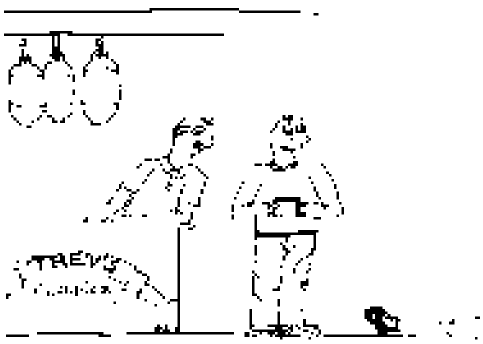
Ferro News

December 1997 Quarterly Newsletter for Ferrocement Boat Owners Issue 5

We're back! Just in time too for the December issue of Ferro News. "Lilly Ann" our Hartley South Seas took us north to Mackay, and back, safely, treating us to idyllic island anchorages, encounters with wildlife, and the friendly companionship of fellow cruisers. Trudy reveals all the details this issue. Keith Wood has kindly let us reprint his account of building a ferrocement yacht which he has published on his web site in the UK. Roy takes a breather after his excellent article last issue on voids! But will be back next issue with more on the subject. Doug describes his latest endeavors. Complying with popular request, this issue has a list of our subscribers and other fellow ferros. I'm sure we all would welcome fellow readers and cruisers to drop in for tea and a chat any time they're in the neighborhood!

Re-subscriptions for Ferro News are not due until June '98, so those that have already sent renewals following issue four, I will hold these over for 1998. Any new subscriptions during the year will automatically receive all back copies for that year.



Keep those letters coming!

Northern Adventure Part I

By Trudy Snowdon S/V "Lilly Ann"

Well, we're back from our trip and grappling with the reality of office hours, house maintenance and wearing shoes! However we now have some great memories of an absolutely fabulous trip up the Queensland Coast and back. Our trip was delayed due to some engine problems at the beginning and consequently we didn't get to the Whitsundays as we planned, having to turn back at the Percy Islands. Once our engine was sorted out, we didn't waste time getting as far north as possible. The weather forecast promised fair sailing for some time, we decided to do an overnight trip in order to meet the dawn at the Wide Bay Bar. A brisk SE - E wind blew all night allowing for a pleasant but chilly night's sailing at around 4 to 6 knots, arriving at the wide bay bar just before dawn. We hove to and watched a spectacular dawn herald the beginning of a new day. It was while we were waiting to cross the bar we saw our first Humpback Whales, breaching over near the horizon in the morning light. We spent the next few days getting as far north as possible, and after another overnight run managed to get to Rosslyn Bay by the next Thursday. This time we again arrived outside the harbour and anchored in about 9 metres of water to wait for dawn. Rosslyn Bay is certainly an impressive harbour, snuggled in close to a columna basalt mountain which dominates the shoreline. The new marina also is impressive, making every effort to provide a range of services to visiting yachties. In a few years it will be a marina to rival the one at Gladstone but for the moment it lacks a few creature comforts (such as a pub to get a decent beer and steak!) and any serious provisioning has to be undertaken in either Yeppoon or Rockhampton. We spent a day and a half in Rosslyn Bay, as gusty SE winds were predicted. We took the opportunity to have a local mechanic check over the engine and explored a number of the basalt mountains which surround the marina. This provided us an interesting view of the harbour from the top of the knoll and we spent an hour or so examining the flora of the area. On Friday afternoon, we left the harbour for Great Keppel Island, which is only about 10 nautical miles from the harbour. Anchoring off Swenson's (??) Beach we discovered that the bay, although picturesque, was somewhat swell affected. We decided it was time to experiment with the stern anchoring equipment and managed to use the stern anchor to pull us around into the swell, making the next few days much more enjoyable. We explored the bays for the next couple of days and managed to catch a few sole and bream in the nearby creek - dinner for a few nights! While we were exploring the creek in the dinghy we found a number of mud berths and careering grids nestled in the mangroves - the creek being navigable at high tide. On Sunday we left Great

(Continued on page 4)

inside...

How To Build A Ferro

By Keith Wood S/V "No Idea"

Our boat is the yacht 'Noidea'. (In case you're wondering about the name, it comes from "What are you going to call your boat?"; - answer - "No idea";).

It's a 57' ferro-cement ocean sailing cruiser, about which the following statistics may be interesting (then again, they may not be - in which case just skip the next bit): length 57', beam 16', draft 8'6";, displacement 45tons (all up). In the course of the construction we consumed 9 tons of sand, 18 tons of cement, 1.3 miles of 1/4"; steel wire, 1.3 miles of 1/6; steel wire, 100000 wire ties, 40 sheets of 8' x 4' 3"; square 1/6; wire mesh, 3500 square yards of 1/2"; chicken wire, 6.5 tons of scrap metal, countless 10000s of screws & bolts. If you're wondering how we went about the construction of a 57' (17.5m) ocean cruiser, then this might give you some idea. The first stage involved fabricating cross-sectional trussed frames, out of 10mm steel rod. The boat contains 17 such frames, spaced 38 inches apart. Each frame was reinforced with horizontal & vertical pieces of angle-iron, fixed to the frames with u-bolts. The vertical piece of angle-iron on each frame was extended with 1/2; inch studding, which was passed through a hole in the centre-beam of the building frame. The frames were secured to the building frame by nuts on the studding, which also allowed vertical adjustment. The horizontal angle-iron on each frame was affixed at the same vertical level, allowing easy visual confirmation of correct alignment. Once the frames were in place, a stem piece of galvanised pipe was shaped & welded to the bottom of each frame - thereby fixing the horizontal spacing of the frames. The piece from the stem to the rear of the keel was a single &3/4; inch pipe.

Two parallel 1/2" inch pipes were used from the rear of the keel to the transom - spaced far enough apart to allow the passage of the propeller shaft between them. The transom was also constructed from shaped pipe, overlaid with square mesh, to form a classic curved transom shape.

The tops of the frames were joined together with steel bar, from the point of the stem, along the deckline, to the top of the transom. At this stage a reasonably rigid construction existed. Onto this were tied the stringers, consisting of 1/4 inch wire spaced horizontally every 3 inches. Another layer of 1/6 inch wire, was tied over this (also at 3 inch spacing) to form a rigid 3 inch mesh. The wires were tied together at every crossing point. Once the hull was completed covered with the rigid mesh, it was then covered with 1/2 inch bird-netting. Five overlapping layers were placed over the outside of the hull, and 5 overlapping layers on the inside between the frames. The frames were also covered with netting. 1/2 inch reinforcing rods were inserted fore & aft along the length of the bottom 1 foot of the keel, which was then cemented, and filled solid. Once this had set, supports were inserted under the keel, allowing the ground to start taking the weight, rather than relying on the whole structure 'hanging'. The whole hull was then tied at 3 inch spacing, to hold the netting in place, and to form a good key for the cement. Then (in a single 11 hour operation) the outside of the hull was cemented by a team of four plasterers, and one labourer. As the day progressed the boat changed from being a see-through 'ghost', into looking like a solid boat. Once the outside of the hull had set,the cementing of the inside started. For the more difficult to access places (such as inside the skeg, shown below) it was necessary to vibrate the cement into place, using a vibrating poker. The inside of the hull (done by us, rather than a professional team)

was plastered one frame section at a time. Once the hull was completed, the decks were constructed in the same manner - notice the use of angle-iron tied to the outside of the deck, holding

the structure in place whilst the

(Continued on page 3)

(Continued from page 2)

underside is cemented (notice also, how little children have no fear of heights!). After the decks, the cabin sides & roof get a similar treatment, although the flat surfaces here allowed the use of sheets of square mesh instead of having to tie rod together. As the structure started to take on strength, so braces could be fitted to the underside of the hull, and the vertical supports (the angle-iron pieces) could be removed. Once the verticals had gone, so that part of the building frame could be removed. It's during operations like these that you lose your fear of heights (in the photo below I am sitting on a 6 inch wide beam, 22 feet above the ground).

With the though-deck angle-iron verticals removed, and the underside of the deck cemented, it was then the turn of the topsides of the decks & the cabin sides. Similar treatment of cabin tops, with lemonade bottles providing the perfect tool to cast nice round holes in the cement. Once the main structure was complete, it was then necessary to fit the ballast. 6.5 tons of scrap steel (in the form of old chain, storage-heater blocks, sash-window weights, etc.), buried in cement in the keel. The keel was divided into sections, and the ballast had to be divided into measured weights in each section. Timber cross-bearers were fitted to the webs (formed from the frames), on to which could be laid the plywood flooring. By this time, the removal of the building frame was starting to reveal something that really looked like a boat. The entire building frame had to be cut off above the height of 7 foot (to allow access for the crane). The outside of the hull also required painting. The rudder needed to be fitted in place. On a boat this size rudders are quite big! The rudder stock is 2.5 inch diameter stainless steel rod, and the whole assembly had to be lifted into place with a chain-hoist. To lift a big boat, you need a big crane. This particular beast had a 200 ton lifting capacity, and if you're wondering how it got the boat past the tree (in the middle of the photo below) - simple, it lifted it over it! Cranes this big make 37.5 tons of boat look like a feather. A load this big breaks a number of road-traffic laws. too wide, too high, too heavy. To transport something like this

requires a special licence from the department of transport, a police escort, a telephone company escort (the top of the boat being higher than the telephone wires). For many parts of the journey, the transporter either had to drive down the middle of the road, or sometimes on the wrong side, in order to avoid various obstacles. It is quite understandable that they only allow you to move loads like this on a Sunday. A three-hour, nine mile, journey later, and the boat arrives at Shoreham Beach wharf. A quick re-assembly of the crane, and the boat can at last take to the water. Two and a half years of most evenings, weekends & holidays, and finally we were afloat!

(Continued from page 1)

Keppel and headed for North Keppel Island to anchor for the night. After anchoring in 2.8 metres of water we explored the shoreline in the afternoon sun.

The next morning we made an early start, bound northward for Island Head Creek, which is situated on the northern end of the Shoalwater Bay Military Training Area. We made good progress under motor and sail at 7 - 8 knots. Island Head Creek is situated behind a large rocky outcrop jutting out into the sea. Once past this headland the creek widens out into a natural harbour with many tributaries providing a range of anchoring sites. Once again we took to the dinghy to explore the area. We discovered amongst other things, a turtle asleep on the mudflat. We were off again early next morning, and made our way to Whites Bay on Middle Percy Island. The day was hot and still, and we had to motor sail again to make progress. However, the journey was definitively worth it. The white sands of the island glistened in the afternoon sun, whilst behind our yacht lay a small rocky outcrop, making the bay the perfect, protected anchorage in a north-easterly wind/swell. We decided to spend the next day at the island in order to explore and take photos. The next morning we woke early to get the best use of the morning sun for photographs. At the easterly end of the bay is a small sand flow gradually making it's march inland over the scrub. To the western side of the Bay lays a green granite/serpentine outcrop, covered in a number of impressive pine trees. Dolphin Bay lies on the other side of the granite outcrop and the sand there is streaked with pink. The island was alive with hundreds of butterflies - Blue Tigers - who were making a migratory path northwards. The Percy's were as far north as we managed this trip - due to the limitations of time. The next day we set out for the Duke Islands - about 20 nautical miles southwest of the Percy Islands. We arrived at the islands at midday and found the navigable passage between Marble and Hunter Island difficult to discern from a distance. The small islet which makes the port side entrance of the passage however, is easily distinguishable as it is a large quartzite rock face with an intrusion or dike rising vertically through the surface. Marble and Hunter Islands looked bare and brown. These islands are privately owned and are used as a cattle station. However, with the wind blowing a pleasant N/NW we anchored off the south eastern beach on Hunter Island - a very pretty little anchorage with a beach fringed by Casuarinas. It was a good thing that it was slack tide when we anchored, for we had forgotten to bring in the lure which we had been towing from Percy's. It wrapped around the shaft when we backed down on the anchor, requiring a dip overboard with a knife to cut it free - the exercise cost us one lure and one damaged fish filleting knife.

The next morning it is was still blowing north westerly, giving us a good sail to Thirsty Sound, and the small township of Plum Tree. On our departure from Hunter Island, we discovered the full force of the current that ripped through the passage between the islands, with Lilly-Ann practically spat out into the open water. The purpose of our visit to Thirsty Sound was to pick up fuel and to see if we could obtain any water. However Thirsty Sound is aptly named - Captain Cook wrote in his journal that Thirsty Sound was so named when they landed in search of fresh water, but alas none was found. It is one of the driest places I have ever visited with the locals trucking in water from bores outside of town. There are signs all over the place requesting visitors to not ask for water. However, you can ask for ice. A friendly couple who run the boatyard" next to the general store truck in bags of clean ice from Rockhampton, and for $3.00 per 10kg bag, were more than happy to melt the ice down for us. A few hours later (after a good long stint in the pub with locals and other boaties) we were back on our dinghy laden with fuel and water. What a place such as Thirsty Sound lacks in scenery, it makes up for it by the warm hospitality of the people, making it a worthwhile stopover on a trip. By this stage we had become fond of our most frequent and littlest of visitors to Lilly-Ann - dropping in at every anchorage along our route. Barely had the anchor been snubbed when swallows would descend upon the yacht, noisily claiming ownership to the new floating rock. At Hunter Island the Swallows made the most of our hessian mats we keep in the dingy to trap sand, diving in and out of the dinghy to pluck fibres for nesting. At Thirsty Sound the Swallows were quite cheeky, by lunchtime they were zooming through the cabin, making their way from one hatchway to the another completely unperturbed by the fact we were sitting there watching them! We spent the next week idlelly cruising between the mainland and beautiful little islands. The beauty of this area is that you can sail to a new destination and make it there by mid afternoon - with enough time left of the day to explore or fish before settling down to a cool drink as the sun sinks slowly in the western sky. We visited spots such as Hexam Island, Pearl Bay and Port Clinton. We had heard from other yachties that water could be found along the sands at Pearl Bay and out of interest, set out in our dinghy on a quest for water. Along the headland to the northwest we found that the beach was literally wet, and by digging in the sand down near the water line, found fresh water. We filled a 20 litre drum with this water which then supplemented our supply in the water tanks. After Port Clinton and another set of Swallows we made our way back to Rosslyn Bay. Our first real bad weather was setting in, and we made a dash for the marina from Port Clinton in a weather window, arriving and berthing before the full brunt of the foul weather settled in. We spent the next few days there, setting off on Sunday for Great Keppel, and after spending the night there sailed for Cape Capricorn, where Beth and and her husband, the Lighthouse Caretakers, happily gave us a tour of the facility. The views from the top of the hill are quite stunning with vistas stretching far out to sea and over Curtis Island. The swell at Cape Capricorn was however quite vicious and again we deployed the stern anchor to keep up into the swell. On Tuesday we set out for North West Reef .

Trudy completes the adventure in the next issue.

Marine Electrical Systems
Part IV - REGULATORS

By Cameron Clarke "S/V JUPITER"

A regulator controls the amount of charge current produced by a device. Our discussion will focus on regulators as they are applied to alternators. Marine alternator regulators, or controllers, vary the applied field current (to the alternator) thereby limiting the generated output current (mechanical amplifier) and voltage so as to charge a connected battery and prevent overcharge. In this part, we learn about internal vs. external types, remote sense options, multi-state regulators, By-pass and Shunt types.First let's define a few terms.

Field Current - The current applied to the alternator by its regulator to produce and control the alternator's output current. **Sense Voltage -** The voltage the regulator measures to adjust the field current (the regulator's means to determine what is happening). **Output Current -** Current produced the alternator as a form of mechanical amplification of the field current applied to the alternator. **Battery Voltage -** A voltage measurement made at the battery terminals. **Internal Regulator -** A device mounted inside the alternator that controls and varies the alternator's output current. **External Regulator -** A device mounted outside the alternator that controls and varies the alternator's output current**. Remote Sense -** A separate wire path to measure an input (battery) voltage which is not affected by the internal loading of the regulator. **Multi-State -** Having more than one state of charge, i.e. being able to adapt to the differing requirements of bulk, absorption, and float phases of battery charging. **Gassing Point -** The voltage level where the acid solution in a lead-acid battery begins to boil producing hydrogen & oxygen gasses. **Float Voltage -** The voltage level, that if maintained, produces neither charge, nor discharge of the battery. **Equalization Voltage -** A high voltage of about 16 volts applied to a lead-acid battery to effect a cleansing action on the plates. Can be very destructive and dangerous.

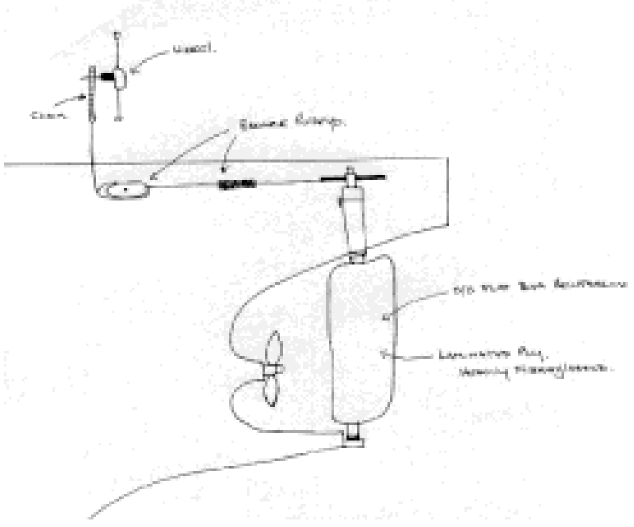
Although the controlling devices differ slightly, both the alternator and DC generator function the same, i.e. more speed or increased field current produces more output and visa versa. Remember, the typical regulator cannot control the speed of the engine which is most likely doing other work. It can, however, vary the field current to regulate the current output at any given engine speed. By varying the field current, the regulator controls the alternator's or generator's output so as to properly charge the battery. How does the regulator accomplish this? The regulator compares the battery voltage (sense voltage) to a reference voltage within the regulator. If the sensed voltage is too low, the regulator increases the field current by increasing the voltage to the field winding. This, in turn, increases the total output current of the alternator. thus charging the battery. When battery voltage rises to a pre-determined voltage and the regulator senses a voltage greater than the set value, then it decreases the field current by decreasing the voltage applied to the field winding, which in turn, reduces the total current output of the alternator. It really is that simple. However, there are a few problems. If the regulator senses a voltage that does not necessarily correspond directly with the battery voltage, then it will control the field winding in proportion to the sense voltage, and may either over or under charge the battery. How can this happen? There are many ways, poor or loose electrical connection, a badly corroded wire, loose or corroded battery terminal, improper wire size, voltage drop in the charging path either positive or negative side, a battery isolation diode in path, etc. Get the idea? The regulator can only do its job properly, if and only if, everything it depends upon is working properly. It is no wonder that so many of us have difficulty with batteries. When experiencing some charging problems, first check all the connections in the wiring path before suspecting a faulty component. Remember from Part 1 our methods to measure voltage drop in a wire path. This is always a good place to start troubleshooting. How does the regulator know how to charge a battery? Well, there a few theories on this, and they basically fall into two methods of thinking, normal verses multi-state charging. Normal charging brings battery voltage up to a predetermined level, often 13.8 volts, and prevents the alternator from producing more by regulating the field current down when the battery reaches that point. This is common in automotive, farm, or general boat use. It is simple and reliable. Multi-state charging defines, depending upon whom you speak with, up to four states of charge for lead-acid batteries. For those of you with my diagrams, refer to the graph of Voltage vs Capacity, the temperature compensation, and 4 Cycles to Battery Charging tables. These four states are known as Bulk Charge, Absorption, Float, and Equalization. Let's define...

Bulk charge is the phase that brings the battery up to about 65% of its capacity. It can be initiated at any time the battery is less than 65% charged (65% full) and is broken into two parts. Let's say we have a 100 amp-hour 12V battery that is just about fully drained, down to 5% capacity. That would mean it contains about 5 amp-hours. Please note this condition is rare and the open circuit, fully rested, battery voltage would be close to 11.2 volts. Now we begin charging with our engine's alternator. The regulator applies maximum field current to the alternator. The alternator at maximum current output is then charging the battery. This continues until the battery reaches about 13.8 volts, the end of the first part of the bulk charge phase accounting for the lowest 40% of capacity. If we terminated charge at this point the battery would contain 40% capacity, or 40 amp-hours in our example. If we plot the rising battery voltage against time (see 4 cycles to Battery Charging chart), we would notice the voltage

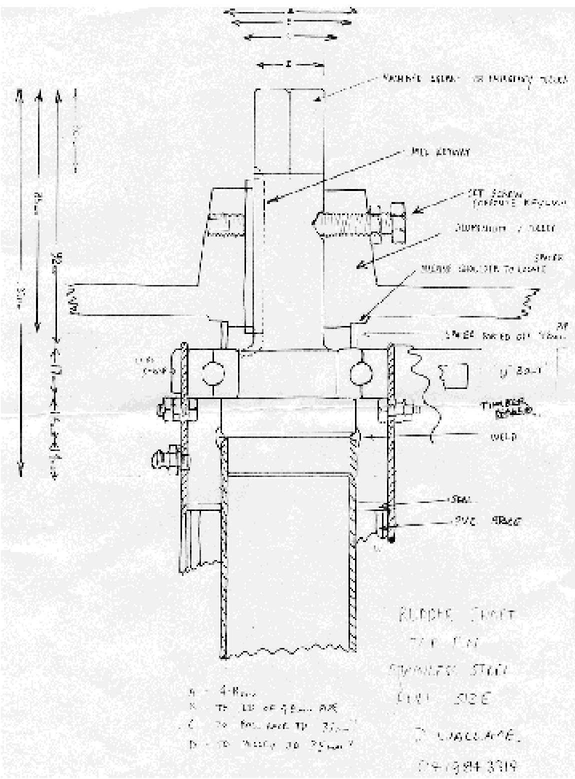
(Continued on page 9)

THE REFIT CONTINUED *By Doug Wallace S/V "Mystery"*

You lucky people going sailing! (Ian&Trudy) I hope to have Mystery back in the water in a couple of years. My solid plywood dodger is finished except for the windows, mainsheet traveller reinforcing, grab rails, windscreen wiper, ventilation flaps and curtains! My main focus for the rest of the year and this summer is getting the hull finished including the added 4 feet on the transom. Last weekend I removed the 22mm propeller shaft and tapped the bronze bearings out of the 1 1/4 inch water pipe propeller tube. I am getting a new 1 inch shaft and will have the bearings bored out to 1 inch. To swing a bigger prop I extended the shaft tube 30 cm . there was a copper tubing grease line concreted in along the top of the stern tube and this was extended to the new bearing position. The bottom of the keel is being extended to support the new rudder heel bearing. (see sketches) I almost bought the quadrant you were advertising, but my rudder is only 75cm x 60cm and I got a 12 inch twin groove alloy v belt pulley which should be strong enough. The balanced rudder has no skeg in front to spoil the laminar flow and should be much improved in efficiency, as well as being right in the wash of the prop for maneuvering under power. My new wheel steering with massive rudder shaft bearings will handle the turbulence and vibration caused by the prop wash. Last month I had the pleasure of meeting Kevin Fleming of Fleming Self Steering Systems, San Diego who was visiting Pt Lincoln. He was brought up here as a boy and was returning to look at buying some land here to retire. (I had already ordered one of his wind vane gears the month before, so it was nice to talk to the designer and discuss my new rudder, transom and wheel steering which can be built to suit the wind vane rather than adapting the vane gear to match an existing setup) At $3,600 Aust before tax it is not cheap, but it is the very best with cast stainless components, not fabricated welded bits, roller bearings throughout, 10 year warranty (including bearings). Next time I am sailing down wind across the Bight I wont have to run the engine as a generator for the autopilot.



To Wayne and Michelle S/V TARA, welcome to the growing band of Floating Footpath enthusiasts. (With a 18 mtr 50 tonne vessel you shouldn't have to yell "concrete"!) To make repairs to the bottom sides while briefly on an expensive slip, this is how I would go about it:



1) Open the wound to expose the damage.

2) Hose with fresh water for about 15 minutes.

3) Set up a battery of borrowed fan heaters to dry the area.

4) Repair steelwork

5) Paint area with epoxy bonding agent (Megapoxy- Vivacity Engineering Pty.Ltd. P.O.Box 71 Hornsby N.S.W. 2077) If a brush can't get through the mesh, thin with epoxy thinners and spray with a household cleaner type plastic spray bottle to wet every thing.

6-A): Plaster small areas with epoxy/ microballoon mix (with a bit of glue powder or cabosil thixatrophic powder in it to prevent sagging).

6-B:) Plaster larger areas with cement (cheaper) but get it on while the bonding epoxy is still sticky. Cement doesn't hang upside down if its more than 5 ml thick so the mesh on lower bilge areas must be fair and within 5 ml of the finished surface. Epoxy filler will hang on much better if you make it stiff enough. While mixing, pick up some on the mixing stick and watch it run off. If it keeps creeping like cold golden syrup its no good, add more glue powder. If a big blob falls off leaving a string that doesn't move, its probably O.K.

7-A) Epoxy repairs can be painted with epoxy (two part) paint as soon as the epoxy filler is stiff enough to stand up to the brush or roller. Epoxy compatible antifouling may be put straight over the epoxy filler without the intervening coat of paint.

(Continued on page 8)

Your Say - Letters

G'Day Guys! We hope you had a great trip north in "Lilly Ann". We are still in CARNARVON, planning to cruise to Monkey Mia in Shark Bay at Christmas. We've been doing a bit of recruiting of late, and will continue to spread the word about Ferro News. Take care all!

Ray and Cindi S/V "Rays Hell"

We certainly did! Ray and Cindi, we dream of the west coast, the atlas lays open on the table at this moment, wondering what a trip from Darwin to Perth must be like. Just the logistics of how we might escape long enough to explore what must be one of the best remote coastal wilderness in Australia, if not the world still remains unsolved. Are we going to see "Rays Hell" venture to the east coast? Maybe we should organise a Ferro Circumnavigation!!

Thanks for the latest copy of "Footpath News" and what a delight it was to read it! At last a mag specialising in Ferro's. I read with interest the article on Insurance and add to the collective knowledge that RACV Insurance has no restriction on ferro's providing they are under $20,000, their current boat ceiling. Perhaps another area of interest is Yacht Clubs with a prejudice to with "HOBSONS BAY YACHT CLUB" in Williamstown Victoria forbids us membership as I quote "they're a lot of trouble ... a risk" So is there an infection we spread or what ... amazing! However I am pleased to report a Marine Engineer with no such problem Mr P Kysil from LUgarno in Sydney who feels the ferro got a bad name because of some rather hasty construction in the past, but despite a few Wally built boats, the ferro is a sound craft and taken care of should last as well as all others.

Robyn and Neil Purvis

Welcome Robyn and Neil. Hope to hear more from you soon! If your encounter with the HBYC was any indiction of their knowledge or experience with sailing or cruisng, it may be best that they be left continue their eutopian existence.

Thank-you for forwarding copies of "Ferro News" - have found them very interesting - with good articles. We have a Queenslander which we live on. Insurance was a problem after Suncorp no longer wanted their "high" premium - NRMA came to the rescue with a premium much lower for a higher sum insured! Other readers may be interested!

Tom Blow s/v "Tahani"

Welcome Tom , we are looking forward to your participation.

Hi All! Sorry about the late subscription, but with time being divided between fitting out my boat and that horrible thing called "work" - there just doesn't seem to be enough hours in the day anymore! My boat is a Fijian 43', she is built using the single shot method of plastering and is coated inside and out with two part epoxy. The finish is better than can be seen on a lot of fiberglass boats. I'm still fitting out the inside and hope to launch her sometime in 1998. As this will be my home once launched I'm using the best material I can afford. All the interior is marine grade ply, covered in white laminex with African Mahogany bench tops and trim. Some details of the boat are as follows: **Hull:** Epoxy coated - mirror finish **Coach House:** African Mahogany, Teak **Masts:** Alloy **Rigging:** All Stainless **Motor:** 75 HP Ford Lees **Steering:** Hydrive Hydraulic **Anchor Winch:** Hydraulic 7t capacity. **Rig:** Cutter Rigged Ketch. I am conducting some tests using different types of epoxy to see how they bond to raw ferro. The test involves coating pieces of ferro removed from my deck for fittings etc and hanging them in salt water to gauge their effectiveness. I will let you know the outcome over the following months. I must go, my glue is almost set. Keep up the good work as it can only get bigger and better.

FOR SALE: I have a Brand New DANFOSS refrigeration setup that I'm not using now. $800.00 ono.

Sean Wynbergen S/V "Distant Horizon"

So when will we see you cruising this way?Also can I encourage to to write an article on selecting and fitting a hydraulic anchor winch? I am keen for information on the subject as I'm disappointed with the performance of my small manual winch that I fitted last year only to find that muscle power could still outlift the winch. Electric winches really need additional battery power and the more powerful manual winches won't fit! To that end I've been pondering a decent hydraulic model!

The fine looking S/V"Distant Horizon" on the travel lift.

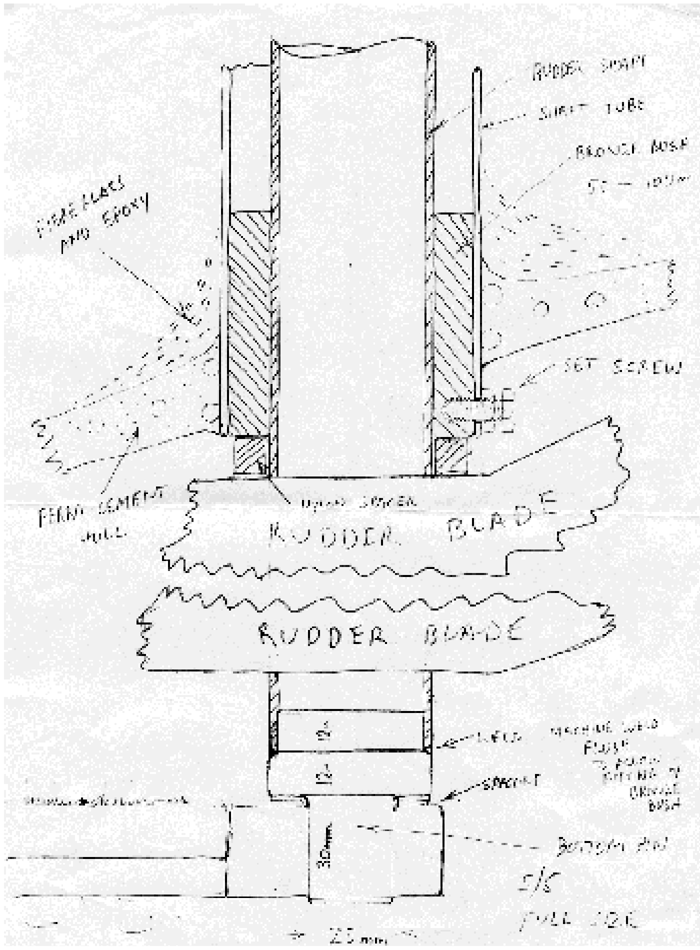
(Continued from page 6)

7-B) Cement plastered repairs should be kept wet, plastic spray bottle with a fine mist of water, but not too wet or it will all fall off! Better to run a bead of sticky co-polymer sealer around the repair and stick a plastic sheet over it to prevent the cement from drying. The cement repair will probably have to be cured for weeks before painting, so just launch next day with bare cement. It will keep curing under water. (They don't paint concrete boat ramps to protect them from sea water) Next month or next year on the slip, clean, acid etch rinse, dry, epoxy and antifoul. best wishes and good sailing !!

CONTACTS

Ian McFarlane
Trudy Snowdon
"S/V Lilly-Ann"
69 Manly Road,
Manly Q 4179
Ph: (07) 3348 6567

Roy Scoon:
Ph: (07) 3395 0248



Rudder Assembly - S/V "Mystery"

STOP PRESS

Readers mights recall that I'm trialling some state of the art kevlar reinforced expoxies (as a marine coating system) supplied to me by Paul Oman (TFT Technolgies) in the US. Gordon Bradford, from Advanced Maintenance System (Australia) has taken great interest in these products and has commenced importing and distributing in Australia. Further more, he is planning to start manufacturing here in Australia with TFT's guidance sometime around February. TFT and Gordon have booked a place at the Underwater Defence Exhibition at Darling Harbour - Sydney 24 -26 Feb 1998. Please let me know if anyone can make the show to make face-to-face contact with the TFT who have been very interested in our problems as ferro cement boat owners.

FERRO NEWS SUBSCRIPTION

4 Issues: 12 Months : $10 (Australia) $13 (Overseas) Back Copies $2
(Subscription renewal period: June. All subscribers mid year receive all back copies for that year)

Name: ______________________________

Postal Address: ______________________________
____

Vessel Name: ____________________ **Port:** ____________________

Design Name: ____________________ **Length:** ____________________

Mail To: Ian McFarlane, 69 Manly Road, Manly Q 4179, Australia

(Continued from page 5)

rises fairly linear with respect to time. As the system continues to charge (part two of the bulk charge phase accounting for the next 25% of capacity), the battery voltage rises non-linear with respect to time, taking a little more time for each additional fraction of a volt. This can continue until the battery reaches its gassing point about 14.4 volts in wet cell (gel 14.2 volts), the end of the bulk charge phase. During the second part, depending upon the regulator, the field current may either remain at maximum, or be slightly decreased. Terminating charge at this point, produces about 65% capacity or 65 amp-hours. Now, let's make a point of distinction. The normal charge method is identical to this bulk charge method up until the battery voltage rises just above float voltage (about 13.5 volts) to say 13.8 volts, or 40% capacity. Float voltage is the level, that if maintained, will neither charge, nor discharge the battery, but will remain the same. As Normal charge is just above float level, it will eventually, over a considerable period of time, bring the battery to 100% and even slightly over because normal charge will regulate the alternator so as to maintain this level for the entire time the system is charging. You will notice the ammeter indicating less and less charge current as time continues until only some small charge current remains so that, after fully charged, will stay charged. In practice, the wiring losses will compensate for the slightly over float voltage setting of the regulator, and because the battery warms up as it charges, the net effect will be the maintenance of float level after some considerable time, and there is no danger of overcharge. Differing here, the Multi-state regulator will continue to increase battery voltage until it reaches the gassing point (about 14.4 volts), at which point it maintains that level of voltage until it determines the battery is very nearly fully charged. This is know as the Absorbtion phase which holds the battery voltage at a constant level during charge and accounts for about 35% of battery capacity. It is important to realize that the battery will be in absorbtion phase any time the voltage is greater than float voltage, only the phase can be completed in less time at or near the gassing point voltage than near the float level. After absorbtion phase, the multi-state regulator then it toggles itself, bringing the battery voltage down to the normal float voltage and acts just like a normal regulator maintaining the float level. The maintenance of float level is also know as "finishing phase". When this condition is reached, you can shut the engine off at any time knowing the battery is fully charged. Why consider a multi-state regulator? Because with it, you can recharge a battery that is drained below 90% capacity faster, and extend the life of batteries that are periodically discharged to 50% or lower levels. Will it harm the ship's electronics? No. Marine electronica can withstand voltages as high as 16 volts. There are several VHF radios that cannot withstand voltages much higher than 16 volts even if they are turned off. It is interesting to note that I have replace many RF Power modules in VHF radios using the S-AV6 Power module where the owner has inadvertently allowed battery voltage to exceed 16 volts, in the case of unattended or unregulated wind generators, etc. This has happened even though the radios are turned off, but the breaker or circuit to the radio was on. Essentially the RF Power module is always connected to the power leads, without running through the radio's power switch. When the Power exceeds some voltage greater than 16 volts, the fuse blows. When the owner replaces the fuse with a higher current one (a no no) because it has blown several times before, the next time it blows the power module! It is an expensive lesson! OK, that brings us to Equalization, the process of bringing battery voltage up to 16 volts and holding there for an hour or less. This causes rapid water loss, and alot of internal agitation of the acid with the plates. It is done to knock off scale, and oxidation from the plates and to make a large bank of series-parallel batteries perform more uniformly. Although this may need be done in large photovoltaic systems of 1000's of amp-hour capacities, I do not feel it need be done for the typical marine house battery system. But at least you know about it. If you decide that your batteries need this punishment, then by all means, make sure to disconnect everything else from the batteries!

Let's return to normal verses multi-state charging methods. Normal charging is the most common method and works well when an engine is started and run a long enough period of time to replenish the small drain on a battery. For instance, in automotive use, the biggest load on the battery is to start the engine. I large number of amps are required to crank the engine over. Then once started, the alternator not only charges the battery, replacing the amps consumed during starting, but also provide the amps necessary to power all the other electrical devices, radio, electric fan, wipers, lights, etc. The battery only has to be big enough to allow reliable engine starting in a wide range of environmental conditions. In practice the starting of an engine consumes less than 10% of the battery capacity. As a consequence, the battery charges to a full state quickly using the normal charge method, i.e. bring voltage up to float level and hold there until shut off. In the multi-state method, it is believed a battery can be more rapidly charged by bringing the voltage up to near the gassing point, holding there until very nearly 100% charged, and then allowing to fall to float level and hold there until shut off. Doing this with a battery that is very nearly full, like the typical automotive use, may even harm the battery by pitting the lead plates more quickly, and should be avoided. However, under typical cruising demands, the house batteries are drained to about 50% capacity, and sometimes more, so many folks like to charge their batteries more quickly, as it may take a normal method eight to twenty hours to charge a house battery from 50% level. Review our discussion of the electro-chemical-mechanical effects of batteries in Part 3. Whereas a properly designed battery and charging system can be recharged in as little as two hours with a multi-state regulator. The reasons to charge more quickly are numerous, less engine heat introduced into cabin in tropical climes, less fuel consumption, less wear on engine (especially light loads which tends to

(Continued on page 10)

(Continued from page 9)

clog diesel injectors), as well as prolonging the battery life by removing deposits from battery plates which occur during deeper discharges. In my estimation, for what it is worth, a cruiser needs both methods. At certain times, the normal charge is necessary, like motorsailing or powerboat passagemaking. For long periods at anchor, the more rapid charge method offered by a multi-state regulator is necessary to replenish the house batteries and extend their life. Although there are many devices available, AutoMac, Ample Power 3-Step, Balmar BRS, Cruising Design, none addresses the full spectrum of cruising needs. That is why I designed my own, the CAC charge controller, which has a switch to enable either normal or fast multi-state charge modes. I refer to it as a multi-state multi-mode charge coltroller for marine use. OK, enough plug, you can read about it

under "CAC Charge Controller" which you will find posted with this seminar

series. Unless, you have purchased one of the above mentioned regulators, you most likely have a normal charging type. But before you run off to purchase a multi-state regulator, there are a few things to do first. Determine your modus operandi, the way you use your battery system. Only if you periodically use 40% or more of your battery capacity should you consider a multi-state regulator system. Review Part 1 and make sure all your connections are adequate. Then go back to Part 2 and review wiring to the alternator, both the output and the ground. Often I have been able to make a simple upgrade in wire size, or move a wire to allow batteries to charge quicker without replacing the regulator. It is cheap and simple, and no regulator, no matter how expensive will cure any defect in the charge path wiring. Do this first! Next, determine if your regulator is internal or external to the alternator. You may have to ask a friend. If it is internal or even mounted on the case of the alternator, you may still be able to replace it with a different one made by Lestek in Texas to accomplish your goals at less cost. Next, if your regulator has a remote sense wire, make sure it goes to the proper place to measure the battery. This will be some point not in the charge path. DO NOT overlook the ground path. A properly configured external regulator requires a minimum of six wires to do the job right. Many models use only four wires and the results will be somewhat diminished. Four wire models share a common ground for voltage sense and field current, and as a result the regulator will error in voltage sensing. You can connect two isolated banks of batteries to one engine alternator. The diode isolator will cause a 0.6 to 1 volt drop between the alternator and battery. A couple regulators allow multiple battery voltage sensors (CAC included) which is the best way. It is important to note that if one of the banks is very nearly charged, the voltage drop in the isolation diode associated with it (internal to battery isolator) will be less as there is less current flowing through the diode, and if not measured separately, may be overcharged by sensing the other, less charged battery. Which is to say, if you compensate for battery isolator voltage drop by the insertion of a sense voltage diode, or adjustable regulator, you may damage one of your batteries. Using multiple sensors, will prevent overcharge of any battery in the system, but may fool the system into thinking the whole system is very nearly charged even though one battery bank is not (due to differing voltage drops in the isolator). When we talked about batteries in Part 3, I pointed out that you get the most amp-hours usage for your investment when the batteries are used to about 50% level and then recharged. A simple system to achieve this is to direct the current flow via a battery switch, so you can manually direct the charge to a particular battery bank. After trying so many means, this is the system I settled on, a battery selector switch, and multiple sensors. Now we need to discuss two other regulators that can be found on a few boats. The By-Pass Regulator ia a regulator that redirects current to another load in order to regulate or reduce current to a primary load. Sometimes used in Photovoltaic (solar) systems, it is more common for wind ot tow generators. Effectively it dumps excess generating capacity from the uncontrollable

source into a resistive load, perhaps a water heater, so as not to over-charge the primary load. It can be a simple voltage sensor that operates a relay to switch power loads. The Shunt Regulator ia regulator that increases the load applied to the generating device (usually solar panels) to maintain a set voltage. These

devices are suitable to small generating capacities (about 5 amps or less) and disparate the excess power as heat. Take care in mounting them and provide for adequate ventilation. The most common use is on Solar panels but is effective for Ni-Cad batteries as well. My favorite Photovoltaic regulator is the Pulse Width Modulated controller made by Heliotrope. It can be set for a variety of voltages, is quiet, and regulates by switching the load on and off very fast, modifying the on time in proportion to the charge required.

MEMBERS *as at December '97*

			Robyn & Neil Purvis	
"C" Mentality	GILCRAFT (SA)	HOWARD (QLD)	Mahesha Goleby	
			Roy Scoon	07 3395 0248
ARANUI	SOUTH SEAS	COFFS HARBOUR	Peter Dight	(066) 52 7155, (066) 52 5744
BEGGARS CHOICE	SAMPSON C-MIST 32'	DAMPIER	Leon Jahn	091 831 659
BEVAREL	WHIMOWAY 14M	WINNWLLIE (NT)	Darrel & Beverley Westlund	
DISTANT HORIZON	FIJIAN	POORAKA (SA)	Sean Wynbergen	W (08) 8222 4216, H (08) 8349 4271
GRATITUDE	47'		P. Ladlow	
HOMER	MAIRICE GRIFFITH	NSW	Russell & Sue Streckfuss	
ISLE OF VIEW	FIJIAN	CORAL COAST	Roger Lindfloss	
L' ALOUETTE	SOUTH SEAS	MOOLOOLABA YC	Robert Hooke	
LADY MARLEN	TAHITIAN	BEACHMERE (QLD)	Colin Stewart	
LILLY-ANN	SOUTH SEAS	MANLY (QLD)	Ian McFarlane/Trudy Snowdon	(07) 3 348 6567
MELRIC II	TAHITIAN	NEW ZEALAND	David & Fran Chown	
MYSTERY	CUSTOM 26'	PT LINCOLN	Douglas Wallace	
			Hartley Ferrocement Boat Owners Association	
OLIVER B BOMMELL	BARQUENTINE	NEW ZEALAND	Captain Barry J Stott	
RAYS HELL	SOUTH SEAS	CARNARVON	Ray and Cindi Jones	0419 866 530
ROCK OF AGES	GOLDEN COWRIE	BUNDABERG	Bob Cooke	
TAHANI	QUEENSLANDER	MANLY (NSW)	T Blow	
TAN T'IEN	HARTLEY	HEMMANT (QLD)	Keith McKlean	
TAVA	SOUTH SEAS	MANLY (QLD)	Len Brind	
THIRD WISH	LEN HEDGES CAPE MORETON 32	(QLD)	Geoff Fowler	
VANORA	RORC 32	COTTESLOE (WA)	Peter Utting	
VIXEN	RORC 32	NSW	Ian Yates	
WISHFUL	GOLDEN CAURI	(VIC)	Janie Chrstophersen & Sol Sutherland	
ZODIAC	KHAN WALKER 40'	CANNONVALE QLD	Keith Fleming	
		WARRIEWOOD (NSW)	Wayne Fitzgerald	