1. Preparation of Material before Sending to Hypo.

Before sending a job to Hypo the R.H.W. is stripped off, reducing it to 26 smaller jobs. This is done on an adapted C.C.M. machine, which is very suitable for this type of job as it has separate sets of wheels one for going through the machine from input to reflector and the other set going back from the reflector. So to strip off R.H.W. 2 put in wheels 2αβγδδγβαδαβγδ being any 4 wheels or straights and no reflector being put in; then the effect of going through R.H.W. only is produced.

2. Preparation of Catalogue Pairings on Hypo.

Suppose the key is W.O. 627 and rings A Y C and that it is an Oyster job. Then wheels ⌖62 with clips in Z A Y will be put in a converted C.C.M. which is connected with a grid 5 x 65 with 325 small squares corresponding to the 325 possible rod pairings; this grid is opposite to photographic apparatus which can film it instantaneously. I.B.M. (Hollerith) cards can be fed into the C.C. M. machine to give any input letter requirod and the preparation of the catalogue pairings could therefore be done by feeding in A to Z| on the first 26 columns. To avoid the necessity of doing this permanent connections have been made inside the machine so that if it is set to work on the first 26 columns the effect of feeding in such cards is produced automatically. The machine is now correctly steckered, set up to AAF (i.e. immediately after M.W.T.O.) and switched on. Thirteen lights show up on the grid corresponding to the thirteen rod pairings at position AAF and these are filmed; the machine then goes on to AAG and so on. Then it comes to AAE nothing is filmed and so successive exposures are taken at AAC, AAD, ABF. In the case of an Oyster job, there are 26 runs of 676 each in length; on Limpet 26 runs of 17,576 in length.

3. Preparation of Message.

Suppose the message to be fairly short, e.g. 150 letters. Then probably instead of trying each letter as E it will be tried as E, N, S, R, I simultaneously. A pile of cards equal in number to the length of the message will be fed into the machine having E, N, S, R, I, punched in successive columns of each card. The stripped message, punched on five hole tape (this is done by the C.C.M. machine in the original stripping given in (1)) is also fed into the machine. On the grid the five rod pairings corresponding to E, N, S, R, I, with the first letter of the stripped message light up; these remain lit and the five for the second letter light up in addition and so on until the R.H.T.O. position is reached (this is known for each of the 26 stripped forms of the message corresponds to an assumed starting position for the R.H.W.). The first film contains all these pairings and the second film will contain all the pairings between the first T.O. and the second and so on. A certain amount of material is wasted as if a pairing is repeated it cannot be shown up twice on the grid.

4. Comparison of Message and Catalogue Pairings

The film of the catalogue pairings and of the message pairings with ENSRI are now compared with each other. One film runs over the other, a pinpoint of light showing whenever there is a coincidence between the two films. When the total amount of light showing at any one position exceeds a

certain amount, which can be fixed arbitrarily in advance, a light at the side of the machine flashes and it is moved back to this position by hand. A pinpoint of light corresponds of course to true rod pairing for that machine position and the number of true rod pairings is high in the right position so the correct position shows up as a high score.

5. Time

	Limpet	Oyster
Stripping	1 - 1🗁 hours	1 - 1🗁hours
Running Master	1 hour	5 minutes
Processing film	30 minutes	30 minutes
Drying Film	20 minutes	20 minutes
Filming Actual Text	🗁 - 1 hour	🗁 - 1 hour
Projection Time	1 hour	5 minutes
	5 hours	3 hours

6. General Comments

If several jobs can be sent at a time, they can be done more economically than if they are sent at scattered intervals, as the different processes can be carried on simultaneously on different messages. One message can be stripped while another is being filmed, a third processed (developed) and a fourth projected.

Hypo is not fully occupied at present and could take more work. It is working on JN 157 also, but this is a temporary affair as a more suitable machine for this is being built.

As at present working it can only search for high scores and not for low, i.e. it could not be run with the bad letters instead of good ones.

Exact tables of relative probabilities of various scores in right and wrong positions are not used; the average right score is estimated roughly and a target set slightly below that. A quick run through is made to see if the right position is picked up as some thing outstanding. If this fails, a second run is made with a lower target and positions examined in order of merit.