exceedingly light and is absolutely uniform in every part of the keyboard. It is not too much to say that the transmitting typewriter excels all others in speed, ease and uniformity of touch, permanence of alignment, manifolding and durability.

The transmitter part of the transmitting typewriter make it possible for a telegraph operator to transmit Morse signals which are absolutely perfect by touching the keys of the keyboard. The touch used is the ordinary quick staccato typewriter touch. Each Morse signal and the elements of which it is made up, namely, the dot, dash and space, are transmitted by the mechanism of the transmitter with absolute accuracy and uniformity, independently of the skill of the operator. The space between the signals, however, is entirely within his control, so that he can space the letters in difficult words more widely than in others and use that fine judgment possessed by all intelligent operators, which is absolutely inseparable from efficient telegraph work, and which it is asserted no mechanism will ever be able to supply.

The Zerograph. Wonderful as the previously mentioned adaptations of the typewriter may be, probably the most wonderful of all is the machine to which we now make reference, namely, the Zerograph of Mr. Leo. Kamm, of London. The apparatus consists in the main of a typewriter, which can be used for the purpose of receiving or transmitting messages, together with the general instruments which are used for the despatch or receipt of ether waves. The most important, however, of all the apparatus is the typewriter portion, or Zerograph, as it is technically called. In general appearance the machine is not much unlike an Ideal-Hammond typewriter. The keys are contained in a circular row, and on the depression thereof, not only is an imprint recorded upon paper in the usual way, but they also transmit through the air two ether waves, which cause the distant receiving typewriter to record the same letters upon a paper tape, in manner similar to that of the Morse instrument already mentioned.

Though similar in working to the ordinary typewriter, the principle and mechanism are widely different. The type-keys are arranged in a quadrant, there being twenty-eight keys whereof twenty-six are allocated to the usual alphabetic purposes. There are, in addition, two shift-keys for figures, etc., and these also serve for spacing

purposes. The types are arranged on a type-wheel or quadrant, as in the earlier models of the Hammond, and move up and down on the post according to the depression of the shift keys. On the depression of a key, the futher end of the lever tilts up, and forces up a check-pin, which not only arrests the movement of the wheel, but also sets in motion the synchronizing arm, and the first impulse is sent to line [sic]. "This arm, which is the most vital part of the apparatus, and travels in a vertical plane, is operated from the axis of the circle, corresponding to the quadrant, and travels round the circular path until its progress is arrested by impact with the projecting check-pin of the depressed type key. The corresponding letter is then printed, and the synchronizing arm is then returned to its original or zero position by means of an electro-magnet." From this it will be seen that what in the Hammond is termed the driver-arm (that is, the arm which directs the movement of the type-wheel), serves not only its original purpose in the Zerograph, but also sets the synchronizing movement in motion, in manner not unlike in theory, but differently in practice, to the synchronizing gear previously mentioned.

It would be impossible, without a very lengthened explanation and the use of much highly technical language, to explain the method by which the various movements are made, but a fully detailed account may be seen in *The Scientific American* for October 17th, 1903.

This machine takes its name from the fact that after the depression of any type-key, the synchronizing arm must return to the normal point of rest, or zero, before another type can be printed, and for this reason misprints are rendered almost impossible. A speed of thirty words per minute can be attained by an operator after very little practice.

To apply the Zerograph to wireless telegraphy, it is only necessary to connect it to the usual apparatus utilized for that work, the typewriter being substituted for the Morse transmitter. To ensure satisfactory and successful operation, however, the inventor has also devised several special contrivances, such as an automatic coherer to enable rapidity in transmission and receiving to be attained, and other items.

The Zerograph is stated to be most favourably adapted to ether communication, owing to only two impulses being necessary to transmit or receive any sign.

In view of the possibility of developments of this machine, therefore, there would seem to be no reason why a man sitting at his Zerograph in London, may not, in the future, be able to hold written converse with his correspondents in the furthermost parts of the globe, wihtout the intervention of any actual physical connection.

Note: Pages 313-314 are missing from the Google scan of the University of California copy of this book. I have retyped their text here using the 1985 Dan R. Post reprint as a source (as the text is in the public domain in the US). I have not, however, reprinted from it the image which appeared on this page (as Post asserted new copyright on his edition and claimed that he did image enhancement). It is a cartoon depicting a donkey typing on a fictitious typewriter (not a Zerograph), the keys of which resemble hooves.

THE HISTORY OF THE TYPEWRITER:

Being an Illustrated . . Account of the Origin, Rise and Development of the Writing Machine.

BY

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1909

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