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The Swiss Cargo Motorship "General Guisan"

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THE new cargo motorship "General Guisan", sailing under the Swiss flag, completed her maiden voyage to South America this spring. Launched last February for the Suisse Atlantique S. A. of Lausanne, she was the first ocean-going vessel to be built for Swiss shipowners. All the other vessels forming the present-day Swiss fleet were purchased from other companies, most of them being fairly old, as modern ships were not available during the war. The courage shown by the Suisse Atlantique S. A. in making this venture and thereby adding a modern vessel (figs. 2 to 4) to the Swiss fleet is for this reason all the more to be applauded.

The building of the ship was entrusted to the British firm of Messrs. William Gray & Co., West Hartlepool. The propulsion plant was supplied by Sulzer Brothers Limited, Winterhur.

The vessel is a single-screw freighter intended chiefly for carrying grain, though she will also be utilised for general cargo. She is of the shelterdeck type, with two complete decks. There are four holds served by five hatches. Forward of the engine-room there is also a deep tank intended for the tansport of edible oils but suitable also for piece and bulk goods or for water ballast when the vessel is sailing light.

In addition to the cargo space there are three large double-berth cabins for six passengers. Spacious single cabins are also provided for officers and engineers, while the rest of the crew is accommodated in comfortable double cabins, all of which are located on the top deck amidships.

The vessel is fitted with two ten-ton and eight five-ton derricks, so that piece goods such as cases and bales can be loaded and unloaded rapidly without outside assistance. The fuel and lubricating oil for the Diesel engines is stored in double-bottom tanks and in engine-room side tanks.

The main data are:—

Deadweight	9,000 tons
Length over all	446 ft.
Breadth moulded	57 ft. 3½ in.
Depth moulded to shelterdeck	37 ft.
Load draught	25 ft. 1 in.

The four-blade propeller has a diameter of 13 ft. 9 in. and a pitch of 10 ft. 11 in.

The propeller shaft is driven by a single-acting Sulzer two-stroke Diesel engine (fig. 5) with the following main data:—

Number of cylinders	7
Cylinder diameter	600 mm. (23⅝ in.)
Stroke	1,040 mm. (41 in.)
Working speed	135 revs. per min.
Normal output at this speed	3,150 B. H. P.

This engine is a standard Sulzer design. It operates on the well-known two-stroke transverse scavenging system, with solid fuel injection. The cylinder jackets of the water-cooled liners are bolted together and connected by tie-rods to the engine frame, with which they form a rigid block. This block is bolted in its turn to the amply dimensioned bedplate. The result is a unit structure highly resistant to bending and wracking stresses, which ensures the perfect supporting of the crankshaft in the bearings. The cylinder covers are composed of two solids of revolution, the inner one fitting into the outer and taking the fuel-injection and starting-air valves. The cylinder liners and covers are cooled with fresh water. The upper part of the two-piece

piston, however, is oil-cooled. The lower and uncooled part of the piston is supported directly on the crosshead pin. Between the cylinder proper and the engine frame there is a special recess through which part of the piston can be observed during service, a feature which greatly facilitates supervision. The cooling-water spaces located above this opening are separated off from the crankcase in such a way that no water can enter the latter even if leakages should occur. Each working piston drives a special lateral scavenge pump of double-acting piston type through a lever and a straight guide. The scavenging air is supplied by the individual pumps to a common receiver running the whole length of the engine and passes from here direct to the scavenge ports in the working cylinders. The fuel pumps are driven from the crankshaft through a simple gear. They are combined in two blocks, one on each side of the driving wheel, and are located at such a height that they can easily be observed and attended to from the floor of the engine-room.

There is a combined oil circuit for the lubrication of the running gear and the cooling of the piston crowns. The oil enters the crosshead pin through telescopic tubes and is conducted partly to the piston crown and partly to the bottom-end bearing through the connecting rod. The crankshaft bearings receive oil direct under pressure. This system of lubrication makes the drilling of passages in the crankshaft unnecessary and thereby greatly improves the fatigue strength of the latter.

The bearing taking the propeller thrust is built on to the bedplate of the engine.

The engine was assembled and tested in Winterthur. In the course of the acceptance tests the following fuel consumption figures were measured:—

Full load	157 gr.	(0.346 lb.)/B.H.P.-hour
¾ load	158 gr.	(0.348 lb.)/B.H.P.-hour
½ load	159 gr.	(0.351 lb.)/B.H.P.-hour

The thermal efficiency of this engine is therefore about 40 %, i. e. 40 % of the heat contained in the fuel is given up to the propeller shaft in the

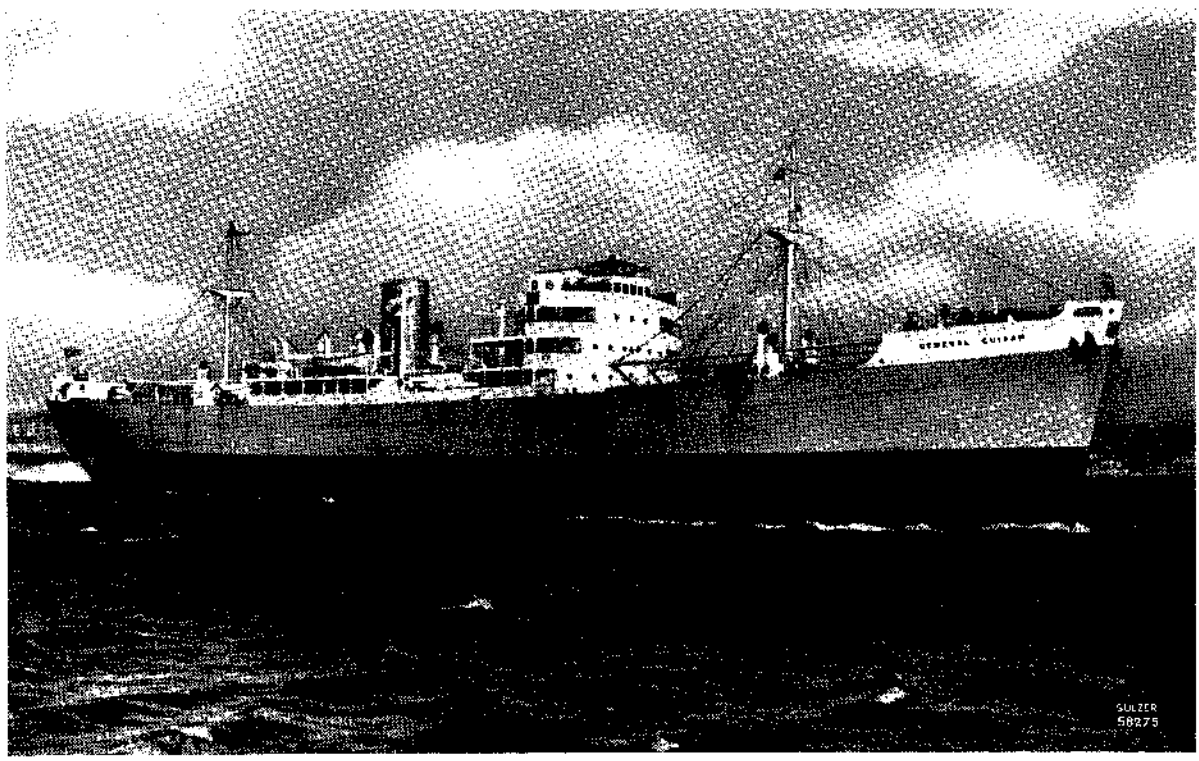

Fig. 2. M.S. "General Guisan" during her trials off West Hartlepool.

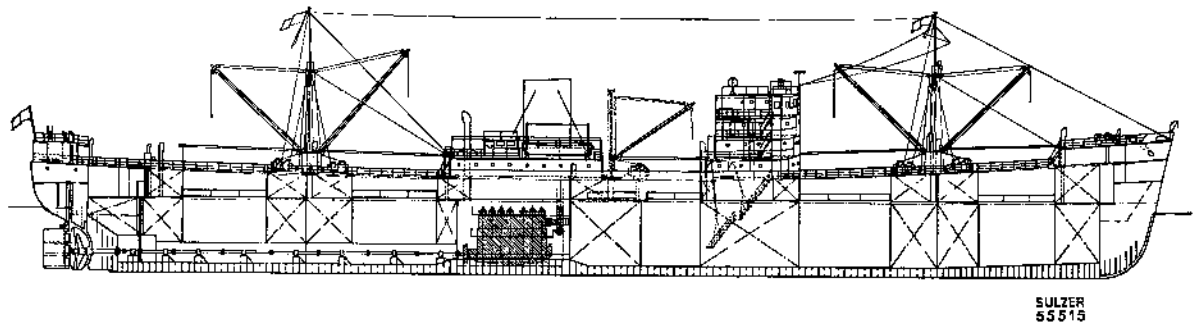

Fig. 3. Profile of the motor cargo vessel "General Guisan". With a length of 446 ft. and a breadth of 57 ft., the vessel has a deadweight capacity of 9,000 tons. She is propelled by a Sulzer two-stroke engine of 3,150 B.H.P.

form of useful output. This good efficiency will greatly contribute to the economy of the vessel.

The lubricating and piston-cooling oil and the fresh water for cylinder cooling are recooled in shell-and-tube type equipment also supplied by Sulzer Brothers. The fresh water and sea water is circulated by Sulzer low-lift marine pumps of vertical design (fig. 6). These pumps have split casings which simplify inspection and overhauls of the internal parts. The sea-water pumps deliver 6,350 cu. ft. per hour against a pressure of 17 lb. per sq. in. while running at 1,500 revs. per min. The fresh-water pumps are of similar construction and run at 1,700 revs. per min., their discharge being 3,900 cu. ft. per hour and the pressure 28 lb. per sq. in. The lubricating and cooling oil is handled by IMO volumetric screw pumps. All the pumps are driven by Brown-Boveri compound d.-c. motors.

The heat contained in the exhaust gases of the main Diesel engine is used for generating steam in a Cochran boiler. The steam thus raised is employed for heating water for the kitchen and cabins, for heating with warm air in the crew's and passengers' rooms and for tempering the contents of the deep tank when viscous oils are carried. The exhaust-gas boiler is also fitted for oil firing, so that steam can be generated for the above purposes even when the propulsion machinery is shut down.

Two further auxiliary engines serve for generating current. These are Sulzer four-stroke types developing 160 B.H.P. at 500 revs. per min., with built-on oil and cooling-water pumps and the necessary oil coolers and filters (fig. 7). Each of these engines is direct coupled with a Brown-Boveri d.-c. generator of 100 kW at 220 volts. A Sulzer air compressor with an intake of 5,300 cu.ft. per hour and a back-pressure of 425 lb. per sq. in. is also connected to the generator shaft and is used for filling the starting-air bottles of the Diesel engines. The compressor can be put in and out of operation while the

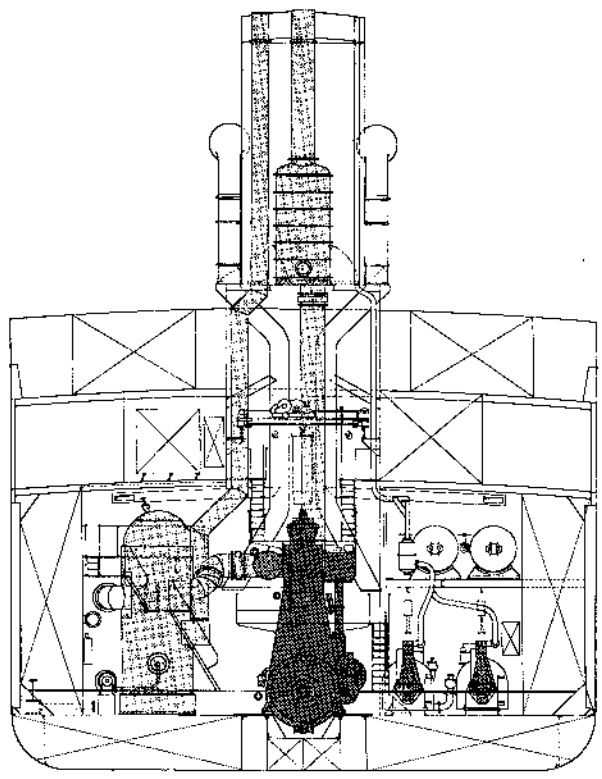

Fig. 4. Cross-section through the vessel and engine-room. The main engine is shown in the centre, to the right the two auxiliary sets with four-stroke Diesel engines and to the left the recuperator for the Diesel exhaust gases.

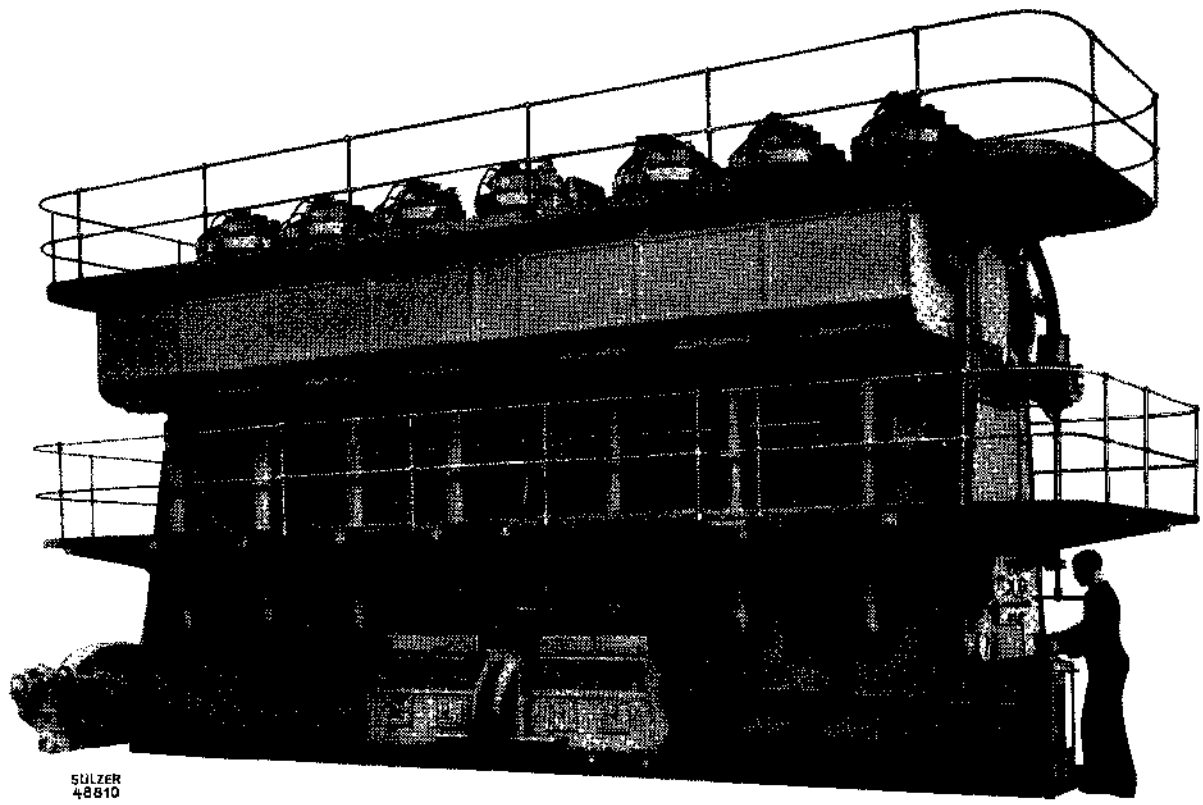

Fig. 5. Seven-cylinder Sulzer marine propulsion engine of two-stroke design, developing 3,150 B.H.P. at 135 revs. per min.

set is running by means of a Benn coupling arranged between compressor and generator. Diesel engine, generator and compressor are mounted on a common bedplate. There is further an auxiliary set, available as a standby, consisting of a Sulzer two-stroke opposed-piston Diesel engine of 40 B.H.P. at 1,000 revs. per min. (fig. 8), a Brown-Boveri d.-c. generator of 25 kW and 220 volts, and a

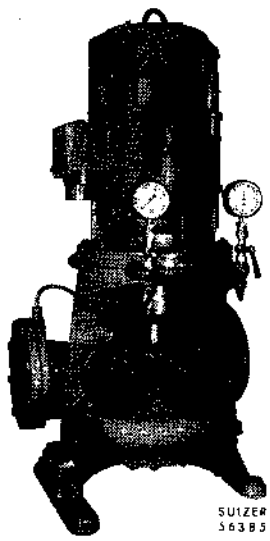

Fig. 6. Sulzer centrifugal pump driven by a 30-H.P. Brown-Boveri d.-c. motor. Sets of this type installed on board are used for delivering fresh and sea water.

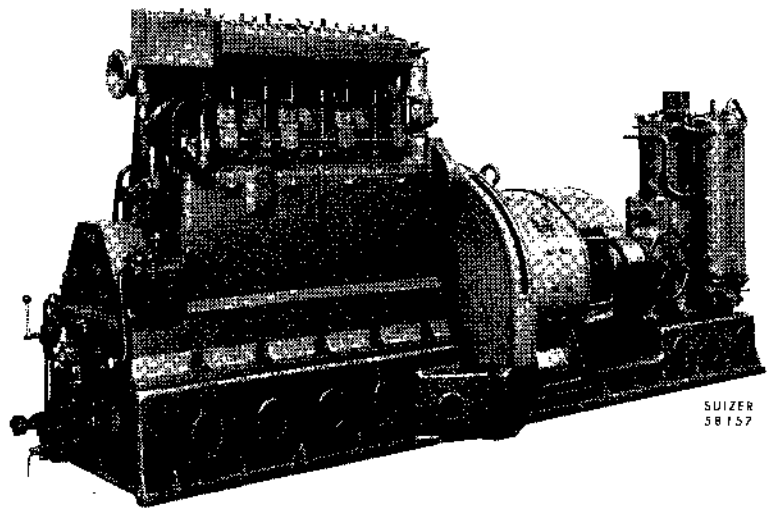

Fig. 7. Auxiliary set consisting of a Sulzer four-stroke engine of 160 B.H.P. at 500 revs. per min., a Brown-Boveri d.-c. generator and a Sulzer starting-air compressor.

Nova starting-air compressor with a capacity of 280 cu.ft. per hour. This set also includes the necessary oil and cooling-water pumps with coolers.

The installation of the machinery, piping and accessories was in the hands of the Central Marine Engine Works, a company associated with Messrs. William Gray & Co. Ltd. of West Hartlepool. Two Sulzer erecting engineers were present to supervise the erection of the Diesel engines.

Works trials were carried out on 6th February 1948, before the acceptance trials proper. These enabled the compasses, anchor winches, chains and the rest of the ship's equipment to be inspected.

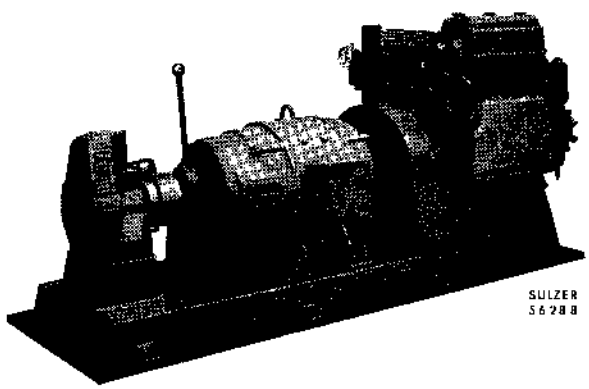

Fig. 8. Sulzer two-stroke opposed-piston engine with a rating of 40 B.H.P. at 1,000 revs. per min., with a Brown-Boveri d.-c. generator and a Nova starting-air compressor.

The opportunity was also taken for trying out the running of the engines with regard to vibrations and critical speeds. The main engine was run slowly through its whole speed range, and in the course of this test it was noted that operation was absolutely regular even at the extremely low speed of 18 revs. per min.

In the course of the works trials 160 starting manœuvres were carried out with the main engine without any trouble whatever being experienced.

The official trials took place on 17th February and were attended by a number of guests and officials of Lloyd's Register as well as the representatives of the owners and contractors. The vessel left the shipyard at 8.45 a.m., towed by two tugs. After the engine had been started up, the command for the first manœuvre was given at 9 a.m. Twenty manœuvres were subsequently carried out in twenty-five minutes, after which the ship turned north to the measured mile, the speed being brought up to the normal figure of 135 revs. per min. The available ballast tanks had been filled to increase stability. The vessel then covered the measured mile along the coast, after the measuring towers on land had been duly advised. The average speed for the two directions was 12.95 knots.

It should be added that measurements of this kind give only an approximate indication of the speed attainable with the fully loaded vessel in service, exact figures being established only after several voyages. The speed measurement was followed by the most difficult manœuvre, namely reversing from full speed ahead to full speed astern. Immediately before reversing the engine was operating at 120 revs. per min. After reversing the speed reached 130—140 revs. per min. astern. No trouble whatever was experienced even with this difficult manœuvre. The further twelve manœuvres required by Lloyd's were then carried out under the supervision of their representative, the performance again being satisfactory in all respects.

During the official trials the vessel flew the British flag and that of the William Gray shipyards. At 4 p.m. the Swiss flag was hoisted on the quarter-deck and that of the Suisse Atlantique S.A. on the after mast. The vessel was thus officially handed over to the Swiss owners.

The crew, who were familiar with local conditions, insisted on getting the vessel back to the shipyard before nightfall, as the waters of West Hartlepool were not yet completely free from mines.

On 22nd February 1948 the M.S. "General Guisan" put out on her maiden voyage for South America with Necochea and Bahia Blanca as her ports of call.