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CHEMICAL REACTIONS FROM TYPEWRITINGS

H. E. Cassidy†

The past fifty years have seen our courts often pothered, and at times intrigued, by the spurious typewritten documents in evidence before them. Many were poorly done, others were indifferent, and a few were well executed. Entirely too many of them succeeded in their purposes.

As the use of writing machines has grown, fraudulent documents have increased until now they are everyday occurrences. Some of the questions arising are: on what make of machine was the document written; was it written on this particular machine; did this particular person write it; is the writing as old as it purports to be; were all the writings done continuously at the same writing; were all the writings done with the same kind of ribbon?

Discovery and demonstration of the facts in such cases are daily accomplishments of document examiners, except those facts resting on whether or not all the typewritings were done with the same ribbon or same kind of ribbon.¹ The determination of the facts in these instances are always difficult and oftentimes impossible unless there are wide differences in the thread counts,² or obvious differences in color density.³ If these evidences are unavailable, the conclusions arrived at by the examiner are necessarily based on other things of a non-demonstratable character which forces him to present his evidence in the form of "opinion testimony" before court and jury. When, in such instances, opposing counsel is armed with an adequate knowledge of typewriters, and is skilled in the art of cross-examination, the subject provides ample opportunities for him to rowel the ribs of the most robust witness.

Among the embarrassing questions he can ask are the following. Do all typewriter operators have the same "touch?" Do some stenographers strike certain keys, and combinations of them, harder

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¹ Around 95% of typewritten documents are prepared with black ribbons, and all such have carbon as their main color ingredient. Carbon is an element which does not react to chemicals.

² Thread counts of typewriter ribbons vary from possibly 250 to 320 per square inch, according to quality, with the best ribbons having the highest counts.

³ The amounts of ink with which ribbons are impregnated are designated as light, medium light, medium, heavy medium, heavy, and extra heavy. The medium degree, because of its universal usage, is taken as the norm at 100%. Heavy medium inking gains 15% in ink life over medium. Heavy gains 35%, and extra heavy gains 45% over medium. Light medium inking recedes 15% in the ink life from medium, and light inking decreases 30% from medium.

than others? Does not a heavy stroke produce a darker writing than a light stroke? Do some stenographers pound the keys harder when writing oft-repeated words? Does the lower or upper half of a typewriter ribbon wear out first? Does the upper part wear out first because the lower case letters are used most and these hit on the upper half of the ribbon? Do all typewriter ribbons eventually wear out? The unused part of the ribbon after a time will write much darker than the upper part, will it not? Are most standard typewriters equipped with a device for shifting the ribbon? If this device is shifted, the writing takes on a darker complexion, does it not? Where on the typewriter is this device located? Is this device sometimes shifted by accident? Are you prepared to say that the affected writing in controversy *was not* caused by an accidental shifting of the ribbon? Is it not possible and highly probable that the writing in issue about which you have been "opinioning" was produced in some one of the many ways which have been brought to your attention?

The very asking of these questions would impress a jury. Some are not germane, but all of them are logical-sounding. The admmissive answers which an open and above board witness would have to make could hardly help from raising in the minds of the jury an element of doubt as to the correctness of the witness' conclusions. Questioned Documents, like accused persons, are presumed to be innocent until proven guilty.

Had the witness in this case, when giving his direct testimony, been prepared to show by tests made in the presence of the court and jury, that the disputed writing had been made with a ribbon containing an entirely different ingredient than the ink of the rest of the writing on the page, the burden of proof would have shifted to the other side of the case. There would have been no cross-examination. Thinking of plausible explanations would have been uppermost in the cross-examiner's mind.

Tests of typewriting in court have never been feasible. An entire page of typewritten matter, when assembled, contains but a small quantity of ink. With such a small amount of material it would be difficult for the most competent chemist to break down, isolate, and identify its several elements. The operation is not a simple one. A well equipped laboratory would be necessary. A court is no place in which to make complicated tests nor to attempt extensive analysis. At least one of the litigants would refuse to agree to the tests. Courts frown on mutilations of exhibits. They would hardly sanction the total destruction of a document in evidence even if first faithfully recorded photographically.

Until recently, there was no suitable chemical or chemical preparation, known to this writer, with which acceptable experiments

or tests could be made of typewritten matter. The reagents capable of distinguishing between typewriter inks, to any extent, either marred the document, obtained fugacious results, or were otherwise unsatisfactory.

Lately, there came to hand a preparation made up of several chemicals with which typewriting can be differentiated with better effect than heretofore. Immediate contacts were made with the manufacturers of nationally known brands of typewriter ribbons.⁴ Some two hundred different ribbons were obtained from them and other sources. Many tests and experiments have been made on writings with these ribbons. It is not the purpose here to discuss the chemicals used. Reputable examiners of questioned documents located at strategic points throughout the United States are informed on this new development, and they are making independent investigations. Additional discoveries can be expected.

A brief description of the general makeup of typewriter ribbons is necessary to an understanding of the subject of chemical distinguishment between typewritings.

The better ribbons are made of long fiber Sea-Island cotton produced on the islands off the coasts of South Carolina and Georgia, and while the majority of ribbons are of cotton, a few are of silk and rayon. The basic color ingredient of the black ink with which these ribbons are impregnated, is carbon which has been mixed with either vegetable, mineral, animal oils, or combinations thereof. The inks of some ribbons are of carbon mixed with acids.

Carbon, even in its purest state, is not a true black. It is gray or brown. Mixing with oils or acids does not produce an ink of sufficient blackness. Makers of typewriter inks, to correct this deficiency in color, add other coloring matters which are known to the trade as "Toners." The intensified blackness given the inks produce writings more pleasing to, and causing less strain on, the eyes.

Some ink mixers prefer pigments, while others consider dyes best for toners. There appears to be but little choice between them, as all of this country's standard makes of typewriter ribbons are of excellent quality. The methods followed and the formulae used are valuable trade secrets which belong to their originators. It need be said here only that there are at least four different kinds of pigments and at least four different types of dyes in use as toners. It is these toners and other qualities of American typewriter ribbons that enables one to chemically distinguish between them. Time may bring forth more information, but on the basis of present knowl-

⁴ The author's sincere thanks are hereby tendered to these companies for their courtesy and friendly cooperation.

edge alone, typewritten matter may be divided into seven distinctive classes or groups:

1. Those with *non-active* toners.
2. Those with toners reacting a *bright blue*.
3. Those with toners reacting a *dark blue*.
4. Those with toners reacting a *wine color*.
5. Those with toners reacting *dark, medium, and light purple*.
6. Those whose carriers (oils or acids) are of a nature which causes the written characters to take on a *halo* under certain tests.
7. Those whose carriers are of a type that they do not give off the *halo*.

The tests which produce these reactions and effects does not affect the carbon of the writings, the results being obtained from the toners and carriers only. As the tests can be made with the minutest quantity of reagents, and on an infinitesimal portion of the writing, such tests should not be objectionable to any fact-seeking tribunal. The evidence of some of the tests disappear within ten minutes simply through evaporation. With proper care residue of the other tests can be successfully removed.

Regardless of the harmlessness of these tests, those representing "the wrong side of the case" will, in response to the frantic importunities of their clients, strenuously object to the making of them.

The use of toners in the preparation of inks is an old art. Hundreds of years ago, makers of handwriting inks of the gallo-tannic or iron varieties started improving the immediate writing qualities of their handiwork by adding provisional coloring matter. Freshly-made iron inks write a dull brown unless toned up with added color, as the iron in ink does not oxidize and turn dark until a lapse of from two weeks to a month. Mixers of typewriter inks, in adding toners, are simply adapting this ancient knowledge to modern requirements, and they have been doing this for a long time. Tests made on typewritings many years old show that toners were in use then that were of some of the same types in use now. It can therefore be safely said that differentiation of typewritten matter is not confined to recently written documents.

The words "Differentiate" and "Distinguish" used throughout this presentation must not be confused with the word "Identify." The writings of different classes of typewriter ribbons of the Black Record variety can be "distinguished" but they can not, at this time, by any known means, be "identified" in any conclusive manner as the work of a particular brand or individual ribbon.

Criminal, Chancery, and Civil Courts will appreciate the legal value of the ability to distinguish between the writings of different typewriter ribbons. Those who preside over these courts will recall the altered deeds, raised checks, "Paid In Full" checks, words added to wills, faked doctors' certificates, altered notes, doctored affidavits, and other forms of typewritten documents that have come before them, which remained unsolved problems in spite of all their efforts, the endeavors of the attorneys on "the right side of the case," and the ability of the "friends of the court" who were called in.

The question of whether or not all the writings on the same page were done with the same ribbon or kind of ribbon will continue to pester our courts, but henceforth these problems will not be, in many instances, the posers they have in the past.

When in open court simple tests on a questioned writing produces a decidedly different color reaction from that of any other parts of the writing on the page, those who are attempting to seize upon something which is not rightfully theirs, will not be so likely to get it as have many in the past. The only thing of any real value they will receive is a vitriolic tongue-lashing from their own lawyer setting forth his personal opinion of those who have no more gumption than to mislead their own counsel.

High-standing ethical attorneys have the most acute sensibilities, and they will never forget those who bring public humiliation upon them.