

*** COMMONWEALTH OF MASSACHUSETTS ***

Norfolk, ss.

Superior Court,
Criminal Session

COMMONWEALTH OF MASSACHUSETTS

VS.

NICOLA SACCO and BARTOLOMEO VANZETTI

AFFIDAVIT OF ALBERT H. HAMILTON.

ALBERT H. HAMILTON, being first duly sworn, deposes and says that for the past thirty-eight years he has been and now is a resident of the City of Auburn, State of New York.

That he is a graduate of Pharmacy, Chemistry and Microscopy of the former New York College of Pharmacy which is now a department of the Columbia University, located in the City of New York.

That for the past thirty-seven years his profession has been that of Micro-chemical investigator and criminalologist in connection with the investigation of crimes and persons suspected of crime.

That as such an investigator he originated a scientific micro-chemical method of examination of exhibits in suspected homicide and suicide cases by which the exhibits examined under a high power microscope, after reveal the truth concerning their creation and history.

That he has been called as such an expert in one hundred and sixty-five homicide cases and a very large

number of lesser crimes throughout the United States from Maine to Arizona.

That for many years his entire time has been given to this character of work; that about 90% of his criminal investigations have been in response to calls from prosecuting attorneys and investigating authorities, district attorneys, sheriffs, police departments and detective agencies throughout the United States.

That he has been called for special expert work along these and other lines by several attorneys-general of the State of New York, the United States Postal Department, and in special senatorial investigations in New York State and North Dakota.

That for the past fifteen years his entire time has been given to this and similar scientific analytical work.

That in connection with his work in gun shot cases he has visited often, during the past thirty-five years, the various American cartridge, revolver, and pistol factories; critically inspected the machines used, their products, the work of their machine tools, and the peculiarities of manufacture that give individuality to a gun or cartridge. That he has studied those details that enable one to recognize the particular manufacture of a gun or a cartridge and has also studied those details that enable one to recognize an individual gun and cartridge as distinguished from all other guns of the same make and the bullet fired through that particular gun as distinguished from any other bullet fired through any other gun of like make.

That he has fired many thousands of cartridges of various calibres in revolvers, pistols, rifles and shot guns for test purposes and examined critically the products

and results from those test shots; that many of these test shots have been fired into human cadavers.

That in many of the homicide cases in which he has been called one of the main questions was; "Did the mortal bullet pass through the disputed gun?"

That his attention was first specifically directed to this pending case as against Nicola Sacco and Bartolomeo Vanzetti by reading a short press article in some newspaper while in Auburn, New York, some time in 1921 or 1922 after the trial and when some form of a motion was being made for a new trial.

That this article stated that a sharp line of demarcation existed as between Commonwealth and defense witnesses as to their veracity and that the experts called upon to testify as to the fatal bullet having passed through the disputed gun of the defendant Sacco were in direct contradiction of each other. That because of these press statements the affiant sent a brief letter to the Judge named in the paper, stating in effect and to his best recollection, that if the letter was not improper he desired to state that there was a method by which the exhibits in the case could be so examined that they would reveal the truth regardless of what was claimed by either side.

That he expected at that time that the letter might be turned over jointly to the District Attorney and counsel for the defense. That no reply was received.

That the matter passed from his recollection until some time in the month of February 1923 he was interviewed upon a train, between Portland, Maine and Boston, Massachusetts, by one Frank Sibley, a reporter for the Boston Globe, relative to his opinion upon a certain claim of the

Commonwealth in this case as to the mortal bullet having passed through the Sacco gun.

That the affiant declined to give an opinion unless he could first examine the exhibits in his own way, explaining to said Sibley that there are two kinds of identifying marks:

1. Those that simply show identity between the mortal bullet and the calibre and the manufacturer of some gun. That these can be seen by the naked eye or by the use of a simple magnifying glass.
2. Those accidental tool marks explosion marks and injuries that are discovered only by the use of a high power compound microscope in the hands of a skilled, trained observer, but which once discovered can be readily shown to Court and jury by this microscope or by photographs.

That these are the only absolutely identifying marks as to the identity between the mortal bullet and the given suspected gun.

That the first set of identification marks cannot be used for the second.

That the first set of identification marks comprises such marks as the general or average width of the lands and grooves; the shape of sides of the lands, the kind of ejector marks left upon the shells, the general shape of "flow-back" around the firing pin dent, et cetara.

That the second set of microscopic marks are without limit or fixed kind as they are nearly all accidental in origin, arising from the relationship of the suspected bullet and suspected gun. They include defects, rust pits, etc., at the muzzle edge, but not those within the barrel remote from the muzzle end. That rust spots within the barrel, scoring scrapping, et cetera, do not identify either the manufacturer or a particular gun. They identify nothing because clean, new, unruled guns, fresh from the factory do the same. They also include a complete set of measurements of each land and groove taken consecutively, the style,

and shape and quality of workmanship of the edges of lands in the weapon and the land marks upon the bullet; and the condition of the roll of the metal along the sides of the lands. That on a suspected shell, claimed to have been fired from a suspected gun, the determination of the question of whether or not it was fired from a suspected gun involves microscopic examination and geometrical, fine measurements of the angular and circular shape of the ejector mark of the ejected shell, likewise of the claw mark on suspected shell, a comparison of same with the gun itself, and with other shells known to have been fired from the suspected gun. It likewise involves the determination of the kind of gilding metal, the markings upon the primer, upon the firing dent, the imperfections upon the firing pin shown in the firing pin dent, the file markings upon the firing pin bushing and the imprint made by same upon the facing of the primer, the kind of metal in the primer, the diameter and depth of the firing pin dent and its location in the primer; and a comparison of all of these matters with shells known to have been fired from the suspected gun.

That the affiant next learned of this case when, on or about March twentieth, 1923, he received an inquiry from Fred H. Moore as to his charges to come to Boston, examine the exhibits and review the expert testimony.

That the affiant, without answering the question of the said Moore, shortly thereafter went to Boston, and, on arrival, informed the said Moore that he was in the City. That, in conference with the said Moore, the said Moore stated to the affiant the general substance of the conflict in the testimony of experts upon the trial in the above entitled case.

He further stated to the affiant that, as counsel for the defendants herein, he was vitally concerned in learning the whole truth with reference to four fundamental

questions:

- (1) Had the hammer of the so-called Vanzetti revolver been replaced by a new hammer since the so-called revolver left the factory of the Harrington & Richardson Company?
- (2). Were one or more of the so-called Fraher shells fired from the so-called Sacco pistol?
- (3) Was the so-called mortal bullet fired from the Sacco pistol?
- (4) Was the so-called mortal bullet discharged from a cartridge of the same date of manufacture as any one or more of the cartridges found in Sacco's possession at the time of his arrest?

Said Moore stated that he wanted answers to these questions independent of the testimony of any expert heretofore called and answers that would be subject to mathematical and photographic proof that others, not experts, could see. He specifically stated that he was anxious, so far as possible, to eliminate mere opinions.

That the affiant then stated to the said Moore that, in order to do this, it would be necessary to examine all exhibits under a high power compound microscope and reproduce, so far as modern photographic processes would allow by photo-micrographs, what was disclosed by the microscope. That the fine measurements that would have to be made by the affiant of the so-called mortal bullet and the so-called Sacco pistol, should be checked up by some skilled, microscopic observer other than the affiant, because proof of this character was not subject to photographic reproduction. That such microscopic measurements would vary microscopically on different days under changed atmospheric conditions; but the relative relationship of such measurements as made under different atmospheric conditions between the so-called mortal bullet, the so-called Sacco pistol and test bullets would not vary in any appreciable amount.

In this same connection, the affiant also stated to the said Moore that he desired to read and study carefully all of the testimony of experts in the above entitled case, as called both by the Commonwealth and by the defense.

That thereafter, on April sixth, 1923, and continuing to and inclusive of April seventh, 1923, in the presence of the District Attorney of Norfolk County, or some representatives of his office, and in the presence of the sheriff of Norfolk County, or some representatives of his office, the affiant did make examination of the following exhibits in this case:

Exhibit 27; known as Vanzetti revolver.

Exhibits 19, 20, 21, 24 and 25, being five automatic 32 calibre pistol bullets, marked 1, 2, 4, X and 5.

Exhibit 30, four exploded 32 calibre ~~exploded~~ shells; one a Winchester, one a Remington U.M.C. and two Peters manufacture and known as Fraher shells.

Exhibit 34; three Winchester 32 calibre automatic pistol exploded shells by Van Amberg at Lowell, Mass, known as the "Van Amberg Lowell test shells".

Exhibit 33; three 32 calibre automatic, pistol cartridge exploded shells, Peters manufacture, known as "Proctor Lowell test shells".

Exhibit 18; the mortal bullet number three, a 32 calibre automatic pistol cartridge bullet.

Exhibit 35; known as the three Van Amberg Lowell test bullets; Winchester 32 automatic pistol cartridge bullets.

Exhibit 36; known as the three Proctor-Lowell test bullets, from 32 calibre automatic pistol Peters cartridges.

Exhibit 28; a 32 calibre Colt automatic pistol, number 219722, known as the defendant Sacco's pistol.

Exhibit 31; containing a collection of mixed manufacture of 32 calibre automatic pistol cartridges including six cartridges of Winchester manufacture.

That previous to the making of this examination the affiant had read all of the testimony as given by all of the experts in the trial of this case, and had made copious notes on said testimony.

That in the examination of said exhibits the affiant first used a simple microscope, followed by a Bausch and Lomb professional compound microscope, equipped with their filar micrometer, an instrument that can measure 1/100,000 on an inch.

That a photograph of said compound microscope as used by the affiant is incorporated with and made a part of this affidavit, on page nineteen of the album of photographs filed herewith.

That upon April sixth and April seventh, 1923, the dates hereinbefore referred to, the affiant had present with him, one Wilbur F. Turner, expert photographer of the City of Boston, and, from time to time, as the affiant's examination of said exhibits proceeded, directed the said Turner's attention to various matters and things appearing upon said exhibits under the microscope, and then directed the said Turner to photo-micrograph said matters so indicated. That the said Turner, then and there, in the presence of representatives of the District Attorney's office and the sheriff's office, made said photographs.

That, at that time and place, the conditions for making photographic micrographs were not such as to enable the said Turner to do all that was required. That, thereafter, the said exhibits, under an order of this court, were taken to the studio of the said Turner in the City of Boston and further photo-micrographs were made. That the affiant has filed herewith and makes a part hereof, the said photo-micrographs as made by the said Turner, under the directions of the affiant, same appearing on pages 1, 2, 3, 4, 5, 6, 7, 12, 13, 14, 15, 16, 17 and 18 of said album.

That the photographs appearing on pages eight and nine of said album are photographs of a drawing made by the affiant to scale one to twenty-five times of the measurements of the bore of the Sacco pistol, the lands and grooves therein and the lands and grooves of the mortal bullet.

That affiant's examination of said exhibits was directed to the determination of the answer to the questions heretofore indicated, as propounded by the said Moore, and to the incidental and collateral questions arising in connection with the questions put to him by the said Moore and his reading of the testimony of experts heretofore called.

In determining my answer to question (1) that is whether the hammer of the so-called Vanzetti revolver, exhibit 27, had at any time since it left the factory been removed and a new one substituted, I made a microscopic examination of the various screws marked 1, 2, 3 and 4 inclusive appearing on page 5 of the album. In removing the hammer of this revolver it is essential that screw #1 should have been removed from the revolver. The removal of this screw together with the subsequent replacing, of necessity, would involve the use of a tool commonly known as a screw driver. The microscopic examination of this screw fails to reveal any marks or scratches or imperfections such as would ordinarily accompany the application of a screw driver to the screw with sufficient force and power to remove the screw, all as indicated by the photograph appearing on page 5 and that particular screw marked with an arrow #1, and also by the enlargement of the same screw-head as the same appears on the photograph on page 4 of said album, and that particular screw-head marked with an arrow #1.

That a comparison of the screw-head marked with an arrow #2 on page 5 of the said album with the other screw-head marked arrow #1 will show that the screw-head #2 has a decided imperfection or mutilation indicating that a screw driver or some instrument of like character has been applied to said screw, while the enlargement of said screw-head #2 appearing on page 4 of the album marked with an arrow #2 shows in greater detail said imperfection and mutilation. All of which matters and things the affiant points out to the court as constituting a sound visual demonstration and proof that screw #1, though necessary to have been removed if the hammer of this revolver had been at any time removed or repaired, has never at any time been removed or repaired.

Further, the affiant alleges and says that the face of screw #1 fails to reveal any scratches or marks such as would ordinarily accompany and be the result of the removal of said screw, all of which matters and things are demonstrated by the photographs

appearing on pages 4 and 5 of the album, and which the court can demonstrate further to his own personal satisfaction by examination under an ordinary microscope of the revolver itself.

That in the determination of my answer to question (2) that is whether or not any one or more of the so-called Fraher shells was fired in the so-called Sacco pistol, the affiant first examined the so-called Fraher shells, exhibit 30, under a simple microscope and later under the compound microscope heretofore referred to.

For purpose of comparison the affiant in the court room at Dedham, in the presence of the District Attorney or his representatives, and in the presence of the sheriff or his representatives, as hereinbefore set forth, fired five separate cartridges from a new Savage automatic pistol 32 caliber, using five assorted cartridges as shown in the bottom row of cartridge heads appearing on page one of the album, the said shells being gathered up by the affiant after firing and the bullets being sifted out of the box of bran into which they had been fired. The photograph of said five cartridge heads appearing on said page one is an enlarged photograph of said cartridge heads so fired as hereinbefore set forth. That likewise, for purpose of comparison, the affiant fired five test shots from a 32 caliber Harrington & Richardson automatic under the same conditions as hereinbefore set forth, using five assorted cartridges. The heads of the five cartridges so discharged appear in the top row of the photograph appearing on page one of the album.

The first comparison made by the affiant of the said four Fraher shells with the five shells discharged from the Savage pistol and the five shells discharged from the Harrington & Richardson pistol as hereinbefore referred to, was for the purpose of comparing the respective sizes of the dents appearing in the four Fraher shells as made by the firing pin with the size of the dents made by the firing pins of the two other pistols, to wit, the Savage pistol and the Harrington & Richardson pistol; that the result of said examination as made by the affiant under

the microscope was that three of the so-called Fraher shells, to wit, those appearing on the photograph on page one of the album and marked F1, F2 and F3, all reveal a firing pin dent larger and different in form than those revealed by any one of the shells fired from either the Savage or the Harrington & Richardson pistol. Likewise, the said examination of the four Fraher shells under the microscope revealed that Fraher shell marked F4 on page one of the album has a firing pin dent smaller than any one or all of the remaining Fraher shells, to wit, F1, F2 or F3.

That as a result of this microscopic examination the affiant determined the following facts:-

(a) That no one of the Fraher shells, F1, F2, F3 or F4, appearing on page one of the album, was fired from a Savage automatic pistol, which fact is visually demonstrated by a comparison of the various photographs appearing on page one of the album. The firing pin dent appearing on S1, S2, S3, S4 and S5 is smaller than the firing pin dent appearing on any one of the so-called Fraher shells.

(b) That Fraher shells F1, F2 and F3 appearing on page one of the album reveal a firing pin dent larger than any of the Harrington & Richardson firing pin dents, H1, H2, H3, H4 or H5, appearing on page one of the album, while Fraher shell F4 reveals a firing pin dent smaller than any firing pin dents appearing in Harrington & Richardson shells, H1 to H5, inclusive, on page one of said album.

That all the said matters are visually demonstrated by the photographs appearing on page one of the album and said conclusions may be demonstrated by the court to his own personal satisfaction by microscopic examination of the various firing pin dents appearing on said various shells.

That from the photographs appearing on page one of the album it is visually demonstrated, using the firing pin dent as the basis of opinion, that no one of the so-called Fraher shells F1, F2, F3 or F4, was fired from a Savage automatic pistol, nor was

any one of said Fraher shells fired from a Harrington & Richardson pistol.

The affiant next examined the ejector marks appearing on said Fraher shells, F1 to F4 inclusive, on page one of the album for the purpose of determining the kind of weapon in which the said shells were fired, using the ejector and claw marks as the basis of the determination of this question. The affiant found that Fraher shells appearing on page one of the album and marked F1, F2 and F3 all show an ejector mark on the base of the shell which is indicated in the photograph appearing on page one of the album by the arrows F1, F2 and F3 pointing to the ejector mark, also that each of said shells marked F1, F2 and F3, further bear upon the side of the shell an additional and an extraordinary ejector or claw mark, all as appears on page thirteen of the album, the upper photograph on said page thirteen of the album being a side view of the shell appearing as F1 on page one of the album, and revealing an ejector or claw mark or mutilation on the side of the shell and pointed out in the photograph by the arrow #1.

That likewise the photographs appearing at the bottom of page thirteen of the album, namely Fraher shells ~~F1~~, F2 and F3, reveal the same character of ejector or claw mark on the side of the shells. The shell appearing at the lower left hand corner of page thirteen of the album is the side view of the same shell as appears, marked F3, on page one of the album, and the shell appearing at the lower right hand corner of page thirteen of the album is the same shell as that marked F2 on page one of the album.

That each of the photographs appearing on page thirteen of the album show one ejector or claw mark on the side of each of the three Fraher shells, F1, F2 and F3, 12/100ths of an inch long and 2/100ths of an inch wide, an ejector or claw mark utterly unknown to any American made pistol and could not possibly have been put on said shells by means of an ejector or claw from an American made pistol.

It is true that the ejector equipment of the Harrington & Richardson pistol does leave an imprint upon the side of a

shell discharged from a Harrington & Richardson pistol, but that imprint is entirely different in kind, character, form, structure, dimensions and location from the imprint on the side of the three Fraher shells, F1, F2 and F3, appearing on page thirteen of the album. The Harrington & Richardson imprint is in three locations; two on the rear of narrow rim of the base on nearly opposite sides of the shell; between them is an irregular pair of dents about one-half to one-third the length of the larger dent appearing on Fraher shells, F1, F2 and F3, on page thirteen, and marked by arrow one. It is also true that the Savage pistol makes an imprint on the side of the shell and an imprint on the edge of the base of the shell, but they are entirely different in location, dimension and form.

All of which matters and things may be visually demonstrated by the Court to his own satisfaction by the examination of any or all of said shells under a microscope.

Further, a comparison under the microscope of the ejector marks on the base of the shells appearing on page one of the album, marked F1, F2 and F3, and again appearing on page thirteen of the album, with the ejector marks appearing on the base of the shells photographed on page one of the album, and marked H1 to H5 inclusive, namely the Harrington and Richardson shells, and the shells appearing on page one of the album, marked S1 to S5 inclusive, the Savage pistol shells, will reveal:

(a) That the Harrington & Richardson ejector makes a mark on the base of the shell similar in location to the Fraher shells, F1, F2 and F3, in general location and general shape, except that it is narrower than the Fraher, not so deep nor has it the pair of deep lines at each edge of the dent as appears on the Fraher dent in upper photograph appearing on page thirteen of the album. Also the lower left hand photograph appearing on page thirteen of the album reveals no ejector mark on the base of the shell, while the shell appearing on the lower right hand corner of page thirteen reveals an ejector mark on the bevel on the base of the shell.

In comparing the upper shell appearing on page thirteen of the album and the shell appearing on the lower left hand corner of the album with the shell appearing on the lower right hand

corner of the album, it should be noted that the shell appearing on the lower right hand corner has a beveled edge, which occasions the difference in the form of ejector mark on said shell at the lower right hand corner on page thirteen from that appearing at the top of page thirteen.

The Harrington & Richardson pistol does cause imprint on the side of shell but same differs in its location, length, breadth and alignment from the long cut marked with arrow one on the shells on page thirteen. A close comparison of the shells themselves under a microscope shows the dissimilarity existing.

(b) That the Savage automatic pistol makes an ejector mark upon the edge of the base of the shell and a mark upon the side of the shell. But the Fraher shells marked F1, F2 and F3 on page one of the album, and the same shells as appear in the photograph on page thirteen of the album, reveal upon the side of the shell an ejector or claw mark utterly unknown to a shell ejected from a Savage pistol and impossible to be made by the Savage pistol mechanism.

That this can be visually demonstrated to the satisfaction of the Court by comparison under the microscope by the Court of any one of the shells appearing on page one of the album marked S1 to S5 inclusive, with the mark appearing upon the base of any one of the shells appearing on page one of the album marked F1, F2 and F3 inclusive, and again appearing on page thirteen of the album.

That there were but four 32 caliber automatic pistols at date of this homicide manufactured in the United States to the best of the affiant's knowledge, information and belief, namely the Savage, the Harrington & Richardson, the Infallible and the Colt. That of these the affiant has, as hereinbefore set forth, eliminated the Savage and the Harrington & Richardson as having been the weapon from which Fraher shells F1, F2 or F3 appearing on page one of the album and again appearing on page thirteen of the album could have been by any possibility discharged.

That the Infallible automatic ejector makes no mark of any kind or character upon the side of the shell in any sense comparable in location, form, size or otherwise with the marks appearing on the shells appearing in the photographs on page thirteen of the album. That likewise the mark appearing upon the base of the shell ejected by the Infallible ejector is a mark utterly dissimilar in kind and character from the ejector marks appearing on any one of the shells marked F1, F2 or F3 on page three of the album. This eliminates the Infallible automatic pistol as having discharged any one of the shells marked F1, F2 or F3 appearing on page one of the album.

That the Colt automatic pistol ejector does make a mark upon the side of the shell about half way between the base of the shell and the top of the shell. This imprint of the ejector or claw on a shell fired from a Colt automatic pistol varies as to the exact place where same appears on the shell, but in general appears about the middle of the shell, but in many cases will not appear at all owing to the fact that in the ejecting process the shell may clear the claw entirely in passing. But the mark made upon the ejected shell by the Colt automatic ejector is always of necessity by the structural form of the claw, different in kind and character from the ejector marks appearing upon the side of the shells on the photographs appearing on page thirteen of the album in that the ejector mark, when same does register on a shell fired from a Colt automatic, is about three to five one-hundredths of an inch wide and five to ten one-hundredths of an inch long, and more or less elliptical in outline rather than a straight line as appears in the photographs on page thirteen of the album.

From all of the above the affiant gives it as his unqualified expert opinion, with no reservations, that Fraher shells F1, F2 and F3, appearing on page one of the album and the same shells appearing again on page thirteen of the album, were not fired from any American made automatic pistol, but were of necessity fired from some automatic pistol of foreign manufacture.

That the affiant having eliminated Fraher shells F1, F2 and F3 on page one of the album as having been fired from any American automatic pistol, next proceeded to the determination of the question whether Fraher shell F4 appearing upon page one of the album, admittedly discharged from a Colt automatic pistol, was discharged from the specific pistol introduced in evidence in this cause, to wit, the so-called Sacco pistol, exhibit 28.

In the determination of this issue the affiant has examined under the microscope said Fraher shell F4 appearing upon page one of the album and again appearing upon page three of the album as F4, and appearing also on page twelve of the album, upper left hand corner, and on page sixteen, upper left hand corner, and compared same with the so-called Proctor test shells admittedly fired from the so-called Sacco pistol by Captain Proctor at the United States Cartridge Company proving grounds at Lowell, Massachusetts, said shells appearing as P1, P2, and P3 on the upper line of page three of the album, and the Van Amberg shells fired under the same conditions and appearing as V1, V2 and V3 at the bottom of page three of the album and again appearing on page twelve of the album as Lowell test shell #1, Lowell test shell #2 and Lowell test shell #3, and again on page sixteen of the album as test shell #1, test shell #2 and test shell #3.

That as a result of said examination the affiant determined the following facts:-

(a) As arranged upon page three of the album, not in the position they occupied in the barrel of the gun, the affiant saw that the firing pin dent upon each of the Van Amberg shells was off center, while in the Fraher shell F4 it was in exact center. Upon page twelve of the album, the Fraher shell F4 and the three Van Amberg Lowell test shells were each photographed as they are located when fired within the barrel with the ejector mark at the extreme left a trifle below the horizontal diameter of the shell. In this natural firing position the Fraher shell shows the firing pin dent in almost perfect center, while upon each of the three test shells it is twenty-three per cent

off and below center, which condition also appears upon page sixteen of the album.

(b) That a comparison of Fraher shell F4 as appears upon page three of the album with the Proctor test shells as appears on the top line of page three of the album, reveals that all of the Proctor firing pin dents are off center the same as in the case of the Van Amberg shells below; that the affiant did not make a further detailed enlargement by photograph of the Proctor test shells because said Proctor test shells were Peters shells with a primer entirely different in character from that used in the Winchester Fraher Shell F4.

(c) That a comparison of the firing pin dent in Fraher shell F4 appearing on pages one and three of the album and again appearing on pages twelve and sixteen of the album with the Van Amberg Lowell test shells, shows that in general the firing pin dent upon the Fraher shell is of the same general diameter as that appearing upon the Van Amberg shells, but this is merely a distinguishing characteristic of the particular make of gun and would be equally applicable to both the 32 Colt automatic and the 380 Colt automatic, in both of which pistols the same sized firing pin is used.

(d) That the affiant next examined for tool marks and imperfections the firing pin dent appearing in Fraher shell F4 and again appearing on pages twelve and sixteen of the album and compared same with the firing pin of the Sacco pistol, said firing pin appearing in the two photographs appearing at the right of page twelve of the album, respectively horizontal and perpendicular views. The horizontal view appearing at the upper right hand corner of page twelve of the album shows at the point indicated by arrow, a distinctive groove in the face of the firing pin at a point just below the extreme point of the firing pin, and same imperfection is again registered by photographic process in the picture appearing at the lower right hand corner on page twelve of the album. The picture appearing at the upper right hand corner of said page twelve of the album shows said imperfection as being a black line directly opposite the arrow. While the same imperfection is registered in the picture at the lower right hand corner as a white streak. In analyzing the

photograph appearing at the lower right hand corner of page twelve showing the breech block of the Sacco pistol with the firing pin protruding through the center, it must be remembered that said photograph was taken from an angle down into the barrel of the Sacco pistol and that the breech block with protruding firing pin is at the extreme end of the barrel from the point where the photographic lens was installed, so that said photograph appearing at the lower right hand corner of page twelve, while intended to reveal the condition of said firing pin and breech block on a line directly parallel with the barrel of the Sacco pistol, does not do so because of the necessary angle from which said photograph was taken.

The angle from which said photograph was taken causes the heavy black half moon shaped line in the photograph, same being the shadow of the firing pin protruding from said breech block.

The imperfection in the face of the firing pin just below the point of the firing pin as heretofore referred to, should and does register itself upon and in the firing pin dent.

If the Fraher shell F4 appearing at the very left hand corner of page 16 of the album was fired through the same automatic pistol as fired the three Lowell test shells appearing also on page sixteen of the album, then the imperfection in the firing pin should register itself upon all four shells the same.

An examination of the four shells appearing on page sixteen of the album fails to reveal that said imperfection in said firing pin has registered upon all of said four shells in the same manner.

An examination of the Fraher shell F4 on said page sixteen of the album shows an imperfection at the right interior of the dent 60/100ths of an inch long when measuring the chord of the arc of the imperfection, said imperfection appearing in said photograph as a semi-circular dark line at the right of the center of the said firing pin dent.

That an examination of all three of the test shells appearing on page sixteen of the album, test shell #1, test shell #2 and test shell #3, shows an imperfection in the firing pin dent as follows:-

An imperfection 25/100ths of an inch long measuring the chord of the arc, begins at two o'clock and extends to about three-thirty and is one-half the width of the imperfection appearing upon the Fraher shell F4.

That in further explanation of the photograph on page twelve of the album, left hand side, showing the Fraher shell F4 and the three Lowell test shells, and likewise the photograph of the same shells again appearing on page sixteen of the album, it should be noted that, under instructions of the affiant, Mr. Wilbur F. Turner, photographer, in taking the photographs on page twelve of the album, focused the lens of the camera on the face of the shells for the purpose of bringing into relief the condition of the face of the shells; while in photographing the shells on page sixteen, again under the instructions of the affiant, said Turner focused the lens of the camera back into the interior of the firing pin dents. This for the purpose of showing in as clear relief as possible the condition of the interior of the said dents. So that for the purpose of determining the condition of said interior of said dents, and of the face of said dents, it is necessary that the photograph appearing on page sixteen of the album shall be used; while for the purpose of determining the condition of the face of the shells, the photographs appearing on page twelve of the album should be used.

That on page two of the album is a photograph of the firing pin and bushing of a Colt automatic pistol; that that part of said photograph appearing at the left, with a screw formation, is what is known as the bushing, and the part that protrudes out of the bushing to the left and right of said screw formation is the firing pin. That the said firing pin fits snugly into the said bushing. That the photograph is taken in such wise as to indicate the firing pin protruding from the bushing to the left. That the photograph appearing at the lower right hand corner on page twelve is a photograph of the breech block. That a bushing like that on page two of the album is screwed into the

breech block, the line of joinder of the two metals appearing in the lower right hand corner of the photograph on page twelve of the album in a circular line about one-half inch from the centre surrounding the firing pin. When this bushing is screwed into the breech block at the time of assembling of a Colt automatic pistol at the factory it is the habit and custom of the factory to put a small set of finishing files into the hands of a mechanic for the purpose of making a uniform surface at the point of jointure of the breech block and bushing, surrounding the hole for the firing pin. That if the court will remove the long sliding top that holds the barrel of the Sacco pistol in place, he will see, on examination of the face of the breech block and bushing, after removing any oil or grease from its face, that the files so used by the mechanic at the time of assembly of the pistol, as hereinbefore set forth, must of necessity be used by a mechanic with an up and down motion from the under side of the breech block to the top side of the breech block; and that the space within which said files can be used is very limited, being peculiarly curtailed by the claw that protrudes on the left side of the breech block and bushing running into the frame work that holds the barrel from the bottom side. The space available for this filing operation on the face of the breech block and firing pin is only one-half of an inch wide and four-tenths of an inch deep. That as a result of this operation the face of the breech block and bushing of every Colt automatic possesses a distinct individuality, imposed upon it by this filing operation at the time of assembly, said individuality consisting of a series of file scratches, running from some parallel, others intersecting and bisecting acutely, and others at nearly right angles and forming a large number of geometrical figures and bifurcated Y-shaped

scratches. The angles so formed, the measurements of the sides, the location of these angles, and the large number of them ^{and do} would give each pistol breech block its individuality.

That for the purpose of determining whether the Fraher shell F4 on pages one and three of the album or the shell appearing at the upper left hand corner on page twelve of the album, was fired in the Sacco pistol, it is necessary to examine the face of the said shell and compare same with the face of the Lowell test shells, admittedly fired from the Sacco pistol, and then compare all of said shells with the face of the breech block and bushing of the Sacco pistol; all to be done under a high power, compound microscope.

It must be understood that at the time of firing an automatic pistol cartridge the recoil of the said cartridge against the breech block and bushing of the automatic pistol forces the base and primer of the cartridge against the breech block and bushing with such force that the harder steel surface of the breech block and bushing imprints upon the softer metal alloy of the cartridge base, any and all irregularities in the surfaces of the breech block and bushing; the extent and degree of this printing process will vary with the hardness of the alloy that goes to make up the base of the cartridge and primer, some munition companies using alloys that make a metal harder than those used by other companies, but in all cases the imprint will be left. This imprint may be compared to an embossing upon the base of the cartridge and primer and consists in the softer metal having a certain raised surface, caused by the softer metal being shaped at the time of the recoil by the irregularities in the harder metal of the breech block and bushing.

The photograph of the four shells appearing on page twelve of the album is a photo-micrograph of the face of said Fraher shell and of the three Van Amberg-Lowell test shells. While the photograph appearing at the lower right hand corner of page twelve of the album is the best reproduction, under highly difficult conditions, of the face of the breech block of the Sacco pistol.

That, in explanation of not showing the face of the Proctor shells for the purpose of comparison, it should be noted that the primer of the Peters shell, used by Captain Proctor in his test shots at Lowell, is composed of an alloy that makes a harder metal than the alloy used in the primer of the Winchester shells used by Captain Van Amberg. The result of the difference in the hardness of the metal is indicated readily to the eye by an examination and comparison of the three Proctor shells, as same appear at the top of page three of the album, with the three Van Amberg test shells at the bottom of page three of the album, and also with the one Winchester Fraher F4, on page three of the album.

It will be noted that the indentation in the primers of the Proctor shells, caused by the firing pin, is round in form, with less flow-back, while the indentation on the primers of the Winchester shells, is more clearly, sharply defined, not rounded, and with pronounced flow-back.

As a result of the primer on the Peters shells being composed of a harder metal than those of the Winchester shells, it does not register with the same degree of fulness the individuality of the pistol from which it is discharged.

An examination of the Fraher shell F4, as same appears in the photograph in the upper left hand corner on page twelve of the album, compared with the other three Lowell test shells reveals as follows; that upon the three Lowell shell primers appear a rectangular prominence or elevation of the copper, 5/100 of an inch horizontally wide and 10/100 of

an inch perpendicularly long at the top centre, each plainly visible on the Lowell shell numbered three, upon the Lowell shell numbered two and visible upon the Lowell shell numbered one, but not so pronounced. Upon the Fraher shell it is entirely missing. Placing a knife blade perpendicularly upon the centre of each of the firing pin dents on the three Lowell shells and observing the flow-back upon the left and right, the affiant says that at the left of the knife blade there is a large, wide roll of the flow-back, but that the portion upon the right is small, fine, and narrow upon each of the three Lowell shells. Applying the knife blade to the Fraher shell F4, in the same horizontal manner, he observes that the amount, width, thickness and roll of the flow-back is equal upon each side. At the upper centre edge of the flow-back upon the three Lowell test shells appears a V-shaped extra amount of flow-back, plainly visible upon the Lowell shells numbered three, and much less distinct upon number two. In nearly the same location appears an extra amount and elevation of flow-back upon the Fraher shell F4, not V-shaped, but a pronounced wedge shape, the wedge having the narrowest edge to the right. Protruding from the top of this wedge shape deposit upwards, are two file marks forming a V-shape, the same being 20/100 of an inch long and 6/100 of an inch wide at the top. Upon the Lowell shells a W-shaped set of file marks extend upward from the V-shaped elevation; the sides of the W as follows, the left side mark is 35/100 of an inch long, the two centre marks are 35 and 40/100 of an inch respectively in length, the right hand side of the W being 35/100 of an inch. That the previously described rectangular elevation is at the top of the centre of the W upon the Lowell shell numbered three.

Upon the primer to the left of the dent upon the Fraher shell F4 on page twelve appear three file marks intersecting each other, forming a long, narrow letter Y, its centre

being 10/100 of an inch to the left of the flow-back. The dimensions of the Y are as follows: the straight file mark at staff of the Y being 30/100 of an inch long, extending upward, the Y being inverted; the left hand side of the Y being 35/100 of an inch long, the right hand side being 40/100 of an inch long. Upon the Lowell test shells, in the same general location as shown upon the Lowell shell #3, page twelve, appears three file marks, intersecting and forming an inverted letter Y, located, at its centre 12/100 of an inch to the left of the flow-back. Its dimensions are: staff of the letter is first 25/100 of an inch long and then changes its direction to the right and extends, in a north-easterly direction, 25/100 of an inch in four, minute, parallel, fine file marks. That the left side of the Y is 25/100 of an inch and 35/100 of an inch to the right, with two extra file marks in between. That between this Y and the left margin of the primer upon the Lowell shell appear nine distinct file marks, running more or less parallel, with two intersections. Upon the Fraher shell, between the Y and the left margin of the primer appear seven coarser, heavier file marks, two of them intersecting, and again being intersected by a third, forming a fan shaped formation.

Upon the Fraher shell F4, appearing upon page twelve, at the right of the firing pin dent, two file marks intersect, forming an inverted V, its apex being 15/100 of an inch from the edge of the flow-back. The left side of the V being 28/100 of an inch long, the right side 50/100 of an inch long, and, 10/100 of an inch from its lower extremity, it is intersected by a short line, 18/100 of an inch long, which in turn is intersected on the left by a horizontal line 30/100 of an inch up from its centre, forming a geometrical figure of a long, narrow, inverted V, with a letter Y

overlapping it and to the right of the V. 6/100 of an inch distant, appears a long file mark 55/100 of an inch long, and, near its centre, a short line intersecting it which is 10/100 of an inch long.

Comparing the Lowell test shells #3 and #2 at the same point with the last above description of Fraher shell F4 the affiant found the following:

An inverted V-shaped formation; the intersection being 16/100 of an inch to the right of the flow-back, the length of line being one inch long, but near its centre it is intersected by a short, wide line 18/100 of an inch long. At the lower extremity there are no intersecting lines as upon the Fraher shell. At the right of it are three parallel lines, one 4/100 of an inch to the right of the upper portion and 35/100 of an inch long. 5/100 of an inch to the right of the lower portion of this V, and 10/100 of an inch to the right of the upper portion, extends a long scratch line, 75/100 of an inch long and at its centre a short line appears off to the left, 13/100 of an inch long; and 15/100 of an inch to the right of the V is a third line, being 50/100 of an inch wide, irregular in shape. No such formation appears upon the Fraher shell in this locality, but does appear upon the Lowell test shell #2 in the lower right hand corner of photograph on page twelve. A portion of it appears upon the Lowell shell #1, the primer in Lowell shell #1 not being forced so complete flat by the explosion, the entire geometrical diagram is not recorded upon Lowell shell #1, but only a portion of the geometrical diagram being recorded on Lowell shell #1.

That measuring the width of the flow-back upon the Fraher shell at about seven-thirty o'clock by the dial, its

greatest width is 10/100 of an inch, whereas upon the Lowell shell at the same seven-thirty o'clock location, it is 15/100 of an inch wide, as measured upon page twelve of the album.

Comparing the surface of the primer upon the Fraher shell F4, appearing on page twelve of the album, the upper portion above the firing pin dent beginning with the file mark extending in V-shape above the centre of the dent and going to the right until the inverted V is reached, affiant saw under the microscope eight, coarse wide file marks, all extending in a perpendicular direction and practically parallel. Taking the same area upon the Lowell test shell #3, appearing in the photograph on page twelve of the album, just below the Fraher shell F4 he observed a number of delicate file marks; the first four delicate file marks beginning at the same location heretofore described above the centre of the flow-back, forming the letter W. Adjoining this the next three delicate file marks form the letter N and then there are three more delicate file marks running parallel, occupying the space to the inverted V on the right, with an extra file mark running through the centre of the letter N.

There is in all of these comparisons so far given between the file marks upon the Fraher shell and the Lowell test shells, a wide difference in the degree of fineness of the file marks indicating the fineness of the file used. The file marks appearing upon the Fraher shell being from two to three one-hundredths of an inch wide, while upon the Lowell test shells the file marks are from one to two one-hundredths of an inch wide, showing that the file used upon the bushing of the pistol firing the Fraher shell was nearly twice as coarse as the file used upon the bushing of the Sacco pistol.

Taking the area upon the face of the primer in the Fraher shell F4, page twelve of the album, that is below the flow-back and pin dent extending from the inverted Y at the

left across to the inverted V upon the right, there are ten coarse, wide, visible file marks, nearly parallel horizontally. In the same way, upon the Lowell shell #3, there are but two plainly visible, coarse file marks and from five to six less visible, and some parallel, others angular very fine file marks, with several intersecting file marks at small acute angles. This location upon the Lowell shells has the finest, smallest file marks upon the face of the primer, whereas upon the face of the primer of Fraher shell F4 some of the coarse, widest, heaviest file marks appear.

That the affiant next compared, under the microscope, the ejector marks registered upon the base of Fraher shell F4 with the ejector mark registered upon the three Van Amberg test shells. If the Fraher shell F4 was fired from the same gun as fired the Van Amberg test shells, namely, the Sacco pistol, then the ejector mark upon all four shells should be the same. The examination of the Fraher shell F4 under the microscope revealed that the ejector mark appearing upon the face of the base of Fraher shell F4 was without any clear cut, defined, right angle apex, but that on the contrary, same was deformed, it being of greatest width at the centre and apex not recorded and its entire edge of irregular formation. Its greatest length as recorded on page two of the album, is 35/100 of an inch and its width at its centre 15/100 of an inch; its top 10/100 of an inch and its cottom, 5/100 of an inch, while on the three test shells on page twelve of the album, the ejector mark is right-angle, triangular in shape, being 13/100 of an inch wide at the top, with apex at the bottom, and 55/100 of an inch long. This applies to each of the three Lowell test shells.

On page sixteen the Fraher shell F4 ejector mark is 15/100 of an inch wide at the top, 20/100 of an inch wide at

its centre, 7/100 of an inch wide at the bottom, and 45/100 of an inch long. Whereas upon the three Lowell test shells it is 15/100 of an inch wide and 65/100 of an inch long, and apex at the bottom. This applies to all three Lowell test shells.

To recapitulate the reasons why the Fraher shell F4 could not have been fired from the Sacco pistol, the affiant directs attention, by way of summary, to the matters hereinbefore set forth in detail as follows:

(a) That the firing pin dent on Fraher shell F4 is substantially in the exact centre of the primer. While the firing pin dent upon all of the test shells is off centre approximately twenty-three (23) per cent, same being visually demonstrated by the photographs appearing upon page three of the album and more clearly defined in the enlarged photographs appearing on pages twelve and fifteen of the album.

(b) That there is an imperfection upon the firing pin of the Sacco pistol which registers upon the Van Amberg test shells but which does not register upon the Fraher shell F4, which is visually demonstrated by the photographs appearing on pages twelve and sixteen of the album.

(c) That there are file marks upon the face of the breech block and bushing of the Sacco pistol made by the mechanic at the time of the assembling and fitting of the Sacco pistol in the factory, which give individuality to the pistol and which register upon shells discharged from that particular pistol; that such imperfections are registered upon the Van Amberg shells as same appear on pages twelve and sixteen of the album, but same are not registered upon Fraher shell F4. That Fraher shell F4 does have upon its face markings indicating the form and structure of the breech

block and bushing with which it came in contact at the time it was discharged, but said markings are entirely different, both as to their relative form and relationship one to the other and as to their fineness, from the markings appearing upon the test shells. All of which is visually demonstrated by photographs appearing on pages twelve and sixteen of the album.

(d) That the flow-back in the firing pin dent of the Fraher shell F4 is an entirely different flow-back, both as to size, form and location, from that appearing on the Van Amberg test shells, all of which is visually demonstrated by the photographs appearing on pages twelve and sixteen of the album.

(e) That the ejector marks appearing upon the Fraher shell F4 is an entirely different ejector mark, both as to size and form, from the ejector marks appearing upon all three of the test shells; which differences are visually demonstrated by the photographs appearing on pages twelve and sixteen of the album.

Summarizing the affiant's answer to question two, that is whether any one or more of the so-called Fraher shells was or were fired from the so-called Sacco pistol, the affiant answers that as a result of his examination he gives it as his unqualified opinion that Fraher shells F1, F2 and F3, as same appear photographed on page one of the album, were not fired from an American made automatic pistol but were fired from some automatic pistol of foreign manufacture; that Fraher shell F4, the Winchester shell, was fired from a Colt automatic pistol, 32 calibre, but was not fired from the so-called Sacco pistol.

The affiant next proceeded to a determination of a question not asked directly by said Moore, but brought out by reason of the affiant's examination of the exhibits and by his reading of the transcript of the expert testimony herein. Namely, whether any one or more of the so-called Savage bullets, exhibits 19, 20, 21, 24 and 25 and marked respectively on the base 2, 1, 4, X and 5, had upon them identifying marks that show that they were discharged through a Savage 32 automatic pistol.

That the affiant first measured the lands and grooves on said bullets under a simple microscope and found that the general average width of the lands on said bullets was $3\frac{1}{2}/100$ ths of an inch, while the general width of the grooves on said bullets was $12\frac{1}{2}/100$ ths of an inch; from this the affiant formed the opinion that all of said five bullets were fired from the same make of weapon.

The affiant having satisfied himself as to the general width of lands and grooves on the said five bullets, next discharged in the court room at Dedham in the presence of the District Attorney or his representatives and of the sheriff or his representatives, from a 32 Savage automatic pistol just from the factory, five 32 automatic bullets steel jacketed, all as hereinbefore set forth, and thereafter measured the lands and grooves as same appeared upon said bullets so discharged.

That the affiant found that the said lands and grooves on said five bullets so discharged under a simple microscope showed the average width of lands as $4\frac{1}{2}/100$ ths of an inch, while the average width of grooves was $10\frac{1}{2}/100$ ths of an inch.

Comparing the average width of lands on the five bullets, exhibits 19, 20, 21, 24 and 25, with the average width of lands on the Savage bullets, shows that the average width of lands on the Savage bullets as $1/100$ th of an inch wider than those appearing on said exhibits. While the average width of the grooves on the Savage bullets is $2/100$ ths of an inch less than those appearing upon the exhibits

That on page six of the album the center line of bullets

shows photo-micrograph of exhibits 20, 19, 21, 25 and 24, while the bottom line shows five Savage bullets as fired by the affiant as hereinbefore set forth in the court room at Dedham. That an examination of said two sets of bullets shows that each of the five exhibits, center line in the photograph, reveals double land-marks or overlapping land-marks; said over-lapping land-marks on each bullet being made by the same land in the gun. While the Savage bullets, lower line in the photograph, reveal no over-lapping land-marks but a clean, single, well-defined land-mark.

From the above the affiant is of the firm opinion that no one of the five exhibits 20, 19, 21, 25 or 24 were discharged from a Savage pistol or from a pistol of equal quality of workmanship and mechanism. That as a further reason for the affiant's opinion that the said five bullets 20, 19, 21, 25 or 24, or none of them, were discharged from a Savage automatic pistol, the affiant directs the Court's attention to the fact that the land-marks appearing upon the five exhibit bullets are all longer than those appearing upon any one of the Savage bullets below. The land-marks on the exhibit bullets in each case extend considerably below the cannellure while in the case of the Savage bullets, the land-mark extends very little above the cannellure. The average length of the land-marks as registered on the photographs on page six of the album of the exhibit bullets is from 83 to 85/100ths of an inch, while the average length of the land-mark on the Savage bullets is 60/100ths of an inch.

That the affiant having eliminated the Savage automatic pistol as the weapon that discharged said five exhibits, next proceeded to the determination of the answer to the question what weapon did discharge said exhibit bullets.

That the Colt automatic was immediately eliminated by the affiant as a possibility because the five bullets, exhibits 20, 19, 21, 25 and 24, all reveal a twist in the land-marks from left to right, while the Colt automatic registers a land-mark on its bullets from right to left.

The Infallible automatic pistol does register a twist on the bullet from left to right, but the lands on the Infallible measure

6/100ths of an inch while the grooves on the Infallible measure 9/100ths of an inch. That incorporated herewith and made a part hereof and filed herewith are two bullets fired through an Infallible automatic 32 pistol and the exploded shells from which they were fired.

That the only American manufactured gun that has a left to right twist of the land-marks and grooves of the same average width as exhibits 20, 19, 21, 25 and 24, is the Harrington & Richardson 32 automatic manufactured at Worcester, Massachusetts.

At the top of page six of the album are five Harrington & Richardson bullets fired through a Harrington & Richardson 32 automatic pistol by the affiant in the court room at Dedham in the presence of the District Attorney or his representatives and of the sheriff or his representatives, all as hereinbefore set forth. That the average width of the lands on said bullets as measured with a simple microscope is $3\frac{1}{2}$ /100ths of an inch, while the average width of grooves on said bullets as measured under the same microscope $12\frac{1}{2}$ /100ths of an inch.

That summarizing the affiant's answer to the question from what make of weapon were exhibits 20, 19, 21, 25 and 24 fired, the affiant gives it as his unqualified opinion that no one of said bullets were fired from a Savage automatic pistol; that the affiant is of the opinion that the width of the lands and grooves on said exhibits is consistent with same having been fired from a Harrington & Richardson 32 automatic pistol.

It must be understood, however, that affiant does not state that the said exhibits 20, 19, 21, 25 or 24, or any of them, were fired from a Harrington & Richardson 32 automatic pistol. He merely does state that the condition of the lands and grooves on the said Exhibit bullets is consistent with same having been fired from a type of gun like the Harrington & Richardson 32 automatic.

In this connection the affiant directs the Court's attention to the upper five bullets appearing on page six of the album and the land and groove registrations thereon showing the imperfections in the land and groove markings, all indicating a particular quality of workmanship and mechanism.

In this connection, however, attention should be directed to the fact that the average length of land-marks on the Harrington & Richardson bullets is 75 to 80/100ths of an inch, while the average length of land-marks on the Exhibit bullets is 84/100ths of an inch.

The affiant next entered upon the determination of the answer to question three, that is whether the so-called mortal bullet was fired from the Sacco pistol.

In entering upon the determination of this question the affiant had in mind that in the course of his expert and investigation work on automatic pistols and particularly on the Colt automatic pistol, he has learned by investigation at the Colt automatic pistol company factory of their methods of manufacture that while it is planned and contemplated by the manufacturer that the bore of each and every 32 Colt automatic pistol shall be identical, nevertheless, no two Colt automatic pistols are identical, either as to the widths of the lands or the width of the grooves or the diameter of the bores. These differences are the inevitable product of the manufacturing process and are caused as follows, to wit:

That after the portion of the pistol known as the barrel has been formed as a solid steel bar, a smooth cylindrical hole is drilled through it lengthwise and given sufficient finish for smoothness to constitute later the finished surface of the lands that are to be left after the rifling tool has cut the groove. The bored cylinder is then placed in a rifling machine, an instrument which holds the barrel in position and permits a tool or rod to be pushed through and re-drawn with a twist motion from right to left until a small peculiarly shaped cutting instrument upon the end of the rod has cut a groove into the surface of the interior of the barrel to a pre-arranged depth, and corresponding in width to the width of the cutting blade at the time that groove was cut. When one groove is thus made, the blade is moved a certain distance and another groove is cut as before, and so on around until the six grooves have been cut with a twist motion into the interior surface of the barrel.

The cutting process starts with a cutting blade fashioned

to the pre-determined standard width of groove blade measuring .105 of an inch and leaving the unremoved space between the two grooves as a land approximating .050 of an inch. Theoretically, each groove and each land so cut should be uniform to the above measurement, but due to the high friction under which the cutting tool works it rapidly wears away the right and left edges of the tool, constantly making it narrower and narrower until there comes a time, after a few hours, when the ^{cutting} tool has to be removed and a new one installed, due to the fact that it has worn to an extent that it is cutting a groove too narrow, leaving a land too wide to conform to the specification of the ballistic engineer. As a result of this constant wear upon the edges of the cutting tool, and the frequent changing of a worn tool to one less worn, the microscopic width of the groove and the land are constantly changing between certain limits, and the twelve measurements in their sequence, extending around the interior of the barrel, six lands and six grooves, have an ever changing combination of twelve measurements. That it is this constant change of the cutting blade that gives the individuality to the new pistols, fresh from the factory; that subsequently as these pistols go out upon the market, are fired, become filled with nitrous corroding fumes from exploded smokeless powder and are improperly cleaned by the use of improper tools and emery flour, which has a tendency to again wear away the sides and corners of the lands, a new individuality is given to these pistols. That this latter process of improperly cleaning a weapon will not affect the individuality of a pistol to such an extent as to affect the relationship between the mortal bullet fired through it and test bullets fired at a later date where the mortal pistol has been constantly in the hands of some officer of the court and out of use.

With the above ideas in mind, the affiant first sought to determine what were the exact measurements of the lands and grooves of the mortal bullet.

Using the Bausch and Lomb compound microscope, together with Filar micrometer attachment and standardized stage micrometer, the affiant measured each land and groove upon the mortal bullet at or near the base. Van Amberg and Proctor had both testified that they found the lands to measure .050 of an inch, and Van Amberg testified that he found the grooves to measure .107 of an inch. The affiant measured each land and groove consecutively. The results of his measurements appear graphically illustrated by the drawing on page nine of the album. That drawing is made to the scale of one to twenty-five.

The affiant's actual measurements consecutively were as follows:-

Land mark #1	.050 inches	groove mark #2	.1000 inches
Land mark #3	.1512 "	" " #4	.1025 "
" " #5	.0525 "	" " #6	.1050 "
" " #7	.050 "	" " #8	.1000 "
" " #9	.050 "	" " #10	.1025 "
" " #11	.050 "	" " #12	.1025 "

The affiant next proceeded to the measurement of the lands and grooves in the Sacco automatic pistol, measuring same at the muzzle, where the fired bullet receives its final marking. He found that the said measurements were as follows, to wit:

Land mark #1	.050 inches	groove mark #2	.1050 inches
" " #3	.045 "	" " #4	.1050 "
" " #5	.050 "	" " #6	.1025 "
" " #7	.0475 "	" " #8	.1025 "
" " #9	.050 "	" " #10	.1025 "
" " #11	.0475 "	" " #12	.1050 "

These measurements are graphically illustrated by drawing on page eight of the album, again drawn to scale of one to twenty-five.

The measurements of the land marks and grooves on a fired bullet should conform with the land and groove measurements of the weapon from which it was discharged when measured consecutively

around the bullet and weapon.

On pages ten and eleven of the album will be found positives upon celluloid of the same pictures appearing upon pages eight and nine of the album. The positive celluloid on page ten being made from the negative of picture on page eight, and the positive celluloid on page eleven made from the negative that made the picture upon page nine.

As heretofore stated, the drawings upon pages eight and nine of the album were made by the affiant on scale one to twenty-five and conform to the set of measurements of the so-called mortal bullet, and the so-called Sacco pistol, as hereinbefore set forth.

If the measurement of the land marks on the mortal bullet conform with the lands and grooves of the Sacco pistol, then it would be persuasive evidence that the mortal bullet came from the Sacco pistol. But the set of measurements do not conform one with the other. All as can be made to appear visually by superimposing the two celluloid positives one upon the other so that the dot center of the bullet of the positive on page eleven is placed upon the dot center of the positive on page ten, and so superimposed the bullet film is revolved upon its common center in an effort to find a location where all twelve lands and grooves simultaneously fit each other, and no such situation can be found with a complete revolution of one film upon the other around the common center. With the two centers superimposed, one or two lands will fit, while the remaining eleven or ten do not.

If the twelve land marks on the mortal bullet did fit the lands and grooves consecutively and simultaneously on the Sacco pistol, it would be proof positive that the mortal bullet came from the Sacco pistol, but that not being the case, it is equally proof positive that the mortal bullet did not come from the Sacco pistol.

The affiant next considered what significance, if any, was to be given the fact that mortal bullet, Exhibit 18, shows some four or five of the land marks wider near the head or nose of the bullet, while the narrow point of said landmark is at the base of

the bullet. The affiant examined all three of the Van Amberg Lowell test bullets and also all the Proctor Lowell test bullets under the microscope and found that the landmarks on each of said bullets were the same width at the head or point nearest the nose of the bullet as at the base of the bullet. If it be assumed that the fact that the land marks being wider at the top or near the nose of the mortal bullet than at the base is significant as indicating the specific weapon from which the mortal bullet was fired, then the fact that the land marks on all of the test bullets fired at Lowell fail to reveal that the land marks are wider at the top or near the nose than they are at the base, should constitute conclusive evidence that the mortal bullet was not fired from the Sacco pistol. That the land marks on the test bullets are of the same width at the top or near the nose as they are at the base is a matter which is demonstrated by the photographs of the test bullets appearing on pages fourteen and seventeen of the album and is a matter which the Court can further demonstrate to his own satisfaction by examination under a microscope of the bullets themselves.

Microscopic examination of the most clearly defined of the two double land-marks appearing on the mortal bullet, Exhibit 18, shows that said double land mark consists of four identifying scratches arranged parallel as follows:- Two at the left $\frac{4}{100}$ ths of an inch apart; $\frac{7}{100}$ ths of an inch to the right are two more parallel scratches $\frac{6}{100}$ ths of an inch apart, and $\frac{5}{100}$ ths of an inch to the right of these is a parallel, deep scratch or cut. While upon each of the six Proctor-Van Amberg Lowell bullets appears a double land-mark, and upon each of said double land marks appear eight parallel fine scratches $\frac{3}{100}$ ths of an inch apart, except that the sixth and seventh lines counting from the left are $\frac{6}{100}$ ths of an inch apart.

Assuming from the above uniformity of measurements of the scratches upon the double land-marks of the Lowell test bullets, that one land in the Sacco pistol made this double land mark upon each of the Lowell bullets, it is conclusively demonstrated that the double land-mark upon the mortal bullet with its different set

of measurements of the scratches on the double land-mark, and with the extra wide land at the top, shows that a pistol other than the Sacco pistol fired the mortal bullet.

On page fifteen of the album appear photographs of six bullets all fired by the affiant out of two new separate 32 Colt automatics, just from the factory, whose numbers appear on page eighteen of the album as consecutively 418830 and 427518.

That all of the bullets so photographed are Winchester 32 calibre automatic pistol cartridge bullets of the same make as the mortal bullet and manufactured within less than twelve months of the date of manufacture of the mortal bullet, and all bear the same identifying "W" as appears upon the mortal bullet. And the said cartridges were loaded at the time they were discharged by the affiant with the same powder content and with the same primer as was the cartridge that contained the mortal bullet at the time that it was discharged.

That the bullets appearing on page fifteen of the album marked H10, H11 and H14 were all fired by the affiant from the same Colt automatic pistol. While the bullets H9, H12 and H13 were all fired from another Colt automatic pistol. Comparison of said photographs will visually demonstrate that bullets #10, #11 and #14 show the same double or superimposed land marks with the same parallel land marks below. While photographs marked H9, H12 and H13 again show the same general character of double or superimposed land marks and again the same type of parallel line land mark, except the extra land mark upon H10, H11 and H14 is a larger, taller imprint than the three ^{upon} H9, H12 and H13, each set corresponds to the pistol that made it, proving that a given land from one pistol made each mark on one set of bullets and a given land in the other pistol made its mark upon the other set of bullets, all indicating and proving that a specific land in the Sacco pistol made its land mark upon each of the Lowell test bullets, and also that the mortal pistol with a different land from those in the Sacco pistol made a different double or superimposed land mark upon the mortal bullet.

The affiant next proceeded to determine whether or not the scoring, that is the scraping off of the tin plating on the metal jacket of the mortal bullet, Exhibit 18, could be used as a basis of determining or as a test of the weapon from which the mortal bullet was fired.

The affiant first examined the so-called Lowell test bullets as fired by Van Amberg and Proctor and found that no two of said bullets show a scoring or scraping at all allied in kind, character, or place, or amount; all of which is a matter of visual demonstration by examination of the photographs of the Lowell test bullets as found on pages fourteen and seventeen of the album, and which the court can visually demonstrate to his own satisfaction by the examination of the said test bullets themselves.

The affiant then discharged from two different Colt automatic pistols, just new from the factory, free and clear of all rust, three cartridges, loaded with metal jacketed bullets, identical in character with the mortal bullets and manufactured, as hereinbefore set forth, within a period of less than twelve months of the date of manufacture of the mortal bullets by the Winchester Company.

The said bullets so discharged from the said two new, Colt automatics, unruined, appear on page eighteen of the album. Photographs marked number one, three and five, were all fired from the same Colt pistol, loaded with the same cartridge and metal jacketed bullet. The photograph of said bullets, as the same appear on page eighteen of the album, reveal that all three of said bullets are scored or scraped in an entirely different and dissimilar manner, no two alike.

An examination of bullets marked number two, four

and six, on page eighteen of the album, discharged from the other Colt automatic, again reveal that no two of said bullets are scored alike, but all of same are scored entirely differently, with no relationship as to the extent, degree, or location of the scoring.

The diameter of the bore of the Colt automatic pistol that fired bullets marked one, three and five, on page eighteen of the album, is .3052 of an inch, while the diameter of the Colt automatic pistol that fired bullets marked two, four and six on page eighteen of the album, is .3032 of an inch, while the bore of the Sacco Colt automatic pistol is .2924 of an inch. It will be noted that of the three bullets fired by the affiant from the smaller diameter bore pistol there appears on the photographs on page eighteen of the album, numbered two, four and six, the greatest amount of scoring, which would seem to give strong foundation for the opinion that the smaller the bore of the pistol at the muzzle, the greater the extent of the scoring.

It will also be noted, that the Sacco pistol is of smaller bore than either of the Colt automatic pistols used by the affiant. Attention is directed, in this connection, to pages fourteen and seventeen of the album, and to the Lowell test bullets themselves, in proof of the fact that the Lowell test bullets show a greater degree and extent of scoring or scraping of metal from the bullet than does the mortal bullet, Exhibit 18.

Insofar as the question of scoring is concerned the affiant is of the firm opinion that scoring cannot be used as a basis of determining the weapon from which a given bullet has been discharged, nor even to the extent of the kind of manufacture of weapon, and cannot indicate that a given bullet was fired from any specific, individual gun,

unless there be some unusual and prominent defect or injury upon the edge of the muzzle end of the land or groove, in which case such a weapon would duplicate its scratches often upon succeeding shots. There is no such defect or injury at or near the muzzle of the Sacco pistol.

Summarizing the answer to the question whether the mortal bullet was fired through the Sacco pistol, the affiant gives it as his unqualified opinion that same was not fired through the Sacco pistol. The mortal bullet does possess upon its face, marks that definitely identify it as having been fired through that particular make of pistol, known as the Colt automatic 32 calibre, but it possesses no particular and specific marks that identify it as having been fired through the specific Sacco 32 automatic pistol.

The mortal bullet does have a twist of the lands from right to left, which is the same twist as is given to a bullet fired from a Colt automatic; likewise the lands of the mortal bullet average in general width .0506 of an inch, which is entirely consistent with the .050 standard measurement of the Colt automatic pistol but entirely inconsistent with the average width of the lands in the specific Sacco automatic pistol which is .0483.

Summarizing the reasons for the affiant's unqualified opinion that the mortal bullet was not discharged from the Sacco automatic pistol, the affiant says:

(a) That, as hereinbefore specifically pointed out in detail, the lands and grooves as same appear on the mortal bullet do not at all fit or correspond with the lands and grooves at the muzzle of the specific Sacco automatic pistol, when consecutively measured.

(b) That the form, structure and markings, on both

lands and grooves of the mortal bullet, possess no peculiar markings or characteristics to identify same as having been fired from the Sacco automatic pistol.

- (c) That the double land mark or superimposed land mark on the mortal bullet, insofar as same possesses any evidentiary value at all indicating the weapon from which the mortal bullet was discharged, indicates by the differences in the markings or lines on said double land mark or superimposed land mark from those appearing on the test bullets fired by Van Amberg and Proctor at Lowell, and from the test bullets fired by the affiant, that the mortal bullet was fired from a pistol other than the Sacco Colt automatic.
- (d) That the scoring or scraping of the metal jacket on the mortal bullet possesses no evidentiary value at all as indicating or tending to prove in any wise whatsoever that the mortal bullet was fired from the Sacco automatic pistol, inasmuch as the same kind and character of scoring or scraping of the metal jacket appears on bullets fired from new Colt automatic pistols; all as appears from the photographs on pages fifteen, seventeen and eighteen of the album, and as likewise appears on the bullets fired from a new Harrington and Richardson and a new Savage pistol, all as appears on page six of the album. That the scoring or scraping of the metal jacket on a bullet possesses no mark of individuality that enables one to determine, at all, from what pistol

a given bullet was fired, or even to determine from what manufacture of pistol the given bullet was fired.

The last above statement is subject to the qualification that where there is a rust pit or other injury immediately at or upon the muzzle edge of the rifling of the pistol, same may register itself upon a metal jacketed bullet and will register itself upon a soft lead bullet. Again attention is directed to the fact that the Sacco pistol shows no rust pit or other injury at or near the muzzle.

The affiant next undertook to determine whether the mortal bullet, Exhibit 18, was discharged from a cartridge like and containing a bullet like any one or more of the cartridges found in Sacco's pistol at the time of his arrest.

The affiant first examined the mortal bullet under the microscope and with a protractor, an instrument for determining angles. The affiant found upon the face of the said mortal bullet a cannellure which appears in the photograph at the extreme right on page seven of the album as a series of parallel lines extending around the said bullet at a point upon ~~xxxxx~~ the lower half of said bullet, said lines being commonly known as nurls; and same being placed on the bullet at the time of manufacture by a nurling wheel, upon the rim of which wheel are nurls producing duplicates of the nurls appearing on a bullet. Examining the nurls on the mortal bullet with the use of the protractor it appears that said nurls on said mortal bullet are three degrees off perpendicular to the left as shown upon page seven by the arrow 3L and the fine hair lines drawn upon the photograph on the upper half of the mortal bullet that are in alignment with the four nurls below them.

The affiant then examined the six cartridges alleged to be found in the defendant' Sacco's pocket, likewise of Winchester manufacture and bearing upon their face the identifying "W" and also containing cannellure with nurls. Microscopic examination of said cannellure on five of the said six cartridges, together with the protractor, revealed that the said five cannellures are exactly perpendicular and not three per cent off the perpendicular as in the case of the mortal bullet, which indicates conclusively that the nurling wheel that made the nurls on the cannellure of the mortal bullet was a different nurling wheel from that used in making the nurls on five of the six cartridges in Sacco's pocket. On the cartridge at the upper left hand corner of page seven of the album the nurls do not extend sufficiently above the metal shell to allow of the use of the protractor, but microscopic

examination of such part of the nurls as does extend above the metal of the cartridge and the entire cannellure, does enable the affiant to have the opinion that an examination of the bullet contained in said cartridge if removed would show that the same nurling wheel made the nurls on the bullet at the extreme upper left hand corner as on the remaining five cartridges.

The above variation of three degrees between the nurls on the mortal bullet and the nurls on the six cartridges found in Sacco's pocket, enables the affiant to form the unqualified opinion that the mortal bullet was manufactured at a time different from the manufacture of the six Winchester cartridges found in Sacco's pocket, and that in due and regular course of manufacture the mortal bullet would not, having been manufactured at a different time, be placed in the same carton as that which contained the six Sacco Winchester cartridges.

That the affiant has turned over to counsel in this cause that certain 32 Savage automatic pistol #248934 from which the cartridges were fired as hereinbefore set forth by affiant, and has likewise turned over to counsel five certain bullets fired through the said pistol together with those certain five shells from which said bullets were discharged.

That affiant has likewise turned over to counsel that certain 32 Harrington & Richardson automatic pistol #29804, together with the five bullets fired through said pistol, together with the five shells from which said bullets were discharged, all as hereinbefore referred to.

That affiant has likewise turned over to counsel herein those certain two 32 caliber Colt automatic pistols #427518 and #418830 hereinbefore referred to, through which the affiant fired those certain bullets photographs of which appear on pages fifteen, seventeen and eighteen of the album, with the exception of mortal bullet as same appears on said pages of the album.

That affiant has likewise turned over to counsel said bullets so fired as hereinbefore set forth.

That affiant has likewise turned over to counsel two bullets and two shells fired from an Infallible 32 caliber automatic pistol.

Further, affiant sayeth not.

Albert H. Hamilton

Subscribed and sworn to before me this fifteenth day of October, 1923.

Justice of the Peace

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5545-9546

COMMONWEALTH OF MASSACHUSETTS
Norfolk, ss. 107 Superior Court
Criminal Session
.....

COMMONWEALTH OF MASSACHUSETTS

VS.

NICOLA SACCO AND BARTOLOMEO
VANZETTI
.....

AFFIDAVIT OF
ALBERT H. HAMILTON

RECEIVED & FILED

OCT 16 1923

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