



W. B. Jackson

"Mahdee" was the first small yacht to try electric drive for auxiliary power

"Mahdee"

The First Small Electric Drive Auxiliary

By A. W. MOFFAT

MAHDEE was launched in April, of last year. In order to allow ample time for the development of plans and their unhurried contemplation I had gone to Sam Crocker with my ideas in February, 1930. Six months is a short enough time at best to do justice to every detail of a completed design. Crocker is a thorough, scientific workman with great experience in designing cruising craft. He works alone. There are certain enterprises in which it is more fun to deal with an individual than with an organization; and this was one of them.

The keel was laid in September, 1930, at the yard of G. F. Lawson & Son, Dorchester, Massachusetts, under a cost plus contract which called for delivery on April 1st. As Lawson had built two other yachts for me I knew from experience the quality of his workmanship and of his knowledge of seasoned material. With *Mahdee* we did not have to hurry. Cooperation between owner, architect and builder together, with plenty of time to decide details, was bound to produce a well-designed, well-built ship. We adhered to the three mottos which anyone building a boat should swear faithfully to follow: The best is none too good; the most expensive is generally the

cheapest in the end; "If you are going to sea and going in safety you've got to be particular."

Mahdee has been successful. She has more than met the expectations of her owner who had definite ideas about what he wanted. To those who judge the desirability of a yacht in terms of speed, she is an enigma, and to those hardy Vikings who have an inferiority complex about power gadgets she is a horror. Departing from orthodoxy in layout, rig and power plant, she has attracted a great deal of attention, yet probably there was never a hull of more time-tried form. A little more depth would make her a regular Brixham trawler.

Anyone building a boat must be honest with himself as to the actual use to which he is going to put her if she is to be best adapted to that use. Some yachtsmen who never get time to go to sea build themselves seagoing vessels in which much comfort has been sacrificed. I knew from bitter experience that I should never be able to use *Mahdee* for more than a couple of short cruises each summer and the other ninety percent of the time she would be used as an intermittent family dwelling, leaving the mooring only on Saturdays and Sundays, half the time under power alone. Accordingly, I wanted *Mahdee*



"Mahdee" has a sunken deck forward and is flush from rail to rail amidships

planned, in every respect, to meet the needs of these actual, if unromantic conditions.

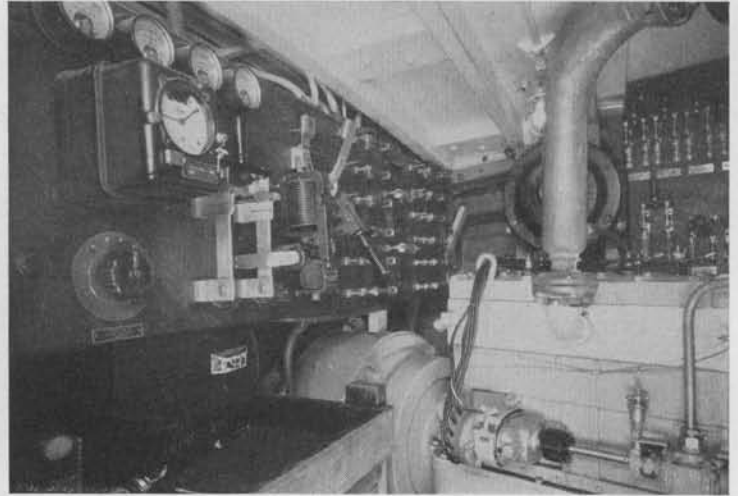
The three factors which from my point of view meant the most were *safety, comfort and silence*.

Safety lies first and foremost in the integrity and experience of both the naval architect and the builder in turning out a ship which, if properly handled, will be safe under any weather conditions likely to be encountered in the waters in which she will be used. Next in importance comes adequate protection against fire. There are too many factors contributing to safety to enumerate them all, but two more are worthy of mention because they are so often given almost no attention: one is the ability to lay hove to promptly and surely; the other is a rig that enables sail to be shortened rapidly without bringing the vessel into the wind or losing steraegway. Not many Marconi mainsails on tracks will come down freely unless in the eye of the wind. It is almost unnecessary to mention, as a major contribution to safety, good ground tackle with adequate means for handling.

Comfort means spaciousness for the number of people berthed aboard, whether lounging, eating or working; it means adequate ventilation at anchor and on any point of sailing, both for living quarters and bilges; ample headroom; a place for everything. But beyond all else, I think, it means the ability to stand up to a moderate angle of heel.

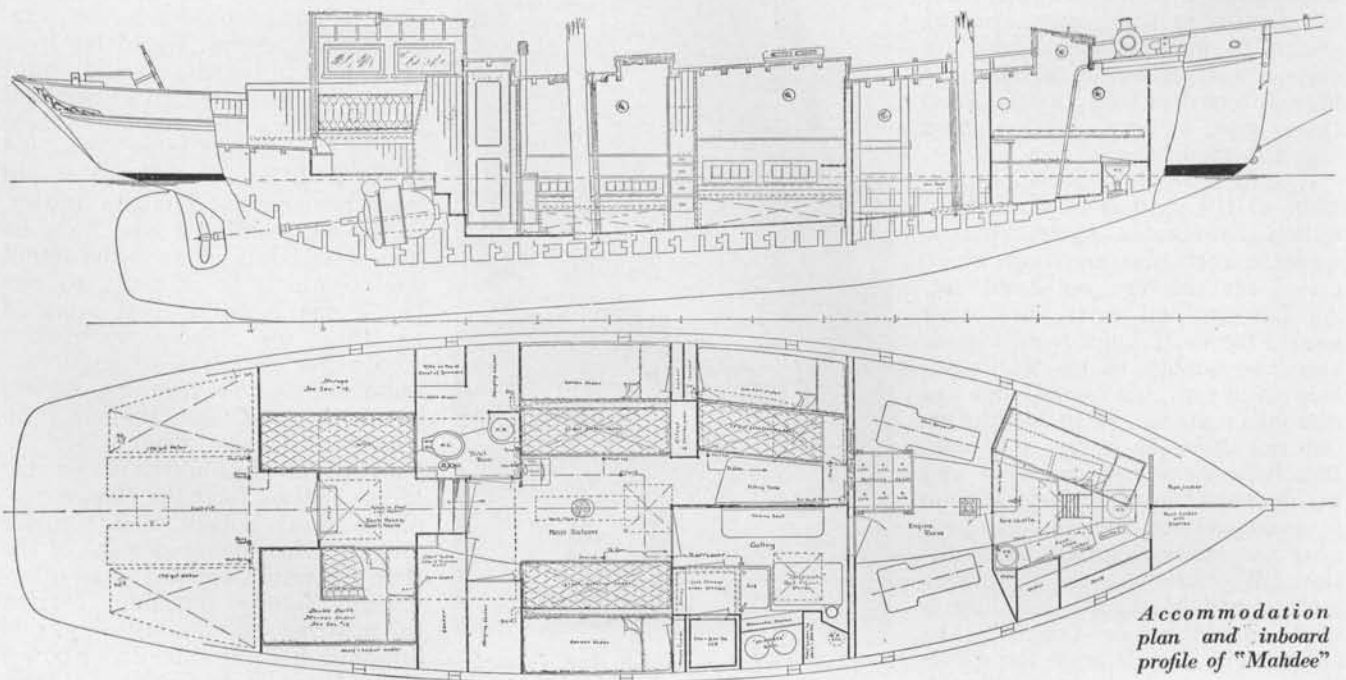
Silence means freedom from mechanical or vibratory noises when under power, and an exhaust so silenced that it is not necessary to shut it off in order to listen for sound signals in a fog.

Economy in first cost defeats its own end. If you cannot build the best of the size you contemplate, build smaller. Economy of operation is another matter — one to which considerable thought was given in developing *Mahdee*. It was necessary to plan a craft which would berth ten in the owner's party and could be handled under power by one man under any conditions; could be kept in first class shape both above and below deck by the same man, and be handled under sail by him and the owner together.



One of the two Winton 10 kw. generator plants, located forward, and the switchboard

The length over all was determined by developing a handsome profile from the first fixed factor, 6' 4" headroom under a flush deck. The length thus determined, after minor changes in working out the design, proved to be 53' 2 3/4". The next fixed factor was 6' draft. The beam and water line length were to be whatever they worked out in modeling a plumb stem hull of great stability with a long straight keel, for easy holding of a course and for the obvious advantages when hove to. The weights of the various units of the power installation were greater than with the usual auxiliary installation, and to some extent affected the design of the hull. The beam worked out to 15' and the load water line to 45' 11". Tonnage measurements were 29 gross, 19 net; displacement 58,000 pounds. The principal weights were as follows: Two 10 kw. Winton generator plants, each, 1350 lbs.; one General Electric motor for propulsion, 2500 lbs.; Exide storage batteries, 1100 lbs.; switchboard, resistors, controller, service motors lead covered cables, 1000 lbs.; outside lead ballast, 16,000 lbs.; inside lead ballast, 4000 lbs.; launch on davits,



Accommodation plan and inboard profile of "Mahdee"

600 lbs.; ground tackle, two anchors and chain, 750 lbs.; electric windlass, 500 lbs.

The cost of the power units was high, as is always to be expected in a pioneer layout. The purchase price of all the units together was approximately \$7500, and the cost of labor and material for wiring \$1700 additional. In every instance the very best was selected. I believe a satisfactory electric drive of the same power could be installed for half the sum.

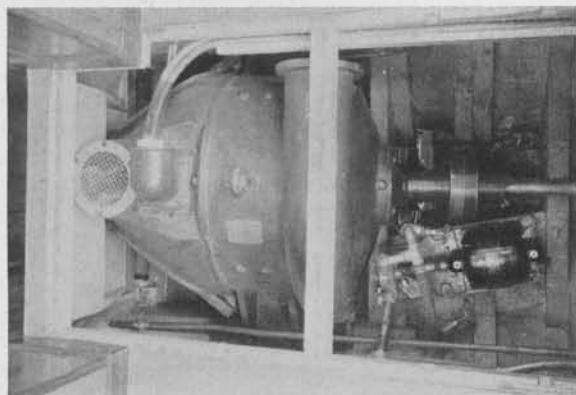
The chief reason for adopting the electric drive is in arrangement of accommodations. The electric motor installed as far aft as possible is clean, odorless, vibrationless, and absolutely silent. It requires lubrication only once a season and otherwise does not need to be looked at. Consequently, the living accommodations can be located all around it, with provision for accessibility. The generator units and batteries can be placed in the most practical location with reference to the particular layout in mind. The controller, of course, is placed near the wheel. You have absolute control of the vessel because the motor is always direct-connected to the propeller and has equal speed ahead or reverse. *Mahdee* started with a solid three-bladed wheel but now has a two-bladed feathering wheel which improves the speed somewhat under sail, as anticipated.

On a 16-hour run under power alone with two generators turning 1350 r.p.m. and the propeller (28" x 18") at 600 r.p.m. the average speed was 7.6 knots; fuel consumption, 4½ gallons of gasoline per hour. With a single generator running, which delivers 110 volts to the 220-volt motor, the speed was 5.7 knots. With fully charged batteries the speed under batteries alone is 5.7 knots for a few minutes, but for practical purposes about 3 knots for an hour's run. An ampere hour meter tells at a glance how much is left in the batteries at all times.

This installation gives three independent sources of power, each generator, or the batteries. The batteries may be charged by either generator and the lights may be run from generator or batteries. Normally, the batteries float on the line exactly like an automobile starting battery.

No electrical knowledge is required to successfully operate an electric drive installation. The instruction book prepared by R. J. Ruedy of the General Electric Company is a masterpiece of simplicity. Anyone who can read the plates on the switchboard has only himself to blame if he goes wrong.

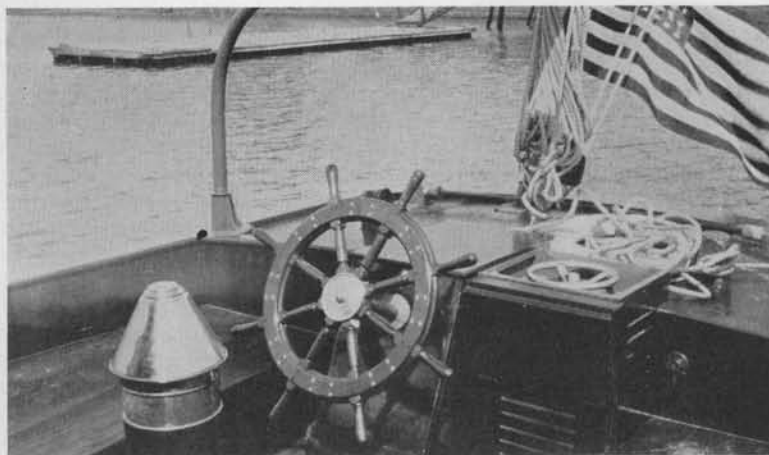
In *Mahdee* the driving motor is located beneath the



The G. E. motor for propulsion, located under the floor of the deckhouse

floor of the sunken deckhouse. The engine room is the full width of the ship abaft the foremast, which keeps the weights well back from the bow. This room is separated from the living quarters by a 4-inch felt-filled bulkhead where the flush deck becomes the forward well deck, as shown in the photograph. It is separated from the forecabin by a partition. This is the only space in the ship which has not full headroom. An ice box type door leads from the engine room into the galley, which occupies the starboard half of the ship amidships for a length of eight feet, separated from a double stateroom on the port side by a partition in which there are sliding panels. A big comfortable transom and a drop leaf table on the partition transform this stateroom into a bar parlor, or a dining room for four, to which things may be passed directly from the galley.

All the cooking aboard *Mahdee* is done by members of the family. The cook can work without feeling isolated from the people in the main cabin or in the bar parlor. Nor is the galley a hot place to work. The break in the deck at the forward end of the flush deck provides space for four ports across the forward end of the galley and bar parlor. There are two on the sides. All are Gust ports, made by Gustafson of South Braintree. They op-



The cockpit, and the controller, alongside the wheel

erate like the breech of a gun, by the touch of a lever which operates a cam. They can not only be locked shut in an instant, but can be locked open for ventilation. The screens need not be removed in closing the port. They never leak, and as the pressure is applied at four points in locking, the glass does not crack. For further ventilation there are three skylights over the galley, the bar parlor and over the main cabin. The high coamings over which these are set are square so that the skylights may be placed to open either fore and aft or 'thwartships, a great advantage in securing maximum ventilation. The galley is further cooled by having the smoke pipe from the coal range set within a larger pipe from the deck up, with the Liverpool head fitted to the outer pipe. Thus the smell of cooking is drawn out by the draft of the stove.

By daytime the deckhouse is a chartroom and a lounging place; by night the starboard upholstered seat folds neatly away to reveal a full-sized double berth underneath. On the opposite side the transom seat is seven feet long, extending, like the double berth, under a deck which is carried three feet abaft the deckhouse. Under this seat is an enormous and very accessible sail locker, and beneath the floor of the deckhouse, in

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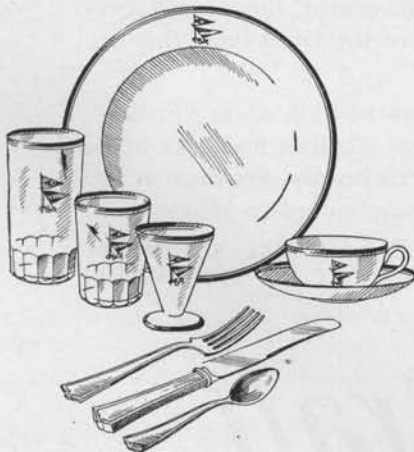


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"Mahdee"

(Continued from page 61)

addition to the propulsion motor, is a service motor for pumping bilges which has a sea connection for hosing decks.

The cockpit is carried the full width of the ship out to the rails, and is self bailing. The criticism of the wide cockpit shown is that it would hold a lot of water if a sea came aboard. According to George Doane's experience in the *Sea Lure* going to Bermuda with the same kind of cockpit, if a sea breaks aboard the weather is so rough that most of the sea rolls right out again. It was because of opportunities to sail in *Sea Lure* over three years that the sliding gunter rig was chosen for *Mahdee*.

A proper awning to make the cockpit livable at anchor in wet weather and so increase the apparent size of the vessel has certain novel features. On each side of the galleys frame which supports the boom is an arm which swings out to secure the after corners of the awning outside the line of the rail so that rain drips clear. The awning is suspended by ordinary mast slides from a track on the under side of the boom, extends over the deckhouse to prevent water from driving in from forward, and the two forward corners lash with lanyards to the main shrouds at any height desired. Thus the whole awning is held rigid and silent.

The sail area of the four lowers is 1500 square feet, just about what you would expect a hull of this displacement to carry with a single reef down all 'round. I wanted a short rig because I was willing to sacrifice speed to comfort and did not want to have to trouble to reef to be comfortable. The result is that *Mahdee* is dull in light airs but quite unexpectedly snappy in a reefing breeze. Her stiffness is indicated by the fact that she has never had her deck under water although she has logged as high as $9\frac{1}{2}$ knots on a reach and has sailed from Portland to Gloucester in $9\frac{1}{2}$ hours.

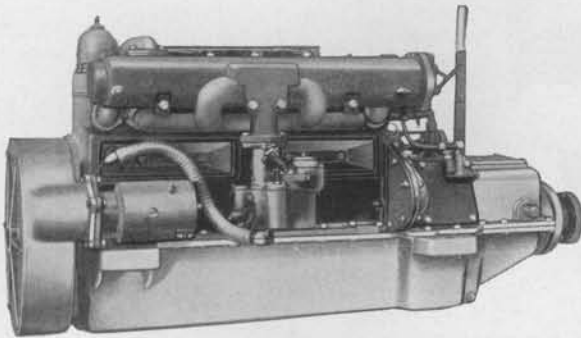
The foremast is a hollow spar built 'round a $2\frac{1}{2}$ -inch copper tube with an air space 'round it which carries the exhausts out just beneath the truck at the masthead. The foresail is orthodox and is equipped with a vang, or fore gaff sheet, which trims to the mainmast and leads down to the deck. When this is trimmed on the wind the fore boom is lashed down to a ring bolt with a watch tackle. This takes the twist out of the sail and makes it much more effective. It also makes possible carrying the fisherman longer because it may be set outside the foresail.

The advantages of the sliding gunter mainsail are in having the shape and size of a Marconi sail with a short mast which needs no spreaders. There is, therefore, a minimum of chafe to the sail. Mast hoops are used so there are no slides to jam if the sail has to be lowered while running off the wind; furthermore, there is the weight of the gaff (or "yard" as I believe it is correctly called) to bring the sail down on the run. The short mast reduces windage considerably when going to windward under power alone, and saves top weight as well. In fact, I have found no disadvantages. The sail seems to set as well as the best of the true jib-headed sails. There is a wire luff rope shackled to the bottom of the yard so that when the wire halliard is set up the whole business is taut. Next summer I plan to use a single part chain halliard as recommended in "Yachting Monthly," with a small windlass at the foot of the mainmast set over a box to house the chain on deck.

The outhauls on all three booms are the same — a wire lace line secured at the forward end, leading through eyes to a cheek block at one side of the after end of the boom, thence over the top of the boom through the block of regulation outhaul fitting which slides on a short length of track, thence aft again to a cheek block on the

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other side of the boom and forward to a tackle. When you slack the tackle the clew comes inboard the length of the track and the lace line slacks up its whole length. This outfit works perfectly, is stronger than a full length boom track, and on occasion can expedite passing reef points.

There are many departures from the orthodox in the design of such details as the ratlines, the telescoping slide of the forehatch, the 5- x 6-inch guards on which the davits are stepped, the method of securing the skylights, which are drip proof. Of the handling of the exhaust I shall hope to write in a later article.

One more feature is worthy of description in detail. *Mahdee's* home mooring is in a tideway. To overcome the continued annoyance of the mooring gear chafing on the bobstay, the lower bobstay fitting was designed with a lower eye. This fitting is a massive bronze casting, faired to the hull and secured by three 1-inch bolts through 12 inches of oak knee. A short length of chain is shackled to the lower eye and secured at the other end by a lanyard to the end of the bowsprit. On approaching the mooring the outboard end of this chain is brought on deck. The end of the mooring chain is equipped with a heavy gaff topsail hook. This is hauled aboard, secured to the short chain, and tossed overboard, thus allowing the boat to ride to her moorings secured below the bobstay, chafe free. The pennant is long enough to lie slack and is used to hand the connection aboard when casting off.

Mahdee has proved herself a grand sea boat, although she has, so far, only had the opportunity to make little jaunts between Long Island Sound and the Maine coast. As a houseboat she is an unqualified success from mooring to back porch. As a power boat she handles with the ease of a steam towboat, but as a racer she would have to have weather that few competitors would be found to start in.

The Outlook for the Outboards

(Continued from page 62)

replaced must be purchased by the driver. Service men will not be permitted to give away or loan parts, as racing motors are not warranted because of the extreme hazards of racing.

"If any changes are made in order to increase the speed of racing motors, then the manufacturer will furnish the parts, or the drawings, or the labor necessary to change the driver's motors to agree with the changes adopted, provided the driver has purchased his equipment within three months preceding the change and provided such motors have been registered. This does not include changes in propellers, spark plugs, piston rings, gears, carburetors or other accessories. Nor does it include changes to be made in the manufacturer's yearly models between December 15th and March 15th. All transportation charges on equipment sent to the factories to be changed must be borne by the owner of the equipment."

+ + +

Down in Texas they have dug out a one-mile race track to a depth of five feet or more and turned it into a splendid race course for outboard boats. A reader of an English boating magazine writes in to the editor to inquire why they don't bank the turns of this water course as they do automobile race tracks.