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Chapter III. Methods for finding the connections of a machine.
Alphabets and boxes. .cf. 55th paper on Friedman Square

For any position of the wheels of a machine the letters of the alphabet can be put into 13 pairs so that the result of enciphering one member of a pair is the other member. These pairs are usually written one under the other and called 'the alphabet' at the position in question. Thus the alphabet for the wheel order Green Red Purple and red position 10 14 11 17 is

Y
MS
VL
ZU
HY
JE
TR
OC
IF
XD
EC
AQ
EW
NP

The order in which these are written is immaterial.

When we have two alphabets to deal with it is sometimes helpful to describe both alphabets simultaneously in the form of a 'box'. Take for instance the two alphabets

α β
VM VU
ZJ ON
ES JW
GA HI
NP TM
XR FG
OF EZ
HI LR
|| ||
DW XP
YT YK
UR AC
QC SD

To form a box from these we choose a letter at random, say T, and write it down with its partner in the first alphabet, Y, following it, thus TY; we then look for Y in the second alphabet and find it in YK; we write the K diagonally downwards to the left from Y, thus $\begin{matrix} TY \\ K \end{matrix}$; now we look for K in

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according to the pairs ~~go, ev....~~ (see Fig 13). In any column of the resulting ~~column~~^{set-up} will be found the letters of the alphabet in pairs; these pairs are the R.H.W. rod points which are connected together through the U.K.W., L.H.W. and M.W. with the U.K.W. and L.H.W. in the position 10 14 and the M.W. in the position given at the head of the column in question: this can be verified from Fig 11 in the case of column 10. In order to decipher the part of the message before the first turnover we set up the purple rods according to the pairs in column 10 of Fig 13. This set of pairs is called the 'coupling of the R.H.W. rods' or simply the 'coupling'. The pairs of letters in the various columns of the purple set-up are the possible constations when the U.K.W., ~~U.K.W.~~ L.H.W., and M.W. have the positions 10 14 10 and the R.H.W. has the positions given at the head of the column. We can therefore use ~~it for~~ the set up for decoding up to the first T.O. Afterwards we have to rearrange the rods with the coupling in the 11th column of the red rod set-up (Fig 15).