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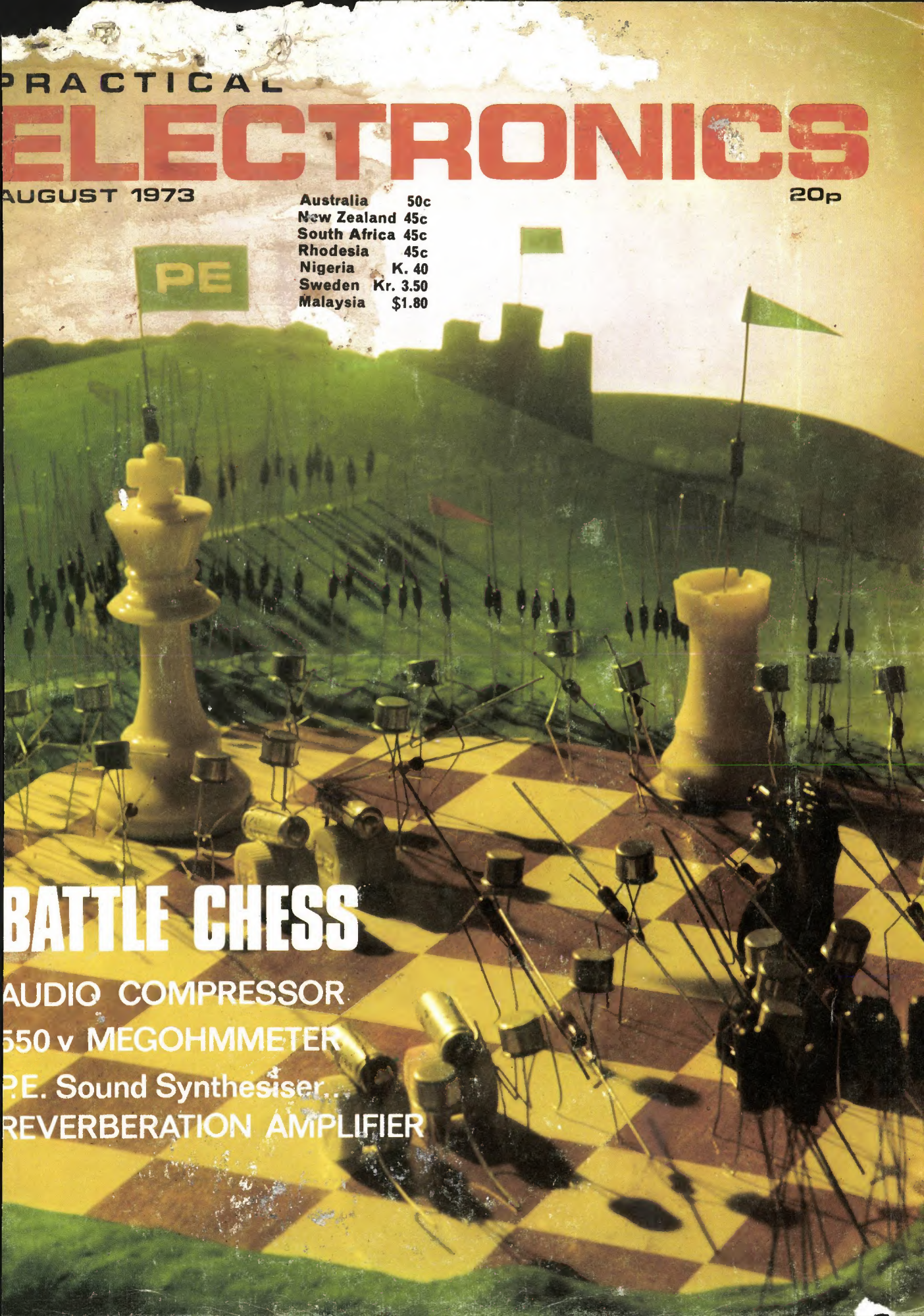


BATTLE CHESS

AUDIO COMPRESSOR

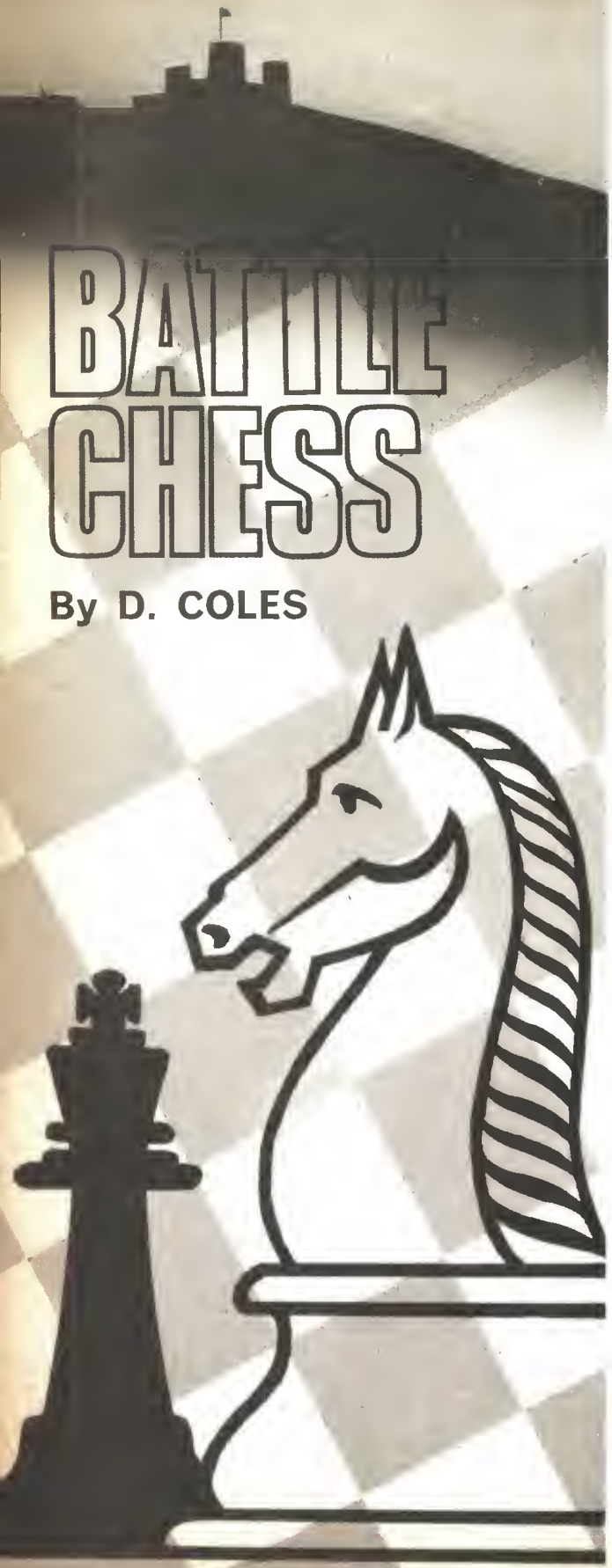
550 v MEGOHMMETER

P.E. Sound Synthesiser...

REVERBERATION AMPLIFIER

BATTLE CHESS

By D. COLES



THE GAME of chess is more Machiavellian than military in its tactics and strategy and the circuit described here provides a version which is much more like the action of a military battle than court intrigue. Thus: Battle Chess.

No claim to originality is made by the author since Edgar Rice Burroughs—of Tarzan fame—once wrote a book called the "Chessmen of Mars" in which the idea was developed fully. The trouble with the Martian game was the requirement for real people, expected to fight to the death. The finding of 32 people willing to play chess in this way would undoubtedly prove difficult but the Battle Chess circuit is designed to simulate the duels which occur.

THE GAME

In basic concept Battle Chess uses the moves of its namesake but introduces a variety of programmable factors which come into play each time there is a confrontation. Thus one piece does not merely "take" its opponent—they have to fight the situation out in an electronic simulation.

PROGRAMMING

A number of factors have been programmed into the simulation circuit which parallel those found in real life military situations:

1. The strength of the various chessmen.
2. The addition of arms which increase the fighting strength of a chessman.
3. The reduction in fighting power due to supply problems (i.e. ditsance between duelling chessmen and their respective King's squares).
4. The proximity of supporting chessmen.
5. The effects of morale.

Combinations of resistors are used to determine factors 1 to 4. Resistance values interact with each other to affect the frequency of multivibrators (see Fig. 1).

Morale, on the other hand, is time dependent, being at its highest immediately after a successfully completed duel. The charge remaining in a capacitor simulates the effects of morale; the charge leaks away to nothing and the probability of winning the next duel drops from exceptionally high for the previously winning player to the normal value over a period of about ten minutes.

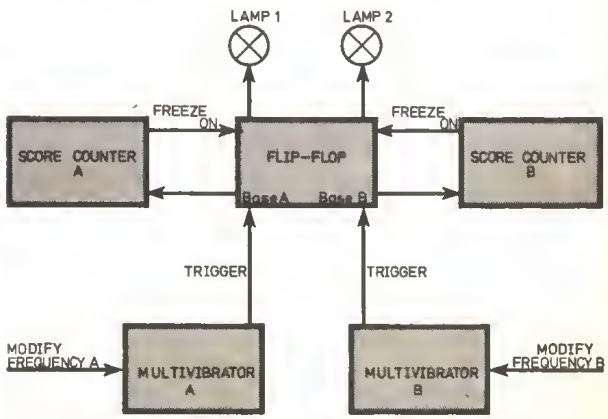


Fig. 1. Block schematic of the Battle circuit showing how the basic units are interconnected

The factors which combine in the game of Battle Chess make it virtually impossible to predict the outcome of a simulated duel. Thus the tactics and strategy which have to be developed by the player are more dynamic, more subject to caprice, than those used in conventional chess and are designed to approximate the real life strategy of a series of military engagements.

THE SIMULATION CIRCUIT

The circuit is shown in block form in Fig. 1 and in detail in Fig. 2.

Two conventional multivibrators A and B have their frequencies determined by external resistances connected between points 1 and 2 and the negative rail. The pulses of each multivibrator simulate the thrusts and parries of a duel and the resistances which combine to set the frequency of oscillation

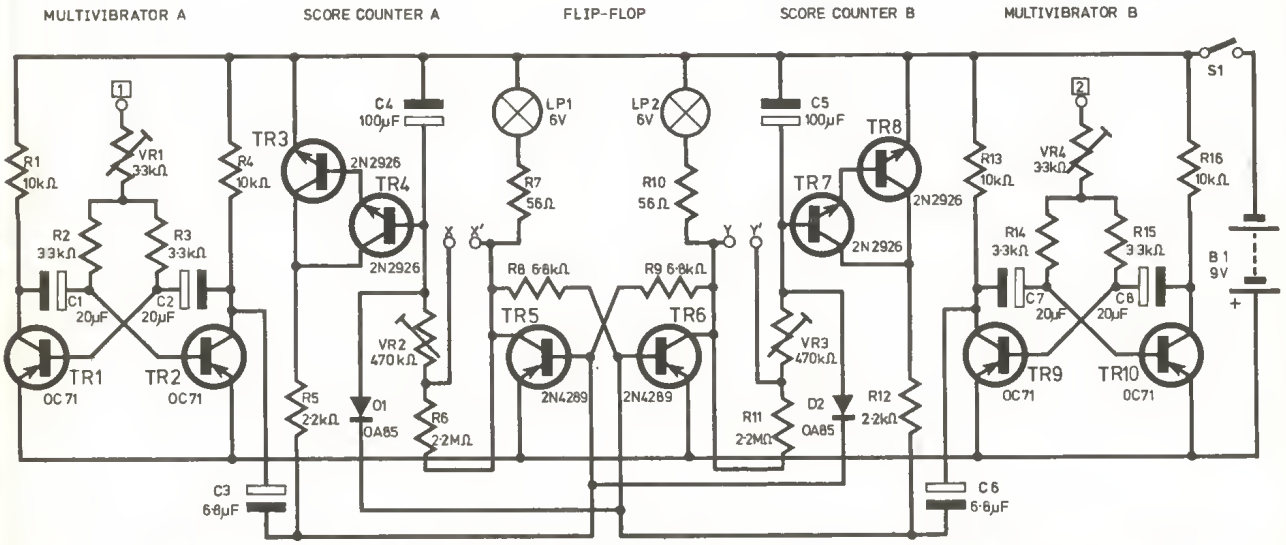


Fig. 2. Detailed circuit diagram of the equipment. When setting the timing of the various sections it may be necessary to select the electrolytic capacitors C1 to C8 if the variable resistors VR1 to VR4 are unable to provide sufficient adjustment to "pull" the periods into agreement

represent the value of the chessman, its distance from its King's square—representing G.H.Q.—and the number of friendly chessmen and their relative positions.

Pulses from each multivibrator are fed to a central flip-flop *via* capacitors C3 and C6. These pulses switch the flip-flop so that lamps LP1 and LP2 are switched on alternately with a continuously varying mark/space ratio. The lamps, as well as providing a visual analogue of the duel, eventually indicate which side has won.

Depending on which flip-flop transistor is ON, a current flows in R7 or R10 providing a potential difference which charges capacitors C4 and C5 through resistors R6 and R11. Additional resistors may be inserted at points XX′ and YY′ to reduce the overall resistance and allow C4 or C5 to charge faster.

These additional resistances simulate weapons used by the battling chessmen. When either C4 or C5 reaches a voltage of about 0·7 volts, the associated score counter, a Darlington pair, switches on, causing two things to happen. The Darlington pair output biases the flip-flop *via* R5 or R12, causing it to freeze with the winning side indicated by the light which remains lit.

The opposing capacitor's charge is neutralised through diodes D1 or D2 so that the other Darlington remains unswitched. The charge in the winning capacitor remains at the switching voltage as long as the lamp remains lit and leaks away once the circuit is switched off. This slowly leaking charge represents the player-army's morale and if a fight is started before the charge has gone, it takes less time to build up to its switching value.

CONSTRUCTION

The simulation circuit layout is not critical and the Veroboard method of construction is ideal.

The multivibrators may be constructed first and checked by temporarily connecting 3·3kΩ resistors between points 1 and 2 and the negative rail. Connect the 9 volt battery and check oscillation with a voltmeter across R4 and R13.

The flip-flop should be built on next, together with its trigger pulse feeds, C3 and C6. Connecting the battery should now cause the lamps to flash alternately in response to the multivibrators and clearly show the variation in mark/space ratio.

When constructing the score counters remember that diodes D1 and D2 must be good ones. A reverse leak on one or both of these, even if only four to five micro-amps, will upset the impartiality of the circuit. Pliers used as a heat shunt when connecting them will reduce the risk of damaging their characteristics.

To test the score counters, connect the battery once more and briefly touch a 10kΩ resistor, connected to the positive rail, to the positive lead of C3. The lights should cease to flash, LP1 should stay lit and LP2 extinguish.

Leave the circuit in this state to check that it is a stable condition; if the situation changes it will almost certainly be one of the diodes at fault. Repeat the test with C5.

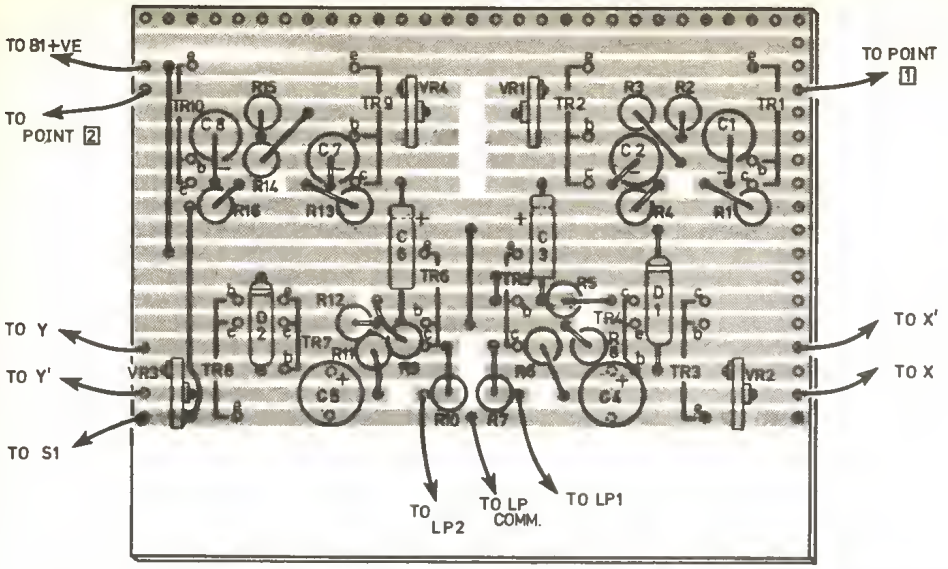


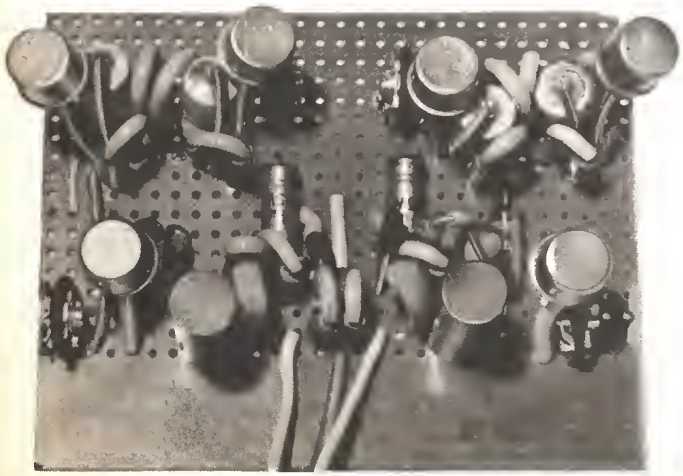
Fig. 3. Veroboard layout of the components on 0·1 inch pitch board. In the present case this was cut from a sheet edge to give a blank area which can be drilled for fixing as required

Finally, test that the flip-flop is charging the score capacitors properly. Temporarily connect a 1MΩ resistor across the points XX'. Discharge the score capacitors by shorting their positive leads to the negative rail before switching on. The lamps should flash for 10 to 15 seconds and then LP1 will remain on and LP2 off. Repeat with the 1MΩ resistor across the points YY' and the opposite situation should occur. Failure at this stage could be due to poor solder joints, leaky diodes or slight tracking between the Veroboard copper strips.

THE PLAYING BOARD

The playing board consists of a matrix of 64 4-way sockets. Each side utilises two of the pin sockets and the connections to each side are similar and may be considered separately.

One of the pin sockets acts as a power feed and is connected to the negative line through a series resistor and a switch contact as in Fig. 4. Current is transferred to the other pin socket through the resistance of the chessman as shown in Fig. 5 and to the multivibrator through a second series resistor and switch contact. The two switches (1-pole, 8-way) act as Rank and File co-ordinates and locate the



Completed circuit board for Battle Chess

COMPONENTS . . .

BATTLE CIRCUIT

Resistors

R1, R4, R13, R16	10k Ω	R6, R11	2·2M Ω
R2, R3, R14, R15	3·3k Ω	R7, R10	56 Ω
R5, R12	2·2k Ω	R8, R9	6·8k Ω

Capacitors

C1, C2, C7, C8	20μF	
C3, C6	6·8μF	All 12V working
C4, C5	100μF	

Potentiometers

VR1, VR4	3·3k Ω	
VR2, VR3	470k Ω	All Skeleton Preset

Transistors and Diodes

TR1, TR2, TR9, TR10	OC71, OC72 or similar
TR3, TR4, TR7, TR8	2N2926 or similar
TR5, TR6	2N4289 or similar
D1, D2	OA85

Miscellaneous

LP1, LP2 6V, 60mA
S1 Single pole ON/OFF (pushbutton type)
B1 PP7, PP9 or similar
Veroboard

PLAYING BOARD

Resistors

R101, R115	4·4k Ω
R102, R116	3·3k Ω
R103, R117	2·7k Ω
R104, R108, R118; R128	2·2k Ω
R105, R109, R114	1·7k Ω
R119, R122, R127	
R106, R110, R113, R120,	1·2k Ω
R123, R126	
R107, R111, R112, R121,	1·0k Ω
R124, R125	
RX (28 off)	10k Ω

Miscellaneous

Four Phono sockets
64 four-way sockets
4 single-pole 8-way wafer switches
Wire, hardboard, 2in × ½in section wood, glue, screws, panel pins.

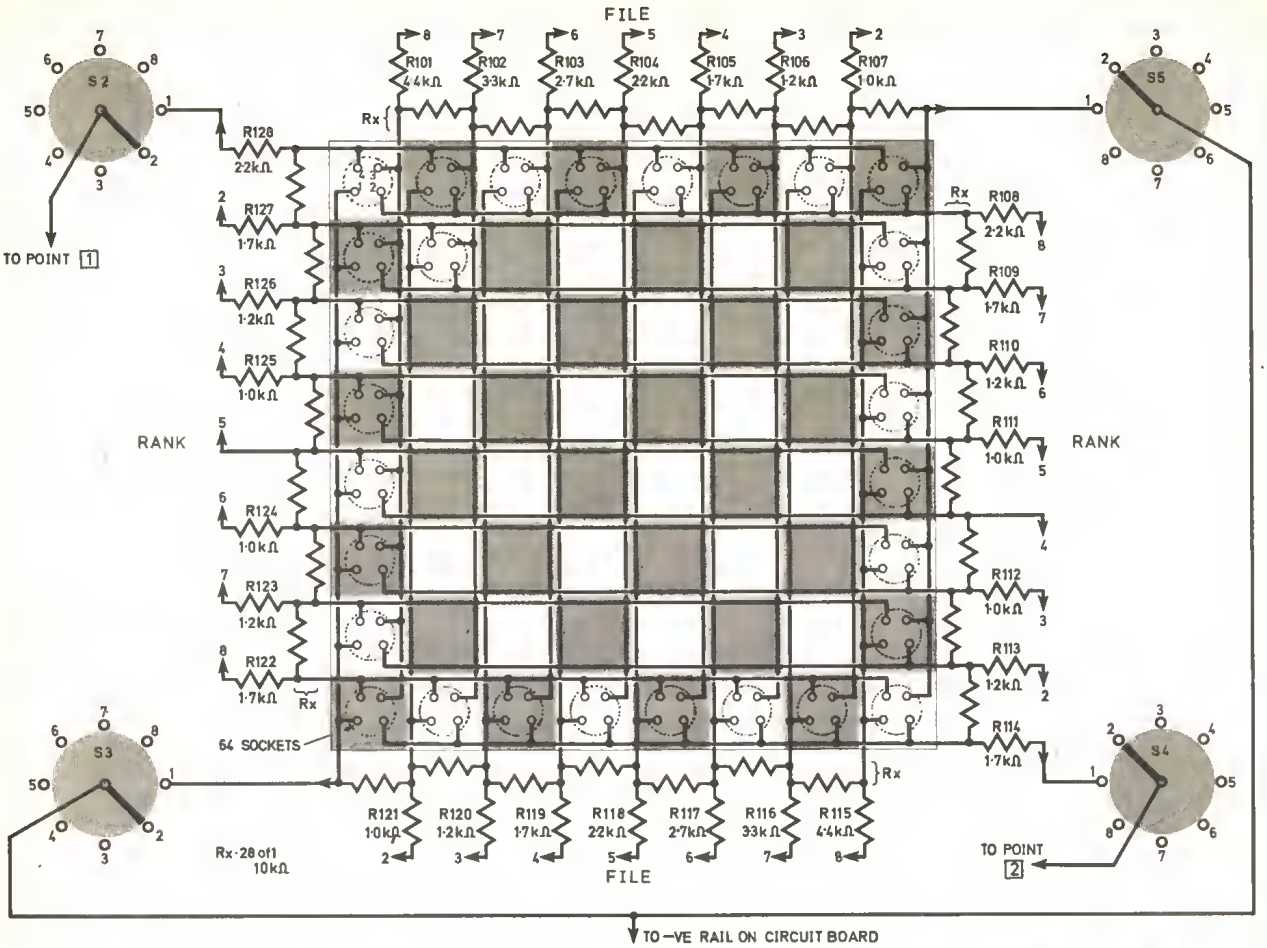


Fig. 4. Wiring of the playing board and Rank & File selection switches. Only the sockets at the periphery have been shown but, of course, there is a socket in each square, wired in a similar manner to all the others

chessmen which are to take part in the duel. The combined resistance of the two series resistors reduces the base biasing current in proportion to the chessman's distance from its King's square.

In addition to the series resistance and the chessman, each Rank and File is connected to its neighbouring Rank or File by a 10kΩ resistor so that a parallel path exists through every other friendly chessman. Thus the number and closeness of the other chessmen modify the final value of the biasing resistance; in effect, they lend their support.

BALANCING

Variations in the chessmen, the weapons, and the playing board resistors are quite in order and may be interpreted as the usual random variations to be found in any army. However, the battle simulator must be balanced so that should an identical situation occur, neither side has a better chance of winning. The four variable resistors VR1 to VR4 are used to balance the circuit.

Starting with the multivibrators temporarily solder a 4·7kΩ resistor to each biasing network at 1 and 2 in turn, using 1 per cent or 5 per cent resistor if possible. Using a voltmeter across R4 or R13, count the number of oscillations in a ten second interval. Using the variable resistors, VR1 or VR4 alter the frequencies until they are, as nearly as possible, equal.

To balance the score counters, temporarily solder two 2·2MΩ resistors across points XX′ and YY′. Switch on the simulator and note which lamp goes out permanently first. Alter VR2 and VR3 until only a small change in each preset changes the lamp which goes out. In between each try, it will be necessary to switch off and discharge C4 and C5.

THE PLAYING BOARD

The playing board circuit is shown in Fig. 4 together with details of switch connections. The 64 sockets are arranged in an 8 × 8 array on a hardboard mounting which forms the top of the circuit cabinet and the playing board. The four single-pole, eight-way switches are mounted two at each end, the press on, press off mains switch, the lamps and phono sockets can be mounted in any convenient position. The line and interconnecting resistors are suspended in the wiring. The wiring can be tied into looms and attached to the inside of the wooden sides with wiring clips. The sockets can be attached with Araldite.

The sides and ends of the cabinet are fastened to the hardboard top with glue and panel pins. The bottom, another piece of hardboard, is secured to the sides with a few screws so that it can be removed for servicing. Dimensions have not been given since size and proportions will vary with the constructor.

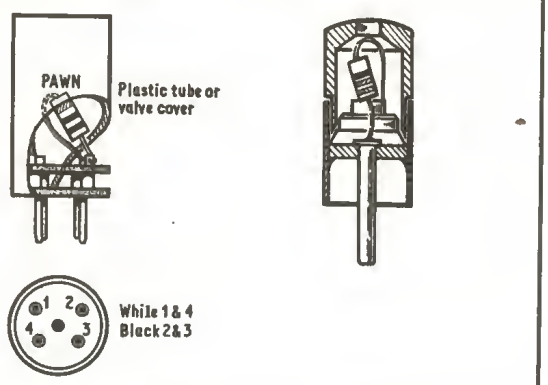


Fig. 5. A suggested form of chessman and weapon

CHESSMEN

Resistors	
King	0 Ω (link)
Queen	330 Ω
Knight	1·2k Ω
Bishop	2·7k Ω
Rook (Castle)	5·6k Ω
Pawn	8·2k Ω
Miscellaneous	
Holders	32 four-way plug bases

WEAPONS

Resistors	
Sword	2·2M Ω
Dagger	5M Ω
Mace	22M Ω
Miscellaneous	
Plugs	Phono plugs in quantity to suit

CHESSMEN AND WEAPONS

In the present example the chessmen are constructed on the four-way plug bases by soldering the correct resistors between the requisite pins as in Fig. 5 and Aralditing a length of plastic tube onto the base. The tube length may be varied to indicate the power of the piece; say three inches for a King reducing to one inch for a pawn. The name of the chessmen should be marked on the outside of the tube. The weapons are constructed similarly, using the phono plugs. Remember the Queening rule for pawns which successfully reach the opposite side of the board and make two Queens for each side.

The more ambitious might wish to mount genuine chessmen on the bases or perhaps even make pieces of their own devising. There are plenty of techniques available today to do this.

FINAL TESTING

When all the wiring is complete and the circuit board secured inside with small brackets, the complete unit may be tested. Switch both sets of co-ordinate switches to Rank 1, File 8 and place a pawn from each side at this position. Switch on the simulator and observe the rate at which the lights flash. Switch off and move the pawns to square: Rank 8, File 1 and switch on; the lights should now flash more slowly. Try the same tests with Kings; the same thing should happen except that the rate of flashing will be higher in both cases. Sometime during these tests a win will be indicated; when this happens, switch off and wait for the score capacitors to discharge, or alternatively discharge by shorting while switched off.

Try adding other pieces to the board in different positions and note the different flashing frequencies of each combination. In some cases the difference will be hard to distinguish since the alteration will be small.

RULES OF PLAY

The chessmen move as for conventional chess and for the same distances.

When one player wishes to take an opposing piece and gain the occupied square, the attacking player must verbally challenge the other. Attacking and defending chessmen should be indicated and the defender cannot retreat from the challenge.

Rank and File co-ordinates are set on the switches to indicate the squares holding each piece. Weapons may be selected at any time and plugged into the phono sockets. The battle simulator is now switched on and the two lamps will flash alternately for, typically, 20 or 30 seconds. The light which remains on after the flashing has ceased indicates the winner who can now occupy the disputed square. The loser is removed from the game and the winner confiscates the loser's weapons for his own arsenal.

TACTICS

The interaction of Player/Chessman/Position/Weapons/Morale alters the probability of any particular piece winning and if two roughly equal chessmen are opposed it is virtually impossible to predict a duel's outcome. The tactics used in Battle Chess can be effective in placing a player in a stronger position.

For example, wherever possible arrange to do battle as near as possible to your own King's square or try to arrange that your own combatant is close to a number of friendly pieces—the more powerful, the better.

Force battles to take place within 5 or 10 minutes of a previously successful battle or fight a delaying action for a similar time if a battle has just been lost. This avoids or uses the morale charge on the capacitor.

Of course there are the obvious comments like "don't throw pieces away in needless battles, they may be useful for support if not for combat" and finally always remember, you may win a battle but lose the war.

NOTES

Although the rules of play suggested follow the rules of conventional chess, the equipment can be used to simulate modern battle conditions quite successfully. The playing board may be marked out with a map, and infantry, tanks, missiles can be substituted for pawns, knights, rooks, etc. In this case, the constructor is left to formulate his own rules. ★