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Individualizing Oil Delivery Imprints

How can a defendant get a fair trial when charged with rigging a series of fuel oil delivery slips in a period of fuel shortages and energy crunch? This is a problem for the courts and defense attorneys, but the document examiner in the same case can be faced with an unusual problem. How can the source of the slips be established? Are they from one meter? Or from several? Such a determination might well reveal significant evidence relevant to the indictment.

How these slips are individualized involves the same basic rules of identification which are applicable to all document problems. There must be an unique combination of individual identifying factors to eliminate any chance of accidental coincidence. What are these individual characteristics, and how are they distinguished from class or group characteristics? The answers to these questions can only be derived from a study of the manner in which the meter printout unit functions and becomes individualized.

The Meter Printout

Fuel oil and gasoline delivery trucks are equipped with a meter which measures the amount of oil pumped from the truck and a synchronized printout device which records this data on the delivery ticket. The design and mode of operation of this printing unit has a significant influence on the individuality of the resulting ticket imprint.

The printing unit consists of a series of concentric rings with ten digits, 0 to 9, on each. The digits are raised faces not unlike the type of typewriters or adding machines. Most machines print seven or eight digits from corresponding rings, four or five of these recording the amount of fuel delivered and three recording the delivery or sales number. The three digits of the sales number appear in the left columns and are spread slightly apart from the digits which record the number of gallons delivered. With some machines code letters appear between the two sets of digits. Machines with four digits for the fuel delivery record in gallon units only, up to 9999 gallons, while those with five digits also record tenths of a gallon. The various rings of digits are so geared that when the right hand one revolves through its ten digits, the next ring to the left advances one unit (Fig. 1).

When a blank ticket is inserted in the machine, it is printed by being slapped against the typefaces by a hard rubber printing pad or block. This pad is driven forward against the back of the ticket by means of a strong spring drive. Thus, the paper and printing pad unit strike the typefaces with a sharp impact. The machine has no ribbon so the type is printed on the ticket by means of carbon paper interleafed between the sheets of the delivery ticket. The top sheet of relatively thin paper is actually printed on the reverse side but can be easily read from the face. With a three-copy ticket, the other two sheets are front printed.

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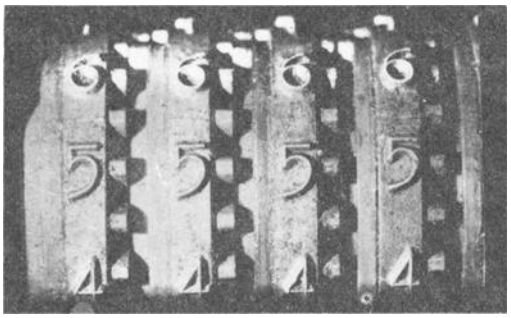

FIG. 1—*Photograph of the actual typefaces of the fuel delivery section of a printing device showing the four concentric rings or numbers.*

Two imprints are made of each ticket, one before any oil is pumped and the second when the delivery is completed. The numerals of the delivery portion are directly geared to the meter so that whenever pumping stops, the device is ready to print the total number of gallons pumped. In making the second imprint the unit automatically shifts the position of the delivery ticket so that the second imprint appears one line below the first. In addition to the total amount of fuel delivered, the sales number on the second imprint is advanced one unit.

Identifying Characteristics

The printout mechanism contains certain manufacturer class characteristics and with use develops individual defects which permit identification of the unit.

Meters of a particular manufacturer may have distinctive type face design (Fig. 2). If the meter contains eight digits and records tenths of a gallon, this last digit may be the same size as the others, or with some machines it may be smaller. In addition, there may be some difference in the spacing between the columns of numerals. These factors allow for initial elimination of certain suspected meters and, of course, must be in agreement in any identification of a questioned meter.

The manner in which the numerals are generally printed on delivery slips indicates that baseline alignment cannot be depended upon as a means of identifying a particular machine. These printout units are not designed so that the numerals should align uniformly along a baseline. Thus, some print high and some low, which means that letters print unevenly top and bottom, and this uneven printing is not a factor in the identification. Unevenness in the sides of impressions in properly horizontally aligned prints might be of value, but the nature of the ring assembly does not provide for much variation in right and left depth of impression. One must remember that the numerals are mounted on rings and only print relatively flat against the paper when they are accurately centered, but if they are above or below the center baseline, one edge of the type, top or bottom, will make a firmer contact with the paper than the other. Only wear on the hard rubber printing pad can create an uneven printing surface and cause uneven impressions.

The rings cannot move out of left or right position nor can the numerals become twisted so that they fail to print erectly. Thus, unlike typewriting identification, these factors do not play a part in the machine identification.

What remains then are actual examples of damage to the type metal itself. If the unit has had a reasonable amount of use under rugged field conditions, a number of type faces will contain damaged areas which are reflected in the printing on the delivery slips. The type face breaks are found to occur at random over the face of the numeral and can

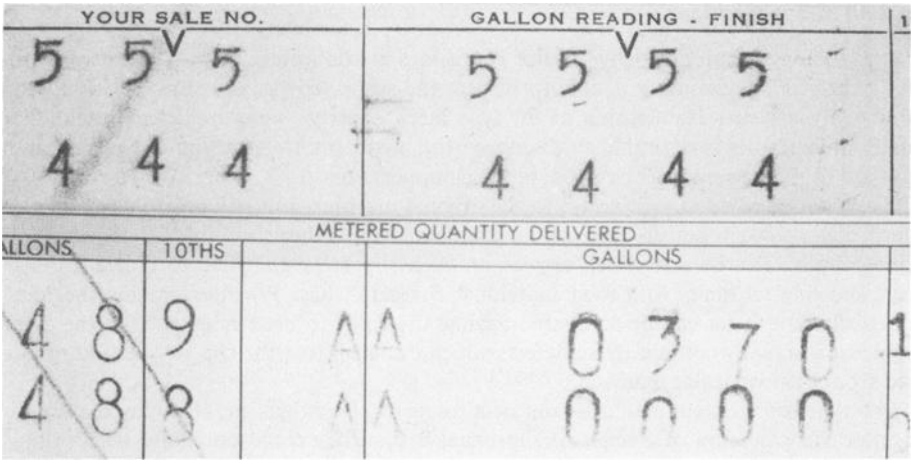

FIG. 2—*Examples of imprints from two different printout devices. Note the difference in size of numerals and spacing between numerals on the two units. Note the code lettering on the lower unit and the small numerals for recording tenths of gallons in the extreme right hand column. The lower print is an actual delivery slip; the upper was made by hand setting the device to prepare a series of slips showing all type defects. The lower, actual delivery slip illustrates the typical irregular baseline alignment.*

be of different degrees of intensity. Since each particular digit is independent of all others as far as damage is concerned, a seven-column machine would have 70 individual digits which could contain identifying defects. The location of a defect on any digit is not correlated to the location of the point of damage on the corresponding digit of another unit, which means that when position is considered the likelihood of two digits having identical defect is remote (Fig. 3).

To attempt to identify the source of an individual ticket may present a difficult problem. Only 7 of the 70 digits are printed on each impression, and except for the sales number, the initial printing consists entirely of zeros. The second printing stamped at the end of delivery records the number of gallons of fuel pumped and the next highest sales number. Generally, this means a change of from one to four digits in the fuel-pumped section and only one digit in the sales number column although a change from 199 to 200 for example would involve all three digits. Thus, the maximum number of digits which could be considered would be fourteen, and in the majority of instances it is limited to a single digit in the sales section and less than four in the other columns since, unless more than 1000 gallons are pumped, at least one zero in both imprints will be repeated. Consequently, the number of identifying defects may be insufficient to establish a positive identification. Thus, without a number of known slips and an opportunity to examine the machine itself a single delivery slip may be beyond identification. If there are a quantity of slips in question, however, identification becomes firmer.

FIG. 3 — *The reproduction of two damaged typefaces and the corresponding imprints from these numerals. The flattended area at the top of the 4 is not easily descerned on the imprint on the delivery slip but with experience can be recognized by the slight widening of the pointed top.*

Method of Examination

In examining a series of delivery slips two things are desirable. First, it speeds the process greatly if the examiner is able to inspect the suspected printout unit to locate and catalog, from visual examination of the type faces, exactly where the defects occur. For this examination it is desirable to disengage the meter printout so that it can be hand-adjusted to print examples of each digit which appears on it.

If it is not possible to gain access to the original machine, it is still possible to establish which digits contain defects through an examination of a large number of delivery slips printed by it. The defects which appear on each slip are catalogued to create a defect chart showing all digits with their individual characteristics. When examining the questioned slips the latter can be compared against the chart to determine whether the digits in question actually contain those defects which establish that the slip in question originated from this particular machine.

Two types of problems can arise out of a particular investigation. One may require the absolute identification of a series of slips, that is that they could only have been printed by one particular device. Such would be the case when during the period under investigation there is no information on how many different devices had been at one time or another installed on a fleet of delivery trucks. In such a case, sufficient individuality must be found to establish that only one printout device could have produced certain of the slips in question.

In the more common situation, however, it is known that the delivery slips originated from a particular company which had only a given number of printout units. Since it is possible to interchange the units from one truck to another it is not necessarily true that a particular machine can be identified by the truck which made the delivery. Records may not be kept as to which unit was on a certain truck on a given time. But the problem at hand deals with a limited number of machines, and it is not necessary to establish from the work of a particular machine that it is the only one in existence that could have printed these slips. Rather the problem becomes one of determining which of a small group of machines produced them. It is a problem of differentiating between a limited number of units. In such a case the total number of defects present can be far fewer for a positive identification than if the number of machines is unlimited. In fact, if there is a break in the upper oval of the numeral "8" in the hundreds column of the fuel delivery section on only one of the machines in use, the presence of this defect on a delivery slip clearly establishes the source of the slip. Unfortunately, not every delivery made by this unit will fall in the 800 gallon bracket so that the problem normally becomes somewhat more complicated. However, in practice relatively few defects will identify all of the company's slips from this machine, and its identification may rest only on one or two unique flaws per slip.

There is one complicating element in the identification problem: variation. Not every impression of any digit is uniform. In particular a slight break may be difficult to recognize in some impressions, while in others it will be clearly revealed. This condition can result from the fact that the digit is not exactly centered vertically with each impression. Wear on the printing pad and other chance factors may also create variation. The examiner should expect these complications and be prepared to handle them.

Conclusions

It is possible to identify a particular printout unit used to stamp fuel oil and gasoline deliveries. Make and model differentiation is based on type design and column spacing. The individual unit is identified primarily by the kind and position of damage to the type

faces and in most instances by this factor alone. Fortunately, the units are used under very adverse conditions, and defects are frequent and undoubtedly are more prominent than with many other types of printing devices.

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