The work of transmitting a message in cipher by means of the cipher printing telegraph equipment may be divided into six steps as follows:

1- Preliminary operations including timing, numbering, and counting words,
2- Perforating
3- Enciphering
4- Deciphering and checking at Sending Station
5- Transmitting enciphered message over line
6- Deciphering and checking at Receiving Station.

Under normal conditions these operations overlap, i.e. different messages or parts of messages are simultaneously passing through these various steps. The apparatus is so arranged that each message may be deciphered as a check before it it transmitted over the line (step #4). It is thought however, that if the work of counting words, perforating and enciphering are carefully and accurately performed step #4 may be eliminated with a resulting saving in labor and apparatus.

The method of performing these six operations is described in detail in the "Operating Instructions" for local and line operating sets. The six steps are also explained in general terms below.

1- PRELIMINARY OPERATIONS.

Each message should be timed on its arrival at the Cipher Bureau as a check on any subsequent delays in handling. This is done automatically with a time stamp. The words in each message should also be counted in accordance with ordinary telegraph practice. Each message should be stamped with a serial number before perforating.

This work may be performed by the perforating or enciphering operator, or if desired, all except the numbering of the message may be performed by a receiving clerk. The message number, time and word count are to be transmitted as part of the message.

2- PERFORATING.

In performing this operation a "perforator" having a keyboard similar to that on a typewriter is used and by this means a perforated paper tape is prepared on which each character of the message is represented by a transverse row of holes. These holes are perforated according to a standard printing telegraph alphabet of 32 characters. As this same code is used in connection with the regular "multiplex" and "start-stop" printing telegraph systems, it need not be explained here.

In addition to the characters of the message proper, the message serial number, filing time, and word count are also perforated in this tape as well as certain characters represented the settings of the "key tapes" as will be explained later.

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3- ENCIPHERING.

This operation produces an "enciphered message tape". The holes punched in this tape represent characters formed by combining the characters of the original message tape with the characters of two "key tapes" The key tapes produce what is in effect an extremely long "running key" and if the tapes are properly handled, this key will never repeat. The key tapes are known as the "A" and "B" tapes and should be made and used as directed in the instructions on "Key Tapes".

The enciphering operation after being perperly started is automatic and may proceed while the original message tape is being perforated.

A switch is provided by means of which the action of the key tapes may be stopped. By using this switch, a certain number of characters at the beginning and end of the message tape are reproduced without being enciphered. Included with these characters are the letters designating the settings of the key tapes, the message serial number, and a series of characters which indicate to the receiving line operator the beginning and end of the enciphered message.

4- DECIPHERING AND CHECKING AT SENDING STATION.

This operation produces from the enciphered message tape, a printed copy of the original message including the message number, check etc. Except for possible errors in transmission, this copy is exactly the same as the one which will be produced at the receiving station when the message is deciphered there.

The tape is deciphered by first setting the key tapes as indicated by the first six characters of the enciphered mess age tape, and then running the enciphered message tape through the machine so that its characters combine with those of the key tapes to produce the characters of the original message. The message characters are printed out automatically in page form.

The deciphered copy and the original message should be carefully compared and the words in the deciphered copy counted and compared with the "check" printed at the top of the sheet.

5- TRANSMITTING.

The enciphered message tapes may be transmitted over any printing telegraph circuit using either "multiplex" or "start-stop" aparatus, if suitable receiving equipment isadded. The enciphered messages are received in the form of perforated tapes and therefore a perforating mechanism or "machine perforator" must be added to the receiving equipment.

A machine perforator may be added to any printing telegraph set by removing the printer unit and substituteng the machine perforator for it, but if this is done it will not be possible to print service messages or other messages which are sent in plain English. For this reason, a shelf which may be attached to any "start-stop" table for mounting the machine perforator, and a small table which may be attached to any "multiplex" table for the same purpose have been designed. When this shelf or table

is used, incoming messages may be printed or received on tape or both at
the will of the receiving operator.

In order to identify the message, indicate its destination, and inform
the receiving line operator thatthe message is in cipher (and therefore
must be received on tape) a short preamble is transmitted with each message.
This preamble is transmitted by the line operator at the sending station
in the usual way and is received on the printer at the receiving station.
After receiving such a preamble, the line operator at the receiving station
switches on the machine perforator and switched off the printer so that the
enciphered message will be received as a perforated tape similar to the
"enciphered message tape" at the sending station.

6- DECIPHERING AND CHECKING AT RECEIVING STATION.

Thetape which is received over the line is deciphered at the receiving
station by the following the same procedure as outlined above for decipher-
ing at the sending station (step #4).   This produces at the receiving sta-
tion a printed copy of the original message including serial number and check.
The words in this message should be counted and compared with the number
given in the "check" and the message should be examined for errors.   In
correcting errors etc, the same procedure may be followed as for handling
ordinary telegraph traffic.