REF.	CONTENT
HW 14/70	Directorate of Gov't Code & Cypher School, WW2, EWT to NY with details of German Hell system
Ref. 22A	Letter entitled "Hellschreiber", from Travis (Directorate of Gov't Code & Cypher School) to Mr. Bayly (in New York), dated 18th March 1943, 3 pages. Summary: technical information, in addition to letter of 16th March 1943; **Research Section of the Foreign Office has decided to develop a [universal] machine** to cover all speed ranges [= keyboard-sent German Hell-Feldfernschreiber & machine-sent news agency Presse-hell]; printing head and magnet unit are copied from original commercial German machine with minor modification; universal type DC motor with "complicated" governing device is replaced with synchronous [AC] motor normally used by Creed & Co. in their Wheatstone senders; speed adjustment is done by varying the working points of two friction disks; relays to make a convenient [remote control] start-stop device (operated by short or long signal) has been eliminated, as traffic could be lost by interference causing inadvertent "stop". Majority of Hell transmissions uses 7-line font, and original intent was to make another machine, especially for 12-line Hell font [basically changing the turn direction of the printer spindle], but the 7-line machine makes "fairly good record" of 12-line transmissions (though upside down). Calculations given for 12- and 7-line Hell transmission speed compared to Morse. Mention of German "tone teleprinter" circuits for point-to-point services; initially Germans used 2-tone operation ("mark" + "space"), then changed to **5 tones**: 3x "mark" + 2x "space, tone reversal possible, all tones lie in land-line voice frequency band 300-2340 Hz, tones separated by 360 Hz (e.g., "space" at 540 Hz, "mark" at 900 Hz, "space" at 1260 Hz, "mark" at 1620 Hz, "space" at 1980 Hz; purpose: minimize effects of selective [= tone-frequency dependent] fading.