In addition to manual steering, the vessel is equipped with a nonhunting-type automatic pilot. An emergency tiller may be quickly attached with removal of a deck flange above the rudder post. In tests and trials the vessel exhibited fine qualities of maneuverability and seaworthiness. A separate chart and instrument room has been provided because of the need for these facilities. Quarters are provided for four scientists in addition to crew space for six.

Six berths are located in the forecastle, two in the deckhouse, and one in the laboratory space. Separate quarters are provided for the captain adjacent to the wheelhouse.

A desirable feature of the George M. Bowers not usually found in fishing vessels of this size is the provision for inside access to working areas, quarters, and storage spaces. This provision for crew comfort is a definite advantage to the multipurpose fishing or exploratory vessel, and was accomplished without loss of space or special arrangements.

Part II - Vessel's Electrical and Auxiliary-Drive Systems

By Richard L. McNeely*

ELECTRICAL SYSTEM

The design of the electrical system of the George M. Bowers fulfills a variety of requirements and makes provision for future possible needs. Of particular note in the installation are features of economy both to the initial cost of the installation and to operational and maintenance expenses.

The larger of the generating plants is 110-volt a.c. single-phase and is rated at 10 kv.-a. The unique design and installation features of the system permits, without overload, intermittent operation of:

Galley range	220 v. a. c. -	200 to 10,000 watts
Thirty-gallon hot-water heater	110 v. a. c. -	1,800 watts
Galley refrigerator	110 v. a. c. -	90 watts
Fourteen cu.ft. deep-freeze unit	110 v. a. c. -	100 watts
Deck flood lights	110 v. a. c. -	600 watts
Deckhouse lighting and wiring circuits	110 v. a. c. -	250 watts
The air compressor	110 v. a. c. -	75 watts
Battery-charging rectifiers	.110 v. a. c. to 110 v. d. c. -	500 watts
Ventilation blower	110 v. a. c. -	100 watts
Fresh-water pump	110 v. a. c. -	80 watts
Anchor winch	110 v. a. c. -	3,000 watts
Navigational aids	110 v. a. c. -	250 watts

and other minor equipment.

Additional auxiliary power is furnished by a 3-kv.-a. 110 volt a.c. generator and 32-volt battery charger. The battery-charging unit is tapped off of a 32-volt generator field exciter.

The main propulsion engine drives one 1,500-watt 32-v. d.c generator and one 3,000-watt 110-v. d.c generator. A motor generator set allows power conversion

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to a.c. The electrical energy produced by the 3,000-watt generator is stored in a 110-volt bank of batteries. Principal use of the motor generator set is a source of emergency a.c. power and a quiet source of a.c. power required in underwater sound experimental work.

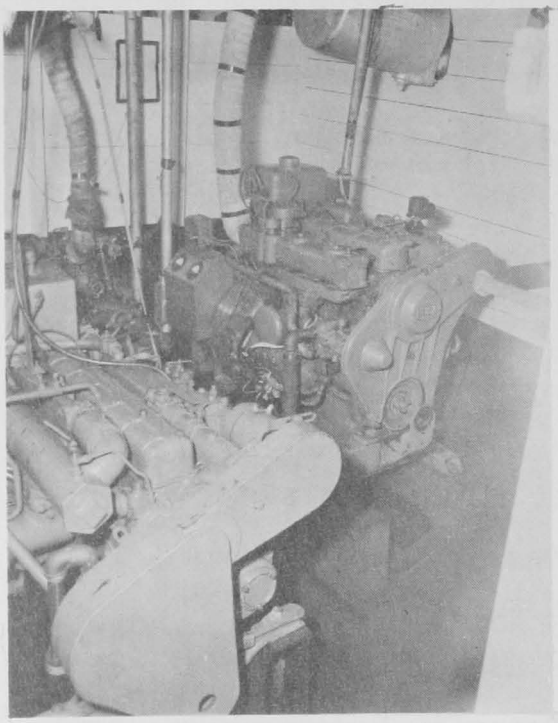

Fig. 8 - View of George M. Bowers Diesel auxiliaries.

All control switches in the 110 v. a.c. and 110 v. d.c. and 32 v. d.c. are of the circuit-breaker type. Plug-in receptacles for all three types of current are provided in the laboratory space and in the radio chartroom. Dissimilar types of plug-in prongs and receptacles prevent error in selection of power source.

The 32-volt system is used for engine cranking only to insure longer battery life. All engine-starting systems are isolated as added protection against electrolysis. All major equipment is bonded with heavy-gauge copper wire and grounded to a keel-mounted grounding buss. Either 220-volt single-phase or 110-volt single-phase shore power may be introduced for ship supply. This is accomplished by means of one air-cooled 10 kv. a. 110-220 volt transformer. An isolation transformer removes shore power grounds from the system.

To prevent even temporary loss of navigation lights due to a.c. power-plant failure, navigation lights are 110 volt d.c. A reserve of power in the 110-volt battery bank would allow from 5 to 10 days of operation without re-charging. With this bank of batteries and a motor generator set, all 110-volt a.c. navigational equipment would be of service in emergencies. Of particular importance is the fact that this electrical system has been designed so that no switch on either the main or auxiliary distribution panels may be thrown in such a manner as to damage the electrical system or any of its equipments in any way.

WINCH-ENGINE AUXILIARY DRIVE

An unusual power take-off installation aboard the George M. Bowers allows a 50 hp. auxiliary Diesel engine to perform double duty.

This engine is equipped with clutch and reverse gear and by means of a fluid coupling-type torque converter provides power requirements in varying amounts for the combination deck winch.

Fig. 9 - View of power-distribution panel, showing 110 v. a.c., 110-v. d.c., 32 v. d.c controls, and isolation transformer.

In numerous operations in fishery investigations, such as the towing of smaller nets, trolling, and underwater sound and television work, slower vessel speeds are

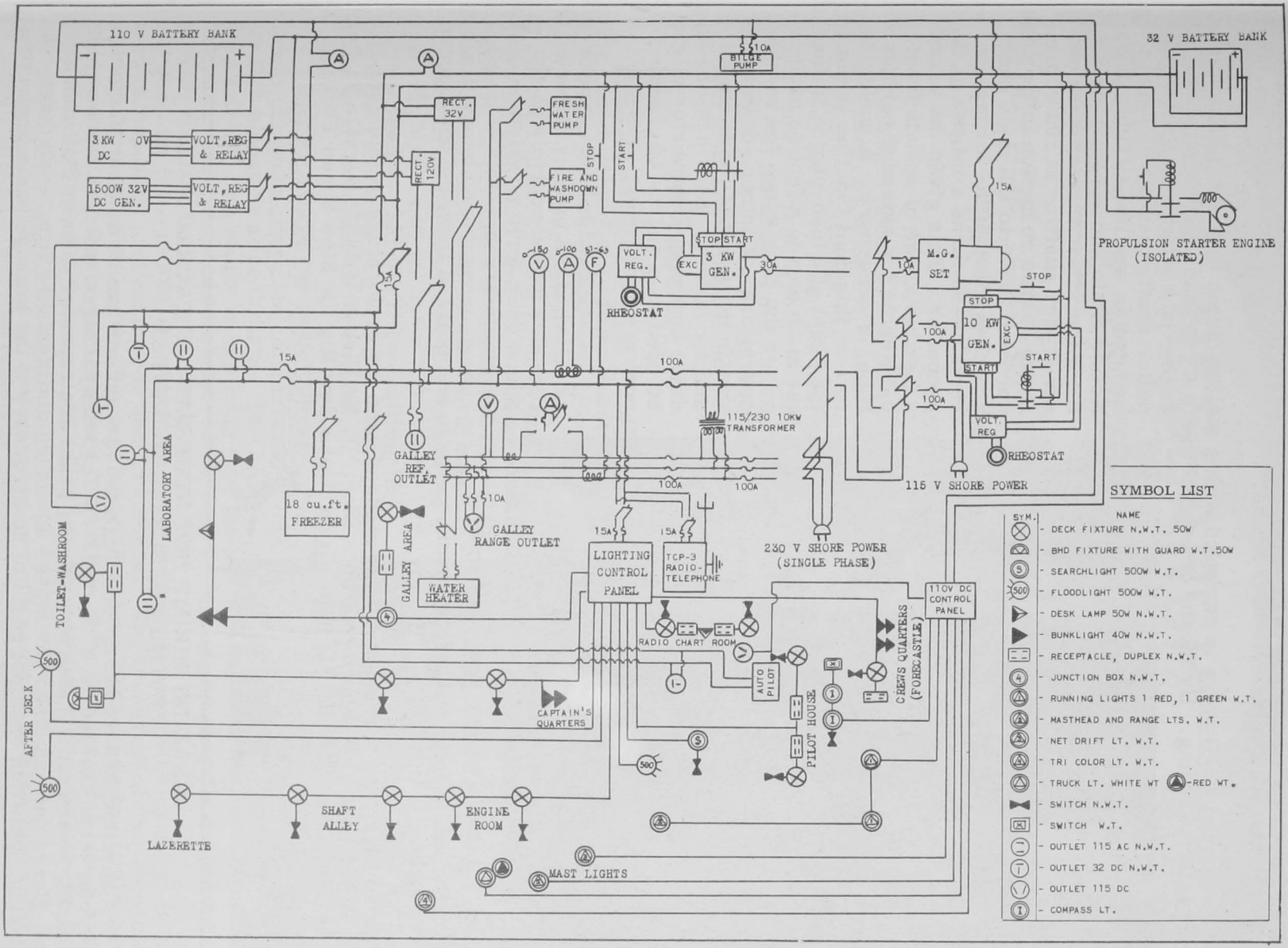

Fig. 10 - Diagram of George M. Bowers' electrical system.

required for extended periods of time. These slower speeds tend to foul larger engines and are not recommended practice.

The George M. Bowers is equipped with a sailing clutch between main engine and propeller shafting. By means of another chain drive take-off from the winch-engine jack shaft to the main propeller shaft, the winch engine may be used as auxiliary engine power. Roller chain and sprocket drive from the winch engine turns the winch jack shafting at 192 r.p.m. A two-to-one reduction in the chain sprocket drive to the main shaft provides through the torque converter 0-96 turns a minute at the propeller. This gives the vessel a flexible range of speeds from 0-3½ knots for extended periods of time, if necessary. A special feature of this dual function is that in the event of winch-engine failure the main engine might be used to power the deck winch for certain operations. Another advantage is that in the event of main-engine starter failure, the winch-engine drive and torque converter might be used as a source of cranking power.

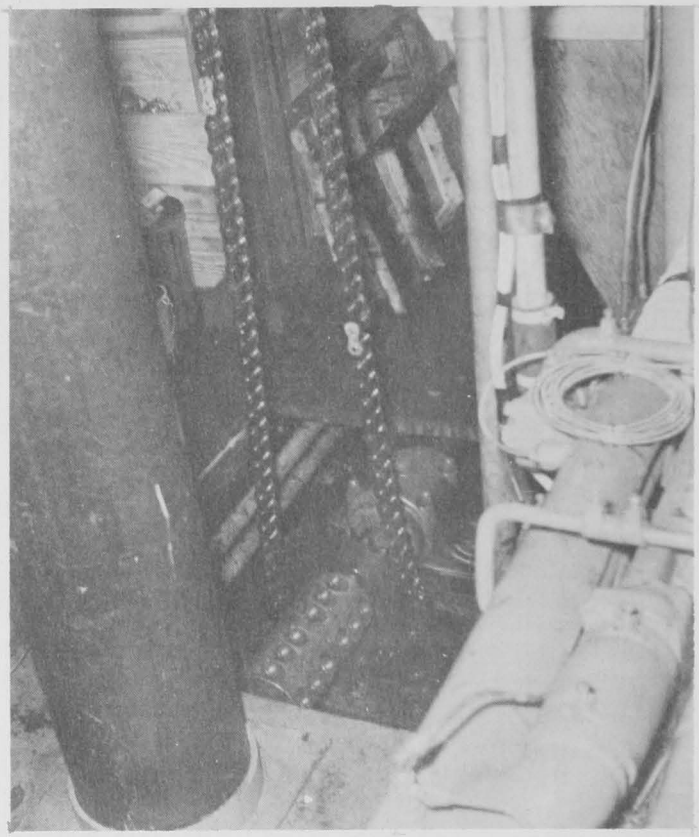

Fig. 11 - View of George M. Bowers' auxiliary drive.

A standard friction-type clutch attached to the torque converter is operated by air controls at the winch operator's position on deck. A simple arrangement of quick change crossover valves will allow either the main-engine or winch-engine drive to be operated from the wheelhouse air controls.

A similar type arrangement was made aboard the exploratory vessel John N. Cobb in 1950 for slow-speed trolling. (See; U. S. Fish & Wildlife Service Fishery Leaflet No. 385, Part II, "John N. Cobb Uses New Rig for Slow Speed Trolling.")

GLAZING SHRIMP NOT NECESSARY IF PACKED WITH PROTECTIVE OVERWRAP

Experiments have shown that unglazed raw shrimp can be held satisfactorily for long-term storage at 0° F. (-17.8° C.) when packaged in waxed cartons with suitable overwrap. Tests by a tasting panel are reported to have indicated that the glazed and unglazed shrimp could not be distinguished from each other. A glazing operation does not seem to be necessary if the package has a protective overwrap.

--Gulf and Caribbean Fisheries Institute, Abstracts, 1953