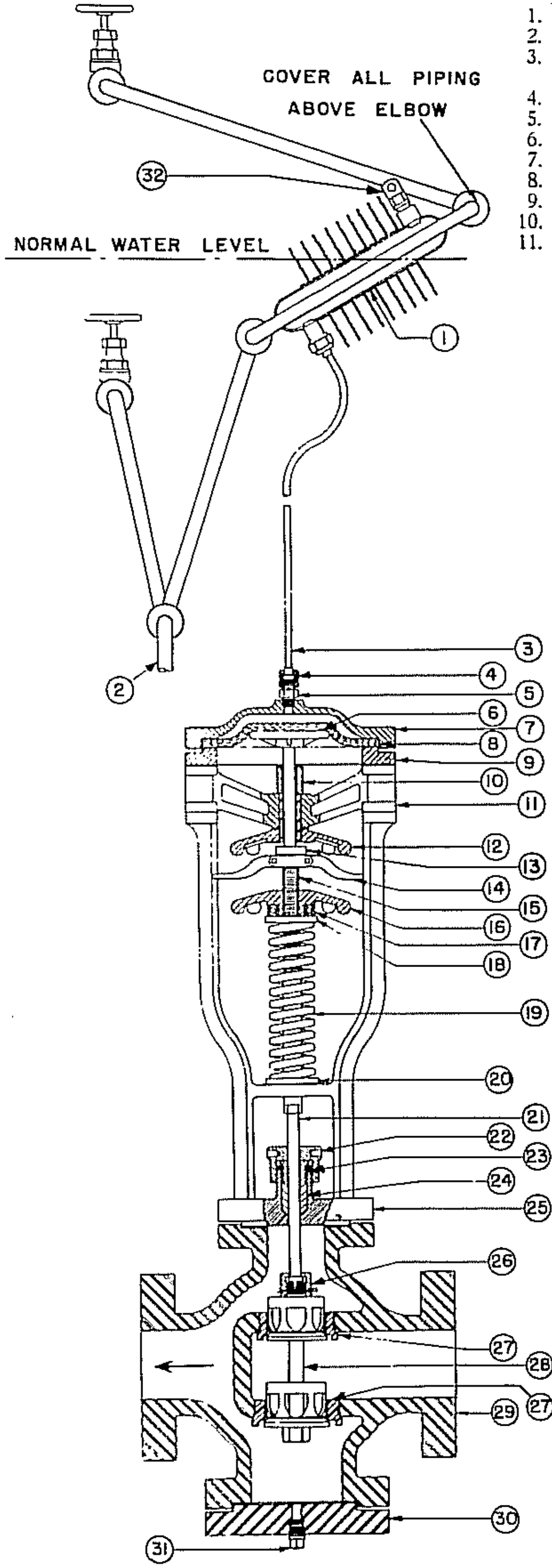
- High Pressure Bronze Body (cast in our own foundry) Non-corroding.
  Screwed Ends or MSS Flanges, 150 and 300 lbs.
- Renewable Wear and Corrosion Resistant Parts.
  STELLITED SEATING SURFACE, forged Stainless Steel Seat Ring (See page 4, Exclusive LESLIE Features)
  Hardened Stainless Steel Main Valve 800 Brinell.
  Hardened Stainless Steel Controlling Valve and Cylinder Liner 500 Brinell, highly ground finish.
  Stainless Steel Controlling Valve Seat and Adjusting Screw.
  Bronze Piston and Phosphor Bronze Diaphragm.
- No Stuffing Boxes.
- External Control Pipe for pressure reductions less than 25% of inlet pressure except when reduced pressure is 100 PSI or more.

FOR LOW REDUCED PRESSURE AND EXPANDED OUTLET PIPING

LESLIE Classes LE-3 and LL-3 (no internal control port) are drilled and tapped for ¼" External Control Pipe connection. See Dwg. No. L-223 F-5 following bulletin and installation page 16. This eliminates the effect of turbulence and pressure drop at outlet body throat, increasing capacity under heavy flow conditions.

DIMENSIONS AND PARTS LIST—See Drawing No. L-223 F-5 following bulletin.

CAPACITY TABLE—See page 15.



1. Generator
2. Blowdown Connection
3. ¼" O.D. Copper Tubing
4. Union Nut
5. Tailpiece
6. Stemplate
7. Diaphragm Plate
8. Diaphragm
9. Diaphragm Ring
10. Travel Limit Bushing
11. Spacer Bar
12. By-Pass Wheel
13. By-Pass Bearing
14. Travel Indicator
15. Adjusting Screw
16. Adjusting Wheel
17. Spring Thrust Bearing
18. Upper Spring Seat
19. Spring
20. Lower Spring Seat
21. Stem
22. Packing Nut
23. Packing Gland
24. Packing
25. Yoke
26. Disc Nut
27. Small Seat—Large Seat
28. Disc
29. Body
30. Body Plate
31. Pipe Plug
32. Filling Plug

FIGURE No. 19

SWARTWOUT FEEDWATER REGULATOR MODEL "SC"
By THE SWARTWOUT COMPANY
18511 Euclid Avenue, Cleveland, Ohio

valve is closed. Close upper and lower hand angle valves on generator piping and open the valve in the blow down line. Then remove filling plug and fill generator with hot water. When generator is full, replace plug and crack upper hand angle valve allowing steam from boiler to circulate through the generator and escape at blowdown. While the generator is thus being kept hot crack the connecting tubing union nut on the top of the diaphragm plate of the regulating valve, and allow the air to escape. When the water appears, tighten the nut. Then close the upper hand angle valve and slowly pour water over the generator until it is cool. Now remove the filling plug and refill the generator. (Do not remove filling plug until generator is entirely cool.) The system is now entirely filled with water and may be cut in. Close the blowdown valve and open upper and lower hand angle valves wide. The regulator will now pick up the load.

7-14. ADJUSTMENTS. Allow the regulator to operate for about twenty minutes and observe the water level being maintained together with the variation. Spring adjustments will affect regulation as follows:

7-15. Increasing tension on the spring will cause regulator to carry a slightly lower water level and will increase its speed in closing off as water level rises.

7-16. Releasing the spring will allow the regulator to carry a slightly higher water level and will decrease its speed in closing off as water level rises.

7-17. While spring adjustments have a slight effect on water level, a change of one inch or more should be made by bleeding off water at the union above the diaphragm to lower the water level or by adding water to the generator to raise the water level.

7-18. GENERAL INSTRUCTIONS. The regulating valve may be bypassed or held in an open position by screwing the bypass wheel out of the spacer bar. During normal operation this wheel should be screwed tightly against the spacer bar and locked by the thumb screw.

7-19. The generator system must be entirely filled with water at all times for satisfactory opera-

SWARTWOUT FEEDWATER REGULATOR

DIAGRAM AND INSTRUCTIONS

Around 1950, the Holland America Line bought, with the aid of the Dutch government, some General Electric 8,500 SHP plants with Foster Wheeler boilers in the U.S. and shipped them to Holland where they were fitted in new passenger liners.

To tell you something about first-class logistics, each individual complete plant was packed and crated and paint-color- coded on all eight corners of each package.

Walking through a warehouse one could not possibly go wrong and pick the wrong part for the wrong ship, or pick it in the wrong sequence. And insiders in The Netherlands still speak about the red, blue and green plants.

The passenger vessel, "STEFAN BATORY" still operated on one of these machinery packages till she was recently laid up.

Sometime after the war the Dutch government still ordered the construction of four so-called "province vessels" of the C-3 type in Chester, Pennsylvania.

They were all named after Dutch provinces, and when they were commissioned they were considered the finest of break-bulk vessels one could ever lay his hands on. Those ships and all the other vessels that changed their drab war colors for more lively colors did not only get the merchant marine of many nations back on their feet, but believe me, made very happy stockholders in many regular liner companies.

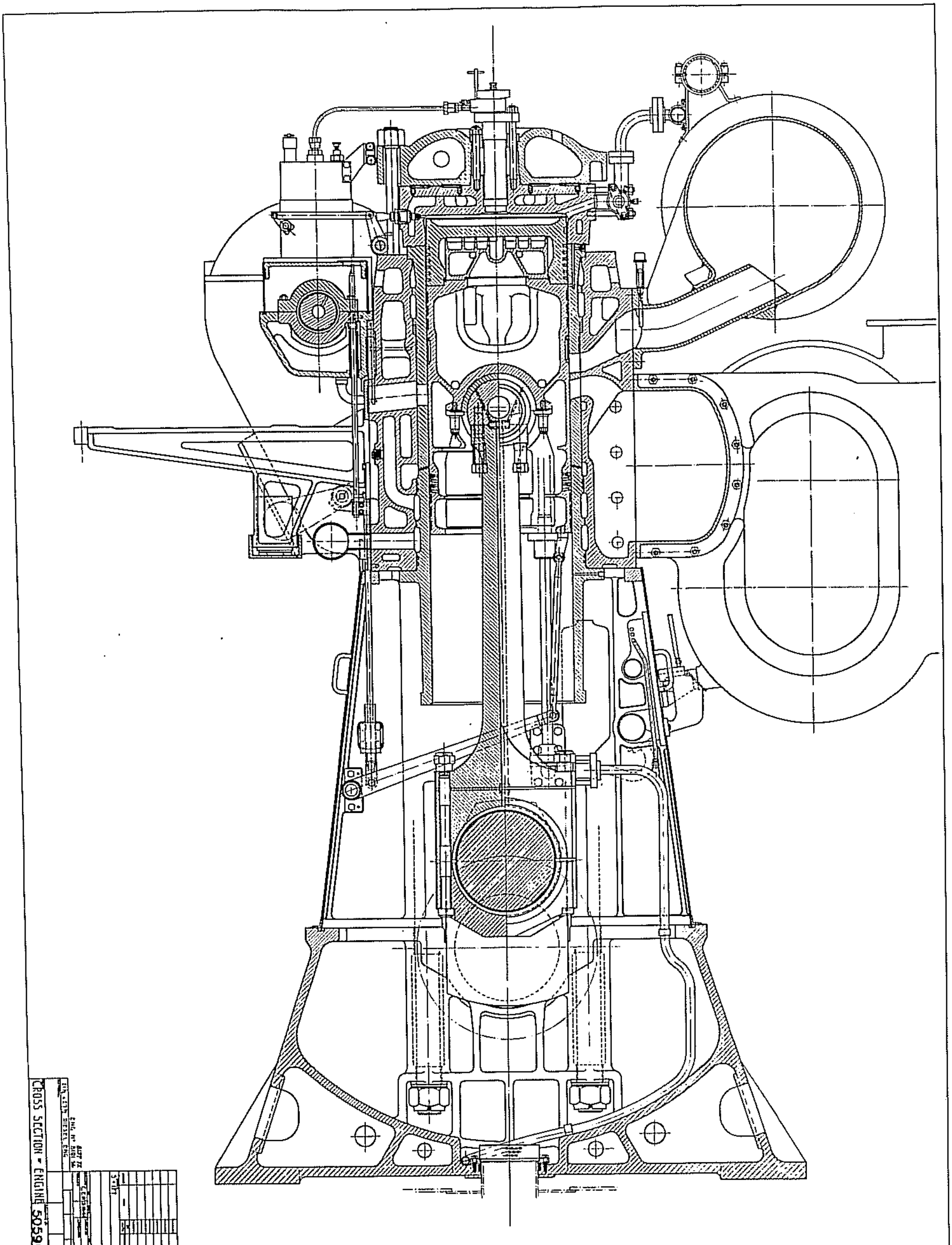
I distinctly remember that making M & R budgets for the approximately 16 vessels we had at one time, was very simple: 200,000 Dutch florins for annual drydocking and repairs, 400,000 Dutch florins for special survey. In those days that was respectively $55,000 and $100,000 U.S. dollars.

That budget never missed.

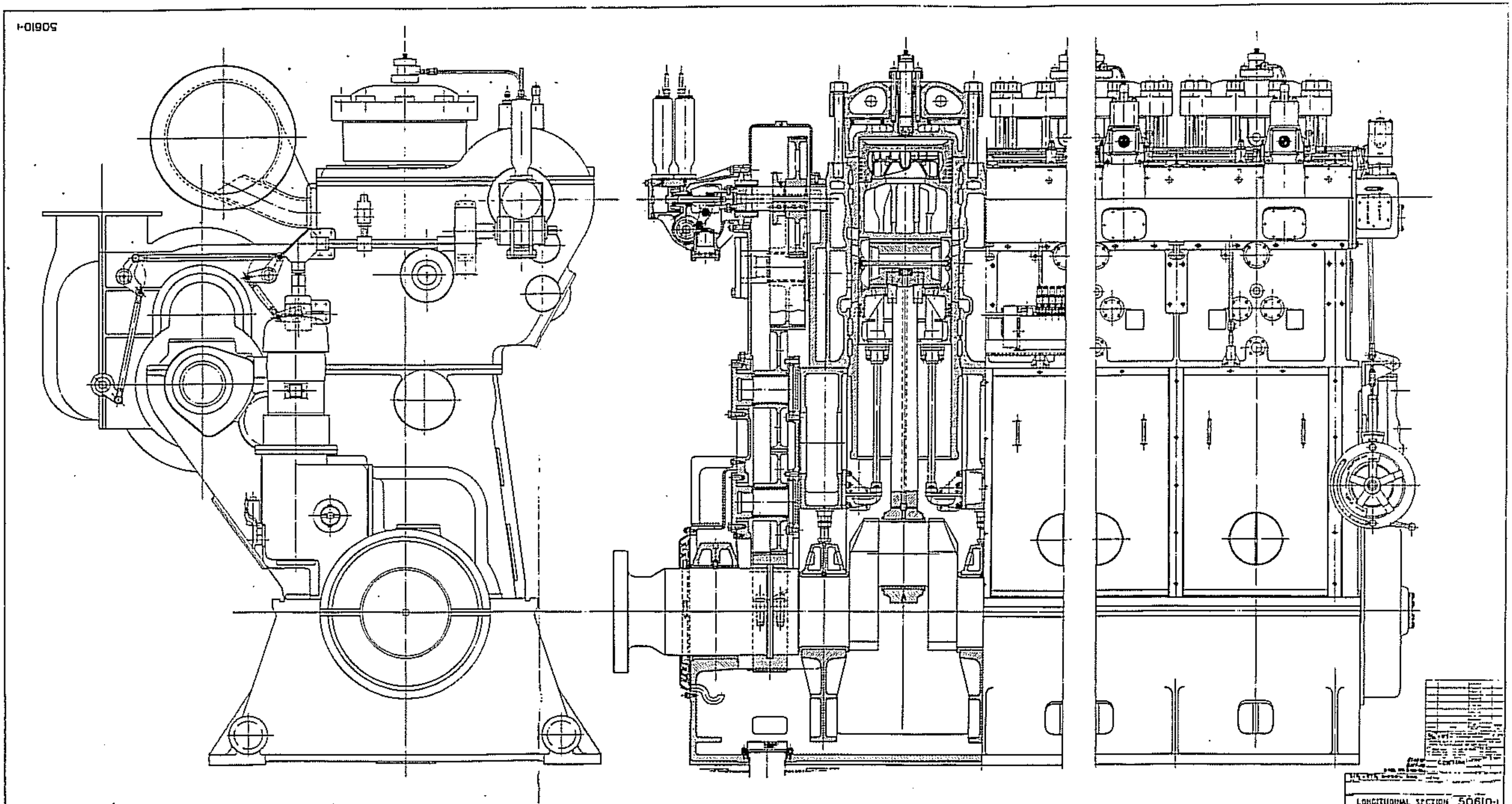
In all the years (1959-1968) that I served as a port engineer and superintendent, we had only one engine breakdown on a Victory ship in open sea that called for towing assistance.

Certainly a remarkable performance and a feather in the hat of the U.S. Maritime industry.

During the years prior to World War II, European merchant shipping had become very diesel propulsion oriented. One could probably safely estimate that it was a matter of 50-50 steam and diesel. Of the steam propelled vessels, the majority certainly was fitted out with steam reciprocating engines. Only some larger passenger vessels and combined passenger/freight steamers were turbine propelled in those days.



HAMILTON MODEL R-621-SA MAIN ENGINE FOR C1-M-AV1 VESSELS



HAMILTON MODEL R-621-SA MAIN ENGINE FOR C1-M-AV1 VESSELS

Not so in the United States of America. At the time of World War II, and before and after the war, the American shipping community was certainly not in love with the low speed diesel engine.

Still, we would be remiss if we would not recognize the tremendous effort that was made during the war to produce diesel propulsion plants.

We have seen combinations of more than one diesel engine to a combined output of 8,500 SHP driving through electro-magnetic couplings and a gearbox a single low speed propeller. These plants were made to fit existing hull designs and in itself formed a remarkable example of versatile thinking.

Another example of this tremendous effort which deserves attention is the flexibility displayed in instances where the engine manufactures could not keep up with the demands for certain components.

Within one type of vessel serving a certain company a variety of combinations of turbines, gearboxes and boilers were fitted, depending on which supplier could provide the equipment at the time of construction of each vessel. In my experience I never had a problem with mismatched equipment.

Stop here for a moment and think about how it works, (or does not work) in today's world, with long deliberations and not to forget the famous "change order", a magical word that seems to change everything that was right in the first place.

Interestingly enough, in all the years of operating these vessels, I never encountered a problem or a breakdown that emanated from the builder or designer combining any of the Westinghouse, General Electric, Allis Chalmers, B&W, Foster Wheeler, or other U.S. products.

Let me continue to sing the ballad of how this was all perfectly orchestrated and skillfully conducted. All of those manufacturers maintained their own typical design features, but when they were united with components from different makes it never failed. Buying and fitting spare parts was a sheer joy.

The surrounding logistics, planning, thinking, brainstorming, and not to forget the communication was more impressive that any of the U.S. designers or manufacturers probably ever realized themselves.

The ships that were built, were apparently structurally very sound and although not primarily built with the intention of longevity, certainly withstood the test of time.

CONCLUSION:

I do hope that I have administered some oxygen to the smoldering ember of professional pride that you must feel deep in your heart when you read about or think about that heroic shipbuilding era.

It was you, your mentors, your teachers, your fathers and grandfathers who designed this in less than a year when the need arose. They brought it to full-fledged production line in two years.

A demonstration of ingenuity and fearless perseverance that did not only support the warfare but also provided the post-war seafaring world with a merchant fleet second to none.

Believe me this has influenced history more than the Spanish Armada or the Battle of Lepanto.

When preparing this paper I did some research, and one of our engineers found in our company library a publication by the U.S. Maritime Commission that was issued in 1949 under the title, "Statistical Summary of Shipbuilding under the U.S. Maritime Commission during World War II." The historian, Mr. Frederice C. Lane did an impressive job and some statistics taken from this study are provided with this paper.

One cannot help but be in total awe thinking that this all was achieved in a matter of months.

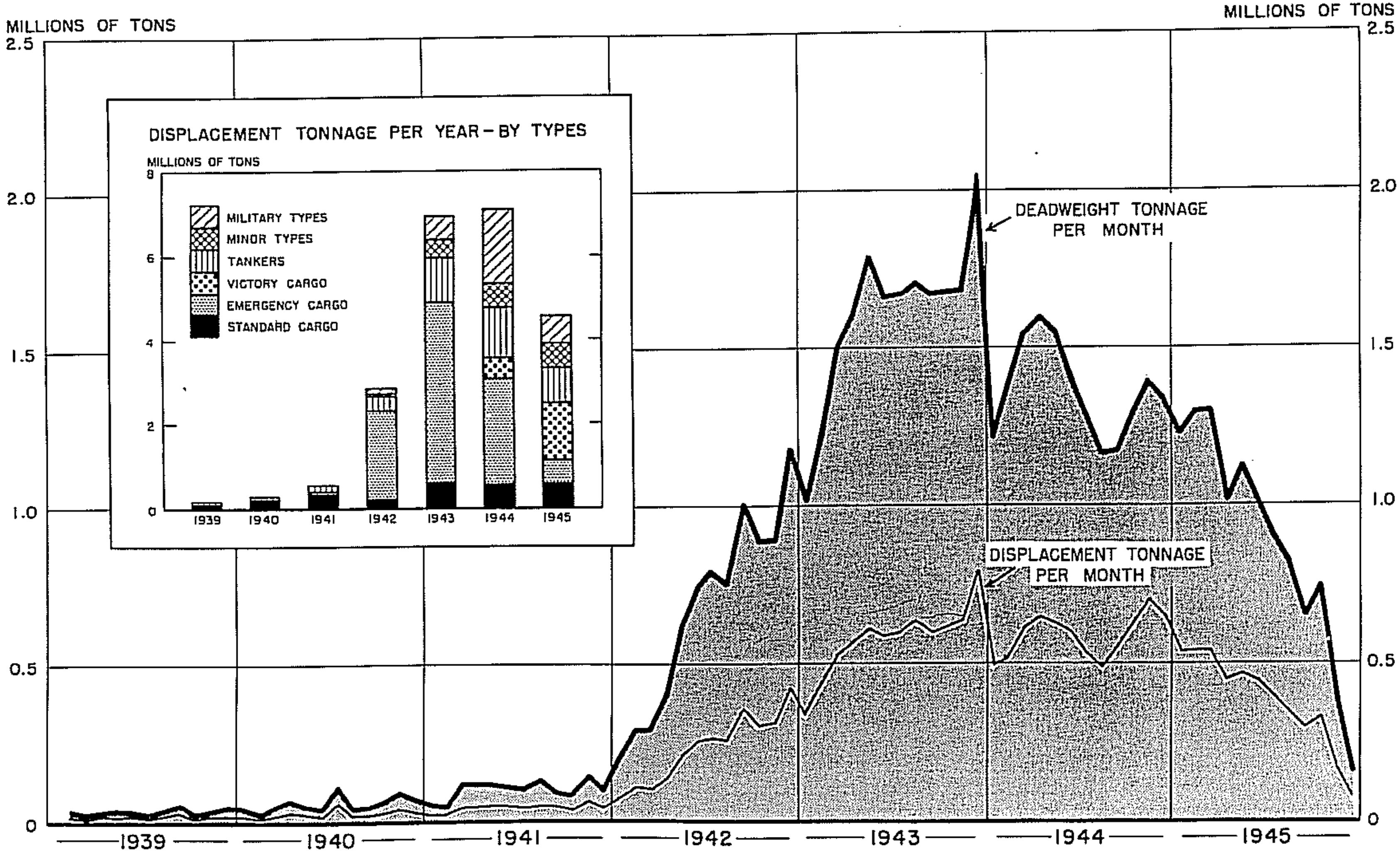
Clearly after the Pearl Harbor disaster that paralyzed this nation for a very brief moment, some people, American people, naval architects and marine engineers stood up, joined forces and did it.

Within the framework of the Steamboat Historical Society, I had an opportunity to visit the "LANE VICTORY", formerly owned by American President Lines, which is now being renovated by an extremely enthusiastic group of people in Los Angeles harbor.

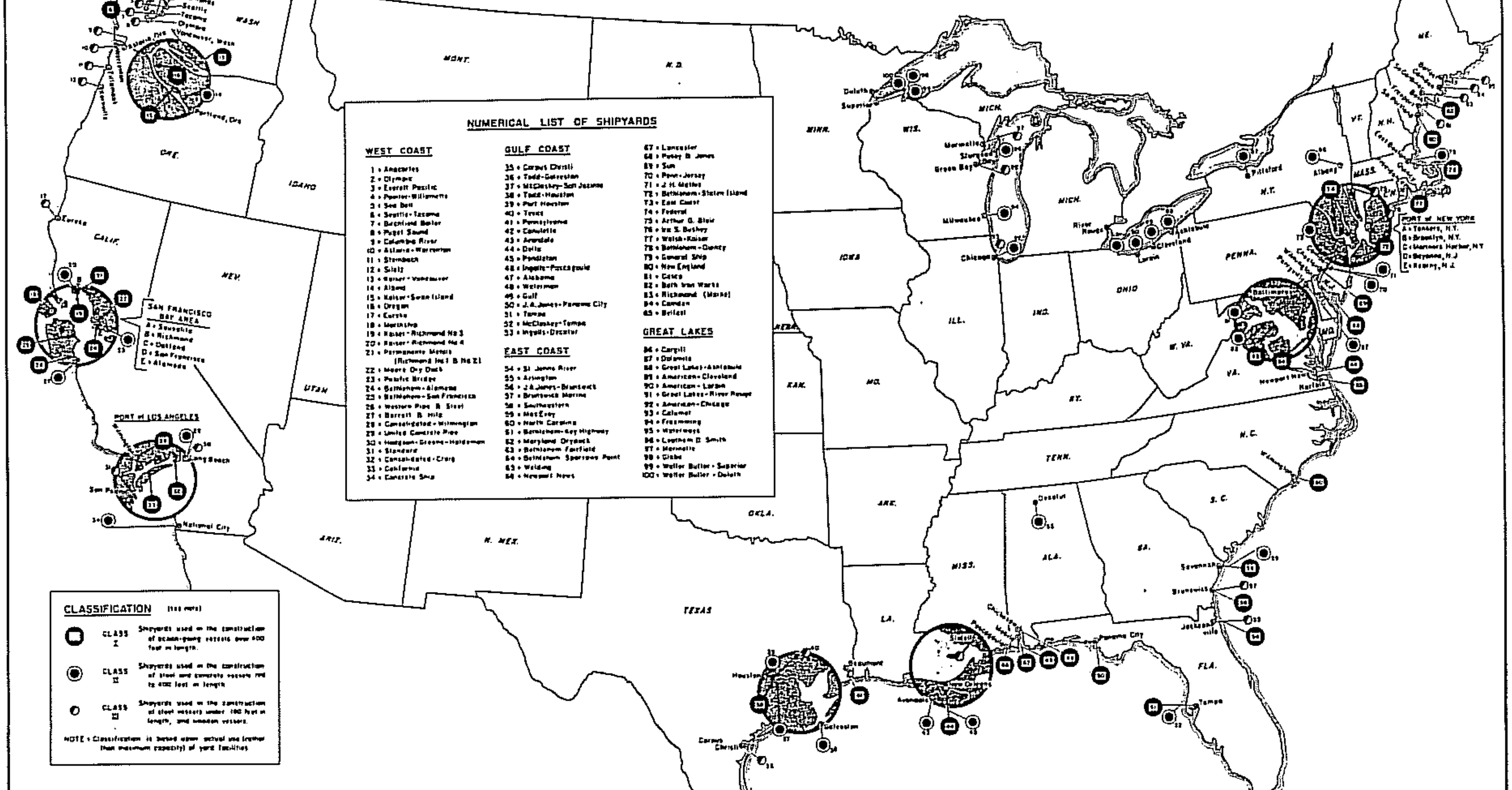
Walking through the vessel, and I must say I am somewhat obsessed with the subject, one cannot avoid the feeling that the war spirit is still roaming around the engine room, the accommodation and the cargo spaces.

It was recently in studying a publication on the passenger vessels "MANHATTAN" and "WASHINGTON" that I discovered that a lot of design thinking of those ships was already incorporated in the construction of some pre-war European passenger liners.

DEADWEIGHT AND LIGHT DISPLACEMENT TONNAGE OF VESSELS DELIVERED UNDER THE U.S. MARITIME COMMISSION PROGRAM, 1939-45



SHIPYARDS UTILIZED BY THE U. S. MARITIME COMMISSION*
1939-1945



* Including Shipyards that Built for Private Account Vessels Exceeding 2,000 Gross Tons

Some of the engineering aspects that I had always figured to be typically European undoubtedly were initiated in this country, even before the second world war.

This presentation has a message - It is not meant to be a scientific presentation. It is not meant to be a reference work that will leave generations to come in total astonishment. It is not meant to contribute to any specific subject like propeller cavitation or ship's bending stresses in superconfused waves - important as they may be for a professional society as ours and the industry as a whole.

If we go on like this, soon enough there will be no shipping generation to be impressed with this history.

I would like to ask you: Would you like to restore this pride? At least make an effort?

I must say that over the past approximately 15 years that I am attending maritime professional meetings in the U.S.A., I am becoming very depressed and tired of listening to Under Secretaries of Transportation, executives in the shipping industry and analysts telling us in what poor shape the maritime industry in this country is.

Generally speaking, lack of resistance leads to paralysis.

Granted this may not be the ideal time to build a large flourishing U.S flag shipbuilding and shipowning industry. Certainly shipping is the first sector to be hit in times of economic hardship. However, in spite of the much-heard negative remarks there are still a number of solid American shipowners who are trying to run a tight show, and I would like to give them credit for all their efforts.

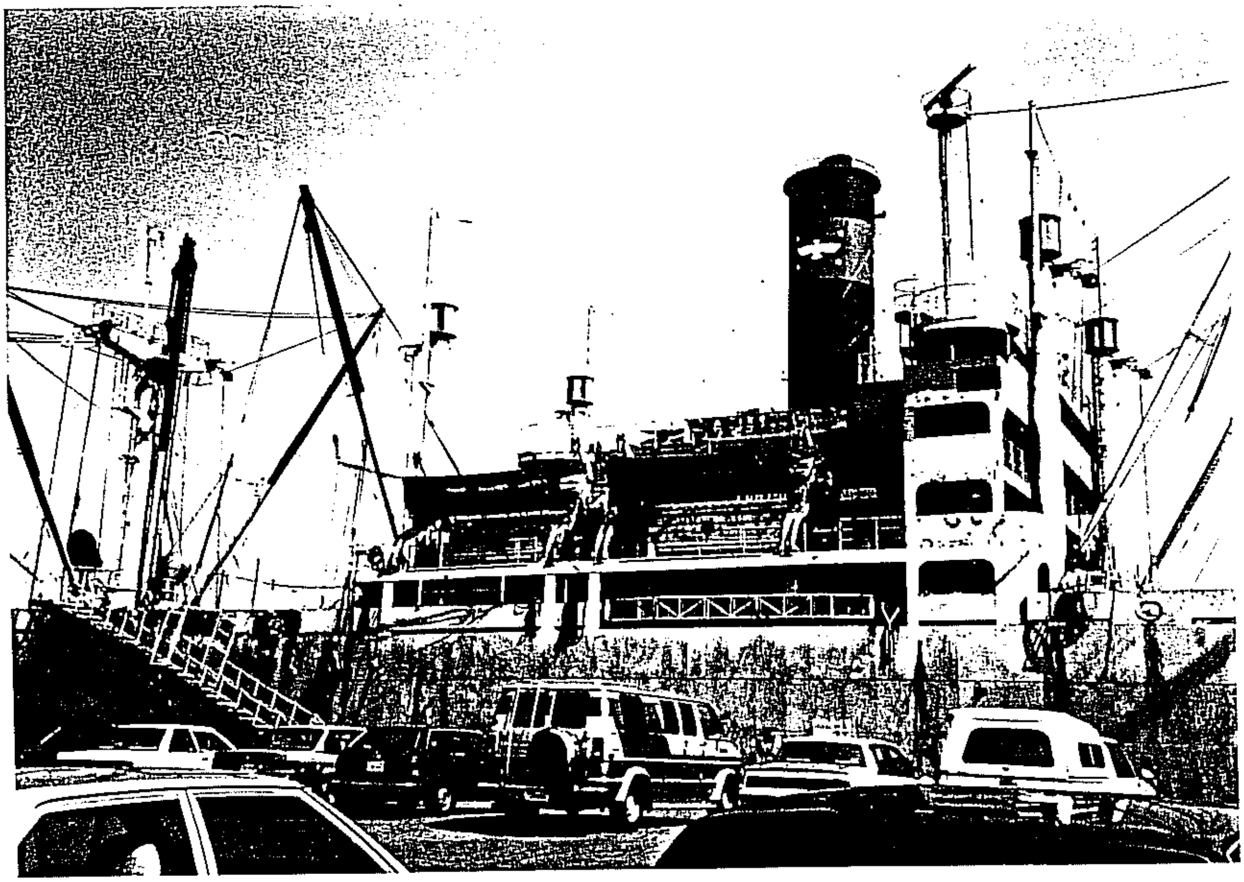
From what I observe, I honestly don't think that there is a real united effort by shipowners, ship builders, ship repairers, and not to forget the labor unions, to make it work.

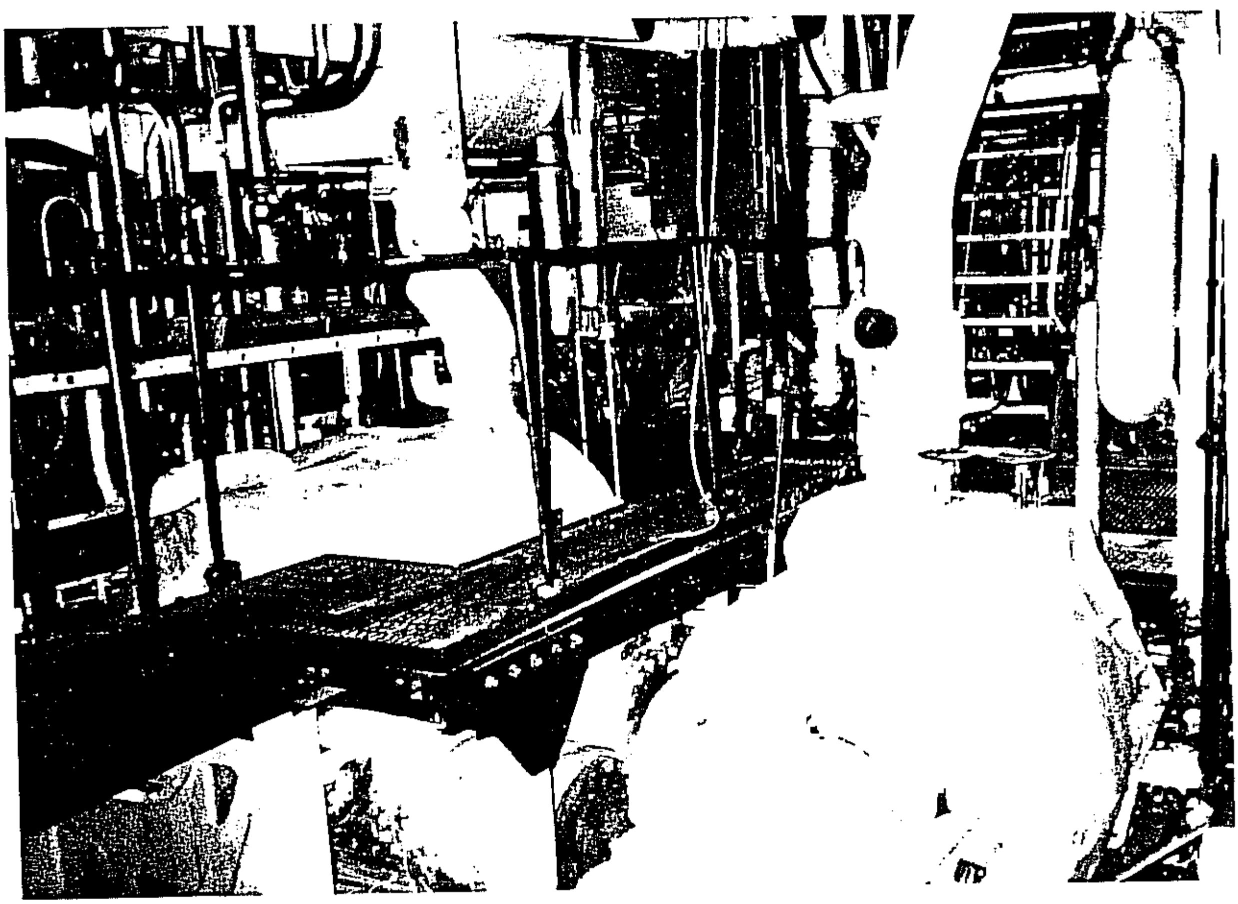
I for one do not have a quick solution, I must admit. Certainly I am not the person to become the apostle and carry the message.

I just thought on the occasion of the anniversary of SNAME, I should walk you through a very proud era in the maritime industry, that generated fame and reputation for this nation.

All the brains and technology are here somewhere between Guam and Block Island.

Don't let them run away with it.





SS "LANE VICTORY"

And apply it within our borders.

I will leave you by quoting a poem I read as a 14-year old in England which does not only apply to the seafarers but also to naval architects and engineers. It reads:

In time of war
And not before
God and the sailor are adored.
When war is over
And peace remitted
God is forgotten
And the sailor quitted.

I would like to ask you after this meeting not to stop thinking in a positive fashion about this all and not to let this go after a double scotch and a good night's sleep, but ask yourself, "What can I do as an individual to bring it back as it was?"