UNLIMITED!

INGENUITY is a valuable quality which, when you come to think about it, is the essence of research and development in any field. Electronics is no exception to this. Ingenuity thrives on constructive criticism of ideas, and suggestions for improvement.

In this feature we hope, from time to time, to be able to publish suggestions submitted by some of our readers on the possible improvement of projects previously described in PRACTICAL ELECTRONICS; short contributions on other subjects may be included. The aim is not to find fault or undermine the abilities or knowledge of our contributors. It may well be that the original article is *par excellence* but could be improved or adapted to suit individual requirements.

We hope that this series will provoke discussion, stimulate thought and further improve our general knowledge on electronic techniques.

Following on the "Magic Boxes" epic last month we are devoting the entire article in this issue to modifications to the "Immersion Heater Economy Circuit" published in our February issue. We have ideas and material for the near future. However, we must emphasise that, whilst limited space does not permit us to publish all your letters, the original authors will be given every opportunity to reply. The views expressed by readers are not necessarily those of the Editor.

IMMERSION HEATER ECONOMY CIRCUIT

MOST OF the letters received on the "Immersion Heater Economy Circuit" suggested that, whilst it may well provide an economy in fuel consumption there was room for further economy on the circuit itself. The remainder of the comments speak for themselves.

SKILLED JOB

I was interested in Mr. Levett's article but think that it is unnecessarily complicated. Also, non-standard adjustment of relays is a skilled job requiring special tools.

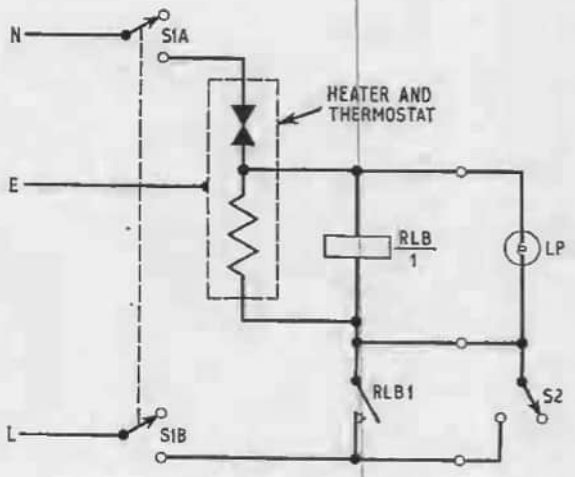
The attached circuit is based on his idea but uses only one relay—the one with the 250 volt coil.

Operation of S2 energises the heater, the lamp and the relay which remains locked on by its own contact. S2 may then be switched off without switching off the heater. When the thermostat operates the heater lamp and relay will be switched off and will remain off until S2 is operated once more. This achieves the one-shot operation of Mr. Levett's circuit but if normal operation is required S2 should be left in the ON position and the lamp would then indicate when the heater was actually on.

The second lamp is not really necessary because, if S2 was operated and the lamp did not come on, it would indicate that the temperature was sufficiently high to open the thermostat provided, of course, that S1 was always left in the ON position.

S2 and the lamp could be one of the commercially available immersion heater switch units wired with 3-core cable to a remote point. Normally the cable would only be required to carry the heater current for a few milliseconds but it should be capable of carrying it indefinitely in case of failure of the relay contact.

A. H. Stewart,
North Harrow,
Middlesex.



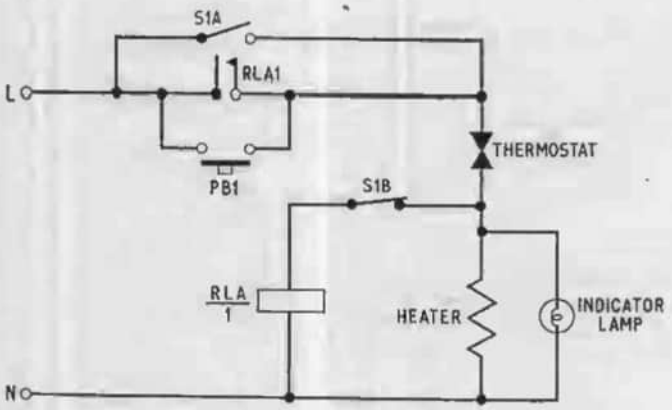
A. H. Stewart's circuit is simplicity in itself and very good. The cable mentioned should be as is used to wire the heater to the mains.

The 1 amp fuse in my circuit was intended as part of the "fail safe" mechanism and would blow if part of the control circuit became faulty. Remember, I noted that the unit and controls should be built upon thick s.r.b.p. (paxolin) or plastic and mounted in an earthed metal box.

A.M.L.

ABUNDANCE

If a housewife requires an abundance of hot water she has to keep pressing the one-shot button. This I think she would probably forget just as much as she would forget to switch off a conventional immersion heater. I respectfully suggest that the following circuit would be cheaper and more practical.

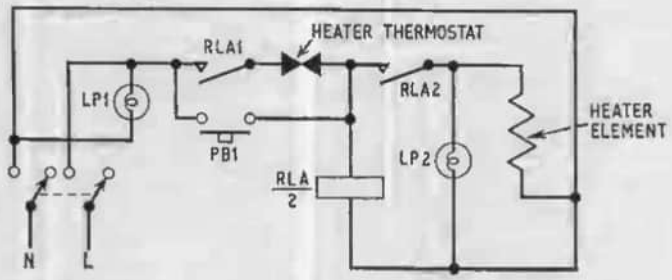


The circuit shows S1 in the "one shot" condition with the thermostat cold. The circuit operation is as follows:

One shot: Push PB1; relay RLA is operated through the thermostat contacts and S1B. Contacts RLA1 close holding the circuit on until the thermostat contacts open, when RLA releases and breaks the heater circuit.

Continuous Operation: Switches S1A and S1B are ganged as a double pole changeover switch. When S1 is operated S1A closes and S1B opens. The relay circuit is broken by S1B and the heater is connected to the mains by S1A. The heater will function according to the action of the thermostat in the normal way until S1 is changed back to the normal one-shot position.

S. H. Bassford,
East Molesey,
Surrey.

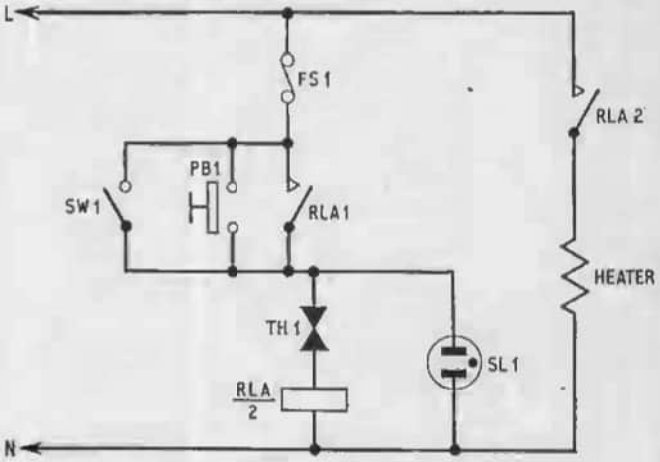


EARTH FAULT . . .

There seems to have been some unnecessary trouble taken with your Immersion Heater Economy Circuit. I should like to point out that if an earth short should occur on the neutral side of the element the heater will stay on. I am enclosing a circuit of my own which seems to be more suitable. The reason for contacts RLA2 is to take the heater load off PB1.

J. Wells,
Bromsgrove,
Worcestershire.

S. H. Bassford and J. Wells managed to fall into a little trap. I regret that the push button will NOT take 15 amp, even for a very small fraction of a second. In fact, it would probably explode with disastrous results. A solution would be to use a microswitch rated at 15 amp. Incidentally, the term "micro" refers not to the physical size of the switch, but to the very small mechanical movement required to change from state to state.—A.M.L.



FIRST CLASS

I regard Alan M. Levett's idea for a single shot immersion heater economy circuit as a first class idea. However, I cannot solve how he determined the necessity for all those relays, capacitors, diodes, etc. From a safety point of view, it is very unwise to place the thermostat in the neutral line of the heater because if an earth fault developed on the neutral end of the immersion heater element it would, if not discovered, boil itself to destruction.

The circuit I would suggest uses only one 15A 240 volt a.c. relay with two sets of heavy duty make contacts. In all immersion heaters I have seen, it is possible to bring out both thermostat leads. Therefore it is advantageous to place the thermostat in the low current relay line, thus reducing contact burning. Mr. Levett's circuit is for all time a one shot, therefore I have inserted a switch across the push button so that at choice, one shot or normal operation can be achieved.

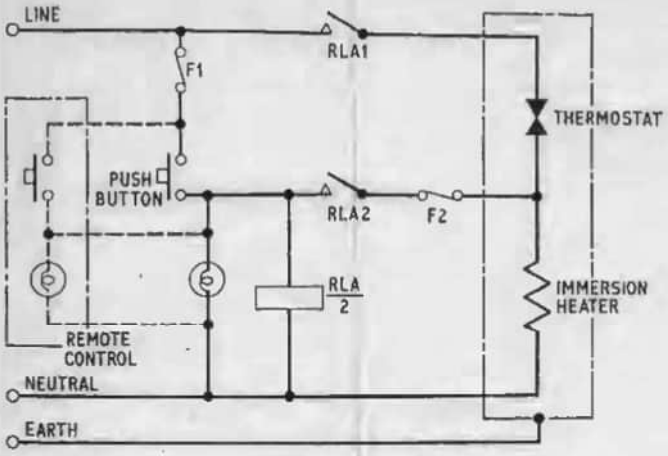
R. Twelves,
Wantage,
Berkshire.

R. Twelves produced an excellent circuit. However, I fail to see his remark about contact burning, for he has a relay contact in the heater circuit. The thermostat, which he has removed from the heater circuit, was designed to take 15 amp without burning.—A.M.L.

. . . DANGEROUS

I should like to point out that in Mr. Levett's circuit, the 1A fuse will not protect the control circuit (including the suggested remote controls) against earth faults, which is a dangerous condition. Here is my suggestion.

Peter A. Collier,
Whitley Bay,
Northumberland.

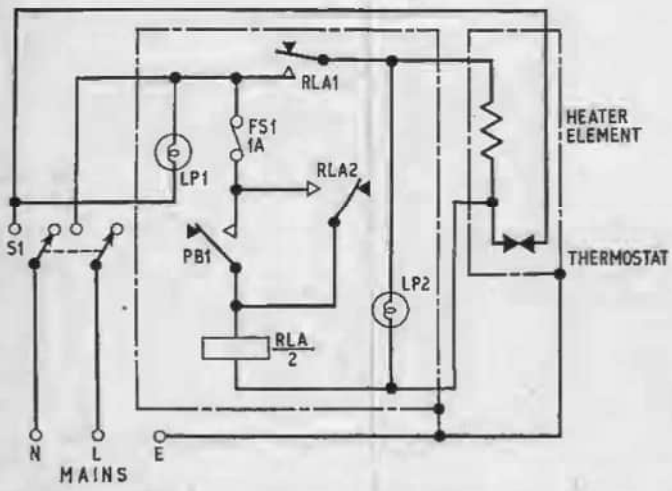


Should contact RLA2 in Peter A. Collier's circuit beat RLA1, then the heater current will be drawn through F1, push button, RLA2, and F2. This means that F1 and F2 will be blown and the push button burnt. This could be avoided by adjusting the relay so that contact RLA1 makes before RLA2. The adjustment of relay contacts is not at all difficult, and only requires time, care and patience.

In actual fact, I did have a very good reason for the circuit containing two relays. With the relay I used in the heater circuit, I found that there was very great contact bounce due to the massive size of the armature, and this did not give a positive operation as I would have liked. As will be noticed, the push button is disconnected after operation, through RLA1 and the relay held in by RLA2, RLA3 switching the main heater relay. As RLA was a low voltage type, some form of voltage drop had to be used. Capacitors were selected as heat is not dissipated to such a great degree. The diode only secures a d.c. voltage across this relay.—A.M.L.

DESIRED RESULTS

I read with interest your article describing a relay circuit for immersion heater control. Unless I have missed the point the circuit seemed to be unnecessarily complex. I believe the simple circuit attached would give the desired results.



In operation from cold the push button PB1 is depressed energising relay RLA, which is held on by contacts RLA2. Contacts RLA1 are now closed allowing current to be passed through the heater and to lamp LP2. When the circuit is broken by the thermostat, switch S1, or mains failure, relay RLA is de-energised releasing the contacts.

F. Pearce,
Biggleswade,
Bedfordshire.

F. Pearce produced another excellent circuit, and I think that his comments have been answered above.
A.M.L.

LAST WORD . . .

The general comment in the letters published was that of damage to the heater due to an earth short. Should an earth fault develop in the heater, how much better for it to indicate its presence, for it MUST be replaced, as in such a condition it would constitute a danger to life. In the event of the system boiling, it will be found that the plumbers have already provided a safeguard in the expansion pipe of the hot water system.

If a continuous supply of hot water were required, it would seem rather an extravagance to fit a one shot device to save fuel. In this case, the best and greatest fuel saving would be in a well lagged hot water storage tank and hot water system. Even with a completely lagged tank, it will be found that the airing cupboard is still warm enough for the job.

A.M.L.