TELESCOPE

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Great Lakes
Maritime
Institute

Dossin Great Lakes Museum,
Belle Isle, Detroit 7, Michigan

Meetings

Business Meeting
Friday 28 August 1964
Dossin Museum, 8 p.m.

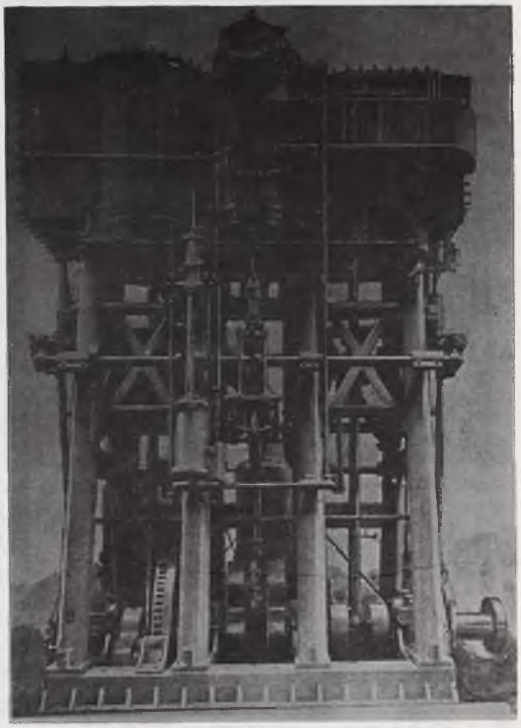
Visitors are welcome to these meetings of the Board of Directors.

General Meeting
Friday 25 September 1964
Dossin Museum, 8 p.m.

Our speaker will be Mr. F. Wells Robison, Technical Liaison Officer of the United States Lake Survey. The program will be their latest film, "The Lake Survey." We have all been familiar with earlier instruments and work of the Lake Survey through viewing the display at Dossin Museum. The waters which they chart have been much in the news for their unusually low levels, making shallower the dredged channels for shipping and bringing hardship to property along the shoreline. What might be considered normal levels for the lakes? Is there any truth in the idea that high water levels on the lakes come in cycles of seven years? Bring these or other questions with you, and learn how the Lake Survey does its work today.

Our cover shows Boland & Cornelius' *John T. Hutchinson*, newly converted to a self-unloader at Fraser-Nelson in Superior, Wisconsin. She is also of interest to readers of our feature article, for she is one of the six Lorain-built Maritime Commission lakers equipped with four-cylinder compound reciprocating steam engines (together with the ten lakers built by Great Lakes Engineering Works and given triple-expansion engines, this class of 1943 had the last conventional reciprocating steam engines given to lake freighters). Our photograph is by Peter Worden, who informs us that the new self-unloading boom fitted to *Richard J. Reiss* at Manitowoc is identical, but painted black. Below is his photograph of car ferry *Ann Arbor No. 7*, upbound in the St. Marys River. She was bound for the Fraser-Nelson yard at Superior for a nearly $2 million rebuilding. *Ann Arbor No. 7* will trade her twin triple-expansion steam engines for diesel-electric propulsion with pilot house controls. She will also have her upper decks raised to give clearance for higher railroad cars. Sometime before the Soo Locks close for the winter, *Ann Arbor No. 7* is to return to Lake Michigan, rebuilt and possibly renamed *Viking* to honor the settlers of Wisconsin, Northern Michigan and Minnesota.

IN THE TRIPLE'S WAKE...



Triple-expansion engine built 1893 at Detroit by Dry Dock Engine Works for the freighter Selwyn Eddy. *Cylinders were 22, 35 and 56 inches in diameter, and length of stroke of their pistons was 44 inches.*
--*From* Around the Lakes, *Detroit Dry Dock Co., 1894.*

by Gordon Bugbee

A Review of Engines Introduced to Power Upper Lakes Bulk Freighters in Modern Times

When the nuclear-powered merchant ship *Savannah* appeared several years ago, the *New York Times* found it odd that the atomic age should find a partner in the seemingly-obsolete steam engine. *Savannah*'s designers had of course made steam from the heat of her reactor to power a conventional steam engine. The world's merchant fleets had turned to using motorships, the *Times* editorial continued, and only on the Great Lakes did steam engines still prevail among large ships.

Diesel engines first came to the lakes half a century ago. But they have been a long time in making any mark on the lake bulk freighter fleet. The longtime king of the fleet was the triple-expansion reciprocating engine. When at last it abdicated, about twenty years ago, a contest for its place grew between its cousin, the Unaflow, and the steam turbine. Among older lake ships that were repowered, the match was about an even draw, while the turbine took the prize among new ships. The diesel made hardly any showing at all. But now, belatedly in the sixties, the diesel engine is beginning to find its place, both in new lake ships and in repowered ones.

The lakes' first triple-expansion engine belonged to the passenger and package freight steamer Lakeland, *built at Cleveland in 1887 as the bulk freighter* Cambria.

--Pesha photograph from one of the photo collections of old lake ships distributed in sets of 25 views by Marine Historical Society of Detroit.

1. Rise and Fall

"It was on Lake Erie where the compound propeller engine for the merchant service in this country first took form," wrote John Morrison in his *History of American Steam Navigation.* Engines having two cylinders could be economical. Steam need not be discarded after it had pushed one cylinder's piston through its power stroke. It could be put to work again, pushing a second, larger cylinder, under lower pressures in keeping with its decreased temperature. This is the basic idea of a "compound" engine.

Such engines had appeared in lake sidewheelers like *Oregon* of 1845 or *Buckeye State* of 1851, according to Morrison. In propeller ships of the 1860s, compound engines were arranged in "steeple" fashion. The smallest cylinder was atop the larger one, and the pistons of both rode on the same piston rod turning the propeller. The old wooden tug *Gladiator* of 1871, dismantled only several years ago, had one of these engines.

Morrison credits the lakes' first fore-and-aft compound engine to the propeller *Egyptian,* built 1873 at Black River, Ohio, where the Lorain yards of American Shipbuilding Company are found today. The fore-and-aft engine had a clear advantage over its predecessors: It could be "balanced." Its cylinders were on separate piston rods, so the power strokes of the two pistons could occur alternately in a rhythm offsetting and minimizing the vibration. This was especially important in days of wooden ships when engine vibration caused practical limits to hull lengths. The fore-and-aft engine--and of course metal hulls--made longer lake ships possible.

Only a simple refinement created the triple-expansion engine, but it was almost fifteen years in coming. As its name suggests, it had three cylinders strung fore-and-aft along

the propeller shaft, and the steam was put to work successively in three stages before being considered spent. The package freighter *Susquehanna* of 1886 had the lakes' first three-cylinder engine, but it used steam only in two stages (i.e., the two larger cylinders were the same size). A year later came bulk ship *Cambria* with the first triple-expansion engine. Quadruple-expansion engines appeared in 1894 in the fast passenger liner *North West* and the river steamer *Unique*.

Cambria and her triple-expansion engine were built just when iron ore was replacing grain as the lakes' most important cargo. Anything from schooners to package freighters could carry grain, as long as they could keep it dry. On the other hand, a specialized type of ship was needed to carry iron ore at minimum cost, and *Cambria* showed what a modern ore ship might look like.

Cambria was built 1887 at Cleveland by Globe Iron Works for the Mutual Transportation Company. At the time, she was considered quite fast, having once beaten the package freighter *Tioga*, then deemed the lakes' fastest, soon after she came out. *Cambria* passed to the Pittsburgh fleet when U. S. Steel was formed in 1901, and was sold again in 1909 to Port Huron and Duluth Steamship Company. They converted her to the passenger and package freight steamer *Lakeland*, with a single deck of staterooms above the main deck. *Lakeland* foundered in Lake Michigan near Sturgeon Bay in 1924.

By 1910 the six-hundred-foot bulk freighter, twice the length of *Cambria*, was becoming common. Iron ore could now be delivered from Lake Superior ports to those on Lake Erie for seventy cents per ton, of which fifteen cents was eaten up in unloading costs. Grain could make the same passage for a cent-and-a-third a bushel. Engines of the six-hundred-footer were of relatively low horsepower, usually about two thousand. These engines could push a loaded laker about 11½ m.p.h. and a "light" one about 12½ m.p.h. Such a ship, travelling downbound loaded and upbound light, could make perhaps thirty-five round trips each season. By season's end, it might have hauled perhaps 475,000 tons of iron ore.

For a brief time in the late 1890s shipowners tried more powerful engines for greater speed, and quadruple-expansion engines briefly found favor in bulk freighters. The two fore-and-aft stacks once borne by *Douglass Houghton* of 1899 testified to that trend. But shipowners begrudged the extra fuel spent on extra speed, and the slower ships became the rule.

In the present century, the "triple" became almost universal for lake bulk freighters. Of today's fleet, about 190 have or originally had triple-expansion engines. Less than twenty have or once had quadruple-expansion engines, and these usually belonged to ships built before 1900 or to a handful of larger ships of the twenties. Six more are four-cylinder compound engines--for Maritime Commission Class lakers built in 1943 at Lorain by American Ship Building Company (see cover). The last lakers built with triple-expansion engines were the other ten of the 1943 Maritime Commission program, those built by Great Lakes Engineering Works at River Rouge and Ashtabula. Only about fifteen other war-built or prewar lake bulk carriers existing today had any other kind of engine--turbines or diesels.

2. Enter the Diesel

The diesel engine came to the lakes shortly after Rudolph Diesel's invention became commercially practical. To attempt an oversimplified description, a diesel engine works

by compressing air in a cylinder, causing the air to become very hot. Oil injected into the cylinder takes fire from the heat, giving off gasses which expand and drive the piston back down again. The oil fuel can be of a relatively unrefined--and thus economical--grade.

The lakes' first motorship was the Canadian canal-sized bulk freighter *Toiler*, built in 1910 at Newcastle, in England. *Toiler* later became familiar as Canada Steamship Lines' *Mapleheath*. When the Seaway made canallers obsolete in 1959, *Mapleheath* was retired; but she had long since exchanged her diesel engine for one of steam. Another early lake motorship was the package freighter *Fordonian*, built 1912 in Glasgow to canal-size dimensions for Merchants Mutual Line of Toronto. *Fordonian* seems to have kept her engine to the end when, on January 14, 1946, as *Badger State*, she ran upon a sunken hulk in the Gulf of Mexico and was lost. A handsome model of *Fordonian* can be seen at the Canadian lakehead in Fort William's historical museum.

The first diesel engines of upper lakes bulk freighters were built for the familiar Ford freighters *Benson Ford* and *Henry Ford II* in 1924. Forty years later, these engines are still in use. Clare Snider, Ford's marine manager, says they run as well as they did the day they were installed, having received unusually rigid maintenance through the years. Forty years is a respectably decent age for a marine engine, and rivals the longevity claimed for a "triple" (with due apologies to the slow-moving, low-pressure giants of the sidewheel car ferry *Lansdowne*--engines that are ninety-two years old this year). The Ford freighters have Sun-Doxford engines of four cylinders, rated at three thousand horsepower. These are slowly-turning engines linked directly to the propeller shaft. When a Ford ship passes close by in the river, the muffled rhythm of its engine can be heard on shore. Some people say it sounds like "*MAK*-ing-*mon*-ey-*MAK*-ing-*mon*-ey-*MAK*-ing-*mon*-ey..."

3. Enter the Turbine

Turbine ships and diesel ships became commercially feasible at about the same time. The first turbine-driven lake ship was also Canadian-owned and British-built, but was a sleek Lake Ontario passenger liner. *Turbinia* was built in 1904 at Hebburn-on-Tyne, England, for service between Toronto and Hamilton for the Turbine Steamship Company. Eventually passing into Canada Steamship Lines' fleet, she last operated out of Montreal in the late twenties, and was broken up in 1937.

A turbine, again to oversimplify grossly, is something like a windmill with blades turned by moving steam. Like most diesel engines (except those of the Ford ships), a turbine is most useful when turning at high speeds. The propeller of a lake bulk freighter, on the other hand, turns best at between 70 and 120 revolutions per minute. Some means must be provided to transmit the power of the fast-turning turbine to the slower-turning propeller shaft. Furthermore, the turbine turns only in one direction, and it would ill suit a lake freighter to be able to move only forward. We shall see that several answers to this problem turned up.

The turbine was about as long in finding its way into a lake freighter as was the diesel. It found use in the twenties and thirties in ships owned by U. S. Steel Corp. fleets. In 1925 the Bradley Transportation Company introduced the

The canaller Mapleheath *was a steamer in her later career as shown here (she is now a salvage barge), but when new in 1910 she was* Toiler, *the Great Lakes' first motorship.*

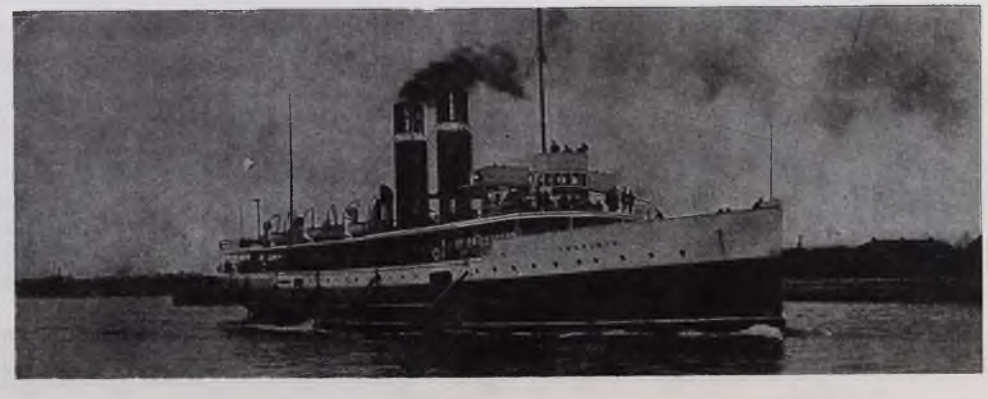
--Bugbee photograph

First upper lakes bulk freight motorships were Benson Ford *(above) and* Henry Ford II *of 1924.*

--Bugbee photograph

Lake Ontario's passenger steamer Turbinia *of 1904 was the first turbine-driven Great Lakes ship.*

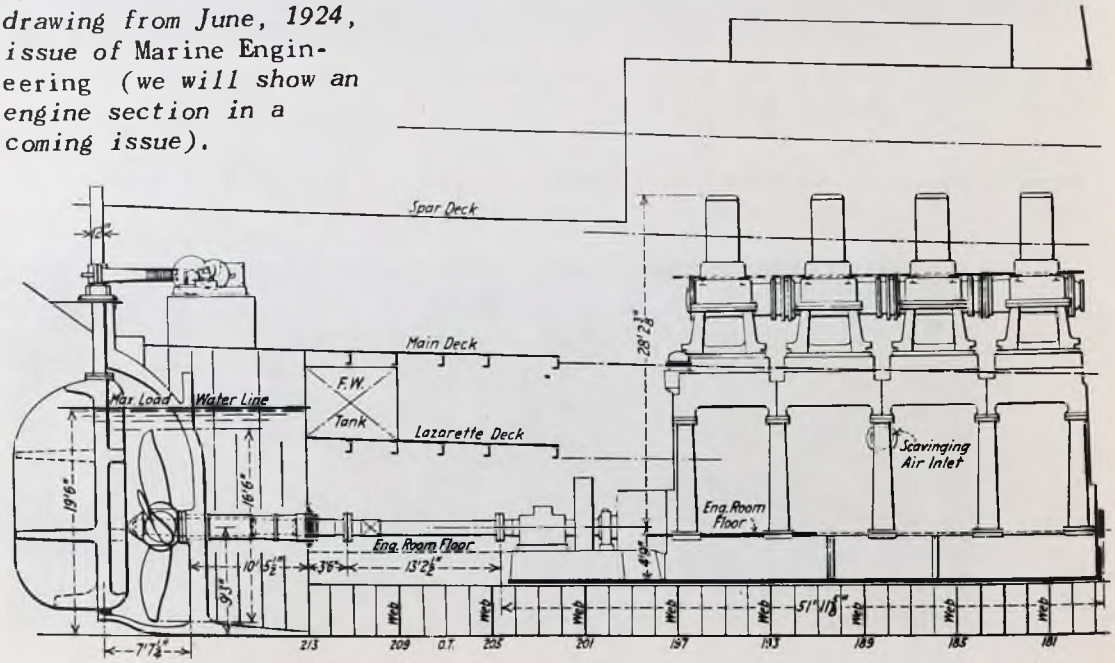
--From a postcard view



Above is a deck view of Henry Ford II *with her near-sister* Benson Ford *passing astern, in a photo from Dossin Museum.*

At right is Bob Lee's photograph of the diesel engine of Henry Ford II.

Position of the engine in Henry Ford II *is shown in this drawing from June, 1924, issue of* Marine Engineering *(we will show an engine section in a coming issue).*



Carl D. Bradley *of 1927 (above) had a turbo-electric drive, while* Governor Miller *(below) was one of four near-sisters of 1938 to introduce geared turbine propulsion to lakers.*

--Bugbee photographs

A group of older lakers were modernized with new engines beginning in 1946 when Inland Steel repowered E. J. Block *with diesel-electric drive.*

--Photo by Father VanderLinden

self-unloader *T. W. Robinson*, built by American Shipbuilding Company at Lorain. The same owner and builder brought out the huge self-unloader *Carl D. Bradley* two years later. At 638 feet of overall length, the *Bradley* was the lakes' longest ship until World War II. She is tragically remembered today for having foundered with all but two of her crew off Gull Island in Lake Michigan in a gale of November 18, 1958, apparently having broken in two. She is the only six-hundred-footer ever lost by storm on the lakes.

For the *Robinson* and *Bradley*, turbines were used to generate electricity to power huge electric motors. An electric motor is easily reversed, and gears can scale down its speed to that of the propeller. The machinery of both ships was built by General Electric. The turbines of the *Bradley* were rated at 4800 horsepower, and those of the *Robinson* at 3600. A third turbo-electric freighter was the large sandsucker *J. R. Sensibar*, converted in 1930 from the Tomlinson freighter *Frank C. Ball* for Construction Materials Corp. of Chicago, and given her new engine at that time. We shall take note of her again.

The only lake fleet building new bulk freighters in the thirties was U. S. Steel's Pittsburgh fleet, and it took up the next innovation. In 1938 Pittsburgh added four ships, *Governor Miller* and *William A. Irvin* from Lorain yards, and *John Hulst* and *Ralph H. Watson* from River Rouge. These had geared turbine engines without the intervening electric motors. They were fitted with double reduction gears to help attain the desired speed. They were compound engines, passing steam to a turbine in a high pressure chamber and then to another in a low pressure one. To meet the problem of reversing the engine, geared turbines are given a separate "astern" turbine set to turn in the opposite direction. When the ship moves ahead, it rides "idle". But when it is in reversing operation, it is burdened with the other turbines, and so cannot develop the full power the engine produces in going forward. This is unlike the electric drive, which can develop equal power in forward or reverse, but in a lake freighter this seems not important, unlike, say, an icebreaker.

These four freighters have engines rated at 2300 horsepower; two engines were built by General Electric and two by DeLaval. In 1942 Pittsburgh added the five *Fairless* class freighters then known as the "Super-Dupers" because they were 639 feet long (the longest ones today measure 730 feet). These had geared turbines rated at 4400 horsepower, and included *Benjamin F. Fairless, A. H. Ferbert, Leon Fraser, Irving S. Olds* and *Enders M. Voorhees*.

Geared turbines were to become standard for new lake freighters, especially those built in the fifties. That of *Wilfred Sykes*, prototype of the most modern lakers, is rated at 7700 horsepower, giving her speed of more than sixteen miles per hour. In choosing the *Sykes*' engine her designers considered this horsepower requirement too high for a reciprocating engine like a "triple." Yet they wanted an engine that would remain highly efficient even when the ship was moving at low speeds, as in docking or locking.

Inland Steel Company, owner of the *Sykes*, was the first to modernize its fleet after the war. Its older freighter *E. J. Block* was due for new boilers in 1946. The owners chose instead to install General Motors war-built twin diesel engines. Each engine was rated at 1200 horsepower at 750 r.p.m., while the propeller shaft turned a tenth as fast. Once again, the engine was used to generate electricity to run electric motors, and the speed of the motors was geared down to suit

the propeller. The *Block* was the lakes' first diesel-electric bulk freighter, and seems to have been the only one.

4. New Engines for Old

Almost forty United States and about fifty Canadian lake bulk freighters have been built since the Second World War or converted from ocean ships for lake use. Except as we shall see below, almost all of these have adopted the geared turbine for propulsion. Most of the United States fleet was built during the fifties, while Canadian shipowners are the only ones building new ships today.

A new lake freighter is expensive, especially for some of the smaller "independent" shipping firms that are not part of a steel corporation. Accordingly, lake shipowners began studying another way to increase cargo capacity. This was to repower older lake freighters with more efficient engines and to boost their speed. Converted ships might make more round trips each season at little extra cost of fuel. A converted typical six-hundred-footer might thus carry 55,000 tons of extra cargo by season's end--done without building new tonnage or maintaining additional crews.

In 1951 at Lorain the Pittsburgh fleet had converted two six-hundred-foot sister freighters originally built in 1917. *Eugene W. Pargny* was given an eight-cylinder Baldwin-Lima-Hamilton diesel engine with reduction gears to its propeller shaft. *Homer D. Williams* received a General Electric geared steam turbine, together with new boilers. Both plants were rated at three thousand horsepower. Speed of the two ships was boosted to 14½ m.p.h. light and 13¼ loaded. As is common with geared turbine plants, the boilers furnish considerably higher steam pressure than a reciprocating engine uses, at high temperatures. (The boilers of the *Sykes* produce steam at 450 pounds per square inch pressure, at 750 degrees Fahrenheit, and burn 4,423 pounds of fuel oil per hour at the ship's speed of 16.5 m.p.h.) Thus, new boilers are required for repowering with turbines.

A number of older lakers were upgraded with geared turbines after the *Williams* experiment. Cleveland-Cliffs furnished DeLaval geared turbines to *William G. Mather*, together with new boilers. These latter need fewer firemen to tend them, reducing the engine crew. Now Cleveland-Cliffs has begun experiments with automatic boiler controls for the *Mather* this year, as reported in the July issue of *Marine Engineering-Log*. The ships re-engined with geared turbines are listed below by fleets, together with their horsepower and date of installation.

PITTSBURGH STEAMSHIP DIVISION

Homer D. Williams	3300	1951

CLEVELAND-CLIFFS SS COMPANY

LaSalle	3300	1951
Ishpeming	3300	1951
William G. Mather	5500	1954
Frontenac	5500	1954
Pontiac	5500	1955

INLAND STEEL COMPANY

L. E. Block	4950	1953
Philip D. Block	4950	1953

SHENANGO FURNACE COMPANY

Col. James M. Schoonmaker	4950	1952
Shenango (now BoCo's *B. W. Druckenmiller*)	4400	1952

REISS STEAMSHIP COMPANY

William A. Reiss	5500	1953
Reiss Brothers	6600	1957

BRADLEY TRANSPORTATION COMPANY

Irvin L. Clymer	4400	1954
B. H. Taylor (now *Rogers City*)	4400	1955

BOLAND AND CORNELIUS

Adam E. Cornelius ii (now *Consumers Power* iii)	5500	1956

Montrealais, *seen from the deck of* South American *at Detroit, is typical of postwar lakers using geared turbine engines.*

--Bugbee photograph

Among repowered older lakers, David P. Thompson *(above) has a Skinner-Unaflow engine, with cabins aft much rebuilt in her conversion.* William G. Mather *(below) was given geared turbines and now has fully-automated boiler controls.*

--Bugbee photographs

INTERLAKE STEAMSHIP COMPANY
Harry Coulby..... *5500* 1957
Charles M. Schwab..... 3960 1960

These were usually larger ships, and drew turbines of between 4400 and 5500 horsepower. *Reiss Brothers* has the largest engine, at 6600, and the *Williams*, *LaSalle* and *Ishpeming* the least at 3300. The oddest conversion of the lot was Interlake's *Charles M. Schwab*, which exchanged her whole stern and machinery for that of the war-built tanker *Gulfport*, which had turbines of 3960 horsepower.

The *Block* and *Pargny* conversions did not seem to encourage other shipowners to try diesels. Only one other laker became a motorship in the fifties. This was Mohawk Navigation's Canadian freighter *Captain C. D. Secord*. In 1954 she was fitted with a 3500-horsepower British war-built diesel engine salvaged from the sunken tanker *Empire Metal* in Italy.

5. Enter the Unaflow

A new form of steam reciprocating engine was as successful as the steam turbine in taking part in repowering of lakers. This was the Unaflow engine, a German innovation, built by Skinner Engine Company of Erie, Pennsylvania, or in Canada by Canadian Vickers at Montreal. Very few of the Unaflow engines were " compound'; instead, they were made of between three and five identical cylinders in a row fore-and-aft, all enclosed in a jacket.

Again to oversimplify, a Unaflow engine introduces steam at both ends of the cylinder to work the upper and lower surfaces of the piston alternately. Such an engine can respond very quickly for maneuvering a ship. This quality led to its choice in 1941 for powering the new Chesapeake & Ohio car ferry *City of Midland 41*, its first installation on the lakes. She and the later car ferries *Badger* and *Spartan* of 1952 were the only U. S. Great Lakes installations of Unaflow engines in new ships except river car ferries.

The first Canadian bulk freighters built after the war also used Skinner-Unaflow engines as built by Canadian Vickers. These included *Hochelaga* and *Coverdale* of 1949 and *Sir James Dunn* and *Thunder Bay* of 1952, all built for Canada Steamship Lines, and *Gordon C. Leitch* and *James Norris* of 1952, for Upper Lakes & St. Lawrence Transportation. All of these engines were of about 4000 horsepower.

Turbines were chosen for the Misener fleet's first postwar laker, the present *John E. F. Misener* of 1951, and subsequently became standard for most Canadian bulk carriers to the present day. Except for Mohawk's dieselized *Captain C. D. Secord*, none of the Canadian fleets have tried repowering their older lakers, so that the Skinner-Unaflow engine has found no opportunity there. A number of postwar canallers like *Northcliffe Hall* adopted Skinner-Unaflow engines, however.

In the late forties and the fifties Skinner engines found wide use in smaller American freighters, especially among self-unloaders. Most of these engines ranged between 2500 and 3500 horsepower. The two largest were about 5000 horsepower: For Columbia's *Joseph H. Frantz* and Shenango's *William P. Snyder, Jr.*

The ships re-engined with Skinner-Unaflow engines are listed below by the fleet that ordered the installation, together with horsepower and date of installation.

WILSON TRANSIT COMPANY
Charles S. Hebard..... 2500 1949
E. J. Kulas ii (now National Steel Corporation's
Thomas E. Millsop ii.... 3500 1951

Canadoc, *seen above in Father VanderLinden's photograph, came out in 1961 as the first new lake bulk freighter with diesel engines since the Ford sisters of 1924. Below is seen Wilson Marine Transit's* Wiltranco No. 1, *the former laker* Horace S. Wilkinson, *which in 1963 dispensed with a main engine in preference to being handled by a powerful tug,* Brian A. McAllister. *The experimental service was not resumed this season.*

The self-unloader Diamond Alkali *was converted from steam to diesel propulsion last winter at Fraser-Nelson shipyard in Superior, Wisconsin. Father VanderLinden's photograph above shows her near Port Huron. Below is a view of her pilot house, showing the new control stand for engines just to the right of the center window. The wheel on the side of the stand operates the main engine and pitch of the propeller, while the lever regulates the bow thruster.*

--Both photos courtesy of Fraser-Nelson S.B. & D.D. Co.

Edward S. Kendrick..... 2500 1952
Charles A. Paul (now
B. F. Jones ii)..... 2500 1952

SHENANGO FURNACE COMPANY
William P. Snyder, Jr. ... 5000 1950

BOLAND AND CORNELIUS
Thunder Bay Quarries ii
(now *Harris N. Snyder*).. 2500 1950
J. F. Schoelkopf, Jr. 3500 1950

INTERLAKE STEAMSHIP COMPANY
Elton Hoyt II i (now
Alex D. Chisholm)..... 3500 1950
Amasa Stone..... 2100 1952
C. H. McCullough, Jr. 3510 1954
Frank Armstrong (note--a
war-built Nordberg)..... 4400 1960

BETHLEHEM FLEET
Maryland (now Buckeye SS's
Henry LaLiberte..... 2100 1951
Bethehem..... 3500 1951
Edward Y. Townsend..... 4000 1954
Daniel J. Morrell..... 3200 1956

COLUMBIA TRANSPORTATION COMPANY
Joseph H. Frantz..... 5325 1955

ROCKPORT STEAMSHIP COMPANY
Charles C. West (two en-
gines for twin-screw)... 4260 1952

KINSMAN TRANSIT COMPANY
Harry L. Findlay..... 3510 1954

PIONEER STEAMSHIP COMPANY
J. J. Sullivan (now Inland's
Clarence B. Randall ii) 2400 1950
J. S. Ashley (now Boland's
Fred A. Manske ii)..... *2500* 1952
David P. Thompson (later
to Boland & Cornelius).. 4220 1959

Both *Henry LaLiberte* and *Clarence B. Randall* have compound engines in steeple fashion, as do car ferries *Badger* and *Spartan* and re-engined car ferries *Pere Marquette 21* and *Pere Marquette 22*.

While the turbine conversions tend to have oil-fired boilers, the Una-flow conversions usually retained coal fuel for theirs, although there are exceptions in both cases. The survival of coal fuel need not be surprising, for lake shipowning companies often own interests in coal sources or ship large quantities of coal. Coal-burning lake bulk carriers outnumber oil-burning ones by about two to one today. Postwar freighters account for most of the oil-burners. But perhaps ten new ships have been built to burn coal, including National Steel's *Ernest T. Weir* and Boland & Cornelius' *John J. Boland*, *Adam E. Cornelius* iii and *Detroit Edison*.

6. Into the Sixties

The diesel engine has begun to find its place in the lake fleet in the last five years. Since 1961, three new Canadian bulk freighters have come out as motorships. First came Paterson's *Canadoc* with Fairbanks-Morse diesels in 1961. Mohawk Navigation added a second motorship to its laker fleet with the new *Silver Isle*, built in 1963 in Ireland. And this season brought Algoma Central's new motorship, *Sir Denys Lowson*, built at Collingwood. She and *Canadoc* are about 600 feet long. Late season will introduce Canada Steamship Lines' new *Saguenay*, first conventional lake bulk freight motorship of maximum size (730 feet--the length of stemwinder *Silver Isle*). These are still few when compared with the Canadian turbine ships still being built, but perhaps begin to constitute a trend. Diesels have found more universal use among Canadian craneships and package freighters like *Yankcanuck*, *Fort St. Louis*, *Hamildoc* and *Hallfax*.

More significant is the fact that all engine conversions of older U.S. lakers since 1960 have created motorships. In 1960 the Columbia fleet removed the turbine-electric machinery of its now-self-unloader *J. R. Sensibar* and replaced it with a 3200-h.p. Nordberg diesel engine. A similar rebuilding three years later fitted Columbia's *W. W. Hollo-*

way with a 2250-h.p. diesel engine. 1963 also brought Pittsburgh's first engine conversion in twelve years, when *Eugene P. Thomas* received a diesel engine. Two self-unloaders have become motorships this season, the Bradley fleet's *Calcite II* and Boland & Cornelius' *Diamond Alkali*.

Another recent modification for many lakers is of course the bow thruster, a transverse tunnel in the bow with a reversible pitch propeller powered by a small, independent engine located forward. Lakers have long been accustomed to maneuvering around the Soo Locks and in harbors without aid of tugs. The bow thruster allows them to ascend such rivers as the Cuyahoga or the Rouge similarly unaided, and otherwise improves control of steering. According to *Detroit Marine Historian* for June, 1964, twenty-seven American and eight Canadian freighters now completed have bow thrusters, and the list is growing.

One other alternative remains--that of having no engine at all. In 1963 the Fraser-Nelson yard at Superior converted the 600-foot Wilson freighter *Horace S. Wilkinson* of 1917 into the unmanned barge *Wiltranco No. 1*. Her quadruple-expansion engine was removed, and she was fitted with a notched stern and a bow-thruster unit. The latter was controlled from the bridge of a powerful tug which pushed her from aft in the rivers or towed her on the open lake. The experiment intended that *Wiltranco*'s fewer trips per season might be more than offset by the much lower operating expenses of the tug-and-barge combination. Wilson did not choose to fit out *Wiltranco No. 1* again for the 1964 season, reportedly for want of a suitable tug. But Gartland Steamship Company has purchased the 4000-horsepower tug *Dakotah* with an eye to similar conversions.

Curiously, in all of this abundance of steam engines, the lakes have produced few of well-informed, but militant, steam engine enthusiasts one finds so common in the East or along the Mississippi. Perhaps this is because lake ship fans are raised as photographers who take only "bow views" of ships, and thus never get a good look at what lies aft. Perhaps it will take a diesel "menace" for the triple to find its chroniclers, with a few fists shaken at the intruder. But an onslaught of engineless-*Wiltrancos* may leave them confused as to what it is that must be "stamped out."

Here is perhaps one reason for such belligerence. As engine speeds and steam pressures go higher, doing greater jobs, the workings of modern engines retire under wraps, and reveal less of themselves to the casual observer. Time was when the parts of the old walking beam engine were put out for him to see, and he could perhaps even see how a triple-expansion engine works. But it is hard for him to find interest in a small casing that just sits and hums.

7. A Case Study

An example of a modern conversion is that of *Diamond Alkali*. Fraser-Nelson Shipbuilding & Dry Dock Co. and its public relations director, Mr. Wesley R. Harkins, have furnished details and background on this work, which they performed last winter for Boland & Cornelius. Fraser-Nelson also converted to a self-unloader BoCo's newly-acquired *John T. Hutchinson* (see cover).

Great Lakes Engineering Works built *Diamond Alkali* (ii) at Ecorse in 1917 as the conventional 600-foot bulk freighter *Frank H. Goodyear* (ii). Boland and Cornelius later bought her for their American Steamship Company. The Manitowoc Shipbuilding Company converted her to a self-unloader in 1939.

In her normal service, *Diamond*

Alkali carries coal from various Lake Erie ports, limestone from ports on Lakes Huron and Michigan, and taconite iron ore pellets from Lake Superior ports. With her 225-foot belt-conveyor boom swung over her side, *Diamond Alkali* can discharge her 13,000-ton cargo at the rate of 1,800 tons per hour. In a normal eight-month shipping season, a self-unloader like *Diamond Alkali* might load as many as 110 cargoes, with a season's total of perhaps 1,400,000 tons.

Last December *Diamond Alkali* wintered at Fraser-Nelson for the proposed conversion. Plans and specifications for her rebuilding had been prepared by Marine Consultants & Designers, Inc., of Cleveland.

First, her 1,900-horsepower triple expansion engine and three scotch boilers were removed, together with steam-driven auxiliaries and the propeller, shaft and rudder. Into the engine space went a 4,320-h.p. sixteen cylinder V-type Nordberg diesel engine. Her stern was fitted with a fifteen-foot-diameter, four-bladed, controllable pitch propeller of the KaMeWa type, by Bird Johnson Company. To correlate the 515-rpm speed of the engine with the 120-rpm speed of the propeller, a Thomas flexible coupling and Lufkin reduction gear was installed.

A Westinghouse control system allows the engine to be held at the designed full-load conditions; while the propeller pitch is automatically corrected to compensate for varying conditions of seas or trim of ship from "light" to fully loaded. A selection lever of the engine room central control console allows four options of control. The engine may be set in "neutral"; full control of both propeller pitch and engine speed can be given to either the engine room or officers in the pilot house; or the engine room can control engine speed while the pilot house controls pitch. A new rudder notched for the propeller was also installed.

Diamond Alkali's new outfit also includes a 500-h.p. bow thruster of the KaMeWa reversible pitch propeller type. Its General Electric motor is mounted above the athwartships tunnel of 5 feet 7 inches diameter, located in the forepeak. The pilot house controls the bow thruster's operation.

Diamond Alkali ran her full sea trials in Lake Superior off Duluth-Superior Harbor on May 3, and left three days later to begin regular service after a shipyard stay of one day less than five months. At Marquette on May 7, she loaded her cargo of iron ore concentrated pellets for delivery at Cleveland.

Her owners have since reported that *Diamond Alkali* makes better than 16 m.p.h. when running "light," and 15 m.p.h. loaded. Previously, her top speed had been about 12 m.p.h. Turn-around time in port is reduced with aid of the bow thruster and instantaneous main engine control, together with her reduced dependence on tugs which may not be immediately available when needed. These improvements give *Diamond Alkali* a potential twenty-three additional trips each season, adding as much as 300,000 tons to her season's total of cargo carried. In addition, the reduced weight of her power plant allows her about 400 extra tons of cargo on each run.

Considerable hull stiffening was done aft during conversion, and a four-foot-wide fin was fitted just above the propeller to improve the flow of water at the stern. Consequently, *Diamond Alkali*'s crew has observed no noticeable increase in vibration as a result of the repowering.

The conversion gives *Diamond Alkali* the distinction of being the most powerful motorship in the American Great Lakes fleet.

Great Lakes & Seaway News

Algoma Central's E. B. Barber *was another laker converted to a self-unloader this past winter. As Peter Worden's photo above shows, she also had her deck raised. An older view below points up her changed appearance and paint scheme.*

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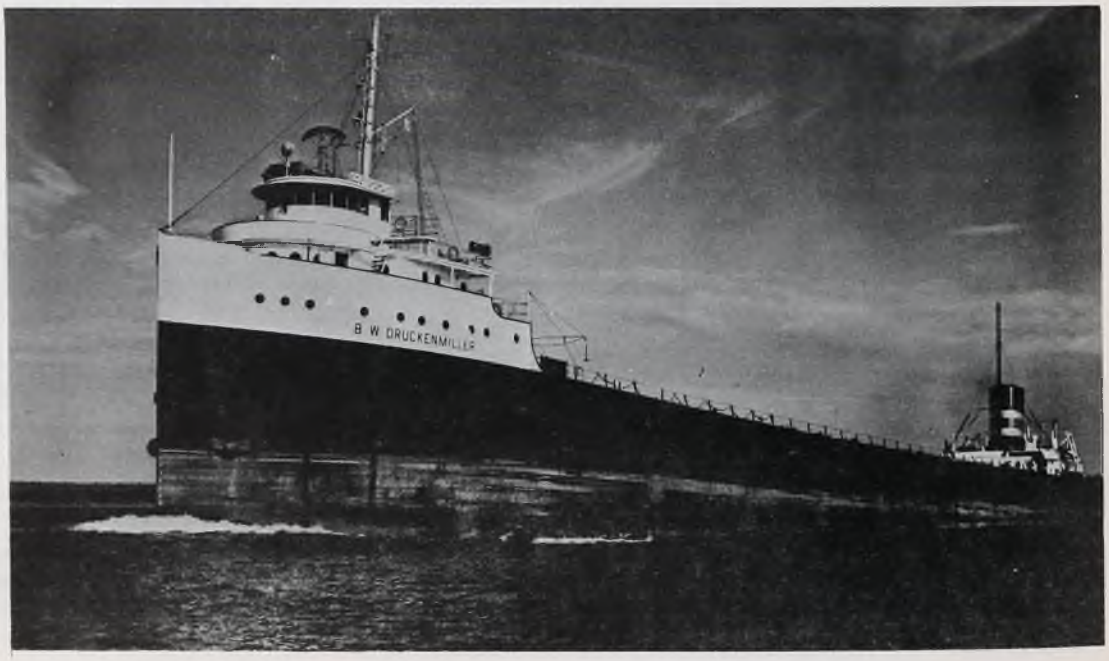
Sale of these two ships took place recently. Above is Upper Lakes Shipping's Pathfinder, *on her first trip down for them, seen in the St. Marys on July 26. She was built in 1906 as* Samuel Mather *(ii) for the Interlake fleet, which owned her until now.* Pathfinder *fitted out for Fraser-Nelson, but didn't wait to pick up the diamond emblems for her stack. Below is* B. W. Druckenmiller, *in colors of Boland & Cornelius, who have just sold her to Wilson. Originally* Shenango, *she is in our list of geared turbine engine conversions on page 155. Peter Worden, who took these photos, says Wilson intends "to install a bow thruster and automatic boiler control (a la* Ben Moreell) *prior to fit-out from Buffalo."*



GREAT LAKES AND SEAWAY NEWS

June 1...Cargo tonnage through the St. Lawrence Seaway for the month of May reached an all-time record of over five million tons, 32 per cent higher than last year. The Welland Canal handled a record 6.5 million tons, more than a million tons higher than in May of 1963. Shipments of iron ore upbound and grain downbound also showed increases. During May, 37 new ocean-going ships passed through the Seaway. The number of transits to date was also higher than last year's.

...Imperial Oil Ltd. has awarded a $4.3 million contract to Port Weller Dry Docks Ltd. for building a coastal tanker. A 5,000-h.p. diesel engine will power her.

...Thieves broke into the canaller *William H. Daniels*, laid up in Toronto harbor, and made off with the radar set and the engine room telegraph system, valued at $4,500.

June 2...The ocean freighter *A. and J. Mercury* was placed under arrest at Port Colborne for non-payment of $8,000 in stevedoring fees accumulated at Toronto and Hamilton. Payment was made at 5 p.m., and she was released. Then at 9 p.m. she was again arrested on a warrant brought by Seafarers International Union charging non-payment of $90,000 in wages.

June 3...The dredge *Shuniah* and the tug *JPP No. 3* were in danger of foundering off the Western Gap of Toronto Harbor after colliding with the self-unloader *Cape Breton Miner* in heavy fog.

...Ground breaking ceremonies were held in Eveleth, Minnesota, for a $40 million iron ore mining and pelletizing complex. The plant is 85% owned by Ford Motor Company and 15% by Oglebay, Norton & Co. It will have an initial capacity of about 1.6 million tons of taconite pellets a year.

...*Calcite II* of the Bradley fleet has completed sea trials in Lake Erie. The former steamer has been repowered with a diesel engine and a bow thruster. The new engine will increase her speed about two miles per hour, and enable her to get in an additional two trips per season. Under testing, the bow thruster was able to push the bow in a ninety degree sweep in three minutes and thirty-nine seconds.

June 6...The Norwegian cargo ship *Fro* went fifty yards of her voyage from Milwaukee to France and went aground in the Kinnickinnic River Basin. Two tugs and a tanker tried unsuccessfully to dislodge her. She was loaded with 7,500 tons of scrap metal, and was drawing about 24 feet of water. Port officials estimated that the water was only about 23 feet deep. Lake Michigan is now at its lowest level in its history.

...*Milwaukee Clipper* will open her 1964 season on June 19.

...The Maids of the Mist, Niagara Falls sightseeing vessels, have begun their voyages to the base of the Horseshoe Falls for the eightieth consecutive year.

June 8...Total Great Lakes shipments of iron ore from U. S. and Canadian ports this year are 4.1 million tons ahead of last year's figures.

June 9...The Norwegian motorship *Fro* slid free from her Milwaukee Harbor clay bank after being its prisoner for four days. A thousand tons of steel scrap was taken from her hold to lighten her. The craneship *Yankcanuck* transferred the cargo with its magnetic crane. *Fro* then headed for the outer harbor and anchored in 30 feet of water where *Yankcanuck* was to load her again.

June 10...The master of the Canadian tanker *B. A. Peerless*, Captain Wilfred F. Garrett, has retired after forty-five years of sailing on the Great Lakes. He started his sailing career in the crew of the passenger ship *Noronic* back in 1919.

...Adrift all night on Lake Erie after a storm broke the mast of their 18-foot sailboat, three youths from Sandusky, O., were rescued by Cleveland-Cliffs ore ship *Edward B. Greene* in high waves 28 miles off Cleveland.

...It has been reported that owners of the passenger steamer *North American* want to run her over part of her old Georgian Bay Line route. However, E. J. Goebel, Georgian Bay president, says he has received no formal request for permission to do so. Georgian Bay Line sold the *North* in 1963 with the provision that she not be used in Lakes cruising of extended duration.

June 11...Michigan's Attorney - General Frank J. Kelley, expressing alarm over the unusually low water levels in the Great Lakes, has called for a conference of representatives of the U. S. and Canadian governments for July 28 to try to solve the problem. The session will be sponsored by Kelley and the Michigan State University research development department.

...325 Detroit businessmen and government leaders have left aboard *South American* for a cruise to Michigan's upper peninsula.

June 12...The tanker *Trina*, formerly the *Texaco Michigan*, will be sold at auction at Kingston to satisfy her debts. She had failed to transit the Seaway before its closing last winter, and a winter storm blew her from her Kingston moorings, causing damage in the harbor.

GREAT LAKES AND SEAWAY NEWS

---The Greek freighter *Venus* hit a concrete pier at Point Vivian in the St. Lawrence after her steering gear carried away yesterday; she freed herself two hours later.

---Seventeen Greek sailors arrived to take the oil tanker *Clark-Milwaukee* from Milwaukee to Greece, under a new name of *Peirates*. She is a low-lying vessel, with only 14½ feet of height above the water, built for New York State Barge Canal use at dimensions of 235 x 35 feet.

June 15---Pittsburgher *Benjamin F. Fairless* and Misener's *Ralph S. Misener* collided head-on in the Welland Canal. Both suffered bow damage, but continued on their intended trips afterward.

---*William G. Mather*, owned by Cleveland-Cliffs, has become the first United States steamship to receive Coast Guard certification permitting it to operate without a fireman to tend it. A new boiler automatic control system performs the fireman's duties, and the system is operated from a console under control of the watch engineer. (See pages 155 and 156.)

---Hanna Mining's monthly report on U.S. iron ore ships shows that the Shenango fleet put *Col. James M. Schoonmaker* in operation last month, as did Buckeye its chartered *James Davidson*. 137 bulk ore carriers are in service as compared to 131 last year at this time and 141 the year before. The U. S. ore fleet is now down to 176 ships, as compared to 197 last year and 206 the year before. These figures exclude self-unloaders, which can carry the pelletized taconite ore.

June 16...The Norwegian sailing ship *Christian Radich* is to visit Milwaukee on August 12-14.

---Operations in the Port of Montreal were at a standstill as 1,500 longshoremen continued a strike over a pension dispute.

---The British motorship *Phrygia* lay at a Detroit dock today with a huge hole in her side above and below water after a collision last night with the Canadian ore ship *Algocen* in Fighting Island Channel of the Detroit River at 7:45 p.m. last night. *Phrygia* was struck on her port side as she was headed upstream toward Detroit. *Algocen* was making a sort of U-turn--really two right turns--from the Trenton Channel across the north end of shallows above Grassy Island into Fighting Island Channel. *Algocen* only received scrapes and scratches on her bow.

June 17---Foreign trade through the Port of Detroit set another record in May, 80% higher than in the same month last year.

June 18---The motor vessel *Saguenay*, built for Canada Steamship Lines, was launched in Lauzon by Davie Shipbuilding Ltd. Except for stemwinder *Silver Isle*, she is the first maximum-size bulk cargo laker equipped with diesels, designed to conserve engine room space and provide a greater carrying capacity. She will first go into service carrying ore from Havre St. Pierre to Sorel, but will also see service later in carrying grain from the Canadian Lakehead.

---McNamara International Corp. of Toronto submitted the low bid of less than $21½ million to build a huge new lock at Sault Ste. Marie, Michigan. Under Federal law, the firm must use American materials and workers except for certain supervisory employees.

---The pilot aboard the British ship *Phrygia*, Captain Arthur E. Welland of Port Credit, Ontario, has stated at a Coast Guard hearing that the Canadian ore carrier *Algocen* was on the wrong side of Fighting Island Channel when the two ships collided.

---Dock workers at Montreal have gone back to work.

June 21---Swiss motorship *Silva Plana* is aground off Marysville in the St. Clair River. Coast Guard officials say it will be necessary to lighten her before she can be freed.

June 24---Attempts were still being made to free the Egyptian freighter *Star of Suez*, which went aground in the St. Lawrence River near Kingston on June 20th.

--The former CSL canaller *Weyburn*, sold last fall to Maryland Shipbuilding & Dry Dock Co. of Baltimore (registered in Panama), ran into difficulties on an ocean voyage. She departed from the port of Aden a few days ago in what was described as a suicidal trip to undertake a crossing of the Indian Ocean during the monsoon season, and was forced to turn back in heavy seas in which another ship was lost. *Weyburn* had been dogged with misfortune soon after she cleared Houston, Texas, last February, with a cargo of grain bound for East Pakistan. Her engines broke down in an Atlantic storm and the ship had to be towed from Bermuda to Ceuta, Spanish Morocco. Her captain, the seventh to take command on the same voyage, also threatened to quit in Aden, but expressed more confidence in a later decision to have *Weyburn* towed to Karachi, instead.

June 25---*Silva Plana* was pulled from the mud bottom of the St. Clair River, and *Star of Suez* was also freed from grounding in the St. Lawrence River.

June 29---A 31-year-old Detroit man fell from Bob-Lo steamer *Ste. Claire* below the Ambassador Bridge, but was pulled from the water by a nearby pleasure craft.

SEAWAY VESSELS IN ACCIDENTS: *Above is Fabre Line's familiar* Marquette, *which burned recently in the North Atlantic. She and* Joliette *were built 1953 for Fabre service to the lakes, and were lengthened after the Seaway was open. Barry Gillham photographed* Marquette *at Toronto in 1960 as seen here. This follows closely upon the loss of Fabre's* Douala *last winter. Below is the bow of* Torsholm *and stern of* Magdeburg *which came together on July 26 at Iroquois Lock when* Torsholm *was unable to check her speed in time. George Ayoub was on hand to photograph them.*

COURAGEOUS CANALLERS

The adventures of the canaller Weyburn *are told on the opposite page. Here she is seen leaving Eisenhower Lock in the Seaway in 1960. Beyond, still in the lock, is a mud-hen like* Clark-Milwaukee, *which will attempt an Atlantic crossing under a Greek crew and the new name of* Peirates *(see opposite page also).*

The Great Lakes Maritime Institute, Inc., promotes interest in the Great Lakes of North America; preserves memorabilia, relics, records and pictures related to these lakes; encourages building of scale models of lake ships; and furthers programs of Dossin Great Lakes Museum, repository of Institute holdings. The Institute was organized in 1952 as the Great Lakes Model Shipbuilders' Guild, with efforts of the late Capt. Joseph E. Johnston. It is incorporated as an organization for no profit under the laws of the State of Michigan. Donations to the Institute have been ruled deductible by the Internal Revenue Service. No Institute member receives any remuneration for services rendered.

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